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# BOEHRINGER INGELHEIM PRIORITY PROJECT B10 AND B6 2019

PLUMBING

HVAC

SPRINKLER

## OPERATIONS AND MAINTENANCE MANUAL

*Contracting in Plumbing, HVAC, and Sprinkler*

CT Licenses: P1-277842, S1-303124, SM1-3935, MG1-MGV-572 and F1-40126

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Jesus Christ paid the price for our sins

# ***Installation, Operation and Maintenance Manuals***

**Job Title:** Black Rock Congregational Church

**Customer PO#:** 4845-16

**Engineer:** Altieri, Sebor, Wieber

**Contractor:** Eastern Mechanical

**Elevation: (ft)** 16

**Date:** 7/15/2019

**Submitted By:** Dan Carafeno

**Agent Order#:** N47228

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## Black Rock Congregational Church

## Product IOMs

Mark Name	Model Name
HFSD 14 ga w GTS-1, HFSD 16 ga w GTS-1	FSD-311
fsd rd, retaining plates	FSDR-511
DAMPER	VCD-23



**Document 481318**  
**Multi-Blade Fire and Combination Fire**  
**Smoke Damper**

DFD-xxx, DFDAF-xxx, FSD-xxx, FSD-xxxV, IMO-xxx, SEDFD-xxx, SEFSD-xxx, and SSFSD-xxx  
 1½ and 3 Hour Fire and Combination Fire Smoke Dampers  
 (with factory installed sleeve and actuator)

**Installation, Operation and Maintenance Manual**

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

These instructions apply to 1½ and 3 hour rated fire and combination fire smoke dampers mounted in: 1) masonry, block, or stud walls and 2) concrete floors. Specific requirements in these instructions are mandatory. Dampers must be installed in accordance with these instructions to meet the requirements of UL 555 and/or UL 555S.

**Note:** Combination fire smoke and fire dampers are manufactured and labeled for either vertical or horizontal installation. The dampers must be installed in accordance with labeling.



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**Receiving and Handling**

Upon receiving dampers, check for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for.

Dampers must be kept dry and clean. Indoor storage and protection from dirt, dust and the weather is highly recommended. Do not store at temperatures in excess of 100°F (38°C).

**Safety Warning**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

This manual is the property of the owner and is required for future maintenance. Please leave it with the owner when the job is complete.



## General Information

**“UL CLASSIFIED (see complete marking on product)”**

**“UL CLASSIFIED to Canadian safety standards (see complete marking on product)”**

Standard 555 & 555S (Listing #R13317)

### Installation Supplements

Refer to the appropriate Greenheck installation supplements for special requirements:

- Concrete Floor with Steel Deck
- Drive Slip Breakaway Connection
- Field Installed Sleeve
- Fire Resistant Ventilated Duct Assembly
- Firestop Material
- Fusible Link Replacement
- Greenheck Test Switch
- Grille Installation
- Metal Stud in Shaftwall Partition
- Non-Concrete Horizontal Mount
- Open or Close Indicator (OCI)
- Quick Connect Breakaway Connection
- Resettable Link (RRL)
- Resettable Link with Blade Indicator (RRL/OCI)
- Sealant Supplement
- Single 3-Sided Retaining Angle Supplement
- Sleeve Extension
- Smoke Detector - Various Types
- Temperature Limited Override (TOR)
- Tunnel Corridor

Installation supplements available at [www.greenheck.com](http://www.greenheck.com).

## Electrical Guidelines

### Electrical Guidelines

All wiring shall be done in accordance with the National Electrical Code ANSI/NFPA-70 latest edition, any local codes that may apply, and wiring diagrams developed in compliance with the job or project design and specifications.

### Important!

Electrical input may be needed for this equipment. This work should be performed by a qualified electrician. Verify power before wiring actuator. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect field wiring. To avoid causing death or serious bodily harm to building occupants, follow all instructions carefully. Dampers must close completely to preserve the integrity of the fire smoke separation.

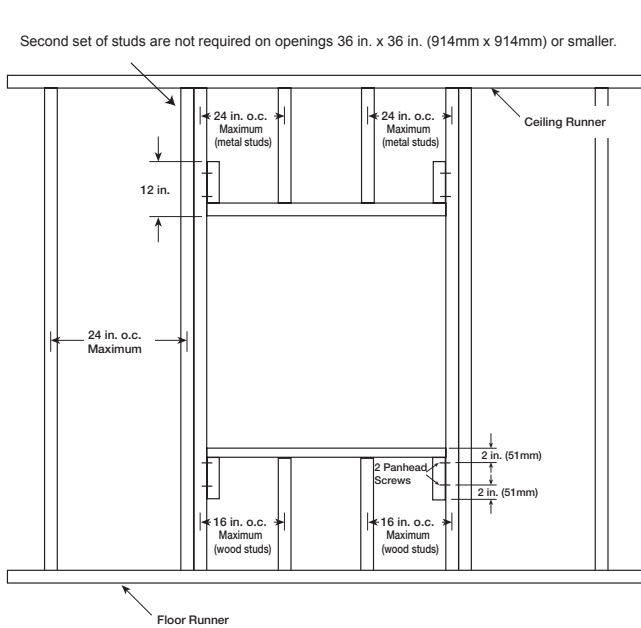
## Pre-Installation Guidelines

The following items will aid in completing the damper installation in a timely and effective manner.

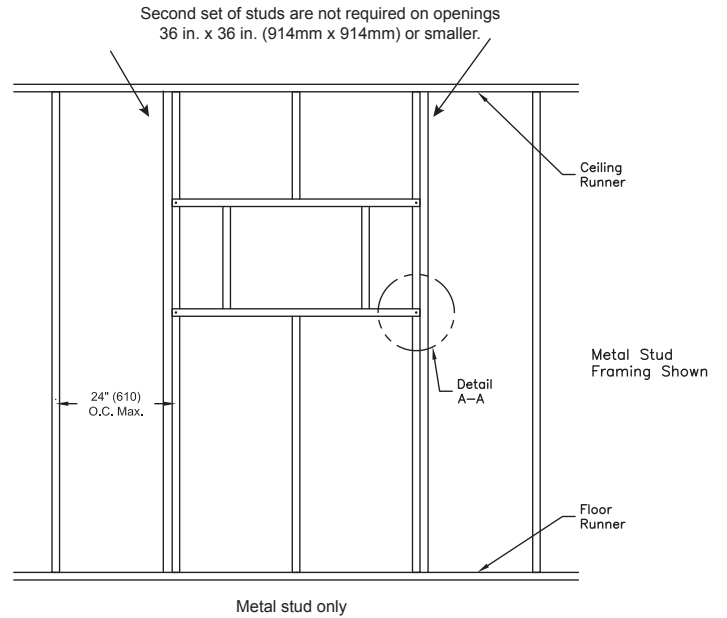
- 1) Check the drawings for proper damper locations within the building. Visually inspect the damper for damage and verify that the Reusable Resettable Link (RRL) is in place and has not activated if provided. These electric links have a button for resetting. Visually inspect the link to verify its not missing or broken. Replace link as necessary.
- 2) Lift or handle damper using sleeve or frame. Do not lift damper using blades or actuators.
- 3) Damper has label on outside of sleeve indicating a ‘No Screw’ area. Do not install screws into this area as screws may interfere with unexposed blade linkage and prevent damper blades from opening and/or closing.
- 4) Damper has label indicating position of damper and sleeve assembly in the wall. Install accordingly to comply with manufacturer’s appropriate UL Classification file number.
- 5) Damper must be installed into duct or opening square and free of twist or other misalignment. Out of square, racked, twisted or misaligned installations can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 6) Damper and actuator must be kept clean and protected from dirt, dust and other foreign materials prior to and after installation. Examples of such foreign materials include but are not limited to:
  - a) Mortar dust
  - b) Drywall dust
  - c) Firesafing materials
  - d) Wall texture
  - e) Paint overspray
- 7) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet of the damper. Excessive dirt or foreign material deposits on the damper can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 8) Caulking is not necessary, nor is it allowed, between the damper sleeve and the wall or floor opening (annular space). However, caulking may be applied to the retaining angles.
- 9) ACCESS: Suitable access (such that RRL’s and actuators can be maintained, etc.) must be provided for damper inspection and servicing. Where it is not possible to achieve sufficient size access, it will be necessary to install a removable section of duct. (Refer to NFPA 90A).
- 10) The Code Authority Having Jurisdiction (AHJ) must evaluate and provide approval of final installation where variations to these instructions are necessary.

## Preparation of Openings

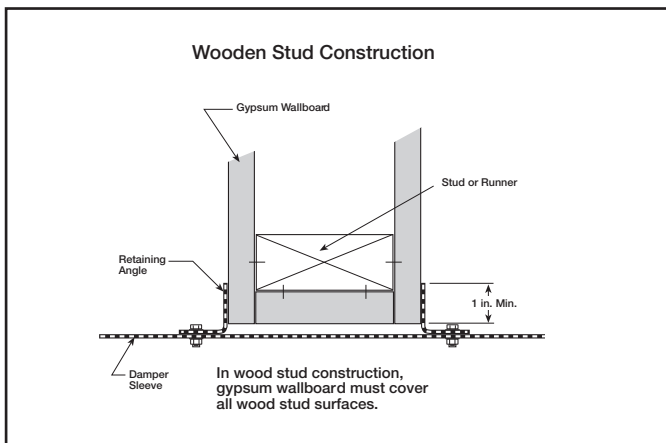
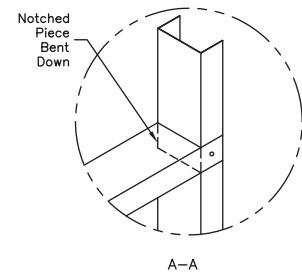
- Frame wall openings as shown below (see **Figure 1 & 2**).
- Gypsum wall board must be fastened 12 in. (305mm) on center to all stud and runner flanges surrounding opening.
- Prepare opening between studs and sleeve assembly as shown below (see **Figure 3 & 4**).
- All construction and fasteners must meet the requirements of the appropriate wall design (See UL Fire Resistance Directory) and/or local codes.



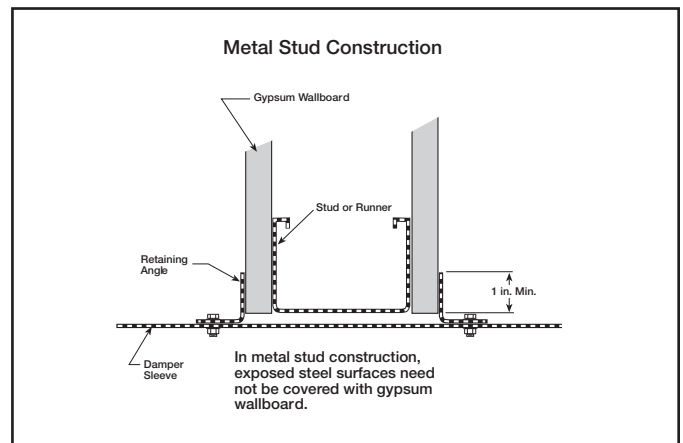
**Figure 1**



**Figure 2**



**Figure 3** (2 sided angle installation shown)



**Figure 4** (2 sided angle installation shown)

## Clearances Required Between Damper Sleeves & Wall/Floor Openings

### Two-sided Angle Installation

Two sided angle installations require clearances for thermal expansion between the damper sleeve and the wall/floor opening. The minimum required clearances are:

- For galvanized steel fire dampers and sleeves:  $\frac{1}{8}$  in. per foot (3mm per .3 m) of damper width and  $\frac{1}{8}$  in. per foot (3mm per .3 m) height with a minimum clearance of  $\frac{1}{4}$  in. (6mm). The total gap may be up to 6 in. (152mm), 3 in. (76mm) per side, as long as the retaining angles overlap the wall/floor by a minimum of 1 in. (25mm).
- For stainless steel fire/smoke dampers and stainless steel or galvanized sleeves:  $\frac{3}{16}$  in. per foot (5mm per .3 m) of damper width and height with a minimum clearance of  $\frac{1}{4}$  in. (6mm), maximum of 2 in. (51mm).

#### Example:

A 12 in. x 12 in. (305mm x 305mm) will require a minimum clearance of  $\frac{1}{4}$  in. (6mm) width and  $\frac{1}{4}$  in. (6mm) on height  
 A 48 in. x 12 in. (1219mm x 305mm) damper will required a minimum clearance of  $\frac{1}{2}$  in. (13mm) on width and  $\frac{1}{4}$  in. (6mm) on height.

These are total clearances (ignoring fastener heads) and do not need to be equally spaced around the damper. Although the minimum requirements are listed above, for ease of installation the following are the recommended clearances for galvanized dampers:

- Width/Height of 48 in. (1219 mm) or less -  $\frac{1}{2}$  in. (13mm) clearance
- Width/Height between 48.01 in. (1220 mm) and 96 in. (2438 mm): 1 in. (25mm) clearance
- Width/Height greater than 96 in. (2438 mm):  $1\frac{1}{2}$  in. (38 mm) clearance

### Single Side Angle Installation

On vertical mount single side angle installations there are no minimum clearance requirements between the wall opening and the damper sleeve. However, to facilitate installation, clearances between the wall opening and the damper sleeve are recommended.

On horizontal mount single side angle installations a minimum clearance is required between the outside of the damper sleeve and the floor opening of  $\frac{1}{8}$  in. per foot (3mm per .3m) of damper width and  $\frac{1}{8}$  in. per foot (3mm per .3m) height with a minimum clearance of  $\frac{1}{4}$  in. (6mm).

## Installing Multiple Section Damper Assemblies

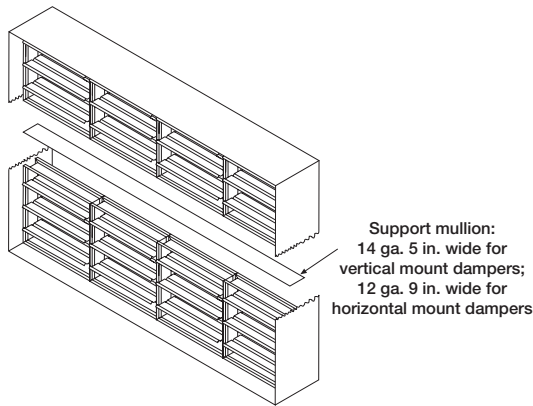
A damper assembly is not restricted to a maximum number of sections, but must not exceed the section sizes and overall sizes shown (see chart below).

Some multiple section high damper assemblies require additional structural support between the damper frames. The following multiple section high damper assemblies require the use of either a support mullion between the damper frames as shown in **Figure 5** or individual sleeves around each row of dampers as shown in **Figure 6**:

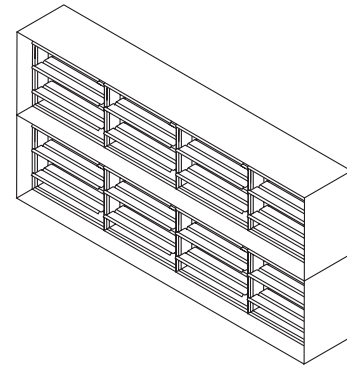
- All horizontal mount dampers
- All vertical mount dampers over 72 in. (1829mm) high and greater than 2 sections wide
- All vertical mount dampers rated for more than 4 in. wg (1 kPa)
- All vertical mount dampers that use fusible links as a closure device

The damper sections must be attached together with #10 ( $\frac{3}{4}$  in. max. [19mm]) sheet metal screws,  $\frac{1}{4}$  in. (6mm) diameter nuts and bolts, tack or spot welds, or  $\frac{3}{16}$  in. (48mm) diameter steel pop rivets. Attachments must be spaced a maximum of 6 in. (152mm) on centers and a maximum of 2 in. (51mm) from corners. Attachments must be made on front face and back face (air entering and air exiting side) of damper sections.

**Note:** Dampers ordered for individual installation may not be installed together. The full assembly size must be specified at the time the dampers are ordered.



**Figure 5:** Single sleeve around outside with support mullion



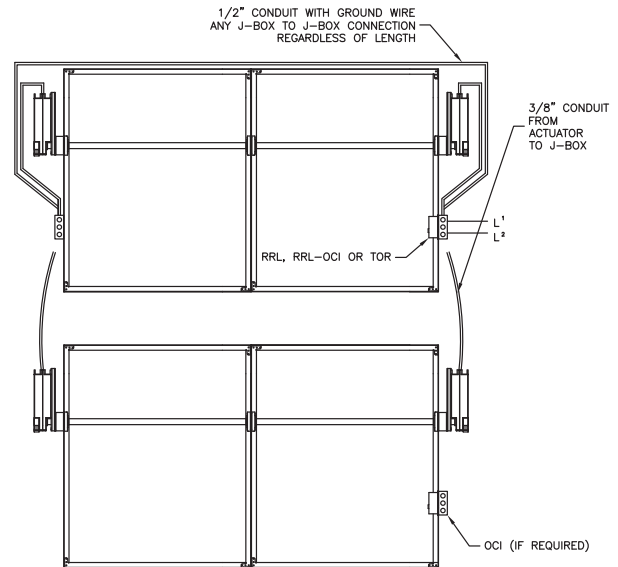
**Figure 6:** Two individually sleeved units with no mullions

### Multiple Section Damper Wiring

Dampers greater than 84 in. (2134mm) high will ship in two ship sections. Conduit whips from ship section will need to be wired to junction box on ship section with the closure device (see Figure 7).

When smoke and fire smoke dampers are ordered with an open/close blade position indicating device (included with the OCI, RRL/OCI, and TOR accessories) one device is provided per row of damper sections. For example, a two section high damper assembly will be provided with two open/closed indicating devices.

Note that all damper sections on a given row are operated by a single jackshaft and thus forced to operate in unison. On two section high dampers, although the two open/closed indicators are not factory wired together, it is common industry practice to field wire the two open switches in series and the two closed switches in series so that the system monitoring the damper will detect a fault if either row of dampers fails to reach the end of stroke condition.



**Figure 7:** Multiple section damper wiring

### Maximum Assembly Tables

Horizontal Mount		
Damper Model	Maximum Single Section Size (inches)	Maximum Overall Size for Multi-Section Dampers (inches)
DFD-210	36 x 36 or 32 x 50	128 x 96
DFDAF-310	32 x 50	144 x 96
FSD-211, 212, 213	36 x 48 or 32 x 50	144 x 96
FSD-211M, 212M	30 x 36	144 x 72
FSD-231M	36 x 36	72 x 48
FSD-311, 312	32 x 50	144 x 96
FSD-311M, 312M	32 x 50	128 x 96
FSD-331, DFDAF-330	30 x 48	144 x 96
IMO-310	32 x 50	NA
IMO-311	32 x 50	NA
SEDFD-210, SEFSD-211	24 x 30	48 x 30
SSFSD-211	24 x 30	48 x 30

Vertical Mount		
Damper Model	Maximum Single Section Size (inches)	Maximum Overall Size for Multi-section Dampers (inches)
DFD-210	36 x 36 or 32 x 50	128 x 100
DFDAF-310	32 x 50	128 x 100
FSD-211, 212, 213	36 x 48 or 32 x 50	128 x 100
FSD-311, 311M, 312, 312M	32 x 50	128 x 100
FSD-311V	50 X 32	100 x 32
FSD-331, DFDAF-330	32 x 36 or 30 x 48	120 x 96
IMO-311	32 x 50	NA
	32 x 50	NA
SEDFD-210, SSDFD-210	24 x 30 or 22 x 36	48 x 30
SEFSD-211, SSFSD-211	24 x 30 or 22 x 36	88 x 72

**Note:** FSD model dampers fitted with a fusible link closure device are limited to single section sizes.



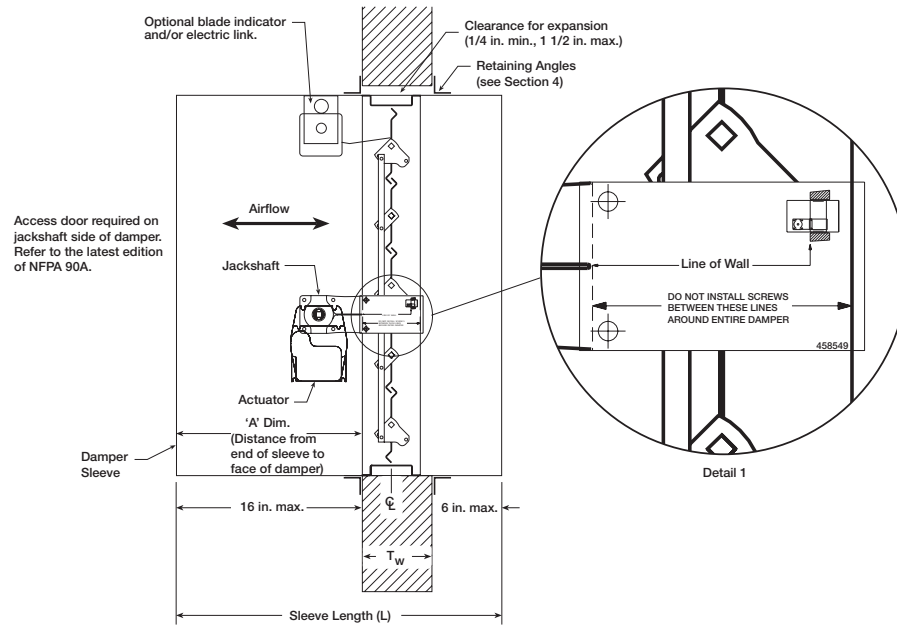


## Inserting Damper into Wall/Floor Openings

Insert the sleeved damper assembly into the prepared opening. Refer to label on outside of sleeve for the recommended location of the damper in the wall or floor (see Dimension A and Detail 1, **Figure 8**).

Special attention must be paid to ensure the following:

- 1) The  $\phi$  (centerline) of the damper frame remains within the plane of the wall or floor
- 2) Attachments made through the retaining angle do not penetrate the 'No Screw' area designated on the damper sleeve.
- 3) The sleeve does not extend more than 16 in. (406mm) beyond the wall or floor on the actuator side of the damper and 6 in. (152mm) on the side opposite the actuator. The sleeve may also extend up to 16 in. (406mm) beyond the wall or floor if the damper has a factory supplied access door.



**Figure 8:** Properly Installed Combination fire smoke damper

Most fire and combination fire smoke dampers come with factory supplied sleeves. For field supplied sleeves, see the Field Supplied Sleeves supplement at [www.greenheck.com](http://www.greenheck.com). The following are recommended sleeve lengths for various wall thicknesses:

Wall Thickness Dimension ( $T_w$ )	Recommended Sleeve Length Dimension (L)
4 - 6 in. (102mm - 152mm)	16 in. (406mm)
7 - 10 in. (178mm - 254mm)	21 in. (533mm)
11 - 13 in. (279mm - 330mm)	24 in. (610mm)

## Securing the Damper/Sleeve Assembly to Wall/Floor Openings

All fire and combination fire smoke dampers may utilize the two sided angle installation method described below. 1½ hour rated fire and combination fire smoke dampers may use the single sided angle installation method up to the following maximum sizes:

- Vertical mount: 80 in. W x 50. in. H (2032mm W x 1270mm H), 50 in. W x 80 in. H (1270mm W x 2032mm H), or 40 in. W x 100 in. H (1016mm W x 2540mm).
  - Horizontal mount: 144 in. W x 96 in. H (3658mm W x 2438mm H)
- **Retaining Angle Gauge:** Retaining angles for 1½ hour rated dampers with a width and height 48 in. (1219mm) or less must be a minimum of 20 ga. (1mm). Retaining angles for all 3 hour rated dampers and all dampers with a width or height greater than 48 in. (1219mm) must be a minimum of 16 gauge (1.5mm).
  - **Retaining Angle Size:** The leg of the retaining angle on the damper sleeve shall be a minimum of 1¼ in. (32mm). The leg of the retaining angle on the wall/floor shall be long enough to cover the annular space and overlap the wall/floor by a minimum of 1 in. (25mm).
  - **Retaining Angle Attachment to Sleeve:** Retaining angles must be attached to the damper using one or more of the following methods of attachment (refer to label on outside of sleeve for 'No Screw' area):
    - Tack or spot welds
    - #10 (¾ in. [19mm] max.) sheet metal screws
    - ¼ in. (6mm) bolts and nuts
    - ⅜ in. (5mm) steel pop rivets

A minimum of two connections per side, top, and bottom, 12 in. (305mm) O.C. maximum for openings of 48 in. W x 36 in. H (1219mm x 914mm) and less. Dampers greater than 48 in. wide (1219mm) or 36 in. high (914mm) require the connections to be no more than 6 in. (152mm) on center.

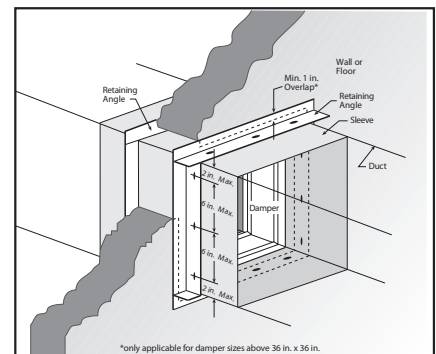
The angles must be attached to all 4 sides of the sleeve. Ensure that fasteners do not interfere with the operation of the damper. The angles need not be attached to each other at the corners.

- **Retaining Angle Attachment to Wall/Floor:**

**Two sided Angle Method:** For two sided angle installations the retaining angles shall not be attached to the wall/floor (see **Figure 9**).

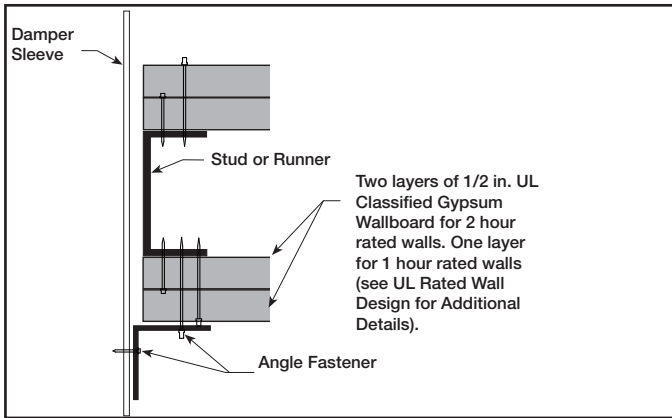
**Single Sided Angle Method:** For single side installations the retaining angles must be attached to the wall/floor (see **Figures 10-13**). For metal stud partitions only, the single-side mounting angle may be directly attached to the metal stud prior to the installation of the drywall.

- Retaining angles must be attached to the partition using one of the methods shown below:
  - Drywall screws of a length such that the screw engages the steel stud/track by ½ in. (13mm) (steel framing).
  - Drywall screws of a length such that the screw engages the wood stud by 1¾ in. (44mm) (wood framing).
  - Steel anchors or self tapping concrete screws penetrating masonry or block 1¼ in. (31mm).
- A minimum of two connections per side are required. Additional connections made at a maximum of 12 in. (305mm) O.C. maximum for openings of 48 in. W x 36 in. H (1219mm x 914mm) and less. Dampers greater than 48 in. wide (1219mm) or 36 in. high (914mm) require the connections to be no more than 6 in. (152mm) O.C.

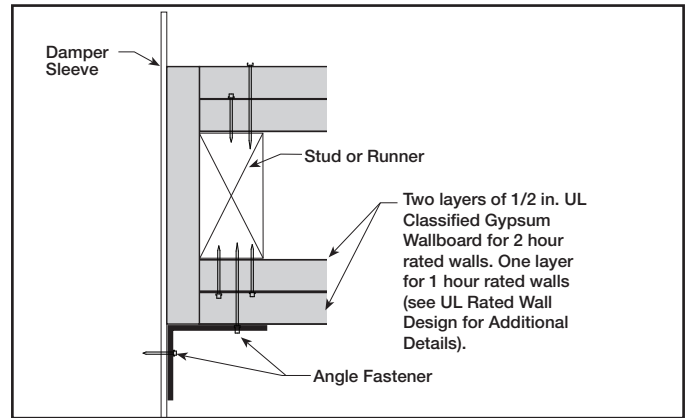


**Figure 9:** 2 sided angle installation method

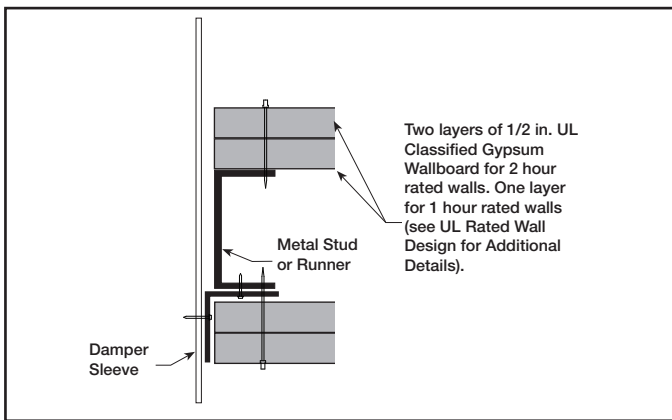
## Securing the Damper/Sleeve Assembly to Wall/Floor Openings cont.....



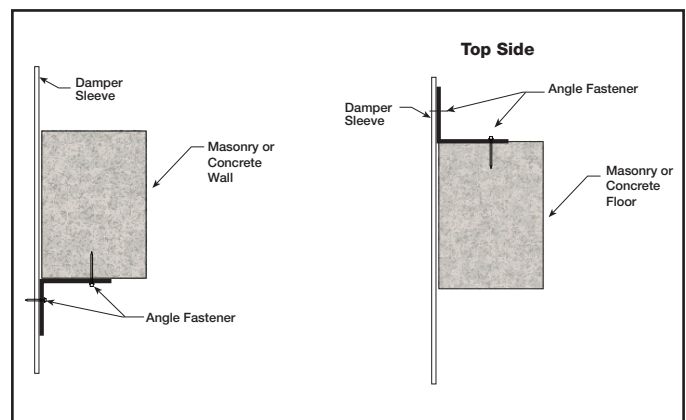
**Figure 10:** Single Side Angle With Steel Stud Wall - Angle Over Wallboard



**Figure 11:** Single Side Angle With Wood Stud Wall



**Figure 12:** Single Side Angle With Steel Stud Wall - Angle Under Wallboard

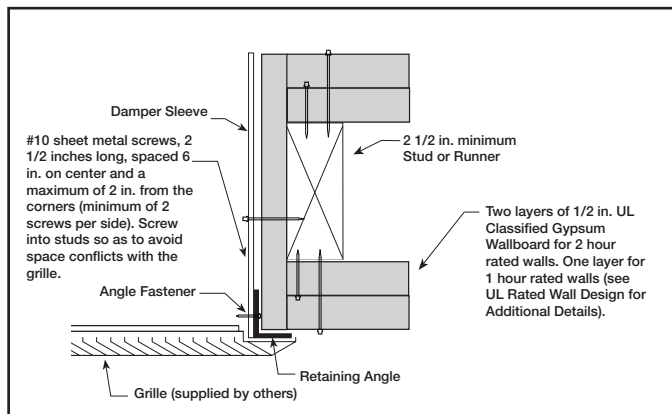


**Figure 13:** Single Side Angle With Masonry or Concrete Wall and Floor

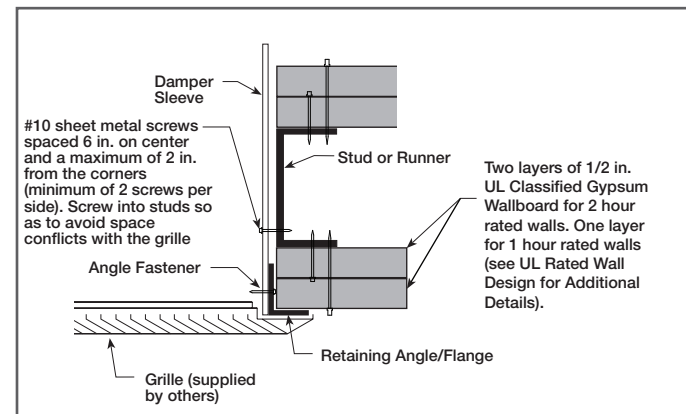
### Grille Installations (Dampers up to 36 in. x 36 in. [914mm x 914mm])

Retaining angles used in conjunction with grille installations must be a minimum of 5/8 in. x 1 in. (15mm x 25mm) 16 gauge (1.5mm) steel. Space screws a maximum of 6 in. (152mm) on center and a maximum of 2 in. (51mm) from the corners (minimum of 2 screws per side). See **Figure 14** and **Figure 15**.

**Note:** Screws used to attach grille are allowed to penetrate reversed angle leg.



**Figure 14:** Wood Stud - Grille



**Figure 15:** Metal Stud - Grille

## Duct to Sleeve Connection

### Sleeve Gauge and Connection Type Requirements

The size of the damper/duct determines the required sleeve gauge and the required duct to sleeve connection (see table to the right). The sleeve thickness must also not be less than the gauge of the connecting duct. Any duct connection other than the breakaway connections described below are considered rigid.

Sleeve Gauge	Duct Dimension	Type of Duct to Sleeve Connection Permitted
14 ga. (0.075 in.) - 10 ga. (0.138 in.) [2mm - 3.5mm]	All duct sizes	Rigid or Breakaway
16 ga. (0.060 in.) [1.5mm]	36 in. (914mm) max. width 24 in. (610mm) max. height 24 in. (610mm) diameter	Rigid or Breakaway
16 ga. (0.060 in.) [1.5mm]	All duct sizes	Breakaway only
18 ga. (0.048 in.) [1.2mm]	85 in. (2159mm) wide and over	
20 ga. (0.036 in.) [0.9mm]	55 in. - 84 in. wide (1397mm - 2134mm)	
22 ga. (.030 in.) [0.76mm]	31 in. - 54 in. wide (787mm - 1372mm)	
24 ga. (0.024) [0.6mm]	13 in. - 30 in. wide (330mm - 762mm)	
26 ga. (0.018 in.) [0.46mm]	12 in. wide and under (305mm)	
See Breakaway Connection section for additional information. UL Standard 555 requires all ducts to terminate at fire damper sleeves.		

### Approved Breakaway Connections

All breakaway connections described below may utilize the following duct sealants: PA2084T duct sealant adhesive manufactured by Precision, DP1010 water base duct sealant manufactured by Design Polymetrics, Grey Pookie, Ductmate PROseal®, or CL Ward S Seal in accordance with SMACNA recommendations.

#### Transverse Joints

The transverse joints shown below are approved as breakaway connections.

- A maximum of two #10 (19mm) sheet metal screws on each side and on the bottom may be used. The screws should be located in the center of the slip pocket and penetrate both sides of the slip pocket.
- Dampers up to 20 inches (508mm) high may use transverse joints on the top and bottom and Drive Slip joints (see Figure 17) on the sides.

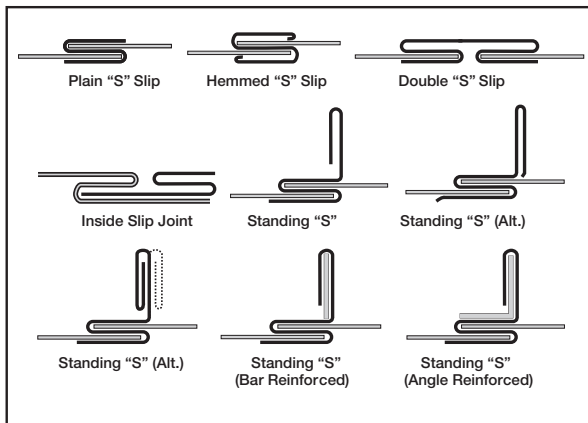


Figure 16 - Transverse Joints



Figure 17

## Approved Breakaway Connections....

### Round and Oval Duct Breakaway Connections

Factory furnished duct collars, type R and O, are also considered breakaway (see Figure 18).

Round or flat oval ducts connected to Type R or O damper collars shall be attached with #10 (19mm) sheet metal screws as follows:

- Ducts up to 22 in. (558mm) wide (or dia.) and less shall have three screws.
- Ducts larger than 22 in. (558mm) wide (or dia.) up to and including 36 in. (914mm) wide (or dia.) shall have five screws.

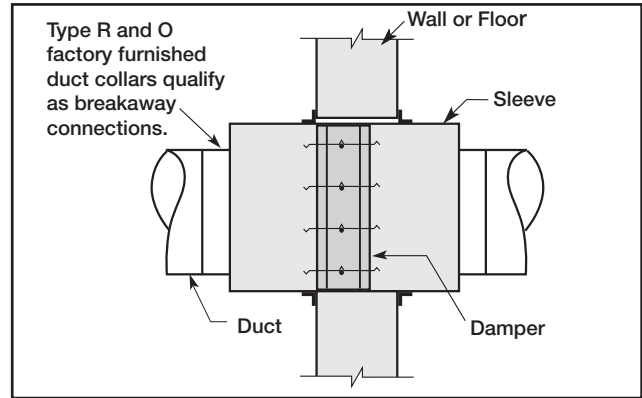


Figure 18: Type R and O Transition

### Manufactured Flanged System Breakaway Connections

Flanged connection systems manufactured by Ductmate, Durodyne, Ward, Nexus, Radiant T-35m, and MEZ are approved as breakaway connections when installed as illustrated (see Figure 19).

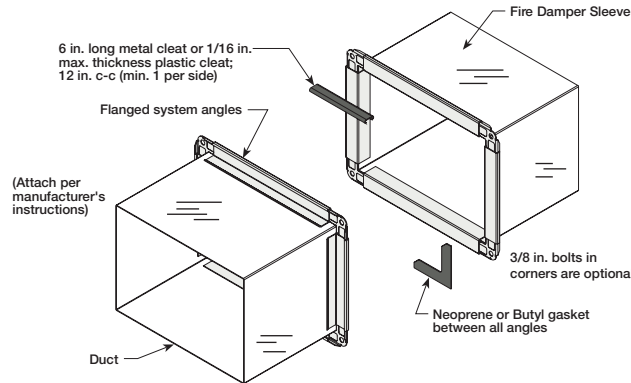


Figure 18

### Proprietary Flange System Breakaway Connections

(TDC by Lockformer, TDF by Engle)

TDC and TDF systems are approved as breakaway connections when installed as described in the TDC or TDF addendum to the SMACNA Duct Construction. Standard 6 in. (152mm) metal clip may be used with spacing as shown in diagram (see Figure 20 & 21). 3/8 in. (9.5mm) metal bolts and nuts may be used to fasten together corner pieces (see Figure 22).

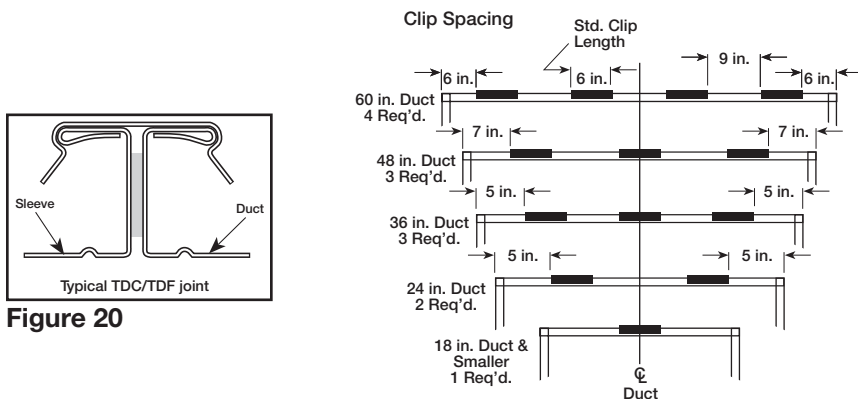


Figure 20

Figure 21

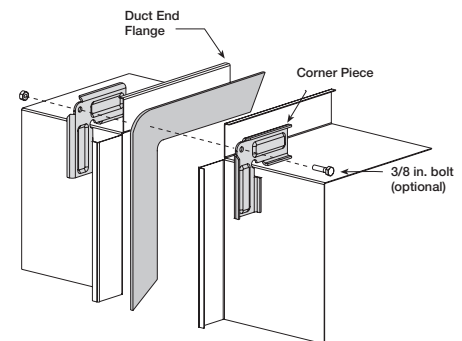


Figure 22

# Actuator and Temperature Response Device Connections

## Actuator Connections

Electrical and/or pneumatic connections to damper actuators should be made in accordance with wiring and piping diagrams developed in compliance with applicable codes, ordinances and regulations (see **Electrical Guidelines**).

## Temperature Response Device Connections

**RRL** - The RRL (resettable link device) incorporates a single thermostat. When the thermostat temperature is reached the sensor interrupts power to the actuator and the actuator's spring return mechanism causes the damper to close. Refer to **Figure 23** for wiring of the RRL thermostat.

**OCI** - The OCI (open or closed indicator) option contains two single pole single throw switches used to indicate the damper blade position. The switches provide a positive open and closed signal and can be used in conjunction with remote indicator lights. Refer to **Figure 24** for wiring of the OCI option.

**RRL /OCI** - The RRL/OCI performs the function of an RRL and OCI (see description above). Refer to **Figure 25** for wiring of the RRL/OCI option.

**TOR** - The TOR (temperature override device) option incorporates two thermostats with fixed settings (usually 165°F [74°C] and 350°F [177°C]). The primary sensor (the sensor with the lower temperature setting) can be bypassed by an external contact closure allowing the damper to reopen until the secondary temperature is reached (the sensor with the higher temperature setting). See **Figure 26**.

The TOR assembly contains two single pole single throw switches used to indicate damper blade position. The switches provide a positive open and closed signal and can be used in conjunction with remote indicator lights. See **Figure 26** for wiring of the TOR thermostats and indicator switches.

If either the TOR or the RRL is ordered with a pneumatic actuator, an EP switch is required with an appropriate electric power circuit to allow the electric thermostat to control the pneumatic actuator.

## Ratings (Figure 23, 24, 25, & 26)

**Integral Switch Type:** Single Pole, double throw

**Electrical Capacity:** 10 Amps, 1/3 hp, 120 or 240 Vac  
 1/2 Amp, 125 Vdc;  
 1/4 Amp 250 Vdc  
 5 Amps, 120 Vac "L" (lamp load)  
 1.0 Amps, 24 Vac  
 1.5 Amps, 24 Vdc

**Temperature Limit:** 165° F (standard primary sensor)  
 212° F (optional primary sensor)  
 250° F (secondary sensor)\*  
 350° F (secondary sensor)\*

\* based on actuator temperature rating

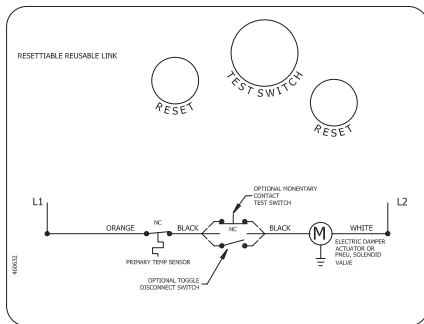


Figure 23: RRL Wiring

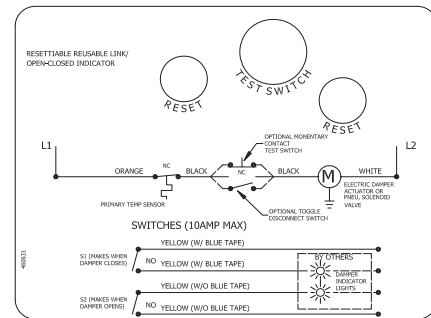


Figure 25: RRL/OCI

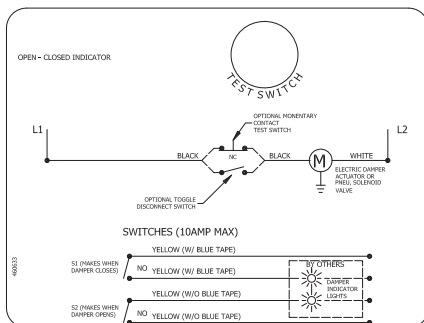


Figure 24: OCI

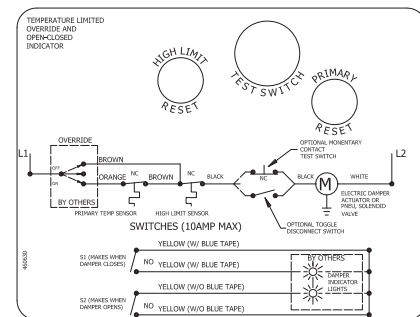


Figure 26: TOR

## Damper Commissioning and Periodic Testing

The International Fire Code (IFC) requires fire dampers to be maintained in accordance with NFPA standard 80 and smoke dampers to be maintained in accordance with NFPA standards 105. NFPA 80 and 105 define the frequency and method for periodically testing life-safety dampers.

NFPA 80 & 105 do not require heat to be applied to a damper's fusible link or thermostat during periodic testing. Electric or pneumatic actuated dampers are required to be tested by temporarily removing electrical or pneumatic power from the actuator to ensure the damper fully closes and then fully opens once power is restored. Mechanical and gravity operated dampers utilizing a fusible link are required to be tested by removing the fusible link and allowing the damper to fully close and then manually reopening the damper.

Greenheck's life safety dampers shall not be tested by applying heat with uncontrollable heat sources (i.e. heat guns, torches, etc.) as this can permanently damage the thermostat or other parts of the damper.

## Damper Maintenance

Dampers do not typically require maintenance as long as they are kept dry and clean. If cleaning is necessary, use mild detergents or solvents. If lubrication is desired for components such as axle bearings, jackshaft bearings and jamb seals, do not use oil-based lubricants or any other lubricants that attract contaminants such as dust.

Dampers and their actuator(s) must be maintained, cycled, and tested a minimum in accordance with:

- The latest editions of NFPA 80, 90A, 92, 101, 105, UL864, AMCA 503-03 and local codes.
- Actuator manufacturer recommendations.

## Damper Troubleshooting

The following is a possible cause and correction list for common concerns with the dampers.

Symptom	Possible Cause	Corrective Action
Damper does not fully open and/or close	Frame is 'racked' causing blades to bind on jamb seals	Adjust frame such that it is square and plumb
	Actuator linkage loose	Close damper, disconnect power, adjust and tighten linkage
	Defective motor	Replace
	Screws in damper linkage	Damper installed too far into wall. Move out to line as designated on damper label
	Contaminants on damper	Clean with a non-oil based solvent (see Damper Maintenance)
RRL or TOR sensor tripped	Heat	Push reset button located on backside of RRL or TOR
Damper does not operate	No power supplied to the actuator	Add power supply

## Our Commitment

*As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.*

Product warranties can be found online at [Greenheck.com](http://Greenheck.com), either on the specific product page or in the literature section of the website at [Greenheck.com/Resources/Library/Literature](http://Greenheck.com/Resources/Library/Literature).

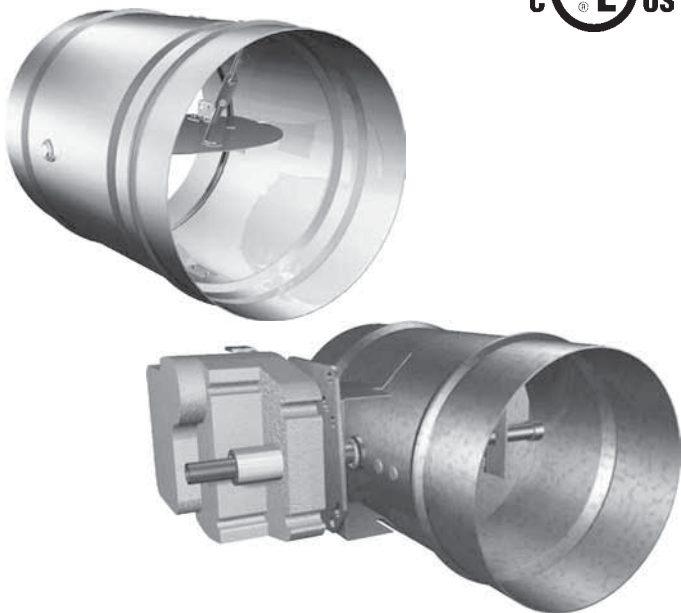




## Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

These instructions apply to 1½ hour rated fire and combination fire smoke dampers mounted in: 1) masonry, block, or stud walls and 2) concrete floors or ceilings. Specific requirements in these instructions are mandatory. Dampers must be installed in accordance with these instructions to meet the requirements of UL 555 and/or UL 555S.



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### Receiving and Handling

Upon receiving dampers, check for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for.

Dampers must be kept dry and clean. Indoor storage and protection from dirt, dust and the weather is highly recommended. Do not store at temperatures in excess of 100°F (38°C).

### Safety Warning

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

This manual is the property of the owner and is required for future maintenance. Please leave it with the owner when the job is complete.



## General Information

“UL CLASSIFIED (see complete marking on product)”

“UL CLASSIFIED to Canadian safety standards (see complete marking on product)”

Standard 555 & 555S (Listing #R13317)

### Installation Supplements only available on greenheck.com

- Steel Deck Supplement

## Electrical Guidelines

### Electrical Guidelines

All wiring shall be done in accordance with the National Electrical Code ANSI/NFPA-70 latest edition, any local codes that may apply, and wiring diagrams developed in compliance with the job or project design and specifications.

### Important!

Electrical input may be needed for this equipment. This work should be performed by a qualified electrician. Verify power before wiring actuator. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect field wiring. To avoid causing death or serious bodily harm to building occupants, follow all instructions carefully. Dampers must close completely to preserve the integrity of the fire smoke separation.

## Pre-Installation Guidelines

The following items will aid in completing the damper installation in a timely and effective manner.

- 1) Check the drawings for proper damper locations within the building. Visually inspect the damper for damage and verify that the Reusable Resettable Link (RRL) is in place and has not activated if provided. These electric links have a button for resetting. Visually inspect the link to verify its not missing or broken. Replace link as necessary.
- 2) Lift or handle damper using sleeve or frame. Do not lift damper using blades or actuators.
- 3) Damper has label on outside of sleeve indicating a ‘No Screw’ area. Do not install screws into this area as screws may interfere with unexposed blade linkage and prevent damper blades from opening and/or closing.
- 4) Damper has label indicating position of damper and sleeve assembly in the wall. Install accordingly to comply with manufacturer’s appropriate UL Classification file number.
- 5) Damper must be installed into duct or opening square and free of twist or other misalignment. Out of square, racked, twisted or misaligned installations can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 6) Damper and actuator must be kept clean and protected from dirt, dust and other foreign materials prior to and after installation. Examples of such foreign materials include but are not limited to:
  - a) Mortar dust
  - b) Drywall dust
  - c) Firesafing materials
  - d) Wall texture
  - e) Paint overspray
- 7) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet of the damper. Excessive dirt or foreign material deposits on the damper can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 8) Caulking is not necessary, nor is it allowed, between the damper sleeve and the wall or floor opening (annular space). However, caulking may be applied to the retaining angles.
- 9) ACCESS: Suitable access (such that RRL’s and actuators can be maintained, etc.) must be provided for damper inspection and servicing. Where it is not possible to achieve sufficient size access, it will be necessary to install a removable section of duct. (Refer to NFPA 90A).
- 10) The Code Authority Having Jurisdiction (AHJ) must evaluate and provide approval of final installation where variations to these instructions are necessary.

## Preparation of Openings

- Frame wall openings as shown below (see **Figure 1 & 2**).
- Gypsum wall board must be fastened 12 in. (305mm) on center to all stud and runner flanges surrounding opening.
- Prepare opening between studs and sleeve assembly as shown below (see **Figure 3**).
- All construction and fasteners must meet the requirements of the appropriate wall design (See UL Fire Resistance Directory) and/or local codes.

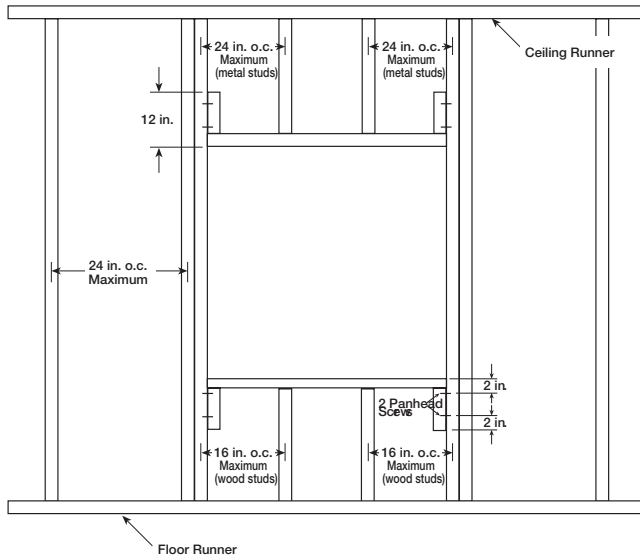


Figure 1

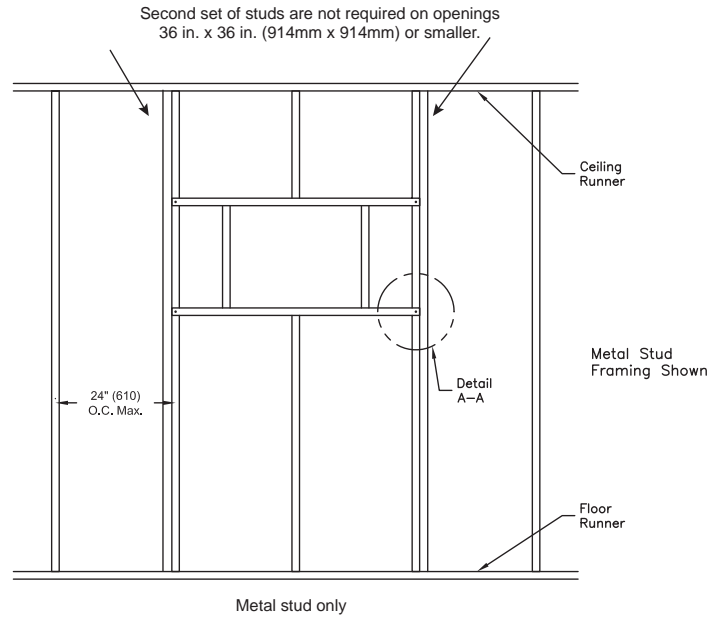


Figure 2

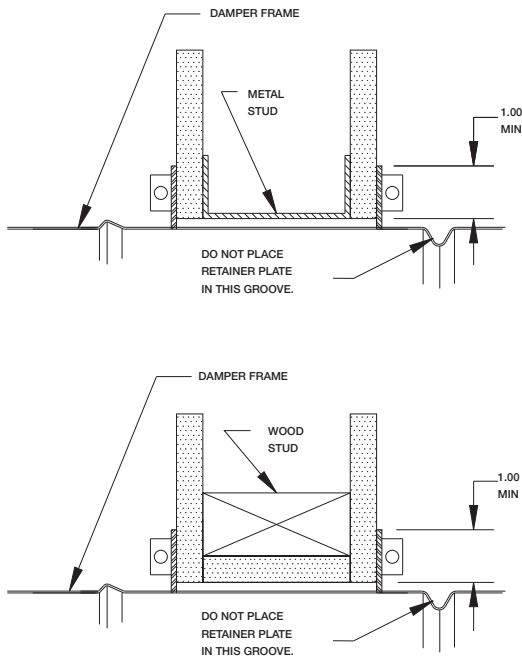
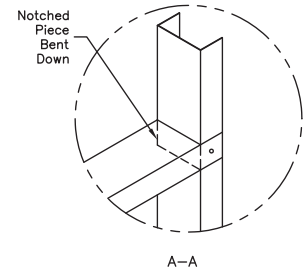


Figure 3



## Clearances Required Between Damper Sleeves and Wall/Floor Openings

Fire damper assemblies expand during periods of intense heat. Therefore, it is essential that openings in walls or floors be larger than the fire or combination fire smoke damper assembly to allow for this expansion. The wall/floor opening must be a minimum of 7/8 in. (22mm) larger than the outside diameter of the damper.

**Maximum Size Table**

Damper Model	Maximum Size
DFDR-510	24 in. (610mm)
FDR-510	
FSDR-511	
FSDR-512	
SEDFDR-510	
SEFSDR-511	
SSDFDR-510	
SSFDR-510	
SSFSDR-511	

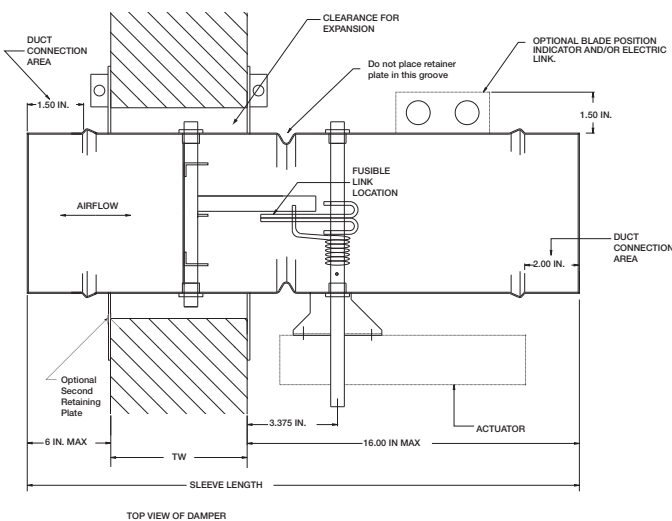
## Inserting Damper into Wall/Floor Openings

Insert the damper assembly into the prepared opening, to appropriate depth (see **Figure 3 & 4**).

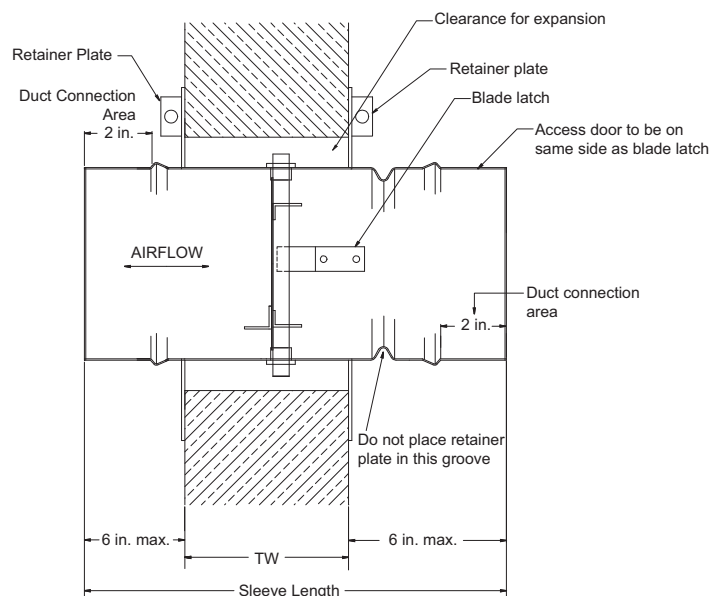
Recommended maximum and minimum insertion depth can be exceeded if:

Special attention must be paid to ensure the following:

- 1) The  $\phi$  (centerline) of the damper frame remains within the plane of the wall or floor
- 2) The sleeve does not extend more than 16 in. (406mm) beyond the wall or floor on the actuator side of the damper and 6 in. (152mm) on the side opposite the actuator. The sleeve may also extend up to 16 in. (406mm) beyond the wall or floor if the damper has a factory supplied access door.



**Figure 3: FSDR/SEFSDR/SSFSDR**

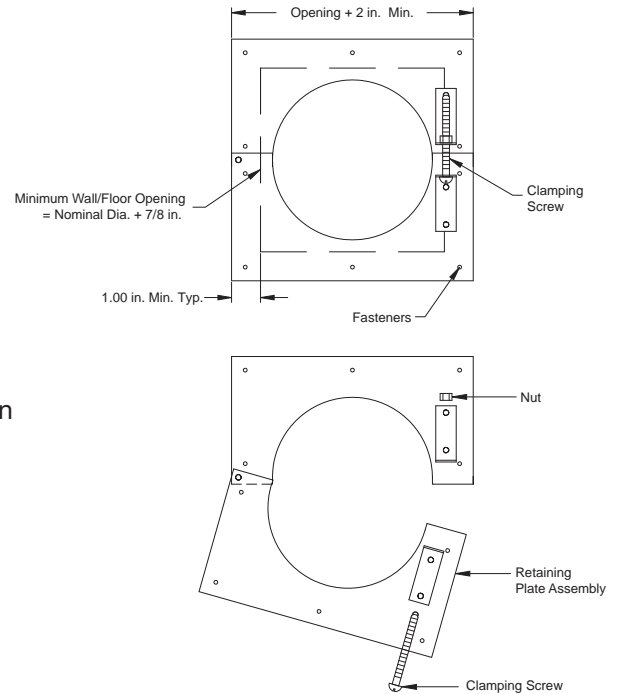


**Figure 4: DFDR/FDR/SEDFDR/SSDFDR/SSFDR**

## Securing the Damper/Sleeve Assembly to Wall and Floor Openings

Damper assemblies must be installed in wall and floor openings using a single retaining plate on either side of the wall/floor or by using a retaining plate on both sides of the wall/floor. The use of a second retaining plate is provided with the dampers. A second retaining plate can be ordered as an option.

- The retaining plate(s) will open up for easy installation when the clamping screw is loosened. If necessary, remove the clamping screw and nut (see **Figure 5**).
- Position the retaining plate between the blade axle and the actuator shaft as shown in **Figure 3 & 4**. Do not place the retaining plate in the groove. **IMPORTANT:** The clamping mechanism should face away from the wall/floor.
- Place the damper and attached retainer plate into the wall/floor opening.
- If a second retaining plate is being used, secure it on the opposite side of the wall/floor.
- Verify position, blade orientation, and actuator clearance then tighten the retainer plate clamping screws.
- The retainer plate(s) must overlap the wall/floor opening a minimum of 1 inch (25mm).
- Secure the retainer plate(s) to the wall at the four corners of each plate when two retainer plates are used and also within  $\frac{3}{4}$  in. (19mm) of the center of each side when one retainer plate is used. The following fasteners shall be used:
  - #8 or #10 screws of a length such that the screw engages the steel stud/track by  $\frac{1}{2}$  in. (13mm)(steel framing).
  - #8 or #10 screws of a length such that screw engages the wood stud by  $1\frac{3}{4}$  in. (44mm) (wood framing)
  - Steel anchors or self tapping concrete screws penetrating masonry or block by  $1\frac{1}{4}$  in. (32mm).



**Figure 5: Retaining Plates**

## Duct to Sleeve Connections

### Sleeve Gauge and Connection Type Requirements

Round duct connections to shall be attached with #8 or #10 sheet metal screws as follows:

- Ducts 22 in. (558mm) dia. and smaller shall have three screws.
- Ducts larger than 22 in. (558mm) dia. up to and including 24 in. (610mm) dia. shall have five screws.

Note: All connections described may have duct sealant, PA2084T duct sealant adhesive manufactured by Precision, DP1010 water base duct sealant manufactured by Design Polymetrics, Grey Pookie, Ductmate PROseal<sup>®</sup>, or CL Ward S Seal applied in accordance with SMACNA recommendations.

# Actuator and Temperature Response Device Connections

## Actuator Connections

Electrical and/or pneumatic connections to damper actuators should be made in accordance with wiring and piping diagrams developed in compliance with applicable codes, ordinances and regulations (see **Electrical Guidelines**).

## Temperature Response Device Connections

**RRL** - The RRL (resettable link device) incorporates a single thermostat. When the thermostat temperature is reached, the sensor interrupts power to the actuator and the actuator's spring return mechanism causes the damper to close. Refer to **Figure 6** for wiring of the RRL thermostat.

**OCI** - The OCI (open or closed indicator) option contains two single pole single throw switches used to indicate the damper blade position. The switches provide a positive open and closed signal and can be used in conjunction with remote indicator lights. Refer to **Figure 7** for wiring of the OCI option.

**RRL /OCI** - The RRL/OCI performs the function of an RRL and OCI (see description above). Refer to **Figure 8** for wiring of the RRL/OCI option.

**TOR** - The TOR (temperature override device) option incorporates two thermostats with fixed settings (usually 165°F [74°C] and 350°F [177°C]). The primary sensor (the sensor with the lower temperature setting) can be bypassed by an external contact closure allowing the damper to reopen until the secondary temperature is reached (the sensor with the higher temperature setting). See **Figure 9**.

The TOR assembly contains two single pole single throw switches used to indicate damper blade position. The switches provide a positive open and closed signal and can be used in conjunction with remote indicator lights. See **Figure 25** for wiring of the TOR thermostats and indicator switches.

If either the TOR or the RRL is ordered with a pneumatic actuator, an EP switch is required with an appropriate electric power circuit to allow the electric thermostat to control the pneumatic actuator.

## Ratings (Figure 6, 7, 8, & 9)

**Integral Switch Type:** Single Pole, double throw

**Electrical Capacity:** 10 Amps, 1/3 hp, 120 or 240 Vac  
 ½ Amp, 125 Vdc;  
 ¼ Amp 250 Vdc  
 5 Amps, 120 Vac “L” (lamp load)  
 1.0 Amps, 24 Vac  
 1.5 Amps, 24 Vdc

**Temperature Limit:** 165° F (standard primary sensor)  
 212° F (optional primary sensor)  
 250° F (secondary sensor)\*  
 350° F (secondary sensor)\*

\* based on actuator temperature rating

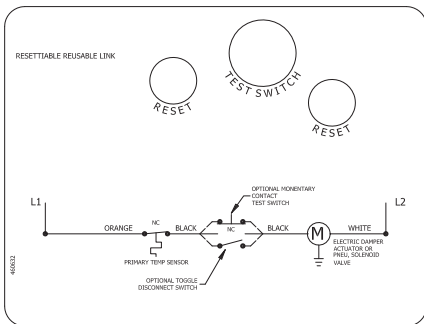


Figure 6: RRL Wiring

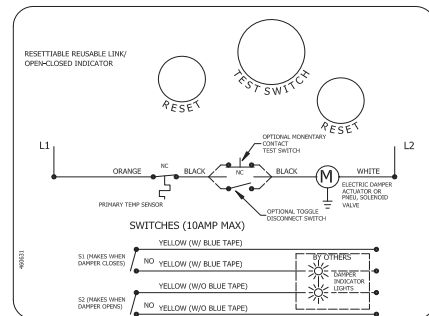


Figure 8: RRL/OCI

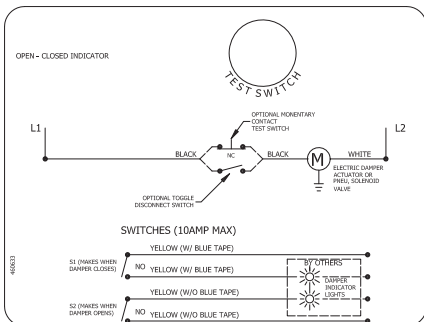


Figure 7: OCI

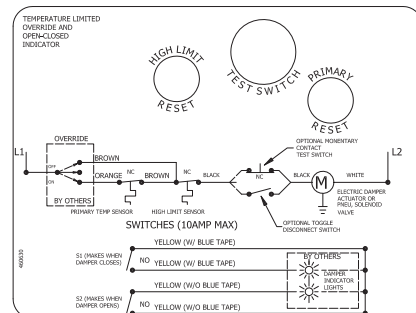
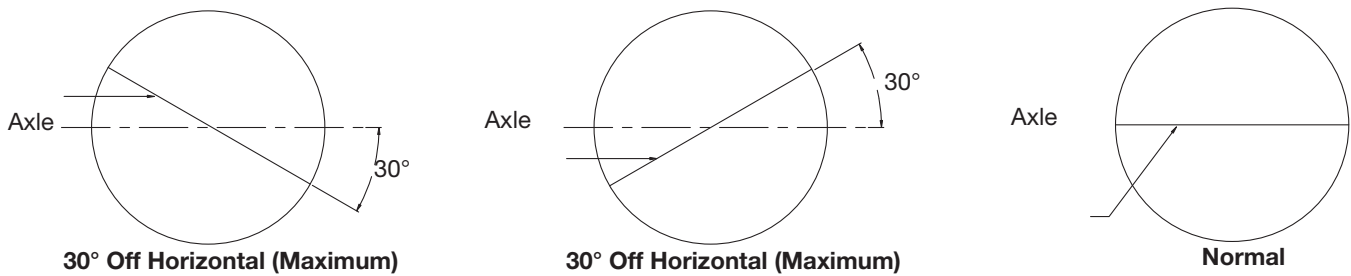


Figure 9: TOR



## Blade Orientation



## Damper Maintenance

Dampers do not typically require maintenance as long as they are kept dry and clean. If cleaning is necessary, use mild detergents or solvents. If lubrication is desired for components such as axle bearings, jackshaft bearings and jamb seals, do not use oil-based lubricants or any other lubricants that attract contaminants such as dust.

Dampers and their actuator(s) must be maintained, cycled, and tested a minimum in accordance with:

- The latest editions of NFPA 80, 90A, 92, 101, 105, UL864, AMCA 503-03 and local codes.
- Actuator manufacturer recommendations.

## Damper Troubleshooting

The following is a possible cause and correction list for common concerns with dampers.

Symptom	Possible Cause	Corrective Action
Damper does not fully open and/or close	Frame is 'racked' causing blades to bind on jamb seals	Adjust frame such that it is square and plumb
	Actuator linkage loose	Close damper, disconnect power, adjust and tighten linkage
	Defective motor	Replace
	Screws in damper linkage	Damper installed too far into wall. Move out to line as designated on damper label
	Contaminants on damper	Clean with a non-oil based solvent (see Damper Maintenance)
RRL or TOR sensor tripped	Heat	Push reset button located on backside of RRL or TOR
Damper does not operate	No power supplied to the actuator	Add power supply

## Notes

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## Installation, Operation and Maintenance Manual

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### Table of Contents

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### Receiving and Handling

Upon receiving dampers, check for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for.

Dampers must be kept dry and clean. Indoor storage and protection from dirt, dust and the weather is highly recommended. Do not store at temperatures in excess of 100°F (38°C).

### Safety Warning

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

## Electrical Guidelines

### Electrical Guidelines

Electrical and/or pneumatic connections to damper actuators should be made in accordance with wiring piping diagrams developed in compliance with applicable codes, ordinances and regulations.

### Important!

Electrical input may be needed for this equipment. This work should be performed by a qualified electrician. Verify power before wiring actuator. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect field wiring. To avoid causing death or serious bodily harm to building occupants, follow all instructions carefully. Dampers must close completely to preserve the integrity of the fire smoke separation.

This manual is the property of the owner and is required for future maintenance. Please leave it with the owner when the job is complete.



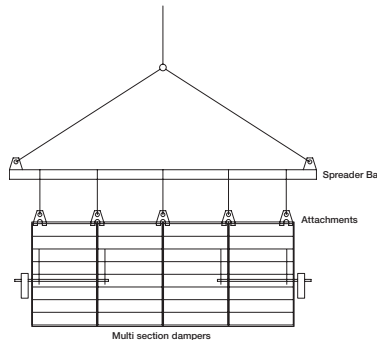
## General Information

### Pre-Installation Guidelines

The basic intent of a proper installation is to secure the volume control damper into the opening in such a manner as to prevent distortion and disruption of damper operation. The following items will aid in completing the damper installation in a timely and effective manner.

1) Check the schedules for proper damper locations within the building. Visually inspect the damper for damage.

2) Lift or handle damper using sleeve or frame. Do not lift damper using blades, linkage, actuators, or jackshifting. When handling multiple sections assemblies, use sufficient support to evenly lift at each section mullion (see drawing). Do not drag, step on, apply excessive bending, twisting, or racking.



3) Do not install screws in damper frame that will interfere with unexposed blade linkage and prevent damper blades from opening and/or closing.

4) Damper must be installed into duct or opening square and free of twist or other misalignment. Damper must not be squeezed or stretched into duct or opening. Out of square, racked, twisted or misaligned installations can cause excessive leakage and/or torque requirements to exceed damper/actuator design.

5) Damper and actuator must be kept clean, dry and protected from dirt, dust and other foreign materials prior to and after installation. Examples of such foreign materials include but are not limited to:

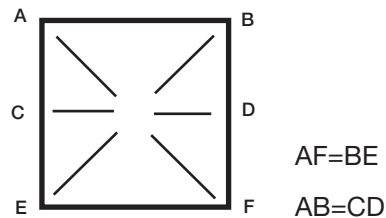
- Mortar dust
- Drywall dust
- Firesafing materials
- Wall texture
- Paint overspray

6) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet (1.50m) of the damper. Excessive dirt or foreign material deposits on damper can cause excessive leakage and/or torque requirements to exceed damper/actuator design.

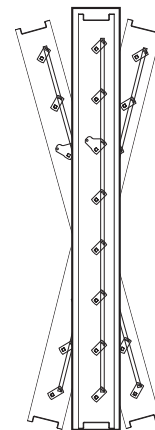
7) ACCESS: Suitable access (actuators maintenance, etc.) must be provided for damper inspection and servicing. Where it is not possible to achieve sufficient size access, it will be necessary to install a removable section of duct.

### Installation

1. Duct opening or opening square should be measured  $\frac{1}{4}$  inch (6mm) larger than damper dimension and should be straight and level (**Figure 1**).



Do not twist or bow. Mount damper plumb in the opening.



**Figure 1**

2. If more than two sections wide, unit ships as a multiple section assembly and a single section together. The single section is joined to the side of the multiple section where the jackshaft extends past the frame four inches (102mm). **Figure 2**.

3. A damper assembly is not restricted to a maximum number of sections but, the assembly must not exceed the section sizes and overall sizes (see table below right).

4. The damper sections must be attached together with #10 x  $\frac{3}{4}$  in. (19mm) max. sheet metal screws,  $\frac{1}{4}$  in. (6mm) diameter nuts and bolts, tack or spot welds, or  $\frac{3}{16}$  in. (4mm) diameter steel pop rivets. Attachments must be spaced a maximum of 12 in. (305mm) on centers and a maximum of 2 in. (51mm) from corners. Attachments must be made on front face and back face (air entering and air exiting side) of damper sections.

5. Two section high dampers require reinforcement using a 14 gauge (2mm), 5 in. (127mm) wide mullion or two individually sleeved units stacked vertically. When using two individually sleeved units, the sleeve acts as the mullion, therefore no mullion is required (mullions are not provided by Greenheck).

## Installation continued....

6. When the height of a face & bypass vertical style (FBV) is greater than 84 in. (2134mm), the damper sections are shipped separate and field assembly is required. Before fastening damper sections together, the non-actuated damper section will need to be flipped upside down so that the linkage is on the same side as the actuated damper. After damper sections are fastened together, attach interconnecting angle as shown in **Figure 3**.

7. If no holes are present in the frame, drill ¼ inch (6mm) diameter holes at six inch (52mm) centers and fasten frames together with ¼ inch (6mm) #20 (.03mm) bolts and nuts (**Figure 3**).

8. Use shims between damper frame and duct opening or opening space to prevent distortion of frame by fasteners holding it in place. Brace at every horizontal mullion and vertically brace at every eight feet (2.4m) of damper width for strength. Dampers in high velocity (2000 fpm [610mm] per second) may require more bracing.

**Note:** Greenheck dampers are specifically designed and engineered for structural integrity based on model and conditions. Attachment, framing, mating flanges, and anchoring of damper assemblies into openings, ductwork, or walls is the responsibility of the installer. Design calculation for these retaining and supporting members should be determined by field engineers for that particular installation.

Damper Model	Maximum Single Section Size W x H in. (mm)	Maximum Overall Size for Multi-Section Dampers
VCD-20, VCD-23	48 x 74 (1219 x 1880)	Unlimited
VCD-33, VCD-34, VCD-40, VCD-42, VCD-43	60 x 74 (1524 x 1880)	Unlimited
VCD-20V, VCD-23V	74 x 48 (1879 x 1219)	NA
VCD-33V, VCD-34V, VCD-42V, VCD-43V	74 x 60 (1879 x 1524)	NA
FBH-33 FBH-43	Face: 60 x 74 (1524 x 1880) Bypass: 60 x 74 (1524 x 1880)	Face: 96 x 74 (2438 x 1880)
FBV-33 FBV-43	Face: 60 x 74 (1524 x 1880) Bypass: 60 x 74 (1524 x 1880)	Face: 96 x 74 (2438 x 1880) Bypass: 96 x 74 (2438 x 1880)
FBH-23	Face: 48 x 74 (1219 x 1880) Bypass: 48 x 74 (1219 x 1880)	Face: 96 x 74 (2438 x 1880)
FBV-23	Face: 48 x 74 (1219 x 1880) Bypass: 48 x 74 (1219 x 1880)	Face: 96 x 74 (2438 x 1880) Bypass: 96 x 74 (2438 x 1880)

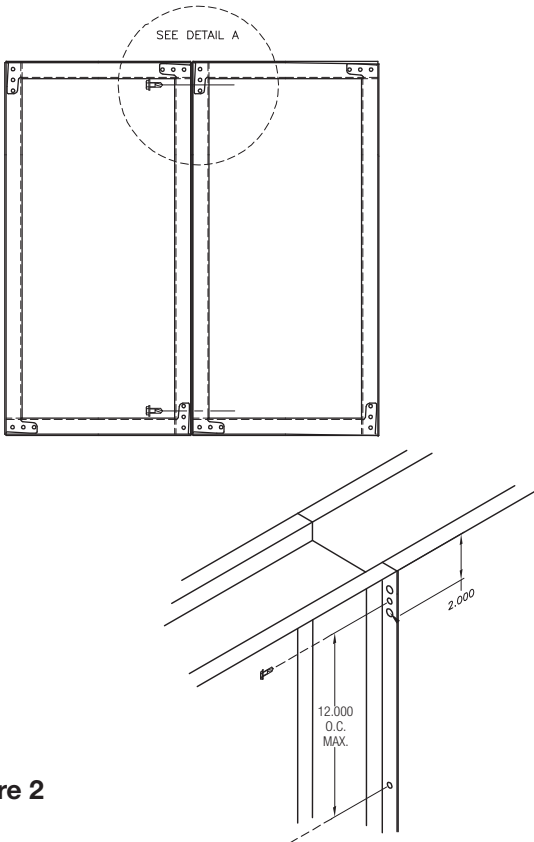


Figure 2

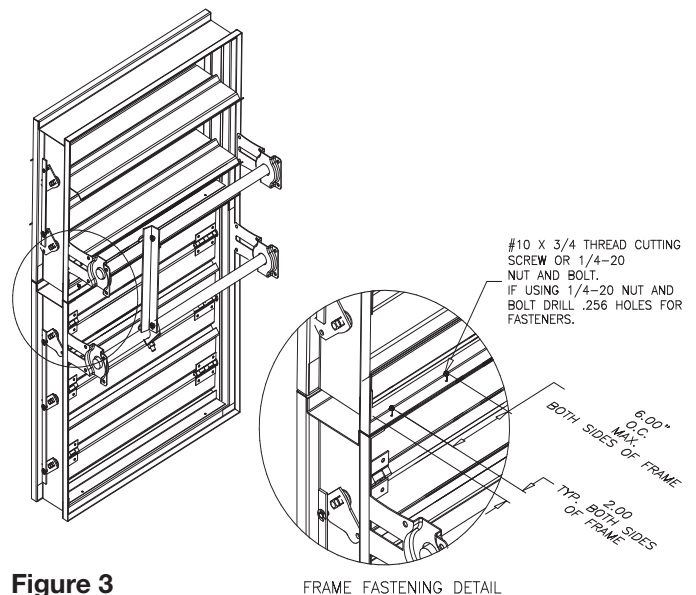


Figure 3

## Installation continued....

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9. If the damper actuator is to be mounted out of the airstream, the extension pin should extend approximately six inches (152mm) beyond the frame. On jackshafted units, the jackshaft should extend through the jackshaft bearing assembly approximately six inches (152mm) beyond the frame.
10. Individual damper sections, as well as entire multiple section assemblies must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each section.
11. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle dampers after installation to assure proper operation. On multiple section assemblies, all sections should open and close simultaneously.
- Note: When you have a vertical damper installation, blades must be horizontal. When blades need to be vertical, you need a vertical blade damper (example: VCD-23V). These dampers are built so they don't crush the jamb seal.

## Damper Maintenance

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Greenheck's dampers are designed to be trouble free and hassle free under normal operation. Dampers are installed square and straight so as to prevent binding during operation. The following annual damper maintenance suggestions will help to insure proper damper operation and increase the life expectancy of the damper.

**Foreign Matter** Over the course of time, dirt and grime may collect on damper surfaces. The damper surfaces should be cleaned to prevent hindrance to airflow.

**Moving Parts** Make sure that parts such as linkage, bearings, blades, etc. that are intended to move freely, can do so. Lubricating these components can prevent possible rusting and unnecessary friction increase. Use only a moli-spray oil or similar graphite based oil as regular lubricating oil will attract dirt.

Bearings. Synthetic, oil impregnated, and ball bearings (without grease fittings) do not require lubrication. Ball bearings with grease fittings require only minimal grease.

**Closure** Remove foreign materials that may be interfering with blade closure or effective sealing of the blades with each other or with the frame.

**Operation** While operating the damper through its full cycle, check to see that the blades open and close properly. If there is a problem, check for loose linkage, especially at the actuator. Tighten the linkage where required.

## Troubleshooting

The following is a cause and correction list for common concerns with the dampers.

Symptom	Possible Cause	Corrective Action
Damper does not fully open and/or fully close	Frame is 'racked' causing blades to bind on jamb seals	Adjust frame such that it is square and plumb
	Actuator linkage loose	Close damper, disconnect power, adjust and tighten linkage
	Defective motor	Replace
	Screws in damper linkage	Locate screws and remove
	Actuator linkage hitting wall or floor	Damper installed too far into wall. Move out to line designated on damper label
	Contaminants on damper	Clean with a non oil-based solvent (see Damper Maintenance)
Actuator runs hot or makes a humming noise	Actuator prohibited from reaching end of stroke	Disconnect linkage from jackshaft, open damper, power actuator to end of spring, tighten linkage. Verify amp draw

## Our Commitment

*As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.*

Product warranties can be found online at [Greenheck.com](http://Greenheck.com), either on the specific product page or in the literature section of the website at [Greenheck.com/Resources/Library/Literature](http://Greenheck.com/Resources/Library/Literature).



# ***Installation, Operation and Maintenance Manuals***

**Job Title:** Black Rock Congregational Church

**Customer PO#:** 4845-16

**Engineer:** Altieri, Sebor, Wieber

**Contractor:** Eastern Mechanical

**Elevation: (ft)** 16

**Date:** 7/15/2019

**Submitted By:** Dan Carafeno

**Agent Order#:** N47228

**BUCKLEY ASSOCIATES INC**

15 PROGRESS CIRCLE

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## Black Rock Congregational Church

## Product IOMs

Mark Name	Model Name
EF-17	CSP
EF-18, EF-19	GB



## Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

### Direct Drive Ceiling Exhaust Fan

Designed for clean air applications where low sound levels are required. Many options and accessories are available such as lights, motion detectors, ceiling radiation dampers and speed controls.



### Direct Drive Inline Exhaust Fan

Designed for clean air applications where low sound levels are required.



#### WARNING!

**To reduce the risk of fire, electric shock, or injury to persons, observe the following:**

- Suitable for use with solid state speed controls.
- Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.
- Before servicing or cleaning unit, switch power off at service panel and lock service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.
- Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
- Sufficient air is needed for proper combustion and exhausting of gases through the flue (chimney) of fuel burning equipment to prevent back drafting. Follow the heating equipment manufacturer's guideline and safety standards such as those published by the National Fire Protection Association (NFPA), and the American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) and the local code authorities.
- When cutting or drilling into wall or ceiling, do not damage electrical wiring or other hidden utilities.
- Select models are acceptable for use over a bathtub or shower when installed in a GFCI protected branch circuit. (Up through size SP-A390)
- Never place a switch where it can be reached from a tub or shower.
- Ducted fans must always be vented to the outdoors.
- These fans are not recommended for cooking exhaust applications. They are designed primarily for low temperature, clean air applications only. The diagram shows the minimum distance these fans should be placed in relation to cooking equipment.
- Fan/Light combination not to be installed in a ceiling thermally insulated to a value greater than R40.

#### CAUTION!

- For general ventilating use only. Do not use to exhaust hazardous or explosive materials and vapors.

#### AVERTISSEMENT!

**Pour réduire le risque d'incendie, de choc électrique ou de blessure corporelle, respecter ce qui suit:**

- Appareil pouvant être utilisé avec un régulateur de vitesse à semi-conducteurs.
- Utiliser cet appareil exclusivement comme prévu par le fabricant. En cas de questions, communiquer avec le fabricant à l'adresse ou au numéro de téléphone figurant dans la garantie.
- Avant tout entretien ou nettoyage de l'appareil, couper l'alimentation sur le tableau électrique et verrouiller le dispositif de sectionnement pour empêcher toute mise sous tension accidentelle. Si le dispositif de sectionnement ne peut pas être verrouillé, attacher un moyen de mise en garde bien visible, tel qu'un panneau, au tableau électrique.
- La pose et le câblage électrique doivent être effectués par des personnes qualifiées en conformité avec les codes et normes en vigueur, y compris pour la résistance au feu du bâtiment.
- Une quantité d'air suffisante est nécessaire pour la bonne combustion et l'extraction des gaz brûlés par le conduit d'évacuation (cheminée) d'appareils à combustible afin d'éviter le reflux. Veiller à suivre les indications du fabricant du matériel de chauffe, les normes de sécurité telles que celles publiées par la National Fire Protection Association (NFPA) et l'American Society for Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) et la réglementation en vigueur.
- Lors de la découpe ou du perçage de murs ou plafonds, ne pas endommager les câbles électriques et autres conduites masquées.
- Certains modèles (jusqu'au modèle SP-A390 inclus) sont approuvés pour une installation au-dessus d'une baignoire ou d'une douche sous réserve d'être raccordés à un circuit de dérivation protégé par un DDFT.
- Ne jamais placer d'interrupteur à un emplacement à portée d'une baignoire ou d'une douche.
- Les caissons d'extraction à gaine doivent toujours être évacués vers l'extérieur.
- Ces caissons ne sont pas conseillés pour les applications d'aspiration de vapeurs de cuisson. Ils sont conçus essentiellement pour l'aspiration d'air propre à basse température. Le schéma indique la distance minimale de placement de ces caissons par rapport à l'équipement de cuisson.
- Le combiné ventilateur/luminaire ne devra pas être installé dans un plafond ayant une isolation thermique d'une valeur supérieure à R40.

#### ATTENTION!

- À utiliser pour la ventilation générale uniquement. Ne pas utiliser pour l'aspiration de matières et vapeurs dangereuses ou explosives.

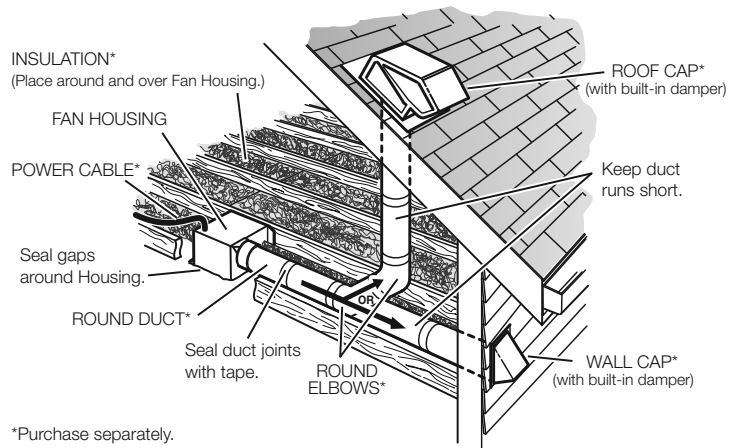
## Typical Installation

The ducting from this fan to the outside of the building has a strong effect on the air flow, noise and energy use of the fan. Use the shortest, straightest duct routing possible for best performance, and avoid installing the fan with smaller ducts than recommended. Insulation around the ducts can reduce energy loss and inhibit mold growth. Fans installed with existing ducts may not achieve their rated airflow.

Rigid metal duct is recommended for optimal fan performance.

Ensure duct joints and exterior penetrations are sealed with caulk or other similar material to create an air-tight path and to minimize building heat loss and gain and reduce the potential for condensation.

Place/wrap insulation around duct and/or fan to in order to minimize possible condensation buildup within the duct, as well as minimize building heat loss and gain.



Energy Star® Certified Fan Model/Size	Recommended Duct Dimensions
SP-A70, SP-A90, SP-A50-90-VG, SP-A90-130-VG, SP-B70, SP-B80, SP-B90	6 inch round
SP-A110, SP-A125, SP-A190	8 x 6 inch rectangular
SP-A200, SP-A250	8 x 8 inch rectangular

## Other Installation Considerations

### Ductwork and Noise

Fiberglass ductboard is a better choice than metal ductwork for reducing fan noise and is highly recommended for low sound applications. Where metal duct is used, sound transmission can be reduced with flexible duct connections between the fan and the duct.

### Sound and Location

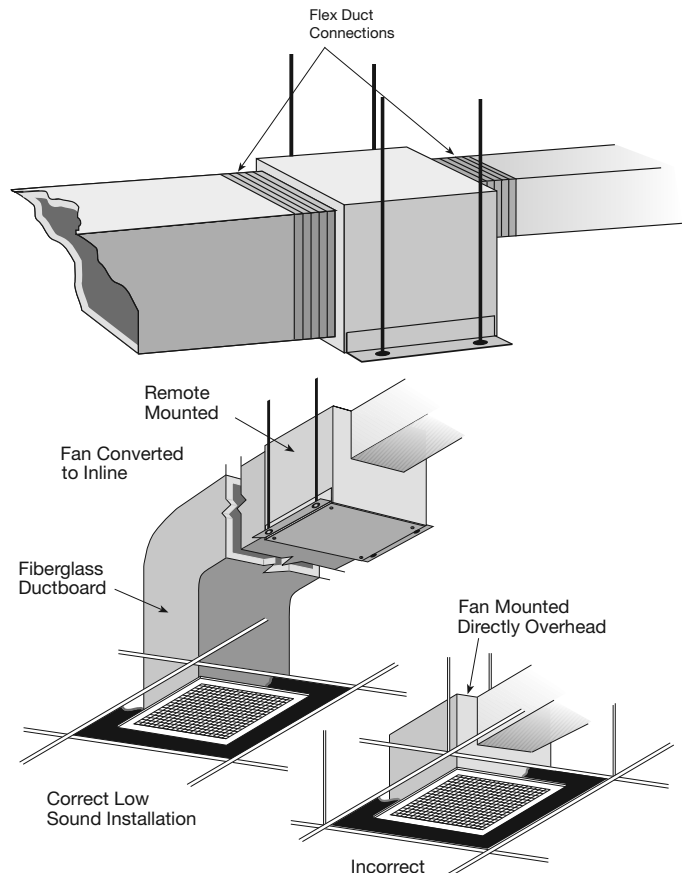
The location of these fans must be taken into consideration before installation. In critical sound installations, insulated ductwork, flexible duct connections or placing the fan in a remote section of ductwork are solutions to meeting the required fan sound levels.

### Filters

The addition of an intake filter is highly recommended for these fans, even in clean air environments excess dirt can accumulate on wheels and motors causing reduced performance and imbalance.

Filters, once installed, should be checked and cleaned periodically to maintain performance.

Washable aluminum mesh filters specifically designed for these fans are available, please consult your representative for more information.



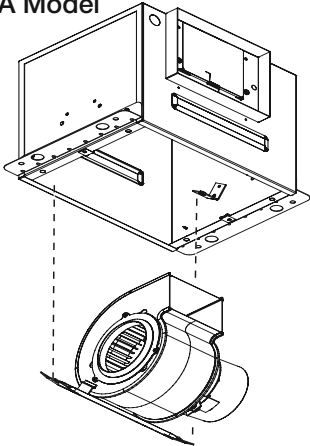


## Prepare the Fan

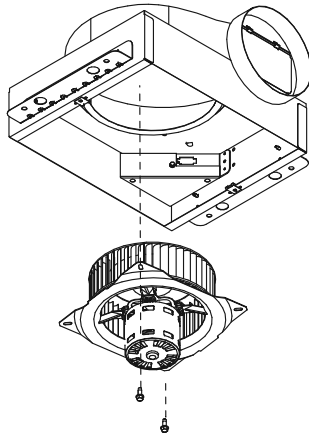
### Power Assembly

If power assembly (motor, wheel, and scroll) is not installed in housing, insert the electrical plug into fan socket, then slide scroll end of power assembly into fan housing. Attach by using two sheet metal screws provided.

A Model

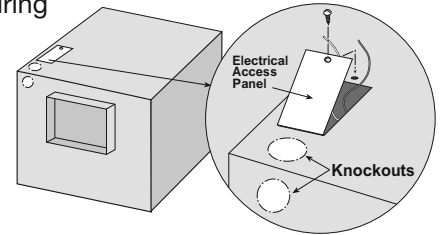


B Model



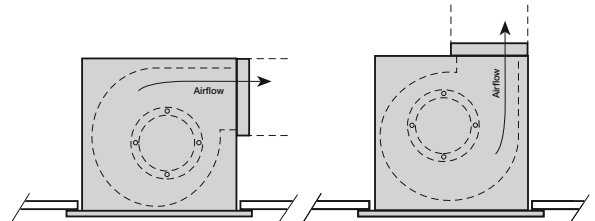
### Remove Wiring Knockout

Remove either top or side wiring knockout, depending on wiring direction, by bending it back and forth to break tabs.



### Ductwork

Check ductwork to see if the fan's discharge requires rotation from horizontal to vertical discharge.

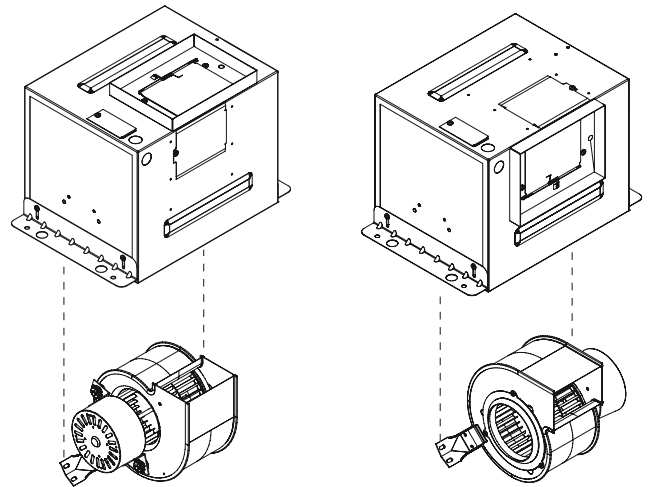


### Fan Rotation

To rotate from horizontal to vertical discharge  
A Models Only

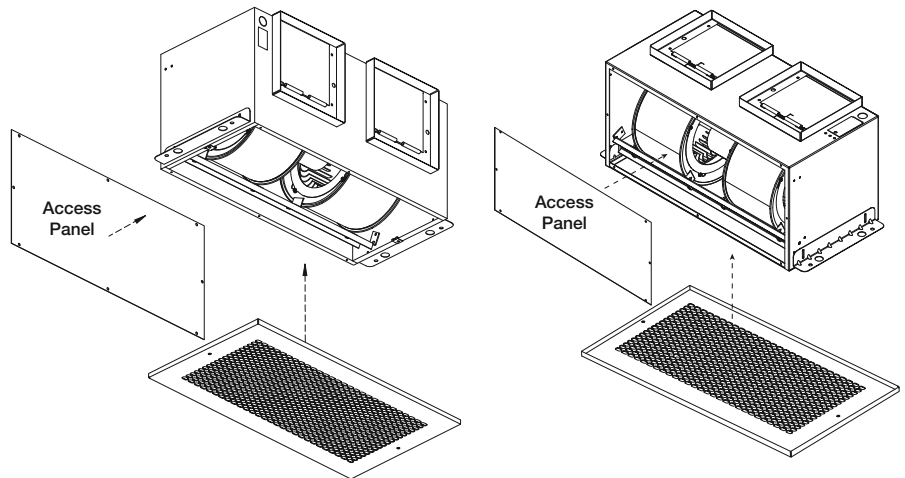
#### A50-510, 710, 780 Models

Remove the two screws holding the power assembly in and pull power assembly out. Rotate power assembly 180 degrees and put back into fan. Use the same screws to reattach power assembly to fan housing. Flip fan over and remove the four screws holding the discharge duct and damper assembly. Exchange the assembly with plate mounted on top of fan, as shown in these illustrations.



#### A700, 900-1500 Models

Remove the eight screws holding the access panel or collar as shown in picture. Rotate the fan housing so the discharge is facing up. Replace access panel or collar and screws.



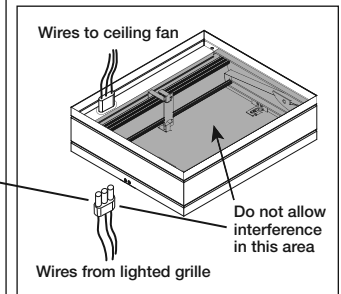
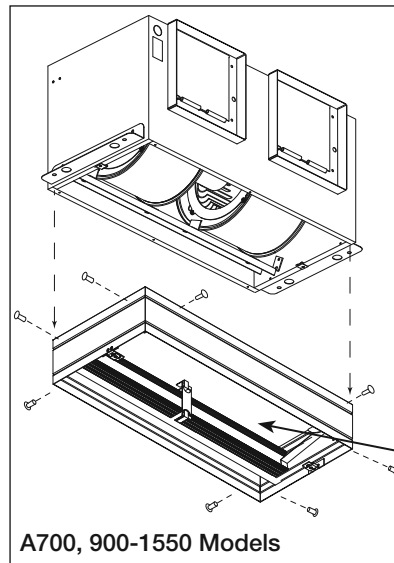
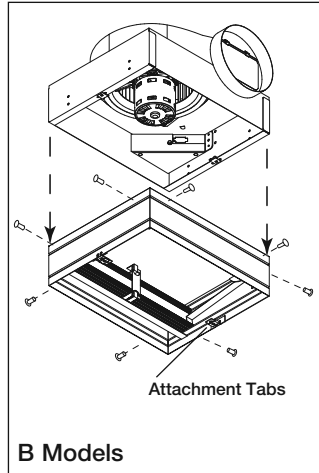
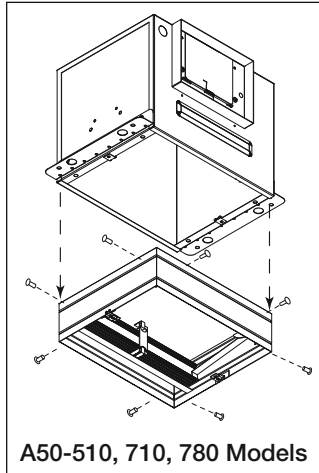
### Ceiling Radiation Damper (CRD)

If fan is to be used in a fire resistive membrane ceiling, a ceiling radiation damper must be used.

If the ceiling radiation damper is already mounted to the fan from the factory, proceed to Install the Fan.

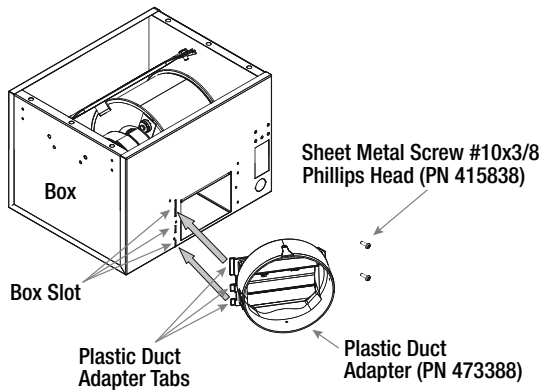
To mount the ceiling radiation damper to fan, make sure grille attachment tabs are facing down. Then place the inlet part of the fan into the ceiling radiation damper collar, and use self-tapping sheet metal screws (by others) to screw through the damper collar and into the fan housing. If the fan/light combination is being used, make sure ceiling

radiation damper has an electrical plug in it. The electrical plug must be inserted into the fan. Make sure the electrical wire will not interfere with damper operation as shown in figure below.

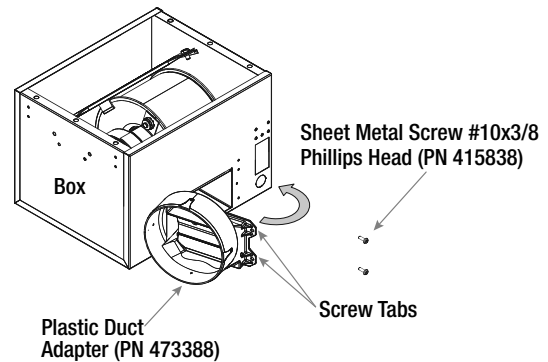


### Discharge Installation A50-90 Models

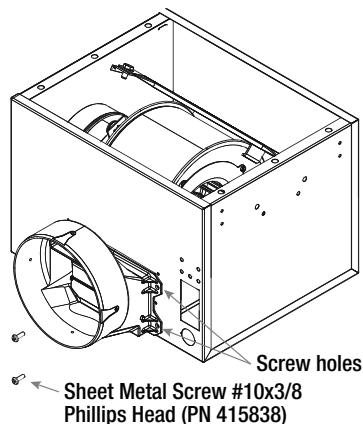
**1** Insert plastic duct tab into box slots.



**2** Rotate plastic duct adapter (PN 473388) until the screw tabs meet the box.

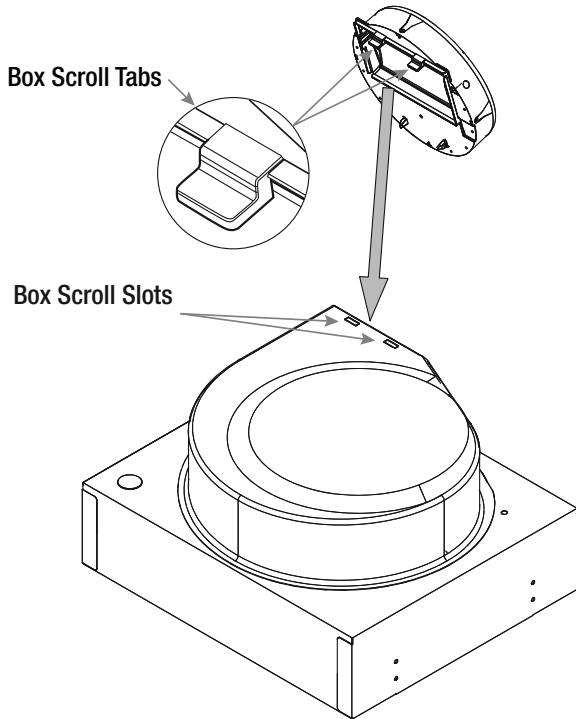


**3** Install screws provided to secure discharge.

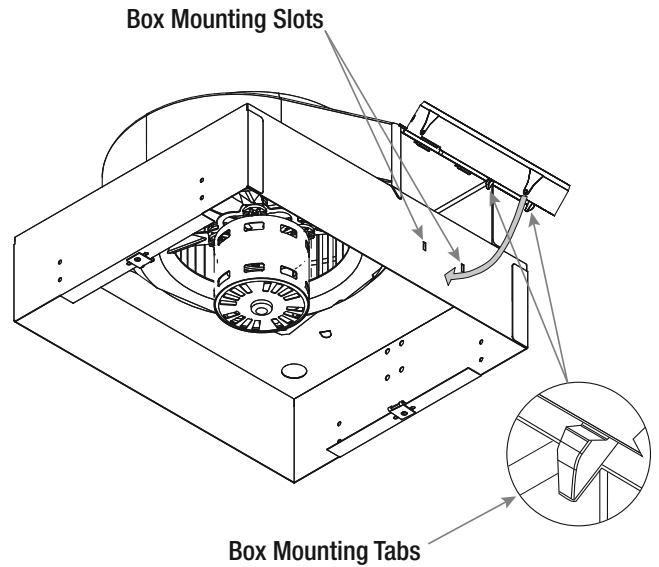


## Discharge Installation for Ceiling and Inline Exhaust Models Sizes B50-200

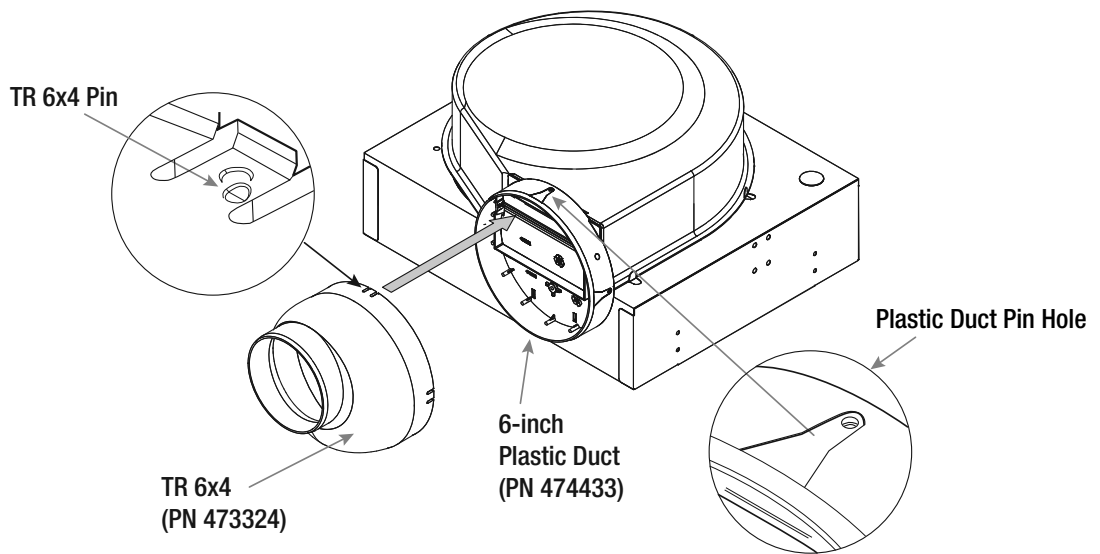
**1** Insert box scroll tab into box scroll slots.



**2** Rotate plastic duct adapter (PN 474433) until the two mounting tabs fully engage into the two box mounting slots.

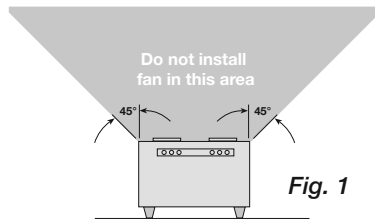


**3** **OPTIONAL**  
Align the pins on the TR 6x4 adaptor to the duct pin hole on the 6-inch duct. Push until the adaptor snaps into place.

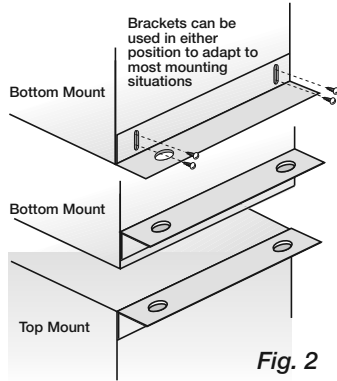


## Install the Fan

- For best performance, choose a location with the shortest possible duct run and minimum number of elbows. Do not mount near cooking equipment, as shown in Fig. 1.



- Attach adjustable mounting brackets to fan, but leave the screws loose until proper height is determined, shown in Fig. 2. Cut hole to dimensions shown in table below:



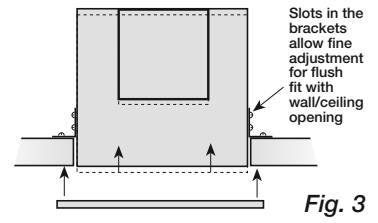
Ceiling Openings		
Ceiling Exhaust Sizes	Fan or Fan/Light	Fan/CRD
A50, A70, A90, A50-90-VG, A90-130-VG, A110, A125, A190	10 <sup>7</sup> / <sub>8</sub> x 13 <sup>3</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>8</sub> x 13 <sup>7</sup> / <sub>16</sub>
A200, A250, A290, A390	12 <sup>1</sup> / <sub>8</sub> x 14 <sup>1</sup> / <sub>4</sub>	12 <sup>1</sup> / <sub>4</sub> x 14 <sup>3</sup> / <sub>8</sub>
A700	23 <sup>3</sup> / <sub>4</sub> x 11 <sup>3</sup> / <sub>4</sub>	24 <sup>1</sup> / <sub>8</sub> x 12 <sup>1</sup> / <sub>4</sub>
A410, A510, A510-VG, A710, A710-VG, A780	14 <sup>3</sup> / <sub>4</sub> x 18 <sup>3</sup> / <sub>8</sub>	14 <sup>7</sup> / <sub>8</sub> x 18 <sup>7</sup> / <sub>16</sub>
A900, A1050, A1410, A1550	14 <sup>3</sup> / <sub>4</sub> x 24	14 <sup>7</sup> / <sub>8</sub> x 24 <sup>1</sup> / <sub>8</sub>
B50 - 200	14 <sup>1</sup> / <sub>8</sub> x 11 <sup>3</sup> / <sub>4</sub>	14 <sup>3</sup> / <sub>8</sub> x 12 <sup>1</sup> / <sub>4</sub>

### NOTE

Model sizes A50-90 are standard with a round duct. Should any model A110-190 require a round duct, Model RDC (Round Duct Connector) may be ordered from manufacturer for field installation.

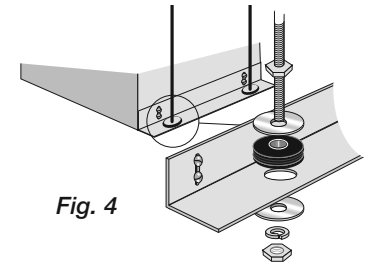
### For Frame Construction:

Position unit between joists. Position brackets such that bottom edge of housing will be flush with finished ceiling, and tighten the adjustable mounting brackets, shown in Fig. 3.

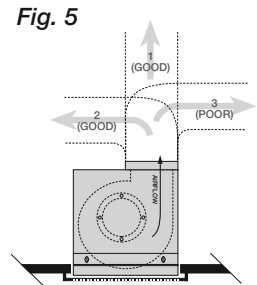


### For Hanging Installations:

Use manufacturer's optional vibration isolator kit Part Number VI Kit. Using the fan's standard adjustable mounting brackets and 10 by 32 threaded rod (by others), hang unit as shown in Fig. 4.



- Installation of ductwork is critical to the performance of the fan, shown in Fig. 5. Straight ductwork (1) or ductwork that turns in the same direction as the wheel (2) is recommended. Ductwork turning opposite the wheel direction (3) will cause turbulence and back pressure resulting in poor performance.

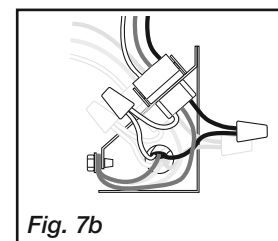
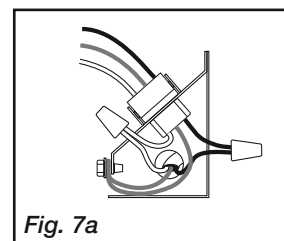
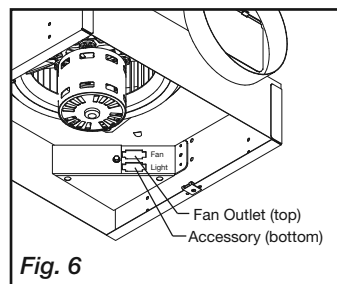


- Slide ductwork over the fan's discharge collar and securely attach it with sheet metal screws.

**Make sure the screws do not interfere with damper operation. Check damper to make sure it opens freely.**

## Wire the Fan

- Remove wiring cover. If fan/accessory combination is being used, make sure the fan plug is connected to the fan receptacle and the accessory plug is connected to the accessory receptacle, shown in Fig. 6. Using proper wire connectors, wire the fan as shown in Fig. 7a. For wiring of light proceed to Fig. 7b.



**115 & 277 Volt**  
 Black wire is "Hot"  
 White wire is "Neutral"  
 Green wire is "Ground"

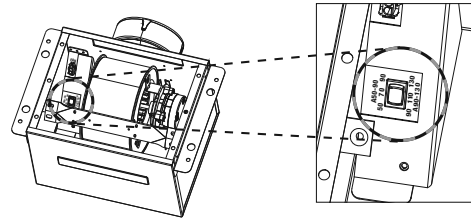
**220 - 240 Volt**  
 Black wire is "Hot"  
 White wire is "Hot"  
 Green wire is "Neutral/Ground"

- Push all wiring into the unit's cover and replace wiring cover.



## A50-90-VG and A90-130-VG Fan Models

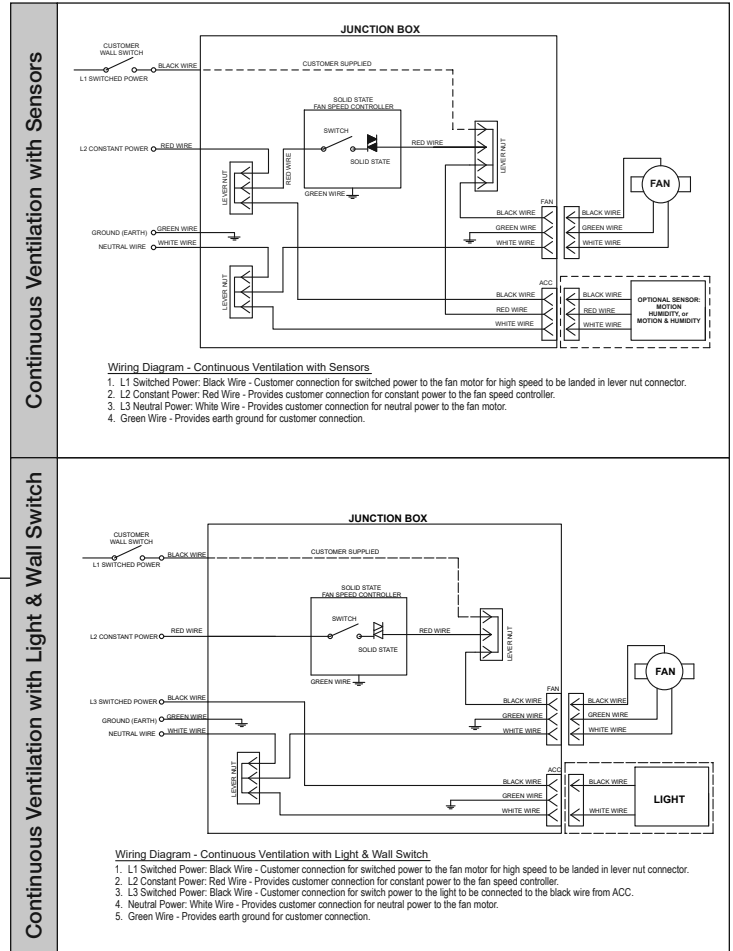
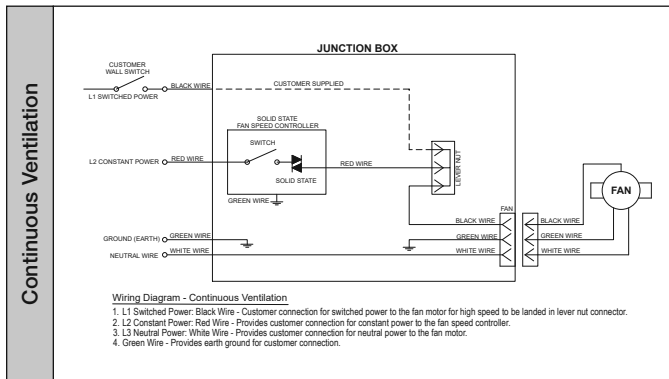
These fan models utilize an internal switch to set the fan to run at one of three flows. Please set three position switch to desired airflow when installing unit.



## Whole House Ventilation Two-Speed Operation

### A90 and 110, B50, 80 and 110 Models

1. Install fan per standard instructions.
2. Fan will operate at the certified airflow rate when wall switch or integrated sensor is activated.
3. Fan will operate at user set low speed when wall switch or integrated sensor is off.
  - a. User defined flow rate can be set by adjusting the dial pre-installed in the fan. Airflow is dependent on overall static pressure in the ductwork. Airflow will need to be verified with a measuring device.
4. When servicing fan, ensure the circuit is shut off at the breaker.



## Attach the Grille

1. If lighted grille is being used, plug wire from lighted grille into accessory socket.  
If lighted grille and ceiling radiation damper are being used, plug wire from lighted grille into ceiling radiation damper socket. Do not plug wire directly into the fan socket. Make sure the wire does not interfere with the ceiling radiation damper operation.
2. Attach grille with two screws provided. Make sure not to over tighten; over tightening will damage grille.
3. Slide attachment screw covers over the attachment screws, shown in Figure 8 and 9.
4. If lighted grille is being used, install light bulb(s) into light socket(s). For fluorescent lights, use 27W GU24 bulbs. For LED lights, use 10W GU24 bulbs. Manufacturer has replacement 27W GU24 bulbs, call 1-800-355-5354 to order.

5. If lighted grille is being used, snap lens into place, by pushing on the outside edges of lens, shown in Fig. 9. To remove lens, use a small screw driver and pry on one side of lens.
6. Turn on power and check fan and light operation.

Fig. 8

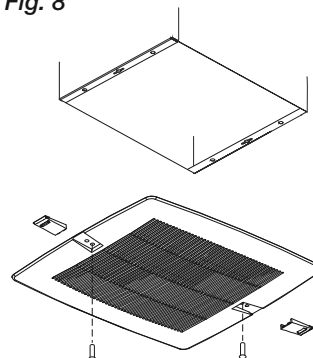
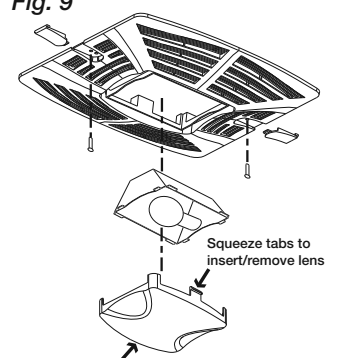
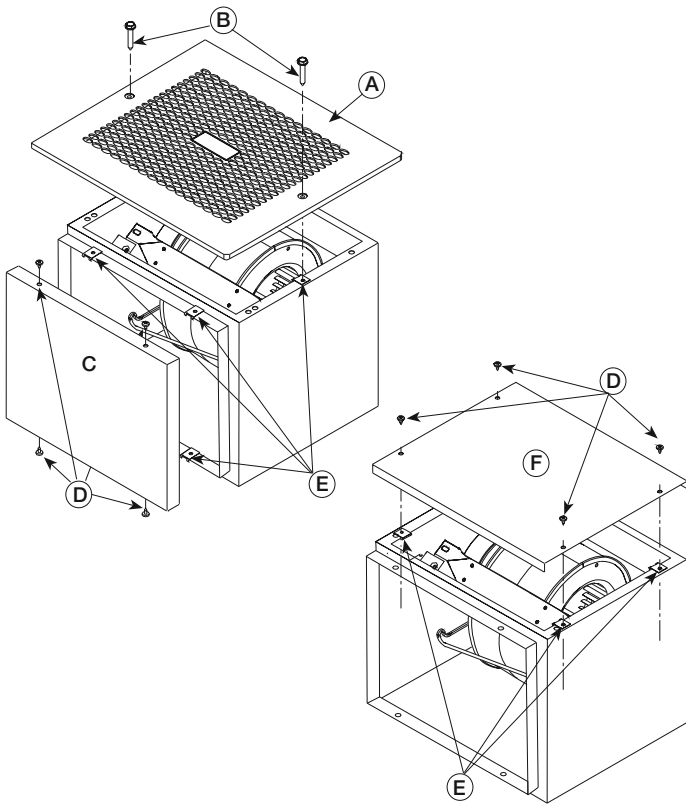


Fig. 9



## Converting from Ceiling to Cabinet Design for Ceiling Exhaust Fans



All convertible sizes will be shipped with grille and duct collar cover. Note, this applies only to fans originally ordered as convertible.

### Conversion Kit Parts List

- Qty. of 1 Blower Box Cover

### Tools Required

- Phillips Head Screwdriver

- Step 1: Remove grille (A) by removing the two grille screws (B).
- Step 2: Remove duct collar cover (C) by removing the four duct collar screws (D).
- Step 3: Discard grille (A), two grille screws (B), and duct collar cover (C).
- Step 4: Remove the six (6) tinnerman clips (E) by twisting them to one side and pulling straight out. Discard two of the six tinnerman clips.
- Step 5: Insert the remaining four tinnerman clips (E) on grille opening side.
- Step 6: Place blower box cover (F) over tinnerman clips (E), which were inserted in step 5.
- Step 7: Screw the blower box cover (F) into place with four blower box cover screws (D).

## General Maintenance Suggestions

Ceiling exhaust fans require very little maintenance, but since small problems over time left unchecked could lead to loss of performance or early motor failure, we do recommend that the unit be inspected periodically (once or twice a year).

The fan motor and wheel should be checked for dust and dirt accumulations. Dirt buildup can lead to loss of performance and motor overheating. Cleaning can be accomplished by brushing off any dust that may have accumulated. Even filtered units can accumulate build-up and should be checked when cleaning filters.

The motor should be checked for lubrication at this time. Lubricate only those motors which have an oil hole provided. A few drops of all purpose oil (SAE 20) will be sufficient.

## Our Commitment

*As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.*

Specific Greenheck product warranties are located on [greenheck.com](http://greenheck.com) within the product area tabs and in the Library under Warranties.

Greenheck's Centrifugal Ceiling and Cabinet Exhaust Fans catalog provides additional information describing the equipment, fan performance, available accessories, and specification data.

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at [www.amca.org](http://www.amca.org).



Phone: 715.359.6171 • Fax: 715.355.2399 • Parts: 800.355.5354 • E-mail: [gfcinfo@greenheck.com](mailto:gfcinfo@greenheck.com) • Website: [www.greenheck.com](http://www.greenheck.com)

## Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

### Direct Drive Downblast Centrifugal Exhaust

These fans are specifically designed for roof mounted applications exhausting relatively clean air. Performance capabilities range up to 6,300 cfm (10,703 m<sup>3</sup>/hr) and up to 1.75 in. wg (435 Pa) of static pressure. The maximum continuous operating temperature is 130°F (54°C). Direct Drive models are available in 20 sizes with nominal wheel diameter ranging from 8 to 22 inches (203 to 558 mm) (060-203 unit sizes). Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number. All fans are UL/cUL Listed Standard 705.



### Belt Drive Downblast Centrifugal Exhaust

These fans are specifically designed for roof mounted applications exhausting relatively clean air. Performance capabilities range up to 44,700 cfm (75,950 m<sup>3</sup>/hr) and up to 3.25 in. wg (809 Pa) of static pressure. The maximum continuous operating temperature is 180°F (82°C). Belt Drive models are available in 29 sizes with nominal wheel diameters ranging from 11 to 54 inches (279 to 1372 mm) (071-540 unit sizes). Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number. All fans are UL/cUL Listed Standard 705.

## General Safety Information

Only qualified personnel should install this fan. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. Other considerations may be required if high winds or seismic activity is present. If more information is needed, contact a licensed professional engineer before moving forward.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.
2. The rotation of the wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin fan wheel faster than max cataloged fan RPM. Adjustments to fan speed significantly affects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces or chemicals. Replace cord immediately if damaged.
6. Verify that the power source is compatible with the equipment.

7. Never open access doors to a duct while the fan is running.

### **DANGER**

Always disconnect, lock and tag power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.

### **CAUTION**

When servicing the fan, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing.

### **CAUTION**

Precaution should be taken in explosive atmospheres.

### **DANGER**

Pour écarter les risques d'incendie, de choc électrique ou de blessure grave, veiller à toujours débrancher, verrouiller et étiqueter la source de courant avant l'installation ou l'entretien.

### **ATTENTION**

Lors de toute intervention sur la soufflante, le moteur peut être suffisamment chaud pour provoquer une douleur voire une blessure. Laisser le moteur refroidir avant toute maintenance.

### **ATTENTION**

Faire preuve de précaution dans les atmosphères explosives.

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## Receiving

Upon receiving the product, check to ensure all items are accounted for by referencing the delivery receipt or packing list. Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier of any damage detected. The customer will make notification of damage (or shortage of items) on the delivery receipt and all copies of the bill of lading which is countersigned by the delivering carrier. If damaged, immediately contact your representative. Any physical damage to the unit after acceptance is not the responsibility of the manufacturer.

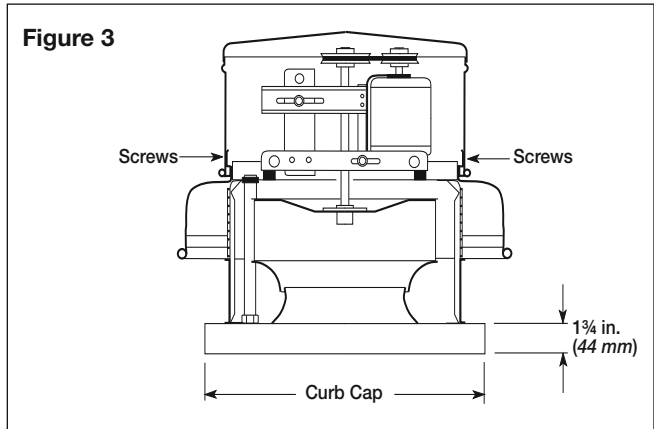
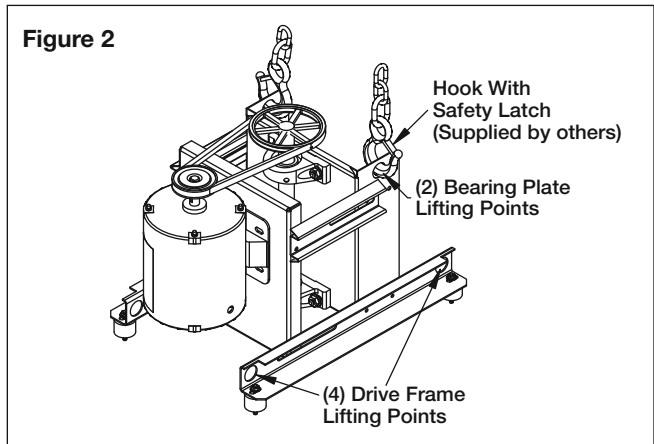
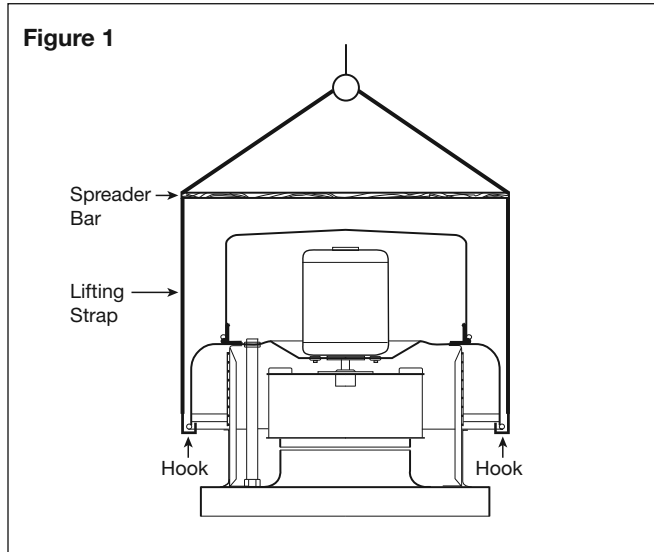
## Unpacking

Verify that all required parts and the correct quantity of each item have been received. If any items are missing, report shortages to your local representative to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

## Handling

### Belt and Direct Drive Units

Lift Direct Drive unit on to the roof utilizing hooks under the lip of the shroud. Evenly space the hooks around the shroud using a minimum of four lifting straps. Use a spreader bar to ensure the straps do not come in contact with the unit (see Figure 1).





When lifting a belt drive unit on to the roof, use either the four lifting points on the drive frame or the two lifting points on the bearing plate if present (see Figure 2 for lifting points). Access to the drive frame is accomplished by removing the screws pointed out in Figure 3. The cover can then be removed and placed on a flat surface in an area protected from strong winds.

When direct and/or belt drive unit is on the roof, move fan to desired location using lifting points and fasten securely through mounting holes in base. Shims may be necessary depending upon roofing material thickness.

The motor amperage and voltage ratings must be checked for compatibility to supply voltage prior to final electrical connection. For direct and/or belt drive installations, the electrical supply should be routed through the conduit chase located between the curb cap and the bottom of the motor compartment. Wiring must conform to local and national codes.

### Storage

Fans are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the fan and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

**Indoor** - The ideal environment for the storage of fans and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain or snow. Temperatures should be evenly maintained between 30° to 110°F (-1° to 43°C) (wide temperature swings may cause condensation and “sweating” of metal parts). All accessories must be stored indoors in a clean, dry atmosphere.

Remove any accumulations of dirt, water, ice or snow and wipe dry before moving to indoor storage. To avoid “sweating” of metal parts, allow cold parts to reach room temperature. To dry parts and packages, use a portable electric heater to get rid of any moisture buildup. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3½ inches (89 mm) off the floor on wooden blocks covered with moisture proof paper or polyethylene sheathing. Aisles between parts and along all walls should be provided to permit air circulation and space for inspection.

**Outdoor** - Fans designed for outdoor applications may be stored outdoors, if absolutely necessary. Roads or aisles for portable cranes and hauling equipment are needed.

The fan should be placed on a level surface to prevent water from leaking into the fan. The fan should be elevated on an adequate number of wooden blocks so that it is above water and snow levels and has enough blocking to prevent it from settling into soft ground. Locate parts far enough apart to permit air circulation, sunlight and space for periodic inspection. To minimize water accumulation, place all fan parts on blocking supports so that rain water will run off.

Do not cover parts with plastic film or tarps as these cause condensation of moisture from the air passing through heating and cooling cycles.

Fan wheels should be blocked to prevent spinning caused by strong winds.

### Inspection and Maintenance During Storage

While in storage, inspect fans once per month. Keep a record of inspection and maintenance performed.

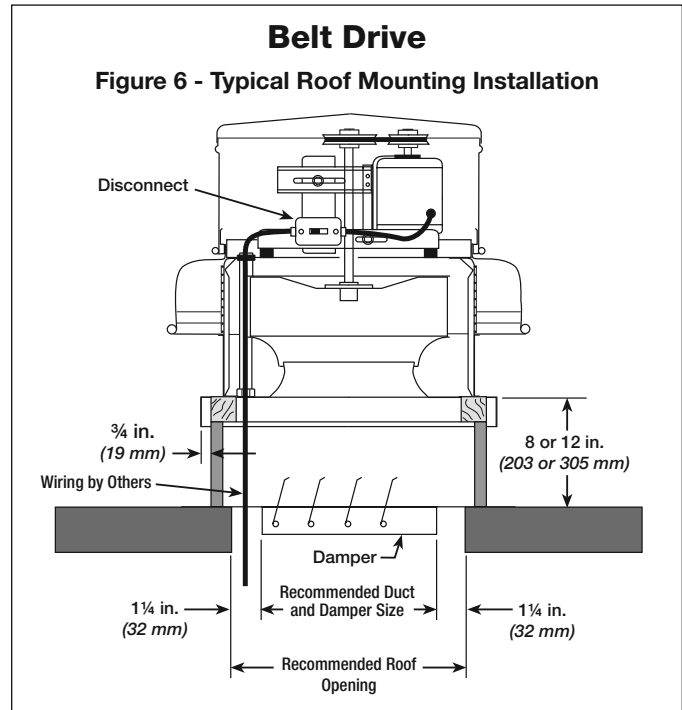
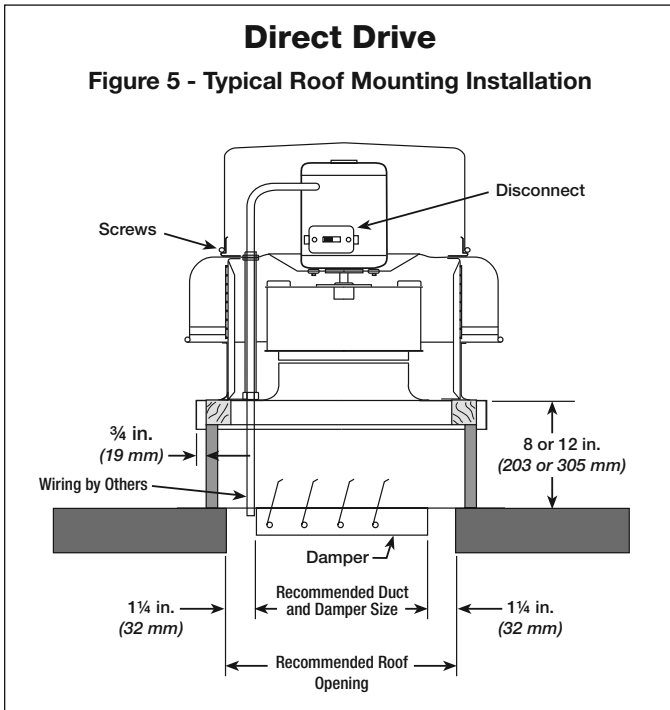
If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the wheel by hand ten to fifteen revolutions to distribute lubricant in motor. If paint deterioration begins, consideration should be given to touch-up or repainting. Fans with special coatings may require special techniques for touch-up or repair.

Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Thoroughly wipe clean with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive, WD-40® or the equivalent.

### Removing From Storage

As fans are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion until the fan equipment goes into operation.

## Dimensional Data



Model Size	Curb Cap	Damper	Roof Opening	*Approx. Weight
060, 065, 070, 075	17 (432)	8 (203)	10½ (267)	18 (8)
080, 085, 090, 095	17 (432)	10 (254)	12½ (318)	26 (12)
097, 098, 099	19 (483)	12 (305)	14½ (368)	57 (26)
103, 103 HP	19 (483)	12 (305)	14½ (368)	62 (28)
123	19 (483)	12 (305)	14½ (368)	65 (30)
133	19 (483)	12 (305)	14½ (368)	66 (30)
143, 143 HP	22 (559)	16 (406)	18½ (470)	76 (35)
163	22 (559)	16 (406)	18½ (470)	80 (36)
183	30 (762)	18 (457)	20½ (521)	119 (54)
203	30 (762)	18 (457)	20½ (521)	130 (59)

- All dimensions are in inches (*millimeters*).
- \* Approximate weight shown in pounds (*kilograms*) is the largest cataloged open drip proof motor.
- “Curb Cap” is the inside dimension of the curb cap.
- The roof curb should be 1½ in. (38 mm) less than the curb cap to allow for roofing and flashing.
- Roof opening is a square dimension

Model Size	Curb Cap	Damper	Roof Opening	*Approx. Weight
071, 081, 091	19 (483)	12 (305)	14½ (368)	58 (26)
101, 101HP	19 (483)	12 (305)	14½ (368)	63 (29)
121	19 (483)	12 (305)	14½ (368)	66 (30)
131	19 (483)	12 (305)	14½ (368)	67 (30)
141, 141HP	22 (559)	16 (406)	18½ (470)	83 (38)
161, 161HP	22 (559)	16 (406)	18½ (470)	89 (40)
180, 180HP	30 (762)	18 (457)	20½ (521)	125 (57)
200, 200HP	30 (762)	18 (457)	20½ (521)	138 (63)
220, 220HP, 240, 240HP	34 (864)	24 (610)	26½ (673)	158 (72)
260	40 (1016)	30 (762)	32½ (826)	305 (138)
300, 300HP	40 (1016)	30 (762)	32½ (826)	320 (145)
330	46 (1168)	36 (914)	38½ (978)	385 (175)
360, 360HP	46 (1168)	36 (914)	38½ (978)	403 (183)
420	52 (1321)	42 (1067)	44½ (1130)	495 (225)
480	52 (1321)	48 (1219)	50½ (1283)	623 (283)
500	64 (1626)	54 (1372)	56½ (1435)	687 (312)
540	64 (1626)	54 (1372)	56½ (1435)	748 (339)

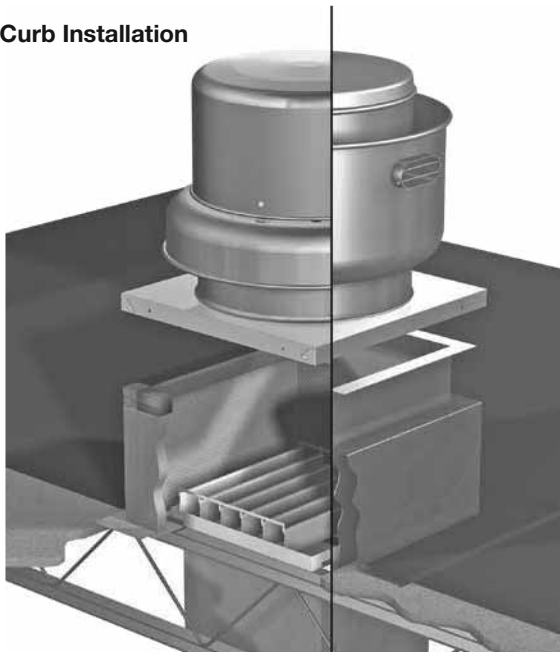
- All dimensions are in inches (*millimeters*).
- \* Approximate weight shown in pounds (*kilograms*) is the largest cataloged open drip proof motor.
- “Curb Cap” is the inside dimension of the curb cap.
- The roof curb should be 1½ in. (38 mm) less than the curb cap to allow for roofing and flashing.
- Roof opening is a square dimension

## Installation

### Typical Roof Mounting Installation

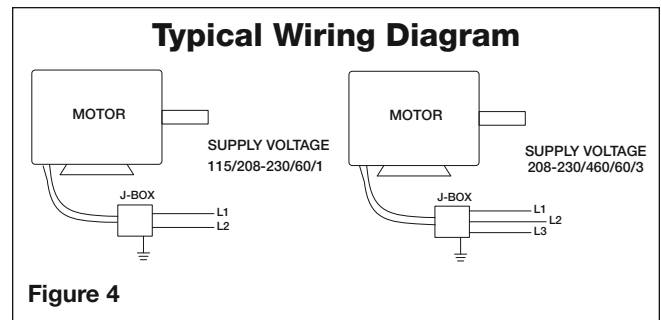
1. On the roof surface, cut an appropriate sized hole and follow manufacturer's instructions on curb installation. Caulk and flash the curb to ensure a water tight seal.

#### Roof Curb Installation



2. If unit is equipped with a backdraft damper, it should be installed now.
3. Remove motor cover. Access to the motor compartment is accomplished by removing the screws as shown in Figure 3, page 2.
4. On **belt drive** fans, use the lifting lugs on the drive frame or bearing plate to lift and place the unit on top of roof curb. Refer to Figure 2, page 2.
5. On **direct drive** fans, lift and place the unit on top of roof curb using hooks under the lip of the shroud. Refer to Figure 1, page 2.
6. Secure fan to curb using a minimum of eight lag screws, metal screws or the suitable fasteners. Shims may be required depending upon curb installation and roofing material.
7. Verify power line wiring is de-energized before connecting fan motor to power source.
8. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Check the power source for compatibility with the requirements of your equipment.
9. Check fan wheel for free rotation, recenter if necessary. Check setscrew(s) for tightness.
10. Check all fasteners for tightness.

11. Mount and wire safety disconnect switch under motor cover. Wire control switches at ground level, refer to Figure 4.
12. Replace motor cover.



### Vari-Green Wiring

For Vari-Green wiring, refer to the Vari-Green Motor and Controls Installation, Operation and Maintenance Manual for complete wiring and operation instructions.

#### IMPORTANT

Installation, troubleshooting and parts replacement are to be performed only by qualified personnel. Consult and follow all applicable national, state and local codes. They will supercede this document.

## Pre-Starting Checks

1. Check all fasteners and setscrews for tightness. The wheel should rotate freely and be aligned as shown in Figure 7.

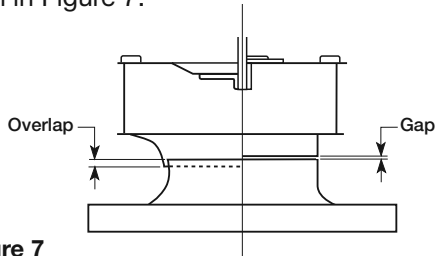


Figure 7

Model Type		Size	Overlap in. (mm)	Gap in. (mm)
Direct	Belt			
X	—	060-095	—	3/32 (2)
X	—	097-163	1/4 (6)	—
—	X	071-161	1/4 (6)	—
X	—	183-243	3/8 (10)	—
—	X	180-240	3/8 (10)	—
—	X	260-540	1/2 (13)	—

2. Wheel position is preset and the unit is test run at the factory. Movement may occur during shipment and realignment may be necessary.
3. **Belt Drive:** Centering wheel across the inlet can be accomplished by loosening the bolts holding the drive frame to the vibration isolators and repositioning the drive frame.

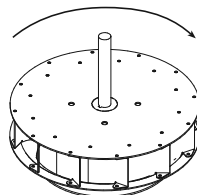
**Direct and Belt Drive:** If further alignment is needed, loosen shroud bolts and move shroud and motor to align wheel over inlet properly.

Wheel and inlet cone overlap can be adjusted by loosening the set screws in the wheel hub and moving the wheel to the desired position. For both **direct and belt drive** models with wheel hubs and shaft pulleys utilizing a tapered bushing interface, reference page 8 for the tapered bushing removal and move the wheel to the desired position.

Fan RPM should be checked and verified with a tachometer.

4. Check wheel rotation (viewing from the shaft side) by momentarily energizing the unit. Rotation should be clockwise as shown in Figure 8 and correspond to rotation decal on the unit.

If wheel rotation is incorrect, reverse two of the wiring leads or check motor wiring for single phase. Fan RPM should be checked and verified with a tachometer.



Clockwise Rotation

Figure 8

### WARNING

Correct direction of wheel rotation is critical. Reversed rotation will result in poor air performance, motor overloading and possible motor burnout.

### AVERTISSEMENT

La turbine doit impérativement tourner dans le bon sens. Une rotation en sens inverse entraînerait de mauvaises performances de soufflage, une surcharge du moteur voire un grillage du moteur.

### IMPORTANT

The fan has been checked for mechanical noises at the factory prior to shipment. If mechanical noise should develop, suggested corrective actions are offered in the Troubleshooting section.

### IMPORTANT

Over tightening belts will cause excessive bearing wear and noise. Too little tension will cause slippage at startup and uneven wear.

### Belt Drive Pre-Starting Belt Tension Checks

5. Always loosen tension enough to install belts without stretching. Do not force belt(s) see Figure 9. Forcing belts will break the cords and cause belt failure.



Figure 9

6. For units with two groove pulleys, adjust so the tension is equal in both belts.
7. If adjustments are made, it is very important to check the pulleys for proper alignment. Misaligned pulleys lead to excessive belt wear vibration, noise and power loss, see Figure 10.

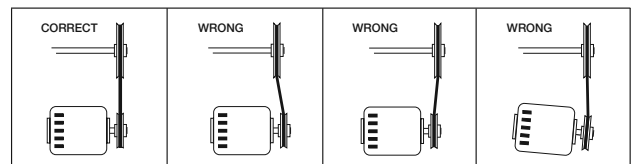


Figure 10

8. Belt tension can be adjusted by loosening four fasteners on the drive frame, see Figure 11. The motor plate slides on the slotted adjusting arms and drive frame angles in the same manner.

Four (4) fasteners in total.

Identical fasteners on opposing side must also be loosened.

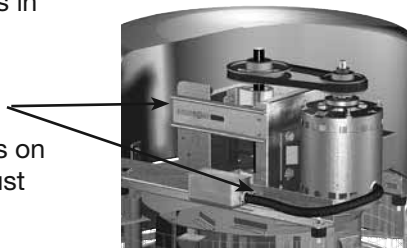


Figure 11

9. **Sizes 071-161:** Belts should be tensioned just enough to prevent slippage at full load. Belts should have a slight bow on the slack side while running at full load, see Figure 12a.

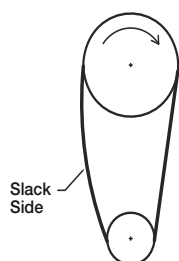


Figure 12a

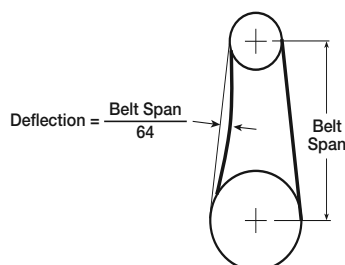


Figure 12b

**Sizes 180-540:** Belt tension should be adjusted to allow 1/64 in. (0.397 mm) of deflection per inch of belt span. For example, a 15 in. (381 mm) belt span should have 15/64 in. (5.95 mm) (or about 1/4 in. (6 mm)) of deflection with moderate thumb pressure at mid-point between pulleys, see Figure 12b.

10. The adjustable motor pulley is factory set for the RPM specified. Speed can be increased by closing or decreased by opening the adjustable motor pulley.
11. Any increase in speed represents a substantial increase in the horsepower required by the unit.
12. Motor amperage should always be checked to avoid serious damage to the motor when speed is varied.

## Operation

1. Before starting up or operating fan, check all fasteners for tightness. In particular, check the set screws in the wheel hub (or the tapered bushing and pulleys if applicable).
2. While in the OFF position or before connecting the fan to power, turn the fan wheel by hand to be sure it is not striking the venturi or any obstacle.
3. Start the fan and shut it off immediately to check rotation of the wheel with directional arrow in the motor compartment, see Figure 8.
4. When the fan is started, observe the operation and check for any unusual noises.
5. With the system in full operation and all ductwork attached, measure current input to the motor and compare with the nameplate rating to determine if the motor is operating under safe load conditions.
6. Keep inlets and approaches to fan clean and free from obstruction.

### IMPORTANT

Adjust (tighten) belt tension after the first 24-48 hours of operation.

## Inspection

Inspection of the fan should be conducted at the first 30 minute and 24 hour intervals of satisfactory operation.

**30 Minute Interval:** Inspect bolts, setscrews and motor mounting bolts. Adjust and tighten as necessary.

**24 Hour Interval:** Check all internal components. On belt drive units only, inspect belt alignment and tension. Adjust and tighten as necessary.

## Maintenance

### DANGER

Disconnect and secure to the "off" position all electrical power to the fan prior to inspection or servicing. Failure to comply with this safety precaution could result in serious injury or death.

### DANGER

Pour écarter les risques de blessure grave ou de mort, débrancher et verrouiller l'alimentation électrique en position « Arrêt » avant tout contrôle ou entretien.

### WARNING

This unit should be made non-functional when cleaning the wheel or housing (fuses removed, disconnect locked off).

### AVERTISSEMENT

L'appareil doit être rendu non opérationnel lors du nettoyage de la turbine ou du caisson (fusibles retirés, sectionneur verrouillé).

### IMPORTANT

Uneven cleaning of the wheel will produce an out of balance condition that will cause vibration in the fan.

Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations and who are experienced with this type of equipment.

Motor maintenance is generally limited to cleaning and lubrication (where applicable). Cleaning should be limited to exterior surfaces only. Removing dust buildup on motor housing ensures proper motor cooling.

Greasing of motors is only intended when fittings are provided. Many fractional horsepower motors are permanently lubricated and should not be lubricated after installation. Motors supplied with grease fittings should be greased in accordance with manufacturer's recommendations. Where motor temperatures do not exceed 104°F (40°C), the grease should be replaced after 2,000 hours of running time as a general rule.

Wheels require very little attention when moving clean air. Occasionally, oil and dust may accumulate causing imbalance. When this occurs, the wheel and housing should be cleaned to ensure smooth and safe operation.

All fasteners should be checked for tightness each time maintenance checks are performed prior to restarting unit.

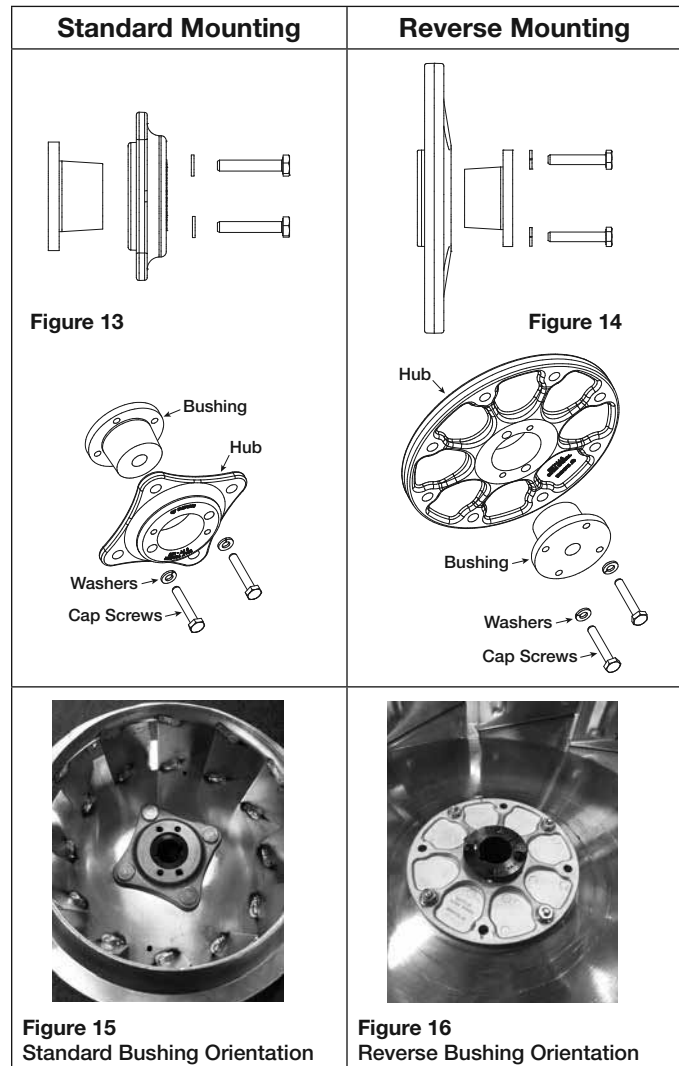
A proper maintenance program will help these units deliver years of dependable service.

## Tapered Bushing Hub Installation and Removal

For wheel hubs and shaft pulleys utilizing a tapered bushing interface, follow this procedure for installation and removal. There are two possible set ups for the tapered bushing, both have the same procedure, but orientation of the hub varies.

### Tapered Bushing Removal:

1. If present, loosen the setscrew holding the bushing and shaft key in place.
2. Loosen and remove the socket head cap screws which fasten the bushing to the hub as shown in the section views and examples of Figures 13-16.



3. **Standard Mounting:** Take the two socket head cap screws that were removed and install them into the visibly threaded holes on the wheel hub.  
**Reverse Mounting:** Install the two socket head cap screws into the visibly threaded holes of the bushing flange.
4. Once both socket head cap screws are installed, tighten them an eighth of a turn at a time, alternating between the two until the hub comes loose from the bushing.

## Bushing Installation:

1. Clean all surfaces of hub and bushing to remove any oil or residue present and do not use any lubricant to install bushing into the hub. For both standard and reverse mounting styles, the socket head cap screws are adjustable from the inlet of the fan.
2. **Standard Mounting:** Slide the bushing and shaft key onto the fan shaft followed by the wheel and hub assembly. If present, use the keyway setscrew to hold the shaft key and bushing in place but **DO NOT** overtighten as this can damage the bushing. Align the unthreaded holes of the hub with the threaded holes of the tapered bushing.  
**Reverse Mounting:** Slide the wheel and hub assembly onto the fan shaft followed by the bushing and shaft key. If present, use the keyway setscrew to hold the shaft key and bushing in place but **DO NOT** overtighten as this can damage the bushing. Align the unthreaded holes of the tapered bushing with the threaded holes of the hub.
3. Install the two bushing socket head cap screws into the aligned holes by hand (or without excessive torque) until the heads of the socket head cap screws are seated against the mating surface.
4. Adjust the height of the wheel in the fan relative to the inlet venturi then tighten the two socket head cap screws an eighth turn at a time in an alternating fashion and to a torque of 10 ft-lbs.

## Belt and Bearing Maintenance

1. Belts tend to stretch after a period of time. They should be checked periodically for wear and tightness. When replacing belts, use the same type as supplied with the unit.
2. Matched belts should always be used on units with multi-groove pulleys.
3. For belt replacement, loosen the tensioning device enough to allow removal of the belt by hand.
4. Once installed, adjust belts as shown in "Pre-Starting Checks."
5. To ensure tightness, check pulley setscrews. Proper keys must be in keyways.
6. Fan RPM should not be readjusted. Only use pulleys of identical size and type when replacing pulleys.
7. Shaft bearings can be classified in two groups: relubricating and non-relubricating. All non-relubricating bearings on belt drive fans are factory lubricated and require no further lubrication under normal use (between -20° to 180°F (-29° to 82°C) in a relatively clean environment).

8. On belt drive fans, the standard cast pillow block bearings are factory lubricated and are provided with external grease fittings. Annual lubrication is recommended, or more frequently if needed. See Table 2. Do not over-grease. Use only one or two shots of lubricant with a hand gun. Maximum hand gun rating is 40 psi. Rotate bearings during lubrication where good safety practice permits. Caution should be employed to prevent over packing or contamination.
9. Units installed in hot, humid or dirty locations should be equipped with special bearings. These bearings will require frequent lubrication. Caution should be employed to prevent over packing or contamination.
10. Grease fittings should be wiped clean. The unit should be in operation while lubricating bearings. Extreme care should be used around moving parts.
11. Grease should be pumped in very slowly until a slight bead forms around the seal. A high grade lithium base grease should be used. See Table 3.
12. During the first few months of operation, check bearing setscrews periodically to ensure tightness.
13. If unit is to be left idle for an extended period, remove belts and store in a cool, dry place to avoid premature belt failure.

## Recommended Bearings Lubrication Frequency in Months

NOTE: If unusual environment conditions exist (extreme temperature, moisture or contaminants) more frequent lubrication is required.

A good quality lithium base grease, conforming to NLGI Grade 2 consistency, such as those listed in Table 3 may be used.

**Table 2: Suggested Fan Bearing Lubrication Intervals**

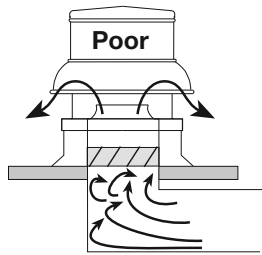
Interval (months)	Type of Service
1 to 3	Heavy duty in dirty, dusty locations; high ambient temperatures; moisture laden atmosphere; vibration.
3 to 6	12 to 24 hours per day, heavy duty, or if moisture is present
6 to 12	8 to 16 hours per day in clean, relatively dry atmosphere
12 to 18	Infrequent operation or light duty in clean atmosphere

**Table 3: Grease Manufacturers**

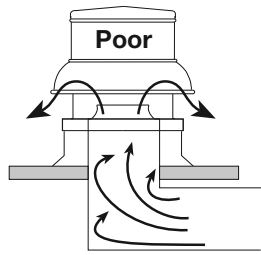
Manufacturer	Grease (NLGI #2)
U.S. Electric Motors	Grease No. 83343
Chevron U.S.A. Inc	Chevron SRI Grease #2
Mobil Oil Corporation	Mobilith
	Mobil 532
Texaco, Inc.	Premium BRB #2
	Texaco Multifak #2
Amoco Oil Co.	Rykon Premium #2
Exxon	Unirex N2
Shell	B Shell Alvania #2

## Fan Inlet Connections

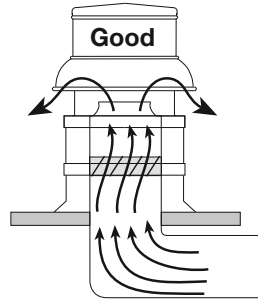
In order to ensure proper fan performance, caution must be exercised in fan placement and connection to the ventilation system. Obstructions, transitions, poorly designed elbows, improperly selected dampers, etc., can cause reduced performance, excessive noise and increased mechanical stress. For performance to be as published, the system must provide uniform and stable airflow into the fan.



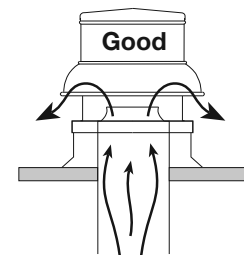
Dampers must open fully. Use motorized dampers in low airflow applications to reduce losses.



Avoid sharp turns or entrance conditions which cause uneven flow. Use turning vanes in elbows to reduce adverse effects.



Provide uniform airflow at fan inlet and through the damper to ensure optimum performance. Curb cap should be three wheel diameters from the radius. Use turning vanes in duct when possible.



Provide uniform airflow at fan inlet to ensure optimum performance.

## Parts List

Each fan bears a manufacturer's nameplate with model number and serial number embossed. This information will assist the local representative and the factory in providing service and replacement parts. Before taking any corrective action, make certain unit is not capable of operation during repairs.

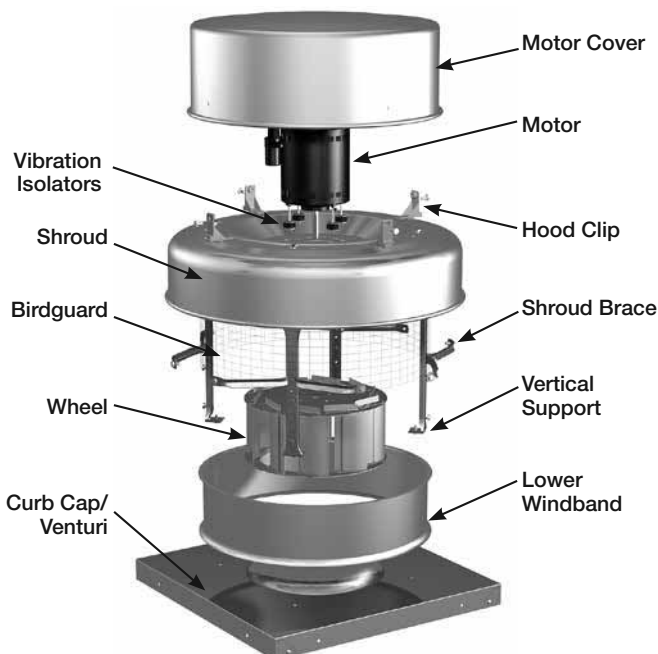
### CAUTION

A fan manufactured with an explosion resistant motor does not certify the entire unit to be explosion proof. Refer to UL Listing mark for the fans approved usage.

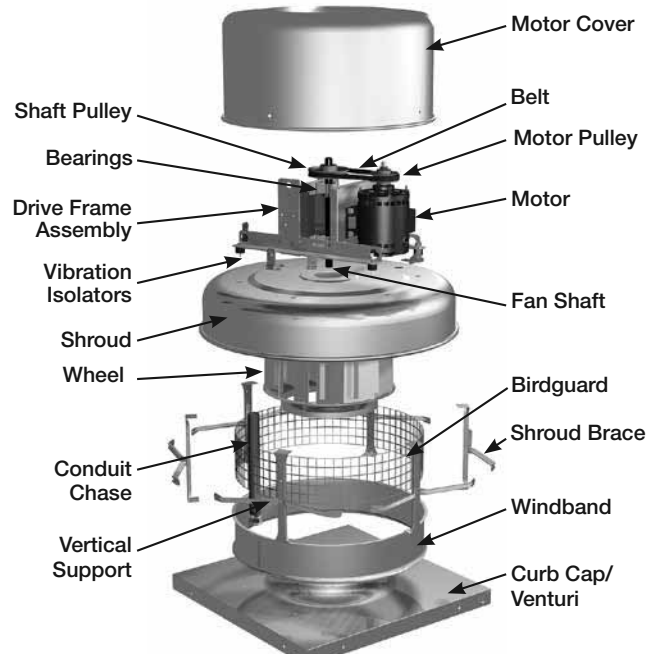
### CAUTION

La présence d'un moteur antidéflagrant sur un ventilateur ne garantit pas que tout l'appareil est antidéflagrant. Pour connaître les emplois autorisés de l'appareil, voir son marquage de conformité UL.

### Direct Drive



### Belt Drive





## Troubleshooting

### WARNING

Before taking any corrective action, make certain unit is not capable of operation during repairs.

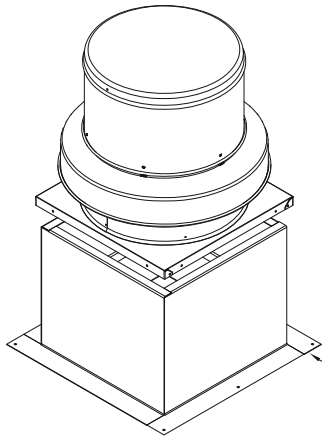
### AVERTISSEMENT

Avant d'entreprendre toute action corrective, s'assurer que l'appareil ne pourra pas fonctionner durant les réparations.

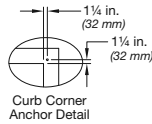
PROBLEM	CAUSE	CORRECTIVE ACTION
Excessive noise or vibration	Wheel rubbing inlet	Adjust wheel and/or inlet cone. Tighten wheel hub or bearing collars on shaft.
	V-belt drive	Tighten pulleys on motor/fan shaft. Adjust belt tension. Align pulleys properly, see page 6, Figures 9 and 10. Replace worn belts or pulleys.
	Bearings	Replace defective bearing(s). Lubricate bearings. Tighten collars and fasteners.
	Wheel unbalance	Clean all dirt off wheel. Check wheel balance, rebalance in place if necessary.
	Belts too tight or too loose	Adjust tension, see page 7, Figure 12a-b.
	Wheel improperly aligned and rubbing	Center wheel on inlet, see page 6, Figure 7.
	Loose drive or motor pulleys	Align and tighten. See "Pre-Starting Checks", see page 6 and 7.
	Foreign objects in wheel or housing	Remove objects, check for damage or unbalance.
	Fan base not securely anchored	Secure properly.
	Motor hood loose and rattling	Tighten fasteners to secure the motor hood.
	Defective or loose motor bearings	Replace motor with same frame size, RPM-HP.
High horsepower	Fan	Check rotation of wheel, see page 6, Figure 8. Reduce fan speed.
	Duct system	Resize ductwork. Check proper operation of face and bypass dampers. Check filters and access doors.
Fan does not operate	Electrical supply	Check fuses/circuit breakers. Check for switches off. Check for correct supply voltage.
	Drive	Check for broken belts. Tighten loose pulleys or belts.
	Motor	Ensure motor is correct horsepower and not tripping overload protector.
Motor overloads or overheats	Lubrication	Check for excessive or insufficient grease in the bearing.
	Mechanical	Replace damaged bearing. Relieve excessive belt tension. Align bearings. Check for bent shaft.
	Belt slippage	Adjust tension or replace bad belts, see pages 6 and 7.
	Over/Under line voltage	Contact power company.
	Incorrect wheel rotation	Check motor wiring, see page 5, Figure 4. Confirm wheel rotation, see page 6, Figure 8.
	Wheel RPM too high	Check drives or slow down fan by opening variable pitch pulley on motor shaft.
	Undersized motor	Check motor ratings with catalog speed and air capacity chart.
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor.
Reduced airflow	System resistance too high	Check system: Proper operation of backdraft or control dampers, obstruction in ductwork, clean dirty filters.
	Unit running backwards	Correct as shown on page 6, Figure 8.
	Excessive dirt buildup on wheels	Clean wheel.
	Improper wheel alignment	Center wheel on inlet, see "Pre-Starting Checks" on page 6.
	Dampers closed	Inspect and repair.
	Blocked duct/clogged filter	Clean or replace.
	Belt slippage	Replace and adjust tension.
	Speed too slow	Check for correct drives.

## Mounting for Severe Duty Installations

**Fan to Curb Mounting:** 5/16-inch self-drilling fasteners are to be installed on each side of fan with one fastener 4 inches from each edge and one fastener in the center. Fasteners are to be equally spaced.

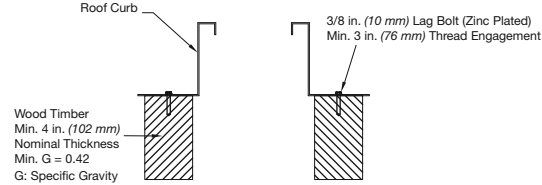
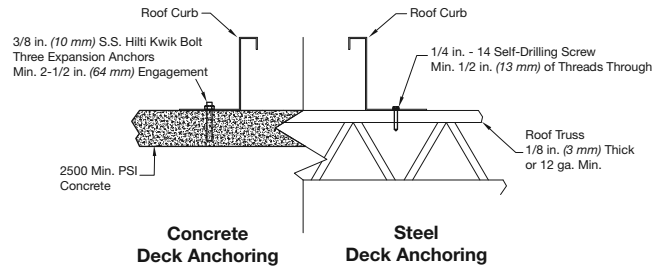


Fan Size	Fasteners Per Side
≤ 163	3
180 to 240	5
≥ 260	9



Roof Curb  
Model GPF, GPFHL, GPFHD or Equivalent  
18 ga. min.  
High wind ratings – 42 in. Tall Max  
Seismic ratings – 24 in. Tall Max  
Steel Welded Construction

**Curb to Deck Mounting:** Fasteners need to be located on all four sides of the curb.



Timber Anchoring

High Wind Ratings					Seismic Ratings		
Fan Size	Curb Cap Size	Self-Drilling Screw Size	Fasteners		Fan Size	Fasteners	
			Per Side	Total		Per Side	Total
Concrete	≤ 141 (432x432 to 559x559 mm)	3/8"	3	12	060-300	2	8
	> 141 (660x660 to 1016x1016 mm)		3	12	330-540	3	12
Steel	≤ 141 (432x432 to 559x559 mm)	1/4" - 14	3	12	060-300	2	8
	> 141 (660x660 to 1016x1016 mm)		4	16	330-540	3	12
Timber	≤ 141 (432x432 to 559x559 mm)	3/8"	3	12	060-300	2	8
	> 141 (660x660 to 1016x1016 mm)		4	16	330-540	3	12

All dimensions are in inches (millimeters).

**NOTE:** Installation instructions for seismic ratings are only recommendations.

Final design must be determined by Structural Engineer of Record (SEOR) including requirements for curb construction, mounting of unit to curb and mounting of curb to structure.

## Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.

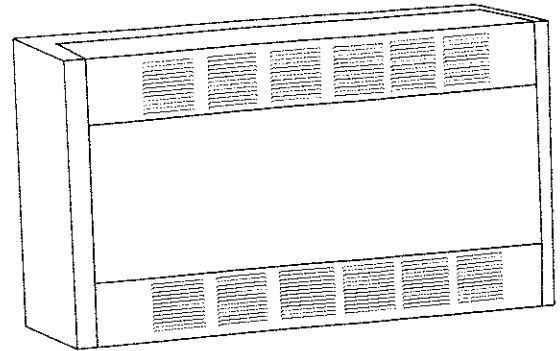
Greenheck Centrifugal Roof Downblast Exhaust Fans catalog provides additional information describing the equipment, fan performance, available accessories, and specification data.

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at www.amca.org.





## 900 Series Cabinet Unit Heaters Model C



# Installation & Maintenance Instructions

Dear Owner,

*Congratulations! Thank you for purchasing this new heater manufactured by Marley Engineered Products. You have made a wise investment selecting the highest quality product in the heating industry. Please carefully read and follow the installation and maintenance directions shown in this manual. You should enjoy years of efficient heating comfort with this product from Marley Engineered Products... the industry's leader in design, manufacturing, quality and service.*

*... The Employees of  
Marley Engineered Products*



## WARNING



**Read carefully** - These instructions are written to help you prevent difficulties that might arise during installation of heaters. Studying the instructions first may save you considerable time and money later. Observe the following procedures and cut your installation time to a minimum.

### **TO REDUCE RISK OF FIRE AND ELECTRIC SHOCK:**

1. Disconnect all power coming to the heater at main service panel before wiring or servicing.  
**Note:** More than one disconnect may be required.
2. All wiring must be in accordance with national and local electric codes and the heater must be grounded.
3. Verify the power supply voltage coming to heater matches the ratings printed on the heater nameplate before energizing.
4. This heater is hot when in use. To avoid burns, do not let bare skin touch hot surfaces.
5. Do not insert or allow foreign objects to enter any ventilation or exhaust opening as this may cause

6. electric shock, fire, or damage to heater.
6. Do not block air intakes or exhaust in any manner. Keep combustible materials at least 24" (610 mm) away from heater. Keep drapes at least 6" (153 mm) above top of front discharge grille. Do not use drapes above top discharge units. Do not install behind doors, furniture, towel rack, or boxes.
7. A heater has hot and arcing (sparking) parts inside. Do not use in areas where gasoline, paint, or flammable liquids are used or stored.
8. Use this heater only as described in this manual. Any other use not recommended by the manufacturer may cause fire, electric shock, or injury.
9. This heater is not approved for use in corrosive atmospheres such as marine, green house, or chemical storage areas.
10. **FOR DUCT CONNECTED HEATERS**, Do not exceed 0.2" wg. external static pressure and do not mount heater on end panels.
11. Do not use **OPTIONAL 0-100% OUTSIDE AIR DAMPER** with bottom air inlet.

## SAVE THESE INSTRUCTION SHEETS

Specifications

HEATING CAPACITY		Series	Cabinet Length (in)	CFM*	Total Line Amperage (includes motor amps)									
					208 1 ph 60 Hz	208 3 ph 60 Hz	240 1 ph 60 Hz	240 3 ph 60 Hz	277 1 ph 60 Hz	347 1 ph 60 Hz	380 3 ph 60 Hz	480 3 ph 60 Hz	600 3 ph 60 Hz	
KW	BTU/hr													
2	6,826	935	35	250	10	6	9	6	8	7	4	3	3	
3	10,239				15	9	13	8	12	9	5	4	4	
4	13,652				20	12	17	10	15	12	7	6	5	
5	17,065				25	15	22	13	19	15	8	7	6	
6	20,478				30	17	26	15	22	18	10	8	7	
7	23,891				34	20	30	18	26	21	11	9	7	
8	27,304				39	23	34	20	30	24	13	10	8	
4	13,652				945	45	500	20	12	18	11	16	13	7
6	20,478	30	18	26				16	23	18	10	8	7	
8	27,304	40	23	34				20	30	24	13	11	9	
10	34,130	48	29	43				25	37	30	16	13	11	
12	40,956	59†	34	51†				30	44	36	19	16	13	
14	47,782	68†	40	59†				35	52†	41	22	18	15	
16	54,608	78†	46	68†				40	59†	47	25	20	17	
6	20,478	958	58	750				30	18	26	16	23	18	10
8	27,304				40	23	34	20	30	24	13	11	9	
10	34,103				48	29	43	25	37	30	16	13	11	
12	40,956				59†	34	51†	30	44	36	19	16	13	
14	47,782				68†	40	59†	35	52†	41	22	18	15	
16	54,608				78†	46	68†	40	59†	47	25	20	17	
6	20,478	968	68	750	31	19	27	16	24	19	11	9	8	
9	30,717				45	27	39	24	34	28	16	13	11	
12	40,956				60	35	52†	31	45	36	20	16	13	
15	51,195				74	44	64†	38	56†	45	25	20	16	
18	61,434				88	52†	77†	45	67†	n/a	29	24	19	
21	71,673				n/a	60†	89†	52†	78†	n/a	34	27	22	
24	81,912				n/a	69†	n/a	60†	n/a	n/a	38	31	25	
8	27,304				978	78	1,000	41	24	36	21	31	25	14
12	40,956	60†	36	52†				31	46	37	20	17	14	
16	54,608	79†	47	69†				41	60†	48	27	21	18	
20	68,260	n/a	58†	86†				50†	74†	n/a	33	26	21	
24	81,912	n/a	69†	n/a				60†	n/a	n/a	39	31	25	
28	95,564	n/a	80†	n/a				70†	n/a	n/a	45	36	29	
32	109,216	n/a	91†	n/a				79†	n/a	n/a	51	41	33	

† - CIRCUIT BREAKERS or FUSED DISCONNECT required  
 \* - Value shown for HIGH SPEED on two speed units

### General Information

900 Series Cabinet Unit Heaters are designed and UL & cUL Listed to be applied as Standard Free Air heaters with both louvered intake and louvered discharge panels for recess or surface installation: a) on the floor, with front inlet and up flow air movement in the up flow, down flow, left or right direction or b) on the ceiling, or Ducted (0.2" wg external static pressure) flange for direct connection of field supplied ductwork to the inlet, discharge, or both inlet and discharge. Ducted heaters can be installed for recess or surface installation: a) on the floor, with front inlet and up flow air movement, b) on the wall, with air movement in the up flow or down flow direction or c) on the ceiling.

**See Figure 1 for Mounting Clearances.**

**Note:** Keep all furniture or any other blocking material at least 24" (610mm) away from front of heater.

When draperies are used, hang them so that when in use they are at least 6" (153mm) above the top of front discharge heater.

Do not use draperies with top discharge heaters.

**See Figure 2 for Mounting Dimensions**

**See Figure 3 for Duct Collar Dimensions and Installation Details.**

### FLOOR MOUNTING

1. Heaters with front inlet and up flow air movement may be mounted directly on any floor surface including carpeting. Where wall to wall carpeting is installed after heater installation the carpeting can be run up to the front and around the heater's body. See Figure 1 for mounting clearances.
2. Heaters can be mounted on either end with air movement left or right directly on any floor surface including carpeting. See Figure 1 for mounting clearances.
3. If optional kick plate is not used, proceed to "HEATER INSTALLATION" section.

### INSTALLATION OF OPTIONAL 900 SERIES BASE KIT

1. If desired, the heaters may be mounted off the floor with optional kick plate panel.
2. Align panel on bottom of heater (Inlet side only.)
3. There should be a 1" (25mm) space from the panel to the front and sides of the heater.
4. Match drill .140" (3.55 mm) diameter holes in the bottom of the heater and secure with screws provided.
5. Proceed to "HEATER INSTALLATION" section.

## CAUTION



**TO PREVENT HEATER FROM FALLING AND CAUSING PERSONAL INJURY, EACH FASTENER, AS APPLIED, SHOULD HAVE THE HOLDING POWER OF AT LEAST 100 POUNDS (45 kg).**

### WALL OR CEILING RECESS MOUNTING

1. Create an opening in the wall 26-5/8" (676mm) high by the width of the heater plus 1/4" (6.4mm). **Example:** If the heater was 68 inches long, the opening should measure 26-5/8" high x 68-1/4" long).
2. The depth of the recess will vary with the desired amount of heater recess.
3. Proceed to "HEATER INSTALLATION" section.

### INSTALLATION OF OPTIONAL 900 SERIES RECESS TRIM KIT

1. Determine depth of heater recess.
2. Align recess trim frame so that the trim frame front edge will touch wall when heater is installed.
3. Match drill .140" (3.55mm) diameter holes in all four sides of the heater and secure trim frame with screws provided.
4. Proceed to "HEATER INSTALLATION" section.



### HEATER INSTALLATION

1. Rough-in electrical wiring. See Figure 2 for knockout locations.
2. Remove the proper knockout in the heater or punch the proper size hole in the bottom or right side of the heater as shown in Figure 2.
3. Remove the front cover by rotating the lock(s) counter-clockwise (ccw).
4. Remove Top (Discharge) Louver Panel by removing 2 screws (one on each end) that attach the louver panel to the end panels.
5. Refer to Figure 3 for location of mounting holes.
6. Mark and drill holes for heater attachment in wall or ceiling.
7. Install heater in opening and tighten screws (field supplied) to insure tight fit of the heater against the mounting surface.
 

**NOTE: Tightening the heater against an irregular wall will cause distortion of the back panel of the heater. If this is the case, shims should be used behind the back panel to keep it straight.**
8. Reinstall the Top (Discharge) Louver Panel by sliding the panel into the heater. Position the panel tabs of the louver panel to rest on the top of the lip of the heater back. Position the louver panel top even with the top of the end panels. Tap the louver panel at the top front (both sides) to seat the panel. Reinstall 2 screws (one on each side) that attach louver panel to the end panels.
9. **WIRING** - See wiring section.
10. After wiring is complete, insure that the control box cover is closed and fastened and that the filter is installed.
11. Adjust the thermostat to the desired set point.
12. Adjust the heat selector to the heat and fan speed desired.
13. Replace front cover and secure by turning the locks clockwise (cw) until tight. Replace plug buttons provided.
14. Leave the heater running a few hours before making any further change in thermostat setting.



**DUCTED APPLICATIONS**

1. See Figure 3 for duct flange size and location.
2. Duct collars have been factory located (Bottom inlet, Front inlet, Top discharge, Front discharge) as ordered.


WARNING


**TO REDUCE RISK OF FIRE AND ELECTRICAL SHOCK: DO NOT EXCEED 0.2" WG EXTERNAL STATIC PRESSURE. DO NOT MOUNT HEATER ON END PANEL (LEFT OR RIGHT AIR FLOW).**

3. To change duct collar location:
  - A. Heater duct panels are supplied with a duct collar attached to one surface and a blank-off plate attached to the other surface. The location of the duct collar and the blank-off plate can be reversed.
  - B. Remove screws holding blank-off plate and remove blank-off plate.
  - C. Remove screws holding duct collar and remove duct collar.
  - D. Position duct collar to location desired, align screw holes, insert and tighten screws to secure duct collar to duct panel.
  - E. Position blank-off plate to location desired, align screw holes, insert and tighten screws blank-off plate to duct panel.
4. Position field ductwork to outside of heater duct flange.
5. Mark and drill starting holes in duct and flange.
6. Install and tighten screws (field supplied) to provide a secure seal.


WARNING


**TO REDUCE RISK OF FIRE AND ELECTRICAL SHOCK: DO NOT USE 100% OUTSIDE AIR DAMPER OPTION WITH BOTTOM AIR INLET. USE ONLY FRONT AIR INLET WITH 100% OUTSIDE AIR DAMPER OPTION.**

**OPTIONAL  
100% OUTSIDE AIR DAMPER**

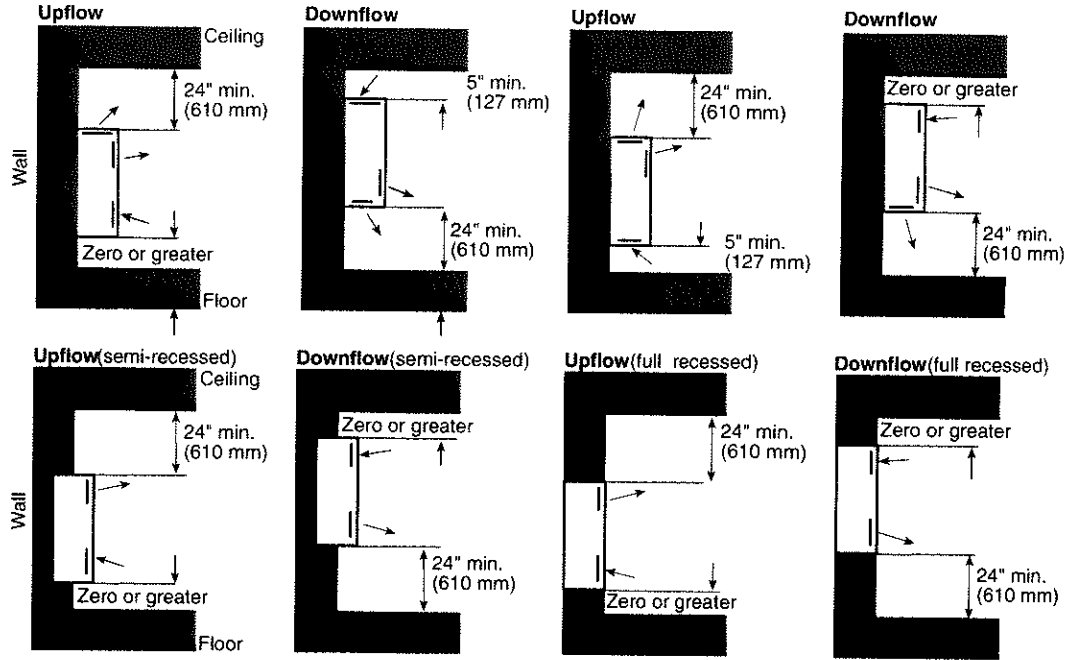
1. Flange brackets for the rear mounted duct collar are packaged unassembled in the heater carton.
2. See Figure 2 for location of damper opening.
3. Position the top flange bracket with the flange at the top of the damper opening and holes in the flange align with holes in the cabinet back.
4. Attach flange to cabinet with screws provided.
5. Position and attach remaining three (3) flange brackets around damper opening.
6. Position field ductwork to outside of flange brackets.
7. Mark and drill starting holes in duct and flange.
8. Install and tighten screws (field supplied) to provide a secure seal.

**OPERATION OF OPTIONAL  
100% OUTSIDE AIR DAMPER**

1. Controls, consisting of an "OPEN-CLOSED" switch and 100% positioning potentiometer, are located on the control panel door.
2. Place switch in OPEN position.
3. The damper will remain open until; the "OPEN-CLOSED" switch is moved to the closed position.

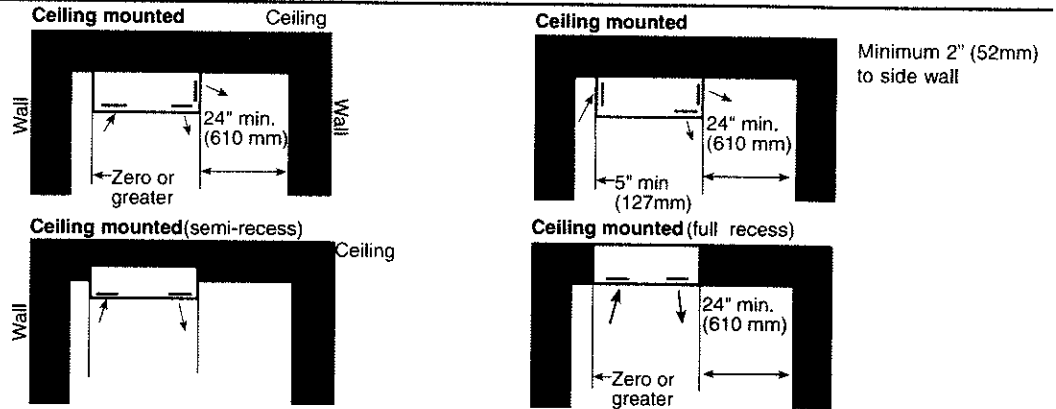
Figure 1

**HEATER:**  
Wall Mounted

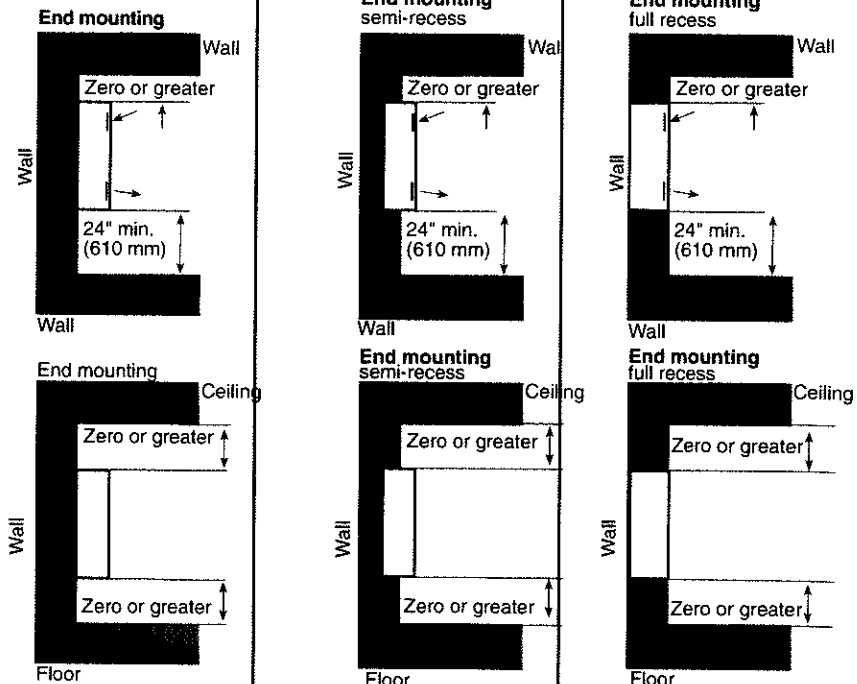


**AIR FLOW:**  
Up or Down

**HEATER:**  
Ceiling Mounted



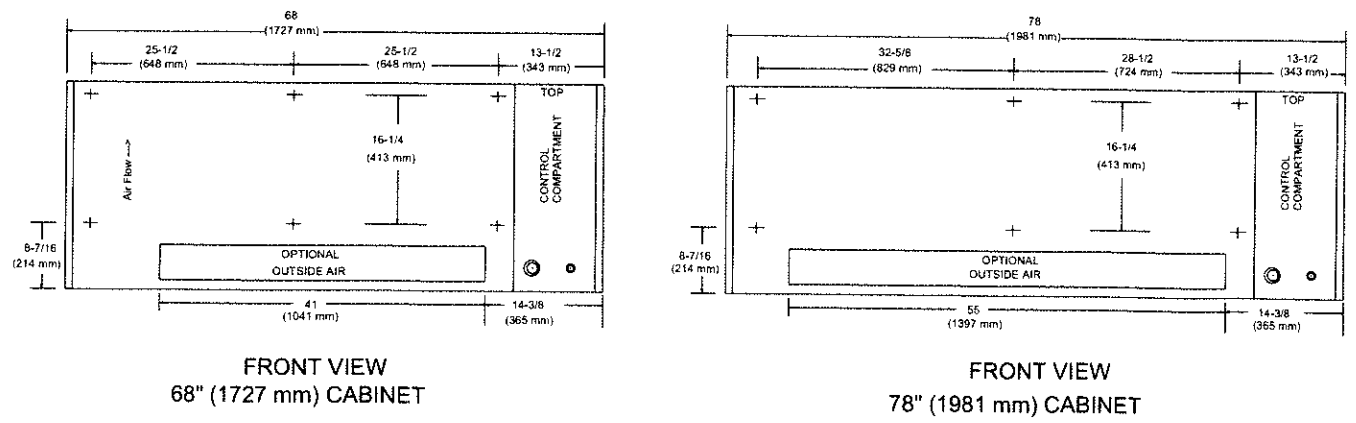
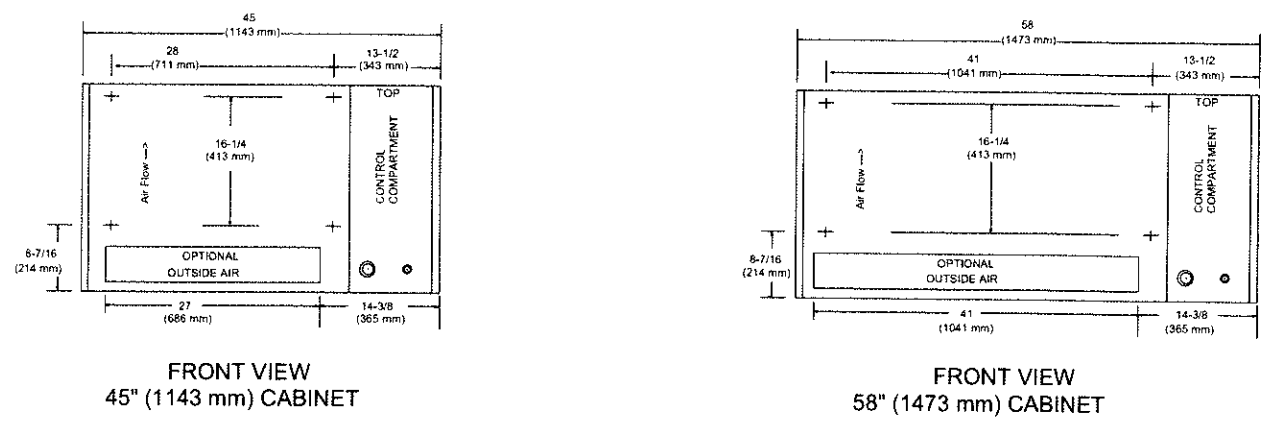
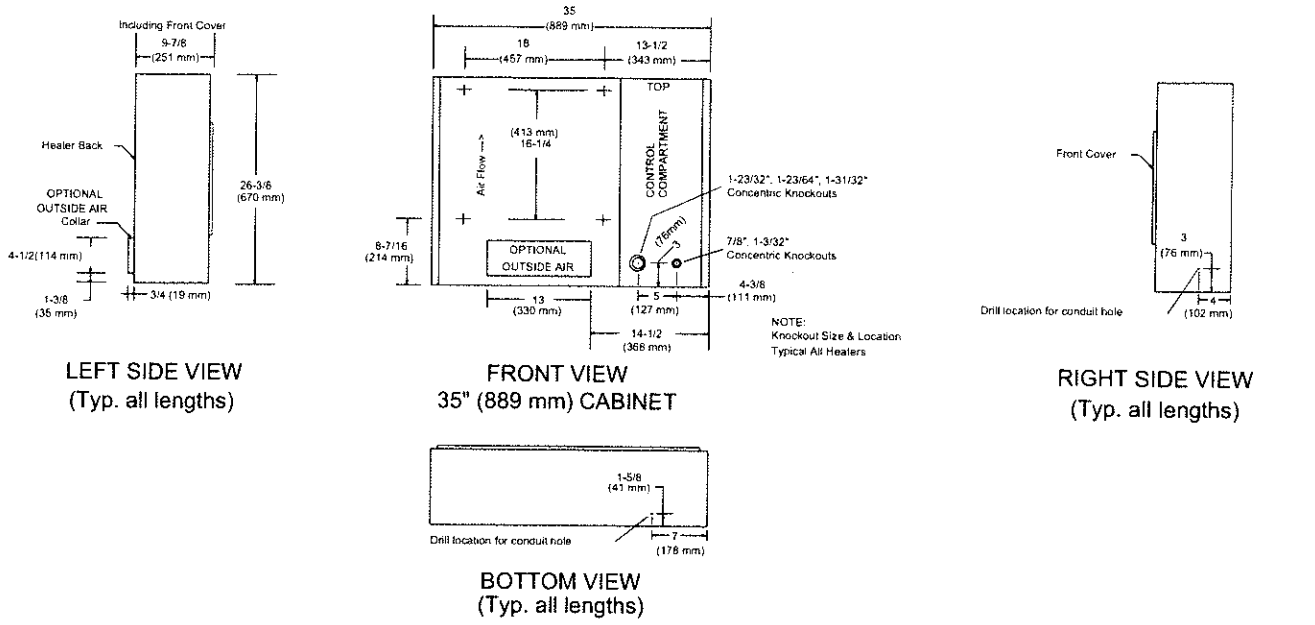
**HEATER:**  
Wall Mounted on End Panel



**AIR FLOW:**  
Left or Right

Figure 2

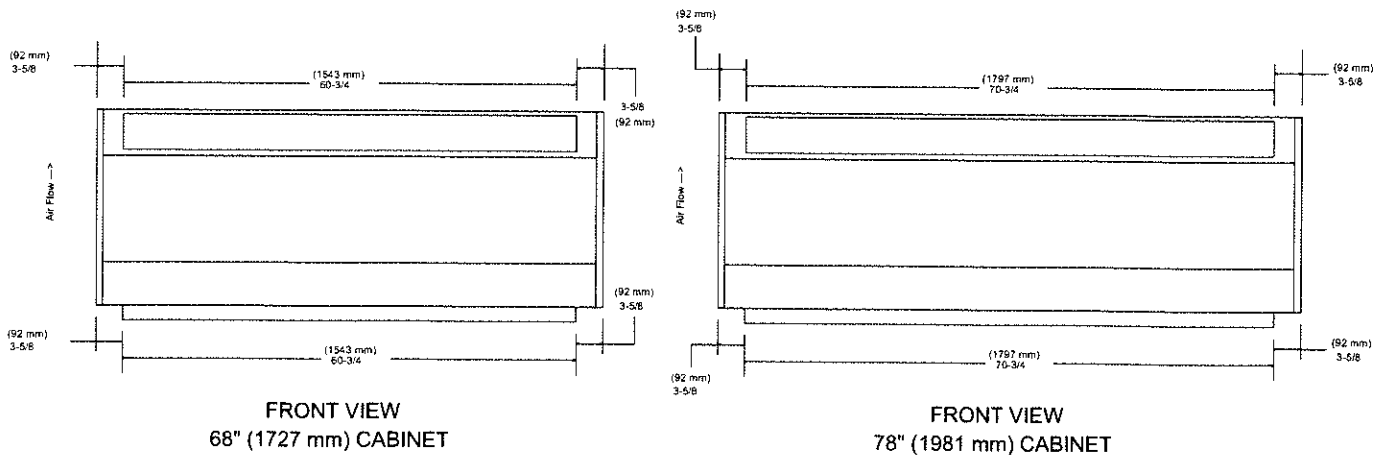
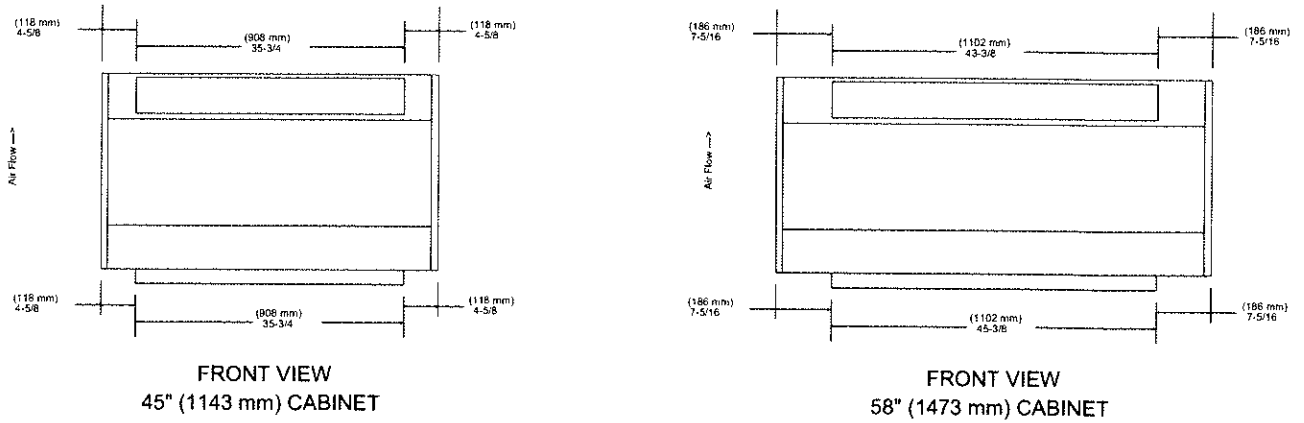
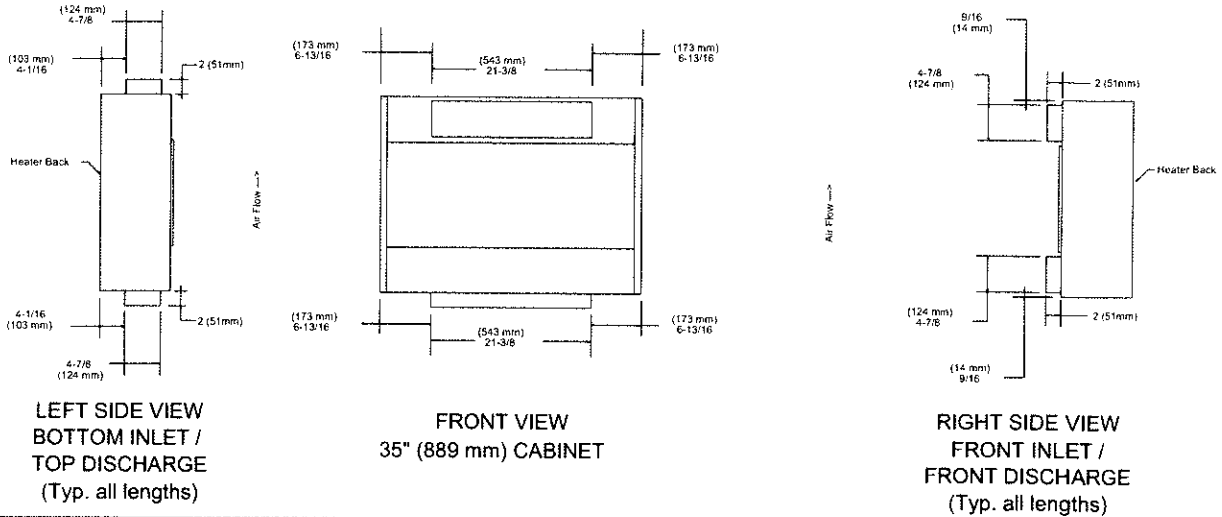
# MOUNTING DIMENSIONS





**Figure 3**

# DUCT COLLARS DIMENSIONS and INSTALLATION DETAILS



**WIRING**

**TO CONVERT 208, 240, 480 & 600 VOLT STANDARD STOCK 5 & 10 KW HEATERS From Three Phase To Single Phase**

**SEE WARNING STEPS 1, 2 & 3 ON PAGE 1 OF THIS INSTRUCTION SHEET.**

1. Figure 4 shows a typical wiring diagram.
2. For actual wiring, see the diagram located on the inside of the front cover.
3. All field wiring must be 75° C min.

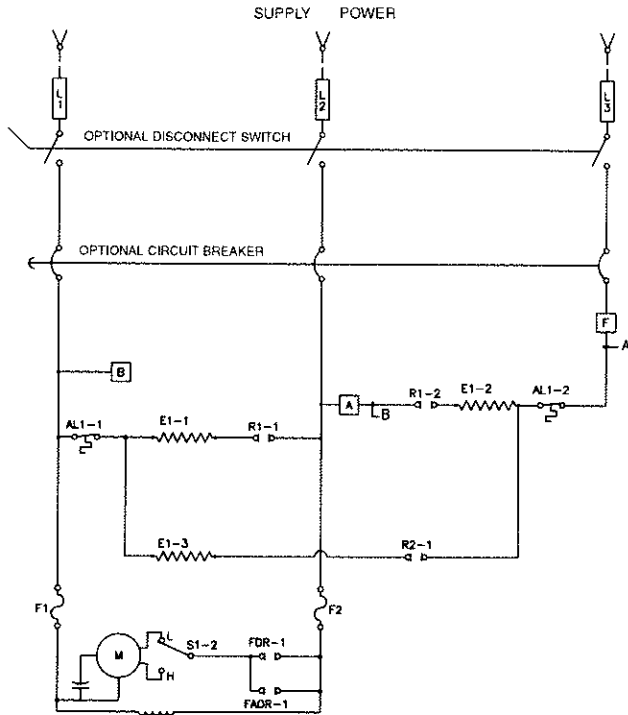
1. Remove front cover.
2. Refer to wiring diagram located inside front cover.

**NOTE: Terminal block and wires that need to be changed are located in wire way above right hand (RH) blower housing.**

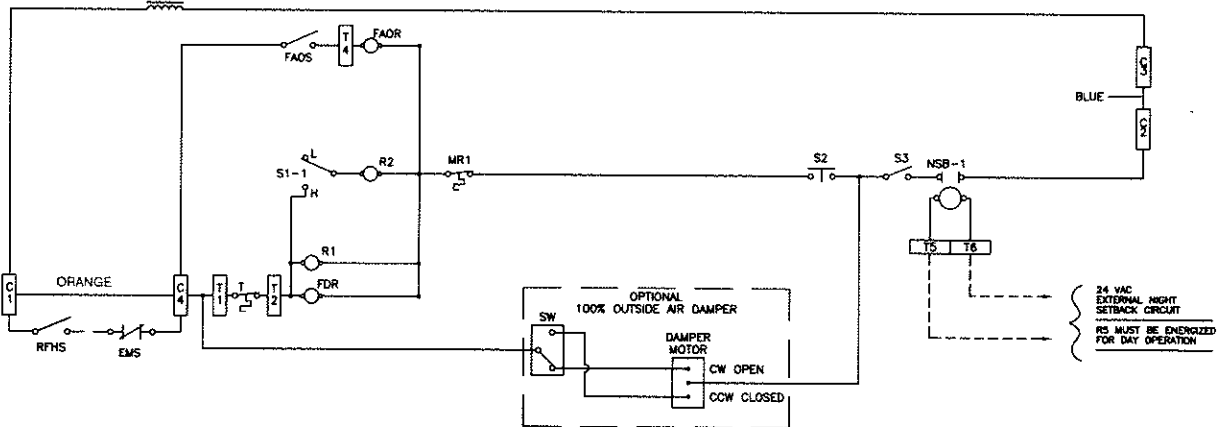
3. Remove two screws holding wireway cover to fan panel.
4. Rotate wireway cover up and out to remove.
5. Terminal block is located within wireway.
6. Relocate wires per wiring diagram located inside front cover.
7. Reinstall wireway cover and reinstall screws.
8. Reinstall front cover.

**Typical Wiring Diagram**

See wiring diagram on the inside of heater front cover.



**Figure 4**



EMS=ENERGY MANAGEMENT SYSTEM TIE-IN (CONTACTS MUST BE CLOSED FOR DAY OPERATION)  
 RFHS=REMOTE MOUNTED FAN/HEAT ON-OFF SWITCH (FIELD SUPPLIED)  
 NOTE: IF EMS AND/OR RFHS ARE INSTALLED REMOVE ORANGE WIRE BETWEEN C1 AND C4.

**FOR EXTERNAL CONTROL SUPPLY:**  
 1. REMOVE BLUE JUMPER BETWEEN C2 AND C3.  
 2. CONNECT EXTERNAL CONTROL (24 VAC STANDARD, 120 VAC OPTIONAL) TO C1 AND C2.

S1 = FAN/HEAT HIGH-LOW SELECTOR SWITCH  
 S2 = DOOR INTERLOCK SWITCH  
 S3 = FAN/HEAT ON-OFF SWITCH (FACTORY INSTALLED OPTION)  
 NSB = NIGHT SETBACK RELAY (FACTORY INSTALLED OPTION)

AL = AUTO RESET LIMIT  
 MR = MANUAL RESET LIMIT (FACTORY INSTALLED OPTION)  
 T = BUILT-IN OR REMOTE MOUNTED SINGLE POLE THERMOSTAT  
 FAOS = FAN AUTO-ON SWITCH (BUILT-IN = FACTORY INSTALLED OPTION)  
 (REMOTE MOUNTED = FIELD INSTALLED OPTION)  
 FDR = FAN DELAY RELAY  
 FAOR = FAN AUTO-ON RELAY (FACTORY INSTALLED OPTION)

1609-2081-020

CIRCUIT BREAKERS

ORDER PART NO. 410086+VAR NOTED BELOW

CABINET LENGTH	KW	208 1 PH 60HZ		208 3PH 60HZ		240 1PH 60HZ		240 3PH 60HZ		277 1PH 60HZ		347 1PH 60HZ		380 3PH 60HZ		480 3PH 60HZ		600 3PH 60HZ	
		QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR
35 in.	2	1	041	1	050	1	041	1	050	1	024	1	017	1	010	1	010	1	059
	3	1	042	1	050	1	042	1	050	1	024	1	017	1	010	1	010	1	059
	4	1	043	1	050	1	043	1	050	1	025	1	018	1	010	1	010	1	059
	5	1	045	1	051	1	044	1	051	1	026	1	018	1	010	1	010	1	059
	6	1	046	1	052	1	045	1	051	1	026	1	019	1	010	1	010	1	059
	7	1	047	1	053	1	046	1	052	1	027	1	020	1	010	1	010	1	059
	8	1	048	1	053	1	047	1	052	1	027	1	020	1	010	1	010	1	059
	8	1	048	1	053	1	047	1	052	1	027	1	020	1	010	1	010	1	059
48 in.	4	1	044	1	051	1	043	1	050	1	025	1	018	1	010	1	010	1	059
	6	1	046	1	052	1	045	1	051	1	026	1	019	1	010	1	010	1	059
	8	1	048	1	053	1	047	1	053	1	027	1	021	1	011	1	010	1	059
	10	1	049	1	055	1	048	1	054	1	007	1	022	1	012	1	011	1	059
	12	2	046	1	056	2	045	1	055	1	007	1	023	1	012	1	011	1	060
	14	2	046	1	057	2	045	1	056	1	021	1	068	1	013	1	012	1	060
	16	2	048	1	058	2	047	1	057	1	022	1	068	1	014	1	013	1	061
58 in.	6	1	046	1	052	1	045	1	051	1	026	1	019	1	010	1	010	1	059
	8	1	048	1	053	1	047	1	053	1	027	1	021	1	011	1	010	1	059
	10	1	049	1	055	1	048	1	054	1	027	1	021	1	011	1	010	1	059
	12	2	046	1	056	2	045	1	055	1	007	1	023	1	012	1	011	1	060
	14	2	046	1	057	2	045	1	056	1	021	1	068	1	013	1	012	1	060
	16	2	048	1	058	2	047	1	057	1	022	1	068	1	014	1	013	1	061
68 in.	6	1	046	1	052	1	045	1	052	1	026	1	019	1	010	1	010	1	059
	9	1	049	1	054	1	048	1	053	1	028	1	021	1	011	1	011	1	059
	12	2	046	1	056	2	045	1	055	1	007	1	008	1	013	1	012	1	060
	15	1	048	1	058	1	048	1	057	1	007	1	068	1	014	1	012	1	061
	1	045	1	044	1	044	1	044	1	026									
	18	3	046	1	056	3	045	1	058	1	028	N/A	N/A	1	014	1	013	1	061
	1	052	1	026															
21	N/A	N/A	1	057	3	046	1	056	1	015	N/A	N/A	1	015	1	014	1	062	
1	053	1	026																
24	N/A	N/A	1	058	N/A	N/A	1	057	N/A	N/A	N/A	N/A	1	009	1	014	1	063	
1	053	1	026																
78 in.	8	1	049	1	054	1	047	1	054	1	027	1	021	1	011	1	010	1	059
	12	2	046	1	056	2	045	1	055	1	007	1	008	1	013	1	012	1	060
	16	2	048	1	058	2	047	1	058	1	022	1	068	1	014	1	013	1	061
	20	N/A	N/A	2	055	2	049	2	054	1	068	N/A	N/A	1	015	1	014	1	062
	24	N/A	N/A	2	055	N/A	N/A	2	054	N/A	N/A	N/A	N/A	1	009	1	014	1	063
	28	N/A	N/A	2	057	N/A	N/A	2	056	N/A	N/A	N/A	N/A	1	016	1	015	1	064
	32	N/A	N/A	2	058	N/A	N/A	2	057	N/A	N/A	N/A	N/A	N/A	N/A	1	016	1	065

ELEMENTS

ORDER PART NO. 1802-2083+VAR NOTED BELOW

CABINET LENGTH	KW	208 1 PH 60HZ		208 3PH 60HZ		240 1PH 60HZ		240 3PH 60HZ		277 1PH 60HZ		347 1PH 60HZ		380 3PH 60HZ		480 3PH 60HZ		600 3PH 60HZ	
		QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR	QTY	VAR
35 in.	2	1	100	1	100	1	101	1	101	1	114	1	115	1	100	1	114	1	115
	3	1	107	1	107	1	114	1	114	1	116	1	105	1	107	1	116	1	105
	4	1	106	1	106	1	107	1	107	1	108	1	109	1	106	1	108	1	109
	5	1	110	1	110	1	111	1	111	1	120	1	121	1	110	1	120	1	121
	6	2	107	2	107	2	108	2	108	2	116	2	105	2	107	2	116	2	105
	7	1	107	1	107	1	108	1	108	1	116	1	105	1	107	1	116	1	105
	1	1	106	1	106	1	107	1	107	1	108	1	109	1	106	1	108	1	109
	8	1	107	1	107	1	108	1	108	1	120	1	121	1	110	1	120	1	121
45 in.	4	2	100	2	100	2	101	2	101	2	114	2	115	2	100	2	114	2	115
	6	2	107	2	107	2	108	2	108	2	116	2	105	2	107	2	116	2	105
	8	2	106	2	106	2	107	2	107	2	108	2	109	2	106	2	108	2	109
	10	2	110	2	110	2	111	2	111	2	120	2	121	2	110	2	120	2	121
	12	4	107	4	107	4	108	4	108	4	116	4	105	4	107	4	116	4	105
	14	2	107	2	107	2	108	2	108	2	116	2	105	2	107	2	116	2	105
	2	2	106	2	106	2	107	2	107	2	108	2	109	2	106	2	108	2	109
	16	2	107	2	107	2	108	2	108	2	116	2	105	2	107	2	116	2	105
58 in.	2	2	110	2	110	2	111	2	111	2	120	2	121	2	110	2	120	2	121
	6	2	107	2	107	2	108	2	108	2	116	2	105	2	107	2	116	2	105
	8	2	106	2	106	2	107	2	107	2	108	2	109	2	106	2	108	2	109
	10	2	110	2	110	2	111	2	111	2	120	2	121	2	110	2	120	2	121
	12	4	107	4	107	4	108	4	108	4	116	4	105	4	107	4	116	4	105
	14	2	107	2	107	2	108	2	108	2	116	2	105	2	107	2	116	2	105
	2	2	106	2	106	2	107	2	107	2	108	2	109	2	106	2	108	2	109
	16	2	107	2	107	2	108	2	108	2	116	2	105	2	107	2	116	2	105
68 in.	2	2	110	2	110	2	111	2	111	2	120	2	121	2	110	2	120	2	121
	6	3	100	3	100	3	101	3	101	3	114	3	115	3	100	3	114	3	115
	9	3	107	3	107	3	108	3	108	3	116	3	105	3	107	3	116	3	105
	12	3	106	3	106	3	107	3	107	3	108	3	109	3	106	3	108	3	109
	15	3	110	3	110	3	111	3	111	3	120	3	121	3	110	3	120	3	121
	18	6	107	6	107	6	108	6	108	6	116	N/A	N/A	6	107	6	116	6	105
	21	N/A	N/A	3	107	3	108	3	108	3	116	N/A	N/A	3	107	3	116	3	105
	24	N/A	N/A	3	106	3	107	3	108	3	108	N/A	N/A	3	106	3	108	3	109
78 in.	3	3	107	3	107	N/A	N/A	3	108	3	108	N/A	N/A	3	107	3	116	3	105
	4	4	106	4	106	4	107	4	107	4	108	4	109	4	106	4	108	4	109
	8	4	107	4	107	4	108	4	108	4	116	4	105	4	107	4	116	4	105
	12	4	107	4	107	4	108	4	108	4	116	4	105	4	107	4	116	4	105
	16	4	106	4	106	4	107	4	107	4	108	4	109	4	106	4	108	4	109
	20	N/A	N/A	4	110	4	111	4	111	4	120	N/A	N/A	4	110	4	120	4	121
	24	N/A	N/A	8	107	N/A	N/A	8	108	N/A	N/A	N/A	N/A	8	107	8	116	8	105
	28	N/A	N/A	4	107	N/A	N/A	4	108	N/A	N/A	N/A	N/A	4	107	4	116	4	105
32	N/A	N/A	4	106	4	107	4	107	4	108	N/A	N/A	N/A	4	106	4	108	4	109
	4	4	107	4	107	N/A	N/A	4	108	N/A	N/A	N/A	N/A	4	107	4	116	4	105

## REPLACEMENT PARTS LIST

### Basic Model Series

Part Description		CH900 Model Series									
		935		945		958		968		978	
		QTY	P/N	QTY	P/N	QTY	P/N	QTY	P/N	QTY	P/N
Filter (Permanent)		1	2010-7008-006	1	2010-7008-007	1	2010-7008-008	1	2010-7008-006	2	2010-7008-007
Filter (Throw-Away)		1	2010-7009-006	1	2010-7009-007	1	2010-7009-008	1	2010-7009-006	2	2010-7009-007
Motor	Standard Heaters	1	3900-2032-000	1	3900-2033-000	1	3900-2033-000	1	3900-2033-000	2	3900-2033-000
	277V Heater	1	3900-2032-001	1	3900-2033-001	1	3900-2033-001	1	3900-2032-000		
	480V Heater	1	3900-2032-002	1	3900-2033-002	1	3900-2033-002	1	3900-2032-001		
		1	3900-2032-002	1	3900-2033-002	1	3900-2033-002	1	3900-2032-002	2	3900-2033-002
Manual Reset Limit		1	4520-2017-003	1	4520-2017-003	1	4520-2017-003				
Auto Reset Limit							4520-2048-000				
Power Relay	24V Control						410101001				
	120V Control						410101003				
Fan Delay Relay	Single Stage 24V Control						410171001				
	Single Stage 120V Control						410171002				
	Two Stage 24V Control						410101001				
	Two Stage 120V Control						410101003				
Transformer (Power)	347V Heater				490015026					490015027	
	380V Heater				490015011					490015023	
	600V Heater				490015026					490015027	
Transformer (Control)	24V Control						490026007				
	120V Control						490026004				
Non-Convertible Heaters Transformer (Control)	24V Control						490026009				
	120V Control						490026010				
Thermostat (Built-In)	Single Stage Heater						410127001				
	Two Stage Heater						5813-2008-000				
Fan/Heat High-Low Switch							5216-2029-000				
Fan/Heat On-Off Switch							5216-2029-001				

**LIMITED WARRANTY**

All products manufactured by Marley Engineered Products are warranted against defects in workmanship and materials for one year from date of installation, except heating elements which are warranted against defects in workmanship and materials for five years from date of installation. This warranty does not apply to damage from accident, misuse, or alteration; nor where the connected voltage is more than 5% above the nameplate voltage; nor to equipment improperly installed or wired or maintained in violation of the product's installation instructions. All claims for warranty work must be accompanied by proof of the date of installation.

The customer shall be responsible for all costs incurred in the removal or reinstallation of products, including labor costs, and shipping costs incurred to return products to Marley Engineered Products Service Center. Within the limitations of this warranty, inoperative units should be returned to the nearest Marley authorized service center or the Marley Engineered Products Center, and we will repair or replace, at our option, at no charge to you with return freight paid by Marley. It is agreed that such repair or replacement is the exclusive remedy available from Marley Engineered Products.

THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESAID EXPRESSED WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS AGREEMENT. MARLEY ENGINEERED PRODUCTS SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES ARISING WITH RESPECT TO THE PRODUCT, WHETHER BASED UPON NEGLIGENCE, TORT, STRICT LIABILITY, OR CONTRACT.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

For the address of your nearest authorized service center, contact Marley Engineered Products in Bennettsville, SC, at 1-800-642-4328. Merchandise returned to the factory must be accompanied by a return authorization and service identification tag, both available from Marley Engineered Products. When requesting return authorization, include all catalog numbers shown on the products.

**HOW TO OBTAIN WARRANTY SERVICE AND WARRANTY PARTS PLUS GENERAL INFORMATION**

- |                                |   |
|--------------------------------|---|
| 1. Warranty Service or Parts   | <b>1-800-642-4328</b>   |
| 2. Purchase Replacement Parts  | <b>1-800-654-3545</b>   |
| 3. General Product Information | <b><a href="http://www.marleymep.com">www.marleymep.com</a></b> |

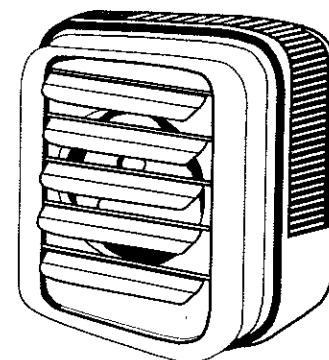
**Note:** When obtaining service always have the following:

1. Model number of the product
2. Date of manufacture
3. Part number or description



**Marley®**  
Engineered Products

470 Beauty Spot Rd. East  
Bennettsville, SC 29512 USA



# MUH Series Modular Unit Heaters



## Installation, Operation & Maintenance Instructions

### Specifications

Basic Model No.	Height in (mm)	Width in. (mm)	Depth in. (mm)	Mounting Weight lbs. (kg)	Wiring Compartment Volume				
MUH0381	16 (406.4)	14 (355.6)	7 1/2 (190.5)	27 (12.2)	90 in <sup>3</sup> (14.70 cm <sup>3</sup> )				
MUH0321				27 (12.2)					
MUH0371				27 (12.2)					
MUH0341				30 (13.6)					
MUH0581				27 (12.2)					
MUH0521				27 (12.2)					
MUH0571				27 (12.2)					
MUH0541				30 (13.6)					
MUH0331				30 (13.6)					
MUH0361				30 (13.6)					
MUH0531				30 (13.6)					
MUH0561				30 (13.6)					
MUH078				21 3/4 (552.5)		19 (482.6)	7 1/2 (190.5)	38 (17.2)	100 in <sup>3</sup> (1639 cm <sup>3</sup> )
MUH072								38 (17.2)	
MUH077	38 (17.2)								
MUH074	38 (17.2)								
MUH108	38 (17.2)								
MUH102	38 (17.2)								
MUH107	38 (17.2)								
MUH104	38 (17.2)								
MUH073	38 (17.2)								
MUH076	38 (17.2)								
MUH103	38 (17.2)								
MUH106	38 (17.2)								

Basic Model No.	Height in (mm)	Width in. (mm)	Depth in. (mm)	Mounting Weight lbs. (kg)	Wiring Compartment Volume				
MUH158	21 3/4 (552.5)	19 (482.6)	12 3/4 (323.9)	54 (24.5)	140 in <sup>3</sup> (2295 cm <sup>3</sup> )				
MUH152				50 (22.7)					
MUH154				50 (22.7)					
MUH208				60 (27.2)					
MUH202				55 (24.9)					
MUH204				55 (24.9)					
MUH156				55 (24.9)					
MUH206				55 (24.9)					
MUH252				30 (76.2)		26 5/8 (676.4)	11 3/4 (298.5)	89 (40.4)	504 in <sup>3</sup> (8260 cm <sup>3</sup> )
MUH254								89 (40.4)	
MUH308	89 (40.4)								
MUH302	89 (40.4)								
MUH304	89 (40.4)								
MUH256	89 (40.4)								
MUH306	89 (40.4)								
MUH402	30 (76.2)	26 5/8 (676.4)	17 1/4 (435.1)		119 (54.0)			648 in <sup>3</sup> (10620 cm <sup>3</sup> )	
MUH404					119 (54.0)				
MUH508					119 (54.0)				
MUH502				119 (54.0)					
MUH504				119 (54.0)					
MUH406				119 (54.0)					
MUH506	119 (54.0)								

## IMPORTANT INSTRUCTIONS

### WARNING

WHEN USING ELECTRIC APPLIANCES, BASIC PRECAUTIONS SHOULD ALWAYS BE FOLLOWED TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, AND INJURY TO PERSONS, INCLUDING THE FOLLOWING:

1. Read all instructions before installing or using this heater.
2. This heater is a commercial/industrial product not intended for use in a residential setting.
3. This heater is hot when in use. To avoid burns, do not let bare skin touch hot surfaces. Keep combustible materials, such as furniture, pillows, bedding, papers, clothes, etc. and curtains at least 3 feet (0.9 m) from the front of the heater.
4. Extreme caution is necessary when any heater is used by or near children or invalids and whenever the heater is left operating and unattended.
5. This heater has hot and arcing or sparking parts inside and is not intended for use in hazardous atmospheres where flammable vapors, gases, liquids or other combustible atmospheres as defined in the National Electrical Code are used or stored. Failure to comply can result in explosion or fire.
6. Do not operate any heater after it malfunctions. Disconnect power at service panel and have heater inspected by a reputable electrician before using.
7. Do not use outdoors.
8. To disconnect heater, turn controls to off, and turn off power to heater circuit at main disconnect panel.
9. Do not insert or allow foreign objects to enter any ventilation or exhaust opening as this may cause an electric shock, fire, or damage to the heater.
10. To prevent a possible fire, do not block air intake or exhaust in any manner.
11. Use this heater only as described in this manual. Any other use not recommended by the manufacturer may cause fire.
12. This heater is not intended for use in special environments. Do not use in damp or wet locations such as marine or greenhouse or in areas where corrosive or chemical agents are present.
13. When installing, see INSTALLATION INSTRUCTIONS for additional warnings and precautions.
14. For safe and efficient operation, and to extend the life of your heater, keep your heater clean - See MAINTENANCE INSTRUCTIONS.

### SAVE THESE INSTRUCTIONS

## INSTALLATION INSTRUCTIONS

### WARNING

To prevent a possible fire, injury to persons or damage to the heater, adhere to the following:

1. Disconnect all power coming to heater at main service panel before wiring or servicing.

**Important Note:** This heater must be installed by a qualified person.

2. All wiring procedures and connections must be in accordance with the National and Local Codes having jurisdiction and the heater must be grounded.
3. Verify the power supply voltage coming to heater matches the ratings as shown on the heater nameplate.

**CAUTION:** ENERGIZING HEATER AT A VOLTAGE GREATER THAN THE VOLTAGE PRINTED ON THE NAMEPLATE WILL DAMAGE THE HEATER AND VOID THE WARRANTY AND COULD CAUSE A FIRE.

4. To reduce the risk of fire, do not store or use gasoline or other flammable vapors and liquids in the vicinity of the heater.
5. The ceiling or wall mounting structure and the anchoring provisions must be of sufficient strength to support the combined weight of the heater and mounting bracket.
6. All built-in thermostats: If the heater is used to prevent piping or liquids from freezing, and if the thermostat is set below 45° F (7°C), the fan must run continuously.
7. The heater must be mounted at least 7' (2134 mm) above the floor to avoid accidental contact with the fan blade which could cause injury.
8. Keep at least 5' clearance in front of the heater. Refer to Table 1 for side, top and back clearance requirements.
9. Do not mount mercury type thermostat directly on unit. Vibration could cause heater to malfunction.

#### Heater Location Instructions

Arrange units so that discharge air streams:

- a. are subjected to a minimum of interference from columns, machinery and partitions;
- b. wipe exposed walls without blowing directly at them;
- c. are directed away from room occupants in comfort heating;
- d. are directed along the windward side when installed in a building exposed to a prevailing wind.

Locate thermostats approximately 5' (1524mm) above the floor on interior partition walls or post away from cold drafts, internal heat sources and away from heater discharge air streams.

Small rooms can be heated by one unit heater.

Large rooms require multi-unit installations. Number and capacity of units will be determined by volume of building and square feet of floor area to be heated. Arrange units to provide perimeter air circulation where each unit supports the air stream from another.



**Mounting the Heater - General**

The heater may be mounted to discharge the heated air either horizontally or vertically. When the heater is mounted for vertical discharge, it is recommended that the heater be positioned so that the access door will open away from the wall to provide greater access to the wiring and control compartment. If the heater is to be mounted with the access door facing a wall, the heater must be mounted far enough from that wall to allow full opening of the access door (a distance approximately equal to the width of the heater, check clearance before installing). Refer to Table 1 for wall and ceiling clearances before mounting heater.

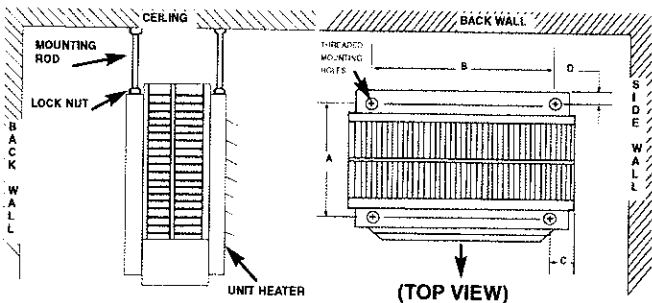
The heater may be mounted for either vertical or horizontal discharge by the use of threaded rods. (Refer to Table 2 for threaded rod sizes required.) Observe the detailed procedures in the following installation instructions.

The heater may also be suspended from the wall or ceiling by means of an optional mounting bracket (type MMB or MCMB) which permits horizontal pivoting of the heater.

After the heater is installed, the louvers may be positioned to direct the heated air in the desired direction. When the heater is installed for horizontal discharge, the louvers should direct the air either straight ahead or downward. Directing the air upward may cause the heated air to remain in the ceiling area and waste energy.

**Table 1. Wall and Ceiling Clearance, inches (mm)**

Unit	Discharge	Ceiling	Side Wall	Back Wall
3 & 5 kW	Horiz.	2 (50.8)	6 (152.4)	9 (228.6)
	Vert.	6 (152.4)	18 (457.2)	18 (457.2)
7.5 to 10 kW	Horiz.	6 (152.4)	6 (152.4)	13 (330.2)
	Vert.	6 (152.4)	24 (609.6)	24 (609.6)
15 to 20 kW	Horiz.	6 (152.4)	9 (228.6)	12 1/2 (317.5)
	Vert.	6 (152.4)	24 (609.6)	24 (609.6)
25 to 50 kW	Horiz.	16 (406.4)	12 (304.8)	18 1/2 (470.0)
	Vert.	12 (304.8)	39 (914.4)	39 (914.4)



**Figure 1. Horizontal Discharge Mounting and Spacing.**

**Table 2. Rod Thread and Spacing Dimensions, inches (mm) for Horizontal Discharge**

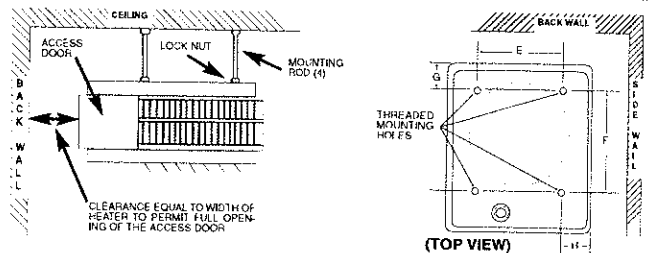
Unit	Rod Thread Type	A	B	C	D
3 - 5 kW	5/16 - 18	6 1/16 (153.9)	6 (152.4)	4 1/16 (103.1)	3/4 (19.0)
7.5 - 10 kW		11 3/8 (289.0)	8 7/8 (225.6)	5 1/8 (130.3)	3/4 (19.0)
15 - 20 kW			14 - 12 (368.3)	6 3/16 (157.2)	5/8 (16.0)
25 - 30 kW	3/8 - 16	10 9/16 (268.2)	14 - 12 (368.3)	6 3/16 (157.2)	5/8 (16.0)
40 - 50 kW		15 15/16 (404.9)	14 - 12 (368.3)	6 3/16 (157.2)	5/8 (16.0)

**Horizontal Discharge (Rod-mount from Ceiling)**

1. Install four threaded mounting rods in the threaded holes and secure in place using lock nuts. (See Table 2).
2. Securely attach the four mounting rods to the ceiling. (Refer to Table 1 for wall and ceiling clearances, and Table 2 for mounting rod spacing).

**Table 3. Rod Thread and Spacing Dimensions, inches (mm) for Vertical Discharge**

Unit	Rod Thread Type	E	F	G	H
3 - 5 kW	5/16 - 18	6 (152.4)	9 3/4 (247.7)	2 (50.8)	4 1/16 (103.1)
7.5 - 20 kW		8 7/8 (225.6)	14 5/8 (371.6)	2 (50.8)	5 7/8 (130.3)
25 - 30 kW	3/8 - 16	14 1/2 (368.3)	21 1/4 (539.8)	2 3/16 (56.0)	6 3/16 (157.2)



**Figure 2. Vertical Discharge Mounting and Rod Spacing**

**Vertical Discharge (Rod-Mount from Ceiling)**

1. Remove bolts from the threaded holes in the back of the heater.
2. Install four threaded mounting rods in the threaded holes and secure in place using lock nuts.
3. Securely attach the four mounting rods to the ceiling. (Refer to Table 1 for wall and ceiling clearances, and Table 3 for mounting rod spacing dimensions.)

**Wiring Branch Circuit (Power)**

1. Connect heater only to the voltage, amperage and frequency specified on the nameplate.
2. Field wiring must be properly sized to carry the amperage in accordance with the NEC.
3. The access door is hinged. There are either one or two screws accessible from the side that must be loosened to gain access. These screws are the captive type; do not try to remove them.
4. A knockout is provided in the back of the heater close to the power terminal block and the control terminal board. The control terminal board knockout is 1/2 inch (12.7 mm) conduit size. The power terminal block knockout is multiple diameter. Use the diameter that fits the required conduit size.
5. A ground terminal is provided near the power terminal board. The ground wire should be connected before other connections are made.
6. The power terminal block is equipped with box terminals sized to accept the correct size power supply wire. Branch circuit wire rated min 600V, 60° C is acceptable for heaters rated up to 80 amps. For heaters rated more than 80 amps, branch circuit wire must be rated at least 75°C. Either aluminum or copper wire is satisfactory for connection to the heater power terminal block box terminal. Copper wire is recommended and must be used with built-in disconnect switch.

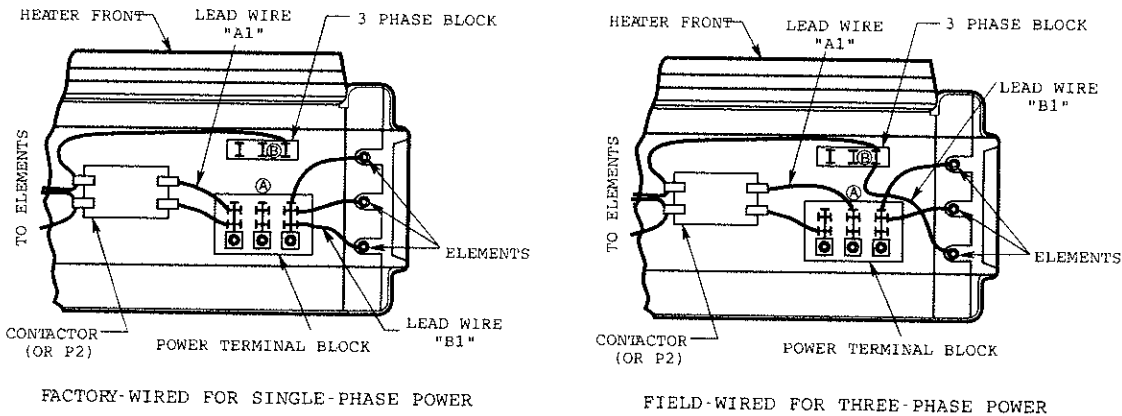
- Each heater has a wiring diagram affixed to the inside of the access door. Consult this diagram before making any field connections.

**Important Note - Installation Screw Lug Torque:**

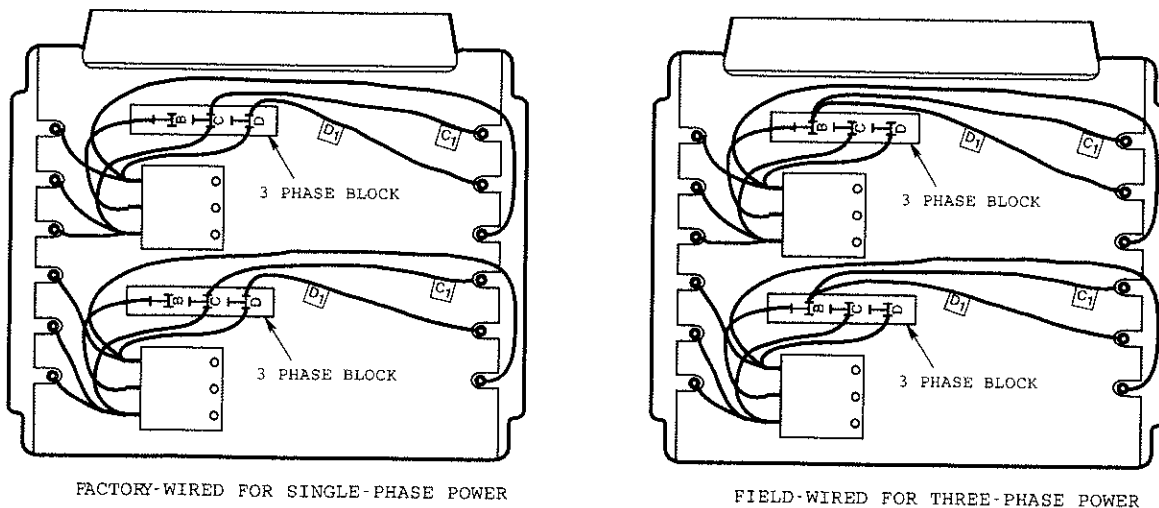
During transportation it is possible screw lug connections can loosen. After installation, before power is turned on to the heater, check all screw lug connections for tightness to a recommended minimum torque of 35 in-lbs. (3.9 N-m). Loose connections may present a hazard.

- Single or three-phase power connections may be used with heater models MUH0521, MUH0581, MUH072, MUH078, MUH102, MUH108, and MUH158. These units are factory wired for single-phase operation. If these heaters are for use with three-phased power, reconnect the wires as indicated in the wiring diagram attached to the heater. Additional information can be found by looking at the wiring illustrations in Figures 3a and 3b and following the directions shown below.

On models MUH0521, MUH0581, MUH072, MUH078, MUH102, and MUH108 (Figure 3a), move only the two wires marked "A1" and marked "B1"; do not move or change any other wiring. The element lead wire marked "B1" which is factory connected to the power terminal block (terminal located closest to the elements) must be moved to terminal "B" on the three-phase terminal block.



**Figure 3a. Wiring Connections for Single-Phase and Three -Phase Power(MUH0521, MUH0581, MUH072, MUH078, MUH102 and MUH108)**



**Figure 3b. Wiring Connections for Single-Phase and Three -Phase Power (MUH158)**

The relay (contactor) lead wire "A1" must be moved from the end terminal of the power terminal block (terminal closest to the contactor or control terminal board) to the "A" terminal of the lower terminal block (center terminal).

Model MUH158 (Figure 3b) has two three-phase terminal blocks located adjacent to the relays (contactors). Move only the two wires marked "C1" and "D1" on each of these two three-phase terminal blocks to terminal "B". Do not move or change any other wires.

9. Electrical Accessories, either kits or factory-installed options, are shown connected by a dash line on the heater wiring diagram.
10. **208/240 VOLT HEATER:** The heaters are wired for 240V from factory. When heater is to be connected to 208V supply, the transformer leads **MUST BE** interchanged. For units rated 30/40kW or higher, interchange ORANGE and RED primary leads. The black colored lead is the COMMON for the transformer (50VA) provided with the high wattage units. For lower kW rated heaters, interchange BLACK and RED primary leads. The WHITE colored lead is the COMMON for the control transformer provided with these heaters. Always refer to the wiring diagram on the cover of the heater before making this reconnection of transformer primary leads.

### Control Wiring

**⚠ WARNING ⚠**

LINE VOLTAGE IS PRESENT ON SOME OF THE TERMINALS ON THE CONTROL TERMINAL BOARD. ALWAYS DISCONNECT THE POWER FROM THE HEATER BEFORE MAKING ANY CONNECTIONS TO THE CONTROL BOARD TO PREVENT ELECTRIC SHOCK HAZARD.

1. Use min. 600 volts, NEC Class 1 insulated wire for all control circuit wiring.
  2. Use a crimp-on type fork terminal on the wire ends that attach to the control terminal board if more than one connection is to be made under the terminal screw.
  3. On units not provided with internal contactor (3 & 5 KW), refer to Figure 4 for wiring diagram.
- NOTE:** Thermostat and control circuit wiring must be suitable to handle the full load of the heater (example MUH0581 is rated 24 amps)
4. On units provided with internal contactor (units rated 7 KW and higher) refer to Figure 5 for wiring diagram. Control wiring must be rated minimum 18 AWG.

## OPERATING INSTRUCTIONS

1. Heater must be properly installed before operation.
2. Turn power supply to heater "ON" at main switch panel.
3. Where applicable, refer to control accessory instructions regarding proper operation of any controls or accessories used with the heater.

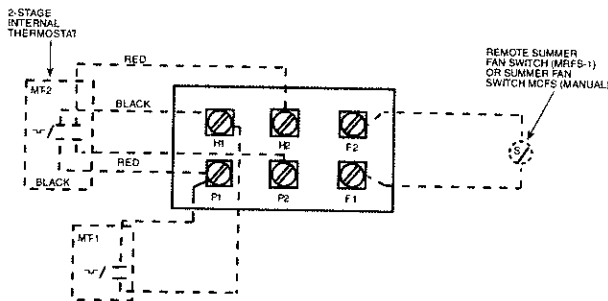


Figure 4. Control Terminal Board (for Heaters Without Contactors)

- NOTES:
1. THIS STYLE CONTROL TERMINAL BOARD USED WITH MODELS MUH0321, MUH0371, MUH0381, MUH0521, MUH0571, AND MUH0581.
  2. WHEN UNIT IS WIRED FOR SINGLE-PHASE, JUMPER H1 TO H2. IF SINGLE-POLE THERMOSTAT IS USED WITH SINGLE-PHASE UNIT, CONNECT THERMOSTAT LEADS TO P1 AND H1.
  3. EXTERNAL LINE VOLTAGE THERMOSTATS SHOULD BE TREATED AS SINGLE STAGE ONLY.

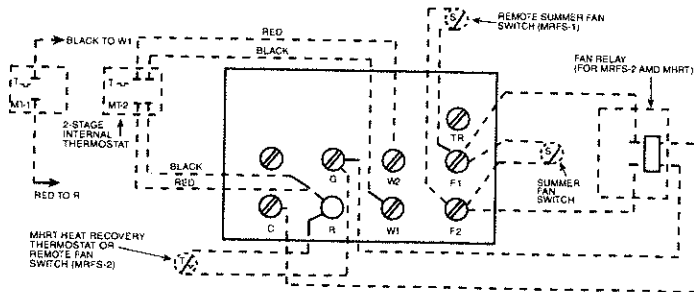


Figure 5. Control Terminal Board (for Heaters With Contactors)

- NOTES:
1. THIS STYLE CONTROL TERMINAL BOARD USED WITH MODELS EXCEPT MUH0321, MUH0371, MUH0381, MUH0521, MUH0571, AND MUH0581.
  2. REMOVE JUMPER W1 TO W2 WHEN 2-STAGE THERMOSTAT IS USED.
  3. \*ONLY ONE OF THESE ACCESSORIES MAY BE INSTALLED IN A SINGLE HEATER.
  4. EXTERNAL LINE VOLTAGE THERMOSTATS SHOULD BE TREATED AS SINGLE STAGE ONLY.

### How To Reset Over -Temperature Safety Control (Factory Installed Option Only):

The limit switch is located internally on the rear of the heater. On the 3KW and 5KW models, the access to the reset button is on the right side (when facing rear of heater); on all other models it is near the top rear of the heater.

The manual reset limit is in series with the automatic recycling protector (limit). The manual reset limit will not reset until the heater has cooled and the button is pushed in.

#### ⚠ WARNING ⚠

DO NOT TAMPER WITH OR BYPASS ANY SAFETY LIMITS INSIDE HEATER.

#### CAUTION ⚠

CAUTION - DO NOT CONTINUE TO ATTEMPT TO USE THE HEATER IF THE SAFETY CONTROL REPEATEDLY OPERATES AFTER BEING RESET. TO DO SO COULD PERMANENTLY DAMAGE THE HEATER OR CREATE A FIRE OR SAFETY HAZARD.

It is important to keep this heater clean. Your heater will give you years of service and comfort with only minimum care. To assure efficient operation follow the simple instructions below.

#### ⚠ WARNING ⚠

ALL SERVICING BEYOND SIMPLE CLEANING THAT REQUIRES DISASSEMBLY SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.

#### ⚠ WARNING ⚠

TO REDUCE RISK OF FIRE AND ELECTRIC SHOCK OR INJURY, DISCONNECT ALL POWER COMING TO HEATER AT MAIN SERVICE PANEL AND CHECK THAT THE ELEMENT IS COOL BEFORE SERVICING OR PERFORMING MAINTENANCE.

#### User Cleaning Instructions:

1. After the heater has cooled, a vacuum cleaner with brush attachment may be used to remove dust and lint from exterior surfaces of the heater including the grille openings.
2. With a damp cloth, wipe dust and lint from grille and exterior surfaces.
3. Return power to heater and check to make sure it is operating properly.

#### Maintenance Cleaning Instructions:

*(To be performed only by Qualified Service Personnel)*

At least annually, the heater should be cleaned and serviced by a qualified service person to assure safe and efficient operation. This should include as necessary, vacuuming dust and debris from the elements and fan, and checking all screw lug connections for tightness to a recommended minimum torque of 35 in-lbs. (3.9 N-m). After completing the cleaning and servicing, the heater should be fully reassembled and checked for proper operation.

## MAINTENANCE INSTRUCTIONS

It is important to keep this heater clean. Your heater will give you years of service and comfort with only minimum care. To assure efficient operation follow the simple instructions below.

#### ⚠ WARNING ⚠

ALL SERVICING BEYOND SIMPLE CLEANING THAT REQUIRES DISASSEMBLY SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.

#### ⚠ WARNING ⚠

TO REDUCE RISK OF FIRE AND ELECTRIC SHOCK OR INJURY, DISCONNECT ALL POWER COMING TO HEATER AT MAIN SERVICE PANEL AND CHECK THAT THE ELEMENT IS COOL BEFORE SERVICING OR PERFORMING MAINTENANCE.

#### User Cleaning Instructions:

1. After the heater has cooled, a vacuum cleaner with brush attachment may be used to remove dust and lint from exterior surfaces of the heater including the grille openings.
2. With a damp cloth, wipe dust and lint from grille and exterior surfaces.
3. Return power to heater and check to make sure it is operating properly.

# MUH

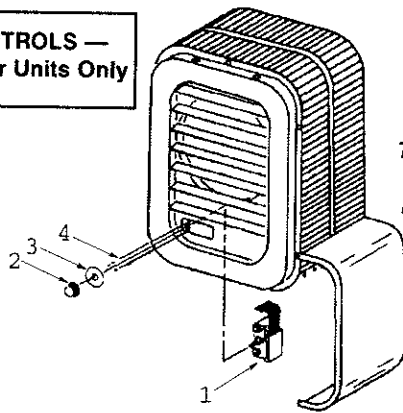
## Built-in Controls

Key No.	Description	Part Number
1	Thermostat, One Pole (MT-1)	5813-0036-000
	Thermostat, Two Stage (MT-2)	5813-0035-000
2	Knob, Thermostat	3301-0060-000
3	Label, Thermostat	3502-1781-000
4	Screws, Fl. Hd., 6-32 x 1/4	5202-7009-021
5	Clip, Thermostat	1403-0041-000
6	Switch, 25A, OEM	5216-0132-000
	Switch, 25A, K & N	5216-0204-000
	Switch, 63A, OEM	5216-0131-000
	Switch, 63A, K & N	5216-0203-000
	Switch 25A, Electro	5216-0200-000
7	Screw, M4 x 10, Rd. Hd., (25A)	—
	Screw, 63A, M5 x 16, Rd. Hd.	—
8	Knob, 25A, OEM "T1"	OEM "T1"
	Knob, 25A, K & N	K & N S1B 6001
	Knob, 63A, OEM	OEM "S4"
	Knob, 63A, K & N	K & N S2B G001
	Knob, Electro	EI 141747
9	Switch, Toggle, 600V	5216-0130-000
10	Relay, Fan, 24V Coil	5018-0008-000
11	Switch Assembly	5216-0199-000
12	Manual Reset Limit	4520-0012-000

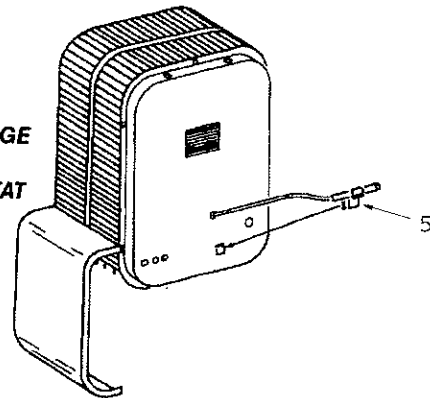
## Heater Replacement Parts

Key No.	Description	Part Number
1	Spring, Element (used on MUH03 thru MUH-20 only)	5208-0073-000
	Spring, Element (used on MUH-25 thru MUH-50 only)	5208-0073-001
2	Spring, Capillary Tube	5208-0072-000
3	Spring, Element Retainer	5208-0074-000
4	Switch (used on MUH-25 thru MUH-50 only)	5216-7076-001
5	Insulator (used on MUH-25 thru MUH-50 only)	2900-0031-000
6	Bracket Extension (used on MUH-15, MUH-20, MUH-40 and MUH-50 only)	1215-0282-000
7	Switch Bracket	1215-0256-000
8	Fan Delay	4520-0010-000
14	Speed Nut	4100-7036-026
15	Bracket, Captive Screw (used on MUH-03 thru MUH-20 only)	1215-0291-000
	Bracket, Captive Screw (used on MUH-25 thru MUH-50 only)	1215-0289-000
17	Protector, Linear Limit (used on MUH03 thru MUH05 only)	4520-0011-000
	Protector, Linear Limit (used on MUH-07 thru MUH-20 only)	4520-0011-001
	Protector, Linear Limit (used on MUH-25 thru MUH-50 only)	4520-0011-002
20	Clamp (used on MUH-20 thru MUH-50 only)	1417-5004-000
	Bracket, Mounting Capacitor (used on MUH-20-8 only)	1215-0314-000
22	Terminal Lug (used on MUH-07 thru MUH-50 only)	3504-7002-001
25	Bushing (used on MUH-20 thru MUH-50 only)	25221-60131
26	Washer, Ground (used on MUH03 thru MUH05 only)	6401-0084-000
27	Screw, Ground (used on MUH03 thru MUH05 only)	5202-0290-002
28	Louver (used on MUH03 thru MUH05 only)	3503-0036-000
	Louver (used on MUH-07 thru MUH-20 only)	3503-0036-001
	Louver (used on MUH-25 thru MUH-50 only)	3503-0036-002
29	Spring, Louver	5208-7005-001
32	Terminal Block, 3-Phase (used on MUH05-21, MUH-07-02, and MUH-10-2 only)	5823-0003-000
	Terminal Block, 3-Phase (used on MUH05-81, MUH-07-8, and MUH-15-8 only)	5823-0003-000
33	Terminal Doublers (used where required)	5819-7012-005

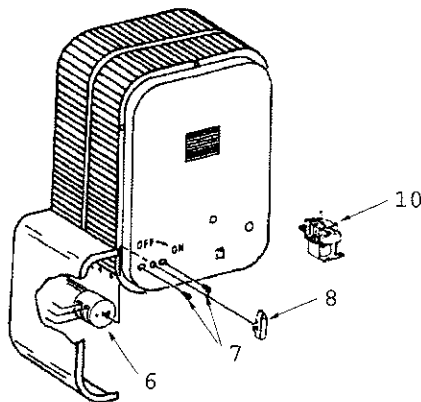
**BUILT-IN CONTROLS —  
Made-to-Order Units Only**



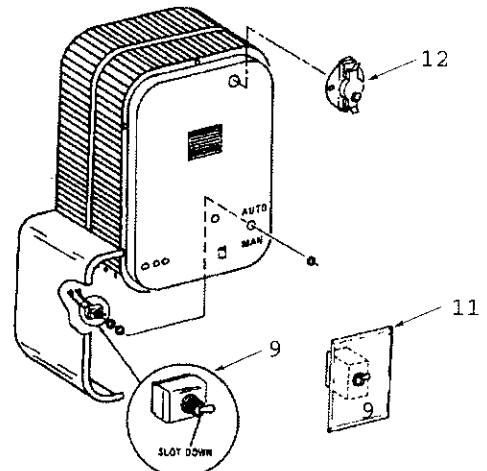
**SINGLE-POLE  
THERMOSTAT, TWO-STAGE  
THERMOSTAT, HEAT  
RECOVERY THERMOSTAT**



**POWER  
DISCONNECT  
SWITCH**

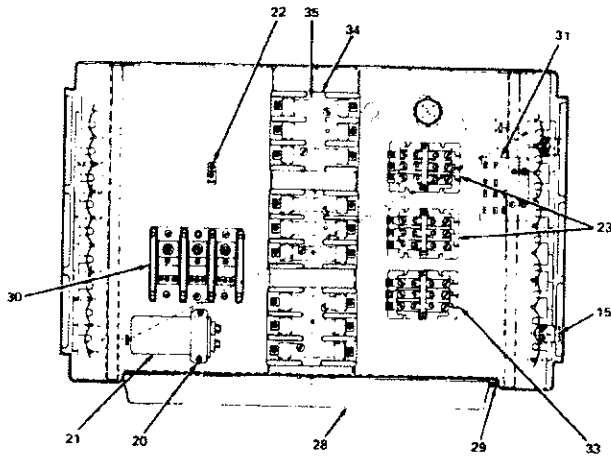


**SUMMER  
FAN  
SWITCH**

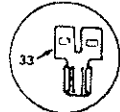


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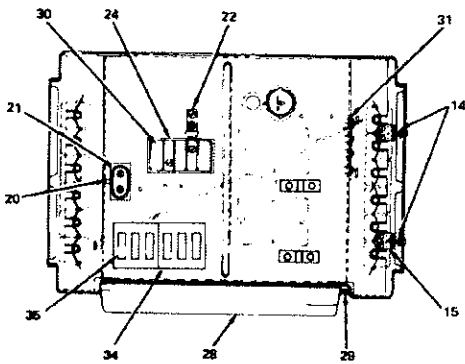
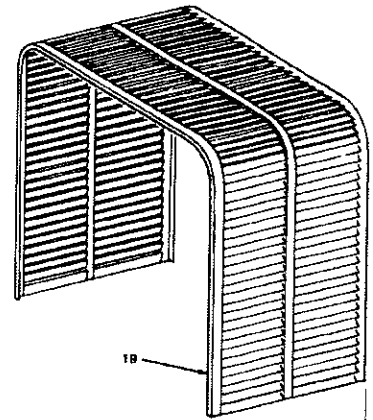
7



**VIEW D-D  
(MUH-25 THRU MUH-50 ONLY)**



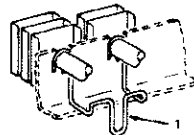
**TERMINAL DOUBLER  
(USED AS REQUIRED)**



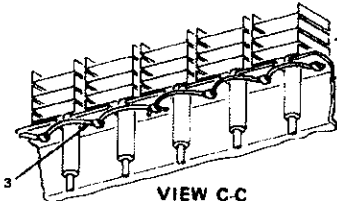
**VIEW D-D  
(MUH-07 THRU MUH-20 ONLY)**



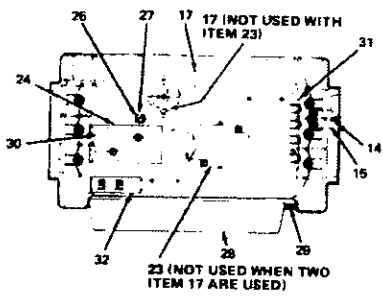
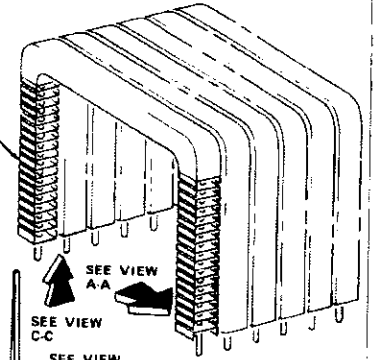
**VIEW A-A**



**VIEW B-B**

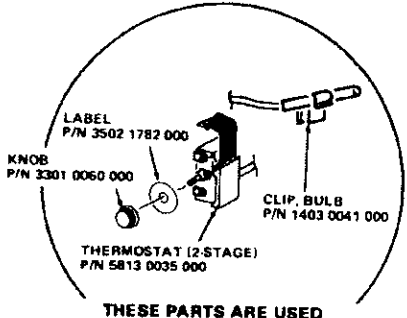
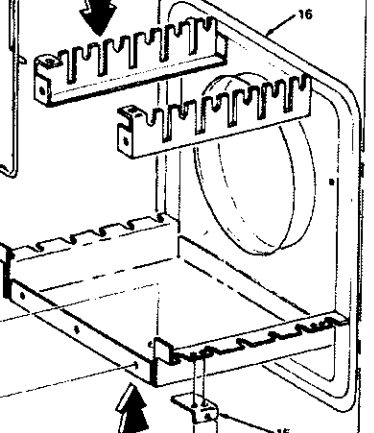
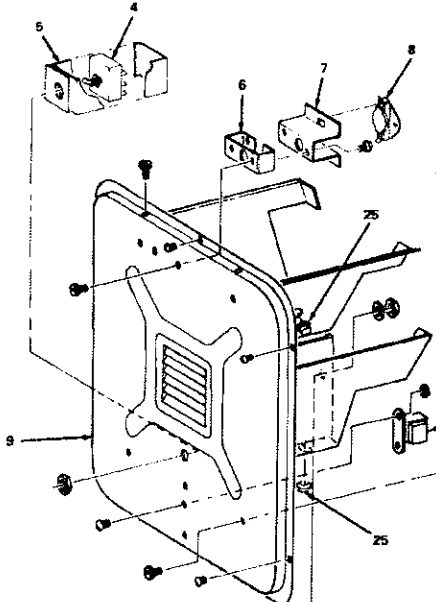


**VIEW C-C**



**VIEW D-D  
(MUH03 THRU MUH05 ONLY)**

23 (NOT USED WHEN TWO ITEM 17 ARE USED)



**THESE PARTS ARE USED  
ON MODEL MUH06-21T ONLY**

LABEL  
P/N 3502 1782 000  
KNOB  
P/N 3301 0060 000  
CLIP, BULB  
P/N 1403 0041 000  
THERMOSTAT (2-STAGE)  
P/N 5813 0035 000



**Maintenance Cleaning Instructions:****(To be performed only by Qualified Service Personnel)**

At least annually, the heater should be cleaned and serviced by a qualified service person to assure safe and efficient operation. This should include as necessary, vacuuming dust and debris from the elements and fan, and checking all screw lug connections for tightness to a recommended minimum torque of 35 in-lbs. (3.9 N-m). After completing the cleaning and servicing, the heater should be fully reassembled and checked for proper operation.

**LIMITED WARRANTY**

All products manufactured by Marley Engineered Products are warranted against defects in workmanship and materials for one year from date of installation, except heating elements which are warranted against defects in workmanship and materials for five years from date of installation. This warranty does not apply to damage from accident, misuse, or alteration; nor where the connected voltage is more than 5% above the nameplate voltage; nor to equipment improperly installed or wired or maintained in violation of the product's installation instructions. All claims for warranty work must be accompanied by proof of the date of installation.

The customer shall be responsible for all costs incurred in the removal or reinstallation of products, including labor costs, and shipping costs incurred to return products to Marley Engineered Products Service Center. Within the limitations of this warranty, inoperative units should be returned to the nearest Marley authorized service center or the Marley Engineered Products Service Center, and we will repair or replace, at our option, at no charge to you with return freight paid by Marley. It is agreed that such repair or replacement is the exclusive remedy available from Marley Engineered Products.

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For the address of your nearest authorized service center, contact Marley Engineered Products in Bennettsville, SC, at 1-800-642-4328. Merchandise returned to the factory must be accompanied by a return authorization and service identification tag, both available from Marley Engineered Products. When requesting return authorization, include all catalog numbers shown on the products.

**HOW TO OBTAIN WARRANTY SERVICE AND WARRANTY PARTS PLUS GENERAL INFORMATION**

- |                                |   |
|--------------------------------|---|
| 1. Warranty Service or Parts   | <b>1-800-642-4328</b>   |
| 2. Purchase Replacement Parts  | <b>1-800-654-3545</b>   |
| 3. General Product Information | <b><a href="http://www.marleymep.com">www.marleymep.com</a></b> |

**Note:** When obtaining service always have the following:

1. Model number of the product
2. Date of manufacture
3. Part number or description



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CITY MULTI Control System  
and Mitsubishi Mr. Slim Air Conditioners

# MA Remote Controller PAR-33MAA

## Instruction Book



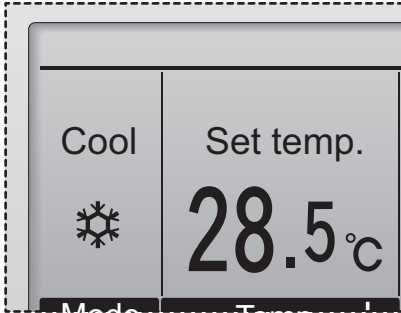
Prior to use, thoroughly read the instructions in this manual to use the product correctly.  
Retain for future reference.

Make sure that this CD-ROM and the Installation Manual are passed on to any future users.  
To ensure safety and proper operation of the remote controller, the remote controller should  
only be installed by qualified personnel.

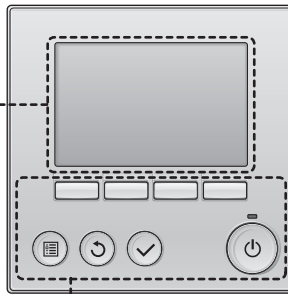
## Product features

### Feature 1

#### Large, easy-to-see display



Full-dot LCD display with large characters for easy viewing



### Feature 2

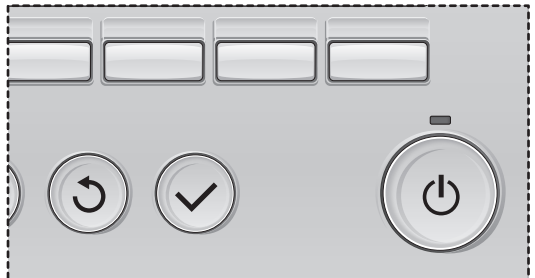
#### Simple button arrangement

### Feature 3

#### Large, easy-to-press buttons

Buttons are arranged according to usage to allow for intuitive navigation.

Frequently used buttons are larger than other buttons to prevent unintended pressing of other buttons.





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# Safety precautions

- Thoroughly read the following safety precautions before using the unit.
- Observe these precautions carefully to ensure safety.

 <b>WARNING</b>	Indicates a risk of death or serious injury.
 <b>CAUTION</b>	Indicates a risk of serious injury or structural damage.

- After reading this manual, pass it on to the end user to retain for future reference.
- Keep this manual for future reference and refer to it as necessary. This manual should be made available to those who repair or relocate the controller. Make sure that the manual is passed on to any future users.

## General precautions

### **WARNING**

Do not install the unit in a place where large amounts of oil, steam, organic solvents, or corrosive gases, such as sulfuric gas, are present or where acidic/alkaline solutions or sprays are used frequently. These substances can compromise the performance of the unit or cause certain components of the unit to corrode, which can result in electric shock, malfunctions, smoke, or fire.

To reduce the risk of shorting, current leakage, electric shock, malfunctions, smoke, or fire, do not wash the controller with water or any other liquid.

To reduce the risk of electric shock, malfunctions, smoke or fire, do not operate the switches/buttons or touch other electrical parts with wet hands.

When disinfecting the unit using alcohol, ventilate the room adequately. The fumes of the alcohol around the unit may cause a fire or explosion when the unit is turned on.

To reduce the risk of injury or electric shock, before spraying a chemical around the controller, stop the operation and cover the controller.

To reduce the risk of injury or electric shock, stop the operation and switch off the power supply before cleaning, maintaining, or inspecting the controller.

If any abnormality (e.g., burning smell) is noticed, stop the operation, turn off the power switch, and consult your dealer. Continued use of the product may result in electric shock, malfunctions, or fire.

Properly install all required covers to keep moisture and dust out of the controller. Dust accumulation and water can cause electric shock, smoke, or fire.

### **CAUTION**

To reduce the risk of fire or explosion, do not place flammable materials or use flammable sprays around the controller.

To reduce the risk of damage to the controller, do not directly spray insecticide or other flammable sprays on the controller.

To reduce the risk of environmental pollution, consult an authorized agency for proper disposal of remote controller.

To reduce the risk of electric shock or malfunctions, do not touch the touch panel, switches, or buttons with a pointy or sharp object.

To reduce the risk of injury and electric shock, avoid contact with sharp edges of certain parts.

To reduce the risk of injury, wear protective gear when working on the controller.

To avoid injury from broken glass, do not apply excessive force on the glass parts.

## Precautions for moving or repairing the controller

### **WARNING**

The controller should be repaired or moved only by qualified personnel. Do not disassemble or modify the controller.  
Improper installation or repair may cause injury, electric shock, or fire.

### **CAUTION**

To reduce the risk of shorting, electric shock, fire, or malfunction, do not touch the circuit board with tools or with your hands, and do not allow dust to accumulate on the circuit board.

## Additional precautions

To avoid damage to the controller, use appropriate tools to install, inspect, or repair the controller.

To avoid discoloration, do not use benzene, thinner, or chemical rag to clean the controller. To clean the controller, wipe with a soft cloth soaked in water with mild detergent, wipe off the detergent with a wet cloth, and wipe off water with a dry cloth.

This controller is designed for exclusive use with the Building Management System by Mitsubishi Electric. The use of this controller for with other systems or for other purposes may cause malfunctions.

To avoid damage to the controller, provide protection against static electricity.

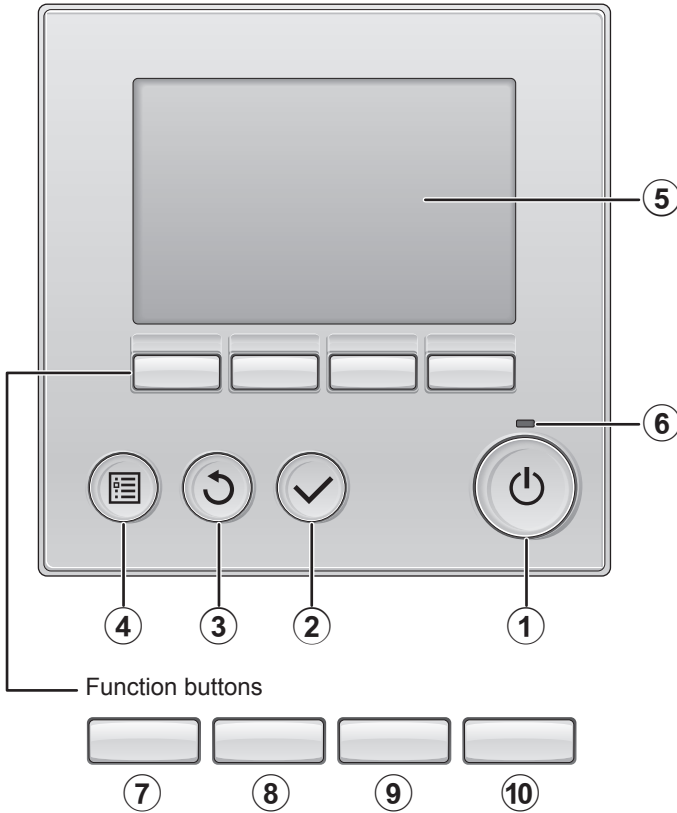
This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.  
Children should be supervised to ensure that they do not play with the appliance.

This appliance is intended to be used by expert or trained users in shops, in light industry and on farms, or for commercial use by lay persons.

If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

# Names and functions of controller components

## Controller interface



**① ON/OFF button**

Press to turn ON/OFF the indoor unit.

**② SELECT button**

Press to save the setting.

**③ RETURN button**

Press to return to the previous screen.

**④ MENU button** Page 20

Press to bring up the Main menu.

**⑤ Backlit LCD**

Operation settings will appear. When the backlight is off, pressing any button turns the backlight on and it will stay lit for a certain period of time depending on the screen.

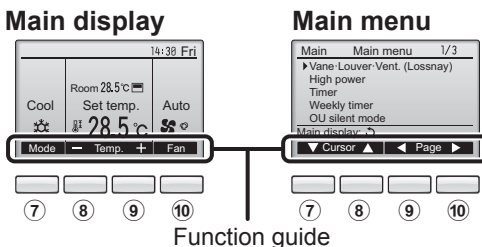
When the backlight is off, pressing any button turns the backlight on and does not perform its function. (except for the **ON/OFF** button)

**⑥ ON/OFF lamp**

This lamp lights up in green while the unit is in operation. It blinks while the remote controller is starting up or when there is an error.

The functions of the function buttons change depending on the screen. Refer to the button function guide that appears at the bottom of the LCD for the functions they serve on a given screen.

When the system is centrally controlled, the button function guide that corresponds to the locked button will not appear.



**⑦ Function button F1**

Main display: Press to change the operation mode.

Main menu: Press to move the cursor down.

**⑧ Function button F2**

Main display: Press to decrease temperature.

Main menu: Press to move the cursor up.

**⑨ Function button F3**

Main display: Press to increase temperature.

Main menu: Press to go to the previous page.

**⑩ Function button F4**

Main display: Press to change the fan speed.

Main menu: Press to go to the next page.

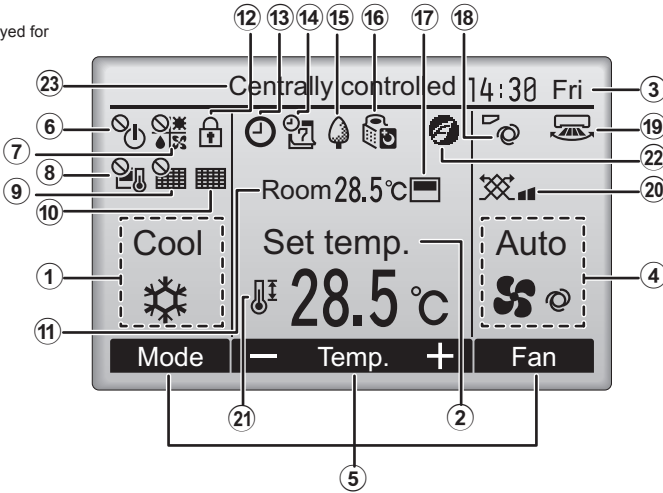
# Names and functions of controller components

## Display

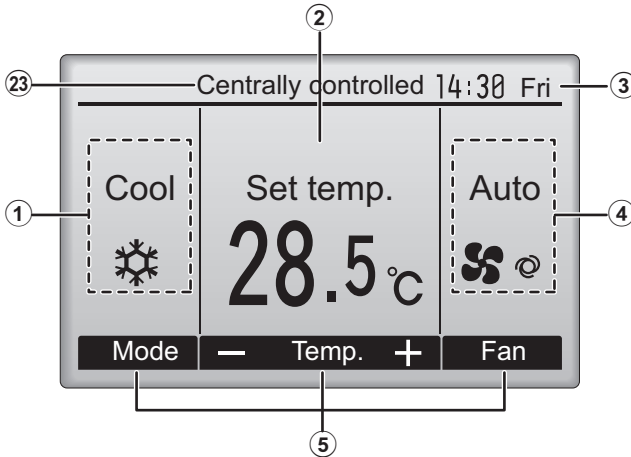
The main display can be displayed in two different modes: "Full" and "Basic." The factory setting is "Full." To switch to the "Basic" mode, change the setting on the Main display setting. (Refer to page 48.)

### Full mode

\* All icons are displayed for explanation.



### Basic mode





**① Operation mode Page 14**

Indoor unit operation mode appears here.

**② Preset temperature Page 15**

Preset temperature appears here.

**③ Clock  
(See the Installation Manual.)**

Current time appears here.

**④ Fan speed Page 16**

Fan speed setting appears here.

**⑤ Button function guide**

Functions of the corresponding buttons appear here.



Appears when the ON/OFF operation is centrally controlled.



Appears when the operation mode is centrally controlled.



Appears when the preset temperature is centrally controlled.



Appears when the filter reset function is centrally controlled.



**Page 56**

Indicates when filter needs maintenance.

**⑪ Room temperature  
(See the Installation Manual.)**

Current room temperature appears here.



**Page 36**

Appears when the buttons are locked.

Most settings (except ON/OFF, mode, fan speed, temperature) can be made from the Main menu. (Refer to page 20.)

**⑬ Page 26, 28, 43**

Appears when the On/Off timer (Page 26), Night setback (Page 43), or Auto-off timer (Page 28) function is enabled.

appears when the timer is disabled by the centralized control system.

**⑭ Page 30**

Appears when the Weekly timer is enabled.

**⑮ Page 41**

Appears while the units are operated in the energy-save mode. (Will not appear on some models of indoor units)

**⑯ Page 32**

Appears while the outdoor units are operated in the silent mode.



Appears when the built-in thermistor on the remote controller is activated to monitor the room temperature (⑪).

appears when the thermistor on the indoor unit is activated to monitor the room temperature.

**⑰ Page 22**

Indicates the vane setting.

**⑱ Page 23**

Indicates the louver setting.

**⑲ Page 23**

Indicates the ventilation setting.

**⑳ Page 34**

Appears when the preset temperature range is restricted.



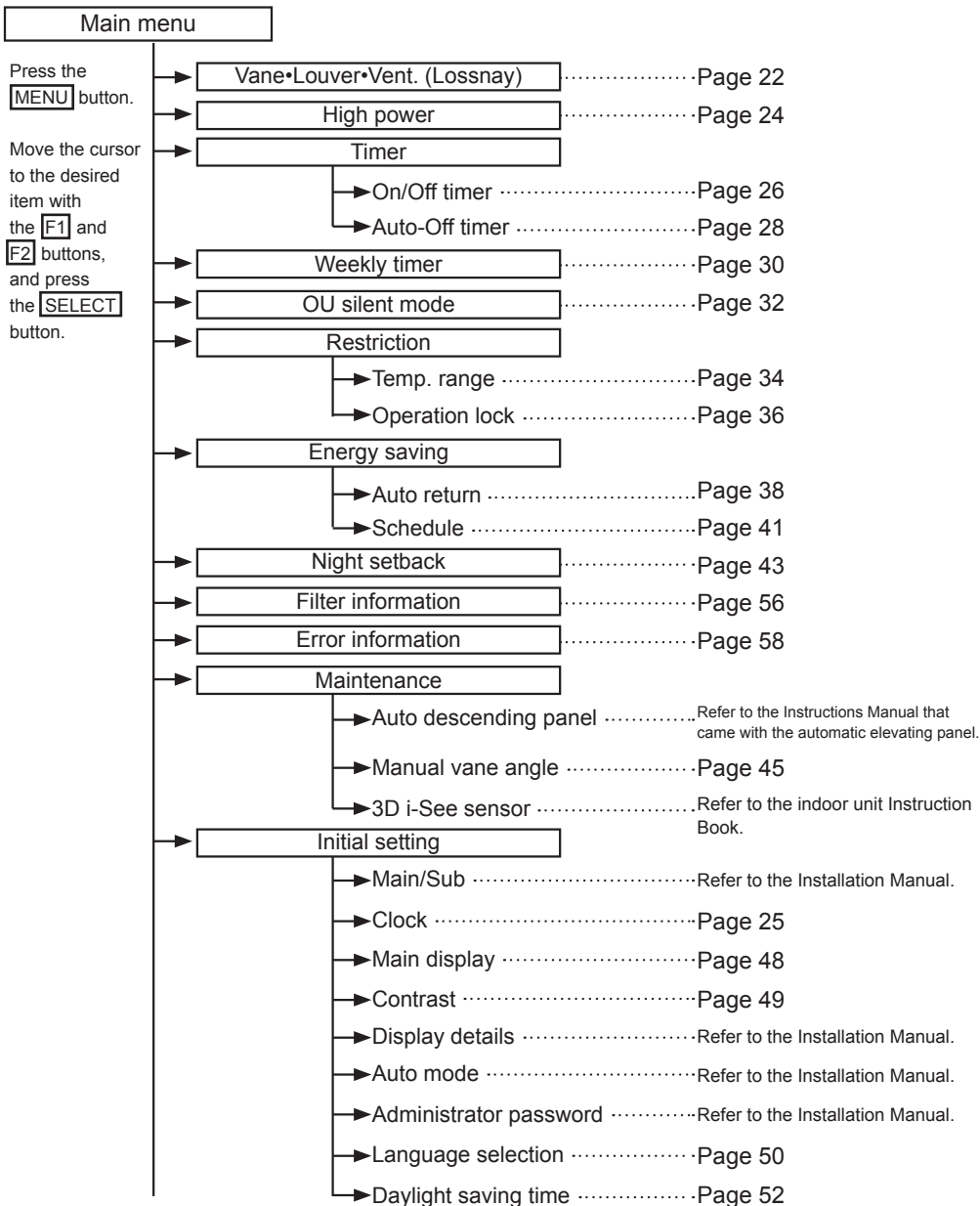
Appears when an energy-saving operation is performed using a "3D i-See sensor" function.

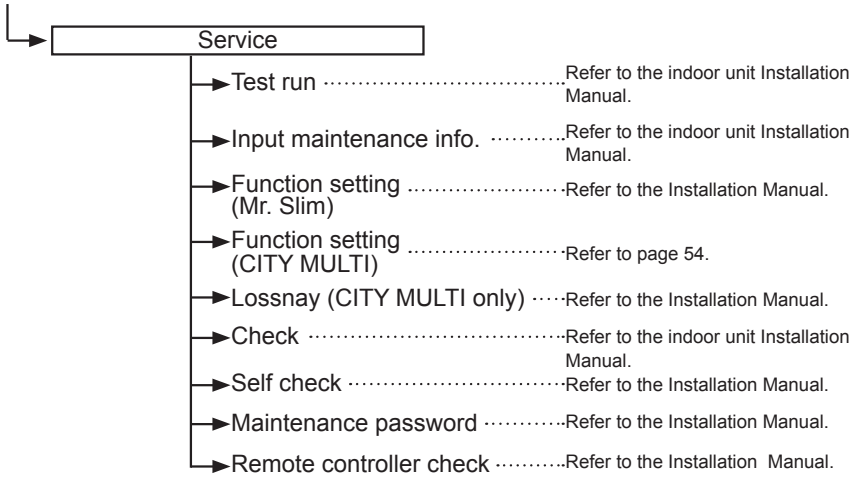
**㉓ Centrally controlled**

Appears for a certain period of time when a centrally-controlled item is operated.

# Read before operating the controller

## Menu structure





Not all functions are available on all models of indoor units.

Icon explanations

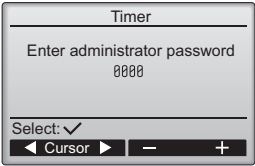






## Controller operation

---

Timer

P

The table below summarizes the square icons used in this manual.

<b>P</b>	<p>The administrator or maintenance user password must be entered on the password input screen to change settings. There is no settings that can skip this process.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <div style="margin-left: 20px;"> <p><b>[F1]</b> : Press to move the cursor left.</p> <p><b>[F2]</b> : Press to move the cursor right.</p> <p><b>[F3]</b> : Press to decrease the value by 1.</p> <p><b>[F4]</b> : Press to increase the value by 1.</p> </div> </div> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="margin-right: 10px;">     </div> <div> <p>*Changes cannot be made unless the correct password is entered.</p> </div> </div>	<b>Main</b>
<b>ON</b>	Indicates settings that can be changed only while the units are in operation.	<b>OFF</b>
	Indicates settings that can be changed only while the units are operated in the Cool, Heat, or Auto mode.	
		Indicates functions that are not available when the buttons are locked or the system is centrally controlled.

# Basic operations

## Power ON/OFF



Button operation

### ON



Press the **ON/OFF** button.

The ON/OFF lamp will light up in green, and the operation will start.

### OFF



Press the **ON/OFF** button again.

The ON/OFF lamp will come off, and the operation will stop.

## Operation status memory

	Remote controller setting
Operation mode	Operation mode before the power was turned off
Preset temperature	Preset temperature before the power was turned off
Fan speed	Fan speed before the power was turned off

## Settable preset temperature range

Operation mode	Preset temperature range
Cool/Dry	19 ~ 30 °C (67 ~ 87 °F)
Heat	17 ~ 28 °C (63 ~ 83 °F)
Auto (Single set point)	19 ~ 28 °C (67 ~ 83 °F)
Auto (Dual set points)	[Cool] Preset temperature range for the Cool mode [Heat] Preset temperature range for the Heat mode
Fan/Ventilation	Not settable

**The settable temperature range varies with the model of indoor units.**

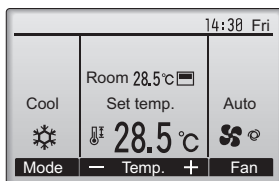
# Basic operations

## Operation mode, temperature, and fan speed settings

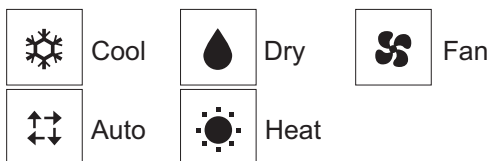


Button operation

## Operation mode



Press the **[F1]** button to go through the operation modes in the order of "Cool, Dry, Fan, Auto, and Heat." Select the desired operation mode.



• Operation modes that are not available to the connected indoor unit models will not appear on the display.

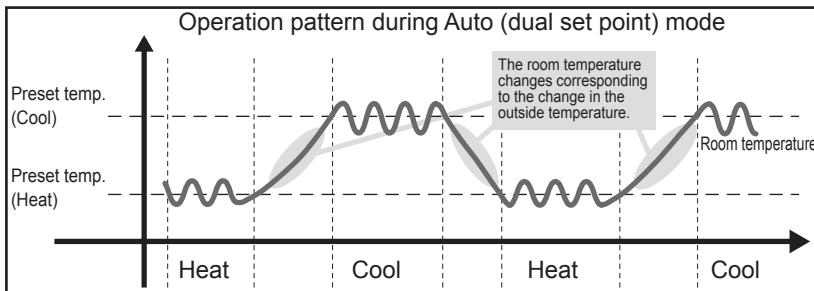
### What the blinking mode icon means

The mode icon will blink when other indoor units in the same refrigerant system (connected to the same outdoor unit) are already operated in a different mode. In this case, the rest of the unit in the same group can only be operated in the same mode.

### <Auto (dual set point) mode>

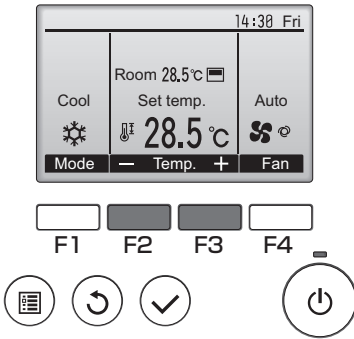
When the operation mode is set to the Auto (dual set point) mode, two preset temperatures (one each for cooling and heating) can be set. Depending on the room temperature, indoor unit will automatically operate in either the Cool or Heat mode and keep the room temperature within the preset range.

The graph below shows the operation pattern of indoor unit operated in the Auto (dual set point) mode.



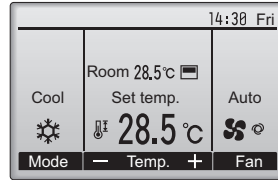
# Preset temperature

<Cool, Dry, Heat, and Auto (single set point)>



Press the **F2** button to decrease the preset temperature, and press the **F3** button to increase.

- Refer to the table on page 13 for the settable temperature range for different operation modes.
- Preset temperature range cannot be set for Fan/Ventilation operation.
- Preset temperature will be displayed either in Centigrade in 0.5- or 1-degree increments, or in Fahrenheit, depending on the indoor unit model and the display mode setting on the remote controller.



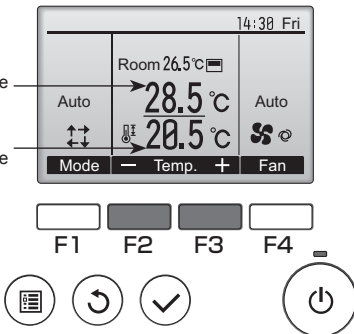
Example display  
(Centigrade in 0.5-degree increments)

<Auto (dual set point) mode>

1

Preset temperature for cooling

Preset temperature for heating

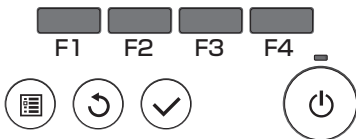
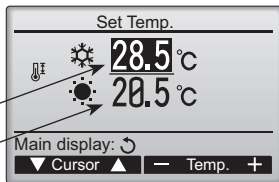


The current preset temperatures will appear. Press the **F2** or **F3** button to display the Settings screen.

# Basic operations

2

Preset temperature for cooling  
Preset temperature for heating



Press the **[F1]** or **[F2]** button to move the cursor to the desired temperature setting (cooling or heating).

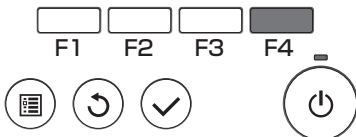
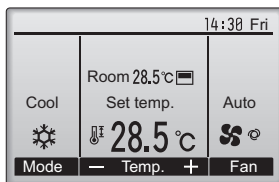
Press the **[F3]** button to decrease the selected temperature, and **[F4]** to increase.

- Refer to the table on page 13 for the settable temperature range for different operation modes.
- The preset temperature settings for cooling and heating in the Auto (dual set point) mode are also used by the Cool/Dry and Heat modes.
- The preset temperatures for cooling and heating in the Auto (dual set point) mode must meet the conditions below:
  - Preset cooling temperature is higher than preset heating temperature.
  - The minimum temperature difference requirement between cooling and heating preset temperatures (varies with the models of indoor units connected) is met.
  - If preset temperatures are set in a way that does not meet the minimum temperature difference requirement, both preset temperatures will automatically be changed within the allowable setting ranges.

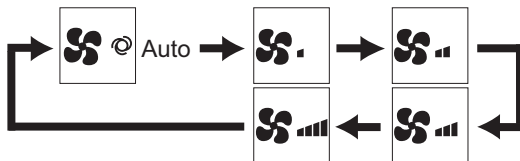
### Navigating through the screens

- To return to the Main display ..... **[RETURN]** button

## Fan speed



Press the **[F4]** button to go through the fan speeds in the following order.



- The available fan speeds depend on the models of connected indoor units.





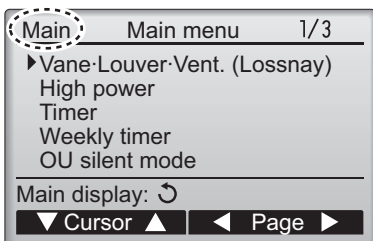
# Navigating through the menu

## Main menu list

Setting and display items		Setting details	Reference page
Vane•Louver•Vent. (Lossnay)		<p><b>Use to set the vane angle.</b></p> <ul style="list-style-type: none"> <li>•Select a desired vane setting from five different settings.</li> </ul> <p><b>Use to turn ON/OFF the louver.</b></p> <ul style="list-style-type: none"> <li>•Select a desired setting from "ON" and "OFF."</li> </ul> <p><b>Use to set the amount of ventilation.</b></p> <ul style="list-style-type: none"> <li>•Select a desired setting from "Off," "Low," and "High."</li> </ul>	22
High power		<p><b>Use to reach the comfortable room temperature quickly.</b></p> <ul style="list-style-type: none"> <li>•Units can be operated in the High-power mode for up to 30 minutes.</li> </ul>	24
Timer	On/Off timer	<p><b>Use to set the operation On/Off times.</b></p> <ul style="list-style-type: none"> <li>•Time can be set in 5-minute increments.</li> <li>* Clock setting is required.</li> </ul>	26
	Auto-Off timer	<p><b>Use to set the Auto-Off time.</b></p> <ul style="list-style-type: none"> <li>•Time can be set to a value from 30 to 240 in 10-minute increments.</li> </ul>	28
Weekly timer		<p><b>Use to set the weekly operation On/Off times.</b></p> <ul style="list-style-type: none"> <li>•Up to eight operation patterns can be set for each day.</li> <li>* Clock setting is required.</li> <li>* Not valid when the On/Off timer is enabled.</li> <li>* 1°C increments</li> </ul>	30
OU silent mode		<p><b>Use to set the time periods in which priority is given to quiet operation of outdoor units over temperature control. Set the Start/Stop times for each day of the week.</b></p> <ul style="list-style-type: none"> <li>•Select the desired silent level from "Normal," "Middle," and "Quiet."</li> <li>* Clock setting is required.</li> </ul>	32
Restriction	Temp. range	<p><b>Use to restrict the preset temperature range.</b></p> <ul style="list-style-type: none"> <li>•Different temperature ranges can be set for different operation modes.</li> <li>* 1°C increments</li> </ul>	34
	Operation lock	<p><b>Use to lock selected functions.</b></p> <ul style="list-style-type: none"> <li>•The locked functions cannot be operated.</li> </ul>	36
Energy saving	Auto return	<p><b>Use to get the units to operate at the preset temperature after performing energy-save operation for a specified time period.</b></p> <ul style="list-style-type: none"> <li>•Time can be set to a value from 30 and 120 in 10-minute increments.</li> <li>* This function will not be valid when the preset temperature ranges are restricted.</li> <li>* 1°C increments</li> </ul>	38
	Schedule	<p><b>Set the start/stop times to operate the units in the energy-save mode for each day of the week, and set the energy-saving rate.</b></p> <ul style="list-style-type: none"> <li>•Up to four energy-save operation patterns can be set for each day.</li> <li>•Time can be set in 5-minute increments.</li> <li>•Energy-saving rate can be set to a value from 0% and 50 to 90% in 10% increments.</li> <li>* Clock setting is required.</li> </ul>	41

Setting and display items		Setting details	Reference page
Night setback		<b>Use to make Night setback settings.</b> •Select "Yes" to enable the setting, and "No" to disable the setting. The temperature range and the start/stop times can be set. * Clock setting is required. * 1°C increments	43
Filter information		<b>Use to check the filter status.</b> •The filter sign can be reset.	56
Error information		<b>Use to check error information when an error occurs.</b> •Error code, error source, refrigerant address, unit model, manufacturing number, contact information (dealer's phone number) can be displayed. * The unit model, manufacturing number, and contact information need to be registered in advance to be displayed.	58
Maintenance	Manual vane angle	<b>Use to set the vane angle for each vane to a fixed position.</b>	45
Initial setting	Clock	<b>Use to set the current time.</b>	25
	Main display	<b>Use to switch between "Full" and "Basic" modes for the Main display.</b> •The default setting is "Full."	48
	Contrast	<b>Use to adjust screen contrast.</b>	49
	Language selection	<b>Use to select the desired language.</b>	50
	Daylight saving time	<b>Sets the daylight saving time.</b>	52
Service	Function setting (CITY MULTI)	<b>Use to make settings for indoor unit's functions.</b>	54

## Restrictions for the sub remote controller



The following settings cannot be made from the sub remote controller. Make these settings from the main remote controller. "Main" is displayed in the title of the Main menu on the main remote controller.

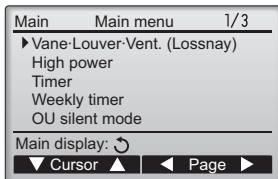
- Timer (On/Off timer, Auto-Off timer)
- Weekly timer
- OU silent mode
- Energy saving (Auto return, Schedule)
- Night setback
- Maintenance (Manual vane angle)

# Navigating through the menu

## Navigating through the Main menu

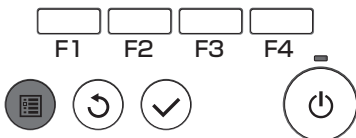
Button operation

### Accessing the Main menu

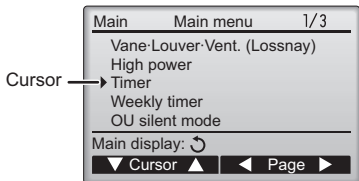


Press the **MENU** button.

The Main menu will appear.

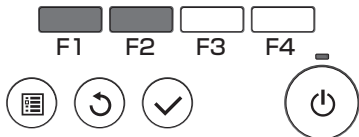


### Item selection

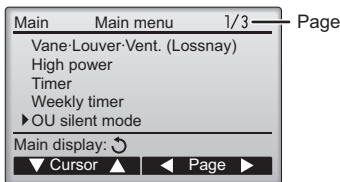


Press **F1** to move the cursor down.

Press **F2** to move the cursor up.

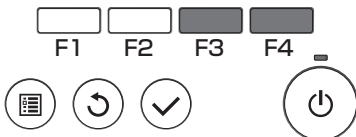


### Navigating through the pages

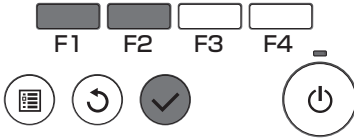


Press **F3** to go to the previous page.

Press **F4** to go to the next page.



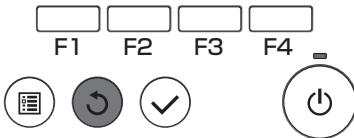
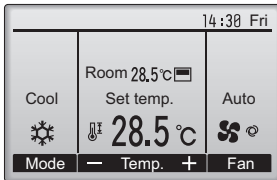
## Saving the settings



Select the desired item, and press the **SELECT** button.

The screen to set the selected item will appear.

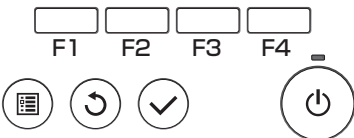
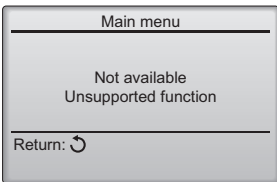
## Exiting the Main menu screen



Press the **RETURN** button to exit the Main menu and return to the Main display.

**If no buttons are touched for 10 minutes, the screen will automatically return to the Main display. Any settings that have not been saved will be lost.**

## Display of unsupported functions



The message at left will appear if the user selects a function not supported by the corresponding indoor unit model.

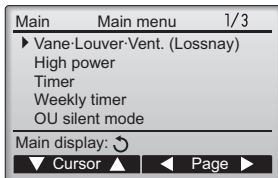
# Controller operation-Function settings

## Vane•Louver•Vent. (Lossnay)

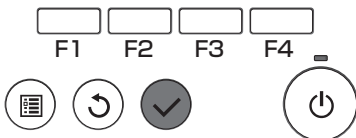


Button operation

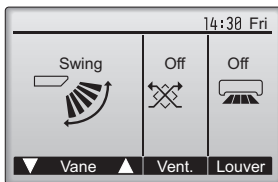
### Accessing the menu



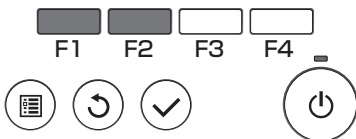
Select "Vane•Louver•Vent. (Lossnay)" from the Main menu (refer to page 20), and press the **SELECT** button.



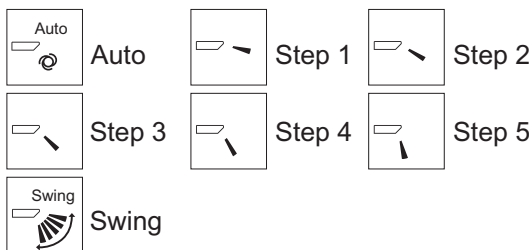
### Vane setting



Press the **F1** or **F2** button to go through the vane setting options: "Auto," "Step 1," "Step 2," "Step 3," "Step 4," "Step 5," and "Swing." Select the desired setting.

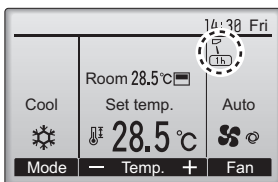


(Sample screen on CITY MULTI)



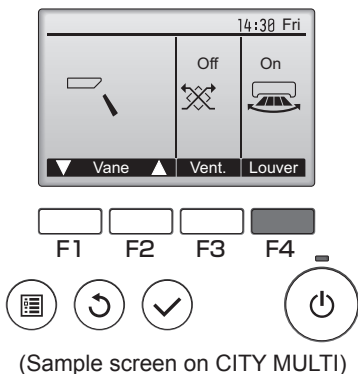
Select "Swing" to move the vanes up and down automatically.

When set to "Step 1" through "Step 5", the vane will be fixed at the selected angle.



- **1h** under the vane setting icon  
This icon will appear when the vane is set to "Step 5" and the fan operates at low speed during cooling or dry operation (depends on the model). The icon will go off in an hour, and the vane setting will automatically change.

## Louver setting

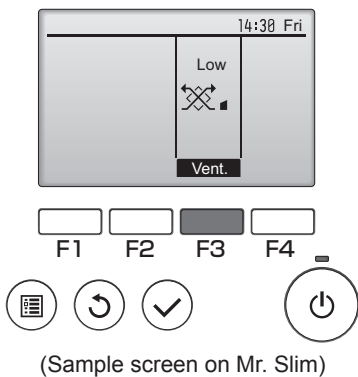


(Sample screen on CITY MULTI)

Press the **F4** button to turn the louver swing ON and OFF.



## Ventilation setting



(Sample screen on Mr. Slim)

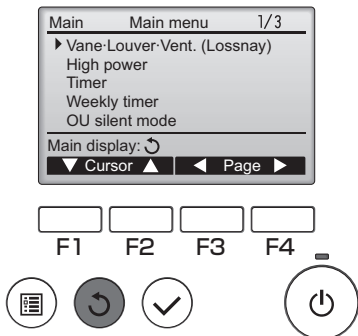
Press the **F3** button to go through the ventilation setting options in the order of "Off," "Low," and "High."

\* Settable only when LOSSNAY unit is connected.



• The fan on some models of indoor units may be interlocked with certain models of ventilation units.

## Returning to the Main menu



Press the **RETURN** button to go back to the Main menu.

# Controller operation-Function settings

## High power

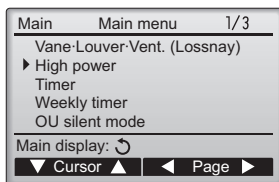


### Function description

High-power operation function allows the units to operate at higher-than-normal capacity so that the room air can be conditioned to an optimum temperature quickly. This operation will last for up to 30 minutes, and the unit will return to the normal operation mode at the end of the 30 minutes or when the room temperature reaches the preset temperature, whichever is earlier. The units will return to the normal operation when the operation mode or fan speed is changed.

### Button operation

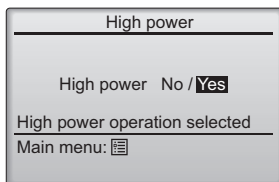
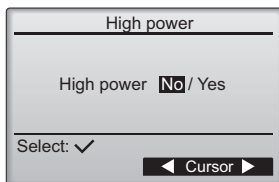
1



Select "High power" from the Main menu during Cooling, Heating, or Auto operation (refer to page 20), and press the **SELECT** button.

"High power" function is available only on the models that support the function.

2



Move the cursor to "Yes" with the **F3** or **F4** button, and press the **SELECT** button.

A confirmation screen will appear.

#### Navigating through the screens

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button

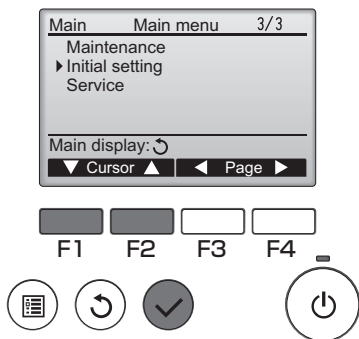


# Clock



## Button operation

1



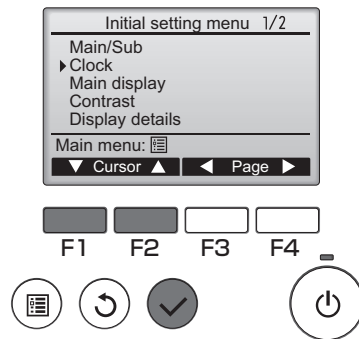
Select "Initial setting" from the Main menu (refer to page 20), and press the **SELECT** button.

**Clock setting is required before making the following settings.**

- On/Off timer
- Weekly timer
- OU silent mode
- Energy saving
- Night setback

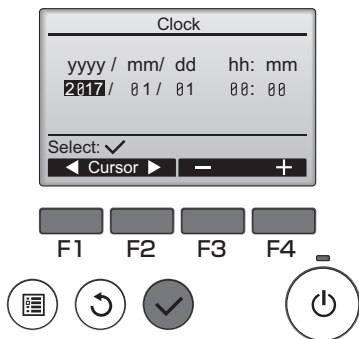
If a given system has no system controllers, the clock time will not automatically be corrected. In this case, periodically correct the clock time.

2



Move the cursor to the "Clock" with the **F1** or **F2** button, and press the **SELECT** button.

3



Move the cursor to the desired item with the **F1** or **F2** button out of year, month, date, hour, or minute.

Increase or decrease the value for the selected item with the **F3** or **F4** button, and press the **SELECT** button.

A confirmation screen will appear.

**Navigating through the screens**

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button

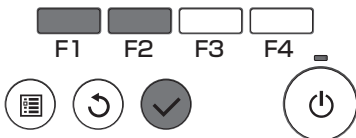
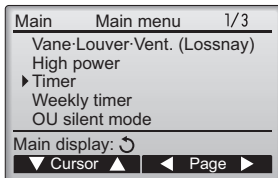
# Controller operation-Function settings

## Timer (On/Off timer)



### Button operation

1

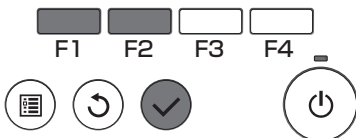
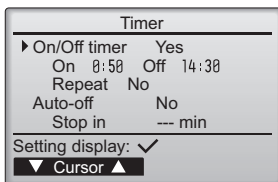


Select "Timer" from the Main menu (refer to page 20), and press the **SELECT** button.

**The On/Off timer will not work in the following cases:**

when On/Off timer is disabled, during an error, during check (in the service menu), during test run, during remote controller diagnosis, when the clock is not set, during Function setting, when the system is centrally controlled (when On/Off operation or Timer operation from local remote controller is prohibited).

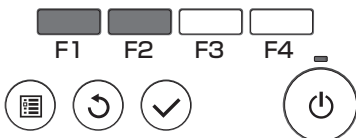
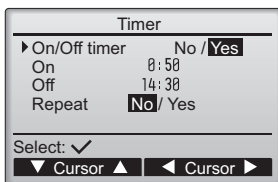
2



The current settings will appear.

Move the cursor to the On/Off timer, and press the **SELECT** button.

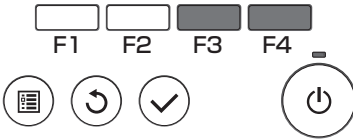
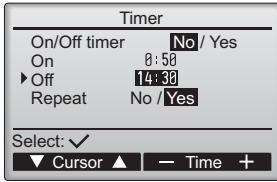
3



The screen to set the timer will appear.

Select the desired item with the **F1** or **F2** button out of "On/Off timer," "On," "Off," or "Repeat."

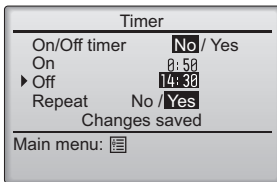
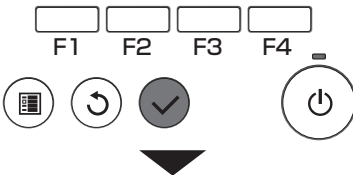
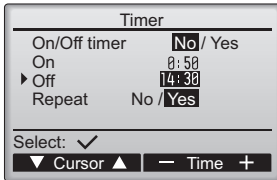
4



Change the setting with the **[F3]** or **[F4]** button.

- On/Off timer: No (disable)/Yes (enable)
- On: Operation start time (settable in 5-minute increments)
  - \* Press and hold the button to rapidly advance the numbers.
- Off: Operation stop time (settable in 5-minute increments)
  - \* Press and hold the button to rapidly advance the numbers.
- Repeat: No (once)/Yes (repeat)

5

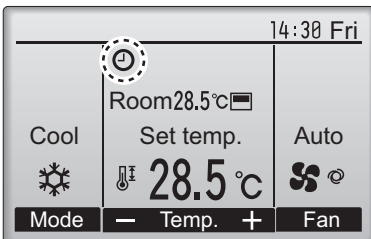


Press the **[SELECT]** button to save the settings.

A confirmation screen will appear.

**Navigating through the screens**

- To go back to the Main menu ..... **[MENU]** button
- To return to the previous screen ..... **[RETURN]** button



will appear on the Main display in the Full mode when the On/Off timer is enabled.

appears when the timer is disabled by the centralized control system.

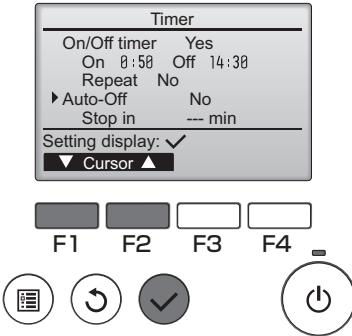
# Controller operation-Function settings

## Timer (Auto-Off timer)



### Button operation

1

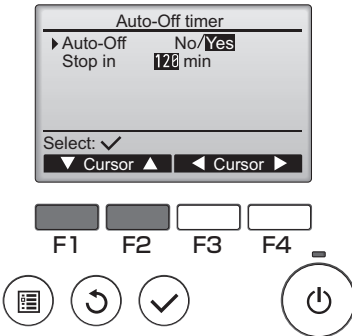


Bring up the Timer setting screen.  
(Refer to page 26.)

Select "Auto-Off", and press the **SELECT** button.

**The Auto-Off timer will not work in the following cases:**  
when Auto-Off timer is disabled, during an error, during check (in the service menu), during test run, during remote controller diagnosis, during Function setting, when the system is centrally controlled (when On/Off operation or Timer operation from local controller is prohibited).

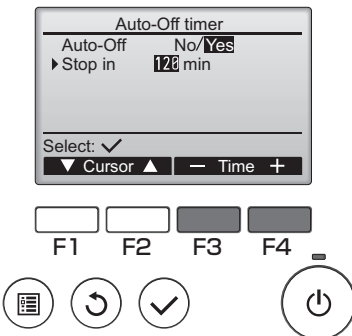
2



The current settings will appear.

Move the cursor to the "Auto-Off" or "Stop in --- min" with the **F1** or **F2** button.

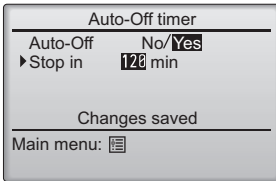
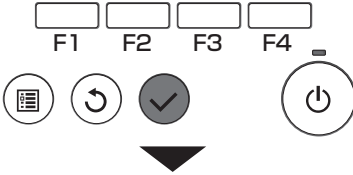
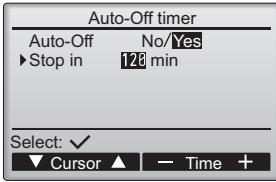
3



Change the setting with the **F3** or **F4** button.

- Auto-Off: No (disable)/Yes (enable)
- Stop in --- min: Timer setting (The settable range is 30 to 240 minutes in 10-minute increments.)

4

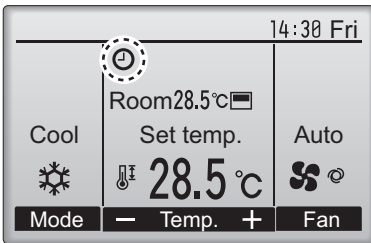



Press the **SELECT** button to save the settings.


A confirmation screen will appear.

**Navigating through the screens**

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button



 will appear on the Main display in the Full mode when the Auto-Off timer is enabled.

 appears when the timer is disabled by the centralized control system.

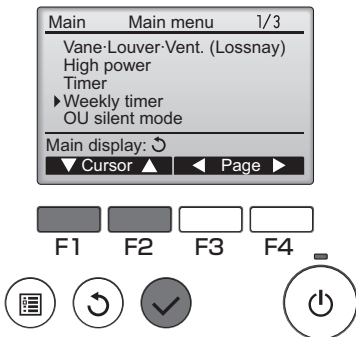
# Controller operation-Function settings

## Weekly timer



### Button operation

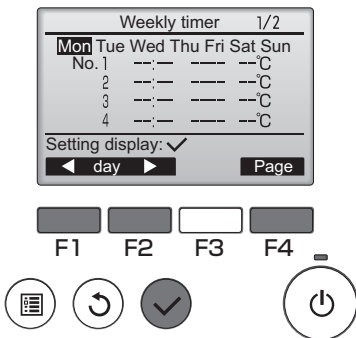
1



Select "Weekly timer" from the Main menu (refer to page 20), and press the **SELECT** button.

**The Weekly timer will not work in the following cases:** when the On/Off timer is enabled, when the weekly timer is disabled, during an error, during check (in the service menu), during test run, during remote controller diagnosis, when the clock is not set, during Function setting, when the system is centrally controlled (On/Off operation, temperature setting, or Timer operation from local remote controller is prohibited).

2



The current settings will appear.

Press the **F1** or **F2** button to see the settings for each day of the week.

Press the **F4** button to see patterns 5 through 8.

Press the **SELECT** button to go to the setting screen.

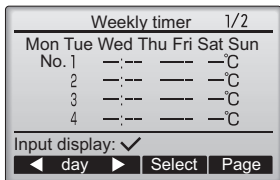
3



The screen to enable (Yes) and disable (No) the weekly timer will appear.

To enable the setting, move the cursor to "Yes" with the **F3** or **F4** button, and press the **SELECT** button.

# 4



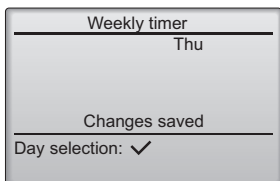
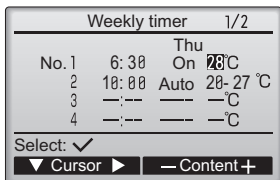
The weekly timer setting screen will appear and the current settings will be displayed.

Up to eight operation patterns can be set for each day.

Move the cursor to the desired day of the week with the **[F1]** or **[F2]** button, and press the **[F3]** button to select it. (Multiple days can be selected.)

Press the **[SELECT]** button.

# 5



Operation pattern setting screen will appear. Press the **[F1]** button to move the cursor to the desired pattern number.

Move the cursor to the time, On/Off, or temperature with the **[F2]** button.

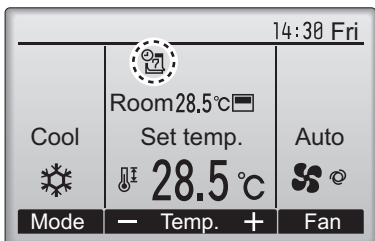
Change the settings with the **[F3]** or **[F4]** button.


- Time: settable in 5-minute increments
- \* Press and hold the button to rapidly advance the numbers.
- On/Off/Auto: Selectable settings depend on the model of connected indoor unit. (When an Auto pattern is executed, the system will operate in the Auto (dual set point) mode.)
- Temperature: The settable temperature range depends on the connected indoor units. (1°C increments) When the Auto (dual set point) mode is selected, two preset temperatures can be set. If an operation pattern with a single preset temperature setting is executed during the Auto (dual set point) mode, its setting will be used as the cooling temperature setting in the Cool mode.

Press the **[SELECT]** button to save the settings. A confirmation screen will appear.

### Navigating through the screens

- To go back to the setting change/day of the week selection screen ..... **[SELECT]** button
- To go back to the Main menu ..... **[MENU]** button
- To return to the previous screen ..... **[RETURN]** button



 will appear on the Main display in the Full mode when the weekly timer setting for the current day exists.

The icon will not appear while the On/Off timer is enabled or the system is under centralized control (Timer operation from local remote controller is prohibited).

# Controller operation-Function settings

## OU silent mode

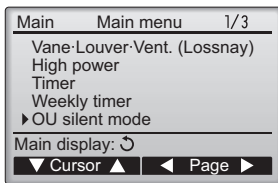


### Function description

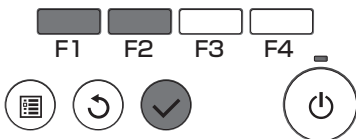
This function allows the user to set the time periods in which priority is given to quiet operation of outdoor units over temperature control. Set the start and stop times each day of the week for the quiet operation. Select the desired silent level from "Middle" and "Quiet".

### Button operation

1



Select "OU silent mode" from the Main menu (refer to page 20), and press the **SELECT** button.



"OU silent mode" function is available only on the models that support the function.

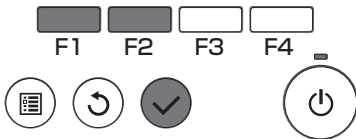
2



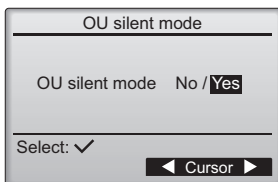
The current settings will appear.

Press the **F1** or **F2** button to see the settings for each day of the week.

Press the **SELECT** button to go to the setting screen.

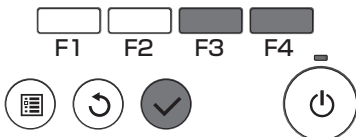


3



The screen to enable (Yes) and disable (No) the silent mode will appear.

To enable this setting, move the cursor to "Yes" with the **F3** or **F4** button, and press the **SELECT** button .





4

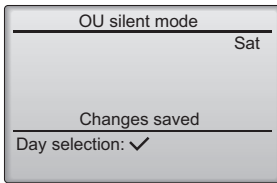
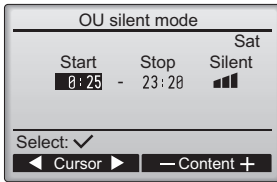


The OU silent mode setting screen will appear.

To make or change the setting, move the cursor to the desired day of the week with the **[F1]** or **[F2]** button, and press the **[F3]** button to select it. (Multiple days can be selected.)

Press the **[SELECT]** button.

5



The setting screen will appear.

Move the cursor to the desired item with the **[F1]** or **[F2]** button out of Start time, Stop time, or Silent level.

Change the settings with the **[F3]** or **[F4]** button.

- Start/Stop time: settable in 5-minute increments
- \* Press and hold the button to rapidly advance the numbers.
- Silent level: Normal, Middle, Quiet



Normal



Middle

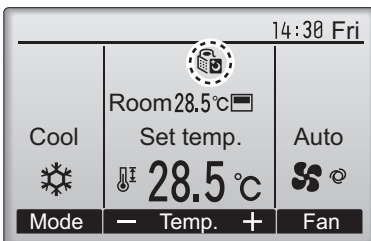



Quiet

Press the **[SELECT]** button to save the settings. A confirmation screen will appear.

**Navigating through the screens**

- To go back to the setting change/day of the week selection screen ..... **[SELECT]** button
- To go back to the Main menu ..... **[MENU]** button
- To return to the previous screen ..... **[RETURN]** button



 will appear on the Main display in the Full mode during the OU silent mode.

# Controller operation-Function settings

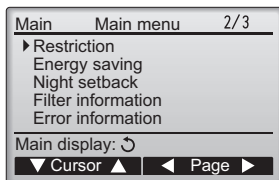
## Restriction

P

### Setting the temperature range restriction

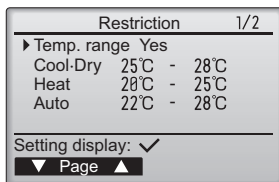
#### Button operation

1



Select "Restriction" from the Main menu (refer to page 20), and press the **SELECT** button.

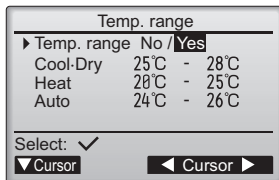
2



The current settings will appear.

Move the cursor to "Temp. range" with the **F1** or **F2** button, and press the **SELECT** button.

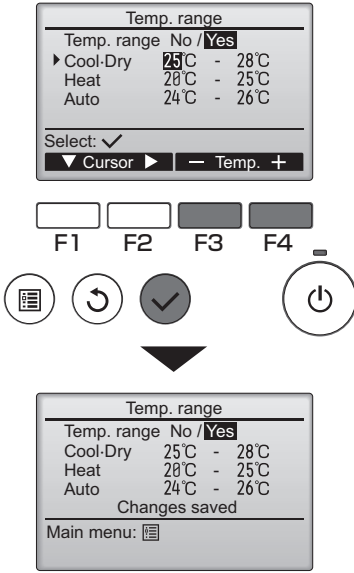
3



The screen to set the temperature range will appear.

Move the cursor to the desired item with the **F1** button out of "Temp. range," "Cool-Dry," "Heat," or "Auto."

# 4



Change the settings with the **[F3]** or **[F4]** button.

- Temp. range: No (unrestricted) or Yes (restricted)
- Cool•Dry: Upper and lower limit temperature (1°C increments)
- Heat: Upper and lower limit temperature (1°C increments)
- Auto: Upper and lower limit temperature (1°C increments)

### Temperature setting ranges

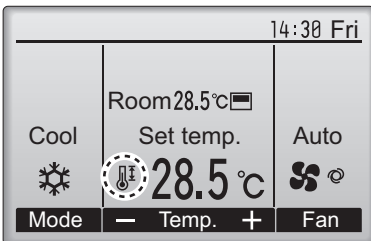
Mode		Lower limit	Upper limit
Cool•Dry	*1 *3	19 ~ 30°C (67 ~ 87°F)	30 ~ 19°C (87 ~ 67°F)
Heat	*2 *3	17 ~ 28°C (63 ~ 83°F)	28 ~ 17°C (83 ~ 63°F)
Auto	*4	19 ~ 28°C (67 ~ 83°F)	28 ~ 19°C (83 ~ 67°F)


- \* The settable range varies depending on the connected unit.
- \*1 Temperature ranges for the Cool, Dry, and Auto (dual set point) modes can be set.
- \*2 Temperature ranges for the Heat and Auto (dual set point) modes can be set.
- \*3 Temperature ranges for the Heat, Cool, and Dry modes must meet the conditions below:
  - Upper limit for cooling - upper limit for heating ≥ Minimum temperature difference (varies with indoor unit model)
  - Lower limit for cooling - lower limit for heating ≥ Minimum temperature difference (varies with indoor unit model)
- \*4 Temperature range for the Auto (single set point) mode can be set.

Press the **[SELECT]** button to save the settings. A confirmation screen will appear.

### Navigating through the screens

- To go back to the Main menu ..... **[MENU]** button
- To return to the previous screen ..... **[RETURN]** button



 will appear on the Main display in the Full mode when the temperature range is restricted.

# Controller operation-Function settings

## Restriction

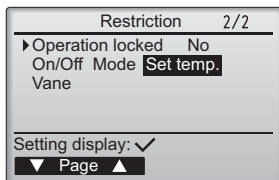


### Operation lock function

To enable the operation lock function, set the item "Operation locked" to "Yes".

#### Button operation

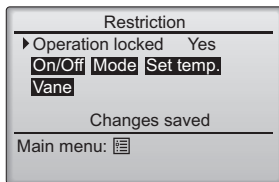
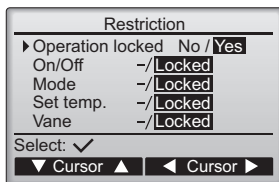
1



Bring up the Restriction setting screen. (Refer to page 34.)

Move the cursor to "Operation locked" and press the **SELECT** button.

2



The screen to make the settings for the operation lock function will appear.

Move the cursor to the desired item with the **F1** or **F2** button out of "Operation locked," "On/Off," "Mode," "Set temp.," or "Vane."

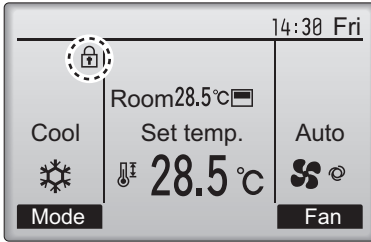
Change the settings with the **F3** or **F4** button.

- Operation locked: No (disable)/Yes (enable)
  - On/Off: On/Off operation
  - Mode: Operation mode setting
  - Set temp.: Preset temp. setting
  - Vane: Vane setting
- ]-" / "Locked"


Press the **SELECT** button to save the settings. A confirmation screen will appear.

#### Navigating through the screens

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button



(When Set temp. is locked)

 will appear on the Main display in the Full mode when the operation lock function setting is enabled.

Operation guide that corresponds to the locked function will be suppressed.

# Controller operation-Function settings

## Energy saving

Main

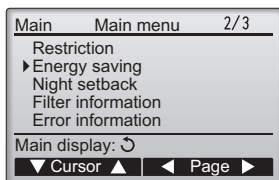
P

### Automatic return to the preset temperature

After the Auto return function is enabled, when the operation mode change or ON/OFF operation is performed from this remote controller, the set temperature automatically returns to the required temperature regardless of the set time.

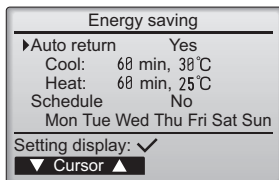
#### Button operation

1



Select "Energy saving" from the Main menu (refer to page 20), and press the **SELECT** button.

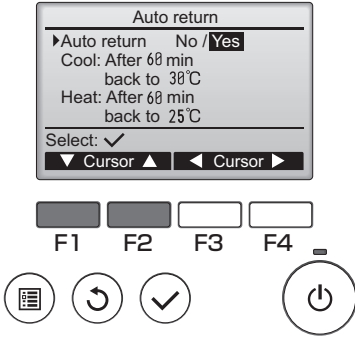
2



The current settings will appear.

Move the cursor to "Auto return" with the **F1** or **F2** button, and press the **SELECT** button.

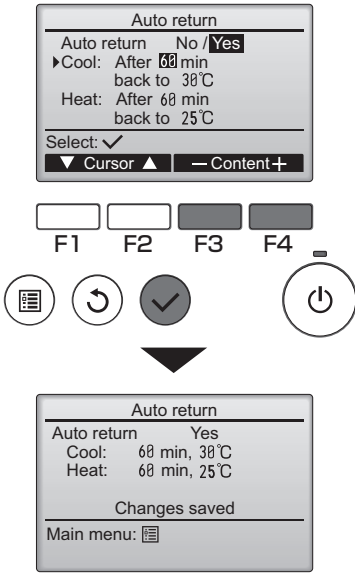
3



The screen to make the settings for the automatic return to the preset temperature will appear.

Move the cursor to the desired item with the **F1** or **F2** button out of "Auto return," "Cool," or "Heat."

4



Change the settings with the **F3** or **F4** button.

- Auto return: No (disable)/Yes (enable)
- Cool: Timer setting range is 30 to 120 minutes in 10-minute increments. Temperature setting range is 19 to 30°C (67 to 87°F) (1°C increments).
- Heat: Timer setting range is 30 to 120 minutes in 10-minute increments. Temperature setting range is 17 to 28°C (63 to 83°F) (1°C increments).

Press the **SELECT** button to save the settings. "Cool" includes "Dry" and "Auto Cool" modes, and "Heat" includes "Auto Heat" mode. The screen to set the selected item will appear.

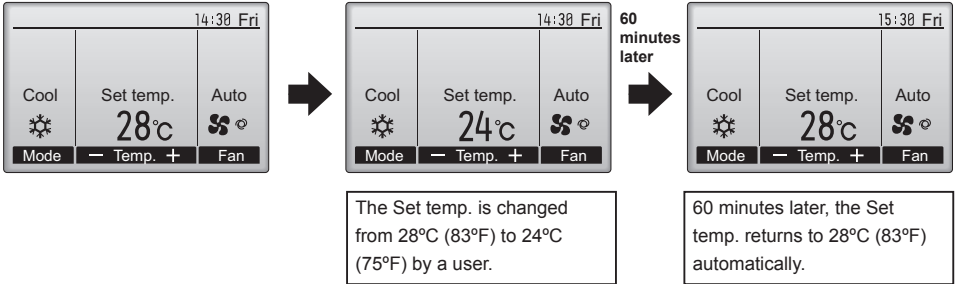
**Navigating through the screens**

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button

Timer or Preset temperature settings will not be effective when the temperature range is restricted and when the system is centrally controlled (when the temperature range setting from local controller is prohibited). When the system is centrally controlled (when timer operation from local remote controller is prohibited), only the timer setting will be ineffective.

<Sample screens when the Auto return function is enabled>

Example: Lower the Set temp. to 24°C (75°F). 60 minutes later, the Set temp. will be back to 28°C (83°F).





# Controller operation-Function settings

## Energy saving

Main

P

### Setting the energy-saving operation schedule

#### Button operation

1

Energy saving	
Auto return	Yes
Cool:	60 min, 30°C
Heat:	60 min, 25°C
▶Schedule	No
Mon Tue Wed Thu Fri Sat Sun	
Setting display:	✓
▼ Cursor ▲	



Bring up the "Energy saving" screen. (Refer to page 38.)

Move the cursor to the "Schedule," and press the **SELECT** button.

2

Energy saving						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
No. 1	---	---	---	---	---	---
2	---	---	---	---	---	---
3	---	---	---	---	---	---
4	---	---	---	---	---	---
Setting display:		✓				
◀ day ▶						



The screen to see the schedule will appear.

Press the **F1** or **F2** button to see the settings for each day of the week.

Press the **SELECT** button to go to the setting screen.

3

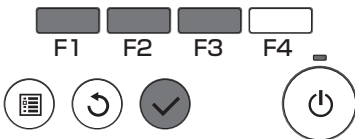
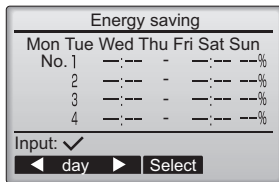
Energy saving	
Energy saving	No / Yes
Select:	✓
◀ Cursor ▶	



The screen to enable (Yes)/disable (No) the energy-saving operation schedule will appear.

Select "No" or "Yes" with the **F3** or **F4** button. Press the **SELECT** button to go to the setting change/day of the week selection screen.

# 4



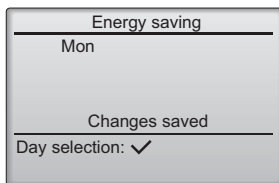
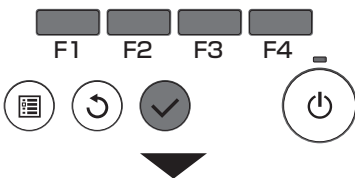
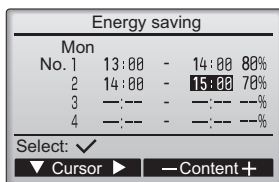
The setting change/day of the week selection screen will appear.

Up to four operation patterns can be set for each day.

Move the cursor to the desired day of the week with the **[F1]** or **[F2]** button, and press the **[F3]** button to select it. (Multiple days can be selected.)

Press the **[SELECT]** button to go to the pattern setting screen.

# 5



The pattern setting screen will appear.

Press the **[F1]** button to move the cursor to the desired pattern number.

Move the cursor to the desired item with the **[F2]** button out of the start time, stop time, and energy-saving rate (arranged in this order from the left).

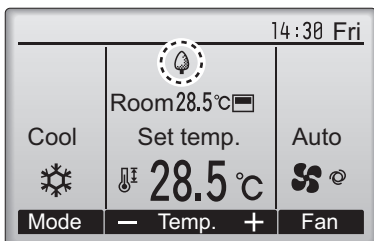
Change the settings with the **[F3]** or **[F4]** button.

- Start/Stop time: settable in 5-minute increments
- \* Press and hold the button to rapidly advance the numbers.
- Energy-saving rate: The setting range is 0% and 50 to 90% in 10% increments.

Press the **[SELECT]** button to save the settings. A confirmation screen will appear.

Press the **[SELECT]** button to save the settings. A confirmation screen will appear.

The lower the value, the greater the energy-saving effect.



will appear on the Main display in the Full mode when the unit is operated in the energy saving mode.

**Navigating through the screens**

- To go back to the setting change/day of the week selection screen ..... **[SELECT]** button
- To go back to the Main menu ..... **[MENU]** button
- To return to the previous screen ..... **[RETURN]** button

# Controller operation-Function settings

## Night setback Main P

### Function description

This control starts heating operation when the control object group is stopped and the room temperature drops below the preset lower limit temperature. Also, this control starts cooling operation when the control object group is stopped and the room temperature rises above the preset upper limit temperature.

The Night setback function is not available if the operation and the temperature setting are performed from the remote controller.

If the room temperature is measured by the air-conditioner's suction temperature sensor, the accurate temperature may not be obtained when the air-conditioner is inactive or when the air is not clean. In this case, switch the sensor to a remote sensor (PAC-SE40TSA/PAC-SE41TS-E) or a remote control sensor.

### Button operation

**1**

Main menu 2/3  
 Restriction  
 Energy saving  
 ▶ Night setback  
 Filter information  
 Error information  
 Main display: ↻  
 ▼ Cursor ▲ ◀ Page ▶

F1 F2 F3 F4

⌂ ↻ ✓ ⏻

Select "Night setback" from the Main menu (refer to page 20), and press the **SELECT** button.

**2**

Night setback  
 Night setback Yes  
 Temp. range 19°C - 28°C  
 Start 23:00  
 Stop 5:00  
 Setting display: ✓

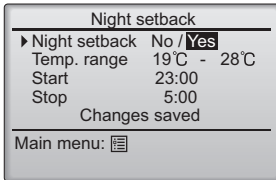
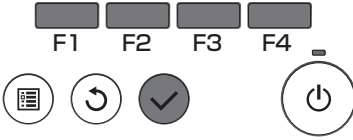
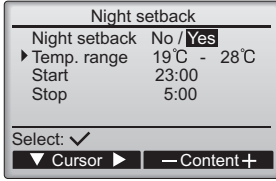
F1 F2 F3 F4

⌂ ↻ ✓ ⏻

The current settings will appear.

Press the **SELECT** button to go to the setting screen.

# 3



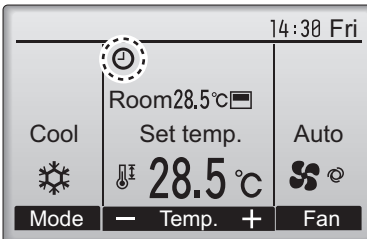
Move the cursor to the desired item with the **[F1]** or **[F2]** button out of Night setback No (disable)/Yes (enable), Temp. range, Start time, or Stop time. Change the settings with the **[F3]** or **[F4]** button.

- Temp. range: The lower limit temperature (for heating operation) and the upper limit temperature (for cooling operation) can be set. The temperature difference between the lower and upper limits must be 4°C (8°F) or more. The settable temperature range varies depending on the connected indoor units.
  - \* 1°C increments
- Start/Stop time: settable in 5-minute increments
  - \* Press and hold the button to rapidly advance the numbers.

Press the **[SELECT]** button to save the settings. A confirmation screen will appear.

### Navigating through the screens

- To go back to the Main menu ..... **[MENU]** button
- To return to the previous screen ..... **[RETURN]** button



will appear on the Main display in the Full mode when the Night setback function is enabled.

appears when the timer is disabled by the centralized control system.

### The Night setback will not work in the following cases:

when the unit is in operation, when the Night setback function is disabled, during an error, during check (in the service menu), during test run, during remote controller diagnosis, when the clock is not set, during Function setting, when the system is centrally controlled (On/Off operation, temperature setting, or Timer operation from local remote controller is prohibited).

# Controller operation-Function settings

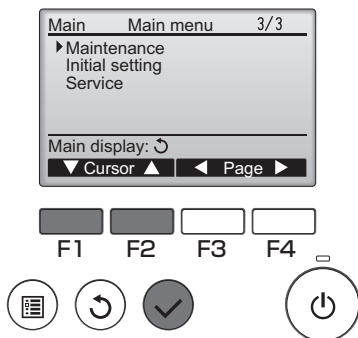
## Manual vane angle

Main

OFF

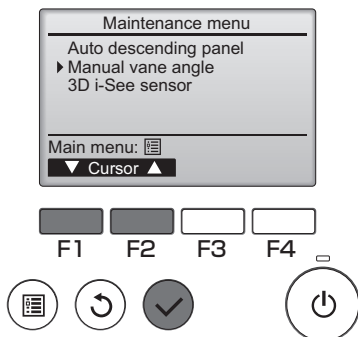
### Button operation

1



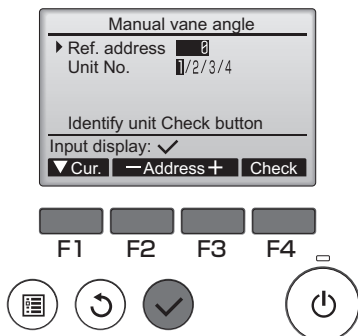
Select "Maintenance" from the Main menu (refer to page 20), and press the **SELECT** button.

2



Select "Manual vane angle" with the **F1** or **F2** button, and press the **SELECT** button.

3



Move the cursor to "Ref. address" or "Unit No." with the **F1** button to select.

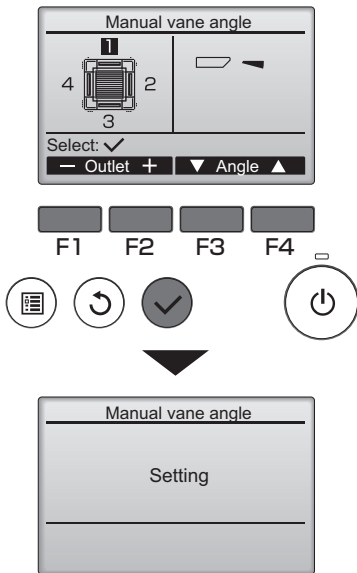
Select the refrigerant address and the unit number for the units to whose vanes are to be fixed, with the **F2** or **F3** button, and press the **SELECT** button.

- Ref. address: Refrigerant address
- Unit No.: 1, 2, 3, 4

Press the **F4** button to confirm the unit.

The screen at left shows a sample display on Mr. Slim. On CITY MULTI units, "M-NET address," is displayed instead of "Ref. address", and the "Unit No." will not be displayed.

# 4



The current vane setting will appear.

Select the desired outlets from 1 through 4 with the **[F1]** or **[F2]** button.

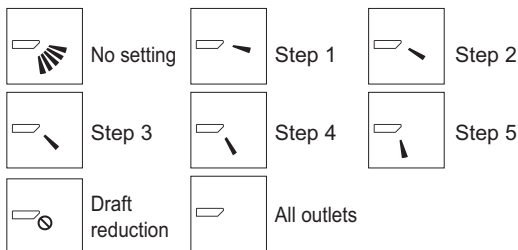
- Outlet: "1," "2," "3," "4," and "1, 2, 3, 4, (all outlets)"

Press the **[F3]** or **[F4]** button to go through the option in the order of "No setting (reset)," "Step 1," "Step 2," "Step 3," "Step 4," "Step 5," and "Step 6."

Select the desired setting.

\* Step 6 can only be set for one outlet.

■ Vane setting




Press the **[SELECT]** button to save the settings.

A screen will appear that indicates the setting information is being transmitted.

The setting changes will be made to the selected outlet.

The screen will automatically return to the previous screen when the transmission is completed.

Make the settings for other outlets, following the same procedures.

**If all outlets are selected,  will be displayed the next time the unit goes into operation.**

Navigating through the screens  
 • To return to the previous screen ..... **[RETURN]** button

**\*Draft reduction**

The [Draft reduction] mode keeps the vane angle more horizontal than the angle of Step 1 so that the airflow will not be directed toward the people.

This function can be set only for one outlet.

This function cannot be set for models with two or three outlets.

In the Draft reduction mode, the airflow may cause the ceiling discoloration.

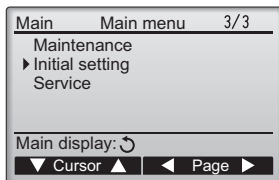
# Controller operation-Function settings

## Main display



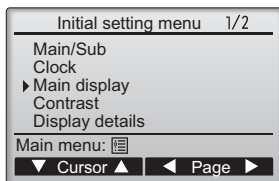
### Button operation

1



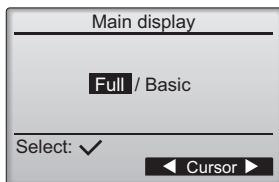
Select "Initial setting" from the Main menu (refer to page 20), and press the **SELECT** button.

2



Move the cursor to the "Main display" with the **F1** or **F2** button, and press the **SELECT** button.

3



Select "Full" or "Basic" (refer to page 8) with the **F3** or **F4** button, and press the **SELECT** button.

A confirmation screen will appear.

#### Navigating through the screens

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button

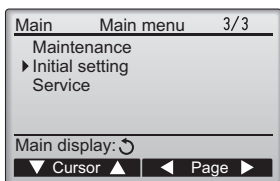


# Contrast



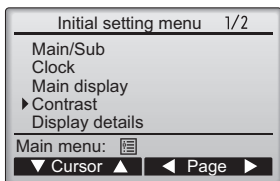
## Button operation

1



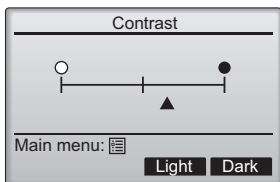
Select "Initial setting" from the Main menu (refer to page 20), and press the **SELECT** button.

2



Move the cursor to the "Contrast" with the **F1** or **F2** button, and press the **SELECT** button.

3



Adjust the contrast with the **F3** or **F4** button, and press the **MENU** or **RETURN** button.

### Navigating through the screens

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button

# Controller operation-Function settings

## Language selection

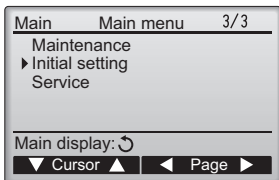


### Function description

The desired language can be set. The language options are English, French, German, Spanish, Italian, Portuguese, Swedish, and Russian.

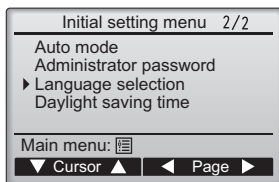
### Button operation

# 1



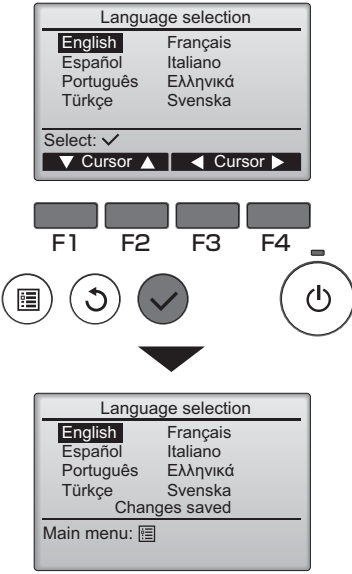
Select "Initial setting" from the Main menu (refer to page 20), and press the **SELECT** button.

# 2



Move the cursor to the "Language selection" with the **F1** or **F2** button, and press the **SELECT** button.

# 3



Move the cursor to the language you desire with the **F1** through **F4** buttons, and press the **SELECT** button to save the setting.

When the power is on for the first time, the Language selection screen will be displayed. Select a desired language. The system will not start-up without language selection.

A screen will appear that indicates the setting has been saved.

**Navigating through the screens**

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button

# Controller operation-Function settings

## Daylight saving time



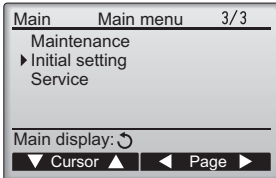
### Function description

The start/end time for daylight saving time can be set. The daylight saving time function will be activated based on the setting contents.

- If a given system has a system controller, disable this setting to keep the correct time.
- At the beginning and the end of daylight saving time, the timer may go into action twice or not at all.
- This function will not work unless the clock has been set.

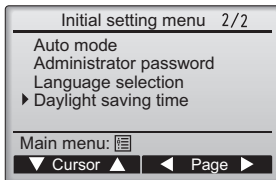
### Button operation

# 1



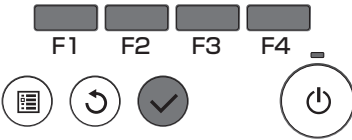
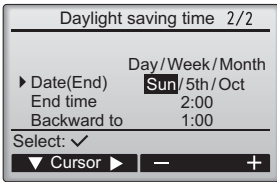
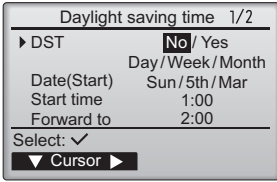
Select "Initial setting" from the Main menu (refer to page 20), and press the **SELECT** button.

# 2



Move the cursor to the "Daylight saving time" with the **F1** or **F2** button, and press the **SELECT** button.

# 3



Move the cursor to the following items with the **F1** button to make the settings.

- **DST**  
Select "No" (disable) or "Yes" (enable) with the **F2** button. The default setting is "No."
- **Date(Start)\*1**  
Set the day of the week, week number, and month with the **F3** or **F4** button. The default setting is "Sun/5th/Mar."
- **Start time**  
Set the start time for daylight saving time with the **F3** or **F4** button.
- **Forward to**  
Set the time when the clock is to be set forward to at the start time above with the **F3** or **F4** button.
- **Date(End)\*1 (2nd page)**  
Set the day of the week, week number, and month with the **F3** or **F4** button. The default setting is "Sun/5th/Oct."
- **End time (2nd page)**  
Set the end time for daylight saving time with the **F3** or **F4** button.
- **Backward to (2nd page)**  
Set the time when the clock is to be set backward to at the end time above with the **F3** or **F4** button.

\*1 If "5th" is selected for the week number and the 5th week does not exist in the selected month of the year, the setting is considered to be "4th."

Press the **SELECT** button to save the settings. A confirmation screen will appear.

### Navigating through the screens

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button

# Controller operation-Function settings

## Function setting (CITY MULTI)



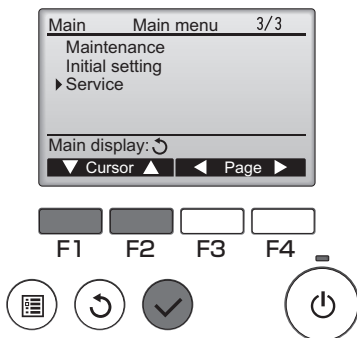
### Function description

Make the indoor units' function settings from the remote controller as necessary.

- The following settings should be made only for CITY MULTI units and as necessary.
- Refer to the Installation Manual for how to make the settings for Mr. Slim units.
- Refer to the indoor unit Installation Manual for information about the factory settings of indoor units, function setting numbers, and setting values.
- When changing the indoor units' function settings, record all the changes made to keep track of the settings.

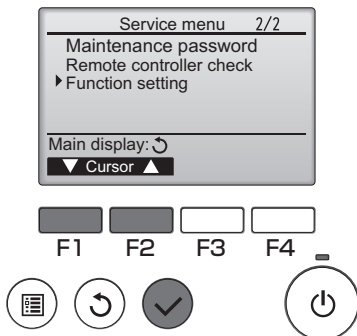
### Button operation

# 1



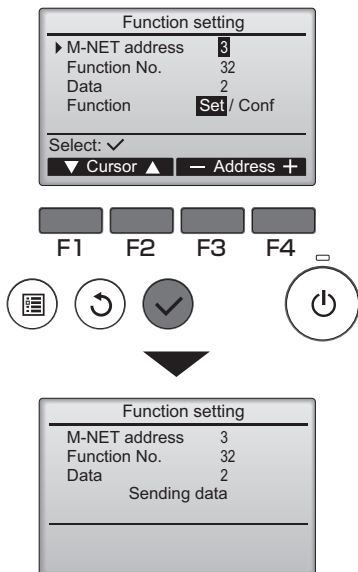
Select "Service" on the Main menu (see page 20), and press the **SELECT** button.

# 2



Select "Function setting" on the Service Menu screen, and press the **SELECT** button.

3

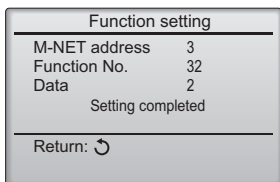


The Function setting screen will appear. Press the **F1** or **F2** button to move the cursor to one of the following: M-NET address, function setting number, or setting value. Then, press the **F3** or **F4** button to change the settings to the desired settings.

Once the settings have been completed, press the **SELECT** button. A screen will appear that indicates that the settings information is being sent.

To check the current settings of a given unit, enter the setting for its M-NET address and function setting number, select Conf for the Function, and press the **SELECT** button. A screen will appear that indicates that the settings are being searched for. When the search is done, the current settings will appear.

4



When the settings information has been sent, a screen will appear that indicates its completion.

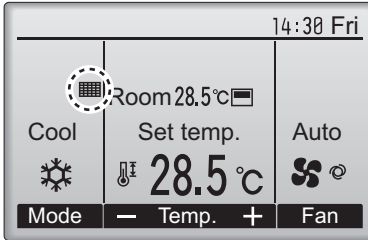
To make additional settings, press the **RETURN** button to return to the screen shown in Step 3 above. Set the function numbers for other indoor units by following the same steps.


Navigating through the screens

- To return to the Service Menu screen ..... **MENU** button
- To return to the previous screen ..... **RETURN** button

# Maintenance

## Filter information



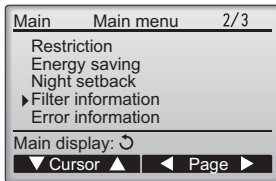
 will appear on the Main display in the Full mode when it is time to clean the filters.

**Wash, clean, or replace the filters when this sign appears.**

**Refer to the indoor unit Instructions Manual for details.**

### Button operation

1



Select "Filter information" from the Main menu (refer to page 20), and press the **SELECT** button.

2



Press the **F4** button to reset filter sign.

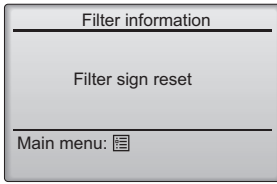
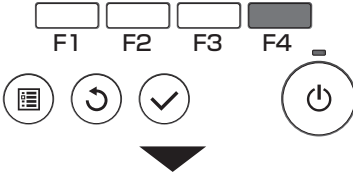
Refer to the indoor unit Instructions Manual for how to clean the filter.



3



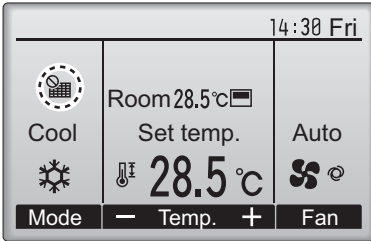
Select "OK" with the **F4** button.




A confirmation screen will appear.

Navigating through the screens

- To go back to the Main menu ..... **MENU** button
- To return to the previous screen ..... **RETURN** button




When the  is displayed on the Main display in the Full mode, the system is centrally controlled and the filter sign cannot be reset.

If two or more indoor units are connected, filter cleaning timing for each unit may be different, depending on the filter type.

The icon  will appear when the filter on the main unit is due for cleaning.

When the filter sign is reset, the cumulative operation time of all units will be reset.

The icon  is scheduled to appear after a certain duration of operation, based on the premise that the indoor units are installed in a space with ordinary air quality. Depending on the air quality, the filter may require more frequent cleaning.

The cumulative time at which filter needs cleaning depends on the model.

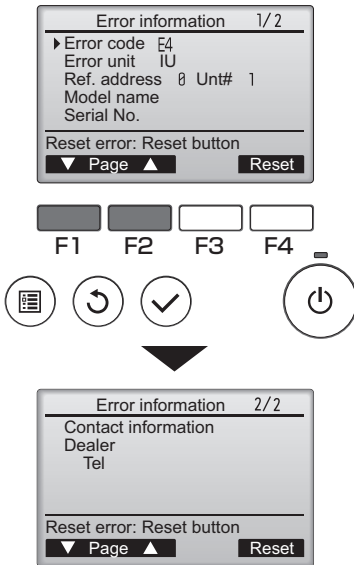
# Troubleshooting

## Error information

**When an error occurs, the following screen will appear.  
Check the error status, stop the operation, and consult your dealer.**

### Button operation

1

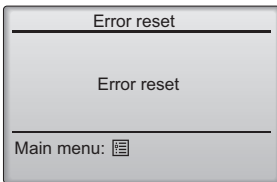
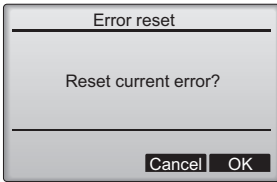
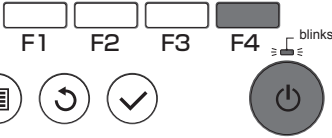
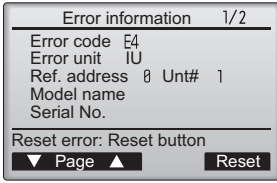


Error code, error unit, refrigerant address, unit model name, and serial number will appear. The model name and serial number will appear only if the information have been registered.

Press the **F1** or **F2** button to go to the next page.

Contact information (dealer's phone number) will appear if the information have been registered.

2



Press the **F4** button or the **ON/OFF** button to reset the error that is occurring.

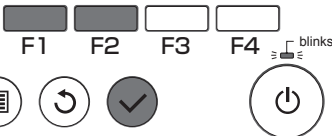
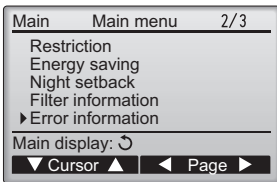
**Errors cannot be reset while the ON/OFF operation is prohibited.**

Select "OK" with the **F4** button.

Navigating through the screens

- To go back to the Main menu ..... **MENU** button

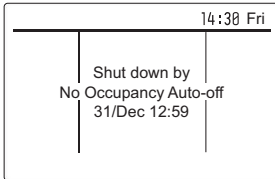
## Checking the error information



While no errors are occurring, page 2/2 of the error information (refer to page 58) can be viewed by selecting "Error information" from the Main menu (refer to page 20). Errors cannot be reset from this screen.

## No occupancy Auto-OFF

**The following screen will appear for the 3D i-See sensor panel model when the unit is stopped due to the No occupancy Auto-OFF function of the energy saving option. Refer to the indoor unit Instruction Book for the 3D i-See sensor setting.**



# Specifications

## Controller specifications

	Specification
Product size	120(W) x 120(H) x 19(D) mm (4 3/4 x 4 3/4 x 3/4 [in]) (not including the protruding part)
Net weight	0.25 kg (9/16 lb.)
Rated power supply voltage	12 VDC (supplied from indoor units)
Power consumption	0.3 W
Usage environment	Temperature 0 ~ 40°C (32 ~ 104°F) Humidity 30 ~ 90%RH (with no dew condensation)
Material	Panel: PMMA Main body: PC + ABS
Sound Pressure Level	The A-weighted sound pressure level is below 70 dB.

## Function list (as of February 1, 2017)

○ : Supported    × : Unsupported

	Function	CITY MULTI	Mr. Slim	Required password
Operation/ Display	Power ON/OFF	○	○	-
	Operation mode switch	○	○	-
	Room temperature setting	○	○	-
	Auto (dual set point) mode	○	○	-
	Fan speed setting	○	○	-
	Vane angle setting	○	○	-
	Louver setting	○	○	-
	Ventilation setting	○	○	-
	High power operation	×	○	-
	Auto descending panel	○	○	-
	Backlight	○	○	-
	Contrast setting	○	○	administrator
	Main display mode switch	○	○	administrator
	Clock setting	○	○	administrator
	Clock display format setting	○	○	administrator
	Language selection (8 languages)	○	○	administrator
	Daylight saving time	○	○	administrator
	Room temperature display	○	○	administrator
Error display	○	○	-	
Filter information	○	○	-	
Schedule/Timer	On/Off timer	○	○	administrator
	Auto-off timer	○	○	administrator
	Weekly timer	○	○	administrator
	Night setback	○	○	administrator
	OU silent mode	×	○	administrator
Energy saving	Auto return	○	○	administrator
	Schedule	×	○	administrator
Restriction	Operation lock	○	○	administrator
	Temperature range restriction	○	○	administrator
	Password (Administrator and Maintenance)	○	○	administrator maintenance
Others	Manual vane angle	○	○	-
	3D i-See sensor	○	○	-
	Test run	○	○	maintenance
	Model information input	○	○	maintenance
	Dealer information input	○	○	maintenance
	Function setting	○	○	maintenance
	Smooth maintenance	×	○	maintenance
	Refrigerant volume check	×	○	maintenance
	Refrigerant leak check	×	○	maintenance

\* The supported functions vary depending on the unit model.

List of functions that can/cannot be used in combination

	High power	On/Off timer	Auto-off timer	Weekly timer	OU silent mode	Temperature range	Operation lock	Auto return	Energy saving schedule	Night setback
High power		○	○	○	△1	○	△2	○	△1	○
On/Off timer	○		○	×1	○	○	○	○	○	△3
Auto-off timer	○	○		○	○	○	○	○	○	△4
Weekly timer	○	×1	○		○	○	○	○	○	△5
OU silent mode	△1	○	○	○		○	○	○	○	○
Temperature range	○	○	○	○	○		○	×2	○	△6
Operation lock	△2	○	○	○	○	○		○	○	○
Auto return	○	○	○	○	○	×2	○		○	△7
Energy saving schedule	△1	○	○	○	○	○	○	○		○
Night setback	○	△3	△4	△5	○	△6	○	△7	○	

○ : Can be used in combination    × : Cannot be used in combination    △ : Restricted

△1: This function is enabled after completing the high power operation because the high power operation has the higher priority.

△2: This function cannot be operated if some operation is locked.

△3: Night setback function cannot be used when the unit is in operation by On/Off timer setting.

△4: Auto-off function cannot be used for Night setback operation.

△5: Night setback function cannot be used when the unit is in operation by Weekly timer setting.

△6: Temperature range setting cannot be used for Night setback operation.

△7: Auto return function cannot be used for Night setback operation.

×1: Weekly timer setting is not effective because On/Off timer has the higher priority.

×2: Auto return function cannot be used because Temperature range setting has the higher priority.





# SPLIT-SYSTEM HEAT PUMP

## PKA-A·KA7

## PCA-A·KA7

### OPERATION MANUAL

FOR USER

For safe and correct use, please read this operation manual thoroughly before operating the air-conditioner unit.

### MANUEL D'UTILISATION

POUR L'UTILISATEUR

Pour une utilisation correcte sans risques, veuillez lire le manuel d'utilisation en entier avant de vous servir du climatiseur.

### MANUAL DE INSTRUCCIONES

PARA EL USUARIO

Lea este manual de instrucciones hasta el final antes de poner en marcha la unidad de aire acondicionado para garantizar un uso seguro y correcto.

English

Français

Español

# Contents

1. Safety Precautions .....	2	5. Care and Cleaning .....	11
2. Parts Names.....	2	6. Troubleshooting.....	13
3. Operation.....	7	7. Specifications .....	14
4. Emergency Operation for IR Wireless Remote controller ...	11		

## 1. Safety Precautions

- ▶ Before installing the unit, make sure you read all the "Safety Precautions".
- ▶ The "Safety Precautions" provide very important points regarding safety. Make sure you follow them.
- ▶ Please report to or take consent by the supply authority before connection to the system.

### Symbols used in the text

- ⚠ **Warning:**  
Describes precautions that should be observed to prevent danger of injury or death to the user.
- ⚠ **Caution:**  
Describes precautions that should be observed to prevent damage to the unit.

### Symbols used in the illustrations

⚡ : Indicates a part which must be grounded.

#### ⚠ Warning:

- For appliances not accessible to the general public.
- The unit must not be installed by the user. Ask the dealer or an authorized company to install the unit. If the unit is installed improperly, water leakage, electric shock or fire may result.
- Do not stand on, or place any items on the unit.
- Do not splash water over the unit and do not touch the unit with wet hands. An electric shock may result.
- Do not spray combustible gas close to the unit. Fire may result.
- Do not place a gas heater or any other open-flame appliance where it will be exposed to the air discharged from the unit. Incomplete combustion may result.
- Do not remove the front panel or the fan guard from the outdoor unit when it is running.
- When you notice exceptionally abnormal noise or vibration, stop operation, turn off the power switch, and contact your dealer.
- Never insert fingers, sticks etc. into the air intakes or outlets.
- If you detect odd smells, stop using the unit, turn off the power switch and consult your dealer. Otherwise, a breakdown, electric shock or fire may result.

- This air conditioner is NOT intended for use by children or infirm persons without supervision.
- Young children must be supervised to ensure that they do not play with the air conditioner.
- If the refrigeration gas blows out or leaks, stop the operation of the air conditioner, thoroughly ventilate the room, and contact your dealer.
- When installing or relocating, or servicing the air conditioner, use only the specified refrigerant (R410A) to charge the refrigerant lines. Do not mix it with any other refrigerant and do not allow air to remain in the lines.  
If air is mixed with the refrigerant, then it can be the cause of abnormal high pressure in the refrigerant line, and may result in an explosion and other hazards.  
The use of any refrigerant other than that specified for the system will cause mechanical failure or system malfunction or unit breakdown. In the worst case, this could lead to a serious impediment to securing product safety.

#### ⚠ Caution:

- Do not use any sharp object to push the buttons, as this may damage the remote controller.
- Never block or cover the indoor or outdoor unit's air intakes or outlets.

### Disposing of the unit

When you need to dispose of the unit, consult your dealer.

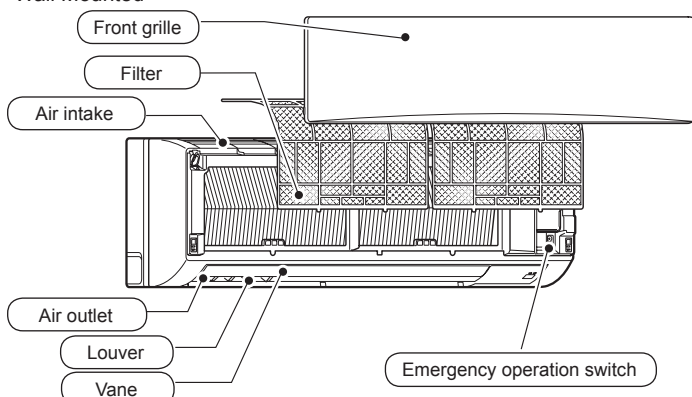
## 2. Parts Names

### ■ Indoor Unit

	PKA-A·KA7	PCA-A·KA7
Fan speed	3 speeds + Auto	4 speeds + Auto
Vane	Auto with swing	Auto with swing
Louver	Manual	Manual
Filter	Normal	Long-life
Filter cleaning indication	100 hr	2,500 hr

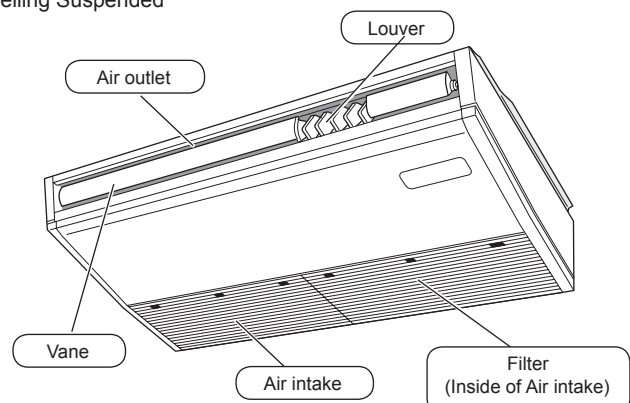
#### ■ PKA-A·KA7

Wall Mounted



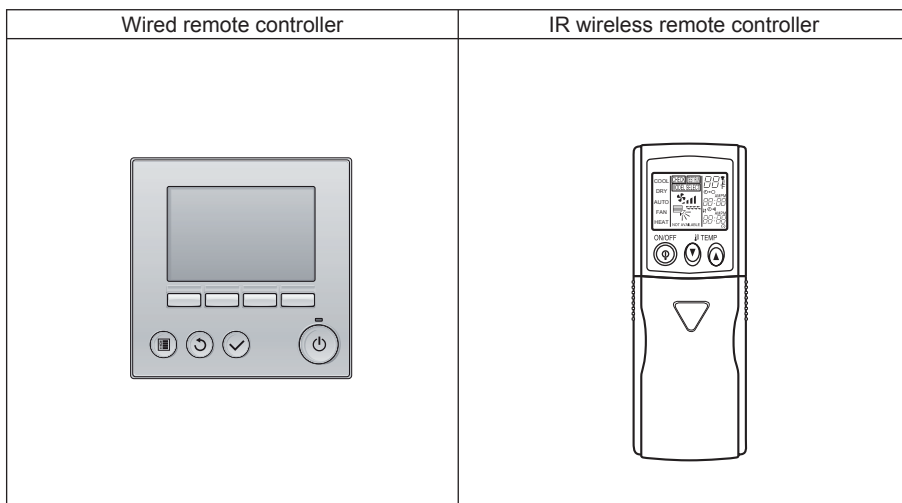
#### ■ PCA-A·KA7

Ceiling Suspended



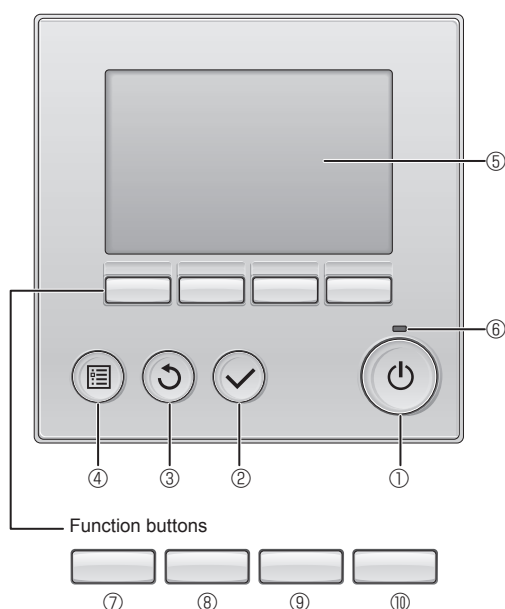
## 2. Parts Names

### ■ Remote controller (Optional parts)



### ■ Wired Remote Controller

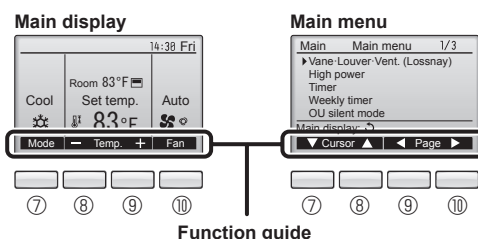
#### Controller interface



The functions of the function buttons change depending on the screen.

Refer to the button function guide that appears at the bottom of the LCD for the functions they serve on a given screen.

When the system is centrally controlled, the button function guide that corresponds to the locked button will not appear.



#### ① [ON/OFF] button

Press to turn ON/OFF the indoor unit.

#### ② [SELECT] button

Press to save the setting.

#### ③ [RETURN] button

Press to return to the previous screen.

#### ④ [MENU] button

Press to bring up the Main menu.

#### ⑤ Backlit LCD

Operation settings will appear.

When the backlight is off, pressing any button turns the backlight on and it will stay lit for a certain period of time depending on the screen.

When the backlight is off, pressing any button turns the backlight on and does not perform its function. (except for the [ON/OFF] button)

#### ⑥ ON/OFF lamp

This lamp lights up in green while the unit is in operation. It blinks while the remote controller is starting up or when there is an error.

#### ⑦ Function button [F1]

Main display: Press to change the operation mode.

Main menu: Press to move the cursor down.

#### ⑧ Function button [F2]

Main display: Press to decrease temperature.

Main menu: Press to move the cursor up.

#### ⑨ Function button [F3]

Main display: Press to increase temperature.

Main menu: Press to go to the previous page.

#### ⑩ Function button [F4]

Main display: Press to change the fan speed.

Main menu: Press to go to the next page.

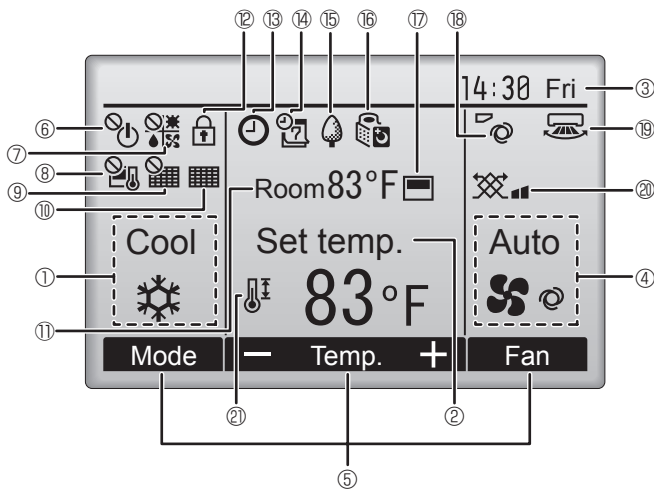
## 2. Parts Names

### Display

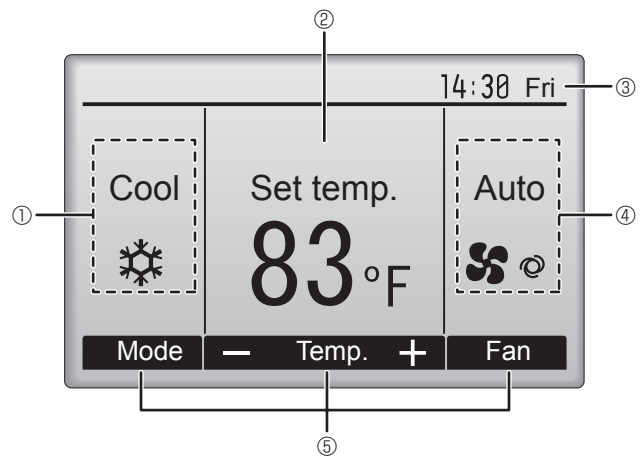
The main display can be displayed in two different modes: "Full" and "Basic". The factory setting is "Full". To switch to the "Basic" mode, change the setting on the Main display setting. (Refer to operation manual included with remote controller.)

<Full mode>

\* All icons are displayed for explanation.



<Basic mode>



#### ① Operation mode

Indoor unit operation mode appears here.

#### ② Preset temperature

Preset temperature appears here.

#### ③ Clock (See the Installation Manual.)

Current time appears here.

#### ④ Fan speed

Fan speed setting appears here.

#### ⑤ Button function guide

Functions of the corresponding buttons appear here.



Appears when the ON/OFF operation is centrally controlled.



Appears when the operation mode is centrally controlled.



Appears when the preset temperature is centrally controlled.



Appears when the filter reset function is centrally controlled.



Indicates when filter needs maintenance.

#### ⑪ Room temperature (See the Installation Manual.)

Current room temperature appears here.



Appears when the buttons are locked.



Appears when the On/Off timer, Night setback, or Auto-off timer function is enabled.



Appears when the timer is disabled by the centralized control system.



Appears when the Weekly timer is enabled.



Appears while the units are operated in the energy-save mode. (Will not appear on some models of indoor units)



Appears while the outdoor units are operated in the silent mode.



Appears when the built-in thermistor on the remote controller is activated to monitor the room temperature (⑪).



Appears when the thermistor on the indoor unit is activated to monitor the room temperature.



Indicates the vane setting.



Indicates the louver setting. (This indication is not available for this model.)



Indicates the ventilation setting.

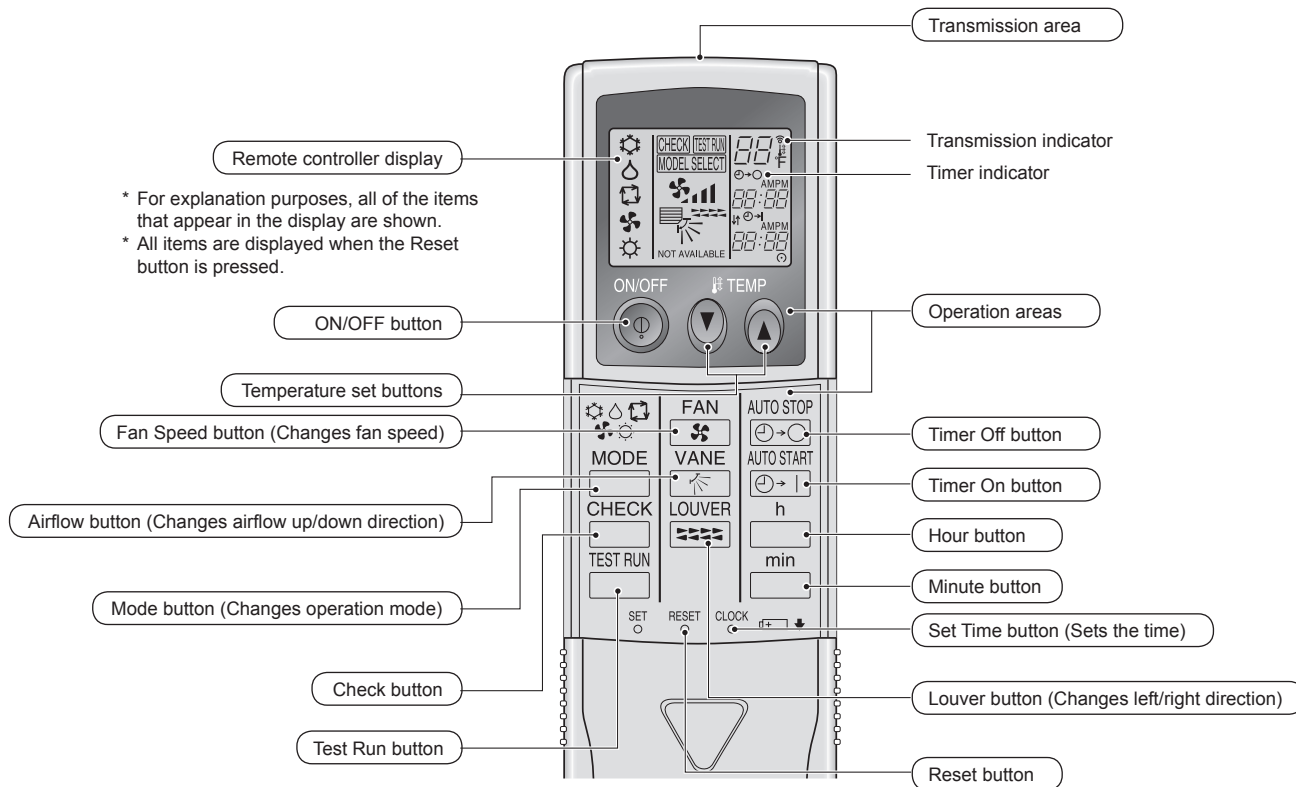


Appears when the preset temperature range is restricted.

Most settings (except ON/OFF, mode, fan speed, temperature) can be made from the Menu screen. (Refer to operation manual included with remote controller.)

## 2. Parts Names

### ■ IR Wireless Remote-Controller

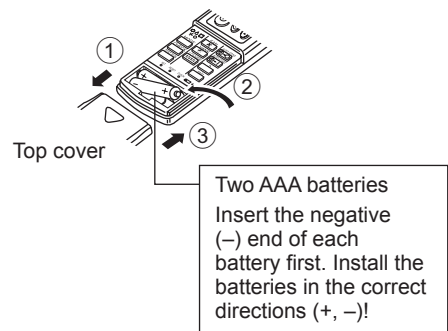


#### Note: (Only for IR wireless remote controller)

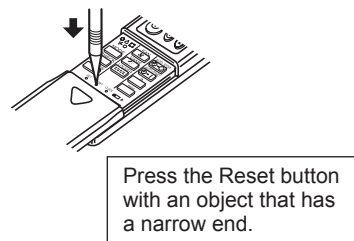
- When using the IR wireless remote controller, point it towards the receiver on the indoor unit.
- If the IR wireless remote controller is operated within approximately two minutes after power is supplied to the indoor unit, the indoor unit may beep twice as the unit is performing the initial automatic check.
- The indoor unit beeps to confirm that the signal transmitted from the IR wireless remote controller has been received. Signals can be received up to approximately 7 meters, 275 19/32 inch in a direct line from the indoor unit in an area 45° to the left and right of the unit. However, illumination such as fluorescent lights and strong light can affect the ability of the indoor unit to receive signals.
- If the operation lamp near the receiver on the indoor unit is flashing, the unit needs to be inspected. Consult your dealer for service.
- Handle the IR wireless remote controller carefully! Do not drop the IR wireless remote controller or subject it to strong shocks. In addition, do not get the IR wireless remote controller wet or leave it in a location with high humidity.
- To avoid misplacing the IR wireless remote controller, install the holder included with the IR wireless remote controller on a wall and be sure to always place the IR wireless remote controller in the holder after use.

#### Battery installation/replacement

1. Remove the top cover, insert two AAA batteries, and then install the top cover.

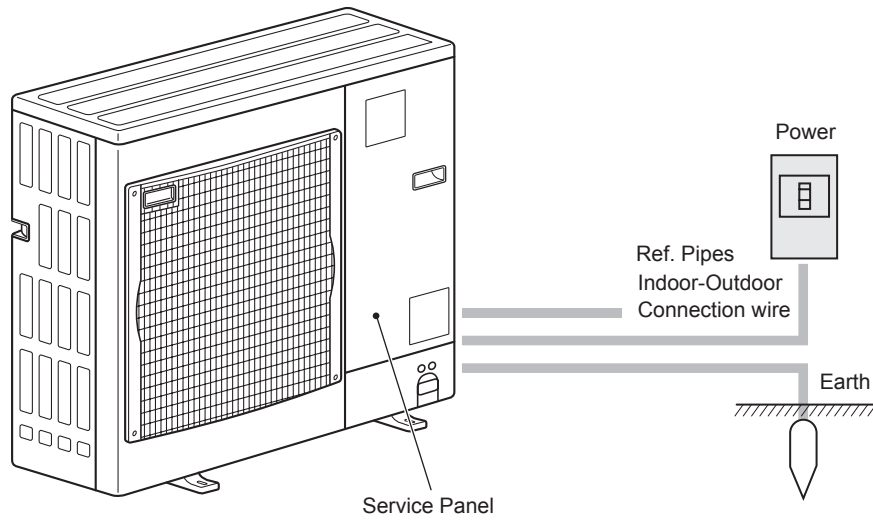


2. Press the Reset button.



## 2. Parts Names

### ■ Outdoor unit



### 3. Operation

■ About the operation method, refer to the operation manual that comes with each remote controller.

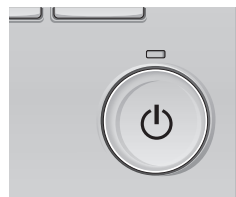
#### 3.1. Turning ON/OFF

##### [ON]



Press the [ON/OFF] button.  
The ON/OFF lamp will light up in green, and the operation will start.

##### [OFF]



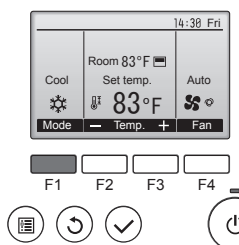
Press the [ON/OFF] button again.  
The ON/OFF lamp will come off, and the operation will stop.

**Note:**  
Even if you press the ON/OFF button immediately after shutting down the operation in progress, the air conditioner will not start for about 3 minutes. This is to prevent the internal components from being damaged.

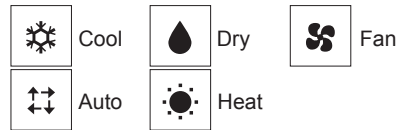
■ Settable preset temperature range

Operation mode	Preset temperature range
Cool/Dry	67 ~ 87 °F (19 ~ 30 °C)
Heat	63 ~ 83 °F (17 ~ 28 °C)
Auto	67 ~ 83 °F (19 ~ 28 °C)
Fan/Ventilation	Not settable

#### 3.2. Mode Selection



Press the [F1] button to go through the operation modes in the order of "Cool", "Dry", "Fan", "Auto", and "Heat". Select the desired operation mode.

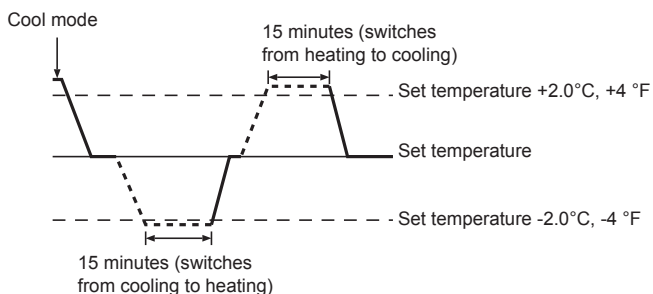


• Operation modes that are not available to the connected outdoor unit models will not appear on the display.

**What the blinking mode icon means**  
The mode icon will blink when other indoor units in the same refrigerant system (connected to the same outdoor unit) are already operated in a different mode. In this case, the rest of the unit in the same group can only be operated in the same mode.

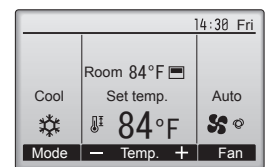
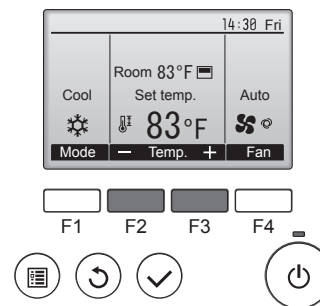
##### Automatic operation

- According to a set temperature, cooling operation starts if the room temperature is too hot and heating operation starts if the room temperature is too cold.
- During automatic operation, if the room temperature changes and remains 2.0 °C, 4 °F or more above the set temperature for 15 minutes, the air conditioner switches to cool mode. In the same way, if the room temperature remains 2.0 °C, 4 °F or more below the set temperature for 15 minutes, the air conditioner switches to heat mode.



- Because the room temperature is automatically adjusted in order to maintain a fixed effective temperature, cooling operation is performed a few degrees warmer and heating operation is performed a few degrees cooler than the set room temperature once the temperature is reached (automatic energy-saving operation).

#### 3.3. Temperature setting <Cool, Dry, Heat, and Auto>



Example display  
(Centigrade in 0.5-degree increments)

Press the [F2] button to decrease the preset temperature, and press the [F3] button to increase.

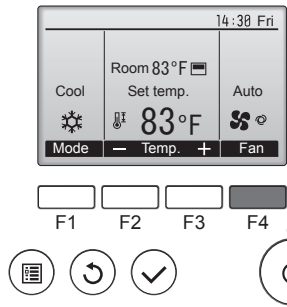
- Refer to the table on this page for the settable temperature range for different operation modes.
- Preset temperature range cannot be set for Fan/Ventilation operation.
- Preset temperature will be displayed either in Centigrade in 0.5- or 1-degree increments, or in Fahrenheit, depending on the indoor unit model and the display mode setting on the remote controller.

##### <For IR wireless remote controller>

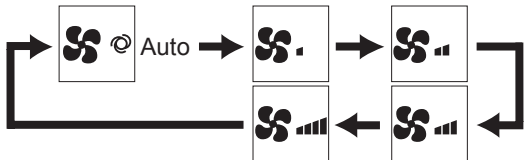
- ▶ **To decrease the room temperature:**  
Press button to set the desired temperature.  
The selected temperature is displayed.
- ▶ **To increase the room temperature:**  
Press button to set the desired temperature.  
The selected temperature is displayed.

### 3. Operation

#### 3.4. Fan speed setting



Press the [F4] button to go through the fan speeds in the following order.



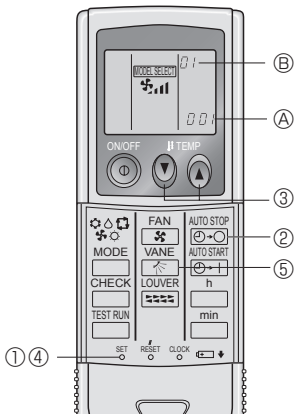
- The available fan speeds depend on the models of connected indoor units.

**Note:**

- The number of available fan speeds depends on the type of unit connected. Note also that some units do not provide an "Auto" setting.
- In the following cases, the actual fan speed generated by the unit will differ from the speed shown the remote controller display.
  - While the display is showing "STAND BY" or "DEFROST".
  - When the temperature of the heat exchanger is low in the heat mode. (e.g. immediately after heat operation starts)
  - In HEAT mode, when room temperature is higher than the temperature setting.
  - When the unit is in DRY mode.

- Automatic fan speed setting (For wireless remote controller)
  - It is necessary to set for wireless remote controller only when automatic fan speed is not set at default setting.
  - It is not necessary to set for wired remote controller with automatic fan speed at default setting.

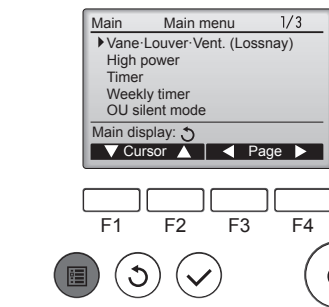
- Press the SET button with something sharp at the end. Operate when display of remote controller is off. MODEL SELECT blinks and Model No. is lighted (A).
- Press the AUTO STOP button. FAN blinks and setting No. is lighted (B). (Setting No.01: without automatic fan speed)
- Press the temp. (+/-) buttons to set the setting No.02. (Setting No.02:with automatic fan speed) If you mistook the operation, press the ON/OFF button and operate again from procedure (2).
- Press the SET button with something sharp at the end. MODEL SELECT and Model No. are lighted for 3 seconds, then turned off.



#### 3.5. Airflow up/down direction setting

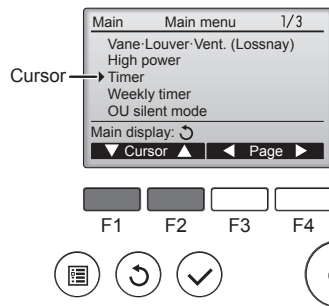
##### 3.5.1 Navigating through the Main menu

###### <Accessing the Main menu>



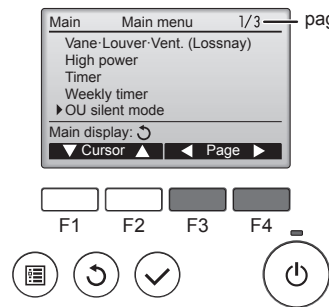
Press the [MENU] button. The Main menu will appear.

###### <Item selection>



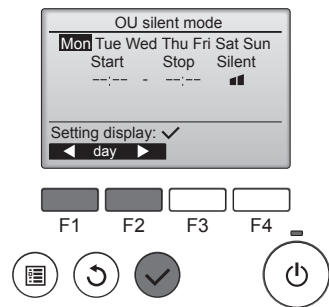
Press [F1] to move the cursor down. Press [F2] to move the cursor up.

###### <Navigating through the pages>



Press [F3] to go to the previous page. Press [F4] to go to the next page.

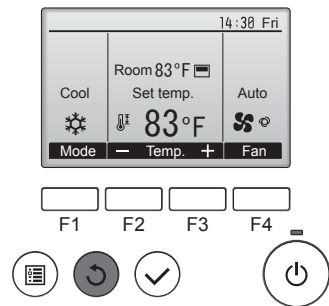
###### <Saving the settings>



Select the desired item, and press the [SELECT] button.

The screen to set the selected item will appear.

###### <Exiting the Main menu screen>



Press the [RETURN] button to exit the Main menu and return to the Main display.

If no buttons are touched for 10 minutes, the screen will automatically return to the Main display. Any settings that have not been saved will be lost.

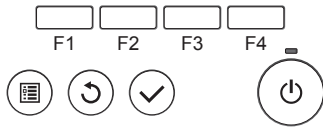


### 3. Operation

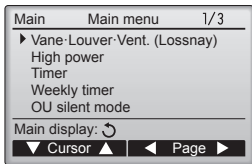
#### <Display of unsupported functions>



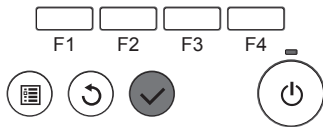
The message at left will appear if the user selects a function not supported by the corresponding indoor unit model.



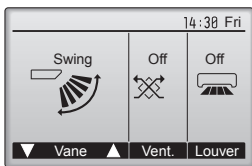
#### 3.5.2 Vane-Vent. (Lossnay) <Accessing the menu>



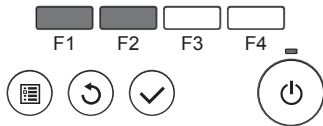
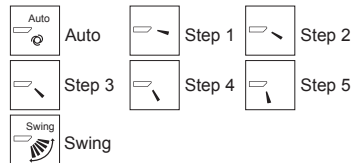
Select "Vane-Louver-Vent. (Lossnay)" from the Main menu (refer to page 8), and press the [SELECT] button.



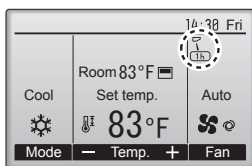
#### <Vane setting>



Press the [F1] or [F2] button to go through the vane setting options: "Auto", "Step 1", "Step 2", "Step 3", "Step 4", "Step 5" and "Swing". Select the desired setting.

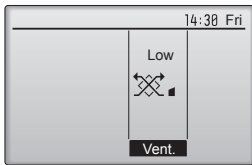


Select "Swing" to move the vanes up and down automatically. When set to "Step 1" through "Step 5", the vane will be fixed at the selected angle.

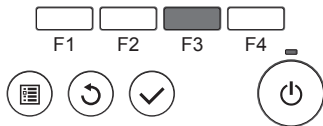


- **1h** under the vane setting icon  
This icon will appear when the vane is set to "Step 2" to "Step 5" and the fan operates at "Mid 1" to "Low" speed during cooling or dry operation (depends on the model).  
The icon will go off in an hour, and the vane setting will automatically change.

#### <Vent. setting>

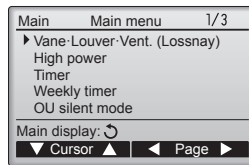


Press the [F3] button to go through the ventilation setting options in the order of "Off", "Low", and "High".  
\* Settable only when LOSSNAY unit is connected.

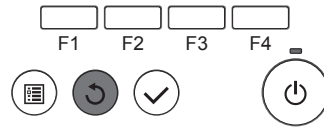


- The fan on some models of indoor units may be interlocked with certain models of ventilation units.

#### <Returning to the Main menu>



Press the [RETURN] button to go back to the Main menu.



#### <To Change the Airflow's Up/Down Direction> (for IR wireless remote controller)

- With the unit running, press the Airflow Up/Down button ⑤ as necessary.
  - Each press changes the direction. The current direction is shown at display.

#### Note:

- During swing operation, the directional indication on the screen does not change in sync with the directional vanes on the unit.
- Available directions depend on the type of unit connected.
- In the following cases, the actual air direction will differ from the direction indicated on the remote controller display.
  1. While the display is in "STAND BY" or "DEFROST" states.
  2. Immediately after starting heat mode (while the system is waiting for the mode change to take effect).
  3. In heat mode, when room temperature is higher than the temperature setting.

#### <[Manual] To Change the Airflow's Left/Right Direction>

- \* The louver button cannot be used.
  - Stop the unit operation, hold the lever of the louver, and adjust to the desired direction.
  - \* Do not set to the inside direction when the unit is in the cooling or drying mode because there is a risk of condensation and water dripping.

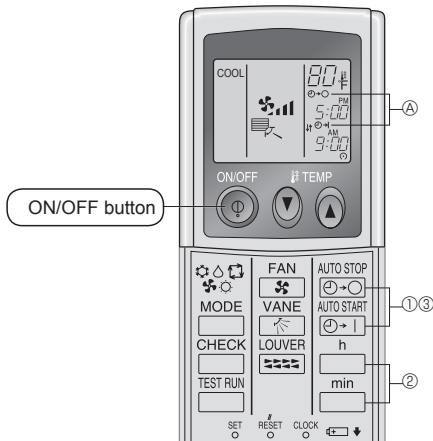


#### ⚠ Caution:

To prevent falls, maintain a stable footing when operating the unit.


### 3. Operation


#### 3.6. Timer



① Press the  or  button (TIMER SET).


- Time can be set while the following symbol is blinking.


OFF timer: A  is blinking.

ON timer: A  is blinking.

② Use the  and  buttons to set the desired time.

③ Cancelling the timer.

To cancel the OFF timer, press the  button.

To cancel the ON timer, press the  button.

- It is possible to combine both OFF and ON timers.
- Pressing the ON/OFF button of the remote controller during timer mode to stop the unit will cancel the timers.
- If the current time has not been set, the timer operation cannot be used.

#### 3.7. Ventilation

For LOSSNAY combination

- The following 2 patterns of operation is available.

- Run the ventilator together with indoor unit.
- Run the ventilator independently.

**Note:**

- With some model configurations, the fan on the indoor unit may come on even when you set the ventilator to run independently.

For IR wireless remote controller and RF thermostat

- Running the ventilator independently is not available.
- No indication on the remote controller.

## 4. Emergency Operation for IR Wireless Remote Controller

(For PKA-A-KA7)

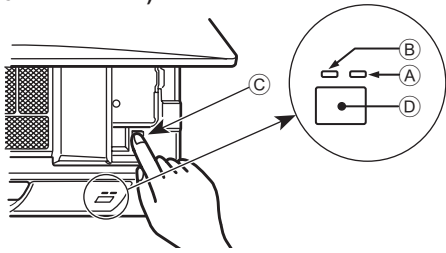


Fig. 4-1

(For PCA-A-KA7)

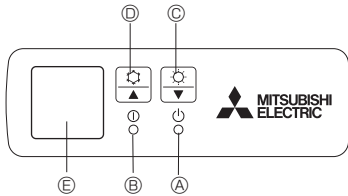


Fig. 4-2

### When the IR wireless remote controller cannot be used

When the batteries of the IR wireless remote controller run out or the IR wireless remote controller malfunctions, the emergency operation can be done using the emergency buttons.

[Fig. 4-1] A DEFROST/STAND BY lamp (Orange)

B Operation lamp (Green)

C Emergency operation switch (cooling/heating)

D Receiver

- Each press of the emergency operation switch will toggle the operation mode.
- Check "COOL/HEAT" with the operation monitor display. (The display will appear orange for 5 seconds after the switch operation.)

[Fig. 4-2] A DEFROST/STAND BY lamp

B Operation lamp

C Emergency operation switch (heating)

D Emergency operation switch (cooling)

E Receiver

Starting operation

- To operate the cooling mode, press the button D for more than 2 seconds.
- To operate the heating mode, press the button C for more than 2 seconds.

Stopping operation

- To stop operation, press the button D or the button C for more than 2 seconds.

[Heat pump type]



[Cooling Only type]



Operation Monitor Display

	GREEN	ORANGE	
STOP	○	○	The display will appear orange for 5 seconds following the switch operation as indicated at the left, and then it will return to the regular display.
COOL	●	○	
HEAT	●	●	

○ Turning off ● Lighting

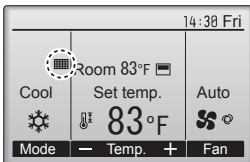
\* Operation details at the time of emergency operation are as shown below.

Note that over the first 30 minutes or so, the temperature adjustment will not function and the unit will be in continuous operation with the fan on high.

Operation Mode	COOL	HEAT
Set Temperature	24°C, 75°F	24°C, 75°F
Fan Speed	High	High
Airflow Direction Up and Down	Step 1	Step 5

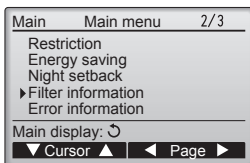
## 5. Care and Cleaning

### ■ Filter information

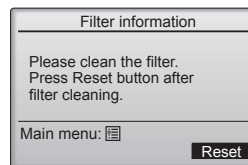


will appear on the Main display in the Full mode when it is time to clean the filters.

**Wash, clean, or replace the filters when this sign appears. Refer to the indoor unit Instructions Manual for details.**

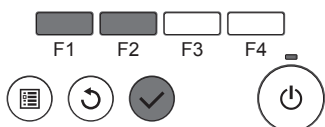
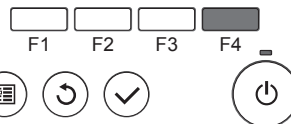


Select "Filter information" from the Main menu (refer to page 8), and press the [SELECT] button.

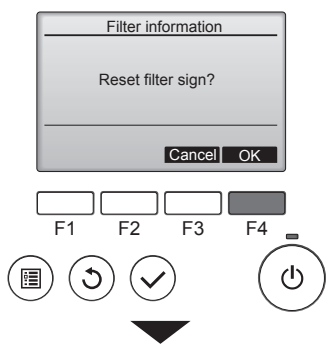


Press the [F4] button to reset filter sign.

Refer to the indoor unit Instructions Manual for how to clean the filter.



## 5. Care and Cleaning

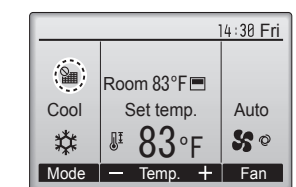



Select "OK" with the [F4] button.

A confirmation screen will appear.


**Navigating through the screens**

- To go back to the Main menu ..... [MENU] button
- To return to the previous screen ..... [RETURN] button




When the  is displayed on the Main display in the Full mode, the system is centrally controlled and the filter sign cannot be reset.

If two or more indoor units are connected, filter cleaning timing for each unit may be different, depending on the filter type.

The icon  will appear when the filter on the main unit is due for cleaning.

When the filter sign is reset, the cumulative operation time of all units will be reset.

The icon  is scheduled to appear after a certain duration of operation, based on the premise that the indoor units are installed in a space with ordinary air quality. Depending on the air quality, the filter may require more frequent cleaning.

The cumulative time at which filter needs cleaning depends on the model.

- This indication is not available for wireless remote controller.

### ► Cleaning the filters

- Clean the filters using a vacuum cleaner. If you do not have a vacuum cleaner, tap the filters against a solid object to knock off dirt and dust.
- If the filters are especially dirty, wash them in lukewarm water. Take care to rinse off any detergent thoroughly and allow the filters to dry completely before putting them back into the unit.

#### ⚠ Caution:

- Do not dry the filters in direct sunlight or by using a heat source, such as an electric heater: this may warp them.
- Do not wash the filters in hot water (above 50°C, 122°F), as this may warp them.
- Make sure that the air filters are always installed. Operating the unit without air filters can cause malfunction.

#### ⚠ Caution:

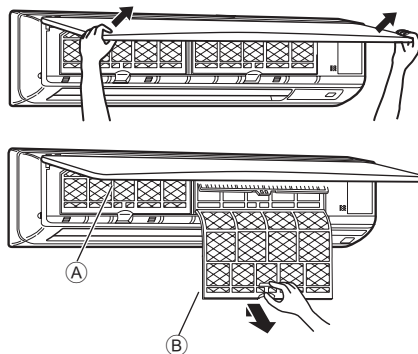
- Before you start cleaning, stop operation and turn OFF the power supply.
- Indoor units are equipped with filters to remove the dust of sucked-in air. Clean the filters using the methods shown in the following sketches.

### ► Filter removal

#### ⚠ Caution:

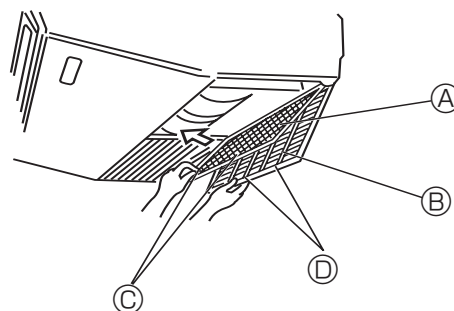
- In removing the filter, precautions must be taken to protect your eyes from dust. Also, if you have to climb up on a stool to do the job, be careful not to fall.
- When the filter is removed, do not touch the metallic parts inside the indoor unit, otherwise injury may result.

#### ■ PKA-A-KA7









- Using both hands, pull both the bottom corners of the intake grille to open the grille, then lift the filter until it clicks at the stop position.
  - Hold the knobs on the filter and pull the filter up, then pull it out downward.  
(Located in two places, on the left and right.)
- Ⓐ Front grille  
Ⓑ Filter

#### ■ PCA-A-KA7



- Open the intake grille.
  - Hold the knob on the filter then pull the filter up in the direction of an arrow. To replace the filter after cleaning, be sure to insert the filter far enough until it fits into the stopper.
- Ⓐ Filter    Ⓑ Intake Grille    Ⓒ Knob    Ⓓ Stopper

## 6. Troubleshooting

Having trouble?	Here is the solution. (Unit is operating normally.)
Air conditioner does not heat or cool well.	<ul style="list-style-type: none"> <li>■ Clean the filter. (Airflow is reduced when the filter is dirty or clogged.)</li> <li>■ Check the temperature adjustment and adjust the set temperature.</li> <li>■ Make sure that there is plenty of space around the outdoor unit. Is the indoor unit air intake or outlet blocked?</li> <li>■ Has a door or window been left open?</li> </ul>
When heating operation starts, warm air does not blow from the indoor unit soon.	<ul style="list-style-type: none"> <li>■ Warm air does not blow until the indoor unit has sufficiently warmed up.</li> </ul>
During heating mode, the air conditioner stops before the set room temperature is reached.	<ul style="list-style-type: none"> <li>■ When the outdoor temperature is low and the humidity is high, frost may form on the outdoor unit. If this occurs, the outdoor unit performs a defrosting operation. Normal operation should begin after approximately 10 minutes.</li> </ul>
Airflow up/down direction changes during operation or airflow up/down direction cannot be set.	<ul style="list-style-type: none"> <li>■ During cooling mode, the vanes automatically move to the horizontal (down) position after 1 hour when the down (horizontal) airflow up/down direction is selected. This is to prevent water from forming and dripping from the vanes.</li> <li>■ During heating mode, the vanes automatically move to the horizontal airflow up/down direction when the airflow temperature is low or during defrosting mode.</li> </ul>
When the airflow up/down direction is changed, the vanes always move up and down past the set position before finally stopping at the position.	<ul style="list-style-type: none"> <li>■ When the airflow up/down direction is changed, the vanes move to the set position after detecting the base position.</li> </ul>
A flowing water sound or occasional hissing sound is heard.	<ul style="list-style-type: none"> <li>■ These sounds can be heard when refrigerant is flowing in the air conditioner or when the refrigerant flow is changing.</li> </ul>
A cracking or creaking sound is heard.	<ul style="list-style-type: none"> <li>■ These sounds can be heard when parts rub against each due to expansion and contraction from temperature changes.</li> </ul>
The room has an unpleasant odor.	<ul style="list-style-type: none"> <li>■ The indoor unit draws in air that contains gases produced from the walls, carpeting, and furniture as well as odors trapped in clothing, and then blows this air back into the room.</li> </ul>
A white mist or vapor is emitted from the indoor unit.	<ul style="list-style-type: none"> <li>■ If the indoor temperature and the humidity are high, this condition may occur when operation starts.</li> <li>■ During defrosting mode, cool airflow may blow down and appear like a mist.</li> </ul>
Water or vapor is emitted from the outdoor unit.	<ul style="list-style-type: none"> <li>■ During cooling mode, water may form and drip from the cool pipes and joints.</li> <li>■ During heating mode, water may form and drip from the heat exchanger.</li> <li>■ During defrosting mode, water on the heat exchanger evaporates and water vapor may be emitted.</li> </ul>
“  ” appears in the wired remote controller display. (*1)	<ul style="list-style-type: none"> <li>■ During central control, “” appears in the wired remote controller display and air conditioner operation cannot be started or stopped using the wired remote controller.</li> </ul>
When restarting the air conditioner soon after stopping it, it does not operate even though the ON/OFF button is pressed.	<ul style="list-style-type: none"> <li>■ Wait approximately 3 minutes. (Operation has stopped to protect the air conditioner.)</li> </ul>
Air conditioner operates without the ON/OFF button being pressed. (*1)	<ul style="list-style-type: none"> <li>■ Is the on timer set? Press the ON/OFF button to stop operation.</li> <li>■ Is the air conditioner connected to a central wired remote controller? Consult the concerned people who control the air conditioner.</li> <li>■ Does “” appear in the wired remote controller display? Consult the concerned people who control the air conditioner.</li> <li>■ Has the auto recovery feature from power failures been set? Press the ON/OFF button to stop operation.</li> </ul>
Air conditioner stops without the ON/OFF button being pressed. (*1)	<ul style="list-style-type: none"> <li>■ Is the off timer set? Press the ON/OFF button to restart operation.</li> <li>■ Is the air conditioner connected to a central wired remote controller? Consult the concerned people who control the air conditioner.</li> <li>■ Does “” appear in the wired remote controller display? Consult the concerned people who control the air conditioner.</li> </ul>
Wired remote controller timer operation cannot be set. (*1)	<ul style="list-style-type: none"> <li>■ Are timer settings invalid? If the timer can be set,  or  appears in the wired remote controller display.</li> </ul>
“PLEASE WAIT” appears in the wired remote controller display. (*1)	<ul style="list-style-type: none"> <li>■ The initial settings are being performed. Wait approximately 3 minutes.</li> </ul>
An error code appears in the remote controller display.	<ul style="list-style-type: none"> <li>■ The protection devices have operated to protect the air conditioner.</li> <li>■ Do not attempt to repair this equipment by yourself. Turn off the power switch immediately and consult your dealer. Be sure to provide the dealer with the model name and information that appeared in the remote controller display.</li> </ul>

## 6. Troubleshooting

Having trouble?	Here is the solution. (Unit is operating normally.)												
Draining water or motor rotation sound is heard.	<ul style="list-style-type: none"> <li>When cooling operation stops, the drain pump operates and then stops. Wait approximately 3 minutes.</li> </ul>												
When dry mode starts, the set temperature changes.	<ul style="list-style-type: none"> <li>When Dry mode starts, the set temperature automatically changes to the optimum initial set temperature.</li> </ul>												
Noise is louder than specifications.	<ul style="list-style-type: none"> <li>The indoor operation sound level is affected by the acoustics of the particular room as shown in the following table and will be higher than the noise specification, which was measured in an echo-free room.</li> </ul> <table border="1"> <thead> <tr> <th></th> <th>High sound-absorbing rooms</th> <th>Normal rooms</th> <th>Low sound-absorbing rooms</th> </tr> </thead> <tbody> <tr> <td>Location examples</td> <td>Broadcasting studio, music room, etc.</td> <td>Reception room, hotel lobby, etc.</td> <td>Office, hotel room</td> </tr> <tr> <td>Noise levels</td> <td>3 to 7 dB</td> <td>6 to 10 dB</td> <td>9 to 13 dB</td> </tr> </tbody> </table>		High sound-absorbing rooms	Normal rooms	Low sound-absorbing rooms	Location examples	Broadcasting studio, music room, etc.	Reception room, hotel lobby, etc.	Office, hotel room	Noise levels	3 to 7 dB	6 to 10 dB	9 to 13 dB
	High sound-absorbing rooms	Normal rooms	Low sound-absorbing rooms										
Location examples	Broadcasting studio, music room, etc.	Reception room, hotel lobby, etc.	Office, hotel room										
Noise levels	3 to 7 dB	6 to 10 dB	9 to 13 dB										
Nothing appears in the IR wireless remote controller display, the display is faint, or signals are not received by the indoor unit unless the IR wireless remote controller is close. (*2)	<ul style="list-style-type: none"> <li>The batteries are low. Replace the batteries and press the Reset button.</li> <li>If nothing appears even after the batteries are replaced, make sure that the batteries are installed in the correct directions (+, -).</li> </ul>												
The operation lamp near the receiver for the IR wireless remote controller on the indoor unit is blinking. (*2)	<ul style="list-style-type: none"> <li>The self diagnosis function has operated to protect the air conditioner.</li> <li>Do not attempt to repair this equipment by yourself. Turn off the power switch immediately and consult your dealer. Be sure to provide the dealer with the model name.</li> </ul>												

\*1: Only for wired remote controller.

\*2: Only for IR wireless remote controller.

## 7. Specifications

Model	PKA-A24KA7	PKA-A30KA7	PKA-A36KA7
Power source (Phase, voltage <V>, Frequency <Hz>)	Single, 208/230, 60		
Rated Input (Indoor only) <kW>	0.05	0.05	0.08
Rated Current (Indoor only) <A>	0.36	0.36	0.57
Heater <kW>	-	-	-
Dimension (Height) <inch>	14-3/8		
Dimension (Width) <inch>	46-1/16		
Dimension (Depth) <inch>	11-5/8		
Airflow (Low-Middle-High) <CFM>	635-705-775		705-810-920
Noise level (Low-Middle-High) <dB>	39-42-45		41-45-49
Net weight <lbs>	46		

Model	PCA-A24KA7	PCA-A30KA7	PCA-A36KA7	PCA-A42KA7	
Power source (Phase, Voltage <V>, Frequency <Hz>)	Single, 208/230, 60				
Fan motor <FLA>	0.54		0.97		
MCA <A>	1		2		
MOCP <A>	15				
Dimension (Height) <inch>	9-1/16				
Dimension (Width) <inch>	50-3/8		63		
Dimension (Depth) <inch>	26-3/4				
Airflow (Low-Middle2-Middle1-High)	DRY <CFM>	530-565-600-670	565-600-635-705	775-850-920-990	810-885-955-1025
	WET <CFM>	495-530-565-635	530-565-600-670	705-775-850-920	740-810-885-955
Noise level (Low-Middle2-Middle1-High) <dB>	33-35-37-40	35-37-39-41	37-39-41-43	39-41-43-45	
Net weight <lbs>	71		79		86

**OPERATION & MAINTENANCE INSTRUCTIONS**

**Contractor: Eastern Mechanical Services**

**Job: Blackrock Church 2<sup>nd</sup> Floor**

**Product: Titus VAV Terminals**

**T.F. Melia Associates, Inc  
9 Progress Drive  
Cromwell, CT 06416**

# IOM

## SINGLE DUCT TERMINAL

### IMPORTANT!

### READ BEFORE PROCEEDING!

## GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During installation, operation maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: refrigerants, UV, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

### Safety Symbols

The following symbols are used in this document to alert the reader to areas of potential hazard:



**danger**  
indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



**caution**  
identifies a hazard which could lead to damage to the machine, damage to other equipment and or environmental pollution. Usually an instruction will be given, together with a brief explanation.



**warning**  
indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



**note**  
is used to highlight additional information which may be helpful to you.





## CHANGEABILITY OF THIS DOCUMENT

In complying with Titus' policy for continuous product improvement, the information contained in this document is subject to change without notice. Titus makes no commitment to update or provide current information automatically to the manual owner. Updated manuals, if applicable, can be obtained by contacting the nearest Titus office or accessing the Titus website.

Operating/service personnel maintain responsibility for the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, the technician should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the unit.

### CHANGE BARS

Revisions made to this document are indicated with a line along the left or right hand column in the area the revision was made. These revisions are to technical information and any other changes in spelling, grammar or formatting are not included.

# IOM SINGLE DUCT TERMINAL

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## Section 1

### Receiving Inspection

After unpacking the terminal, check it for shipping damage. If any shipping damage is found, report it immediately to the delivering carrier. Store units in a clean, dry location prior to installation.

Also, inspect damper rotation of the unit by rotating the damper by hand to check for free movement, and ensure there is no damage or binding of the damper. If controls are connected to the damper, release the manual clutch (most controls are equipped with this) and rotate the damper by hand. If there is any restriction to the rotation of the damper, contact your Titus rep and inform them of this issue.



Do not use the flow sensor, connecting tubing, or damper shaft linkage as a handle to lift or move assembly. Damage to the flow sensor or controls may result.

### Supporting the Assembly

Assembly Many basic single duct terminals are light enough to be supported by the duct work itself. Where heavier accessory modules, such as DDC controls, coils, attenuators, or multiple outlets are included, the terminal should be supported directly. Straps screwed directly into the side of the terminal, threaded rod through the optional hanger brackets (see Figure 1), or the method prescribed for the rectangular duct on the job specifications may be used.

Important: If equipped with pneumatic controls, the terminal must be mounted right side up. It must be level within  $\pm$  or  $-10$  degrees of horizontal, both parallel to the air flow and at the right angle of air flow. The control side of the terminal is labeled with an arrow indicating UP. The first letter of the model number (P) indicates pneumatic controls. Most electronic units (A-analog controls and D-digital controls) can be installed in any orientation. Check with the local TITUS representative for verification.

### Duct Connections

Slip each inlet duct over the inlet collar of the terminal. Fasten and seal the connection by the method prescribed by the job specification.

The diameter of the inlet duct "D" in inches must be equal to the listed size of the terminal; e.g. a duct that actually measures 8 inches must be fitted to a size 8 terminal. The inlet collar of the terminal is made 1/8 inch smaller than listed size in order to fit inside the duct (see Figure 1).



Do not insert duct work inside the inlet collar of the assembly. Inlet duct should be installed in accordance with SMACNA guidelines.

The outlet end of the terminal is designed for use with slip and drive duct connections. A rectangular duct the size of the terminal outlet should be attached.

Inspect the Aerocross inlet flow sensor for shipping damage, and ensure that the high (green) and low (red) tubes are attached. Provide at least 1 1/2 times the inlet duct diameter of straight duct for optimum control accuracy. For more information on our Aerocross, see the Aerocross Flow Sensor Application Guide.

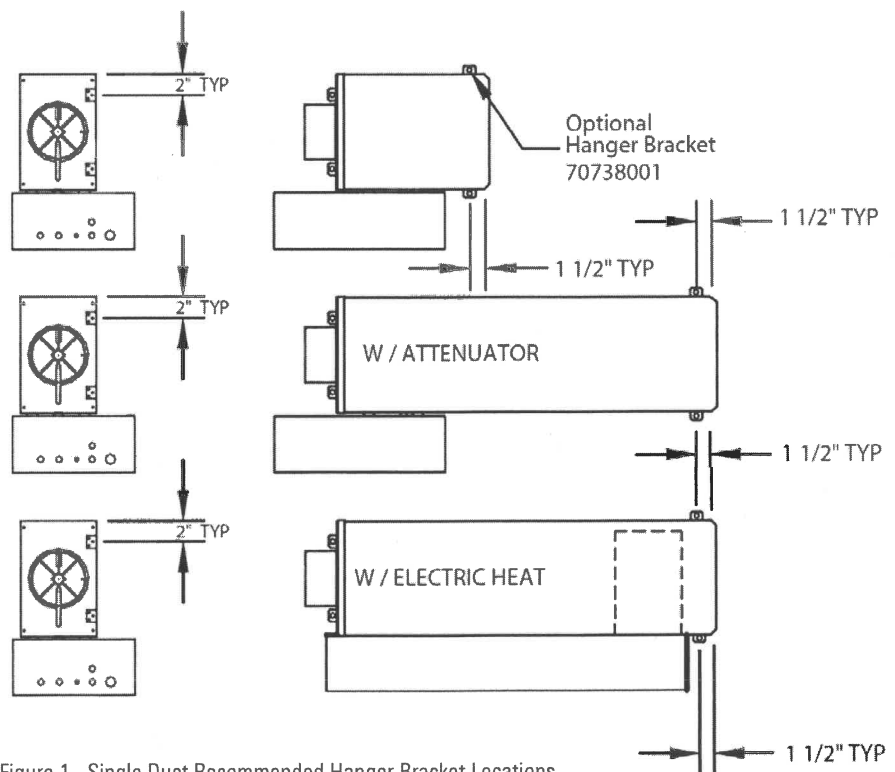


Figure 1 - Single Duct Recommended Hanger Bracket Locations

# IOM

## SINGLE DUCT TERMINAL

### Section 1 - General Information

#### Field Wiring

All field wiring must comply with the local codes and with the National Electrical Code (ANSI/NFPA 70-1981). Electrical, control and piping diagrams are shown on the exterior labeling or on the diagram on the inside of control enclosure cover. All electric heaters if provided by TITUS are balanced by kW per stage. The installing electrician should rotate these heater stages by phase in order to help balance the building electric load.

#### Control Start-up, Operation

Detailed information regarding power, accessory and communications connections, start-up and operating procedures for the controls provided by TITUS are available from your local TITUS representative. For specific information on controls by other manufacturers, contact that manufacturer's local branch or dealer.

**Important:** Units with digital controllers may incorporate specific communication addresses based on Building Management Systems Architecture, and original engineering drawings. Installing the terminal in a different location than noted on unit label may result in excessive start-up labor.

#### Calibration Instructions

For Pneumatic Controls, see PNEU-IOM:  
Operations Manual for Pneumatic Controls.

For Analog Controls: Titus TA1, see ANA-IOM:  
Analog Controller Calibration.

For Digital Controls:  
see control manufacturer's manual Replacement

Description	Part Number
<b>Primary Damper Assembly</b>	
Size 4-5-6"	31171301
Size 7"	31171302
Size 8"	31171303
Size 9"	31171304
Size 10"	31171305
Size 12"	31171306
Size 14"	31171307
Size 16"	31171308

#### Damper Shaft Extension

Short Stub all sizes	70300301
Long Ext. Sz. 4-6, 14, 16	70300302
Long Ext. Sz. 7-12	70300303
Shaft Bearing - All	70324901

#### Control Tube

Red Stripe 1/4" O.D.	61510035
Green Stripe 1/4" O.D.	61510234
Red Stripe 3/8" O.D.	61510279
Green Stripe 3/8" O.D.	61510280
Yellow Stripe 1/4" O.D.	61510260
White Stripe 1/4" O.D.	61510261
Blue Stripe 1/4" O.D.	61510262

#### Tees for sensor taps

Plastic 1/4"	42150011
Plastic 3/8"	42150020

#### Plugs for tees

1/4"	42160081
3/8"	10015601

#### AeroCross™ Multipoint Velocity Sensors

Size 4"	3151520001
Size 5"	3151520001
Size 6"	3151520002
Size 7"	3151520003
Size 8"	3151520004
Size 9"	3151520005
Size 10"	3151520006
Size 12"	3151520007
Size 14"	3151520008
Size 16"	3151520009
Size 24" x 16"	3151520009

Table 1 - Replacement Parts

# **OPERATION & MAINTENANCE MANUAL**

## Black Rock Congregational Church

MATERIALS INSTALLED BY

**EASTERN MECHANICAL SERVICES INC**

3 STARR ST

DANBURY, CT 06810-6927

P: (203) 792-7668

OPERATIONS & MAINTENANCE MANUAL CREATED BY

***Win*supply<sup>®</sup>**  
**OF SHELTON**

*HEATING • A/C • PLUMBING • DESIGN • KITCHEN • BATH*

## Section

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## W1 AND W1H

MATERIAL PROVIDED BY



# INSTALLATION INSTRUCTIONS



## AFWALL® MILLENNIUM™ FLUSHOMETER WALL-MOUNTED TOILETS

Models 3351.101, 3352.101, 3353.101, 3354.101, 2257.101, 2257.101.NAF, 2633.101, 2634.101

Meets the American Disabilities Act Guidelines and ANSI A117.1 Requirements for the Physically Challenged

Thank you for selecting American Standard – the benchmark of fine quality for over 100 years. To ensure this product is installed properly, please read these instructions carefully before you begin. (Certain installations may require professional help.) Also be sure your installation conforms to local codes.

**▲ CAUTION: PRODUCT IS FRAGILE. TWO PEOPLE ARE RECOMMENDED FOR HANDLING TO AVOID BREAKAGE AND POSSIBLE INJURY!**

NOTE: For proper operation product requires a minimum of 30 psi working line pressure

### RECOMMENDED TOOLS AND MATERIALS

Closet Carrier Support  
Putty Knife

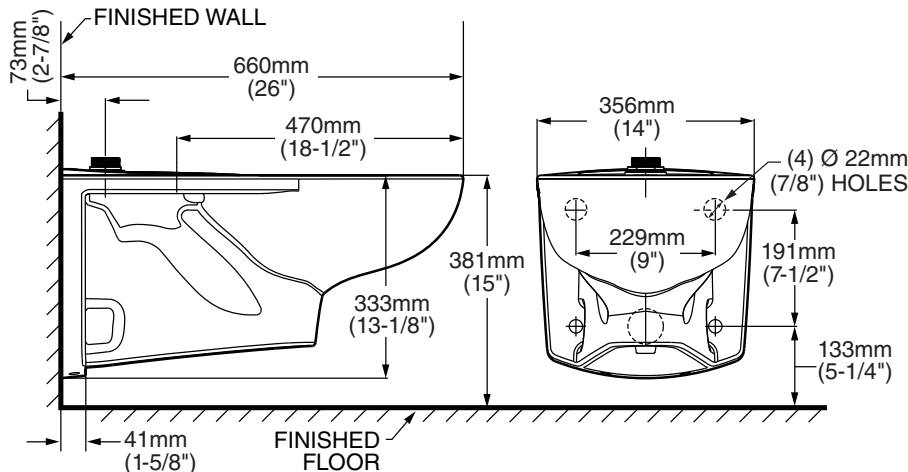
Regular Screwdriver  
Adjustable Wrench

Sealant  
Tape Measure

Carpenters Level  
Flush Valve

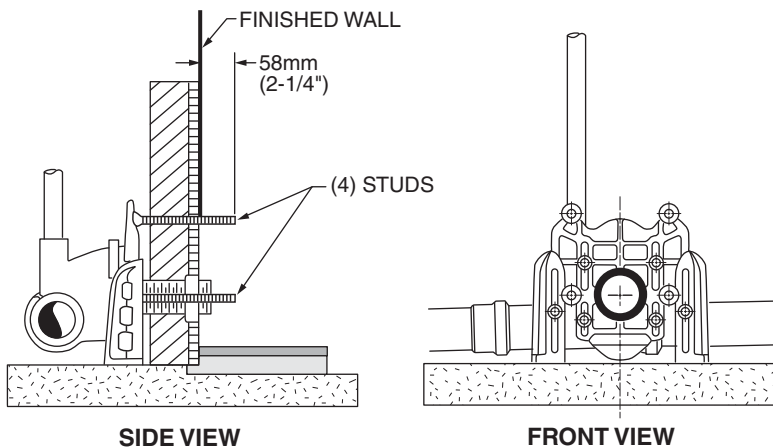
SAVE FOR FUTURE USE

#### 1 Pictures may not exactly define contour of china



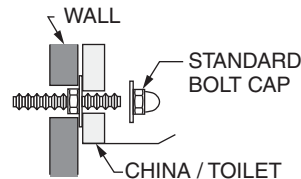
#### 2 FIXTURE MOUNTING

Fixture studs should project 58mm (2-1/4") from face of finished wall.

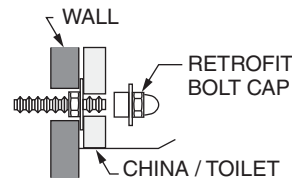


**NOTE:** If carrier bolt does not extend or is flush with china, use retrofit caps 7381285-200.0070A (sold separately).

##### STANDARD BOLT CAP



##### RETROFIT BOLT CAP



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© AS America, Inc. 2014

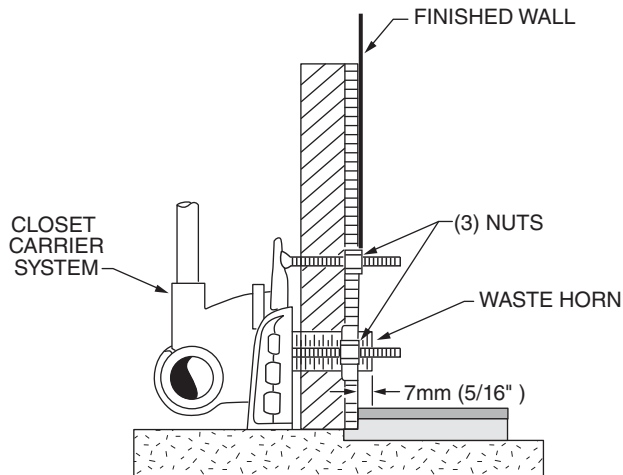
7301962-100 Rev. E

7301962-100B



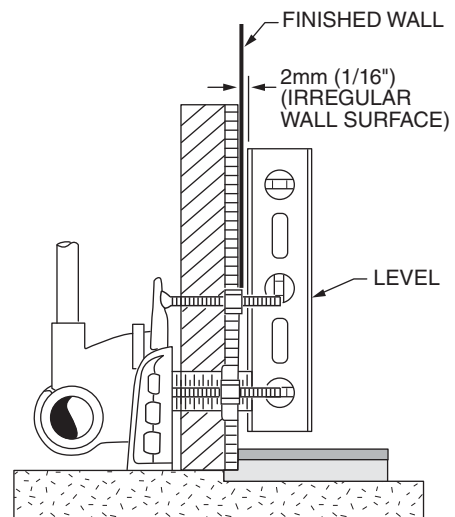
3

- Place back-up nuts on both bottom bolts, and the top left-hand bolt only.
- Adjust the two lower back-up nuts so that front face of nuts and washers are positioned to allow a minimum 1/16" (2mm) gap between fixture and wall surface.
- Adjust waste horn to project 7mm (5/16") from finished wall.



4

- Using a level, adjust the top left back-up nut so that it is in the same vertical plane as the lower left back-up nut.



5

- NOTE: Bearing nuts and washers must be set to take full loading from the fixture allowing 1/16" (2mm) clearance between fixture and wall.
- Follow support manufacturer's recommended setting of closet outlet connection.
- Place felt or neoprene gasket (wax ring not recommended) on closet outlet.
- When the fixture is installed, closet outlet gasket must be compressed sufficiently to assure a gas and watertight seal.

### The following steps require a helper:

- Install bowl on support using cap nuts and fiber washers with the back-up nuts and washers.

DO NOT APPLY TOP RIGHT FIBER WASHER AND CAP NUT UNTIL OTHER CAP NUTS HAVE BEEN FIRMLY TIGHTENED USING A WRENCH.

- Install top right cap nut with fiber washer and run up hand tight. Wrench tighten approximately 1/4 turn.
- Apply sealant to gap between bowl and finished wall. Remove excess sealant.

#### **In the United States:**

American Standard Brands  
P.O. Box 6820  
Piscataway, New Jersey 08855  
Attention: Director of Customer Care

For residents of the United States, warranty information may also be obtained by calling the following toll free number: (800) 442-1902

[www.americanstandard.com](http://www.americanstandard.com)

#### **In Canada:**

AS Canada, ULC  
5900 Avebury Rd.  
Mississauga, Ontario  
Canada L5R 3M3  
Toll Free: (800) 387-0369  
[www.americanstandard.ca](http://www.americanstandard.ca)

#### **In Mexico:**

American Standard B&K Mexico  
S. de R.L. de C.V.  
Via Morelos #330  
Col. Santa Clara  
Ecatepec 55540 Edo. Mexico  
Toll Free: 01-800-839-1200  
[www.americanstandard.com.mx](http://www.americanstandard.com.mx)



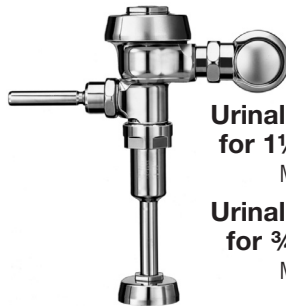
# INSTALLATION INSTRUCTIONS FOR EXPOSED ROYAL® FLUSHOMETERS



**Closet Flushometer for 1½" Top Spud**

MODELS 110/**111**  
113, 115 & 116

**Service Sink Flushometer for 1½" Top Spud**  
MODEL 117



**Urinal Flushometer for 1¼" Top Spud**

MODEL 180

**Urinal Flushometer for ¾" Top Spud**  
MODEL 186



**Closet Flushometer for 1½" Back Spud**  
MODELS 120, 121 & 122

### LIMITED WARRANTY

Unless otherwise noted, Sloan Valve Company warrants this product, manufactured and sold for commercial or industrial uses, to be free from defects in material and workmanship for a period of three (3) years (one (1) year for special finishes, SF faucets, PWT electronics and 30 days for PWT software) from date of first purchase. During this period, Sloan Valve Company will, at its option, repair, replace, or refund the purchase price of any product which fails to conform with this warranty under normal use and service. This shall be the sole and exclusive remedy under this warranty. Products must be returned to Sloan Valve Company, at customer's cost. No claims will be allowed for labor, transportation or other costs. This warranty extends only to persons or organizations who purchase Sloan Valve Company's products directly from Sloan Valve Company for purpose of resale. This warranty does not cover the life of the batteries.

**THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. IN NO EVENT IS SLOAN VALVE COMPANY RESPONSIBLE FOR ANY CONSEQUENTIAL DAMAGES OF ANY MEASURE WHATSOEVER.**

## PRIOR TO INSTALLATION

Before you install the flushometer, be sure the items listed below are installed. Also, refer to the rough-in diagram below.

- Closet fixture • Drain line • Water supply line

### IMPORTANT:

- **ALL PLUMBING SHOULD BE INSTALLED IN ACCORDANCE WITH APPLICABLE CODES AND REGULATIONS.**
- **WATER SUPPLY LINES MUST BE SIZED TO PROVIDE AN ADEQUATE VOLUME OF WATER FOR EACH FIXTURE.**

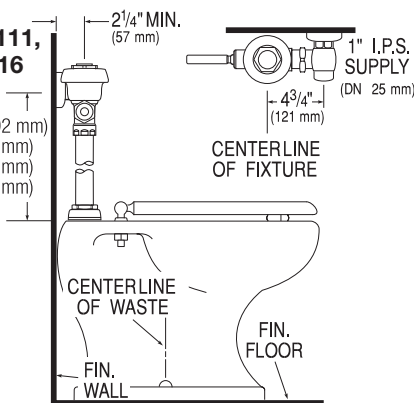
- **FLUSH ALL WATER LINES PRIOR TO MAKING CONNECTIONS.**

Sloan's flushometers are designed to operate with 15 to 80 psi (103 to 552 kPa) of water pressure. **THE MINIMUM PRESSURE REQUIRED TO THE VALVE IS DETERMINED BY THE TYPE OF FIXTURE SELECTED.** Consult fixture manufacturer for minimum pressure requirements. Most High Efficiency water closets require a minimum flowing pressure of 25 psi (172 kPa). Many building codes and the ASME A112.19.2 fixture standard list Maximum static water pressure as 80 PSI (552 kPa).

## ROUGH-INS

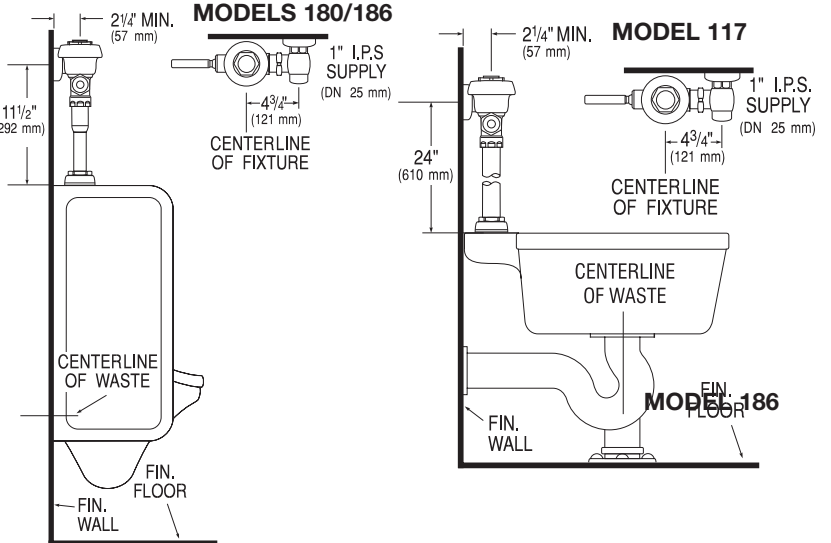
### MODELS 110/111, 113, 115, & 116

Model 111 – 11½" (292 mm)  
Model 113 – 16" (406 mm)  
Model 115 – 24" (610 mm)  
Model 116 – 27" (686 mm)



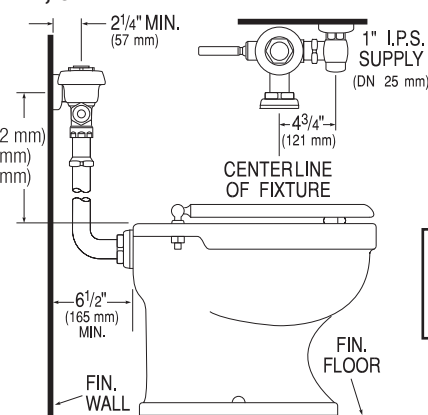
### MODELS 180/186

11½" (292 mm)



### MODELS 120, 121, & 122

Model 120 – 11½" (292 mm)  
Model 121 – 16" (406 mm)  
Model 122 – 24" (610 mm)



### !!! IMPORTANT !!!

**WHEN MOUNTED ON AN ADA ACCESSIBLE BOWL, THE ROUGH-IN TO THE SUPPLY INLET SHOULD BE NO HIGHER THAN 37½" OR THE HANDLE WILL EXCEED MAXIMUM HEIGHT ALLOWANCES UNDER ADA GUIDELINES.**

## TOOLS REQUIRED FOR INSTALLATION

- Straight blade screwdriver
- Sloan A-50 Super-Wrench™, Sloan A-109 Plier Wrench or smooth jawed spud wrench

**!!! IMPORTANT !!!**

PROTECT THE CHROME OR SPECIAL FINISH OF SLOAN FLUSHMETERS — DO NOT USE TOOTHED TOOLS TO INSTALL OR SERVICE THESE VALVES. USE A SLOAN A-50 SUPER-WRENCH™, SLOAN A-109 PLIER WRENCH OR SMOOTH JAWED SPUD WRENCH TO SECURE ALL COUPLINGS. SEE “CARE AND CLEANING” SECTION.

**!!! IMPORTANT !!!**

NEVER OPEN CONTROL STOP TO WHERE THE FLOW FROM THE VALVE EXCEEDS THE FLOW CAPABILITY OF THE FIXTURE. IN THE EVENT OF A VALVE FAILURE, THE FIXTURE MUST BE ABLE TO ACCOMMODATE A CONTINUOUS FLOW FROM THE VALVE.

**!!! IMPORTANT !!!**

WITH THE EXCEPTION OF CONTROL STOP INLET, DO NOT USE PIPE SEALANT OR PLUMBING GREASE ON ANY VALVE COMPONENT OR COUPLING!

**!!! IMPORTANT !!!**

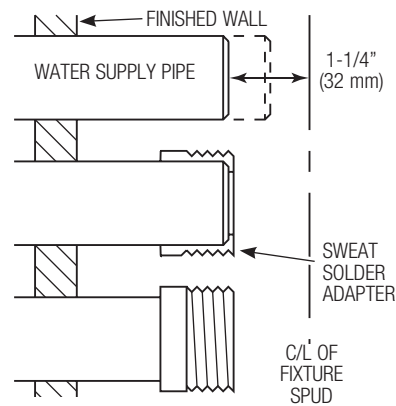
THIS PRODUCT CONTAINS MECHANICAL AND/OR ELECTRICAL COMPONENTS THAT ARE SUBJECT TO NORMAL WEAR. THESE COMPONENTS SHOULD BE CHECKED ON A REGULAR BASIS AND REPLACED AS NEEDED TO MAINTAIN THE VALVE'S PERFORMANCE.

Please take the time to read this manual to ensure proper product installation and longevity.

When further assistance is required, please contact your local Sloan Representative or Sloan Technical Support at:  
1-888-SLOAN-14 (1-888-756-2614)

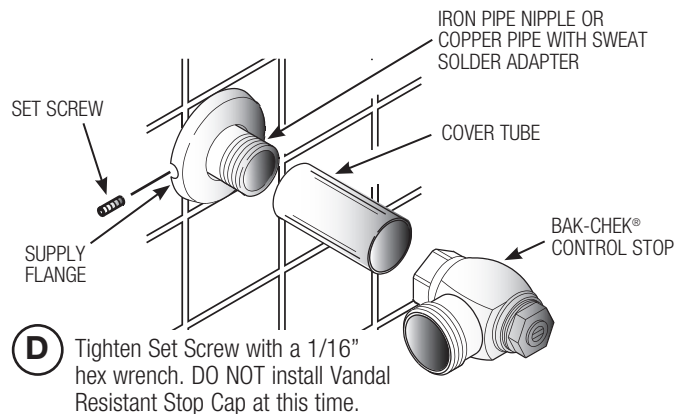
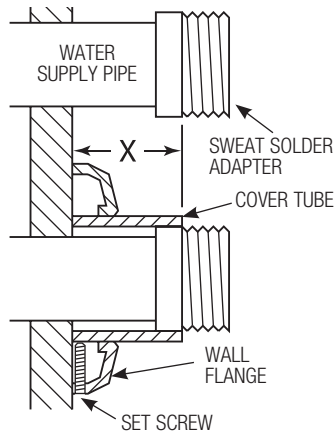
## 1 - INSTALL OPTIONAL SWEAT SOLDER ADAPTER (ONLY IF YOUR SUPPLY PIPE DOES NOT HAVE A MALE THREAD)

- Measure from finished wall to C/L of fixture spud. Cut pipe 1¼" (32 mm) shorter than this measurement. Chamfer O.D. and I.D. of water supply pipe.
- Slide threaded adapter fully onto pipe.
- Sweat solder the Adapter to pipe.



## 2 - INSTALL COVER TUBE, WALL FLANGE AND CONTROL STOP TO SUPPLY PIPE

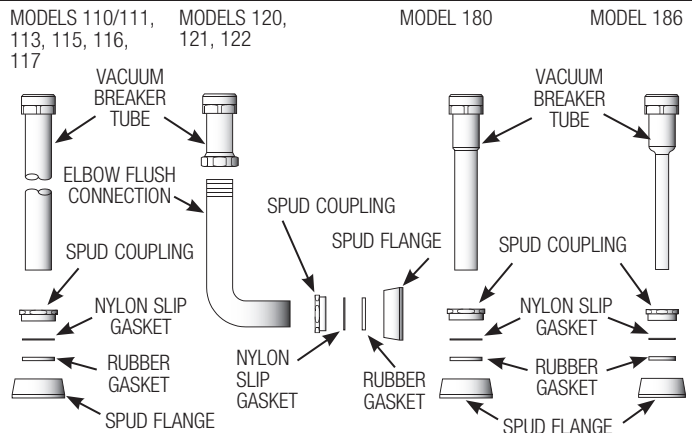
- Measure from finished wall to first thread of Adapter or threaded supply pipe (dimension "X"). Cut Cover Tube to this length.
- Slide Cover Tube over pipe. Slide Wall Flange over Cover Tube until against wall.
- Thread Control Stop onto pipe. Tighten with a wrench.



- Tighten Set Screw with a 1/16" hex wrench. DO NOT install Vandal Resistant Stop Cap at this time.

## 3 - INSTALL VACUUM BREAKER FLUSH CONNECTION

- Slide Spud Coupling, Nylon Slip Gasket, Rubber Gasket and Spud Flange over Vacuum Breaker Tube.
- Insert Tube into Fixture Spud.
- Hand tighten Spud Coupling onto Fixture Spud.



## 4 - INSTALL FLUSHOMETER AND TRIPLE SEAL HANDLE ASSEMBLY

### NOTE

For high efficiency urinal flushometers (0.5, 0.25 and 0.125 gpf), it is necessary to first insert the flow control component into the tailpiece assembly. See the H1015A flow control kit and separate instructions for details on how to install.

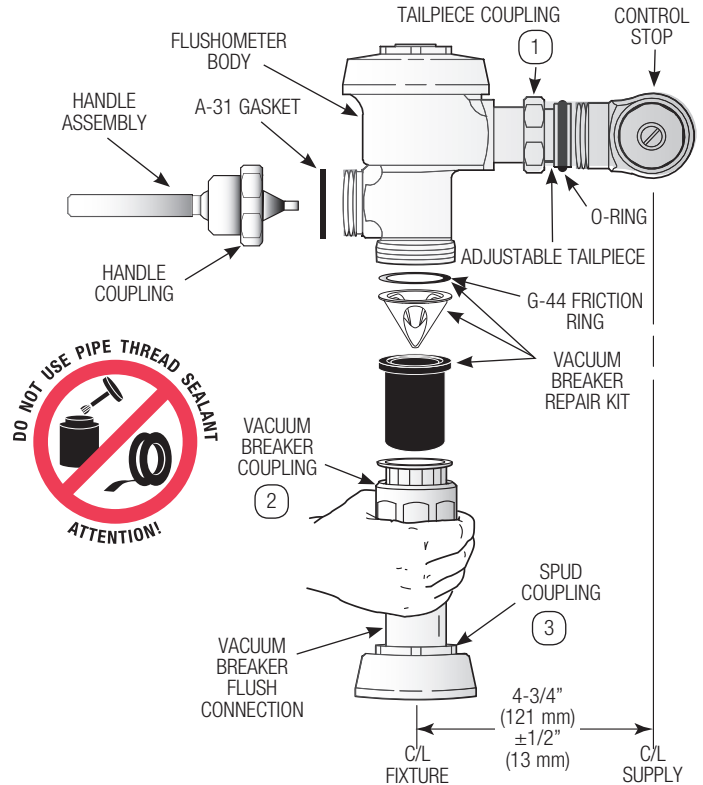
- A** Lubricate tailpiece O-ring with water. Insert Adjustable Tailpiece into Control Stop. Tighten Tailpiece Coupling by hand.
- B** Align Flushometer directly above the Vacuum Breaker Flush Connection by sliding the Flushometer Body IN or OUT as needed. Tighten Vacuum Breaker Coupling by hand.

### NOTE

Maximum adjustment of the Sloan Adjustable Tailpiece is 1/2" (13 mm) IN or OUT from the standard 4-3/4" (121 mm) (centerline of Flushometer to centerline of Control Stop).

If roughing-in measurement exceeds 5-1/4" (133 mm), consult factory for longer tailpiece.

- C** Align Flushometer Body and securely tighten first the Tailpiece Coupling (1), then the Vacuum Breaker Coupling (2), and finally the Spud Coupling (3). Use a wrench to tighten these couplings in the order shown.
  - D** Install the red A-31 Handle Gasket on the Handle Assembly. Insert the Handle Assembly into the Handle opening in the Flushometer Body. Securely tighten the Handle coupling with a wrench.
- Sloan's triple-sealed Flushometer Handle is ADA-compliant.



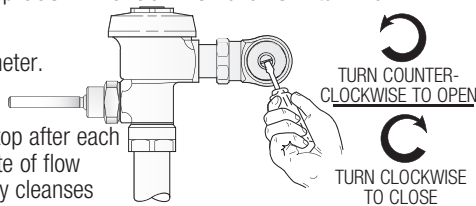
## 5 - FLUSH OUT SUPPLY LINE

- A** Make sure Control Stop is CLOSED and remove Flushometer Outer Cover.
- B** Remove Inside Cover and lift out Inside Parts Assembly.

- C** Reinstall Outside and Inside Cover wrench tight. Open Control Stop to flush supply line. Close Control Stop and remove Outside and Inside Cover.
- D** Reinstall Inside Parts Assembly, Inside Cover and Outside Cover wrench tight.

## 6 - ADJUST CONTROL STOP AND INSTALL VANDAL RESISTANT STOP CAP

- A** Open Control Stop COUNTERCLOCKWISE one FULL turn from closed position.
- B** Activate Flushometer.
- C** Adjust Control Stop after each flush until the rate of flow delivered properly cleanses the fixture.

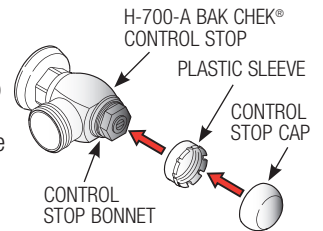


### !!! IMPORTANT !!!

Sloan's flushometers are engineered for quiet operation. Excessive water flow creates noise, while too little water flow may not satisfy the needs of the fixture. Proper adjustment is made when plumbing fixture is cleansed after each flush without splashing water out from the lip AND a quiet flushing cycle is achieved.

Never open Control Stop to where the flow from the valve exceeds the flow capability of the fixture. In the event of a valve failure, the fixture must be able to accommodate a continuous flow from the valve.

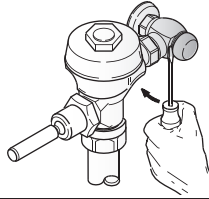
- D** Install Vandal Resistant Control Stop Cap onto Control Stop.
  - Thread the Plastic Sleeve onto the Stop Bonnet until it is snug (tighten only by hand; do not use pliers or a wrench).
  - Place the metal Control Stop Cap over the plastic Sleeve and use the palm of the hand to push or "pop" the Cap over the fingers of the Plastic Sleeve. The Cap should spin freely.



Important: DO NOT install Cap onto Sleeve unless the Sleeve has been threaded onto Control Stop Bonnet. If the Sleeve and Cap are assembled off of the Control Stop, the Sleeve WILL NOT come apart from the Cap.

## VANDAL RESISTANT CONTROL STOP CAP REMOVAL

Use a large flat screwdriver as a lever to remove the Cap from the Control Stop. Insert the screwdriver blade between the bottom edge of the Cap and the flat surface of the Control Stop body as shown. Push the screwdriver handle straight back toward the wall to gently lift the Cap. If necessary, work the screwdriver around the diameter of the Cap until you can grasp the Cap and lift it completely off the Sleeve. The Sleeve should remain attached to the bonnet of the Control Stop.



## TROUBLESHOOTING GUIDE

### 1. Flushometer does not function (no flush).

- Control stop or main valve is closed. Open control stop or main valve.
- Handle assembly is damaged. Replace handle or install handle repair kit.
- Relief Valve is damaged. Replace relief valve.

### 2. Volume of water is not sufficient to siphon fixture.

- Control stop is not open wide enough. Adjust control stop for desired delivery of water volume.
- Diaphragm assembly is damaged. Replace diaphragm assembly.
- Incorrect diaphragm assembly is installed in flushometer; for instance, urinal assembly inside a closet flushometer, or low consumption assembly inside a higher consumption fixture. Determine the flush volume required by the fixture and replace diaphragm. Use valve label and markings on fixture for reference.
- Water supply volume or pressure is inadequate. If no gauges are available to properly measure supply pressure or volume of water at the flushometer, then remove the relief valve from the diaphragm assembly, reassemble the flushometer and completely open the control stop.
  - If the fixture siphons, more water volume is required. Install a higher flushing volume diaphragm. **IMPORTANT – LAWS AND REGULATIONS PROHIBIT THE USE OF HIGHER FLUSHING VOLUMES THAN LISTED ON FIXTURE OR FLUSHOMETER.**
  - If the fixture DOES NOT siphon or if a low consumption flush is required, steps must be taken to increase the water supply pressure and/or volume. Contact the fixture manufacturer for minimum water supply requirements of the fixture.

### 3. Length of flush is too short (short flush).

- Diaphragm assembly is worn or damaged. Replace diaphragm assembly.
- Handle assembly is damaged. Replace handle or install handle repair kit.
- Incorrect diaphragm assembly is installed in flushometer; for instance, urinal assembly inside a closet flushometer, or low consumption assembly inside a higher consumption fixture. Determine the flush volume required by the fixture and replace diaphragm. Use valve label and markings on fixture for reference.

### 4. Length of flush is too long (long flush) or continuous.

- Metering bypass hole (upper filter ring) in diaphragm is clogged. Remove the diaphragm assembly. Remove the primary and secondary filter rings from the diaphragm, wash under running water, and reassemble. Replace as necessary.
- Diaphragm or relief valve is damaged. Replace diaphragm or relief valve.
- Incorrect diaphragm assembly is installed in flushometer; for instance, closet assembly inside a urinal flushometer, or water saver assembly inside a low consumption flushometer. Determine the flush volume required by the fixture and replace the diaphragm. Use valve label and markings on fixture for reference.
- Inside cover is damaged. Replace Inside cover.
- Supply line water pressure has dropped and is not sufficient to close the valve. Close control stop until pressure is restored.
- Relief valve is not seated properly. Disassemble diaphragm components (relief valve, filter rings, and diaphragm unit), wash under running water, and reassemble. Replace as necessary.

### 5. Chattering noise is heard during flush.

- Inside cover is damaged. Replace inside cover.
- Relief valve or diaphragm is damaged. Replace relief valve or diaphragm assembly.

### 6. Handle Leaks.

- Handle seal or assembly is damaged. Replace handle or install handle repair kit.

### 7. Water splashes from fixture.

- Control stop is open wider than necessary. Adjust control stop for desired delivery of water volume.
- Water saver/conventional diaphragm assembly is installed on low consumption fixture or closet diaphragm assembly is installed on urinal fixture. Determine the required flush volume (see label on valve or markings on fixture). Replace diaphragm assembly or relief valve for appropriate flush volume of fixture.

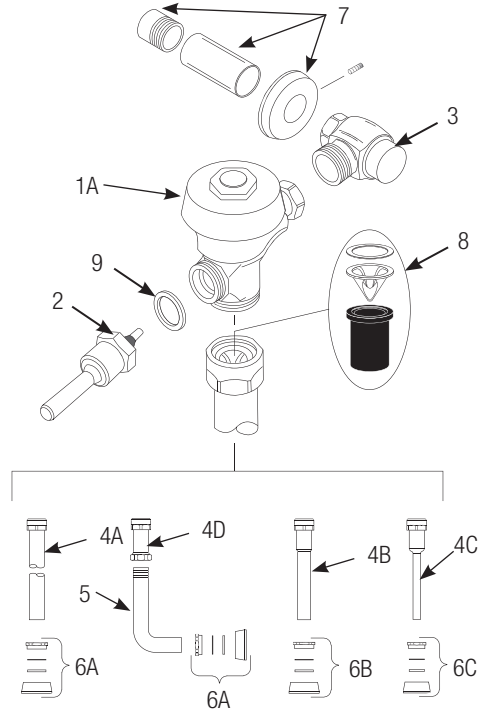
**When assistance is required, please contact your local Sloan Representative or Sloan Technical Support at:  
1-888-SLOAN-14 (1-888-756-2614)**

## CARE AND CLEANING

DO NOT use abrasive or chemical cleaners (including chlorine bleach) to clean Flushometers that may dull the luster and attack the chrome or special decorative finishes. Use ONLY mild soap and water, then wipe dry with clean cloth or towel.

While cleaning the bathroom tile, protect the Flushometer from any splattering of cleaner. Acids and cleaning fluids will discolor or remove chrome plating.

## PARTS LIST



Item No.	Part No.	Description
1	†	Valve Assembly
2	B-73-A	ADA Compliant Handle Assembly
3	H-700-A	Bak-Chek® Control Stop
4A	V-600-AA	1½" (38 mm) Vacuum Breaker Assembly ‡
4B	V-600-AA	1¼" (32 mm) Vacuum Breaker Assembly
4C	V-600-AA	¾" (19 mm) Vacuum Breaker Assembly
4D	V-600-A	Vacuum Breaker Assembly
5	F-109	1½" (38 mm) Elbow Flush Connection
6A	F-56-A	1½" (38 mm) Spud Coupling Assembly
6B	F-57-A	1¼" (32 mm) Spud Coupling Assembly
6C	F-58-A	¾" (19 mm) Spud Coupling Assembly
7	H-634-AA	1" (25 mm) Sweat Solder Kit with Cast Set Screw Flange
	H-636-AA	¾" (19 mm) Sweat Solder Kit with Cast Set Screw Flange
8	V-651-A	High Back Pressure Vacuum Breaker Repair Kit
9	A-31	Handle Gasket
†		Part number varies with valve model variation; consult factory.
‡		Length varies with valve model variation; consult factory.

**NOTE:** The information contained in this document is subject to change without notice.

## U1 AND U1H

MATERIAL PROVIDED BY



# INSTALLATION INSTRUCTIONS

*American Standard*

Style That Works Better

## WASHBROOK URINAL 6590 & 6515 SERIES

Thank you for selecting American Standard – the benchmark of fine quality for over 100 years. To ensure this product is installed properly, please read these instructions carefully before you begin. (Certain installations may require professional help.) Also be sure your installation conforms to local codes.

### BEFORE YOU BEGIN

**⚠ CAUTION: PRODUCT IS FRAGILE. TO AVOID BREAKAGE AND POSSIBLE INJURY HANDLE WITH CARE!**

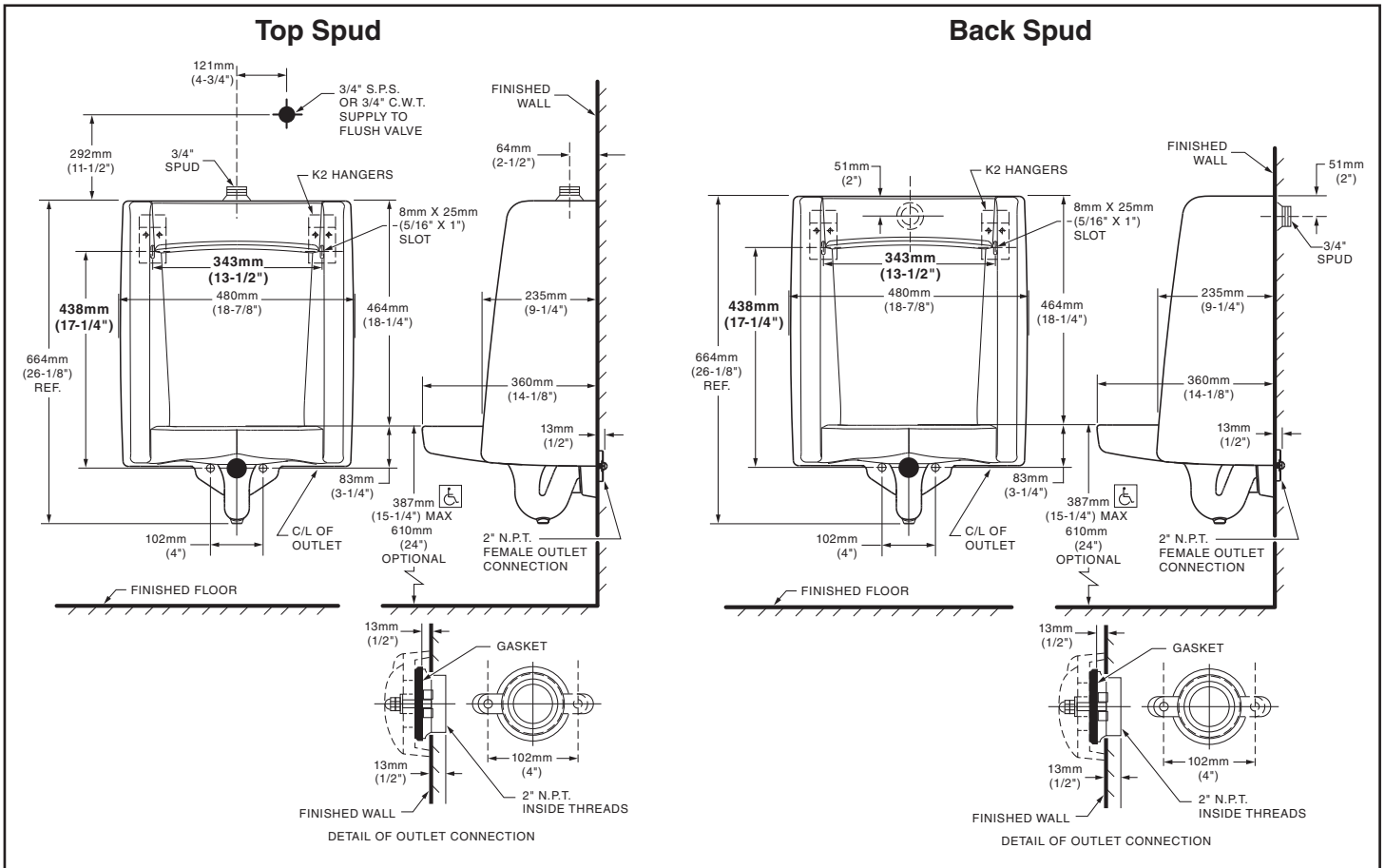
**NOTES:**

- Pictures may not exactly define contour of china and components.
- Observe all local plumbing and building codes.
- Refer to local codes and manufacturer's instructions for flush valve requirements.
- Carefully inspect the new urinal for damage.
- Fixture dimensions are nominal and conform to tolerances by ASME Standard A112.19.2.
- Site preparation may require additional tools and hardware.

### RECOMMENDED TOOLS AND MATERIALS

Safety Glasses    Tape Measure    Adjustable Wrench    Blade Screwdriver    Pencil    Levels  
 Thread Sealant    1/4" Ratchet    Hole Cutting Equipment

SAVE FOR FUTURE USE

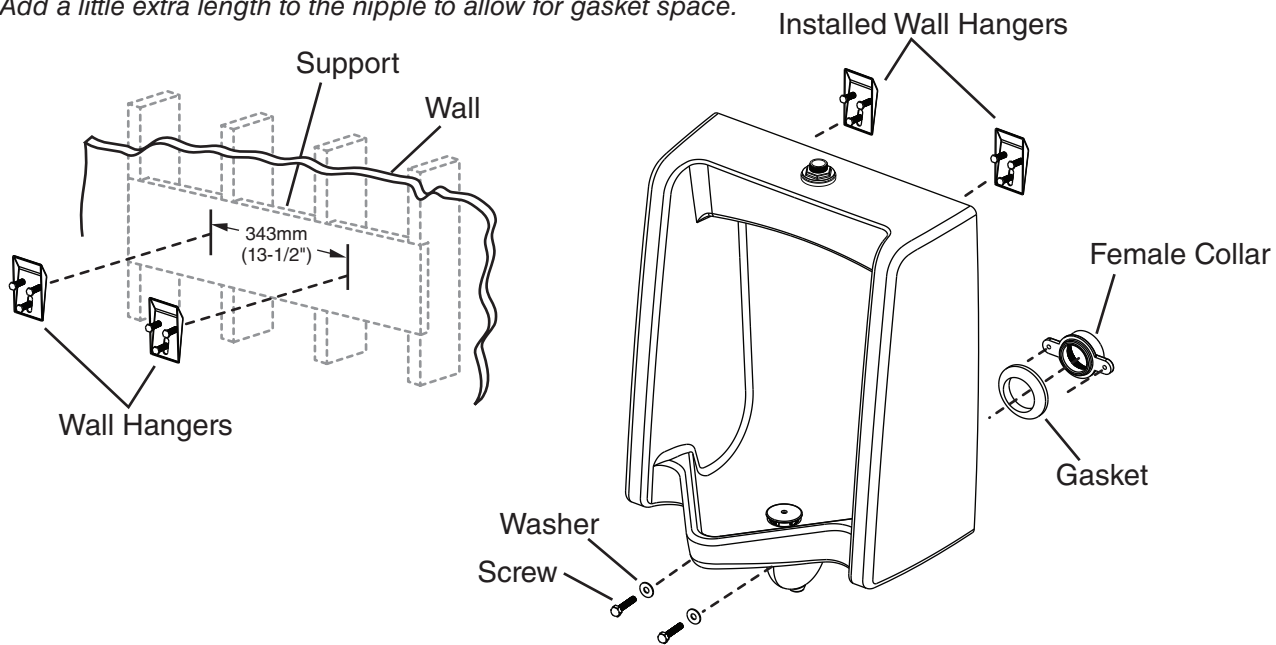


Product names listed herein are trademarks of AS America Inc.  
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## 1 PREPARATION

- Turn the water supply OFF.
- Install or relocate the supply tubing and waste pipe as necessary to conform to the roughing in dimensions.
- Install the shut off valve.
- Install adequate support framing for the wall hangers as needed.
- Determine the position of the waste pipe nipple. When establishing the nipple length, take into account the length of the urinal outlet spud and the distance the female collar will thread onto the waste pipe nipple.

NOTE: Add a little extra length to the nipple to allow for gasket space.



## 2 INSTALL THE URINAL

**⚠ CAUTION: RISK OF PERSONAL INJURY OR PRODUCT DAMAGE. HANDLE WITH CARE. VITREOUS CHINA CAN BREAK OR CHIP IF THE PRODUCT IS HANDLED CARELESSLY.**

**⚠ CAUTION: RISK OF PRODUCT DAMAGE. DO NOT OVERTIGHTEN THE BOLTS.**

- Install the wall hangers according to the roughing in illustration.
- Apply thread sealant tape to the pipe threads and install the female collar to the waste pipe.
- Place the gasket onto the female collar with the beveled surface facing away from the collar.
- Carefully position the urinal on the wall hangers.
- Secure the urinal to the female collar using the screws and washers provided.

## 3 COMPLETE THE INSTALLATION

- Install the flush valve according to the manufacturer's instructions.
- Connect the water supply and complete the waste pipe connections.
- Turn on the water supply.
- Flush and check the entire installation for leaks.

## CARE & CLEANING

Wash with mild soapy water and rinse thoroughly. Dry with a soft cloth. Avoid detergents, disinfectants or cleaning products in aerosol cans as they may damage fittings.

### In the United States:

American Standard Brands  
P.O. Box 6820  
Piscataway, New Jersey 08855  
Attention: Director of Customer Care  
For residents of the United States, warranty information may also be obtained by calling the following toll free number: (800) 442-1902  
[www.americanstandard.com](http://www.americanstandard.com)

### In Canada:

AS Canada, ULC  
5900 Avebury Rd.  
Mississauga, Ontario  
Canada L5R 3M3  
Toll Free: (800) 387-0369  
[www.americanstandard.ca](http://www.americanstandard.ca)

### In Mexico:

American Standard B&K Mexico  
S. de R.L. de C.V.  
Via Morelos #330  
Col. Santa Clara  
Ecatepec 55540 Edo. Mexico  
Toll Free: 01-800-839-1200  
[www.americanstandard.com.mx](http://www.americanstandard.com.mx)





# INSTALLATION INSTRUCTIONS FOR EXPOSED ROYAL® FLUSHOMETERS



**Closet Flushometer for 1½" Top Spud**  
 MODELS 110/111, 113, 115 & 116  
**Service Sink Flushometer for 1½" Top Spud**  
 MODEL 117



**Urinal Flushometer for 1½" Top Spud**  
 MODEL 180  
**Urinal Flushometer for ¾" Top Spud**  
 MODEL 186



**Closet Flushometer for 1½" Back Spud**  
 MODELS 120, 121 & 122

### LIMITED WARRANTY

Unless otherwise noted, Sloan Valve Company warrants this product, manufactured and sold for commercial or industrial uses, to be free from defects in material and workmanship for a period of three (3) years (one (1) year for special finishes, SF faucets, PWT electronics and 30 days for PWT software) from date of first purchase. During this period, Sloan Valve Company will, at its option, repair, replace, or refund the purchase price of any product which fails to conform with this warranty under normal use and service. This shall be the sole and exclusive remedy under this warranty. Products must be returned to Sloan Valve Company, at customer's cost. No claims will be allowed for labor, transportation or other costs. This warranty extends only to persons or organizations who purchase Sloan Valve Company's products directly from Sloan Valve Company for purpose of resale. This warranty does not cover the life of the batteries.

**THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. IN NO EVENT IS SLOAN VALVE COMPANY RESPONSIBLE FOR ANY CONSEQUENTIAL DAMAGES OF ANY MEASURE WHATSOEVER.**

## PRIOR TO INSTALLATION

Before you install the flushometer, be sure the items listed below are installed. Also, refer to the rough-in diagram below.

- Closet fixture • Drain line • Water supply line

### IMPORTANT:

- **ALL PLUMBING SHOULD BE INSTALLED IN ACCORDANCE WITH APPLICABLE CODES AND REGULATIONS.**
- **WATER SUPPLY LINES MUST BE SIZED TO PROVIDE AN ADEQUATE VOLUME OF WATER FOR EACH FIXTURE.**

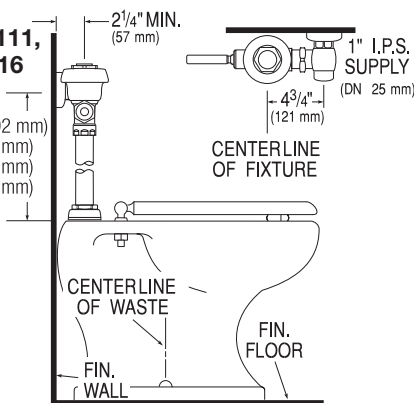
- **FLUSH ALL WATER LINES PRIOR TO MAKING CONNECTIONS.**

Sloan's flushometers are designed to operate with 15 to 80 psi (103 to 552 kPa) of water pressure. **THE MINIMUM PRESSURE REQUIRED TO THE VALVE IS DETERMINED BY THE TYPE OF FIXTURE SELECTED.** Consult fixture manufacturer for minimum pressure requirements. Most High Efficiency water closets require a minimum flowing pressure of 25 psi (172 kPa). Many building codes and the ASME A112.19.2 fixture standard list Maximum static water pressure as 80 PSI (552 kPa).

## ROUGH-INS

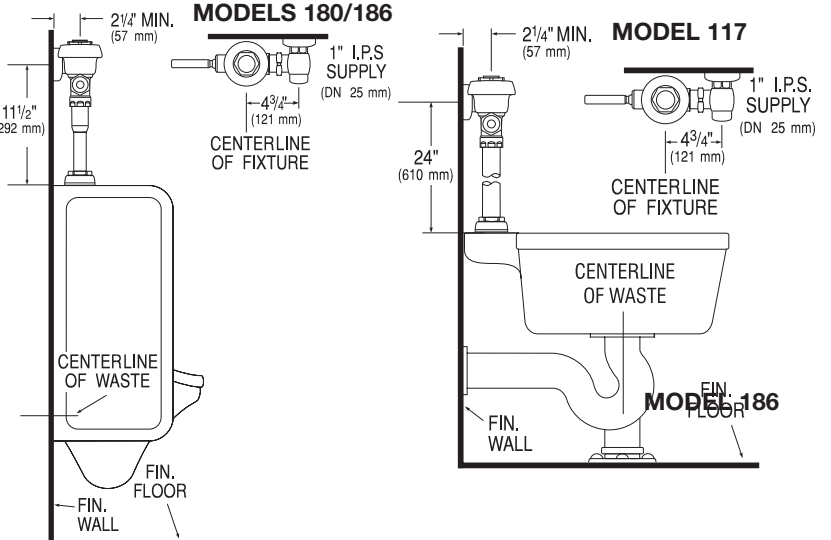
### MODELS 110/111, 113, 115, & 116

- Model 111 – 11½" (292 mm)
- Model 113 – 16" (406 mm)
- Model 115 – 24" (610 mm)
- Model 116 – 27" (686 mm)



### MODELS 180/186

- 11½" (292 mm)

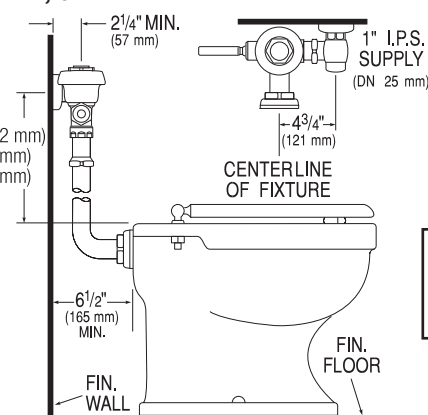


### MODEL 117

- 24" (610 mm)

### MODELS 120, 121, & 122

- Model 120 – 11½" (292 mm)
- Model 121 – 16" (406 mm)
- Model 122 – 24" (610 mm)



### !!! IMPORTANT !!!

**WHEN MOUNTED ON AN ADA ACCESSIBLE BOWL, THE ROUGH-IN TO THE SUPPLY INLET SHOULD BE NO HIGHER THAN 37½" OR THE HANDLE WILL EXCEED MAXIMUM HEIGHT ALLOWANCES UNDER ADA GUIDELINES.**

## TOOLS REQUIRED FOR INSTALLATION

- Straight blade screwdriver
- Sloan A-50 Super-Wrench™, Sloan A-109 Plier Wrench or smooth jawed spud wrench

**!!! IMPORTANT !!!**

PROTECT THE CHROME OR SPECIAL FINISH OF SLOAN FLUSHMETERS — DO NOT USE TOOTHED TOOLS TO INSTALL OR SERVICE THESE VALVES. USE A SLOAN A-50 SUPER-WRENCH™, SLOAN A-109 PLIER WRENCH OR SMOOTH JAWED SPUD WRENCH TO SECURE ALL COUPLINGS. SEE “CARE AND CLEANING” SECTION.

**!!! IMPORTANT !!!**

NEVER OPEN CONTROL STOP TO WHERE THE FLOW FROM THE VALVE EXCEEDS THE FLOW CAPABILITY OF THE FIXTURE. IN THE EVENT OF A VALVE FAILURE, THE FIXTURE MUST BE ABLE TO ACCOMMODATE A CONTINUOUS FLOW FROM THE VALVE.

**!!! IMPORTANT !!!**

WITH THE EXCEPTION OF CONTROL STOP INLET, DO NOT USE PIPE SEALANT OR PLUMBING GREASE ON ANY VALVE COMPONENT OR COUPLING!

**!!! IMPORTANT !!!**

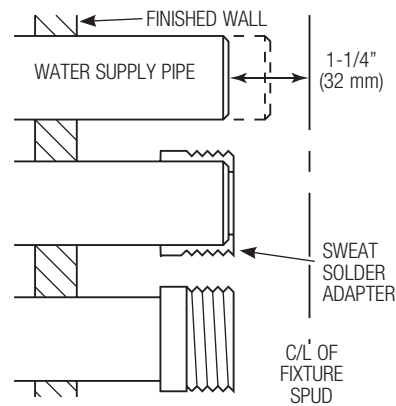
THIS PRODUCT CONTAINS MECHANICAL AND/OR ELECTRICAL COMPONENTS THAT ARE SUBJECT TO NORMAL WEAR. THESE COMPONENTS SHOULD BE CHECKED ON A REGULAR BASIS AND REPLACED AS NEEDED TO MAINTAIN THE VALVE'S PERFORMANCE.

Please take the time to read this manual to ensure proper product installation and longevity.

When further assistance is required, please contact your local Sloan Representative or Sloan Technical Support at:  
1-888-SLOAN-14 (1-888-756-2614)

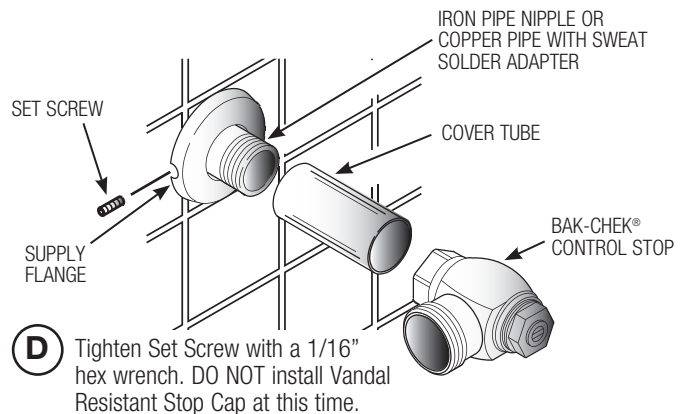
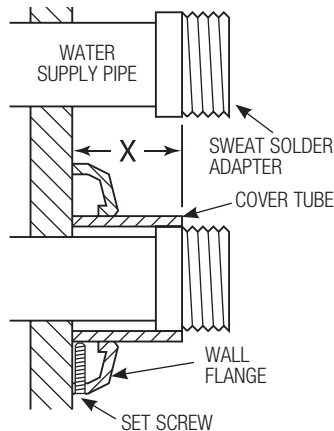
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- Measure from finished wall to C/L of fixture spud. Cut pipe 1¼" (32 mm) shorter than this measurement. Chamfer O.D. and I.D. of water supply pipe.
- Slide threaded adapter fully onto pipe.
- Sweat solder the Adapter to pipe.



## 2 - INSTALL COVER TUBE, WALL FLANGE AND CONTROL STOP TO SUPPLY PIPE

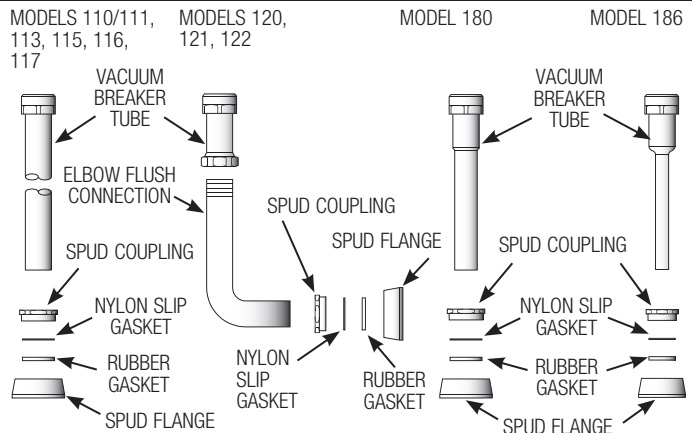
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- Tighten Set Screw with a 1/16" hex wrench. DO NOT install Vandal Resistant Stop Cap at this time.

## 3 - INSTALL VACUUM BREAKER FLUSH CONNECTION

- Slide Spud Coupling, Nylon Slip Gasket, Rubber Gasket and Spud Flange over Vacuum Breaker Tube.
- Insert Tube into Fixture Spud.
- Hand tighten Spud Coupling onto Fixture Spud.



## 4 - INSTALL FLUSHOMETER AND TRIPLE SEAL HANDLE ASSEMBLY

### NOTE

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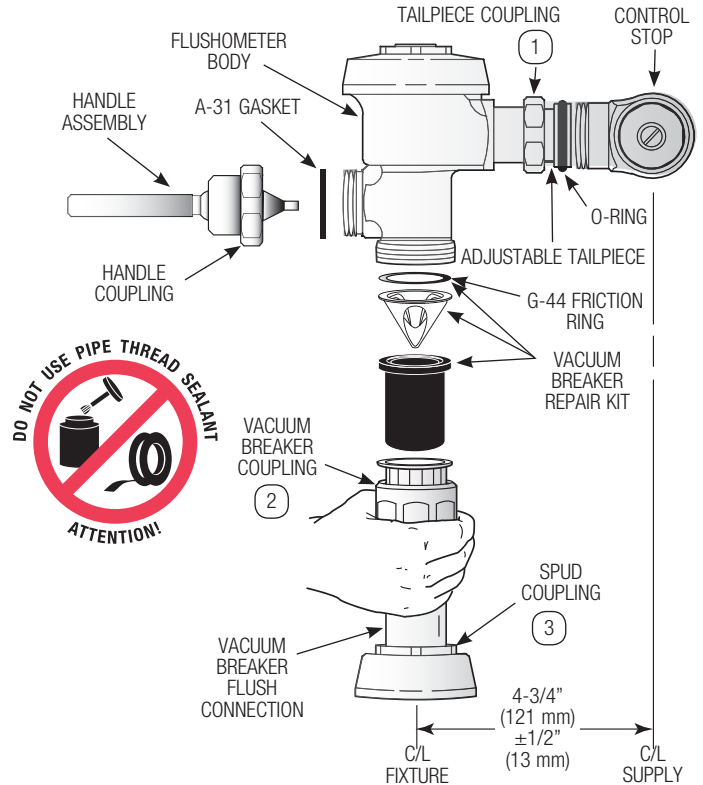
- A** Lubricate tailpiece O-ring with water. Insert Adjustable Tailpiece into Control Stop. Tighten Tailpiece Coupling by hand.
- B** Align Flushometer directly above the Vacuum Breaker Flush Connection by sliding the Flushometer Body IN or OUT as needed. Tighten Vacuum Breaker Coupling by hand.

### NOTE

Maximum adjustment of the Sloan Adjustable Tailpiece is 1/2" (13 mm) IN or OUT from the standard 4-3/4" (121 mm) (centerline of Flushometer to centerline of Control Stop).

If roughing-in measurement exceeds 5-1/4" (133 mm), consult factory for longer tailpiece.

- C** Align Flushometer Body and securely tighten first the Tailpiece Coupling (1), then the Vacuum Breaker Coupling (2), and finally the Spud Coupling (3). Use a wrench to tighten these couplings in the order shown.
  - D** Install the red A-31 Handle Gasket on the Handle Assembly. Insert the Handle Assembly into the Handle opening in the Flushometer Body. Securely tighten the Handle coupling with a wrench.
- Sloan's triple-sealed Flushometer Handle is ADA-compliant.



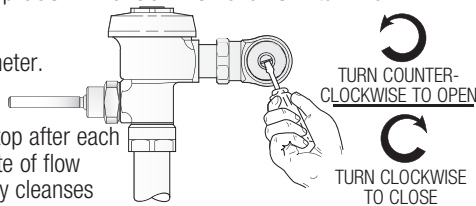
## 5 - FLUSH OUT SUPPLY LINE

- A** Make sure Control Stop is CLOSED and remove Flushometer Outer Cover.
- B** Remove Inside Cover and lift out Inside Parts Assembly.

- C** Reinstall Outside and Inside Cover wrench tight. Open Control Stop to flush supply line. Close Control Stop and remove Outside and Inside Cover.
- D** Reinstall Inside Parts Assembly, Inside Cover and Outside Cover wrench tight.

## 6 - ADJUST CONTROL STOP AND INSTALL VANDAL RESISTANT STOP CAP

- A** Open Control Stop COUNTERCLOCKWISE one FULL turn from closed position.
- B** Activate Flushometer.
- C** Adjust Control Stop after each flush until the rate of flow delivered properly cleanses the fixture.

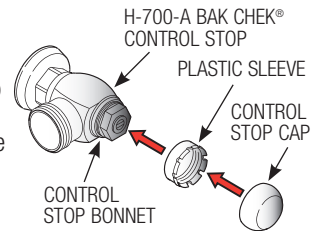


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Never open Control Stop to where the flow from the valve exceeds the flow capability of the fixture. In the event of a valve failure, the fixture must be able to accommodate a continuous flow from the valve.

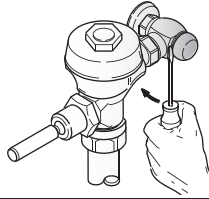
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  - Thread the Plastic Sleeve onto the Stop Bonnet until it is snug (tighten only by hand; do not use pliers or a wrench).
  - Place the metal Control Stop Cap over the plastic Sleeve and use the palm of the hand to push or "pop" the Cap over the fingers of the Plastic Sleeve. The Cap should spin freely.



Important: DO NOT install Cap onto Sleeve unless the Sleeve has been threaded onto Control Stop Bonnet. If the Sleeve and Cap are assembled off of the Control Stop, the Sleeve WILL NOT come apart from the Cap.

## VANDAL RESISTANT CONTROL STOP CAP REMOVAL

Use a large flat screwdriver as a lever to remove the Cap from the Control Stop. Insert the screwdriver blade between the bottom edge of the Cap and the flat surface of the Control Stop body as shown. Push the screwdriver handle straight back toward the wall to gently lift the Cap. If necessary, work the screwdriver around the diameter of the Cap until you can grasp the Cap and lift it completely off the Sleeve. The Sleeve should remain attached to the bonnet of the Control Stop.



## TROUBLESHOOTING GUIDE

### 1. Flushometer does not function (no flush).

- Control stop or main valve is closed. Open control stop or main valve.
- Handle assembly is damaged. Replace handle or install handle repair kit.
- Relief Valve is damaged. Replace relief valve.

### 2. Volume of water is not sufficient to siphon fixture.

- Control stop is not open wide enough. Adjust control stop for desired delivery of water volume.
- Diaphragm assembly is damaged. Replace diaphragm assembly.
- Incorrect diaphragm assembly is installed in flushometer; for instance, urinal assembly inside a closet flushometer, or low consumption assembly inside a higher consumption fixture. Determine the flush volume required by the fixture and replace diaphragm. Use valve label and markings on fixture for reference.
- Water supply volume or pressure is inadequate. If no gauges are available to properly measure supply pressure or volume of water at the flushometer, then remove the relief valve from the diaphragm assembly, reassemble the flushometer and completely open the control stop.
  - If the fixture siphons, more water volume is required. Install a higher flushing volume diaphragm. **IMPORTANT – LAWS AND REGULATIONS PROHIBIT THE USE OF HIGHER FLUSHING VOLUMES THAN LISTED ON FIXTURE OR FLUSHOMETER.**
  - If the fixture DOES NOT siphon or if a low consumption flush is required, steps must be taken to increase the water supply pressure and/or volume. Contact the fixture manufacturer for minimum water supply requirements of the fixture.

### 3. Length of flush is too short (short flush).

- Diaphragm assembly is worn or damaged. Replace diaphragm assembly.
- Handle assembly is damaged. Replace handle or install handle repair kit.
- Incorrect diaphragm assembly is installed in flushometer; for instance, urinal assembly inside a closet flushometer, or low consumption assembly inside a higher consumption fixture. Determine the flush volume required by the fixture and replace diaphragm. Use valve label and markings on fixture for reference.

### 4. Length of flush is too long (long flush) or continuous.

- Metering bypass hole (upper filter ring) in diaphragm is clogged. Remove the diaphragm assembly. Remove the primary and secondary filter rings from the diaphragm, wash under running water, and reassemble. Replace as necessary.
- Diaphragm or relief valve is damaged. Replace diaphragm or relief valve.
- Incorrect diaphragm assembly is installed in flushometer; for instance, closet assembly inside a urinal flushometer, or water saver assembly inside a low consumption flushometer. Determine the flush volume required by the fixture and replace the diaphragm. Use valve label and markings on fixture for reference.
- Inside cover is damaged. Replace Inside cover.
- Supply line water pressure has dropped and is not sufficient to close the valve. Close control stop until pressure is restored.
- Relief valve is not seated properly. Disassemble diaphragm components (relief valve, filter rings, and diaphragm unit), wash under running water, and reassemble. Replace as necessary.

### 5. Chattering noise is heard during flush.

- Inside cover is damaged. Replace inside cover.
- Relief valve or diaphragm is damaged. Replace relief valve or diaphragm assembly.

### 6. Handle Leaks.

- Handle seal or assembly is damaged. Replace handle or install handle repair kit.

### 7. Water splashes from fixture.

- Control stop is open wider than necessary. Adjust control stop for desired delivery of water volume.
- Water saver/conventional diaphragm assembly is installed on low consumption fixture or closet diaphragm assembly is installed on urinal fixture. Determine the required flush volume (see label on valve or markings on fixture). Replace diaphragm assembly or relief valve for appropriate flush volume of fixture.

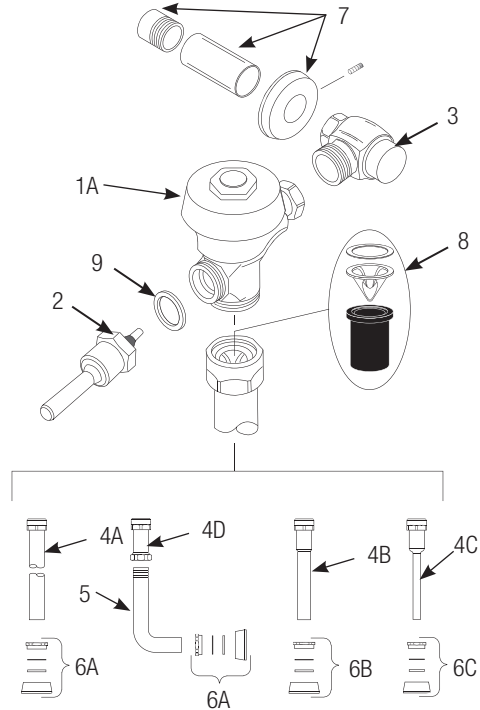
**When assistance is required, please contact your local Sloan Representative or Sloan Technical Support at:  
1-888-SLOAN-14 (1-888-756-2614)**

## CARE AND CLEANING

DO NOT use abrasive or chemical cleaners (including chlorine bleach) to clean Flushometers that may dull the luster and attack the chrome or special decorative finishes. Use ONLY mild soap and water, then wipe dry with clean cloth or towel.

While cleaning the bathroom tile, protect the Flushometer from any splattering of cleaner. Acids and cleaning fluids will discolor or remove chrome plating.

## PARTS LIST



Item No.	Part No.	Description
1	†	Valve Assembly
2	B-73-A	ADA Compliant Handle Assembly
3	H-700-A	Bak-Chek® Control Stop
4A	V-600-AA	1½" (38 mm) Vacuum Breaker Assembly ‡
4B	V-600-AA	1¼" (32 mm) Vacuum Breaker Assembly
4C	V-600-AA	¾" (19 mm) Vacuum Breaker Assembly
4D	V-600-A	Vacuum Breaker Assembly
5	F-109	1½" (38 mm) Elbow Flush Connection
6A	F-56-A	1½" (38 mm) Spud Coupling Assembly
6B	F-57-A	1¼" (32 mm) Spud Coupling Assembly
6C	F-58-A	¾" (19 mm) Spud Coupling Assembly
7	H-634-AA	1" (25 mm) Sweat Solder Kit with Cast Set Screw Flange
	H-636-AA	¾" (19 mm) Sweat Solder Kit with Cast Set Screw Flange
8	V-651-A	High Back Pressure Vacuum Breaker Repair Kit
9	A-31	Handle Gasket

† Part number varies with valve model variation; consult factory.  
‡ Length varies with valve model variation; consult factory.

**NOTE:** The information contained in this document is subject to change without notice.

L1

MATERIAL PROVIDED BY

**Winsupply**<sup>®</sup>  
THE WINSUPPLY FAMILY OF COMPANIES

# INSTALLATION INSTRUCTIONS CARE AND MAINTENANCE



## WALL HUNG SINK

**NOTE:** For installation of models using concealed or exposed arms, follow instruction provided by arms manufacturer.

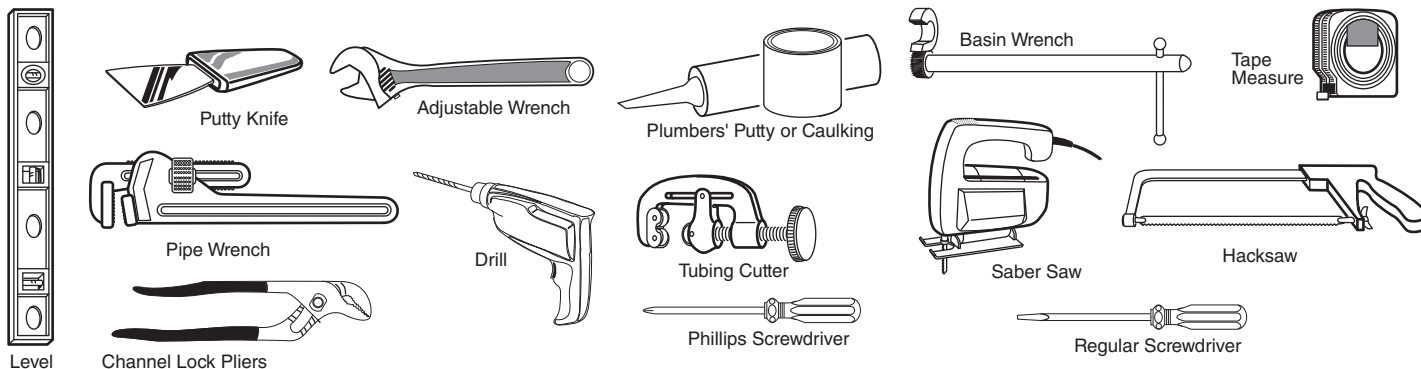
Thank you for selecting American Standard - the benchmark of fine quality for over 100 years. To ensure this product is installed properly, please read these instructions carefully before you begin. (Certain installations may require professional help.) Also be sure your installation conforms to local codes.

**▲ CAUTION: PRODUCT IS FRAGILE. TO AVOID BREAKAGE AND POSSIBLE INJURY HANDLE WITH CARE!**

**NOTE:** Pictures may not exactly define contour of china and components.

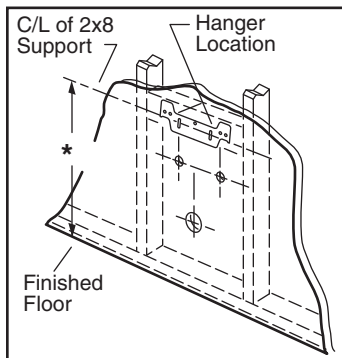
**OBSERVE LOCAL PLUMBING AND BUILDING CODES**

### Recommended Tools & Materials



**1** Provide suitable reinforcement behind finished wall for lavatory hanger mounting screws. \*Determine horizontal center line location of support from the table listed in Step 2. (Make sure support bottom extends to lavatory back wall bottom.)

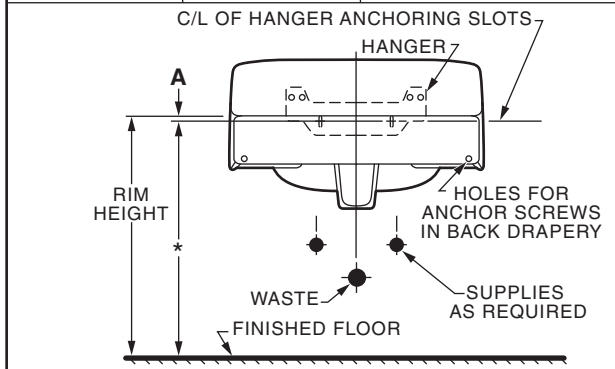
**NOTE:** If replacing an existing sink be certain to shut off water supply before removing old sink.



**2** Determine the desired rim height (for example 32") then select from the Table at right the height of the hanger mounting bolts centerline

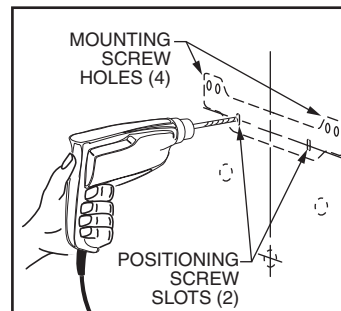
TABLE		
Part #	Model	Distance "A"
0124	Comrade	- 2-1/2" (64mm)
0321	Declyn	- 2-3/4" (70mm)
0355/0356	Lucerne	- 1" (25mm)
0372/0373	Penlyn	- 1/8" (3mm)
4867/4869	Regalyn	+ 2-3/4" (70mm)
0436	Missouri	+ 1" (25mm)
9024	Decorum	- 3-11/16" (93mm)

**EXAMPLE:**  
For Lucerne:  
32" - 1" = 31"  
For Missouri:  
32" + 1" = 33"



**3** Position hanger according to Step 2, making sure its center is aligned with the waste hole centerline. Mark the hanger screw locations through its mounting holes.

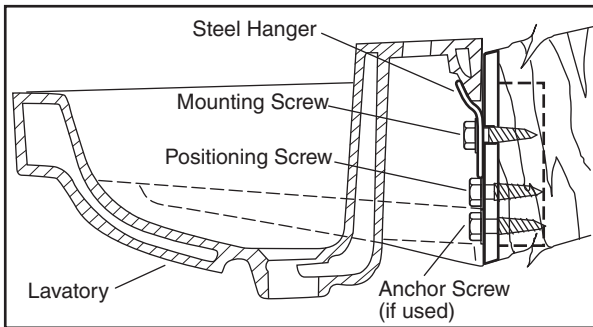
**4** Drill pilot holes in positioning screw slots of hanger. (Note: Some models are supplied with anchor screws, or steel hangers for lavatory installations. Other models are not provided with mounting hardware which can be purchased at local hardware outlets. Lavatories with bottom anchor screw holes should be secured with anchor screws in addition to hangers.)



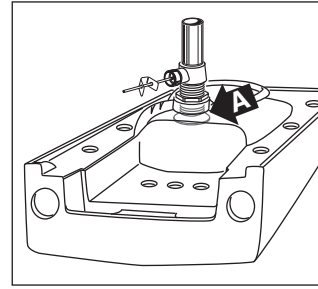
Product names listed herein are trademarks of AS America, Inc.  
© AS America, Inc. 2015

SAVE FOR FUTURE USE

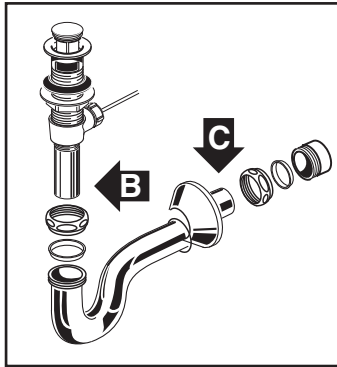
- 5** Affix hanger to wall (hand tighten only). Mount lavatory for positioning, level the deck, and mark bottom anchor screw holes (if applicable). Remove lavatory, tighten the hanger positioning screws and drill pilot holes for anchor screws and 4 mounting screws. Install and tighten the mounting screws.



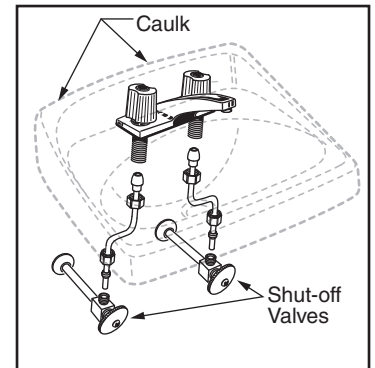
- 6** Following manufacturers instructions, install faucet and drain assembly. (Not included). Be certain to apply a bead of sealing putty on the underside of the drain (Part "A") in order to ensure a watertight seal between the lavatory and drain. Remove excess putty after installing drain on lavatory.



- 7** Return the fitted lavatory to the installed position. Connect trap to drain assembly hand tight to check alignment. It may be necessary to cut off part of the tailpiece (area "B") or part of the horizontal leg of the trap (area "C").



- 8** Secure lavatory on hanger as shown in 5. Insert and tighten anchor screws if applicable. Connect hot and cold supply lines to the shut-off valves. Tighten trap joints for watertight assembly. Apply a bead of caulk around the edge which contacts the wall as shown.



### AS AMERICA, INC. ONE YEAR LIMITED WARRANTY

If inspection of this AS America, Inc. ("American Standard") plumbing product, within one year after its initial purchase, confirms that it is defective in materials or workmanship, American Standard will repair or, at its option, exchange the product for a same or similar model.

This limited warranty applies only to the original purchaser and installation of these products. In the event of a limited warranty claim, proof of purchase will be required—save sales receipts.

This limited warranty does not apply to local building code compliance. Since local building codes vary considerably, the purchaser of this product should check with a local building or plumbing contractor to insure local code compliance before installation.

This limited warranty will be void if the product has been moved from its initial place of installation; if it has been subjected to faulty maintenance, abuse, misuse, accident or other damage; if it was not installed in accordance with American Standard's instructions; or if it has been modified in a manner inconsistent with the product as shipped by American Standard.

American Standard's option to repair or exchange the product under this limited warranty does not cover any labor or other costs of removal or installation including any costs of any surrounding material such as tile or marble. American Standard is not responsible for any other incidental or consequential damages attributed to a product defect or to the repair or exchange of a defective product, all of which are expressly excluded from the warranty. This limited warranty does not cover the extension beyond the duration of this limited warranty of any implied limited warranties, including those of merchantability or fitness for an intended purpose. (Some states or provinces do not allow the exclusion or limitation of implied warranties, so this exclusion may not apply to you.)

This limited warranty gives you specific legal rights. You may have other statutory rights that vary from state to state or from province to province, in which case this limited warranty does not affect such statutory rights.

For service under this warranty, it is suggested that a claim be made through the contractor or dealer from or through whom the product was purchased, or that a service request (including a description of the product model and of the defect) be sent to the following address:

**In the United States:**  
American Standard Brands,  
P.O. Box 6820  
Piscataway, New Jersey 08855  
Attention: Director of Consumer Affairs

For residents of the United States, warranty information may also be obtained by calling the following toll free number: (800) 442-1902  
[www.americanstandard.com](http://www.americanstandard.com)

**In Canada:**  
AS Canada ULC  
5900 Avebury Road  
Mississauga, Ontario  
Canada L5R 3M3  
Toll Free: (800) 387-0369  
[www.americanstandard.ca](http://www.americanstandard.ca)

**In Mexico:**  
Customer Service Manager  
AS Maquila, S.A. de C.V.  
Via Morelos #330  
Col. Santa Clara  
Ecatepec 55540 Edo. Mexico  
[www.americanstandard.com.mx](http://www.americanstandard.com.mx)

**THIS WARRANTY IS NOT TRANSFERABLE FROM ORIGINAL CONSUMER PURCHASER.**



# Symmetrix®



## Lavatory Faucet S-20 Series Installation and Service Instructions

For California Residents

**WARNING:** This product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

### Installation

**Caution:** Be sure to turn off hot and cold water supplies before installing or servicing faucet.

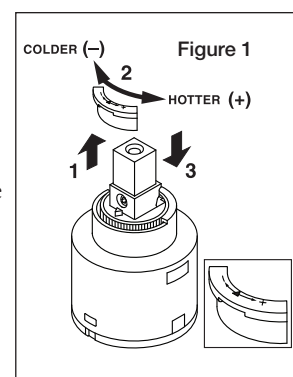
- Loosely install the anchor bar (KN-23), spacer (KN-26) and nut (L-36) on the mounting bolts and place gasket on base of faucet. Push faucet supplies and anchor bolt/spacer/nut assemblies with gasket through holes in sink. Secure faucet to sink by tightening nuts from underside. (If sink or counter surface is uneven, use putty or sealant to make proper seal under base.)
- Connect hot supply to left tube and cold supply to right tube using appropriate connectors.
- Pop-up drain installation:
  - Remove pop-up plug, tail piece and flange from the drain body. Make sure that locknut is threaded all the way down onto the body with flat friction washer in middle and beveled washer on top.
  - Apply plumbers putty or sealant to bottom of flange.
  - Install drain body through drain opening in lavatory and screw flange onto the drain body making sure that the threads are completely engaged for proper sealing and strength of the connection. Apply joint compound to all threaded parts to insure proper seal. Apply putty or teflon tape to tail piece before attaching to drain body.
  - Tighten locknut to compress the beveled flange evenly across the bottom of the drain opening taking care not to over tighten the locknut, causing damage to the lavatory.
  - Remove one of two ball washers from inside the threaded cavity. Insert pop-up plug and pivot rod into body. Add one ball washer (the second ball washer should remain inside the body) to the outside of the ball. Tighten the retaining nut until the ball is seated on the internal and external ball washers.
 

Note: The pop-up plug can be installed either in the removable or non-removable position, depending on the location of the hole located in the guide at the bottom of the plug.
  - Slide the pivot rod through one side of the spring clip, then the appropriate adjustment hole and then other side of the spring clip.
  - Insert lift rod through faucet housing and the top of the lift strap and secure it in place by tightening the screw.
 

Note: To ensure proper operation of lift rod and pop-up, some adjustment of the linkage may be required. There are two possible adjustment points: 1) lift strap to lift rod and 2) lift strap to pivot rod.
- It is very important to thoroughly flush the supply lines to prevent foreign matter, i.e. copper chips, sand, stones, etc. from damaging the sealing surfaces of cartridge.

Remove aerator and turn valve handle on to full cold position, open cold supply. Without closing, turn handle to full hot and open hot supply. Let water run in hot only and cold only positions long enough to flush supply lines thoroughly. Shut off faucet and replace aerator. Check for leaks.

- The handle limit stop can be set to limit handle turn to the hot position. The limit mechanism is factory set to allow full handle travel. To adjust the limit stop, turn handle to the full hot position and lift handle to open faucet approximately half way to obtain a smooth flow for correct initial temperature measurement.
- If when faucet is on and in full hot position and water is too hot, shut off water, remove plug button (KN-157), loosen set screw (L-22) and remove handle (KN-3RB, KN-3BRB or LN-135). Lift limit stop ring using a small flat head screw driver and rotate clockwise to lower temperature. If water is not hot enough, rotate counter clockwise (See Figure 1 above). After correct temperature is achieved, reattach handle, reversing procedure above.



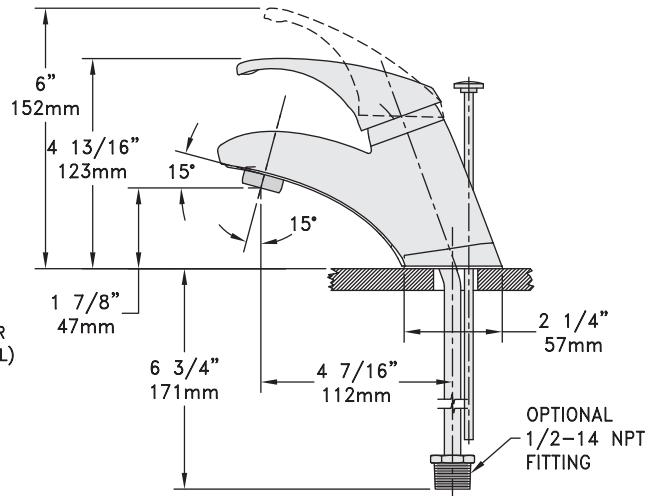
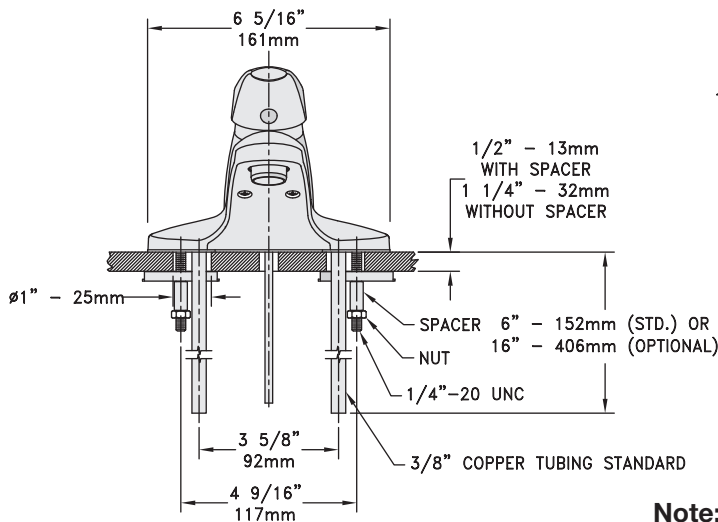
Limit stop adjust

### Replacing cartridge (KN-4)

- Remove plug button (KN-157), loosen set screw (L-22) and remove handle (KN-3RB, KN-3BRB or LN-135).
- Engage tabs in cartridge wrench (LN-34) with slots in compression ring (KN-2) and use screwdriver in wrench holes or pliers on wrench and turn counter clockwise until compression ring engages with cap (LN-8). Continue turning counter clockwise so that cap/ring assembly is removed from the body (LN-371). Remove cartridge and o-ring seal (KN-4).
- Install new cartridge while taking care to maintain position of the o-ring seal at the base of the cartridge. Match posts in base of cartridge with alignment holes in valve body during assembly.
- Reassemble faucet in reverse fashion. Thread cap onto body firmly by hand. Do not use a wrench which may damage the finish. Tighten compression ring (KN-2) finger tight using the wrench (LN-34) then 1/4 to 1/2 turn further.
- Set hot water limit stop in accordance with installation step 5 above.



## Dimensions Symmetrix Lavatory Faucet, S-20-2

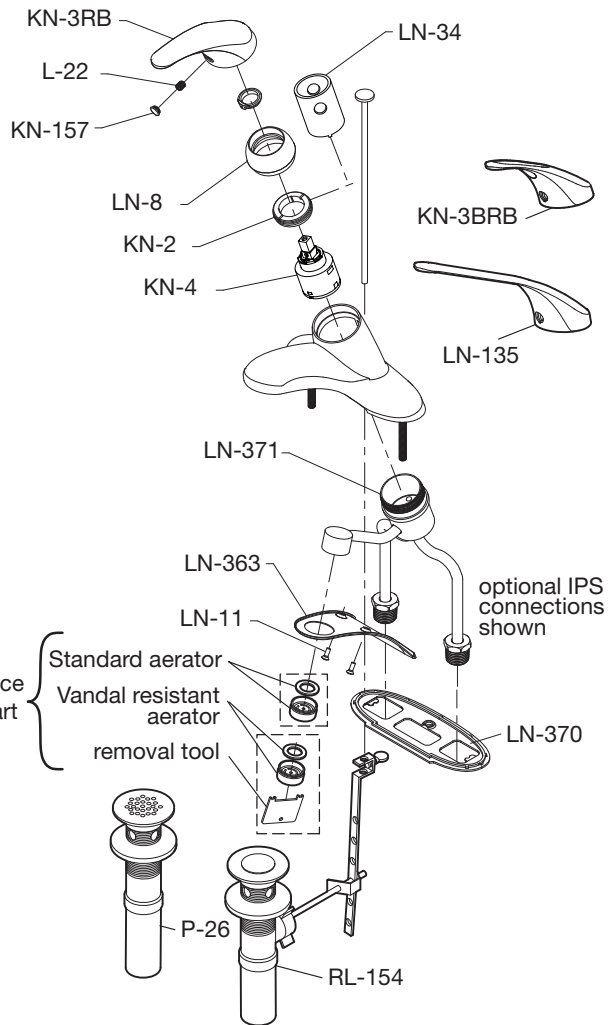


**Note:** Dimensions subject to change without notice.


## Parts Assembly Symmetrix Lavatory Faucet, S-20 Series

- KN-2      Compression ring
- KN-3RB\*   Solid handle
- KN-3BRB\*   Loop handle
- KN-4      Cartridge
- KN-23     Anchor bar (2)
- KN-26     Mounting spacer (2)
- KN-157    Plug button
- LN-8\*     Valve cap
- LN-11\*    Screw (2)
- LN-15\*    Aerator without removal key
- LN-34     Cartridge wrench
- LN-135    6" lever handle with red/blue indicators
- LN-363\*   Undercover plate
- LN-370    Mounting gasket
- LN-371    Cartridge housing assembly
- L-22      Set screw
- L-36      Mounting nut (2)
- RL-154\*   Pop-up drain assembly (complete)
- P-26      Grid drain assembly (complete)

For Decorative Finish Faucets add suffix to parts marked with an asterisk as follows:  
 Suffix -STN    Satin finish



Aerator (flow regulator)	Part Number	
	Standard Aerators	Vandal Resistant with removal tool
2.2 gpm (8.3L/min)	LN-15*	LN-101*
1.5 gpm (5.7L/min)	FLR-110-1.5*	RL-288 (non-aerated)
1.0 gpm (3.8L/min)	FLR-110-1.0*	RL-288-VP-1.0 (non-aerated)
0.5 gpm (1.9L/min)	----	LN-100*

Removal tool part number, LL-60K 



# Symmetrix®



## Lavatory Faucet S-20-BH Series Installation and Service Instructions

For California Residents

**WARNING:** This product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

**Caution:** Be sure to turn off hot and cold water supplies before installing or servicing faucet.

1. Place gasket on base of faucet then loosely install the anchor bar (KN-23), spacer (KN-26) and nut (L-36) on the mounting bolts. Push faucet supplies and anchor bolt/spacer/nut assemblies with gasket through holes in sink. Secure faucet to sink by tightening nuts from underside. (If sink or counter surface is uneven, use putty or sealant to make proper seal under base.)
2. Connect supply hoses to supply stops (left hose to hot, right to cold). Hot hose is marked with tag. Note: If the LCT handle is being used the supplies will be reversed. The right side hose will be marked hot and should cross over and be connected to the hot supply. Connect the left side hose to the cold supply.
3. **Pop-up drain installation:**
  - a) Remove pop-up plug, tail piece and flange from the drain body. Make sure that locknut is threaded all the way down onto the body with flat friction washer in middle and beveled washer on top.
  - b) Apply plumbers putty or sealant to bottom of flange.
  - c) Install drain body through drain opening in lavatory and screw flange onto the drain body making sure that the threads are completely engaged for proper sealing and strength of the connection. Apply joint compound to all threaded parts to insure proper seal. Apply putty or teflon tape to tail piece before attaching to drain body.
  - d) Tighten locknut to compress the beveled flange evenly across the bottom of the drain opening taking care not to over tighten the locknut, causing damage to the lavatory.
  - e) Remove one of two ball washers from inside the threaded cavity. Insert pop-up plug and pivot rod into body. Add one ball washer (the second ball washer should remain inside the body) to the outside of the ball. Tighten the retaining nut until the ball is seated on the internal and external ball washers. Note: The pop-up plug can be installed either in the removable or non-removable position, depending on the location of the hole located in the guide at the bottom of the plug.
  - f) Slide the pivot rod through one side of the spring clip, then the appropriate adjustment hole and then other side of the spring clip.
  - g) Insert lift rod through faucet housing and the top of the lift strap and secure it in place by tightening the screw. Note: To insure proper operation of lift rod and pop-up,

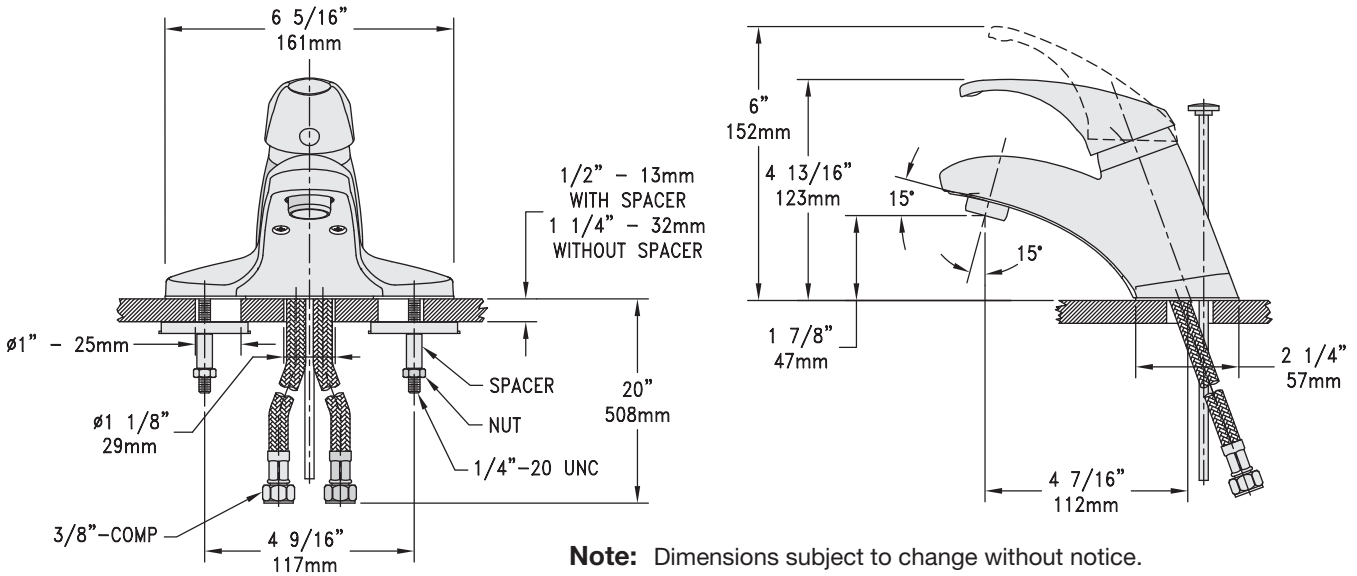
some adjustment of the linkage may be required. There are two possible adjustment points:

- 1) lift strap to lift rod and 2) lift strap to pivot rod.
4. It is very important to thoroughly flush the supply lines to prevent foreign matter, i.e. copper chips, sand, stones, etc. from damaging the sealing surfaces of cartridge. Remove aerator and turn valve handle on to full cold position, open cold supply. Without closing, turn handle to full hot and open hot supply. Let water run in hot only and cold only positions long enough to flush supply lines thoroughly. Shut off faucet and replace aerator. Check for leaks.
5. The handle limit stop can be set to limit handle turn to the hot position. The limit mechanism is factory set to allow full handle travel. To adjust the limit stop, turn handle to the full hot position and lift handle to open faucet approximately half way to obtain a smooth flow for correct initial temperature measurement.
6. If when faucet is on and in full hot position and water is too hot, shut off water, remove plug button (KN-157), loosen set screw (L-22) and remove handle (KN-3RB, KN-3BRB or LN-135) or plug button (T-33), screw (LN-171), and handle (LN-122). Lift limit stop ring using a small flat head screw driver and rotate clockwise to lower temperature. If water is not hot enough, rotate counter clockwise (See Figure 1 on reverse side). After correct temperature is achieved, reattach handle, reversing procedure above.

### Cartridge Replacement (KN-4):

1. Remove plug button (KN-157), loosen set screw (L-22) and remove handle (KN-3RB, KN-3BRB or LN-135) or plug button (T-33), screw (LN-171), and handle (LN-122).
2. Engage tabs in cartridge wrench (LN-34) with slots in compression ring (KN-2) and use screwdriver in wrench holes or pliers on wrench and turn counter clockwise until compression ring engages with cap (LN-8). Continue turning counter clockwise so that cap/ring assembly is removed from the body (LN-371BH). Remove cartridge and o-ring seal (KN-4). Install new cartridge while taking care to maintain position of the o-ring seal at the base of the cartridge. Match posts in base of cartridge with alignment holes in valve body during assembly. Reassemble faucet in reverse fashion. Thread cap onto body firmly by hand. Do not use a wrench which may damage the finish. Tighten compression ring (KN-2) finger tight using the wrench (LN-34) then 1/4 to 1/2 turn further. Set hot water limit stop in accordance with installation step 5 above.

### Dimensions Symmetrix Lavatory Faucet, S-20-2-BH (with braided supply hose)




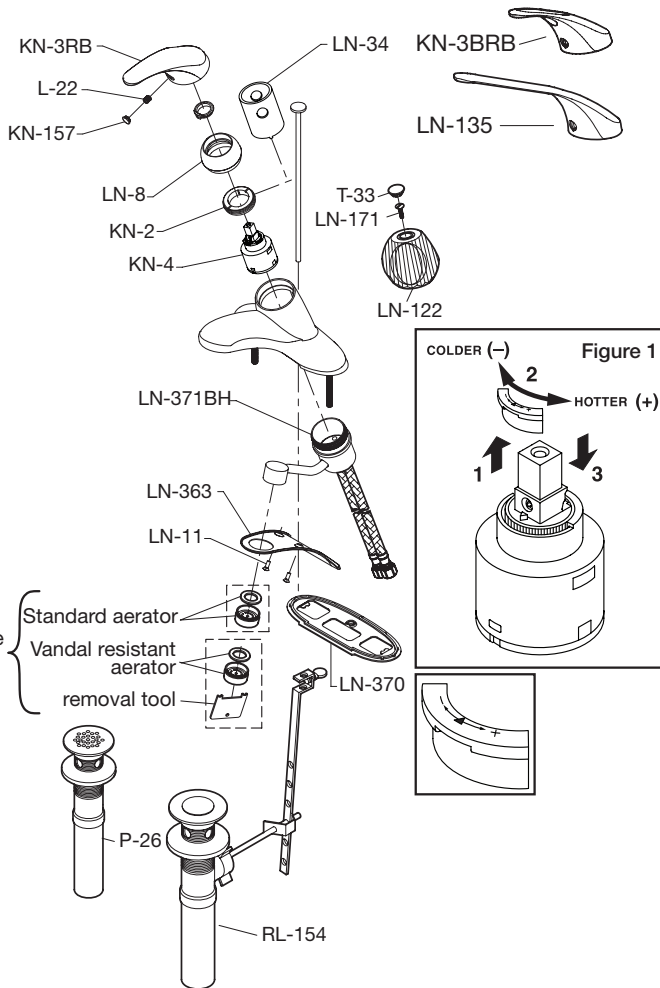
### Parts Assembly Symmetrix Lavatory Faucet, S-20-BH Series

- KN-2 Compression ring
- KN-3RB\* Solid handle
- KN-3BRB\* Loop handle
- KN-4 Cartridge
- KN-23 Anchor bar (2)
- KN-26 Mounting spacer (2)
- KN-157 Plug button
- LN-8\* Valve cap
- LN-11\* Screw (2)
- LN-34 Cartridge wrench
- LN-122 Acrylic Handle
- LN-135 6" lever handle with red/blue indicators
- LN-171 Screw
- LN-363\* Undercover plate
- LN-370 Mounting gasket
- LN-371BH Cartridge housing assembly
- L-22 Set screw
- L-36 Mounting nut (2)
- RL-154\* Pop-up drain assembly (complete)
- P-26 Grid drain assembly (complete)
- T-33 Plug button

For Decorative Finish Faucets add suffix to parts marked with an asterisk as follows:  
 Suffix -STN: Satin Nickel finish  
 Suffix -BC: Brushed Chrome finish

Reference chart

Aerator (flow regulator)	Part Number	
	Standard Aerators	Vandal Resistant with removal tool
2.2 gpm (8.3L/min)	LN-15*	LN-101*
1.5 gpm (5.7L/min)	FLR-110-1.5*	RL-288 (non-aerated)
1.0 gpm (3.8L/min)	FLR-110-1.0*	RL-288-VP-1.0 (non-aerated)
0.5 gpm (1.9L/min)	----	LN-100*
Removal tool part number, LL-60K 		



L2

MATERIAL PROVIDED BY

**Winsupply**<sup>®</sup>  
THE WINSUPPLY FAMILY OF COMPANIES

# Installation

## EXD-3N

### Express® Deck Lavatory System EXD-Series

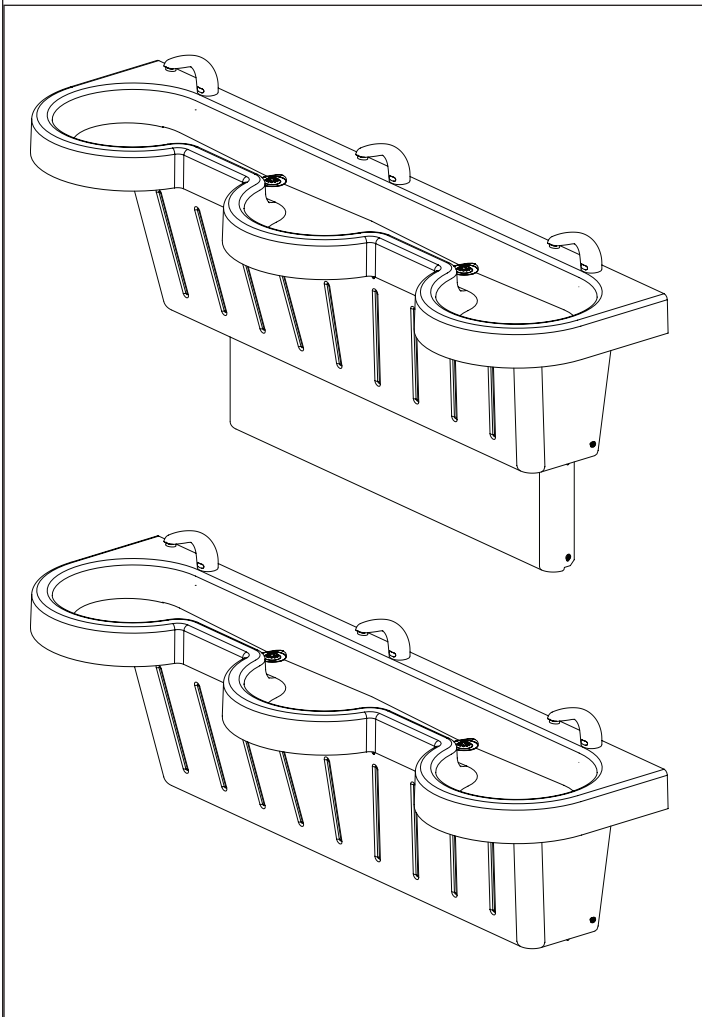
(Standard and Wall-Hung Pedestals)

Express® Decks are ADA and TAS compliant.



### Table of Contents

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 **IMPORTANT**

Read this entire installation manual to ensure proper installation, then file these instructions with the owner or maintenance department.

Flush all the water supply lines before making connections. Debris in supply lines will cause the valves to malfunction.

Turn OFF electrical power to the outlet when installing the Express® Deck.

Wall anchors used must have a minimum pull-out rating of 1,000 lbs.

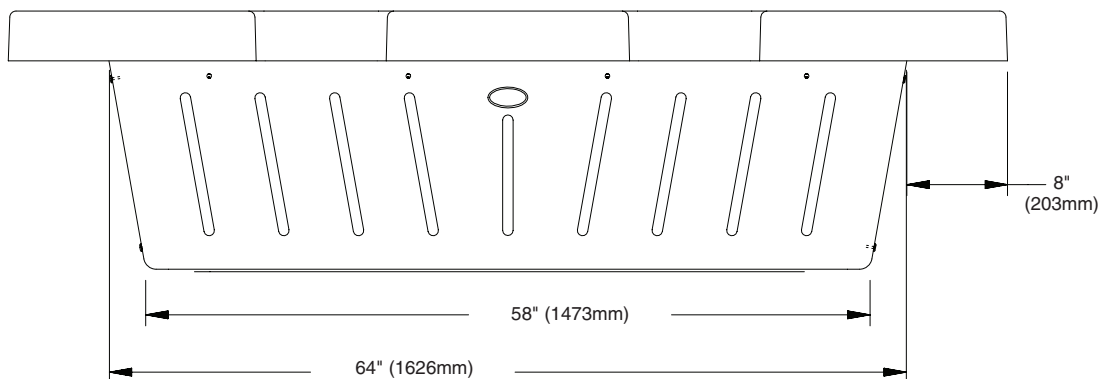
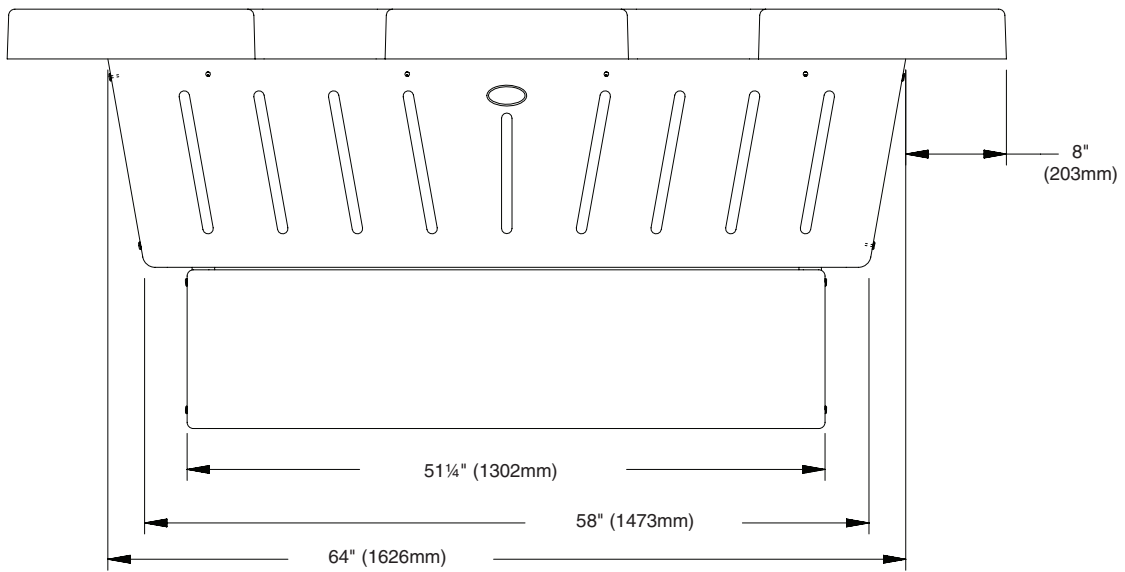
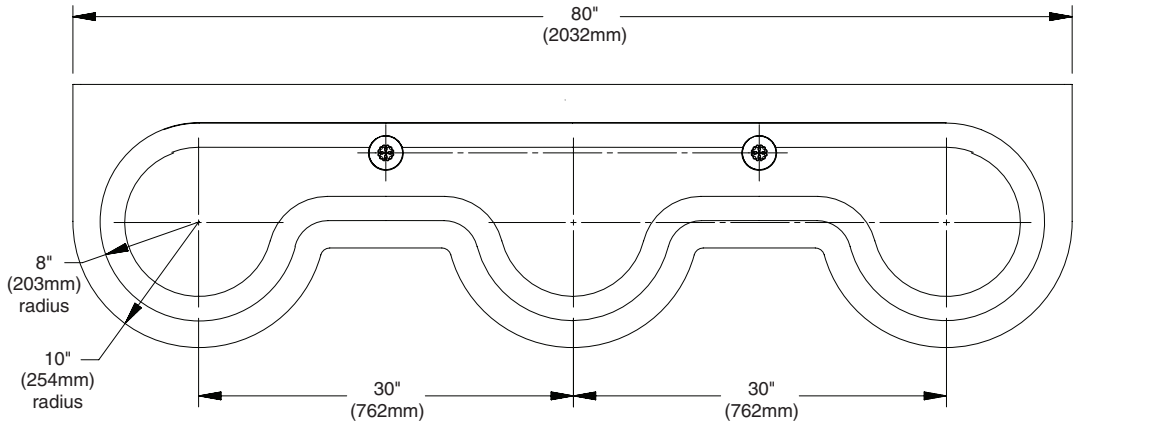
Product warranties may be found under “Product Information” on our web site at [www.bradleycorp.com](http://www.bradleycorp.com).



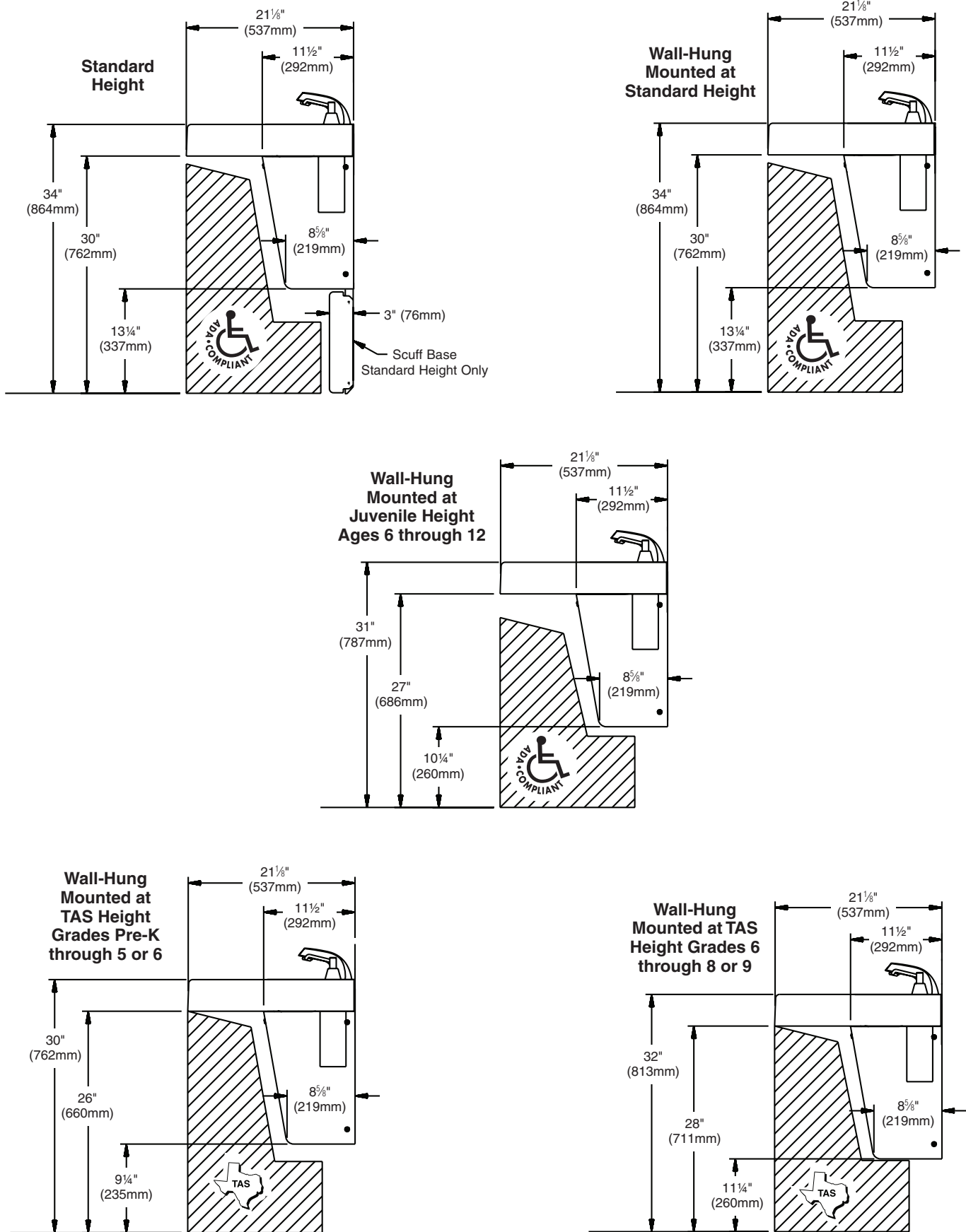
P.O. Box 309, Menomonee Falls, WI 53052-0309  
Phone: 800.BRADLEY (800.272.3539) Fax: 262.253.4161  
[bradleycorp.com](http://bradleycorp.com)

# EXD-3N/STD and EXD-3N/WH

## Express® Deck Lavatory System Dimensions



## Express® Deck Lavatory System Dimensions *continued . . .*



## Installation Instructions

### Supplies required for installation:

- (8) 3/8" wall anchors, bolts and 1" min. O.D. washers to mount main frame and bowl to wall (minimum pull-out rating of 1,000 lbs.)
- STD. HEIGHT ONLY: (2) 3/8" wall anchors, bolts and 1" min. O.D. washers to mount scuff base to wall
- 1/2" Nominal copper tubing for hot and cold supply piping
- 1-1/2" NPT drain piping
- 110 volt electrical outlet for optional 110/24 VAC plug-in transformer, if required
- (2) #10 wall anchors and fasteners for optional Navigator valve mounting
- 240/208-volt or 277-volt electrical box for optional electric tankless water heater

### Step 1: Rough in



**IMPORTANT:** Dimensions shown in Figure 1 on page 5 are for a Standard and Wall-Hung Pedestal Express® Deck only. Make sure to follow appropriate dimensions based on configuration and required rim height. See Charts 1 and 2 on page 5 before beginning rough-ins.

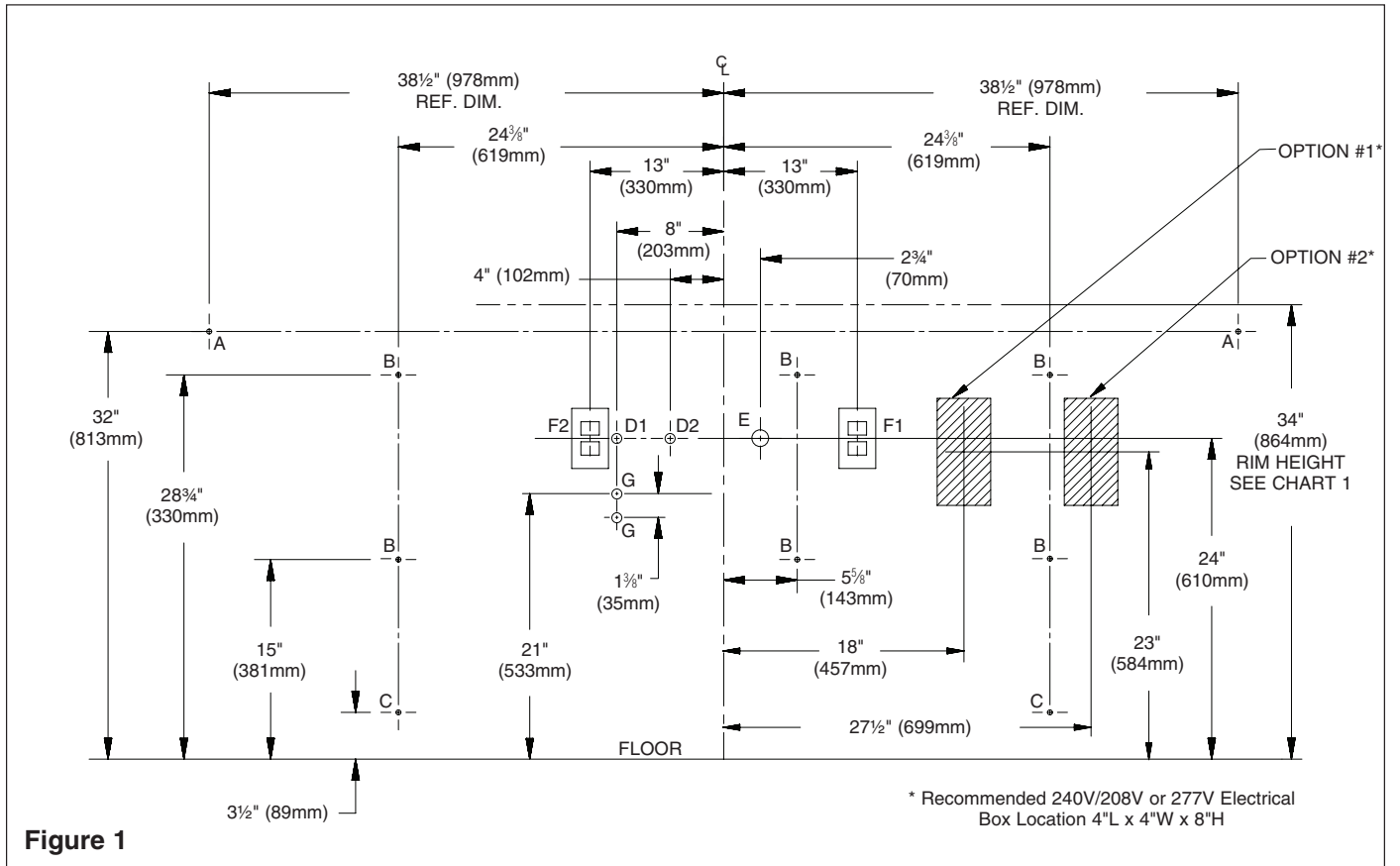
1. Rough in 1/2" nominal copper tubing hot and cold supply lines through wall at dimensions shown.
2. Rough in 1-1/2" NPT drain waste connection through wall at dimensions shown.
3. FOR OPTIONAL ELECTRIC FAUCETS: Install the 110 volt GFCI electrical outlet per local code at the location shown in Figure 1.
4. Install eight to ten 3/8" wall anchors with a minimum pull-out rating of 1,000 lbs. (supplied by installer) at the locations shown in Figure 1.
5. On the back of the bowl, measure the distance between the 3/4" bowl mounting holes. Divide this measurement in half. Measure and mark this dimension on the wall to the left of the centerline and to the right of the centerline. Install two 3/8" wall anchors with a minimum pull-out rating of 1,000 lbs. (supplied by installer) at the locations marked (ref. location "A" shown in Figure 1).

*NOTE: Wall anchors at location "C" (standard frame only) do not require a minimum pull-out rating of 1,000 lbs.*

*NOTE: The anchors will be used to mount the Express® Deck bowl and frame to the wall.*



# EXD-3N Express® Deck Lavatory System Dimensions



**CHART 1**

RIM HEIGHT	VERTICAL HEIGHT ADJUSTMENTS "A" THROUGH "F"	FIXTURE STYLE
34"	NONE	STANDARD HEIGHT
34"	NONE	WALL HUNG
32"	SUBTRACT 2"	TAS, GRADES 6 THRU 8/9
31"	SUBTRACT 3"	JUVENILE HEIGHT

**CHART 2**

CODE	DESCRIPTION	QTY.
"A"	3/8" BOWL WALL ANCHORS WITH A MINIMUM PULL-OUT FORCE OF 1,000 LBS.	2
"B"	3/8" MAIN FRAME WALL ANCHORS WITH A MINIMUM PULL-OUT FORCE OF 1,000 LBS.	8
"C"	3/8" BASE FRAME WALL ANCHORS, STANDARD FRAME OPTION ONLY.	2
"D1"	1/2" NOMINAL COPPER TUBING HOT SUPPLY, STUB OUT 2" FROM WALL	1
"D2"	1/2" NOMINAL COPPER TUBING COLD OR TEMPERED SUPPLY, STUB OUT 2" FROM WALL	1
"E"	1-1/2" NPT DRAIN, STUB OUT 2" FROM WALL	1
"F1"	110V GFCI PROTECTED ELEC. OUTLET (PRIMARY FOR OPT'L ELECTRONIC FAUCETS)	1
"F2"	110V GFCI PROTECTED ELEC. OUTLET (SECONDARY FOR OPT'L ELECTRONIC FAUCETS)	1
"G"	#10 WALL ANCHORS/FASTENERS FOR OPTIONAL NAVIGATOR® VALVE MOUNTING	2

## Installation Instructions *continued* . . .

### Step 2: Mounting frame to wall

1. Using a T20 Torx key, remove the eight #10-24 flat head Torx screws and #10 finish washers securing the access panel to the main frame, and remove the panel (see Figure 2).

2. Position the frame against the wall, ensuring that it is level.



**IMPORTANT: Anchoring the frame to a wall that is *not* flat may cause the frame to bend.**

3. Ensure that the back of the frame is flat against the wall.

4. Once you have positioned the frame such that it is level (and resting on the floor, standard height frame only) and flat against the wall, use the 3/8" bolts and 1" min. O.D. washers to mount the frame to the wall (Figure 3).

5. When mounting the standard height frame, mount the scuff base to the wall at the same time (using two additional 3/8" bolts and washers mentioned in Step 1, procedure #3 on page 5) (see Figure 3).

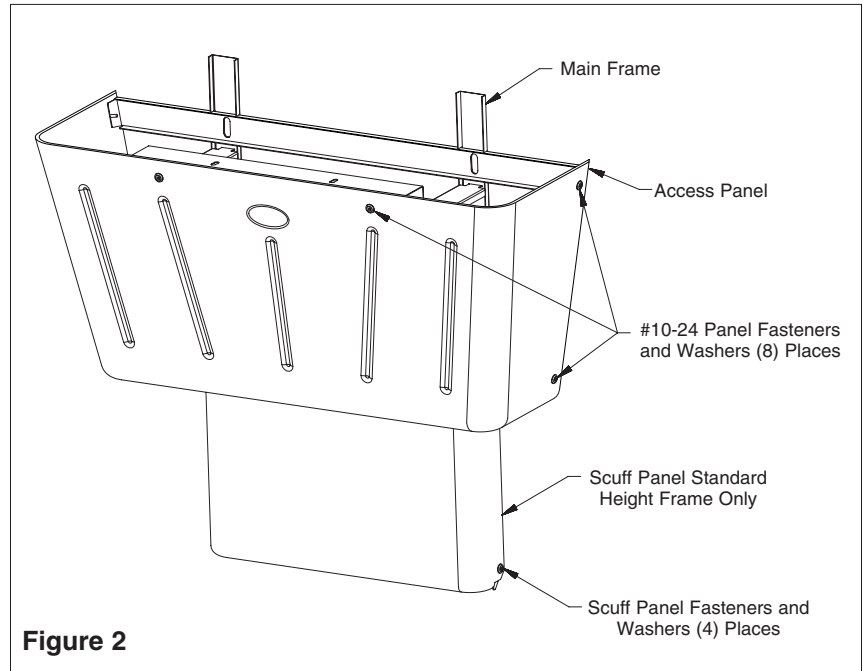


Figure 2

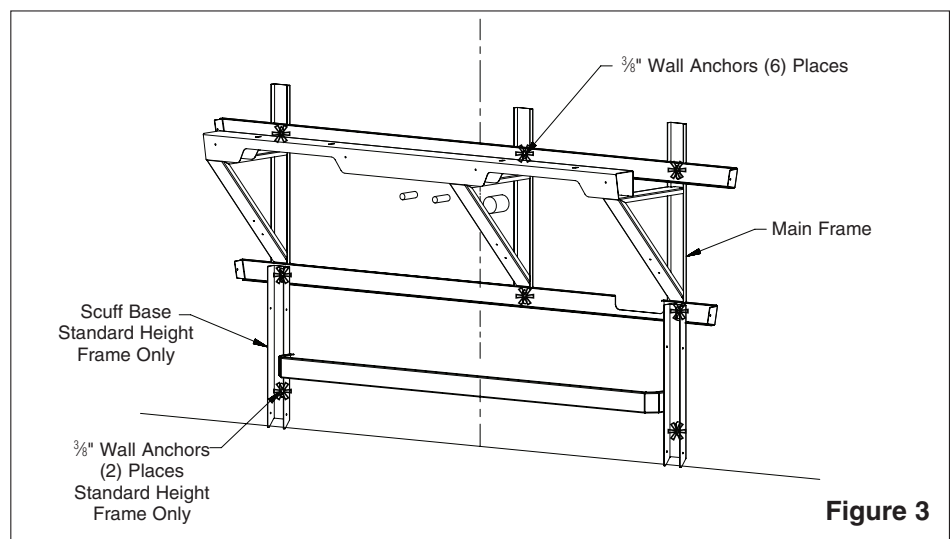


Figure 3

## Installation Instructions *continued* . . .

### Step 3: Installing bowl

- WARNING:** To prevent serious injury and/or damage to the bowl, move and position the bowl with the assistance of another person and always use appropriate lifting procedures.

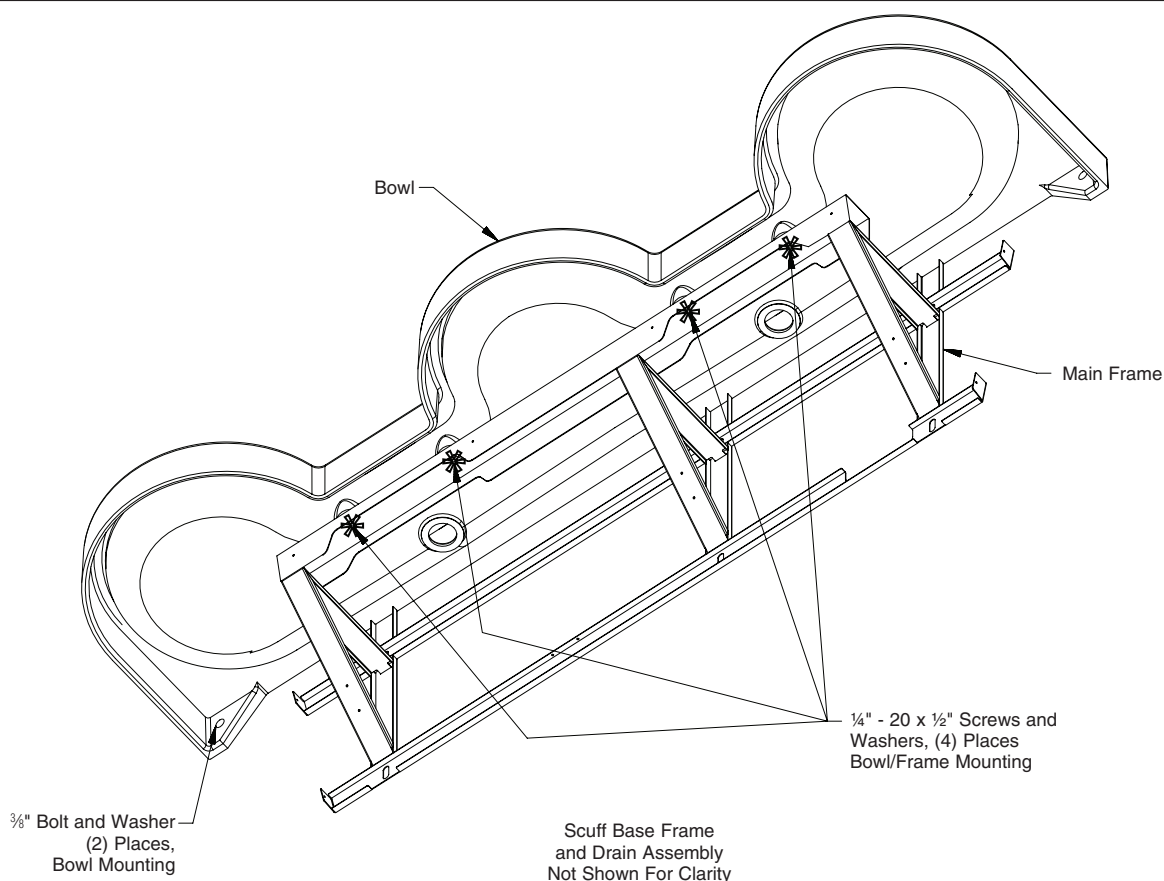
*NOTE:* Refer to Figure 4 below when installing the bowl.

*NOTE:* The tailpiece on the waste tee has been rotated upward for shipping purposes. Turn the tailpiece down to its proper position before installing the bowl.

1. With someone to assist you, place the bowl squarely onto the frame.
2. Attach the front underside of the bowl to the frame using the four 1/4"-20 x 1/2" pan-head screws and washers provided. **Do not tighten bolts at this time.**

- IMPORTANT:** When bolting the bowl to the frame and wall, do not overtighten bolts. Overtightening bolts can damage the Terreon® material.

3. After the bowl is attached to the frame, use 3/8" bolts and 1" min. O.D. washers (supplied by the installer) to bolt the bowl to the wall anchors, two places.
4. Tighten the screws installed in procedure #2 above to secure the bowl to the frame. **Do not overtighten.**



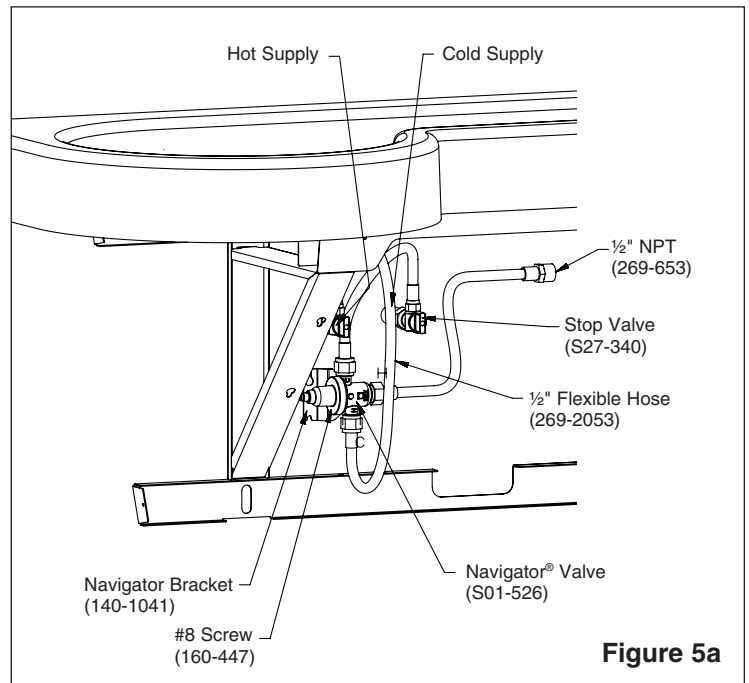
**Figure 4**

## Installation Instructions *continued* . . .

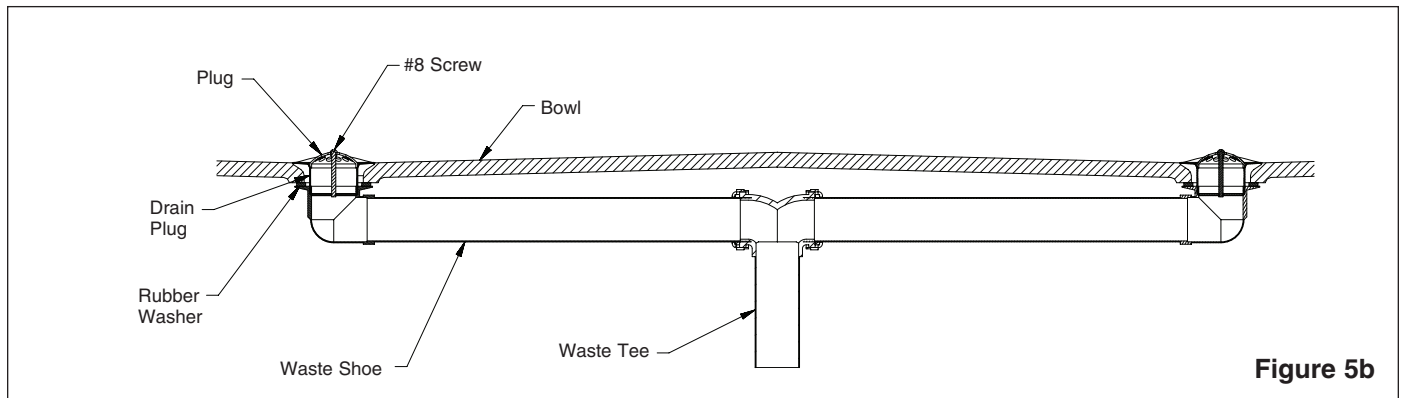
### Step 4: Connecting supply and drain

**NOTE:** Refer to Figure 5c for optional tempered supply connections.

1. Connect the Navigator® Thermostatic Mixing Valve as shown in Figure 5a.
2. Install two drain plugs in the two holes in the bottom of the bowl (refer to Figure 4 on page 7).
3. Beneath the bowl, install the 1/8" rubber washers onto the drain plugs, and thread the waste tee to the drain plugs (Figure 5b).
4. Connect the 1-1/2" tubular pipe to the waste tee and to the 1-1/2" drain pipe stubbed out of the wall.
5. Install strainers on the drain plug openings inside the bowl using the #8 screws.



**Figure 5a**



**Figure 5b**

## Installation Instructions *continued* . . .

### Step 5: Connecting optional hot water heater

**☑ WARNING:** To avoid personal injury or damage to the unit when installing the water heater, make all plumbing connections first, then proceed with the electrical connections.

*NOTE: 240/208 or 277 voltage is required for hot water heater. Refer to the installation manual provided with the hot water heater for further installation information.*

1. Remove the cover from the water heater. Attach the bracket to the cover with the two screws, nuts and washers, then reattach the cover (see Figure 6a).
2. Hang the water heater on the right side frame member (see Figure 6b).
3. Connect the 1/2" flexible hose from the cold water supply stub-out to the hot water heater inlet.
4. Connect the 1/2" flexible hose from the hot water heater outlet to the supply inlet on the solenoid valve assembly.

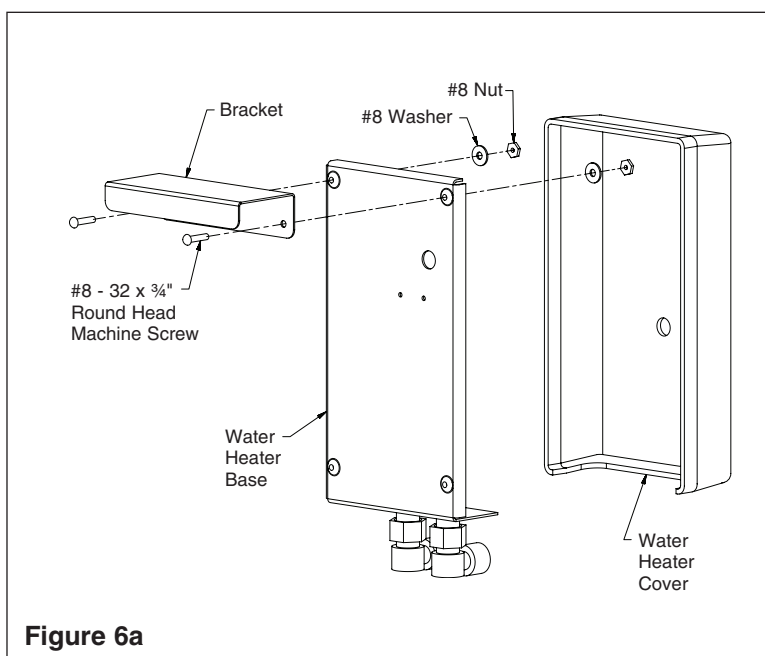


Figure 6a

### Step 6: Completing installation

1. Install the faucets according to the installation instructions that came with your faucets.
2. Turn on the water supply to the Express® Deck and check for leaks.
3. **FOR DECKS WITH INFRARED FAUCETS ONLY:** Turn on the electrical power to the electrical outlet and pass your hand in front of each faucet's sensor until all the air is purged from the lines and water is flowing smoothly.

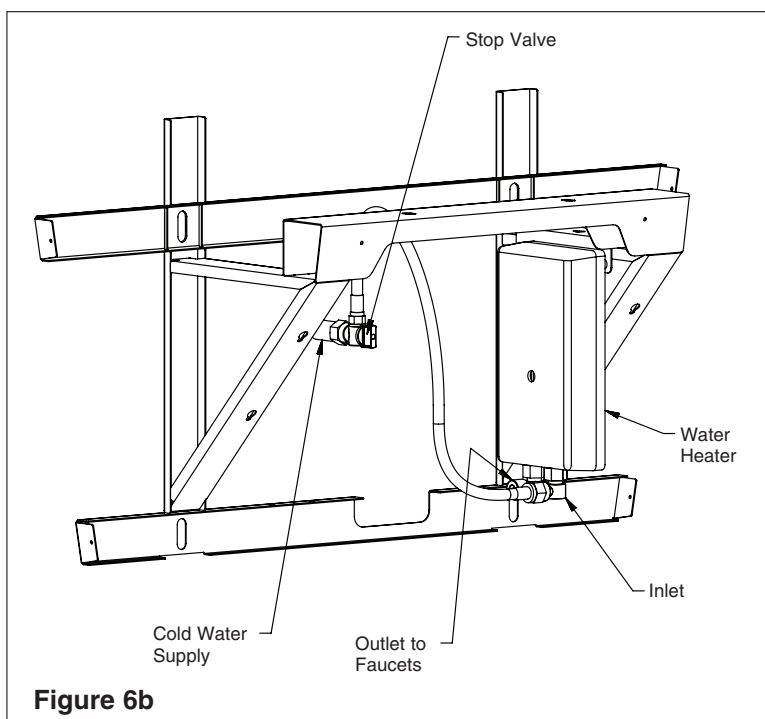


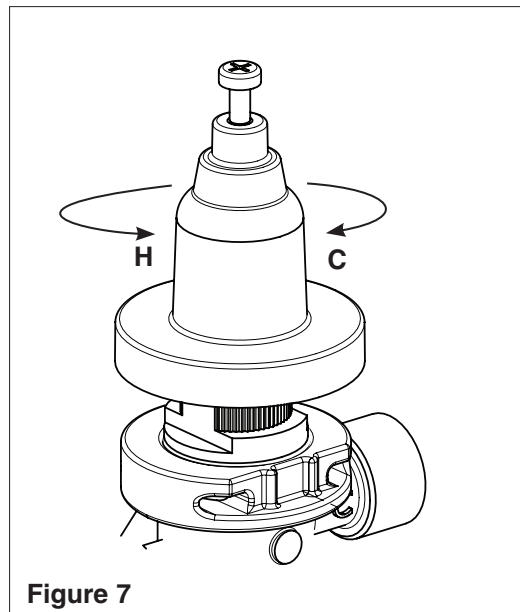
Figure 6b

## Installation Instructions *continued* . . .

### Step 7: Adjust the Temperature

**NOTE:** This valve is **NOT** factory preset. Upon installation, the temperature of this valve must be checked and adjusted to ensure delivery of a safe water temperature. Water in excess of 110°F (43°C) may cause scalding.

1. Loosen the cap screw about ¼" (4–6 turns) and lift up the cover (do not remove).
2. Using the cover, turn the cartridge gently until desired water temperature is reached. Do not turn past stops as this may damage the unit. Push the cover down and tighten the screw.
3. After testing is complete, reinstall panel to frame. Fasten panel with eight Torx-head screws provided (see Figure 2 on page 6).



## Cleaning and Maintenance Instructions



**IMPORTANT:** Strong alkaline or acid-based chemicals and cleansers should not be used to clean Terreon®. If these chemicals come in contact with the Terreon® surface, wipe off the surface immediately and flush with soapy water.

### Terreon® and panel maintenance

The bowl is constructed of Terreon®, a densified solid surface material composed of an acrylic modified polyester resin. Terreon® is resistant to chemicals, stains, burns and impact. Surface damage can be easily repaired with everyday cleaners or fine grit abrasives. The panel is made of an acrylic/ABS laminate, and will not chip, peel or flake. With regular cleaning, your Terreon® fixture will provide years of dependable service.

### Cleaning

- **Daily Cleaning:** Wipe the surface with a damp cloth and wipe dry.
- **Weekly Cleaning:** Wipe the surface with a damp cloth and a household liquid detergent. Stubborn stains can be removed as follows:
  1. Using a #7448 Scotch-Brite® pad, scrub with an abrasive cleanser such as Ajax®, Comet® or Soft Scrub® and water.
  2. Clean thoroughly with soapy water and allow to dry.
- **Scorch Marks:** Although Terreon® will not burn, a lit cigarette in contact with Terreon® could leave a scorch mark. Scorch marks can be removed by buffing with a #7448 Scotch-Brite pad or with an abrasive cleaner.
- **Repair kit:** In the unlikely event your Terreon® surface becomes damaged, it can easily be repaired. Contact your Bradley representative to order a repair kit and be sure to specify color when ordering.

### Panel cleaning

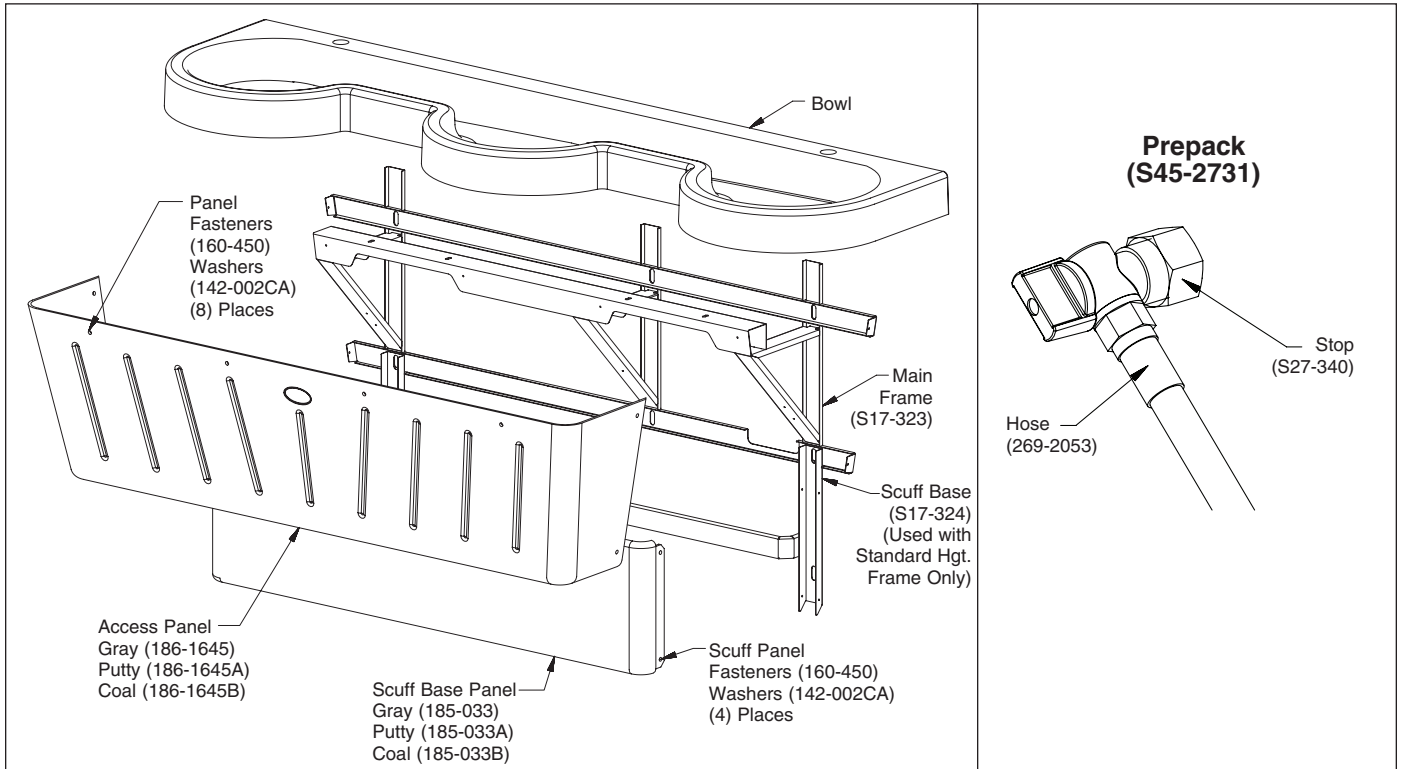


**IMPORTANT:** Do not use abrasive cleansers to clean the panel. Abrasive cleaners can mar the surface.

- **Graffiti/Vandalism:** If vandals create markings on the panel, Bradley recommends using Motsenbocker's LIFT OFF® to remove ink and spray paint. Remover #3 is for ink and markers, and Remover #4 is for spray paint. Motsenbocker's LIFT OFF® can be ordered through Sanitary Maintenance Service Inc. (call 1-800-451-5523 x 425 or visit [www.sanitarymaintenance.com/product.htm](http://www.sanitarymaintenance.com/product.htm) for ordering information). After cleaning with LIFT OFF®, give the panel a final thorough cleaning with a liquid tub and tile cleaner to remove soil and maintain the glossy finish.

*NOTE: Use of brand names is intended only to indicate a type of cleaner. This does not constitute an endorsement, nor does the omission of any brand name cleaner imply its inadequacy. Many products named are regional in distribution and can be found in local supermarkets, department and hardware stores or through your cleaning service. It is emphasized that all products should be used in strict accordance with package instructions.*

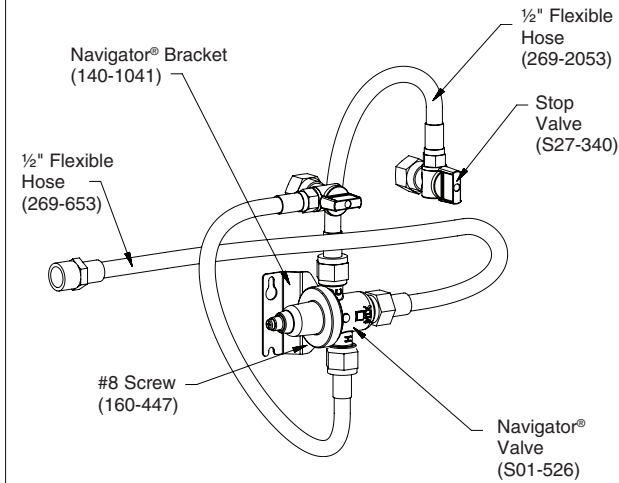
# Assembly of Components



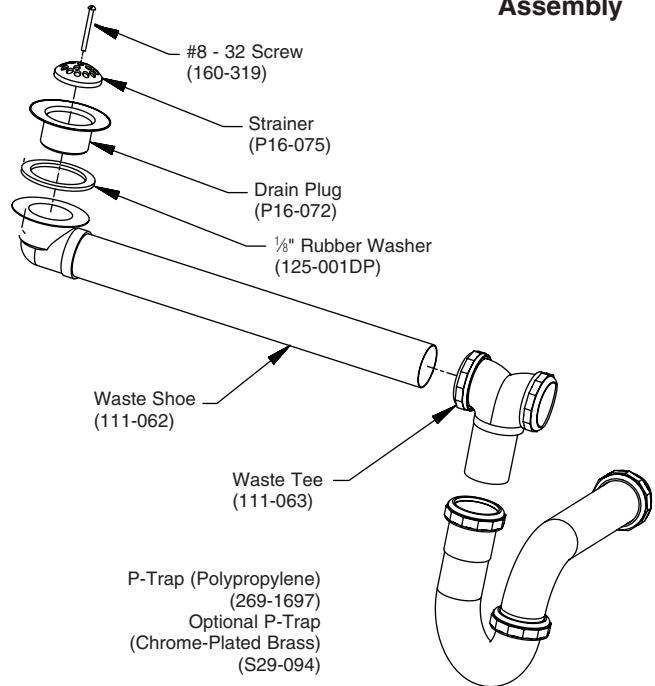
## Bowl Mounting Hardware



## Navigator® Valve Assembly



## Drain Assembly



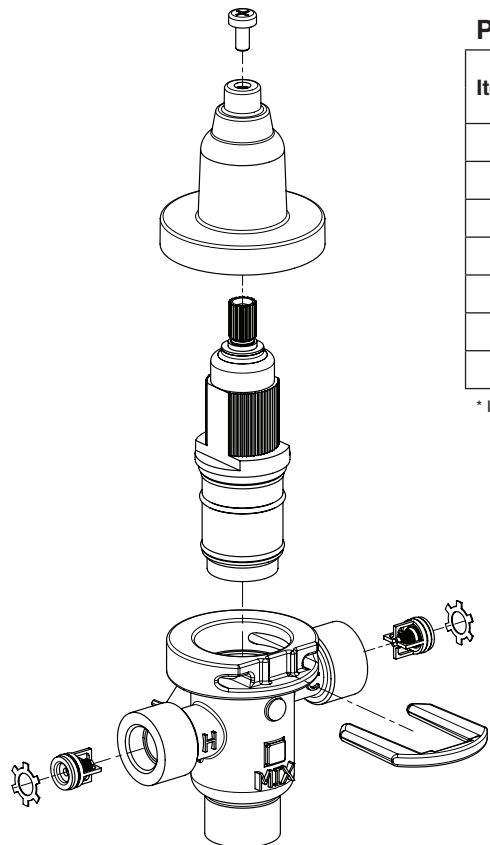


Installation

### Thermostatic Mixing Valve Troubleshooting

- ⚠** Before attempting to troubleshoot the valve or disassemble the components, check for the following conditions:
- If stop valves are used, make sure that they are fully open.
  - Make sure that the hot and cold inlet pipes are connected properly, and that there are no cross-connections or leaking stop valves.
  - Check the hot water heater output to make sure that it is at least 10° F above the set temperature.
- ☑** Be sure to close the appropriate shut-off valves prior to disassembly of the valve and reopen the valves after inspection and repair is complete.

Problem	Cause	Solution
External leaks.	Damaged cartridge or O-rings.	Replace cartridge with part number 269-1927
Improper water temperature or temperature fluctuation.	Hot water supply is not 10° above desired set point.	Increase hot water supply temperature
	Valve temperature is not properly set.	Adjust the temperature as shown on page 10, step 7.
Limited water flow.	Dirt and debris have built up in the valve or strainer.	1. Check to make sure both hot and cold supplies are connected to the Navigator mixing valve and that they have water flow.  2. Remove cover and U-clip. Remove the cartridge and clean the strainer. It is not required to grease cartridge, however if desired, use silicone grease only. Do not use grease on check valves.



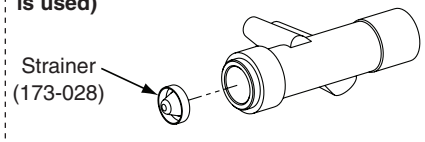
#### Parts List

Item	Part No.	Description	Quantity		
			S59-4000	S59-4000A	S59-4000BY
1	160-463	Cap Screw	1	1	1
2	107-582	Cover	1	1	1
3	269-1927	Thermostatic Cartridge	1	1	1
4	198-014	Check Valve*	2	2	2
5	132-051	Retaining Ring*	2	2	2
6	118-319	Valve Body	1	1	1
7	146-079	U-Clip	1	1	1

\* Included with Prepack S65-326

#### Tempered Line Adapter Option Part no. S39-804

(replaces S59-4000 if tempered line is used)



## INSTALLATION INSTRUCTIONS FOR OPTIMA SENSOR ACTIVATED LAVATORY FAUCETS WITH THE OPTIMA CONTROL BOX

### DECK MOUNTED OPTIMA FAUCETS



**ETF-600** Low-height, hardwired  
**EBF-650** Low-height, battery

**ETF-610** Low-height, hardwired  
**EBF-615** Low-height, battery

**ETF-660** Low-height, hardwire with side sensor  
**EBF-665** Low-height, battery w/side sensor

**ETF-80** Mid-height, hardwired  
**EBF-85** Mid-height, battery

**ETF-880** Mid-height, hardwired  
**EBF-187** Mid-height, battery

### GOOSENECK DECK MOUNTED OPTIMA FAUCETS



**ETF-770** Hardwired with side sensor  
**EBF-775** Battery with side sensor

**ETF-700** Hardwired  
**EBF-750** Battery

**ETF-700-S** Hardwired with surgical bend  
**EBF-750-S** Battery with surgical bend

### WALL MOUNTED OPTIMA FAUCETS



**ETF-500** Hardwired  
**EBF-550** Battery

**ETF-500-S** Hardwired with surgical bend  
**EBF-550-S** Battery with surgical bend

**ETF-800** Hardwired  
**EBF-850** Battery

### CONTROL BOX FOR ALL FAUCETS



Control Box w/o Turbine  
EFP-39-A



Control Box w/ 0.5 gpm Turbine  
EFP-40-A



Control Box w/1.5 gpm Turbine  
EFP-11-A

### TABLE OF CONTENTS

• Prior To Install.....	2.	• Deck Mounted Rough-in .....	4.
• Mixing Valve Installation .....	2.	• Wall Mounted Rough-in.....	5.
• Important .....	2.	• Dimensional Data .....	5.
• Quick Connect Tee.....	2.	• Troubleshooting Instructions .....	7.
• Tools Required.....	2.	• Care and Cleaning Instructions.....	8.

#### LIMITED WARRANTY

Unless otherwise noted, Sloan Valve Company warrants this product, manufactured and sold for commercial or industrial uses, to be free from defects in material and workmanship for a period of three (3) years (1 year for SF faucets, special finish and PWT electronics and 30 days on PWT software) from date of first purchase. During this period, Sloan Valve Company will, at its option, repair, replace, or refund the purchase price of any product which fails to conform with this warranty under normal use and service. This shall be the sole and exclusive remedy under this warranty. Products must be returned to Sloan Valve Company, at customer's cost. No claims will be allowed for labor, transportation or other costs. This warranty extends only to persons or organizations who purchase Sloan Valve Company's products directly from Sloan Valve Company for purpose of resale. This warranty does not cover the life of the battery.

**THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. IN NO EVENT IS SLOAN VALVE COMPANY RESPONSIBLE FOR ANY CONSEQUENTIAL DAMAGES OF ANY MEASURE WHATSOEVER.**

**PRIOR TO INSTALLATION**

Prior to installing the Sloan Optima Faucet, install the items listed below. Also, refer to rough-in illustrations on pages 4 and 5.

- Lavatory/sink
- Drain line
- Hot and cold water supply lines or pre-tempered water supply line

**MIXING VALVE**

When installing the faucet with a Sloan mixing valve, these Installation Instructions AND the Installation Instructions packaged with the mixing valve **MUST** be followed.

**IMPORTANT**

- **ALL PLUMBING SHOULD BE INSTALLED IN ACCORDANCE WITH APPLICABLE CODES AND REGULATIONS.**
- **FLUSH ALL WATER LINES PRIOR TO MAKING CONNECTIONS.**
- **KEEP THREAD SEALANT OUT OF YOUR WATERWAY TO PREVENT COMPONENT PART DAMAGE! DO NOT USE ANY SEALANT ON COMPRESSION FITTINGS.**

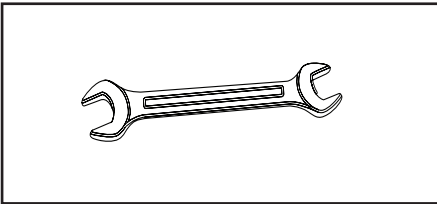
**QUICK CONNECT BAK CHEK® FILTER TEE USAGE**

A QUICK CONNECT BAK-CHEK® FILTER TEE MUST BE USED WITH EACH INSTALLATION.

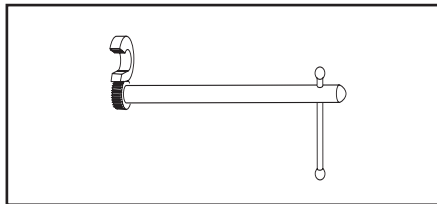
When connecting a Sloan Optima Faucet to both hot and cold water supplies, a two inlet Quick Connect Bak-Chek® Filter Tee is provided and required as illustrated. Water temperature can be controlled by adjusting the supply stops. When connecting the faucet to a single line water supply or a pre-tempered water supply, a single inlet Quick Connect Bak-Chek® Filter Tee must be used. A Quick Connect Bak-Chek® Filter Tee must also be used when a Temperature Mixing Valve is included with the faucet.

**TOOLS REQUIRED FOR INSTALLATION**

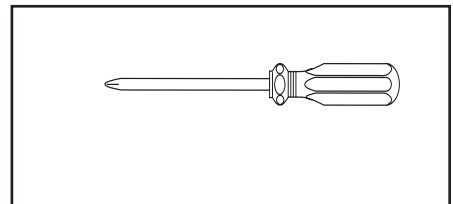
Gather the required tools and parts before starting installation. Additional parts may be required, depending on your installation. Check local codes. Check existing electrical supply.



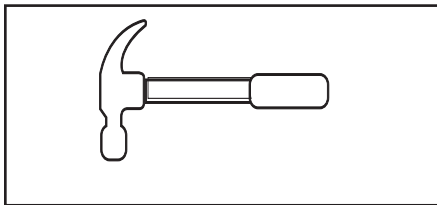
1. Open end wrenches for hex sizes: 1/2", 9/16", 5/8", 15/16"



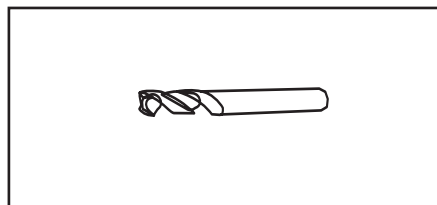
2. Basin wrench



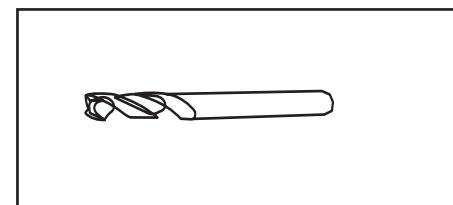
3. Phillips head screwdriver, #2



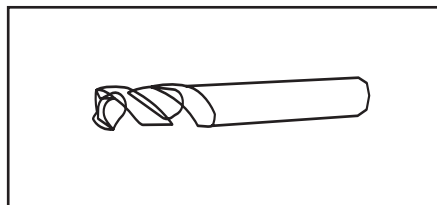
4. Hammer (if installing plastic or hollow wall anchors to mount valve module)



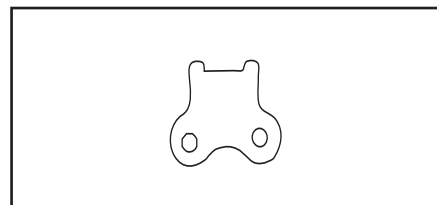
5. 1/4" drill bit (if plastic wall anchors are used to mount valve module)



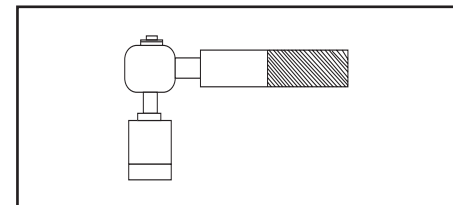
6. 5/16" drill bit (if hollow wall anchors are used to mount valve module)



7. 3/8" drill bit (if toggle nut anchors are used to mount valve module)

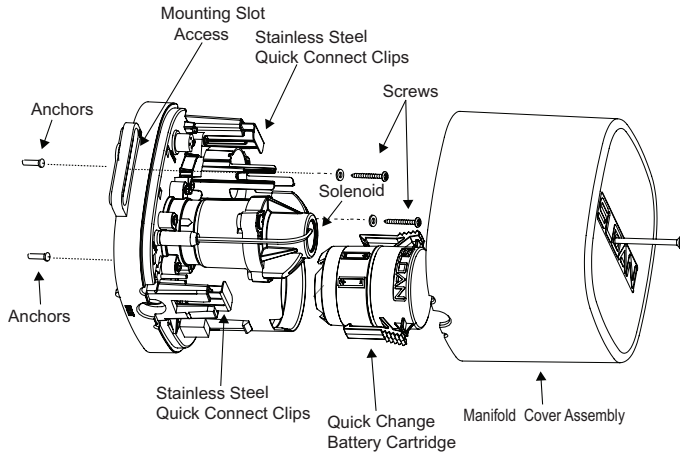


8. Spray head key (supplied with some models)



9. 13 mm Socket

**MANIFOLD INSTALLATION**

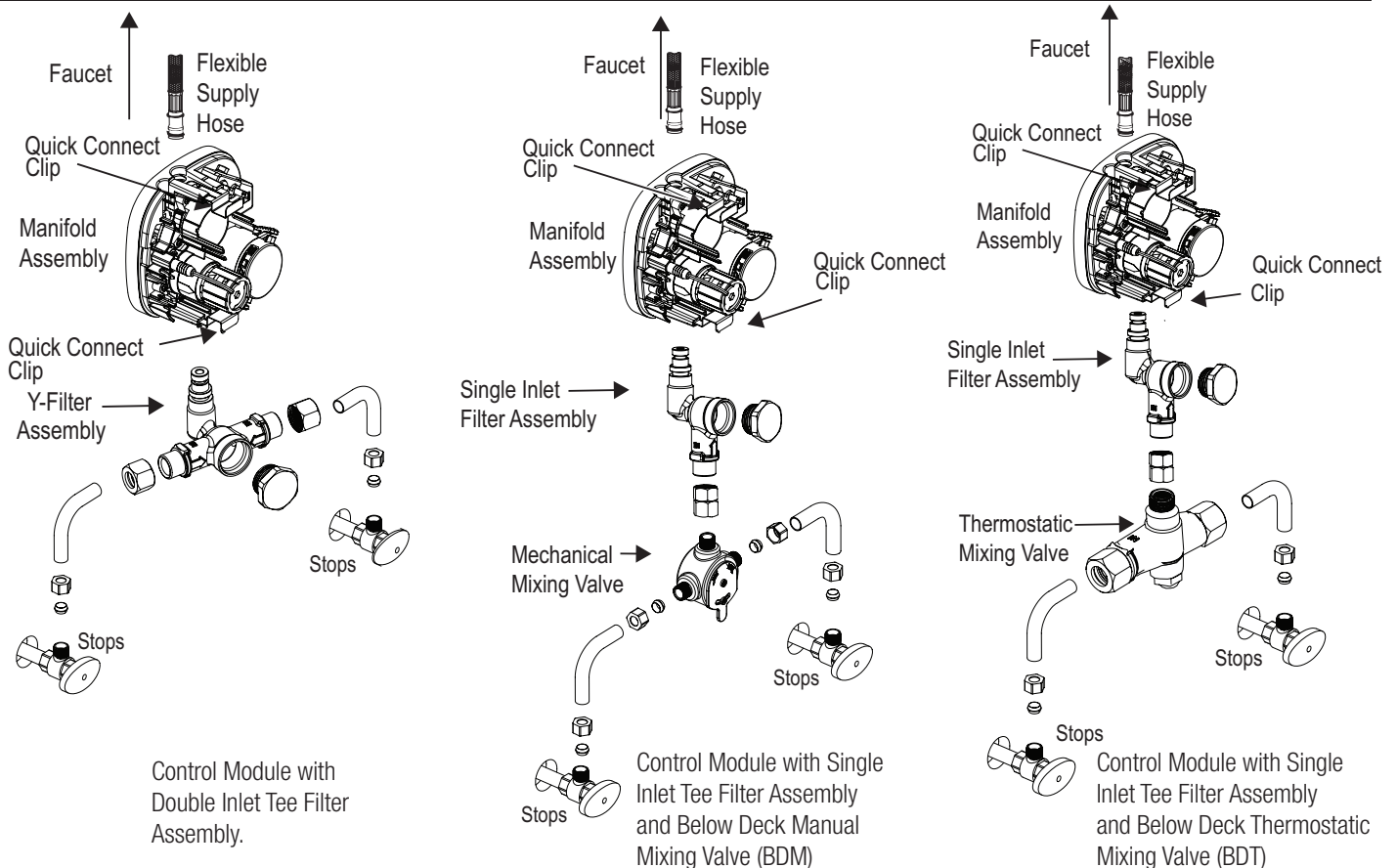


- A.** Ensure there is enough clearance for the flexible supply hose from the spout to connect to the control module
  - B.** Secure control module to wall using the included mounting accessories. The control module must be mounted on a level vertical surface with the Sloan logo on the manifold facing outwards on the top right side of the manifold. Do not mount the manifold in any other position.
  - C.** Insert the flexible supply hose from the bottom of the spout into the top of the mounted manifold. Insert the Filter "T" fitting into the bottom of the mounted manifold. Ensure that the stainless steel clips on both the top and bottom of the manifold are secured.
- NOTE: NEVER OPEN STAINLESS STEEL CLIPS WHEN WATER SUPPLY IS TURNED ON.**

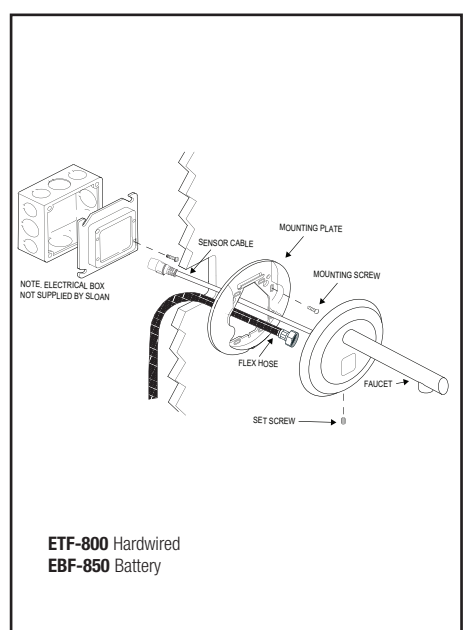
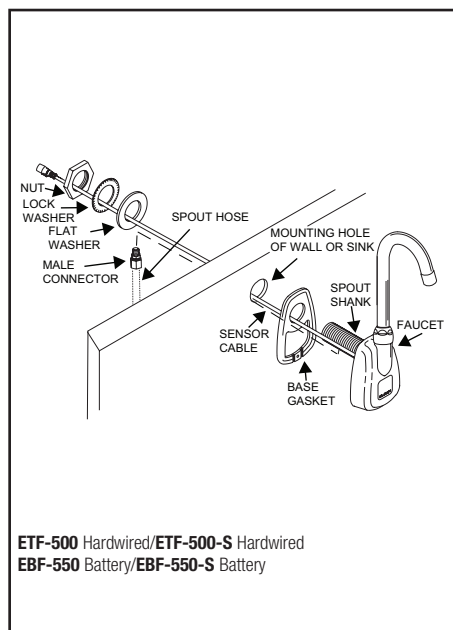
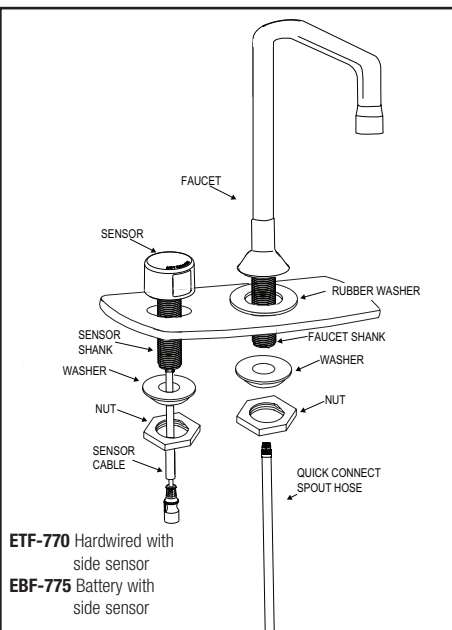
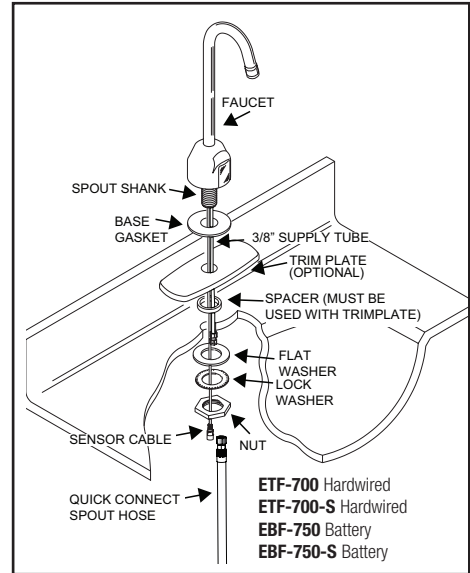
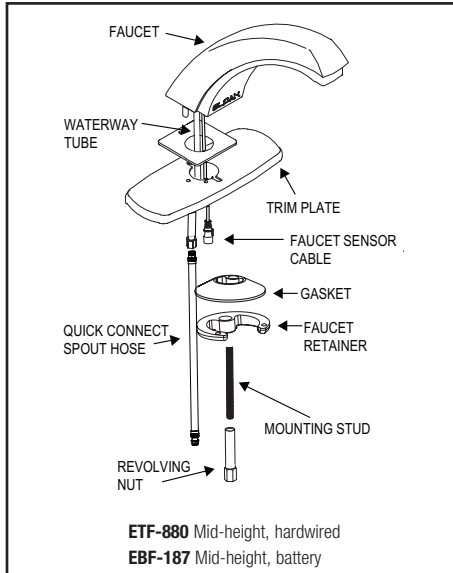
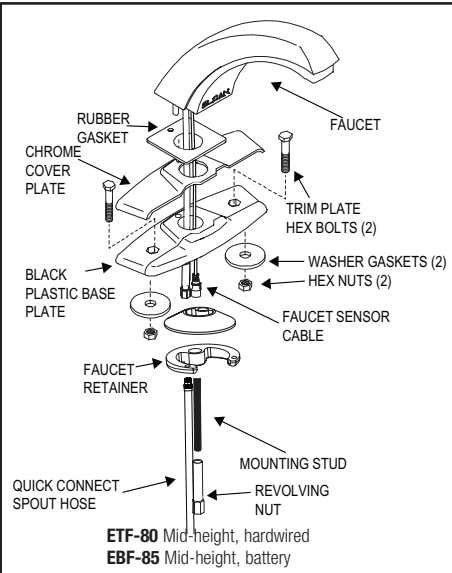
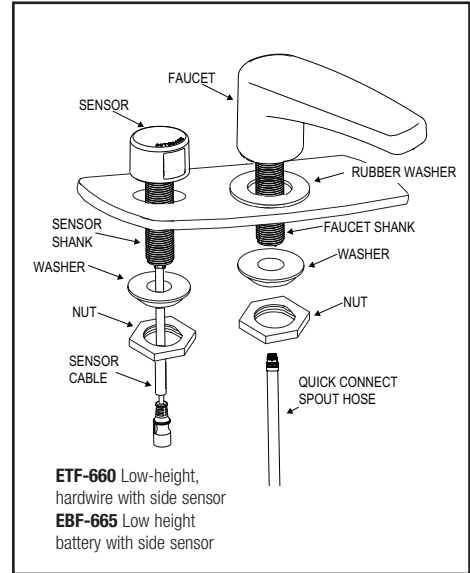
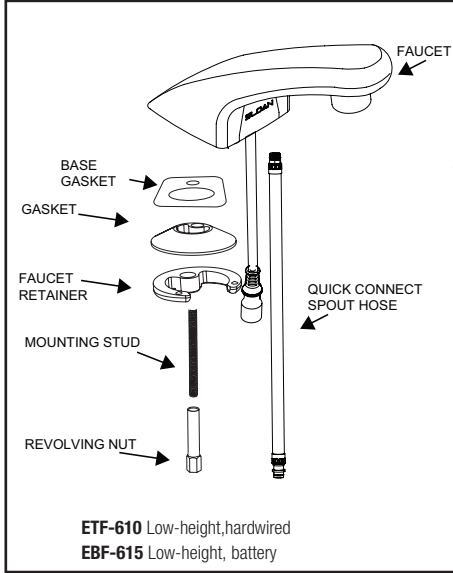
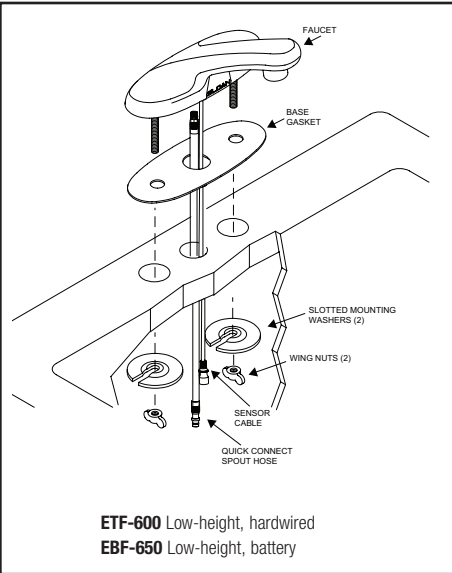
**NOTE: FOR UNITS WITH TURBINES, USE ONLY 0.5GPM / 1.9 LPM CONTROL BOXES WITH SPOUTS RATED FOR THE SAME FLOW AND USE ONLY 1.5 GPM / 5.7 LPM CONTROL BOXES WITH SPOUTS RATED FOR THAT SAME FLOW. DO NOT USE THESE CONTROL BOXES ON ANY OTHER FLOW RATES. CONTROL BOXES WITHOUT TURBINES MAY BE USED WITH ANY SPOUT UP TO 2.2 GPM / 8.3 LPM**


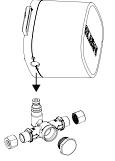
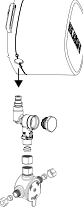
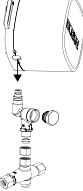
- D.** Connect water supply lines from the stops to the Filter "T" fitting. If a mixing valve is being used, connect water supply lines to the mixing valve. Connect the mixing valve to the single inlet filter tee using the supplied fitting.
- E.** Attach sensor cable and solenoid cable to the appropriate connections on the manifold.
- F.** Insert the battery assembly.
- G.** This unit can use 4 (AA) batteries alone, or accept 6 VDC or 24 VAC power to function as a hardwired unit with battery back up.
- H.** If a 6 VDC plug-in transformer is used, plug it into the appropriate connection on the manifold to convert the faucet into a "plug-in with battery back-up".
- I.** If 24 VAC hardwires are being used, use the supplied adapter piece to connect the wires to the appropriate connection on the manifold.
- J.** If the unit contains an optional turbine, connect the plug from the turbine assembly into the appropriate connection on the manifold.
- K.** If ganging multiple units in a "daisy chain" configuration to a single power supply use the SFP35 gang adapter kit.
- L.** Inspect and tighten all connections. Place the manifold cover onto the unit.
- M.** Turn on water.



**BELOW DECK CONFIGURATION**



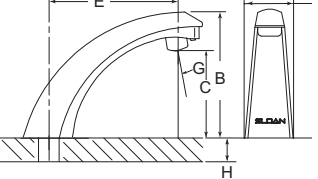
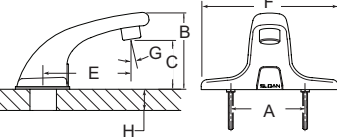
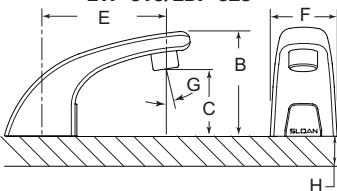
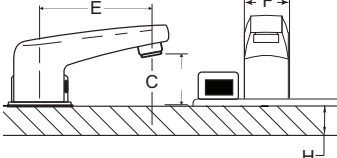
**DECK MOUNTED INSTALLATIONS**



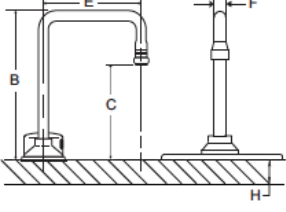
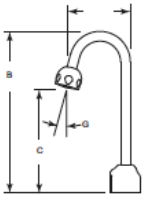
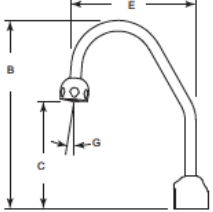
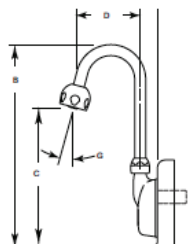
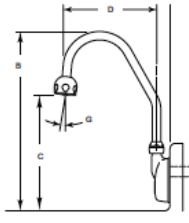
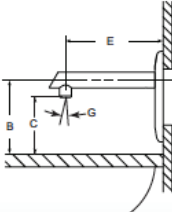
BELOW DECK CONTROL ROUGH-IN DIMENSIONS				
OPTIMA CONTROL BOX	MODEL IMAGE	HEIGHT	WIDTH	DEPTH
OPTIMA CONTROL BOX		5" (127 mm)	6" (163 mm)	4 1/2" (115 mm)
OPTIMA CONTROL BOX WITH DOUBLE INLET FILTER TEE		6 1/4" (159 mm)	6" (153 mm)	4 1/2" (115 mm)
OPTIMA CONTROL BOX WITH SINGLE INLET FILTER TEE AND BDM (MIX60)		10 1/8" (258 mm)	6" (153 mm)	4 1/2" (115 mm)
OPTIMA CONTROL BOX WITH SINGLE INLET FILTER TEE AND BDT (MIX135)		10 3/4" (274 mm)	6" (153 mm)	4 1/2" (115 mm)

QUICK CONNECT HOSE/SENSOR CABLE LENGTHS		
	QUICK CONNECT SPOUT HOSE LENGTH	SENSOR CABLE LENGTH
		
DECK MOUNTED MODELS	24" (610 mm)	28" (711 mm)
WALL MOUNTED MODELS	36" (914 mm)	36" (914 mm)

**DECK MOUNTED FAUCET MODEL ROUGH-IN DIMENSIONS (WITHOUT TRIMPLATE)**

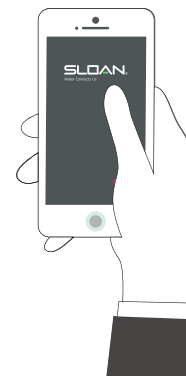
FAUCET MODEL	A	B	C	D	E	F	G	H
	MOUNTING	HEIGHT 1 (DECK TO TOP OF SPOUT)	HEIGHT 1 (DECK TO CENTER OF SPRAYHEAD)	PROJECTION 1 (CENTERLINE OF FAUCET TO END OF SPOUT)	PROJECTION 2 (CENTERLINE OF FAUCET TO CENTER OF SPRAYHEAD)	WIDTH (OF FAUCET)	SPRAY ANGLE (DEGREES)	MAX. DECK THICKNESS
ETF-80/EBF-85 ETF-880/EBF-187 	Single Hole	5 3/4" (146 mm)	4 1/4" (108 mm)	6 1/2" (165 mm)	5 1/8" (130 mm)	2" (51 mm)	12°	1 1/2" (38 mm)
ETF-600/EBF-650 	4" Centerset	3 5/8" (92 mm)	2 3/16" (56 mm)	4 1/2" (114 mm)	4 1/2" (114 mm)	6 5/16" (160 mm)	12°	3/4" (19 mm)
ETF-610/EBF-625 	Single	3 1/2" (89 mm)	2 1/12" (64 mm)	4 1/2" (114 mm)	4 1/2" (114 mm)	2 3/16" (56 mm)	12°	3/4" (19 mm)
ETF-660/EBF-665 	4" Centerset	3 3/4" (95 mm)	2 1/4" (57 mm)	5 1/4" (133 mm)	5 1/4" (133 mm)	1 1/2" (38 mm)	6°	3/4" (19 mm)

**GOOSENECK DECK MOUNTED / WALL MOUNTED FAUCET MODEL ROUGH-IN DIMENSIONS WITHOUT TRIMPLATE**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
<b>FAUCET MODEL</b>	<b>MOUNTING</b>	<b>HEIGHT 1 (DECK TO TOP OF SPOUT)</b>	<b>HEIGHT 1 (DECK TO CENTER OF SPRAYHEAD)</b>	<b>PROJECTION 1 (CENTERLINE OF FAUCET TO END OF SPOUT)</b>	<b>PROJECTION 2 (CENTERLINE OF FAUCET TO CENTER OF SPRAYHEAD)</b>	<b>WIDTH (OF FAUCET)</b>	<b>SPRAY ANGLE (DEGREES)</b>	<b>MAX. DECK THICKNESS</b>
<b>ETF-770 EBF-775</b> 	4" Centerset	9-3/4" (248 mm)	5-1/2" (140 mm)	6-1/8" (156 mm)	5-1/2" (140 mm)	1" (25 mm)	0°	1-1/2" (38 mm)
<b>ETF-700 / EBF-750</b> 	Single Hole	10-1/4" (260 mm)	6-1/4" (159 mm)	5-1/4" (133 mm)	4-1/2" (115 mm)	0.5" (13 mm)	15°	1-1/2" (38 mm)
<b>ETF-700-S / EBF-750-S</b> 	Single Hole	12-1/4" (311 mm)	6-7/8" (175 mm)	9-1/2" (241 mm)	8-7/16" (215 mm)	0.5" (13 mm)	5°	1-1/2" (38 mm)
<b>ETF-500 / EBF-550</b> 	1" (25 mm) Diameter Hole Required	N/A	6-1/8" (156 mm)	4-9/16" (116 mm)	4-1/4" (108 mm)	0.5" (13 mm)	15°	N/A
<b>ETF-500-S / EBF-550-S</b> 	1" (25 mm) Diameter Hole Required	N/A	6-3/4" (171 mm)	8-3/16" (208 mm)	7-1/8" (156 mm)	0.5" (13 mm)	5°	N/A
<b>ETF-800 / EBF-850</b> 	4" Electrical Box & Plaster Ring or 2 1/2" Hole for Mounting bracket	N/A	6-23/32" (170 mm)	6" (152 mm)	7-1/8" (156 mm)	1" (25 mm)	0°	N/A

## TROUBLESHOOTING INSTRUCTIONS

**NOTE:** To automatically check battery strength, troubleshoot, diagnose and report faucet issues with a wireless device, use the Sloan SmartPhone APP. The APP is available free-of-charge at the Apple iPhone APP store for iOS devices or the Google Play APP store for Android devices. For more information about the APP and its capabilities please visit [www.Sloan.com](http://www.Sloan.com).



### LED indicator light in the IR (infrared) sensor is red.

A. Battery power is low.

Install four (4) new AA sized alkaline batteries. Check that the orientation of each battery matches the positive (+) and negative (-) symbols shown in the bottom of the battery compartment.

Re-attach battery compartment to control module. Green LED will illuminate. If the Green LED does not illuminate, remove battery compartment for 10 seconds and return into place.

### Faucet DOES NOT function.

A. Batteries not installed or are exhausted.

Install four (4) AA sized alkaline batteries. Check that the orientation of each battery matches the positive (+) and negative (-) symbols shown in the bottom of the battery compartment. Reattach battery compartment to control module. Green LED will illuminate. If the Green LED does not illuminate, remove battery compartment for 10 seconds and return into place.

B. Power Cable not installed (Hardwire models).

Install power cable and check connection.

C. Sensor Cable not installed.

Install sensor cable and check connection. Confirm connection guide markings are aligned.

D. Sensor range is set too short and is not detecting the target.

Increase sensor detection range.

### Sensor is activated but faucet DOES NOT deliver water.

A. Faucet has initiated its adaptive sensing calibration program.

Wait 60 seconds before activating faucet.

B. Solenoid Cable not connected.

Check solenoid cable connection. Confirm connection guide markings are aligned.

### Sensor Range Requires Manual Adjustment.

Sensor Range is measured in units from 1 to 5, with 1 being closest to the faucet and 5 being farthest from the faucet. The factory default Sensor Range is 3.

A. To determine what the current Sensor Range setting is, press the red "Sensor" button on the upper right hand corner of the Optima Control Box for 1 second. Five seconds after pressing the button, the green LED beside it will blink to indicate the Sensor Range setting. For example, if it is set at 2, the green LED will blink 2 times.

B. To adjust the Sensor Range, press and hold the red "Sensor" button for three seconds and release once the green LED comes on to indicate that you are in Sensor Range adjustment mode. Then press the "Sensor" button one second at a time for however many times you wish to increase the range. For example, if the Sensor Range is set at 2 and you wish to increase it to 4, press the "Sensor" button two times for one second each time..

C. If you wish to decrease the Sensor Range, follow the same procedure to enter into Sensor Range adjustment mode, and then press the "Sensor" button one second at a time. The button is designed to go up to 5 units and then back down to 1 unit. For example, if the Sensor Range is set at 4 and you wish to decrease it to 2, press the "Sensor" button three times for one second each time.

D. To conform your changes, wait 5 seconds and then press the red "Sensor" button on the upper right hand corner of the Optima Control Box for 1 second. Five seconds after pressing the button, the green LED beside it will blink to indicate the Sensor Range setting. For example, if it is now set at 2, the green LED will blink 2 times.

### Solenoid produces an audible "CLICK" when an object is placed in the detection zone of the sensor but NO water flows.

A. Water supply to faucet is not open.

Open supply stop(s).

B. Inlet fitting filter is clogged.

Remove, clean, and reinsert. Replace with EBF1004 solenoid filter kit if necessary.

C. Aerator or spray head is clogged.

Remove, clean, and reinsert.

### Solenoid valve DOES NOT produce an audible "CLICK" and NO water flows. Green LED illuminates when batteries installed.

A. Solenoid valve module is not working properly.

Replace EFP43A solenoid valve module.



## TROUBLESHOOTING INSTRUCTIONS (CONT.)

### Faucet delivers only a slow flow or dribble when sensor is activated.

- A. Water supply valve is partially closed.  
Open the supply stop(s) completely.
- B. Inlet fitting filter is clogged.  
Remove, clean, and reinsert. Replace with EBF1004 solenoid filter kit if necessary
- C. Aerator or spray head is clogged.  
Remove, clean, and reinsert.

### Faucet DOES NOT stop delivering water or continues to drip after user is no longer detected (automatic shut-off fails even when batteries are removed).

- A. Solenoid valve seat is dirty.  
Remove, clean, and reinsert solenoid filter. Activate faucet several times to flush out dirt.
- B. Sensor range is set too long and is detecting the sink or some other object.  
Reduce sensor detection range.
- C. Solenoid valve module is not working properly.  
Replace EFP43A solenoid valve module.

### The water temperature is too hot or too cold on a faucet connected to hot and cold supply lines with inlet filter fitting.

- A. Supply stops are not adjusted properly.  
Adjust supply stops.

**NOTE: For some systems, a thermostatic mixing valve may be required**

## CARE AND CLEANING INSTRUCTIONS

DO NOT USE abrasive or chemical cleaners (including chlorine bleach) to clean faucet that may dull the luster and attack the chrome or special decorative finishes. Use ONLY mild soap and water, then wipe dry with clean cloth or towel. While cleaning the bathroom tile, protect the faucet from any splattering of cleaner. Acids and cleaning fluids will discolor or remove chrome plating.



## FCC INFORMATION TO USERS

This equipment has been tested and found to comply with the limits for a class B digital devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

**If further assistance is required, please contact Sloan Tech Support  
at 1-888-SLOAN-14 (1-888-756-2614)**

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**S1**

MATERIAL PROVIDED BY



**ELKAY****Top Mount Installation Instructions**  
**Instrucciones de Instalación de Montaje sobre Cubierta****STEP ONE**

Place sink upside down on countertop surface. Place sink in exact position for installation and pencil completely around sink to create a sink outline.

**STEP TWO**

Scribe actual opening 5/16" inside the sink outline, all the way around.

SAMPLE CUTOUT SIZES		
SINK SIZE	CUTOUT LENGTH	CUTOUT WIDTH
25 x 22	24 3/8	21 3/8
33 x 22	32 3/8	21 3/8
37 x 22	36 3/8	21 3/8
38 x 22	37 3/8	21 3/8
40 x 22	39 3/8	21 3/8
43 x 22	42 3/8	21 3/8
48 x 22	47 3/8	21 3/8
54 x 22	53 3/8	21 3/8

**STEP THREE**

Cut out on inside of this line (following the manufacturer's instructions). Install faucet to sink and tighten.

**STEP FOUR**

Apply a silicone caulk around entire perimeter of opening. Set bowl into opening.

**STEP FIVE**

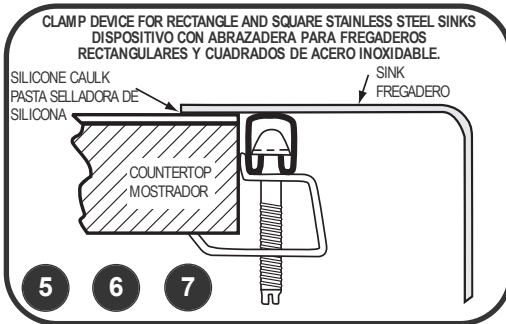
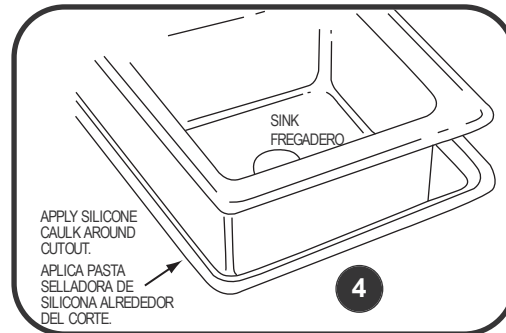
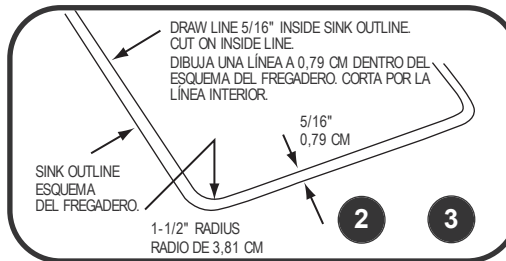
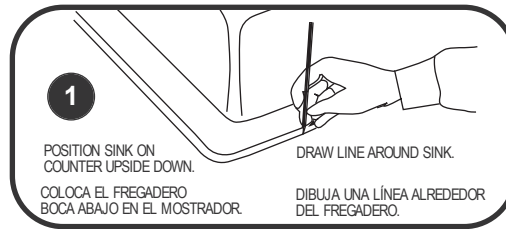
From underside of sink, place one clamp near center, tighten by hand enough to hold sink in place. This applies to all four sides. Fasten balance of clamps in position and hand tighten. (Usually 3 clamps on end, balance divided equally front and back). Space clamps as equally as possible. For countertops thicker than 3/4" up to 1-1/2", Elkay recommends using LK364.

**STEP SIX**

From the top side, check seal between rim and countertop. Adjust clamps to high spot if necessary.

**STEP SEVEN**

Tighten clamp evenly with screwdriver or socket wrench in rotation until sink is seated with countertop. **Caution:** Do not over-tighten clamps.

**PASO UNO**

Coloca el fregadero boca abajo en la superficie del mostrador. Coloca el fregadero en la posición exacta para la instalación y delinea con un lápiz alrededor del fregadero.

**PASO DOS**

Traza la línea de la abertura real 0,79 cm más adentro del borde delineado del fregadero, bordeándolo por completo.

EJEMPLOS DE LINEA DE CORTE		
Medida de Fregadero	Longitud del Corte	Anchura del Corte
635mm x 558mm	619.1mm	542.9mm
838.2mm x 558mm	822.3mm	542.9mm
939.8mm x 558mm	923.9mm	542.9mm
965.2mm x 558mm	949.3mm	542.9mm
1016mm x 558mm	1000.1mm	542.9mm
1092.2mm x 558mm	1076.3mm	542.9mm
1219.2mm x 558mm	1203.3mm	542.9mm
1371.6mm x 558mm	1355.7mm	542.9mm

**PASO TRES**

Corta dentro de esta línea (siguiendo las instrucciones del fabricante). Si el fregadero viene con una plataforma para grifo, instala el grifo en el fregadero y apriétalo.

**PASO CUATRO**

Aplica pasta selladora de silicona alrededor de todo el perímetro de la abertura. Coloca el tazón en la abertura.

**PASO CINCO**

Desde debajo del fregadero, coloca una abrazadera cerca del centro, ajústala con la mano lo suficiente como para mantener el fregadero en su lugar. Esto debe hacerse en los cuatro lados. Sujeta el contrapeso de las abrazaderas en su lugar y apriétalo con la mano. (Generalmente 3 abrazaderas en el extremo, el contrapeso dividido igualmente entre la parte frontal y posterior). Coloca las abrazaderas a la misma distancia una de la otra, tanto como sea posible. Para mostrador grueso de 19mm hasta 38mm Elkay recomienda utilizar LK364.

**PASO SEIS**

Desde el lado superior, revisa el sello entre el borde y el mostrador. Ajusta las abrazaderas a un punto más alto si es necesario.

**PASO SIETE**

Aprieta la abrazadera de forma pareja con un destornillador o llave de dados en rotación hasta que el fregadero se asiente en el mostrador. **Precaución:** No aprietes demasiado las abrazaderas.

**What You Will Need**

The tools you will need to install your stainless steel sink are few and commonly found in the average home toolbox.

Here is a list of what you will need:

- Caulking for mounting sink rim.
- Plumbers putty for mounting faucet and strainers.
- Yardstick or Rule (at least 3-feet long).
- Flashlight.
- Long, thin screwdriver (shank at least six inches).
- Adjustable wrenches (2), or open ends.
- Pipe wrench.

**Lo Que Necesitarás**

Las herramientas que necesitarás para instalar tu fregadero de acero inoxidable son pocas y pueden encontrarse normalmente en una caja de herramientas común del hogar.

A continuación una lista de lo que necesitarás:

- Masilla para instalar el borde del fregadero.
- Masilla de plomero para instalar el grifo y los escurridores.
- Vara de medir o Regla (de al menos 91 cm).
- Linterna.
- Destornillador largo y fino (vástago de al menos 15,24 cm).
- 2 Llaves ajustables, o de extremos abiertos.
- Llave para tubería.

Los tornillos de instalación vienen con el fregadero.

## Use and Care Hints

### Satin Finish

Regular cleaning is important to maintain the appearance of your Elkay sink.

### Easy Cleaning Instructions

Rinsing is the most important part of sink care. An Elkay stainless steel sink finish will retain its original bright appearance if the sink is **rinsed** thoroughly after each use. "Thorough" rinsing can be done by running the water throughout the sink for a few minutes after each use. Typically, a rinse and towel drying after each use takes care of most everyday clean ups.

### Recommendations for Proper Maintenance

- **Do...** Use only a mild liquid dishwashing detergent with a soft sponge to clean and then thoroughly rinse the sink.
- **Do...** Rinse thoroughly after each use. "Thorough" rinsing can be done by running water for a few minutes and rubbing the cleaned area with a sponge.
- **Do...** Towel dry after each use to prevent mineral deposits from building up on the surface of the sink.
- **Do Not...** Allow liquid soap or other household cleansers to dry on the surface of the sink. Most brands contain chemical additives which will affect the original finish.
- **Do Not...** Use solutions of chlorine bleach and water in the sink. Chlorides, which are found in most soaps, detergents, bleaches, and cleansers, are very aggressive to stainless steel. If left on the sink too long they can cause surface pitting.
- **Do Not...** Use a steel wool pad to clean your sink. Steel wool pads have a tendency to break apart and small particles of steel can become embedded in the surface of the sink. The steel particles will rust and will give the appearance that the sink itself is rusting.
- **Do Not...** Use abrasive cleansers or abrasive pads as it will scratch the surface.
- **Do Not...** Leave wet sponges, cloths, or cleaning pads on the sink. This can lead to surface rust.

Following these recommendations for the care and cleaning of your stainless steel sink will insure that it will provide you with many years of service.

### Chlorides

Today, chlorides are found in most all soap, detergents, bleaches and cleansers; chlorides can be oppressive to stainless steel. However, chlorides are very water soluble. Therefore, **THOROUGH RINSING** of your sink after each use to remove any chloride residue and a weekly scouring is all that is required to keep your sink looking bright and shiny.

### Water Quality

The quality of your water can affect your sink's appearance. If your water has a high iron content, a brown surface stain can form on the sink giving the appearance of rust. Additionally, in areas with a high concentration of minerals, or with over-softened water, a white film may develop on the sink. To combat these problems, we suggest that the sink be towel dried after use.

### Discoloration, Rust and Possible Pitting

Wet sponges, cloths, cleaning pads and rubber mats left on the sink can lead to discoloration. Steel wool pads should never be used to clean your sink as they leave small iron particles in the grain lines which rust and can damage the sink. Continued usage in this manner may eventually lead to the sink itself rusting and pitting.

### Liquid Soap

Do not allow concentrated liquid detergent to dry on your sink. Most brands contain chemical additives which will affect the original finish.

### Spotting

The quality of your water can affect your sink's appearance. In areas with hard water, a brown surface stain can form on the sink giving the appearance of rust. This phenomena also occurs in water with high iron content. Additionally, in areas with a high concentration of minerals, or with over-softened water, a white film may develop on the sink. To combat this problem, we suggest that the sink be towel dried after use.

### Foods

Heavy salt concentration or foods containing high levels of salt should not be allowed to dry onto the sink surface. Rinse your sink thoroughly after use.

## ▶ ELKAY LIMITED SINK WARRANTY

Elkay warrants to the original purchaser of an Elkay stainless steel sink that Elkay will, at its option, replace or repair, without charge, such product if it fails due to a manufacturing defect for a lifetime of normal residential use. Product replacement does not include transportation cost or labor installation cost. This warranty covers only stainless steel self-rimming drop-in sinks installed in a conventional countertop surface and stainless steel undermount sinks installed in a conventional solid surface countertop and applies to residential installations only. Elkay reserves the right to examine product in question and its installation prior to replacement.

### WASTE FITTINGS AND ACCESSORIES ARE NOT WARRANTED OTHER WARRANTY CONDITIONS ON SINKS

This warranty applies to sinks purchased after March 1st 2001 as shown on the purchaser's dated receipt. For sinks purchased prior to March 1st 2001, the applicable warranty at that time will be in effect. Our warranty does not cover product failure or damage caused by the use of optional Elkay accessories, abusive treatment, misuse, environmental factors, normal wear including dents and scratches, improper care and cleaning, use of aggressive and abrasive cleaners, damage due to handling or failure to follow the recommended procedures for installation, care and maintenance as detailed in the installation and care guide provided with every sink. This warranty is extended only to the original consumer purchaser of the product. This warranty does not cover shipping costs, labor costs, or any other charges for such items as installation or replacement of the sink, diagnosis or replacement of any faucet or component part, or any other expense or loss.

This warranty does not cover obsolete, discontinued nor display products, whether such items are purchased at discount outlets and/or on-line or sold on clearance or close out.

**All incidental or consequential damages are specifically excluded. No additional warranties, express or implied are given, including but not limited to, any implied warranty of merchantability or fitness for a particular purpose.**

Some states do not allow the exclusion or limitation of incidental damages or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

### TO OBTAIN SERVICE UNDER WARRANTY

1. Write to: Elkay Manufacturing Company  
Attention: Consumer Services  
2222 Camden Court  
Oak Brook, IL 60523
2. Include a letter containing the following information:
  - a. Date of purchase and installation
  - b. Proof of Purchase (copy of original dated invoice)
  - c. Description of nature of defect
  - d. Model number or description of model and/or component part if possible.

## Consejos de Uso y Mantenimiento

### Acabado Satinado

La limpieza regular es importante para mantener la apariencia de tu fregadero Elkay.

### Instrucciones para una Limpieza Fácil

Enjuagar es el paso más importante del cuidado del fregadero. El acabado de un fregadero de acero inoxidable Elkay mantendrá su apariencia brillante original si el fregadero se enjuaga completamente después de cada uso. Un enjuague «completo» puede hacerse dejando correr agua por el fregadero durante unos minutos después de cada uso. Generalmente, enjuagar y secar con toalla después de cada uso es lo principal de la mayoría de las limpiezas diarias.

### Recomendaciones para un Mantenimiento Adecuado

- **Se Recomienda...** Usar sólo un detergente líquido y suave para fregar con una esponja para limpiar y luego enjuagar abundantemente el fregadero.
- **Se Recomienda...** Enjuagar completamente después de cada uso. Un enjuague «completo» puede hacerse dejando correr agua durante unos minutos y frotando el área limpia con una esponja.
- **Se Recomienda...** Secar con una toalla después de cada uso para evitar que se acumulen depósitos minerales en la superficie del fregadero.
- **No Se Recomienda...** Dejar que jabón líquido u otros limpiadores del hogar se sequen en la superficie del fregadero. La mayoría de las marcas contienen aditivos químicos que afectarán el acabado original.
- **No Se Recomienda...** Usar soluciones de blanqueador con cloro y agua en el fregadero. Los cloruros, que pueden hallarse en la mayoría de los jabones, detergentes, blanqueadores y limpiadores, son muy agresivos para el acero inoxidable. Si se dejan en el fregadero durante mucho tiempo pueden causar picaduras en la superficie.
- **No Se Recomienda...** Usar una esponja de alambre para limpiar tu fregadero. Las esponjas de alambre tienden a romperse y pequeñas partículas de acero pueden insertarse en la superficie del fregadero. Las partículas de acero se oxidarán y darán la apariencia de que el fregadero se está oxidando.
- **No Se Recomienda...** Usar limpiadores o almohadillas abrasivas, ya que dañarán la superficie.
- **No Se Recomienda...** Dejar esponjas, paños, o almohadillas de limpieza húmedas en el fregadero. Esto podría provocar que la superficie se oxide.

Seguir estas recomendaciones para el cuidado y la limpieza de tu fregadero de acero inoxidable asegurará que te brindará muchos años de servicio.

### Cloruros

En la actualidad, la mayoría de los jabones, detergentes, blanqueadores y limpiadores contienen cloruros; estos son muy agresivos para el acero inoxidable. Sin embargo, los cloruros son muy solubles en agua. Por lo tanto, ENJUAGAR ABUNDANTEMENTE tu fregadero después de cada uso para quitar cualquier residuo de cloruro, y pulirlo una vez a la semana es todo lo que se necesita para mantener el fregadero brillante y reluciente.

### Calidad del agua

La calidad del agua puede afectar la apariencia de tu fregadero. Si el agua tiene un gran contenido de hierro, una mancha superficial marrón puede formarse en el fregadero, dando la apariencia de óxido. Adicionalmente, en áreas con una gran concentración de minerales, o con agua demasiado suave, una película blanca puede formarse en el fregadero. Para combatir estos problemas, sugerimos secar con toalla el fregadero después de usarlo.

### Decoloración, Óxido y Posibles Picaduras

Las esponjas húmedas, paños, almohadillas de limpieza y tapetes de goma que se dejen en el fregadero pueden causar decoloración. Las esponjas de alambre nunca deben usarse para limpiar tu fregadero, porque dejan pequeñas partículas de hierro en las líneas de la veta, las que pueden oxidarse y dañar el fregadero. El uso continuo de esta manera puede provocar finalmente que el fregadero se oxide y se pique.

### Jabón líquido

No permitas que el detergente líquido concentrado se seque sobre tu fregadero. La mayoría de las marcas contienen aditivos químicos que afectarán el acabado original.

### Manchas

La calidad del agua puede afectar la apariencia de tu fregadero. En áreas con agua dura, una mancha superficial marrón puede formarse en el fregadero, dando la apariencia de óxido. Este fenómeno también ocurre en agua con alto contenido de hierro. Adicionalmente, en áreas con una gran concentración de minerales, o con agua demasiado suave, una película blanca puede formarse en el fregadero. Para combatir este problema, sugerimos secar con toalla el fregadero después de usarlo.

### Alimentos

La alta concentración de sal o los alimentos con alto contenido de sal no deben dejarse secar en la superficie del fregadero. Enjuaga tu fregadero abundantemente después de usarlo.

## GARANTÍA LIMITADA DE POR VIDA DE ELKAY PARA EL FREGADERO

Elkay garantiza al comprador original de un fregadero Elkay de acero inoxidable que Elkay, a su criterio, reparará o reemplazará, sin cargo alguno, dicho producto si presenta defectos de fabricación durante toda una vida de uso residencial normal. El reemplazo del producto no incluye los costos de transporte ni de la mano de obra de instalación. Esta garantía sólo cubre los fregaderos empotrados con rebordes, de acero inoxidable instalados en un mostrador convencional y los fregaderos de acero inoxidable instalados en un mostrador convencional de superficie sólida, además, sólo se aplica a instalaciones residenciales. Elkay se reserva el derecho de examinar el producto en cuestión y su instalación antes de reemplazarlo.

### LOS ACCESORIOS Y ACOPLAMIENTOS DEL DESAGÜE NO ESTÁN GARANTIZADOS

### OTRAS CONDICIONES DE LA GARANTÍA DE FREGADEROS

Esta garantía cubre los fregaderos comprados después del 1ro de marzo de 2001, según la fecha registrada en los recibos del comprador. Los fregaderos comprados antes del 1ro de marzo están cubiertos por la garantía vigente en la fecha de compra. Nuestra garantía no cubre la falla o daño del producto causado por: uso de accesorios opcionales de Elkay, uso abusivo e inapropiado, factores ambientales, desgaste normal incluyendo arañazos y abolladuras, limpieza y cuidado inapropiados, uso de limpiadores agresivos y abrasivos, daños debidos al manejo o errores al seguir los procedimientos recomendados de instalación, cuidado y mantenimiento detallados en la guía de instalación y cuidado, adjunta a cada fregadero. Esta garantía se extiende únicamente al comprador y usuario original del producto. La garantía no cubre costos de transporte, mano de obra o cualquier otro costo por conceptos tales como la instalación o reemplazo del fregadero, diagnóstico o reemplazo de cualquier grifo o pieza ni cualquier otra pérdida o gasto. Esta garantía no cubre productos obsoletos, descontinuados o en exhibición, si tales artículos se compran en tiendas de descuento y/o en internet o se venden en rebaja o liquidación.

**Todos los daños directos o indirectos quedan específicamente excluidos. No se ofrecen otras garantías adicionales, expresas o implícitas, incluyendo, pero no limitándose a, cualquier garantía implícita de comerciabilidad o idoneidad para un propósito en particular.**

Algunos Estados no permiten la exclusión o limitación de daños directos o indirectos, ni límites a la duración de una garantía implícita; por lo tanto las exclusiones o limitaciones anteriores pueden no ser pertinentes en su caso.

Esta garantía le otorga a usted derechos legales específicos, y usted puede también tener otros derechos, que varían según el estado.

### PARA OBTENER SERVICIO BAJO ESTA GARANTÍA

1. Escriba a: Elkay Manufacturing Company  
Atención: Consumer Services  
2222 Camden Court  
Oak Brook, IL 60523
2. Incluya una carta que contenga la siguiente información:
  - a. Fecha de compra e instalación
  - b. Comprobante de Compra (copia de la factura original fechada)
  - c. Descripción del defecto
  - d. Número de modelo o descripción del modelo y/o pieza si es posible



## INSTALLATION / OWNER'S MANUAL

Single Handle Kitchen Faucet  
Model # LK1000, LK1001

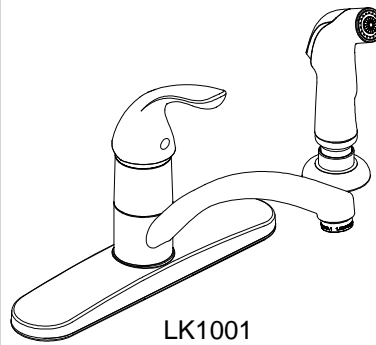
### Important

#### You choose the flow rate

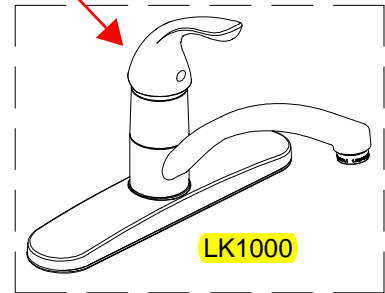
This faucet ships with an eco-friendly 1.5GPM flow regulator installed.

If you desire higher flow rate, a 2.2GPM flow regulator has also been included in the box.

Switching the flow regulator is simple! See the "Flow Regulator Replacement" section for details.

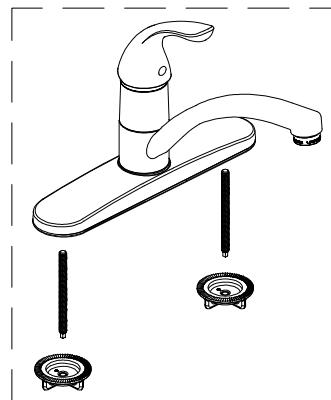
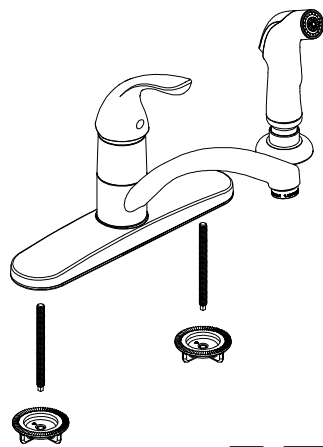


LK1001



LK1000

### INCLUDES:



OPTIONAL 2.2GPM AERATOR

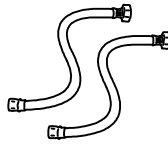
### RECOMMENDED TOOLS:



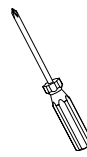
Groove joint pliers



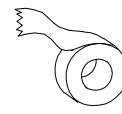
Wrench



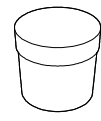
(2) 1/2 in Supply Lines



Screwdriver



Sealant Tape

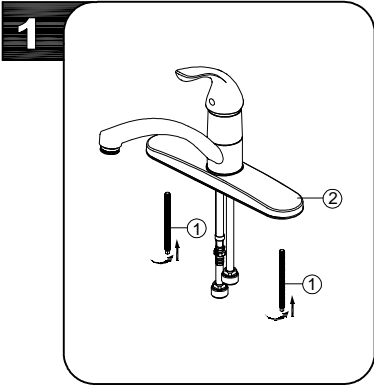


Plumber's Putty

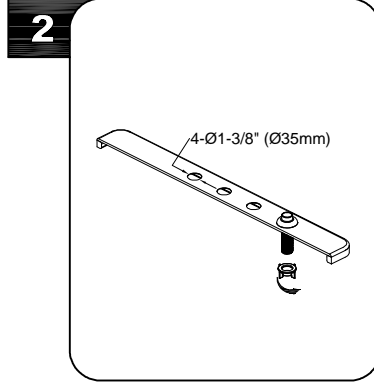
**SAVE FOR CONSUMER**

**WARNING: Please carefully read and properly follow the instructions for installation found in this manual.**

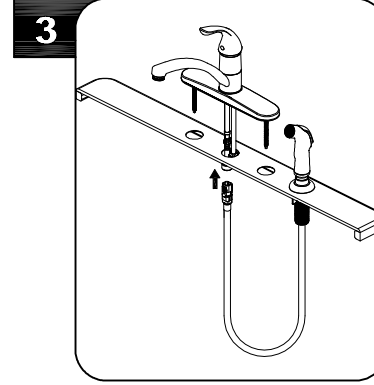
**STEPS:**



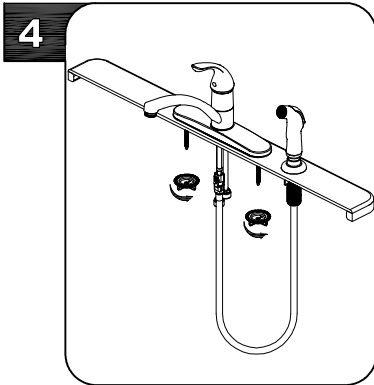
Shut off water supplies. Screw bolt (1) onto the escutcheon (2). If your model has a spray, proceed to step 2. If your model does not have a spray, skip to step 4.



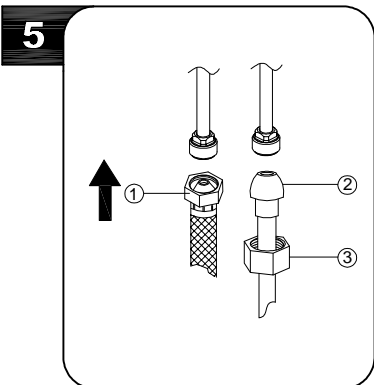
For models with spray ( fits 4 - hole sinks ): Insert spray support through far right - hand hole on sink. Screw hold - down nut onto shank and hand tighten.



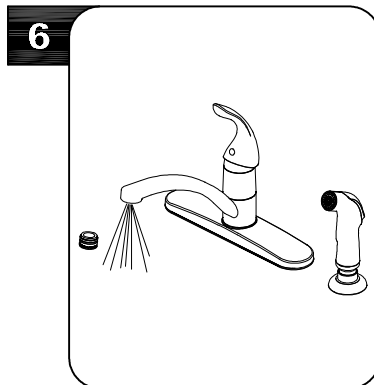
For models with spray: Insert spray hose down through the support and sink. Attach the spray hose to the connection beneath the faucet by aligning the tabs on quick connector. Push quick connector housing firmly upward and snap onto receiving tube tab. Pull down moderately to ensure connection has been made.  
If it is necessary to remove the quick connector, squeeze tabs on hose between index finger and thumb, then pull down to disconnect.



Place faucet in position on sink. From under sink, screw mounting nuts onto faucet. Tighten mounting nuts. Hand tighten only.



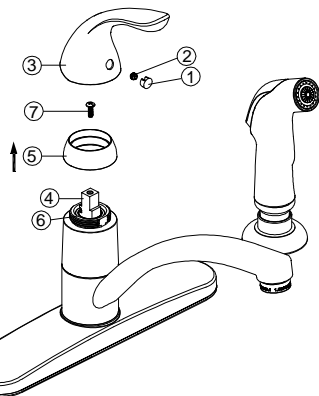
Make connections to water lines. Use 1/2" I.P.S. faucet connections (1) or use coupling nuts (3) with 3/8" O.D. ball-nose riser(2). Use wrenches to tighten connections. Do not overtighten.



Important: After installation is completed, remove aerator assembly. Turn on hot and cold water supplies. Turn handle to full open position for one minute. Check for leaks. Replace aerator.

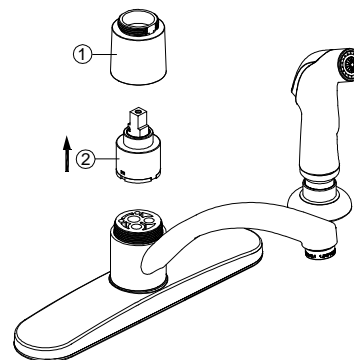
## CARTRIDGE REPLACEMENT

### 1



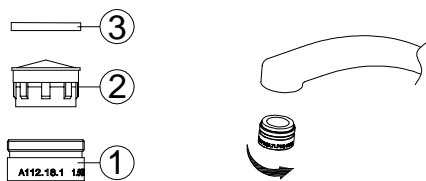
Shut off water supply. Remove set screw plug (1). With valves in "closed" position, unscrew set screw (2) and remove handle (3) from valve stem (4). Loosen the screw (7) from valve stem (4). Loosen the cap (5) from the sleeve (6).

### 2



Loosen sleeve (1) by turning it counter-clockwise and lift out the cartridge (2). Remove the old cartridge and replace with the new cartridge. Replace sleeve and tighten. Reinstall the handle.

## FLOW REGULATOR REPLACEMENT



This faucet ships with a 1.5GPM aerator installed. An optional 2.2GPM aerator is also included in the box.

To switch the flow rate of the faucet:

1. Disassemble aerator assembly by separating the aerator shell (1), aerator (2) and washer (3). Remove existing aerator (2) and install the new aerator. (2.2GPM=Red, 1.5GPM=Green)
2. Reinstall the aerator assembly.

## CARE AND CLEANING INSTRUCTIONS

Congratulations on your purchase of an Elkay product. Although your product is extremely durable, attention should be given to the care, cleaning and maintenance of this product. Cleaning agents and abrasives may cause damage, which may result in oxidation and discoloration.

By following these simple guidelines for proper care and cleaning, it will give you years of enjoyment:

**TO CLEAN:** Simply wipe gently with a damp cloth and blot dry with a soft towel. A common rule of thumb is: when you dry off, dry off your product.

- Avoid build-up of soap, toothpaste or mineral deposits, as these tend to have an adverse effect on the appearance of the product.
- NEVER use cleaning products of any kind on this product - especially those containing ammonia, bleach or alcohol - or those with any form of abrasive.

**FOR CARE AND MAINTENANCE:**

- The water in certain areas of the world can be very caustic - standing water around the product can cause damage. Be sure to remove standing water with a dry, soft cloth as soon as possible.
- For polished brass finishes, as often as once a week, you can apply a paste wax or special, non-abrasive, brass coating (DO NOT APPLY POLISH).
- Before applying a protective coating, gently brush the entire fixture using a soft tooth brush. This will remove any dirt or deposit build-up.
- These simple steps will add temporary protective coating to your faucet and extend the life of the finish.

Failure to follow care and cleaning will void your warranty. For additional information, please visit [elkayusa.com](http://elkayusa.com).



## WARRANTY

### ELKAY LIMITED LIFETIME WARRANTY

#### ELKAY LIMITED LIFETIME WARRANTY

Elkay warrants that all parts and finishes of the Elkay Residential brand faucets are free from defects in materials and workmanship for the life of the product, if purchased after 1996. This warranty covers the original consumer purchaser of the product only.

If the product should leak or drip during normal use, Elkay will provide, free of charge, a replacement cartridge. For other defects in material or workmanship, Elkay will, at its option, supply replacement parts (or if no longer available a comparable product). Elkay reserves the right to examine product in question and its installation prior to replacement.

#### What is not covered:

1. Damage caused by accident, negligence, misuse, abuse, improper installation or operation or failure to follow care or installation instructions enclosed with your product.
2. Damage occurring during shipment of the product (claims must be presented to the carrier).
3. Normal wear and tear.
4. Labor charges, costs of removal and reinstallation, and any damages to other property.
5. All industrial, commercial and business use whose purchasers are hereby extended a limited lifetime on mechanical parts and 5 years on finish.

#### What you must do to obtain warranty service:

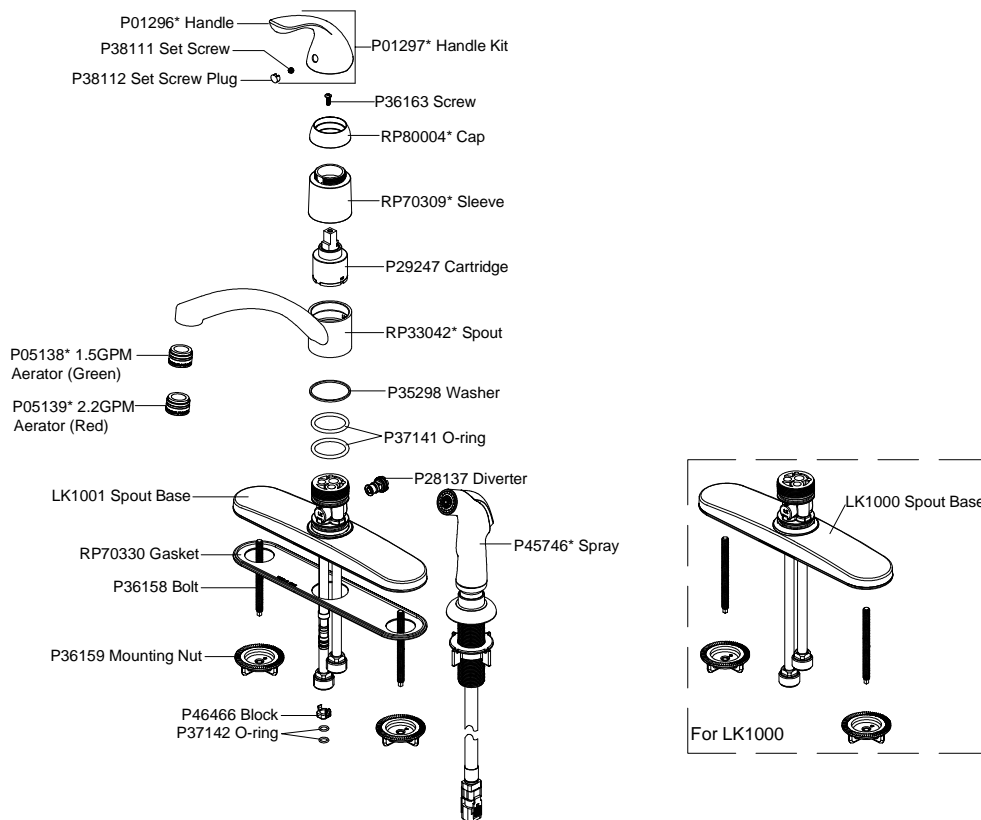
Either write to Elkay, attention Customer Care, 2222 Camden Court, Oak Brook, IL 60523 or call 1-800-223-5529. Please provide date of purchase and installation, description of nature of the defect, and model number or description of model and/or component part.

THIS LIMITED WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED IMPLIED, ARISING BY LAW OR OTHERWISE, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THIS LIMITED WARRANTY MAY NOT BE ALTERED, VARIED, OR EXTENDED, EXCEPT BY A WRITTEN INSTRUMENT EXECUTED BY ELKAY. THE REMEDY OF REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS LIMITED WARRANTY IS EXCLUSIVE. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES TO ANY PERSON, WHETHER OR NOT OCCASIONED BY NEGLIGENCE OF ELKAY, INCLUDING WITHOUT LIMITATION DAMAGES FOR LOSS OF USE, COSTS PROPERTY DAMAGE OR OTHER MONETARY LOSS.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

This warranty covers product installed in the United States and Canada.

## REPLACEMENT PARTS



## SHOWER

MATERIAL PROVIDED BY





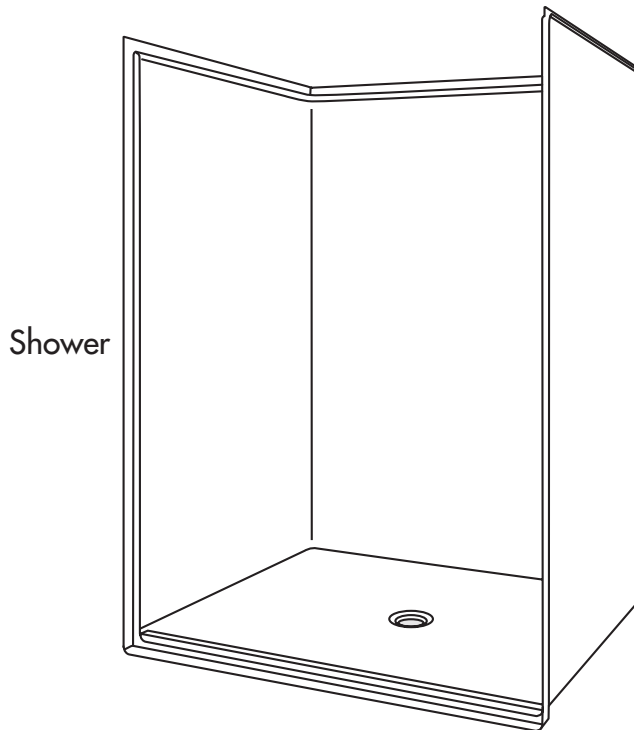
Aquatic products may be specified as Lasco Bathware.

## ADA/ANSI COMPLIANT BARRIER-FREE SHOWER STALLS

For roll-in showers with a flat threshold, build up or recess the bathroom floor 3/4" less the thickness of the finished floor. For beveled thresholds, build up or recess the bathroom floor 3/4" less the thickness of the finished floor, ensuring that the finished floor meets the base of the bevel at the threshold.

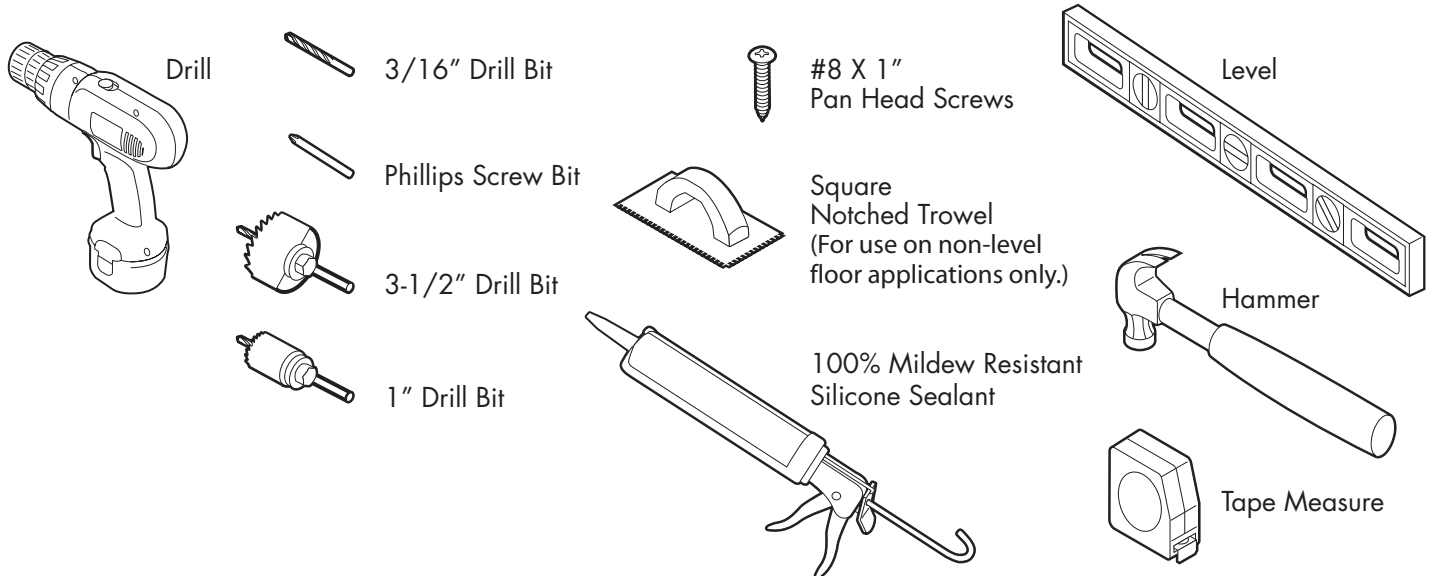
It is recommended that the bathroom floor outside ADA clear floor space be designed with a floor drain to alleviate any water over spray that may escape the shower stall.

### Items Included



Product illustration may not be representative of your unit.

### Tools Needed



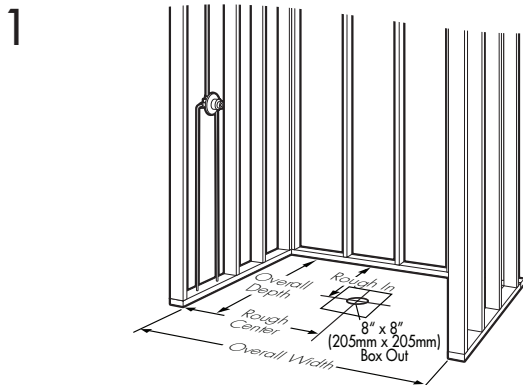


**NOTICE:** Please inspect the unit thoroughly before installation to make sure it has not been damaged during transportation. Under no circumstances should a damaged unit be installed. Neither Aquatic nor the distributor will be responsible for removal or reinstallation costs should a replacement be necessary due to installation of a damaged unit.

## PRE-INSTALLATION PLANNING

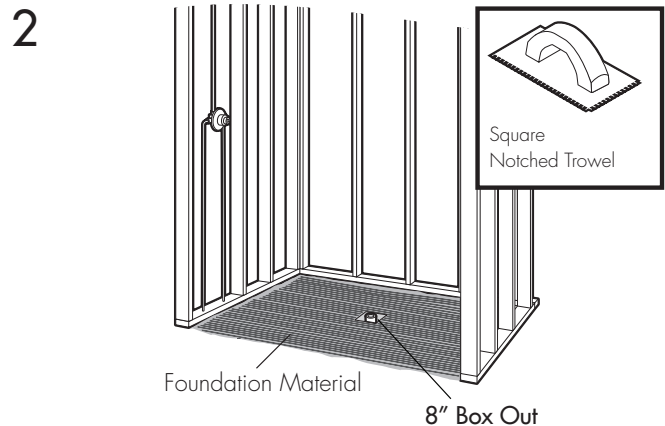
- Unit must be placed within bathroom area before completion of door framing or, if preferred, studs may be omitted or knocked-out to permit unit placement.
- Review job print and Aquatic rough-in dimensions; verify all key dimensions against actual job conditions.
- Make sure framed-in alcove is of proper size, square and plumb; check floor for levelness.
- If alcove floor is not completely level**, foundation materials [non-shrink grout] are mandatory under the bottom of each unit to solidify for wheelchair support.
- If fire-rated alcove is required, approved finish material must be in place prior to unit installation to meet fire safety requirements of local building code and/or FHA/HUD Minimum Property Standards. **NOTE: Finished alcove must have interior dimensions shown on rough-in diagram to permit installation of unit.**
- Provide 8" x 8" (205mm x 205mm) box out for 2" (50mm) IPS and drain connection.**
- To avoid obstruction, make sure that supply lines and valve plumbing are not strapped to studs and do not project into alcove. Also, drain pipe must not project above floor level prior to installation.
- Make sure all plumbing is complete and to code.
- To prevent scuffing while installing unit, cover the entire bottom of the unit with a piece of cardboard or other protective material.
- Fasten drain fitting to unit before installing** [see manufacturer's instructions].  
Fasteners for wood framing—1½" galvanized roofing nails or #10 x 1½" self-tapping washer head screws;  
for concrete or block walls—1" concrete nails and nailing tool;  
for steel studs (18 ga.)—drill flanges and studs with 5/32" carbide bit and use #12 x 1" sheet metal screws.

## INSTALLATION PROCEDURE



**Note:** If fire-rated alcove is required, approved finish materials must be in place prior to unit installation to meet fire safety requirements of local building codes and/or FHA/HUD Minimum Property Standards.

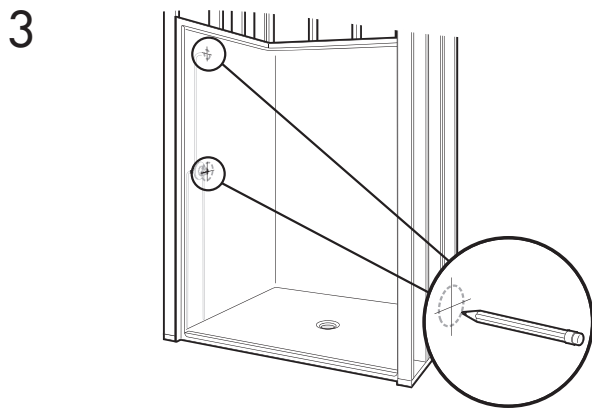
Check dimension of alcove; make sure walls are square and plumb and floor is level. **For completely level floor**, proceed to Step 3.



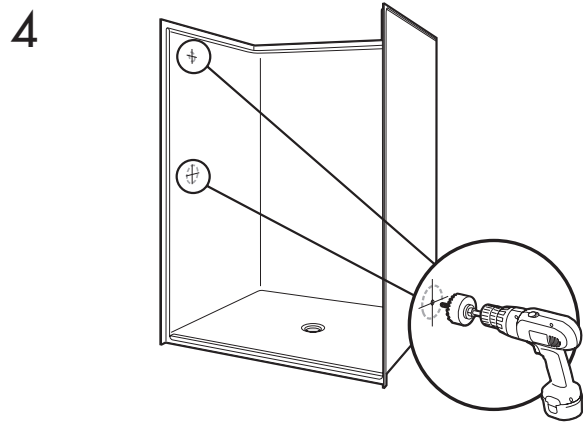
For **non-level alcove floor** applications, prepare a foundation material mix (industrial plaster, mortar mix) and spread throughout the alcove floor with a square notched tile trowel. The foundation materials should spread around the drain and extend to the perimeter of the shower floor.



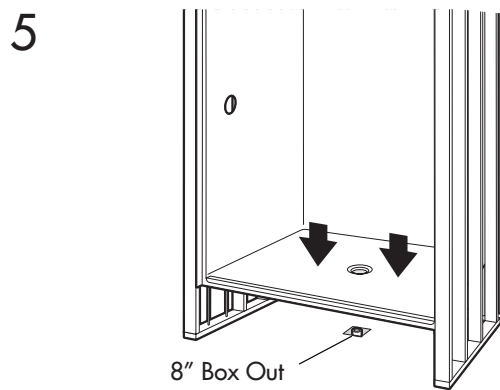
INSTALLATION PROCEDURE, CONT.



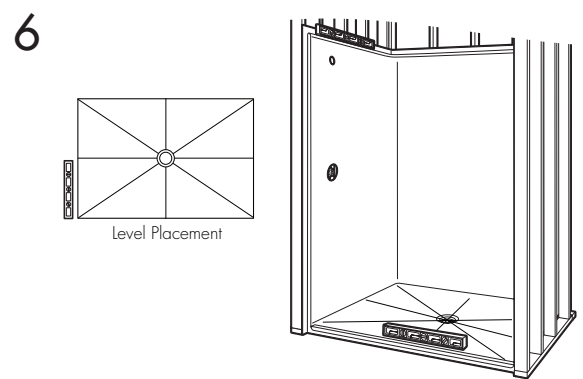
If mounting fittings — from stable reference points (back wall studs, floor) measure the locations of spout and valves. Note measurements.



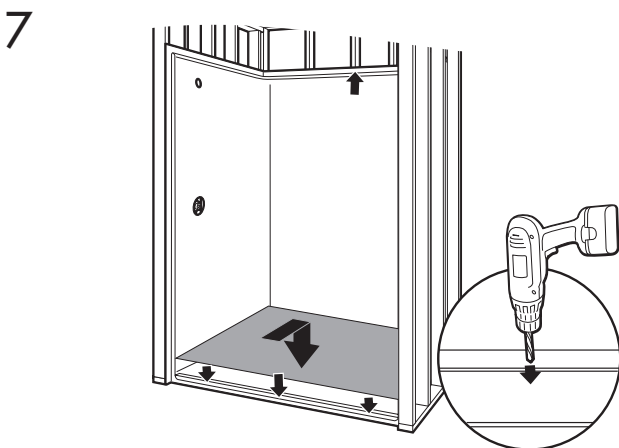
Mark fitting locations. (Refer to measurements from step 3.) Using a hole saw (fine tooth or abrasive grit cutting edge), make necessary openings for filler and valves, drilling from inside (smooth side) out.



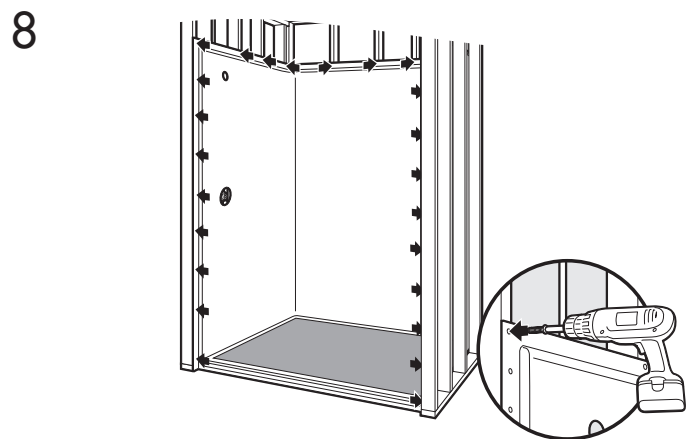
Place the unit directly on level floor (or on top of foundation materials) with drain fitting over and onto waste pipe with threshold firmly on the floor. Assure waste pipe protrudes well into drain fitting. Maintain proper floor slope towards drain.



Check for level. Check for proper floor slope (1/4" per foot) by placing level in locations shown above and measuring slope along the length of the level.



Cover the entire bottom of the unit with a piece of cardboard or other protective material. Pre-drill pilot hole and fasten the center of the back nailing flange to stud to secure unit in place. Once secured proceed by pre-drilling pilot holes and fastening unit to floor starting in the center of the base flange, moving outward every 8 inches.



Fasten vertical nailing flanges to studs starting from the floor, moving upward every 8 inches. Fasten horizontal nailing flanges at every stud.



9. Make final connections to supply lines and waste pipe in accordance with plumbing code requirements. Strap water lines and valve/s to studs.
10. **Water test for proper drainage.**

## CLEAN-UP

1. **Do not remove warranty/maintenance adhered label.**  
Leave on unit for owner/occupant per code requirement.
2. **Prevent staining.** Remove **all** debris before plumbing leak test. Use sponge with warm water and liquid detergent. Rinse, drain and wipe clean. Do not use abrasive cleansers such as scouring powders, steel wool, metal scrapers, sandpaper or anything else that might mar, dull or scratch the finish.
3. Plaster and latex paint may be removed with warm water, liquid detergent and brittle brush or plastic scraper. Glues, tars and enamels may be removed with acetone or paint thinner. **Do not use** turpentine or laquer thinner. **Do not use** excessive heat or any caustic solvents or chemicals.
4. Dull areas and light scratches may be removed by buffing with a light colored automotive rubbing compound and buffing pad. Entire unit can be waxed with light colored automotive wax. **Do not wax bottom of unit.**
5. See user maintenance label for more details.

## USER MAINTENANCE INSTRUCTIONS

**IMPORTANT!** Use only recommended cleaners and procedures described herein. Use of other materials and methods may damage your bath fixture and void the warranty.






1. For normal cleaning: Never use abrasive cleaners such as scouring powders or pads, steel wool, scrapers, sandpaper or anything else that could scratch or dull the surface of your Aquatic unit. Instead, use warm water and liquid detergents or non-abrasive cleansers, especially those bathroom cleaners recommended for cleaning fiberglass.
2. To keep your Aquatic bath fixture sparkling clean: Apply a coat of good quality automotive paste wax or polish and buff to a high shine with a soft cloth or towel. Repeat every six months for easier cleaning and long lasting protection.  
**NOTE:** DO NOT WAX textured, slip-resistant standing surface of the unit bottom. This could result in greater risk of slipping and personal injury.
3. To restore a scratched or dull unit: Use an automotive polishing compound applied with a clean cotton rag. Rub scratches and dull areas vigorously. Wipe off residues. Follow with automotive wax treatment described above.
4. To remove adhesive: Try 3-M Natural Cleaner, De-Solv-It or similar materials. If residues remain, saturate a small, white, cotton rag with nail polish remover (naphtha or acetone) and rub vigorously until the adhesive dissolves and disappears. These solvents are highly flammable and must be used sparingly and with caution. Do not smoke or permit others to do so. Make sure all nearby heating devices (including pilot lights) are extinguished. Do not allow solvent to go down the drain. Make sure not to contact plastic drain grates or other synthetic materials.
5. Rubber Mats: If you use a rubber "anti-skid" mat, make sure to remove it from the unit after each use to avoid harm to the surface finish.
6. Hard Water: Water in certain regions, if not wiped up after bathing/showering, may cause fading of some bath fixture colors. This is a natural occurrence beyond Aquatic 's control. (See Warranty)

**CAUTION:** When using any cleaning or polishing materials, make sure to read and follow all package instructions carefully. Wear rubber gloves at all times and avoid contact with eyes, skin, clothing, rugs and furnishings. Make sure all residues are rinsed off thoroughly.

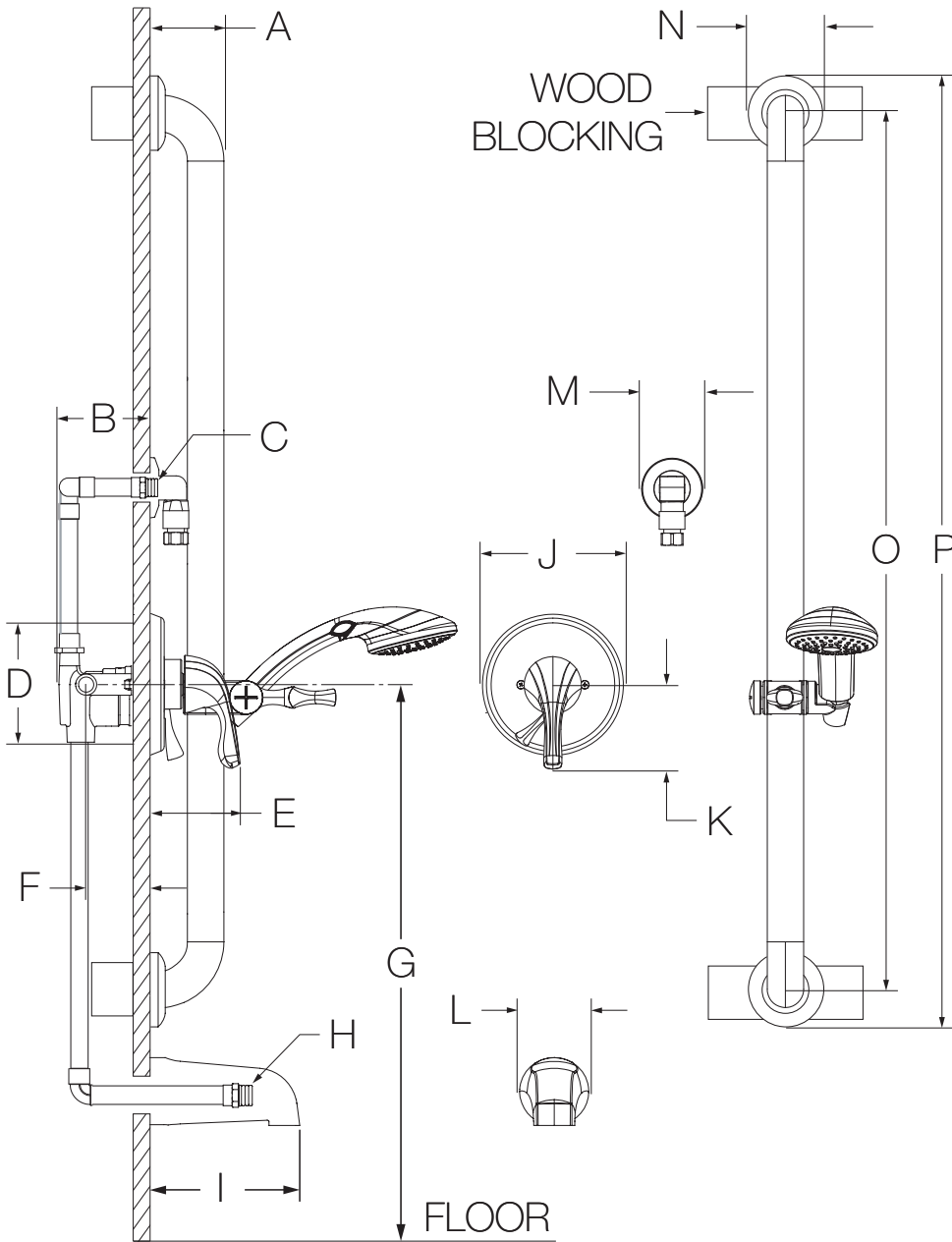
Customer Service | Technical Services | Warranty Services



## S-9603-PLR, S-9604-PLR Operation & Maintenance Manual

Model Numbers	Specification
<input checked="" type="checkbox"/> <b>S-9603-PLR</b> <i>Origins Hand Shower System</i> <input type="checkbox"/> <b>S-9604-PLR</b> <i>Origins Tub/Hand Shower System</i>	<p><b>S-9603-PLR</b> Hand shower system powered by the Temptrol® Pressure Balancing valve. Features adjustable stop screw to limit handle turn, integrated volume control, 36" slide bar, in-line vacuum breaker, 60" flexible metal hose, ADA hand shower and standard 2.5 gpm (9.5 L/min) flow restrictor. Components made from metal and nonmetallic materials plated in standard polished chrome finish.</p> <p><b>S-9604-PLR</b> Tub/hand shower system powered by the Temptrol® Pressure Balancing valve. Features adjustable stop screw to limit handle turn, integrated diverter, 36" slide bar, non-diverter tub spout, in-line vacuum breaker, 60" flexible metal hose, ADA hand shower and standard 2.5 gpm (9.5 L/min) flow restrictor. Components made from metal and nonmetallic materials plated in standard polished chrome finish.</p>
<p><b>Modifications</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>-1.5</b>  1.5 gpm (5.7 L/min) flow restrictor</li> <li><input type="checkbox"/> <b>-2.0</b> 2.0 gpm (7.6 L/min) flow restrictor</li> <li><input type="checkbox"/> <b>-SS</b> Slip spout on any tub/shower unit</li> <li><input type="checkbox"/> <b>-X</b> <i>Integral service stops</i></li> <li><input type="checkbox"/> <b>-CHKS</b> Integral check stops</li> <li><input type="checkbox"/> <b>-IPS</b> 1/2" female IPS connections</li> <li><input type="checkbox"/> <b>-REV</b> Reverse coring for back to back installations</li> <li><input type="checkbox"/> <b>-LP</b> Loop handle</li> <li><input type="checkbox"/> <b>-B</b> Chrome brass escutcheon</li> <li><input type="checkbox"/> <b>-D</b> Chrome brass dome cover</li> <li><input type="checkbox"/> <b>-VP</b> Vandal proof escutcheon screws</li> <li><input type="checkbox"/> <b>-QD</b> Quick disconnect on hand shower units</li> <li><input type="checkbox"/> <b>-R</b> White vinyl hose in place of metal hose</li> <li><input type="checkbox"/> <b>-VB</b> Elevated vacuum breaker</li> <li><input type="checkbox"/> <b>-OP</b> 13" oval plate</li> <li><input type="checkbox"/> <b>-72</b> 6' hose in place of 5' standard</li> <li><input type="checkbox"/> <b>-B30</b> <i>30" adjusting bar in place of standard 36" bar</i></li> <li><input type="checkbox"/> <b>-B48</b> 48" adjusting bar in place of standard 36" bar</li> <li><input type="checkbox"/> <b>-L/GB</b> Less grab bar</li> <li><input type="checkbox"/> <b>-T24</b> 24" grab bar in place of standard 36" bar</li> <li><input type="checkbox"/> <b>-TRM</b> Trim only, valve not included</li> <li><input type="checkbox"/> <b>-STN</b> Satin Nickel finish</li> </ul>	<p> </p> <p><b>Compliance</b></p> <ul style="list-style-type: none"> <li>-ASME A112.18.1/CSA B125.1</li> <li>-WaterSense 1.5 gpm (5.7 L/min) 2.0 gpm (7.6 L/min)</li> </ul> <p>  <small>C US Certified by CSA Group</small></p> <p><u>For California Residents</u> <b>WARNING:</b> This product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.</p> <p><b>Warranty</b></p> <p><b>Limited Lifetime</b> - to the original end purchaser in consumer/residential installations. <b>5 Years</b> - for industrial/commercial installations. Refer to <a href="http://www.symmons.com/warranty">www.symmons.com/warranty</a> for complete warranty information.</p>
<p><b>Note:</b> Append appropriate -suffix to model number.</p>	

**Dimensions**



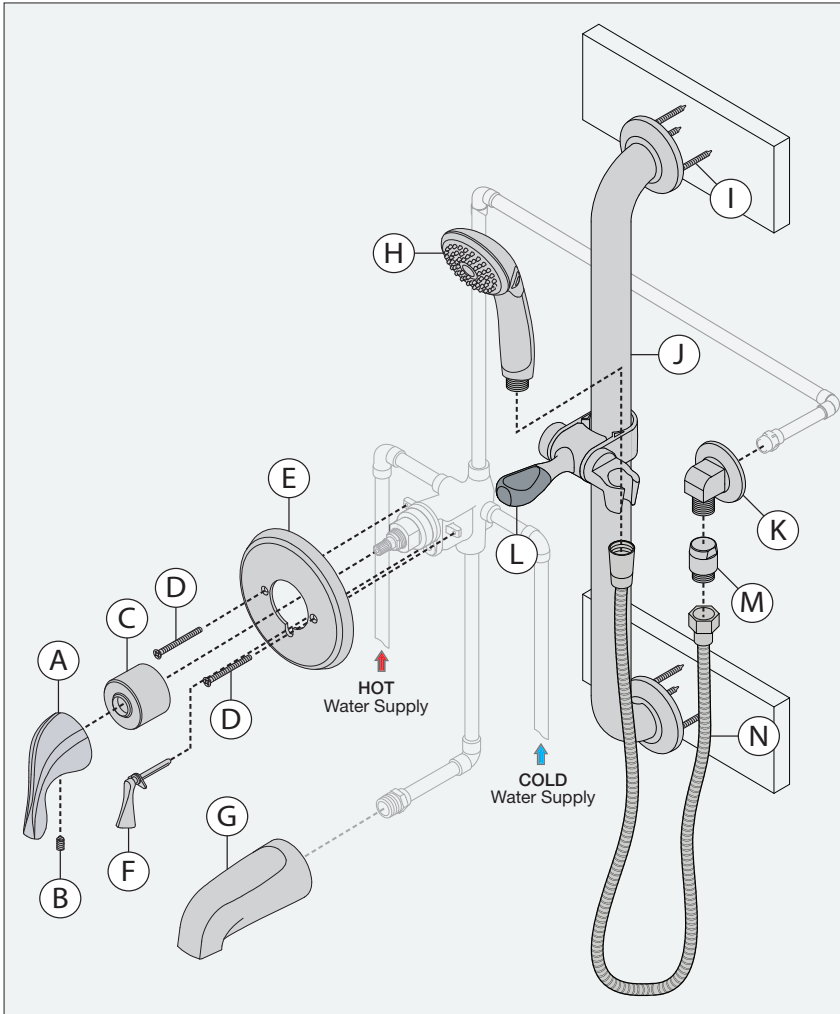
Measurements	
A	3", 76 mm
B	3 1/2", 89 mm
C	Male 1/2" NPT fitting must protrude 3/8" from finished wall
D	Shower Valve Hole Size Min. Ø 3", 76 mm Max. Ø 4", 102 mm
E	3 5/8", 92 mm
F	Rough-in 2 3/8" ± 1/2", 60 mm ± 13 mm
G	Ref. 32", 813 mm (S-9604-PLR) Ref. 42", 1067 mm (S-9603-PLR)
H	Male 1/2" NPT fitting must protrude 4" from finished wall
I	5 1/2", 140 mm
J	Ø 5 3/4", 146 mm
K	3 3/8", 86 mm
L	Ø 2 1/2", 64 mm
M	Ø 2 1/2", 64 mm
N	Ø 3 1/8", 79 mm
O	36", 914 mm
P	39", 991 mm

**Notes:**

- 1) All dimensions measured from nominal rough-in (see F as reference).
- 2) Dimensions subject to change without notice.



**Parts Breakdown**



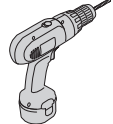
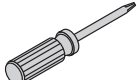

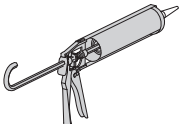


Replacement Parts		
Item	Description	Part Number
A B	Handle Assembly	RTS-063*
C	Dome Cover	T-19*
D E	Shower Escutcheon Kit	Standard S-9600-PLR-ESC* Brass S-9600-PLR-B-ESC*
F	Diverter or Volume Control Handle	Standard RTS-062* Brass RTS-062-B*
G	Tub Spout	060*
H	Hand Shower	ADACHS*
K	Wall Ell	40A*
L	Slide Mechanism	FP-SM6*
M N	In-line Vacuum Breaker & 60" Hose	SP-4*

**\*Note:** Append -STN to part number for Satin Nickel finish.

**Notes:**

- 1) Apply a bead of silicone around the perimeter of all shower trim installed flush to the finished wall. Leave opening on bottom of escutcheon for weep hole.
- 2) Apply plumber tape to all threaded connections.
- 3) Escutcheon artwork is dependent on handle style.

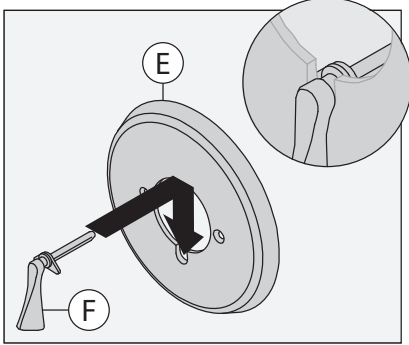
Tools Required	
Adjustable wrench	
Allen wrench (1/8")	
Drill	
Phillips head screwdriver	
Plumber tape	
Silicone	

**Installation**

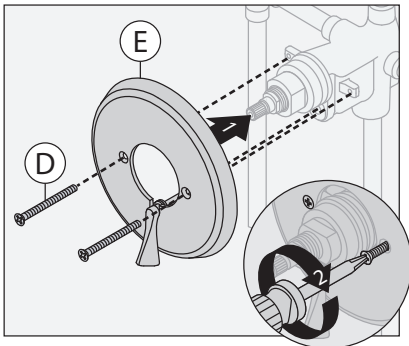
**Note:**

For valve body installation, please see valve body manual.

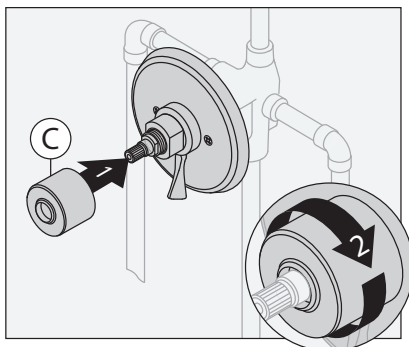
- 1) Attach diverter handle or volume control handle (F) to shower escutcheon (E).



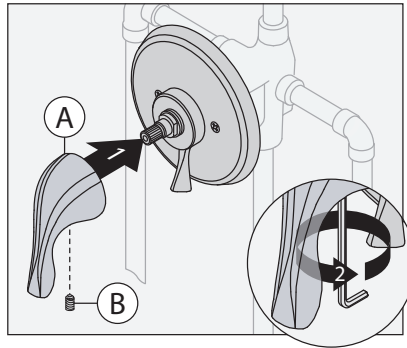
- 2) Install shower escutcheon (E) to shower valve. Secure with two screws (D).



- 3) Install dome cover (C) to valve. Turn clockwise to secure.

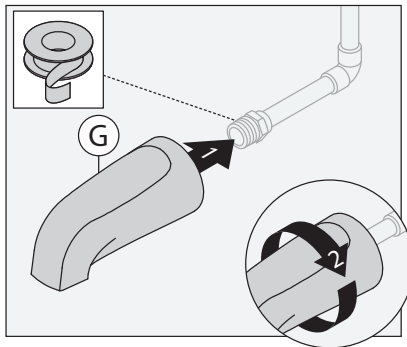


- 4) Install handle (A) to valve. Secure with set screw (B).

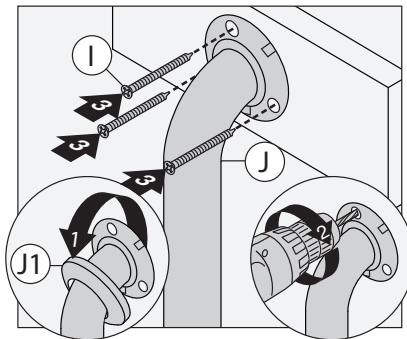


**Note:** Handle should be facing the 6 o'clock position.

- 5) Install tub spout (G) to pipe fitting. Turn clockwise to secure.

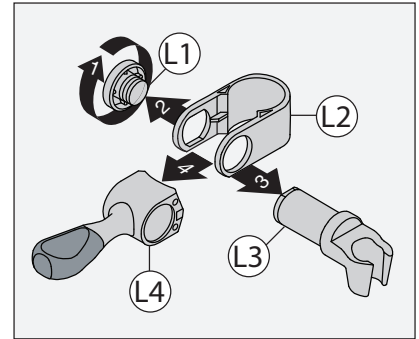


- 6) Remove slide bar ends (J1) from slide bar flanges. Using flanges as a guide, drill 1/8" pilot holes into studs or wood blocking. With slide bar (J) in position, secure to wall using screws (I). Attach slide bar ends (J1) to bar flanges.

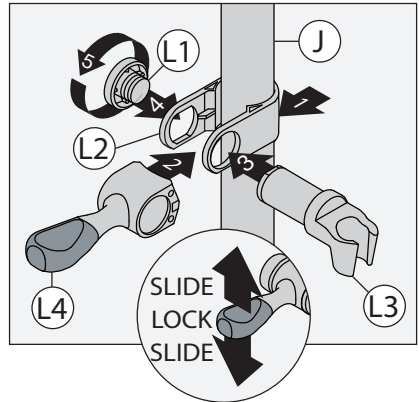


**Note:** Slide bar must be secured with at least two of the three screws (I) at each end.

- 7) Disassemble slide assembly (L).



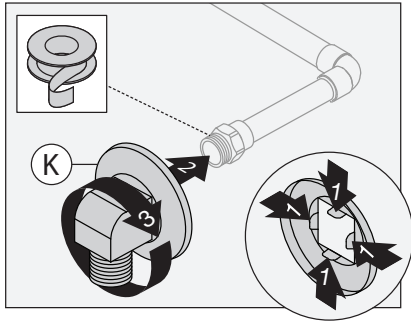
- 8) Install slide assembly (L) to slide bar (J). Flat edge on (L2) and (L3) must be aligned. Arrows on (L2) and (L4) indicate bottom side.



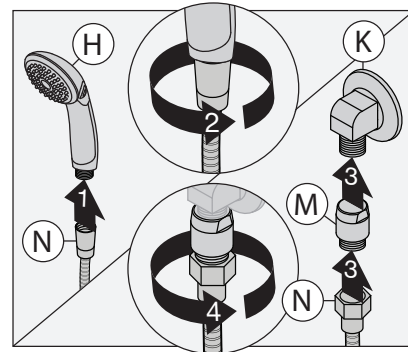
**Note:** Adjust screw cap (L1) for ease of movement of slide assembly.

## Installation

9) Press tabs on wall ell flange. Install wall ell (K) to pipe fitting. Turn clockwise to secure.

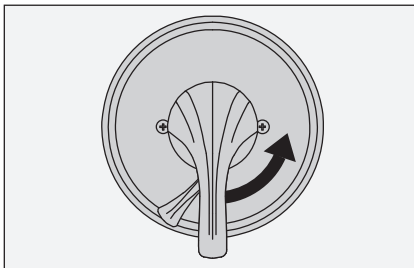


10) Attach hand shower (H) to hose (N). Attach hose (N) to vacuum breaker (M). Connect vacuum breaker (M) to wall ell (K). Turn clockwise to tighten.

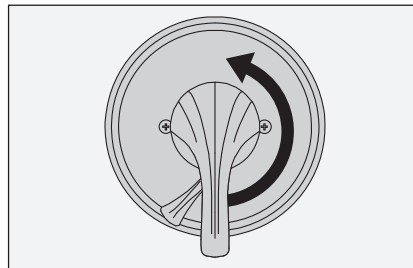


## Operation (Temperature Control)

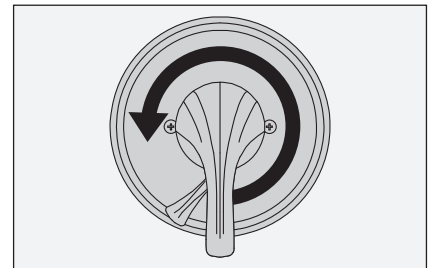
1) Turn shower handle counterclockwise approximately 1/4 turn to put valve in cold position.



2) Turn shower handle counterclockwise approximately 1/2 turn to put valve in warm position.

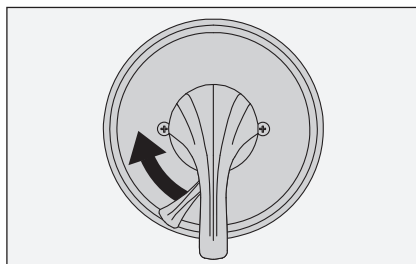


3) Turn shower handle counterclockwise approximately 3/4 turn to put valve in hot position.

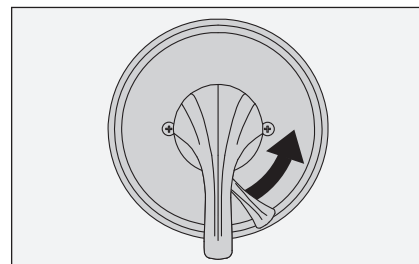


## Operation (Diverter Control)

1) Turn diverter handle left for tub spout operation.



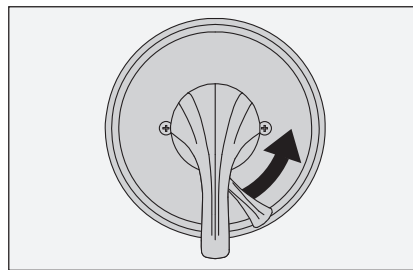
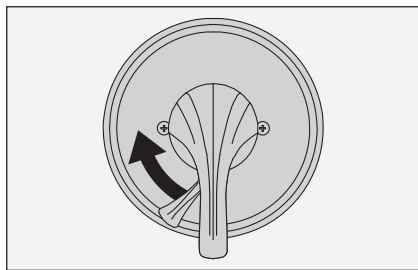
2) Turn diverter handle right for showerhead operation.



## Operation (Volume Control)

1) Turn volume control handle left for high flow.

2) Turn volume control handle right for low flow.



## Troubleshooting Chart

Problem	Cause	Solution
Finish is spotting.	Elements in water supply may cause water staining on finish.	Clean finished trim area with a soft cloth using mild soap and water or a non-abrasive cleaner and then quickly rinse with water.

**F1**

MATERIAL PROVIDED BY



# ELKAY®

## INSTALLATION, CARE & USE MANUAL

*Manual de Instalación, Cuidado y Utilización*

*Manuel d'installation/entretien/utilisation*

### **EZTL™ & LZTL™ Series Versatile Bi-Level Water Coolers**

*EZTL™ & LZTL™ Serie versátil bi-nivel enfriadores de agua*

*EZTL™ & LZTL™ Série versatile refroidisseurs d'eau à deux niveaux*



Unit Installed: EZSTL8LC

Versatile Cooler Models EZSTL8L and LZSTL8L configuration as shipped



Versatile Cooler Models EZSTL8L and LZSTL8L alternate installation

**Note: Danger! Electrical shock hazard. Disconnect power before servicing unit.**  
 Nota: peligro! Peligro de descarga eléctrica. Desconecte antes de reparar la unidad  
 Remarque : Danger ! Risque de choc électrique. Débrancher avant de réparer l'appareil.

Uses HFC-134A refrigerant  
 Usa refrigerante HFC-134A  
 Utilise du fluide frigorigène HFC-134A

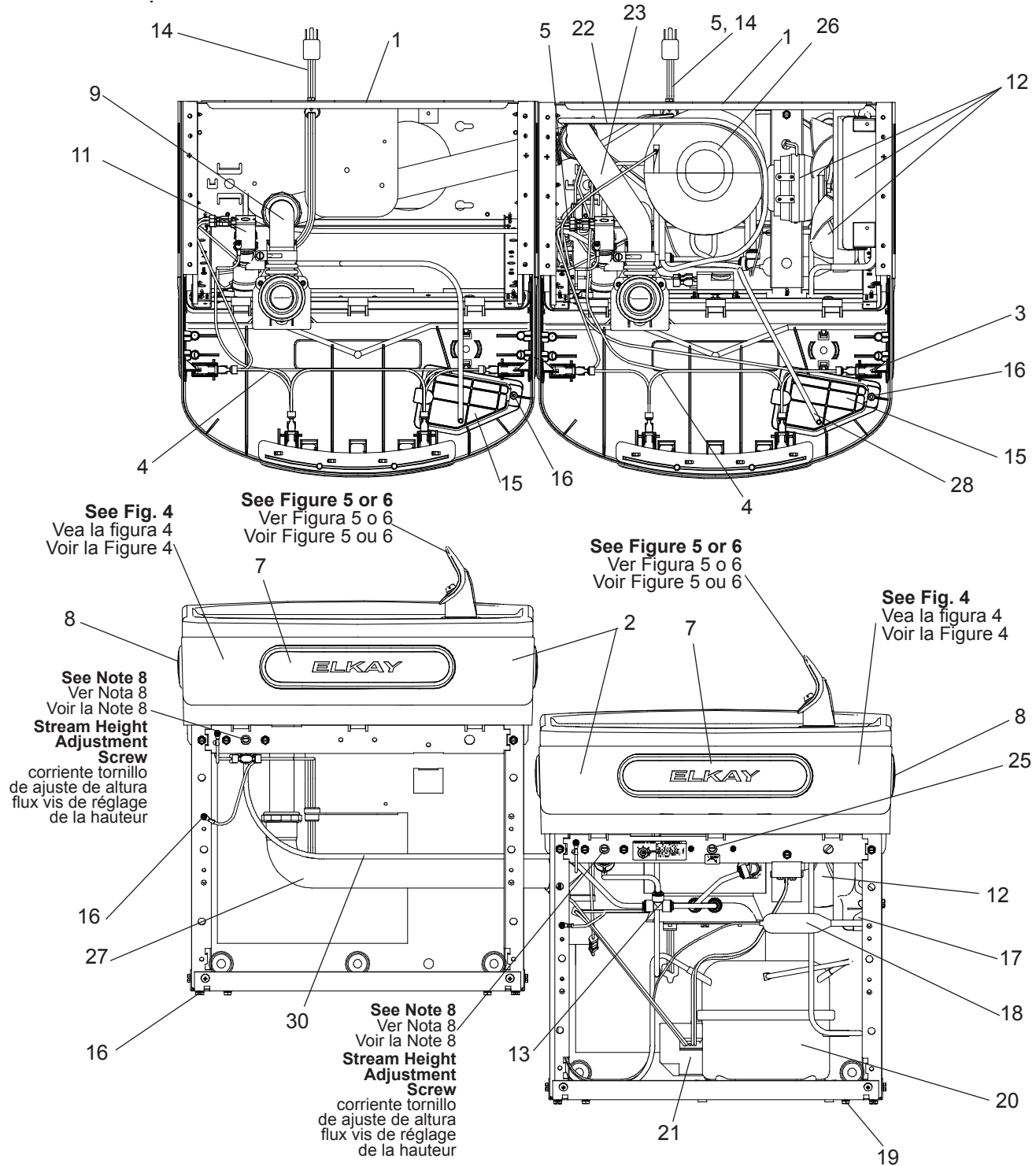
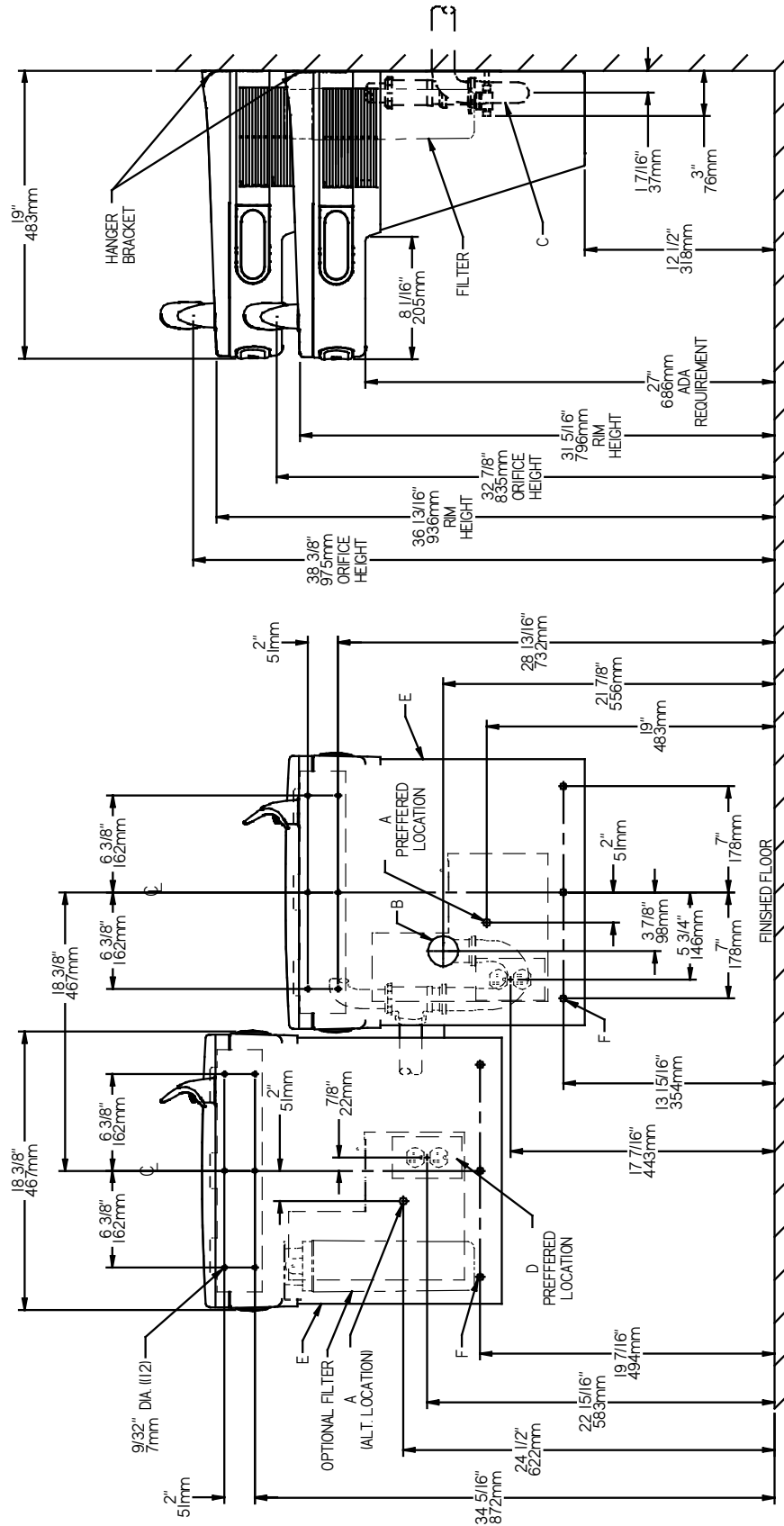


FIG. 1

**STANDARD ROUGH-IN FOR BI-LEVEL MODELS**



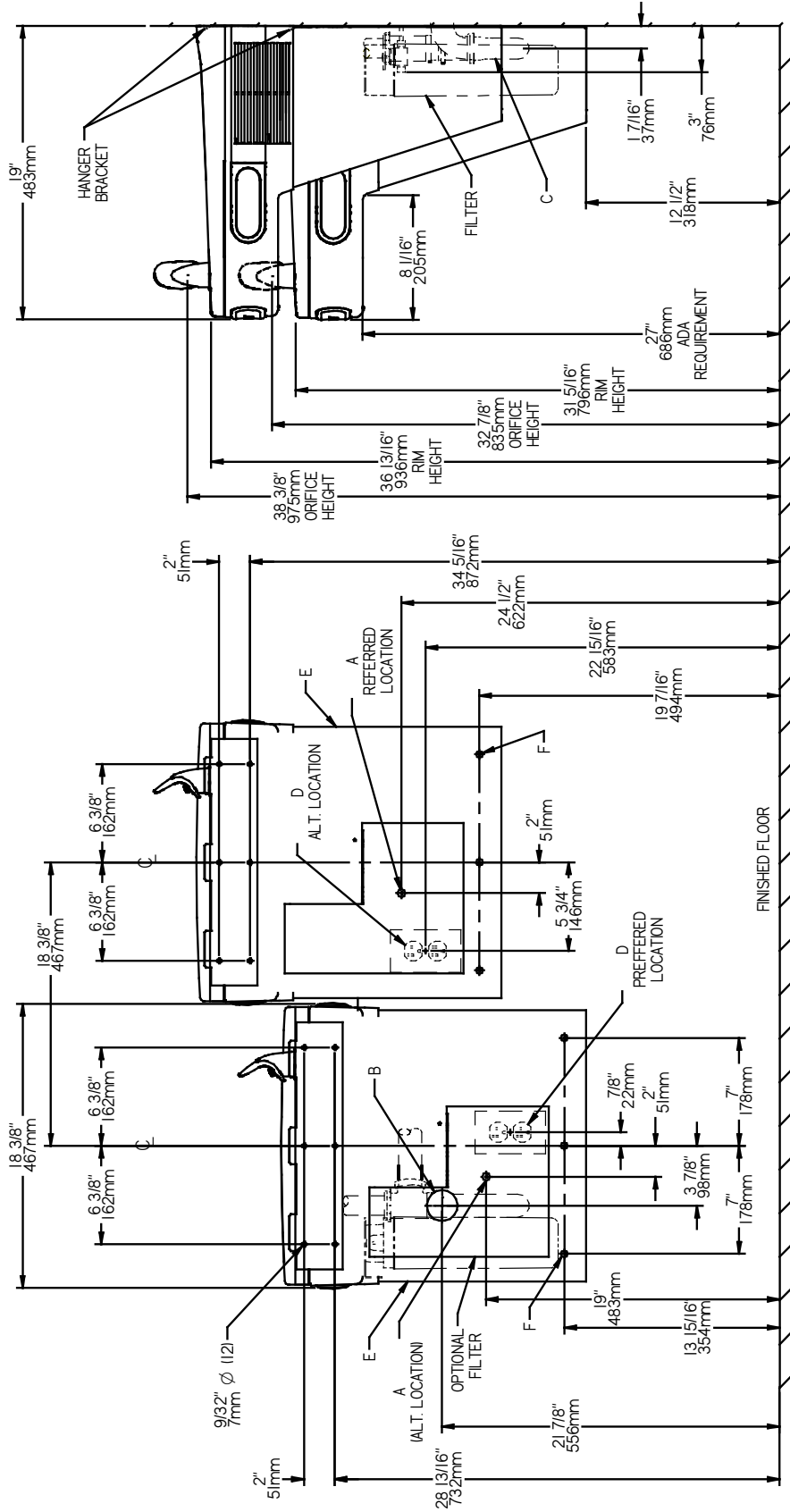
**REDUCE HEIGHT BY 3 INCHES FOR INSTALLATION OF CHILDREN'S ADA COOLER**

- LEGENDA/LEYENDA/LÉGENDE**
- A = RECOMMENDED WATER SUPPLY LOCATION 3/8" O.D. UNPLATED COPPER TUBE CONNECT STUB WITH SHUT OFF (BY OTHERS) 3" (76mm) MAXIMUM OUT FROM WALL**  
 La UBICACION 3/8" O RECOMENDADA de ABASTECIMIENTO DE AGUA. D. El TUBO del COBRE de UNPLATED CONECTA TALONARIO CON APAGO (POR OTROS) 3" (76 mm) el MAXIMO FUERA DE PARED
  - B = RECOMMENDED LOCATION FOR WASTE OUTLET TO ACCOMMODATE 1-1/2" NOMINAL DRAIN. DRAIN STUB 2" OUT FROM WALL**  
 LUGAR RECOMENDADO PARA La SALIDA DE RESIDUOS DEBERA ACOMODAR UN DESAGUE NOMINAL DE 1-1/2" (25.4mm). TRONCO DE DESAGUE DEBERA QUEDAR A UNA DISTANCIA DE 2" PULGADAS (50.8mm) DE LA PARED.
  - C = 1-1/2" TRAP NOT FURNISHED\*\***  
 PURGADOR DE 1-1/2 NO PROPORCIONADO\*\*
  - D = ELECTRICAL SUPPLY (3) WIRE RECESSED BOX DUPLEX OUTLET**  
 ALAMBRES DE SUMINISTRO ELECTRICO (3) EN TOMA DUPLEX EMPOTRADO TIPO CAJA
  - E = INSURE PROPER VENTILATION BY MAINTAINING 6" (152 mm) (MIN.) CLEARANCE FROM CABINET LOUVERS TO WALL.**  
 ASEGURE UNA VENTILACION ADECUADA MANTENIENDO UN ESPACIO E 6" (152 mm) (MIN.) DE HOLGURA ENTRE LA REJILLA DE VENTILACION DEL MUEBLE Y LA PARED
  - F = 7/16" BOLT HOLES FOR FASTENING UNIT TO WALL**  
 AGUJEROS DE LAS TUERCAS DE 7/16" PARA SUJETAR LA UNIDAD A LA PARED
- \*\*NEW INSTALLATIONS MUST USE GROUND FAULT CIRCUIT INTERRUPTER (GFCI)**  
**\*\*LAS NUEVAS INSTALACIONES DEBEN UTILIZAR LOS INTERRUPTORES DE CIRCUITO DE TIERRA DE LA AVERIA (GFCI)**
- \*\*LES NOUVELLES INSTALLATIONS DOIVENT EMPLOYER LES INTERRUPTEURS DE CIRCUIT MOULUS DE DEFAUT (GFCI)**

**FIG. 2**



**ALTERNATE ROUGH-IN FOR BI-LEVEL MODELS**



**FIG. 3**

**REDUCE HEIGHT BY 3 INCHES FOR INSTALLATION OF CHILDRENS ADA COOLER**

- LEGEND/LEYENDA/LÉGENDE**
- A = RECOMMENDED WATER SUPPLY LOCATION 3/8" O.D. UNPLATED COPPER TUBE CONNECT STUB WITH SHUT OFF (BY OTHERS) 3" (76mm) MAXIMUM OUT FROM WALL**  
 La UBICACION 3/8" O RECOMENDADA de ABASTECIMIENTO de AGUA. D. El TUBO del COBRE de UNPLATED CONECTA TALONARIO CON APAGO (POR OTROS) 3" (76 mm) el MÁXIMO FUERA DE PARED
  - B = RECOMMENDED LOCATION FOR WASTE OUTLET TO ACCOMMODATE 1-1/2" NOMINAL DRAIN. DRAIN STUB 2" OUT FROM WALL**  
 LUGAR RECOMENDADO PARA La SALIDA DE RESIDUOS DEBERA ACOMODAR UN DESAGUE NOMINAL DE 1-1/2" (25.4mm). TRONCO DE DESAGUE DEBERA QUEDAR A UNA DISTANCIA DE 2" PULGADAS (50.8mm) DE LA PARED.
  - C = 1-1/2" TRAP NOT FURNISHED\*\***  
 PURGADOR DE 1-1/2 NO PROPORCIONADO\*\*
  - D = ELECTRICAL SUPPLY (3) WIRE RECESSED BOX DUPLEX OUTLET**  
 ALAMBRES DE SUMINISTRO ELECTRICO (3) EN TOMA DUPLEX EMPOTRADO TIPO CAJA. PRISE DOUBLE AVEC BOITIER ENCASTRE POUR ALIMENTATION ELECTRIQUE (3) FILS.
  - E = INSURE PROPER VENTILATION BY MAINTAINING 6" (152 mm) (MIN.) CLEARANCE FROM CABINET LOUVERS TO WALL.**  
 ASEGURE UNA VENTILACION ADECUADA MANTENIENDO UN ESPACIO E 6" (152 mm) (MIN.) DE HOLLGURA ENTRE LA REJILLA DE VENTILACION DEL MUEBLE Y LA PARED
  - F = 7/16" BOLT HOLES FOR FASTENING UNIT TO WALL**  
 AGUIEROS DE LAS TUERCAS DE 7/16" PARA SUJETAR LA UNIDAD A LA PARED
- \*\*NEW INSTALLATIONS MUST USE GROUND FAULT CIRCUIT INTERRUPTER (GFCI)**  
**\*\*LES NOUVELLES INSTALLATIONS DOIVENT EMPLOYER LES INTERRUPTEURS DE CIRCUIT MOULUS DE DEFAULT (GFCI)**

### HANGER BRACKETS & TRAP INSTALLATION

- 1) Remove hanger brackets (Item 29) fastened to back of cooler by removing one (1) screw.
- 2) Mount the hanger bracket as shown in Figure 2 or 3.

**NOTE:** Hanger Brackets MUST be supported securely. Add fixture support carrier if wall will not provide adequate support. Anchor hangers securely to wall using all six (6) 1/4" dia. mounting holes.

#### **IMPORTANT:**

1-7/16 in. (37mm) dimension from wall to centerline of trap must be maintained for proper fit.

### INSTALLATION OF COOLER

- 3) Hang the cooler on the hanger bracket. Be certain the hanger bracket is engaged properly in the slots on the cooler back as shown in Figure 2 or 3.
- 4) Remove the four (4) screws holding the lower front panel at the bottom of cooler. Remove the front panel by pulling straight down and set aside.
- 5) Connect water inlet line--See Note 4 of General Instructions.
- 6) Install trap. Remove the slip nut and gasket from the trap and install them on the cooler waste line making sure that the end of the waste line fits into the trap. Assemble the slip nut and gasket to the trap and tighten securely.

**IMPORTANT:** If it is necessary to cut the drain, loosen the screw at the black rubber boot and remove tube, check for leaks after re-assembly.

- 7) Plug in electrical power. Unit must have electrical power to have water flow.

### START UP

#### Also See General Instructions

- 8) Stream height is factory set at 35 PSI. If supply pressure varies greatly from this, adjust screw located on the left side below push bar ass'y. on crossbar. CW adjustment will raise stream and CCW adjustment will lower stream. For best adjustment, stream should hit basin approximately 6-1/2" (165mm) from bubbler on the downward slope of the basin.

**NOTE:** If continuous flow occurs at the end of the compressor cycle, turn cold control counterclockwise 1/4 turn.

- 9) Replace the front panel ensuring that the metal wrapper is secured inside of the upper shroud. Replace all four screws previously removed.

## CLEANING

Warm, soapy water or mild household cleaning products can be used to clean the exterior panels of the EZ coolers. Extra caution should be used to clean the mirror finished stainless steel panels. They can be easily scratched and should only be cleaned with mild soap and water or Windex glass cleaner and a clean, soft cloth. Use of harsh chemicals or petroleum based or abrasive cleaners **will void the warranty.**

### INSTALACIÓN DE LOS SOPORTES FIJADORES Y EL PURGADOR

- 1) Retire el soporte fijador que se encuentra conectado a la parte posterior del enfriador sacando un (1) tornillo.
- 2) Monte el soporte fijador de la manera descrita en Fig. 2, 3.

**NOTA:** Es necesario que el soporte fijador sea apoyado seguramente. Agregue un portador al soporte fijador si La pared no aporta soporte adecuado. Amarre el soporte colgante seguramente a la pared. Usando todos los seis (6) agujeros de montaje de ¼ pulg. (63.5 mm) de diám.

#### **IMPORTANTE:**

Es necesario mantener una distancia de 1-7/16 pulg. (37mm) de la pared a la línea central del purgador para poder obtener un ajuste correcto.

### INSTALACIÓN DEL ENFRIADOR

- 3) Cuelgue el enfriador en el soporte colgante. Asegúrese que el soporte colgante está enganchado adecuadamente en las ranuras en la parte posterior del enfriador según descrito en Figura 2 o 3.
- 4) Retire los cuatro (4) tornillos que sujetan el panel frontal inferior en el pie del enfriador. Retire el panel frontal al jalarlo hacia abajo y póngalo al lado.
- 5) Conecte la tubería de entrada de agua – Consulte la Nota 4 de la Instrucciones Generales.
- 6) Instale el purgador. Retire la tuerca deslizante y el obturador del purgador e instálos en la tubería de descarga del enfriador, asegurándose de que el extremo de la tubería de descarga encaje en el purgador. Ensamble la tuerca deslizante y el obturador en el purgador y apriete firmemente.

**IMPORTANT:** Si llega a ser necesario cortar la tubería de descarga, afloje el tornillo en el fuelle negro de goma y retire la tubería, después del reensamblaje, compruebe que no haya pérdidas.

- 7) Enchufe la alimentación eléctrica.

### INICIO

#### También consulte las Instrucciones Generales

- 8) La altura del chorro viene predefinida de la fábrica en 35 psi. Si la presión de la fuente varía grandemente de esto, ajuste el tornillo situado en el lado izquierdo debajo de la barra del empuje ass'y. en la barra transversal. Un ajuste en el sentido de las manecillas del reloj alzará al chorro y un ajuste en el sentido contrario a las manecillas del reloj bajará el chorro. Para lograr el mejor ajuste, el chorro debe caer al estanque aproximadamente un 6-1/2 pulg. (165 mm) del grifo en la inclinación hacia abajo del estanque.

**NOTA:** Si ocurre un flujo continuo al fin del ciclo del compresor, gire el control del agua fría una cuarta vuelta en el sentido contrario a las manecillas del reloj.

- 9) Reemplace el panel frontal asegurando que la envoltura metálica está bien sujeta adentro de la cubierta superior. Reemplace todos los cuatro tornillos previamente retirados.

## LIMPIEZA

Se puede usar agua tibia enjabonada o un producto no abrasivo de limpieza para limpiar los paneles exteriores de los enfriadores EZ. Debe usar mucho cuidado al limpiar los paneles de acero inoxidable de acabado espejo. Es muy fácil rayarlos y únicamente debe limpiarse con jabón no abrasivo y agua o con el limpiador de vidrios Windex y un paño limpio y suave. El uso de productos químicos o limpiadores abrasivos o aquellos basados en petróleo **anulará la garantía.**

### INSTALLATION DES SUPPORTS DE SUSPENSION ET DU SIPHON

- 1) Retirez le support de suspension fixé au dos du refroidisseur en retirant une (1) vis.
- 2) Montez le support de suspension comme indiqué dans la figure 2 ou 3.

**REMARQUE:** Le support de suspension doit être accroché sûrement. Renforcez le soutien du mur par l'ajout d'un élément porteur fixe si le mur ne peut pas, à lui tout seul, offrir un soutien suffisant. Fixez le support au mur en utilisant des trous de fixation de 6 pouces ¼ de diamètre.

#### **IMPORTANT:**

Une distance de 1 à 7/16 pouces (37 mm) entre le mur et l'axe du siphon doit être respectée pour assurer une pose correcte.

### INSTALLATION DU REFROIDISSEUR

- 3) Pendez le refroidisseur au support de suspension. Assurez-vous que le support est correctement inséré dans les emplacements au dos du refroidisseur, comme indiqué dans la figure 2 ou 3.
- 4) Retirez les four (4) vis maintenant en place le panneau frontal au bas du refroidisseur. Retirez le capot inférieur en tirant vers le bas et mettez-le de côté.
- 5) Reliez l'alimentation en eau — Référez-vous à la remarque 4 des Instructions Générales.
- 6) Mettez en place le siphon. Retirez l'écrou coulissant et le joint statique du siphon et installez-les sur la conduite résiduaire du refroidisseur en vérifiant bien que l'extrémité de la conduite résiduaire entre dans le siphon. Installez l'écrou coulissant et le joint statique au siphon et serrez fortement.

**IMPORTANT:** Au cas où il serait nécessaire de couper le drain, déserez la vis située sur la gaine noire en caoutchouc et retirez le tube, puis vérifiez qu'il n'y a pas de fuites avant de remonter.

- 7) Branchez l'alimentation électrique.

### DEMARRAGE

#### Voir également le chapitre Instructions Générales

- 8) La pression de la vapeur a été réglée en usine à 35 psi. Si la pression d'approvisionnement change considérablement de ceci, ajustez la vis plac du côté gauche au-dessous de la barre de poussée ass'y. sur la barre transversale. Le réglage dans le sens des aiguilles d'une montre augmente le jet, et dans le sens inverse le diminue. Pour un meilleur réglage, le jet doit frapper le bassin à une distance d'environ 6 pouces et demi (165 mm) du barboteur sur la pente descendante du bassin.

**REMARQUE:** Si un flot continu se déclenche à la fin du cycle de compression, tournez le Contrôleur de refroidissement d'un quart de tour dans le sens inverse des aiguilles d'une montre.

- 9) Remettez le panneau frontal en place en vérifiant que le couvre-joint métallique est bien installé à l'intérieur de l'enveloppe de protection supérieure. Révissez les four vis otées précédemment.

## ENTRETIEN

Utiliser de l'eau tiède savonneuse ou des produits de nettoyage domestiques doux pour nettoyer les panneaux extérieurs des refroidisseurs EZ. Une prudence supplémentaire est requise lors du nettoyage du miroir ou des panneaux inox. Ces éléments peuvent se rayer facilement et doivent être uniquement nettoyés à l'aide de savon doux et d'eau ou de liquide nettoyant pour vitres Windex et d'un chiffon doux et propre. L'utilisation de produits chimiques corrosifs et de nettoyants abrasifs ou dérivés du pétrole **annulera la garantie constructeur.**

## Service Instructions

### Lower and Upper Shroud

To access the refrigeration system and plumbing connections, remove four screws from bottom of cooler to remove the lower shroud. To remove the upper shroud for access to the pushbars, regulator, solenoid valve or other components located in the top of the unit, remove lower shroud, disconnect drain, remove four screws from tabs along lower edge of upper shroud, unplug two wires and water tube.

### Bubbler

To remove the bubbler, first disconnect the power supply. The underside of the bubbler can be reached through the access panel (Item 36) on the underside of the upper shroud (Item 2). Remove the access panel by removing the retaining screw. To remove the bubbler, loosen locknut from the underside of the bubbler and remove the tubing from the quick connect fitting per the Operation Of Quick Connect Fittings section in the General Instructions. After servicing, replace the access panel and retaining screw.

### Switches Behind the Push Bar

The regulator, Item 11, in an EZ cooler is always held fully open by the use of a single regulator nut (See Figure 7). Water is not dispensed until the pushbar is depressed to activate a switch which then opens a solenoid valve. When installing the regulator nut, the regulator spring must be depressed while turning the nut.

Single bar units will have the same wiring as side push bar units but will not have the extra leads attached to sidebars.

To remove sidebars, from the inside compress the flared tabs and pull out carefully. To reinstall side pushbars, the front of the pushbar is inserted first. While keeping the switch depressed, snap the rear of the pushbar into position.

## Atienda a Instrucciones

### Las cubiertas inferiores y superiores

Para obtener acceso al sistema de refrigeración y las conexiones de plomería, retire cuatro tornillos de la parte inferior del enfriador para así poder retirar la cubierta inferior. Para retirar la cubierta superior para obtener acceso a las barras tope de empuje, regulador, la válvula del solenoide u otros componentes ubicados en la parte superior de la unidad, retire la cubierta inferior, desconecte el tubo de desagüe, retire cuatro tornillos de las lengüetas a lo largo del borde inferior de la cubierta superior, desenchufe dos cables y la tubería de agua.

### Burbujeador

Para quitar el burbujeador, primero hay que desconectar la alimentación. Se puede obtener acceso a la parte inferior del burbujeador a través del panel de acceso (Figura 36) en la parte inferior de la cubierta superior (Figura 2). Quite el panel de acceso sacando el tornillo de retención. Para retirar el burbujeador, suelte la contratuercas de la parte inferior del burbujeador y saque la tubería del accesorio de conexión rápida según descrito en la sección Funcionamiento de los Accesorios de Conexión Rápida en las Instrucciones Generales. Después de realizar el servicio, reemplace el panel de acceso y el tornillo de retención.

### Interruptores detrás de la barra tope de empuje

El enfriador EZ es parecido a un sensor fotoeléctrico en que el regulador siempre está completamente abierto pero no surte el agua hasta que la barra tope se empuja (figura 8). Se escuchará un sonido de chasquidos al activar el interruptor y la válvula del solenoide. Una sola tuerca del regulador mantiene abierto el regulador en todo momento. Al instalar la tuerca, es necesario presionar el resorte del regulador mientras gira la tuerca.

Unidades con una sola barra tendrán el mismo cableado que las unidades con barras tope laterales pero no tendrán los cables extras conectados a las barras laterales.

Para retirar las barras laterales, desde el interior, hay que contraer las lengüetas acampanadas y retire cuidadosamente. Para reinstalar las barras tope laterales, se debe introducir la parte frontal de las barras primero. Con el interruptor presionado, encaje con un chasquido la parte posterior de la barra tope en la posición correcta.

## Entretenir des Instruccions

### Enveloppes de Protection Supérieure et Inférieure

Pour accéder au système de réfrigération et aux raccords de plomberie, retirez les four vis situées au bas du refroidisseur pour retirer l'enveloppe inférieure. Pour retirer l'enveloppe supérieure afin d'avoir accès aux boutons-poussoir, au régulateur, à l'électrovanne ou à tout autre composant situé au sommet de l'unité, retirez l'enveloppe inférieure, déconnectez le drain, retirez les quatre vis des pattes situées le long de l'arête inférieure de l'enveloppe supérieure, et débranchez les deux câbles ainsi que le raccordement en eau.

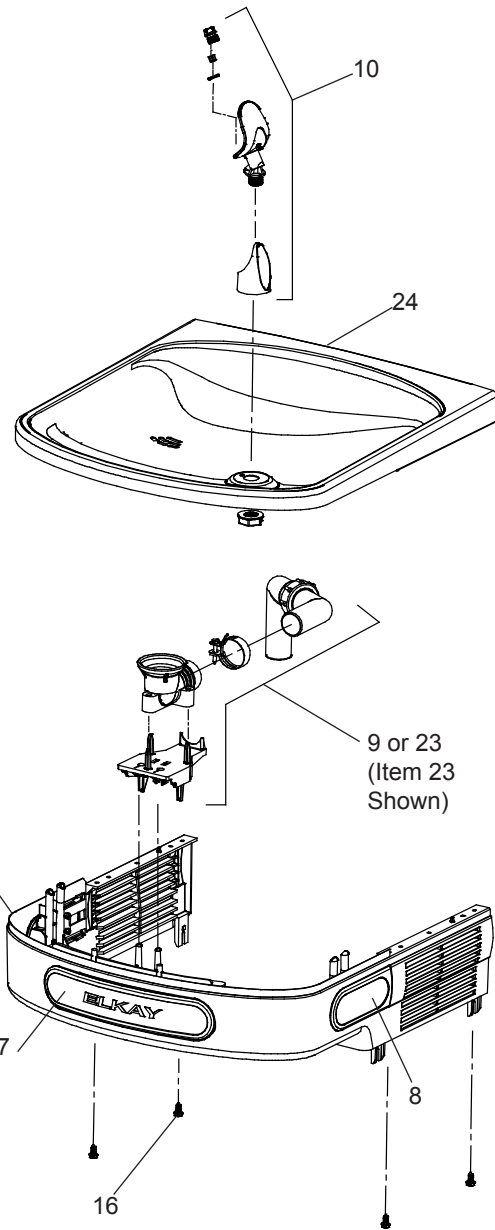


FIG. 4

### Barboteur

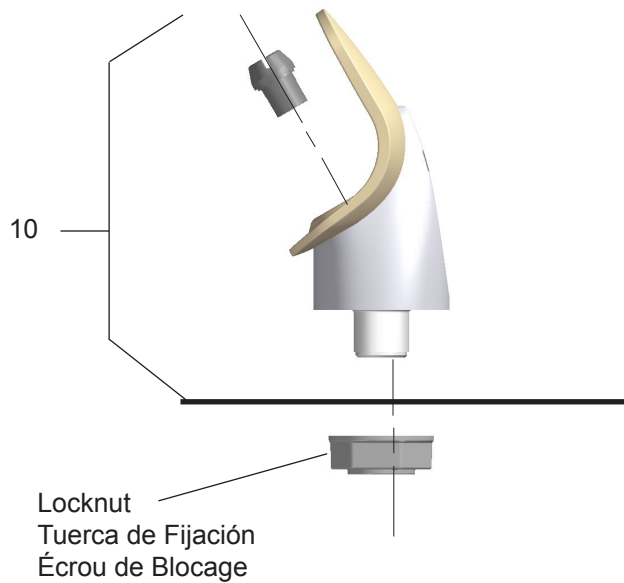
Pour déposer le barboteur, débranchez d'abord l'alimentation électrique. Le dessous du barboteur est accessible par le biais du panneau d'accès (composant 36) sur la face inférieure du collecteur d'air. Déposez le panneau d'accès en retirant la vis de retenue. Pour déposer le barboteur, desserrez l'écrou de blocage du dessous du barboteur et retirez la tubulure à partir du raccord rapide conformément à la section Utilisation des raccords rapides dans les instructions générales. Une fois le travail terminé, remplacez le panneau d'accès et la vis de

### Interrupteurs derrière le bouton-poussoir

Le refroidisseur EZ a un fonctionnement similaire à celui d'un capteur photo-électrique, dans le sens où le réglage est toujours complètement ouvert mais ne dispense de l'eau que lorsque l'on presse le bouton-poussoir (composant 8). Un cliquetis se produit quand l'interrupteur et l'électrovanne se mettent en marche. Un seul écrou de réglage maintient le réglage en position ouverte en permanence. Lors de l'installation de l'écrou, le ressort de détente doit être en position relâchée pendant le réglage de l'écrou.

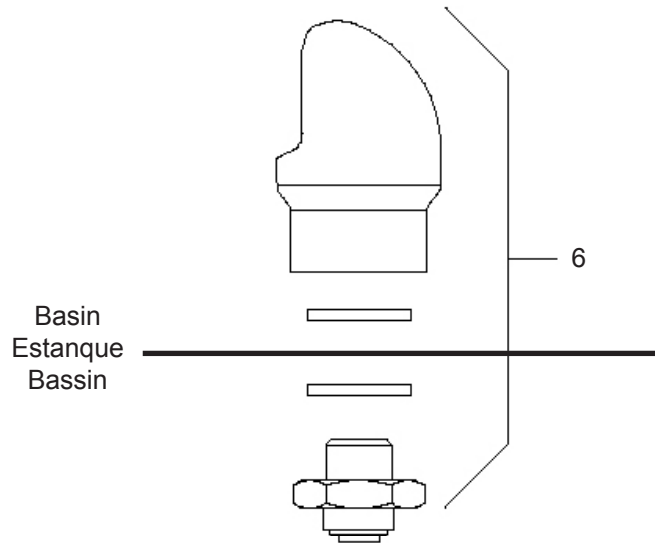
Les unités à une barre possèdent le même câblage que les unités à boutons-poussoir latéraux mais ne possèdent pas les connexions supplémentaires attachées aux barres latérales.

Afin de retirer les barres latérales, pressez les pattes évasées de l'intérieur et tirez doucement. Pour réinstaller les barres latérales, la partie avant est d'abord insérée. En gardant l'interrupteur relâché, encastrer l'arrière du bouton-poussoir en position.



BUBBLER DETAIL  
 DETALLE DEL GRIFO  
 DETAIL DU BARBOTEUR

FIG. 5



VANDAL RESISTANT BUBBLER DETAIL  
 DETALLE DEL GRIFO RESISTENTE AL VANDALISMO  
 DESCRIPTION DU BARBOTEUR RESISTANT AU VANDALISME

FIG. 6

**NOTE:**

When installing replacement bubbler and pedestal, tighten locknut only to hold parts snug in position. Do Not Overtighten.

**NOTA:**

Al instalar el grifo y pedestal de reemplazo, apriete la tuerca unicamente para mantener las piezas en una posicion ajustada. No dede apretarse demasiado.

**REMARQUE:**

Lors de L'installation du barboteur de remplacement ou du socle, serez la vis afin de maintenir les elemants en place. Ne Pas Serrer Trop Fortement.

**Cleaning the strainer**

To clean the strainer, unscrew the cap of the solenoid valve. Remove screen and rinse thoroughly with water. Insert screen back into solenoid valve and screw cap on. Make sure the o-ring is placed properly.

**Limpieza del filtro**

Para limpiar el filtro, desatornille la tapa de la válvula solenoide. Retire la malla y enjuague a fondo con agua. Inserte nuevamente la malla en la válvula solenoide y atornille la tapa. Asegurese de que el retén anular quede colocado correctamente.

**Nettoyage du filtre**

Pour nettoyer le filtre, dévisser le bouchon du robinet électromagnétique (ou électro robinet). Retirez l' écran et rincez-le à fond sous l' eau. Remettez l' écran en place dans l' électro robinet puis revissez le bouchon. Assurez-vous que le joint torique est correctement positionné.

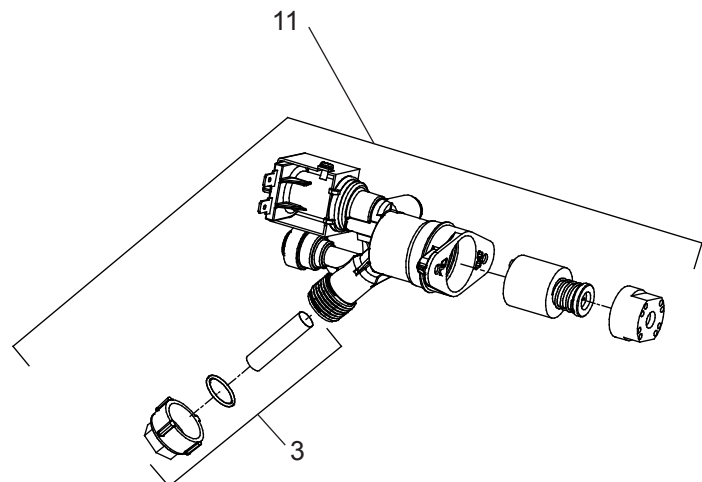


FIG. 7

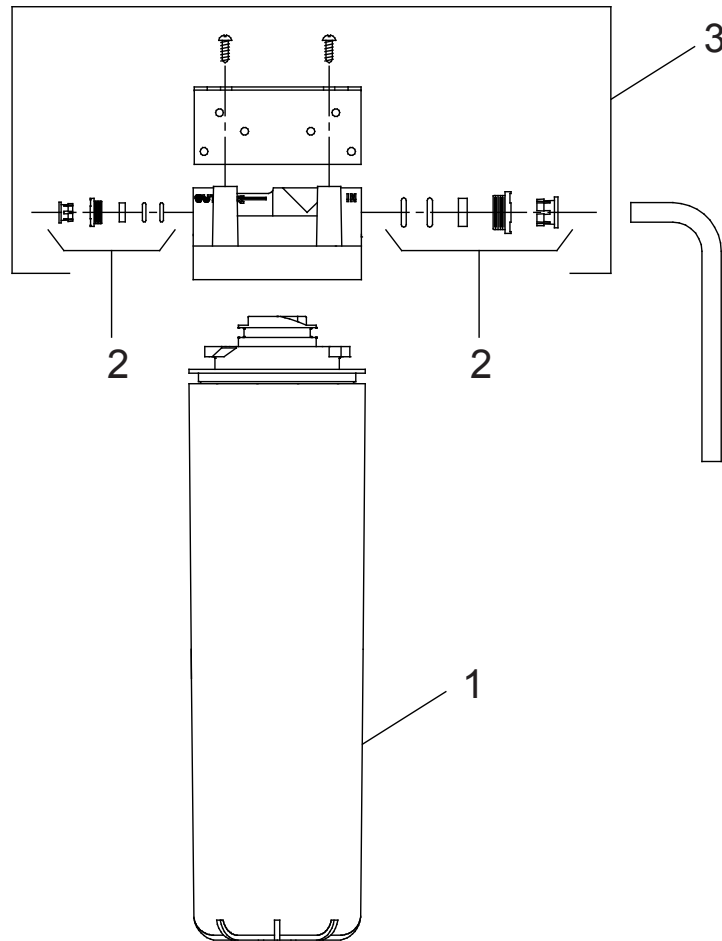


Fig. 8

**WATERSENTRY® Filter Detail**  
**Detalle WATERSENTRY® Filtro**  
**Description WATERSENTRY® Filtrage**

WATERSENTRY® FILTER PARTS LIST (See Fig. 8)			LISTA DE PIEZAS DEL FILTRO (Vea la Fig. 8)	LISTE DES PIÈCES DU FILTRE (Voir Fig. 8)
ITEM NO.	PART NO.	DESCRIPTION	DESCRIPCIÓN	DESCRIPTION
1	51299C	Filter Assy-1500 Gal.	Ensamblado del Filtro-1500 Galón	Ens. filtre-1500 Gallon
2	98926C	Kit-Filter Head Fitting Includes John Guest Fittings	Kit-Filtro Jefe de montaje incluye a John Guest Accesorios	Kit-Filtrez Fitting tête comprend John Guest Raccord
3	000000746	Assy -Filter & Bracket includes Filtr Head/Mtg Bkt/ John Guest Ftgs/Screws	Asamblea-filtro y soporte incluye cabeza del filtro / Soporte de montaje / John Guest Accesorios / Tornillos	Assemblée-Filter & Support inclut filtre Tête / Patte de montage / John Guest Raccords / Vis

**220V PARTS LIST/ 220V LISTA DE PIEZAS/ 220V LISTE DES PIÈCES**

ITEM NO.	PART NO.	DESCRIPTION	DESCRIPCIÓN	DESCRIPTION
11	000000802	Kit - Solenoid Valve/Regulator Assy	Kit - Montaje del Regulador/Válvula Soleoide	Kit - Solénoide de la Vanne/Régulateur
12	000000245	Kit - Fan Motor Assy/Blade/Motor/Shroud/ Screws/Nut (220V-50Hz/60Hz)	Kit - Ventilador Motor Montaje/Hoja/Motor/ Cubierta/Tornillos/Tuerca (220V-50Hz/60Hz)	Kit - Ventilateur Moteur Assemblée/Lame/Moteur/ Cache/Vis/Ecrou (220V-50Hz/60Hz)
14	36066C 36067C	Power Cord Power Cord Non-Refrigerated	Cable eléctrico Cable eléctrico L/R	Cordon d'Alimentation Cordon d'Alimentation L/R
*20	1000002147 1000002146	Compressor Serv. Pak (220V/50Hz) Compressor Serv. Pak (220V/60Hz)	Compressor Paquete de servicio (220V/50Hz) Compressor Paquete de servicio (220V/60Hz)	Kit d'Entretien du Compresseur (220V/50Hz) Kit d'Entretien du Compresseur (220V/60Hz)
21	98751C 98752C	Kit - Elect/Overload/Relay/Cvr (220V/50Hz) Kit - Compr Elect/Relay/Cvr/ Overload (20V/60Hz)	Kit - compresor eléctrico/relé/sobrecarga/cubierta (220V/50Hz) Kit - compresor eléctrico/relé/sobrecarga/cubierta (220V/60Hz)	Kit-compresseur électrique/relais/surcharge/couverture (220V/50Hz) Kit-compresseur électrique/relais/surcharge/couverture (220V/60Hz)
34	36004C	Jumper Wire (220V)	Puente de alambre (220V)	Fil de raccordement (220V)
NS	28030C	Brkt - Power Inlet	Soporte - Entrada De Eléctrico	Support - Entrée d'alimentation
NS	35826C	Inlet Power	Entrada De Eléctrico	Entrée d'alimentation
NS	36357C	Split Snap Bushing	Buje rápido partido	Douille instantanée fendue

\*INCLUDES RELAY & OVERLOAD. IF UNDER WARRANTY, REPLACE WITH SAME COMPRESSOR USED IN ORIGINAL ASSEMBLY.

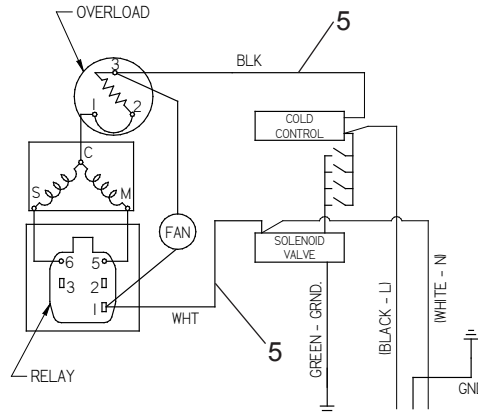
NOTE: All correspondence pertaining to any of the above water coolers or orders for repair parts MUST include Model No. and Serial No. of cooler, name and part number of replacement part.

\*INCLUYE RELÉ Y SOBRECARGA. SI ESTÁ BAJO GARANTÍA, REEMPLACE CON EL MISMO COMPRESOR USADO EN EL ENSAMBLADO INICIAL.

NOTA: Toda la correspondencia relacionada con el enfriador de agua anterior o con una orden de reparación piezas DEBERÁ incluir el número de modelo y número de serie del enfriador, el nombre y número de pieza de la pieza de repuesto.

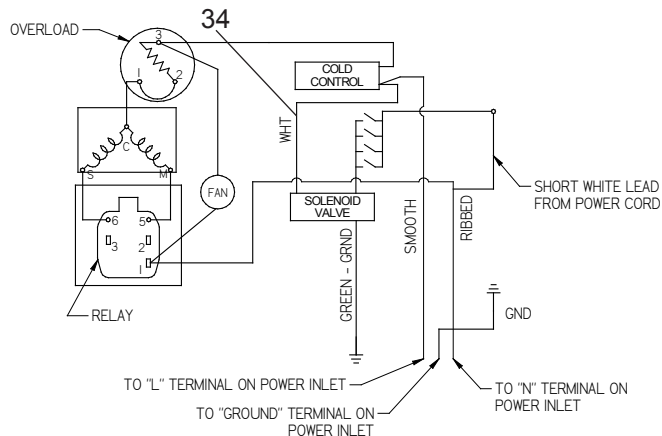
\*COMPREND RELAIS ET SURCHARGE. SI SOUS GARANTIE, REMPLACEZ AVEC LE MÊME SURPRESSEUR QUE CELUI UTILISÉ ORIGINALEMENT.

NOTE: Toute correspondance au sujet des refroidisseurs d'eau courante ou toute commande de pièce de rechange DOIT inclure le numéro de modèle et le numéro de série du refroidisseur ainsi que le nom et le numéro de pièce à remplacer.



**Fig. 9**

115V Wiring Diagram  
 Esquema eléctrico 115V  
 Diagramme de câblage 115V



**Fig. 10**

220V Wiring Diagram  
 Filtered and Non-Filtered Bottle  
 Filler

BLACK ROCK CONGREGATIONAL CHURCH O&M MANUAL EMS JOB 4845  
EZ(S)TL8\*1G, 2G LZ(S)TL8\*1G, 2G

115V PARTS LIST/ 115V LISTA DE PIEZAS/ 115V LISTE DES PIÈCES

ITEM NO.	PART NO.	DESCRIPTION	DESCRIPCIÓN	DESCRIPTION
1	28401C	Hanger Bracket	Soporte colgante	Support de suspension
2	56229C	Assy - Shroud - Upper (Front Side Push)	Cubierta - Superior (Frontal Lateral Presión)	Enveloppe de Protection - Supérieure (Face Laterel Poussoir)
3	56230C	Assy - Shroud - Upper (Front Push)	Cubierta - Superior (Frontal Presión)	Enveloppe de Protection - Supérieure (Face Poussoir)
3	98169C	Kit - Replacement Cap/Screen/O-Ring	Kit del reemplazo Tapa/Malla/Reten Anular	Kit De rechange De Bouchon/Ecran/joint Torique
4	36216C	Wiring Harness (Front Side Push)	Haz de hilos (Frontal Lateral Presión)	Câblage Electrique (Face Laterel Poussoir)
4	36217C	Wiring Harness (Front Push)	Haz de hilos (Frontal Presión)	Câblage Electrique (Face Poussoir)
5	98774C	Kit - Internal Wiring/Pwr Cord/Black and White Jumper Wires	Kit - Cableado Interno/Cable/Negro Y Blanco Puentes	Kit - Câblage Interne/Câble d'Alimentation/Noir et Fils de Raccordement Blanc
6	97446C	Kit - VR Bubbler with Nipple	Kit - Vandar peleele resistente con Nipple	Kit - Vandar barboteur résistant avec Nipple
7	98734C	Kit - Pushbar (Front/Side) EZS TL	Kit - Manillar (Frontal/Lateral) EZS TL	Kit - Barre de Poussée (Avant/Côté) EZS TL
8	56074C	Pushbar - Side	Empuje Bar - Side	Poussez Bar - Side
9	97969C	Kit - Drain Replace EZTLD	Kit - Tubo de Desagüe - EZDTL	Kit - Tube de Drainage EZDTL
10	92715C	Kit - Bubbler Assembly	Kit - Ensamblado del borboteador	Kit - Ens. barboteur
11	98466C	Kit - Solenoid Valve/Regulator Assy	Kit - Montaje del Regulador/Válvula Solenoide	Kit - Solénoide de la Vanne/Régulateur
12	98775C	Kit - Fan Motor Assy/Blade/Motor/Shroud/ Screws/Nut	Kit - Ventilador Motor Montaje/Hoja/Motor/ Cubierta/Tornillos/Tuerca	Kit - Ventilateur Moteur Assemblée/Lame/Moteur/ Cache/Vis/Ecrou
13	1000001994	Kit - Tee 1/4" (3 Pack)	Kit - Tee" 1/4 (paquete de 3)	Kit - Tee" 1/4 (Pack de 3)
14	36287C	Power Cord EZTL	Cable eléctrico EZTL	Cordon d'Alimentation EZTL
14	35980C	Power Cord L/R	Cable eléctrico L/R	Cordon d'Alimentation L/Réfrigérant
15	56213C	Access - Panel	Panel -Acceso	Panneau - Accés
16	98898C	Kit - Hardware (EZ)	Kit - Juego de Accesorios (EZ)	Kit - De Visserie (EZ)
17	98776C	Kit - Condenser/Drier	Kit - Condensador/Secador	Kit - Condenseur/Séchoir
18	66703C	Drier	Secador	Déshydrateur
19	98777C	Kit - Compr Mtg Hdwe/Grommets/ Clips/Studs	Kit - Matériel de Montaje Compresor/Ojal/ Pinza/Taquete	Kit - Montage du Compresseur Materiel/Joint d'étanchéité/Clip/Goujon
*20	36322C	Compressor Serv. Pak	Compresor Paquete de servicio	Kit d'Entretien du Compresseur
21	000000238	Kit - Electrical Relay/Overload/Cover	Kit - compresor eléctrico/relé/sobrecarga/cubierta	Kit-compresseur électrique/relais/surcharge/couverture
22	98778C	Kit - Heab/Drier	Kit - Intercambiador Térmico/Secador	Kit - Echangeur Thermique/Déshydrateur
23	98900C	Kit - Drain Replace/Tube/Bracket/ Fitting/Clamp	Kit - reemplazar/tubo/soporte/montaje/abrazadera de desagüe	Kit - entier/tubo/soporte/montaje/ poste de desagüe
24	55001109	Basin - Stainless Steel	Estanque - Acero inoxidable	Basin - Inox
25	98773C	Kit - Cold Control/Screws	Kit - Control del Enfriamiento/Tornillos	Kit - Contrôle de Refroidissement/Vis
26	98724C	Kit - Evaporator Assembly	Montaje del Kit-Evaporador	Assemblée de L'évaporateur en Kit
27	45874C	Wasteline Assy. TL	Malgaste la Asamblea de la Linea TL	Gaspiller TL d'Assemblée de Ligne
28	56092C	Poly tubing (Cut to length)	Tubería de polipropileno (Para cortar al largo)	Poly tube (Ajusté à la longueur souhaitée)
NS	28020C	Wrapper - Filler Light Grey	Envoltura Llenador Acero inoxidable	Couvre-joint - Inox
NS	28021C	Wrapper - Filler Stainless	Envoltura Llenador Gris claro	Couvre-joint - Gris clair
NS	1000000888	Kit - EZTL Wrapper/Serv Label - Stainless (R)	Kit - envoltura de acero inoxidable (R)	Kit de Filtrage d'Eau (Si Fourni)
NS	1000000944	Kit - EZTL Wrapper/Serv Label - Light Grey (R)	Kit de luz gris envoltura (R)	Enveloppe extérieure kit-inox (R)
NS	1000000758	Kit - EZTLD Wrapper/Serv Label - Stainless (L)	Envoltura exterior kit-acero inoxidable sin rejillas (L)	Kit-gris de Cape extérieure (R)
NS	1000000759	Kit - EZTLD Wrapper/Serv Label - Light Grey (L)	Gris luz kit envoltura exterior sin rejillas (L)	Acier inoxydable-kit Cape extérieure sans persiennes (L)
NS	See Filter Table	Water Filter Kit (When Provided)	Kit de Filtro de Agua (Cuando provisto)	Enveloppe extérieure kit-gris sans persiennes (L)
NS	75635C	Screw - #10-16 x .75 PTHD	Tornillo - #10-16 x .75 PHTD	Vis - #10-16 x .75 PHTD

\*INCLUDES RELAY & OVERLOAD. IF UNDER WARRANTY, REPLACE WITH SAME COMPRESSOR USED IN ORIGINAL ASSEMBLY.

NOTE: All correspondence pertaining to any of the above water coolers or orders for repair parts MUST include Model No. and Serial No. of cooler, name and part number of replacement part.

\*INCLUYE RELÉ Y SOBRECARGA. SI ESTÁ BAJO GARANTÍA, REEMPLACE CON EL MISMO COMPRESOR USADO EN EL ENSAMBLADO INICIAL.

NOTA: Toda la correspondencia relacionada con el enfriador de agua anterior o con una orden de reparación piezas DEBERÁ incluir el número de modelo y número de serie del enfriador, el nombre y número de pieza de la pieza de repuesto.

\*COMPREND RELAIS ET SURCHARGE. SI SOUS GARANTIE, REMPLACEZ AVEC LE MÊME SURPRESSEUR QUE CELUI UTILISÉ ORIGINALEMENT.

NOTE: Toute correspondance au sujet des refroidisseurs d'eau courante ou toute commande de pièce de rechange DOIT inclure le numéro de modèle et le numéro de série du refroidisseur ainsi que le nom et le numéro de pièce à remplacer.

REPAIR SERVICE INFORMATION TOLL FREE NUMBER 1-800-260-6640

NÚMERO GRATIS DE SERVICIO 1-800-260-6640

INFORMATIONS POUR LE SERVICE PAR NUMERO SANS FRAIS 1-800-260-6640

FOR PARTS, CONTACT YOUR LOCAL DISTRIBUTOR OR CALL 1.800.834.4816

PARA PIEZAS, CONTACTE A SU DISTRIBUIDOR LOCAL O LLAME AL 1.800.834.4816

POUR OBTENIR DES PIÈCES, CONTACTEZ VOTRE DISTRIBUTEUR LOCAL OU COMPOSEZ LE 1.800.834.4816

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DWH

MATERIAL PROVIDED BY







## INSTALLATION GUIDE AND OWNER'S MANUAL

### FlowCo™

### ELECTRIC INSTANTANEOUS WATER HEATERS





***BEFORE ATTEMPTING ANY INSTALLATION, MODIFICATION OR SERVICE OF THIS HEATER, MAKE SURE THE ELECTRICAL POWER IS DISCONNECTED.***

Read and understand the instructions thoroughly before attempting the installation or service of this water heater. Failure to follow the instructions can result in serious injury, death and/or property damage. The warranty of the water heater will depend upon proper installation according to the instructions. Some heaters come supplied with separate faucet aerators. If supplied, the aerator must be installed in the faucet for optimum performance. The heater must only be used to heat water and must be installed in a location where it is not subject to freezing temperatures. The manufacturer is not liable for any damages resulting from improper installation or misuse.

The installation must conform to the latest requirements of the National Electrical Code and all applicable state and local codes. This information is available through local authorities. You must understand the requirements before beginning this installation.

This unit is not required by UL 499 to employ a temperature and pressure relief valve (T&P). You should check with local codes to find out if one is required. If it is, it must be installed in the outlet hot water pipe between the heater and the isolation valve.

## **IMPORTANT SAFETY INSTRUCTIONS**

When using this electrical equipment, basic safety precautions should always be followed, including the following:

### **READ AND FOLLOW ALL INSTRUCTIONS**

Supply this appliance only from a grounded system. A green terminal (or a wire connector marked “G”, “GR”, “Ground”, or “GROUNDING”) is provided for wiring the appliance. To reduce the risk of electric shock, connect this terminal or connector to the grounding terminal of the electric service or supply panel with a continuous copper wire in accordance with the electrical installation code.

## **Contents**

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**CAUTION**

**DO NOT INSTALL IN A BATH ENCLOSURE OR SHOWER STALL OR CONNECT TO A SALT-REGENERATED WATER SOFTENER OR A WATER SUPPLY OF SALT WATER. ATTENTION:**

**NE PAS INSTALLER DANS UNE BAIGNOIRE OU UNE CABINE DE DOUCHE ET NE PAS BRANCHER À UN ADOUCISSEUR D'EAU RÉGÉNÉRÉ AVEC DU SEL OU À UN APPROVISIONNEMENT EN EAU SALÉE.**

**CAUTION**

**(CANADIAN INSTALLATIONS ONLY) CONNECT ONLY TO A CIRCUIT PROTECTED BY A CLASS A GROUND FAULT CIRCUIT INTERRUPTER. ATTENTION: BRANCHER UNIQUEMENT**

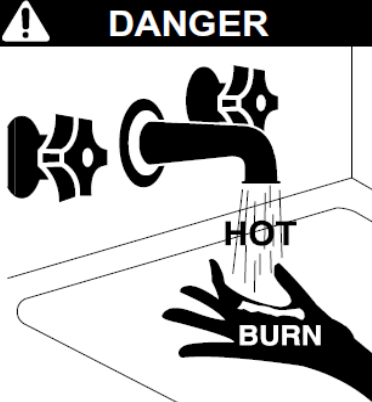
**À UN CIRCUIT PROTÉGÉ PAR UN DISJONCTEUR DE FUITE DE TERRE DE CLASSE A.**

**CAUTION**

**(CANADIAN INSTALLATIONS ONLY) USE COPPER CONDUCTORS ONLY. USE BONDING CONDUCTOR IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE PART I. UTILISEZ**

**DES CONDUCTEURS EN CUIVE UNIQUEMENT. UTILISEZ DES CONDUCTEURS DE MISE À LA MASSE CONFORMEMENT AU CODE CANADIEN DE L'ÉLECTRICITÉ, PARTIE I.**

## SAVE THESE INSTRUCTIONS

<b>!</b> <b>DANGER</b>	<p>Hot water can be dangerous, especially for infants or children, the elderly, or infirm. There is hot water scald potential if the thermostat is set too high.</p> <p>Water temperatures over 125° F (51° C) can cause severe burns or scalding resulting in death.</p> <p>Hot water can cause first degree burns with exposure for as little as:</p> <ul style="list-style-type: none"> <li>3 seconds at 140° F (60° C)</li> <li>20 seconds at 130° F (54° C)</li> <li>8 minutes at 120° F (48° C)</li> </ul> <p>Test the temperature of the water before placing a child in the bath or shower.</p> <p>Do not leave a child or an infirm person in the bath unsupervised.</p>
	

## GENERAL

The Eemax, Inc.™ **FlowCo** is a non-thermostatic electric tankless water heater. FlowCo is specifically designed to take in cold water and heat it to temperatures suitable for handwashing and other fixed-flow applications.

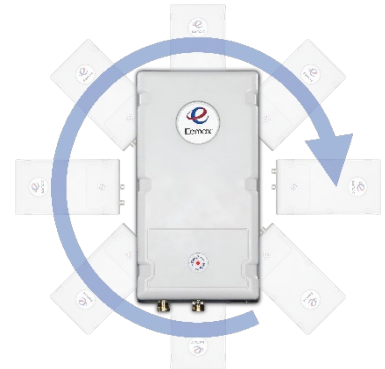
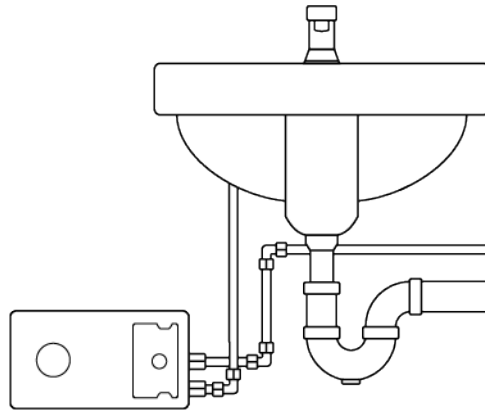
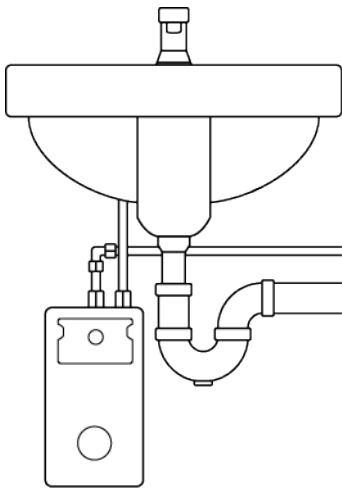
To obtain optimum performance and energy savings, the unit should be located as close as possible to the point-of-use. The unit is supplied with compression rings and nuts suitable for direct coupling to 3/8" copper or PEX™ piping. Do not use additional screwed fittings, pipe dope or teflon tape – doing so will void the warranty. **DO NOT SOLDER PIPES WHILE THE UNIT IS INSTALLED** as serious damage to the heater will result and the warranty will be voided.

## 1) MOUNTING THE UNIT TO THE WALL



**THIS HEATER MUST BE INSTALLED IN A LOCATION WHERE IT IS NOT SUBJECT TO FREEZING TEMPERATURES.**

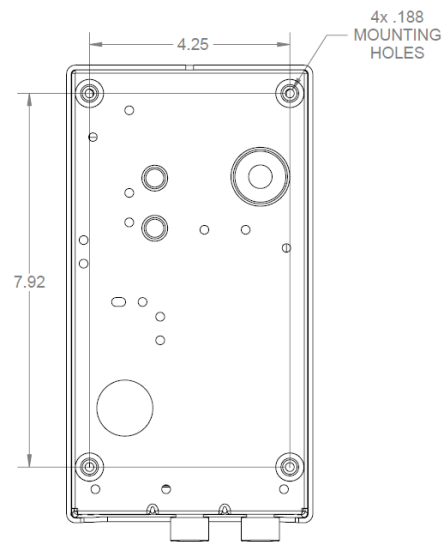
1. The heater should be mounted on the wall under the sink, as close to the point-of-use as possible. Ideal position is fittings pointed down, but the heater can be mounted in any orientation.



2. Make sure to leave a minimum of 8 inches service clearance at the end **OPPOSITE** the fittings.



3. Remove the cover and fasten to the wall using the four mounting holes at each corner of the back plate. Replace the cover.



## 2) PLUMBING HOOK-UP

The heater is supplied with 3/8" brass compression fittings that are compatible with either copper or plastic pipes. Make sure these fittings are used for this installation. Contact your Eemax representative for further information.

### **CAUTION**

**NEVER SUBSTITUTE THREADED PIPE FITTINGS USING PIPE DOPE OR TEFLON TAPE AND NEVER SOLDER ANY PIPE CONNECTIONS WHILE ATTACHED TO THIS HEATER BECAUSE DAMAGE TO THE HEATER WILL RESULT. DOING THIS WILL VOID THE WARRANTY!**

Eemax strongly recommends that the heater be supplied directly from the main cold water trunk line when possible. This helps to avoid a potential water flow interruption to the heater which could lead to a failure of the heating element.

### System Requirements:

- **Minimum/maximum working pressure: 30 PSI/150 PSI**
- **Optimal operating pressure range: 35 to 80 PSI**
- **Minimum turn on flow rate is model dependent (refer to the table below)**

Base Model*	Turn On Flow Rate, GPM (LPM)						
	0.2 (0.76)	0.25 (0.95)	0.3 (1.14)	0.4 (1.51)	0.5 (1.89)	0.7 (2.65)	0.8 (3.03)
SPEX1812	•						
SPEX2412		•					
SPEX3012		•					
SPEX3512			•				
SPEX35			•				
SPEX48				•			
SPEX55					•		
SPEX65						•	
SPEX75						•	
SPEX95							•
SPEX3208		•					
SPEX4208				•			
SPEX8208						•	
SPEX3277		•					
<b>SPEX4277</b>				•			
SPEX60						•	
SPEX80						•	
SPEX90						•	
SPEX100							•

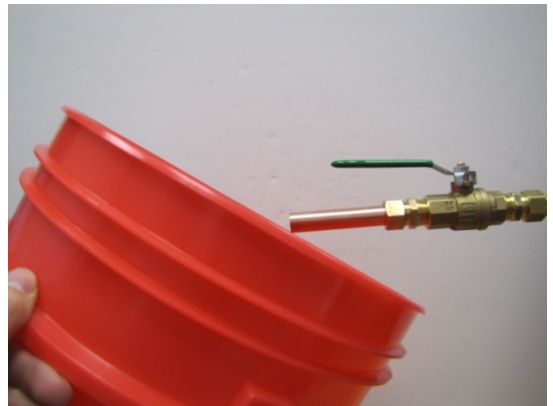
\*Special suffixed models (i.e. CA, etc.), will have identical temperature rises as their base model

For optimum performance, Eemax recommends the use of isolation valves (full flow ball type) on the inlet and outlet pipes.

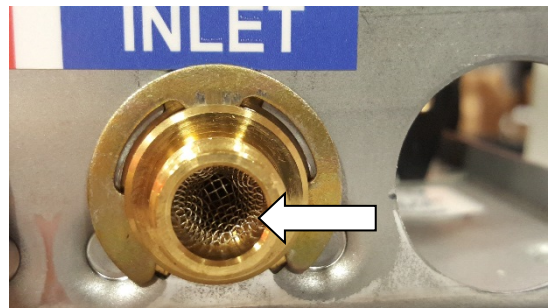


**BEFORE ATTEMPTING ANY INSTALLATION, MODIFICATION OR SERVICE OF THIS HEATER, MAKE SURE THE ELECTRICAL POWER IS DISCONNECTED.**

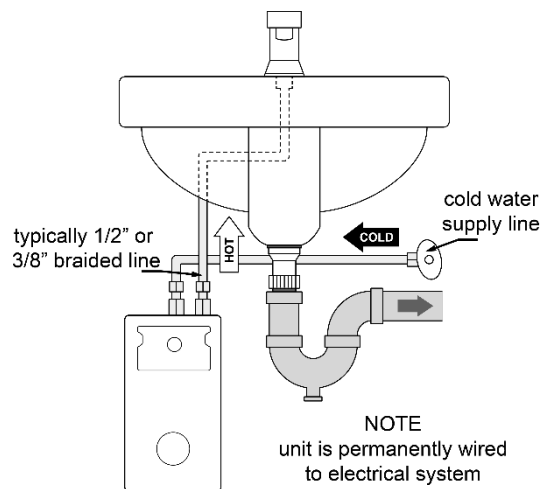
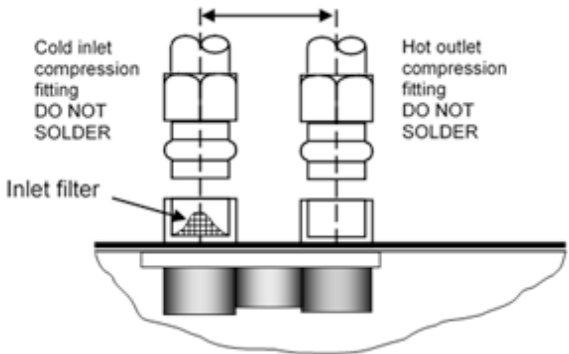
**1.** The heater’s water INLET and OUTLET are labeled. Install full flow ball valves to the inlet and outlet pipes and run water through the inlet pipe into a bucket to purge it of any debris. Close the inlet ball valve.



**2.** Make sure the inlet filter screen is present in the inlet fitting and the inlet and outlet pipes are correctly aligned with the heater connections to minimize stress on the heater.

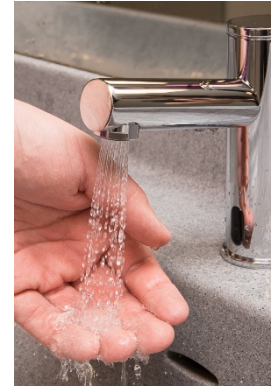


**3.** Remove the cover. Connect the pre-assembled inlet and outlet pipes to the heater (**do not overtighten compression fittings**) and fully open the inlet and outlet ball valves. Check the system for water leaks at all plumbing connections. If a leak is present at the compression fitting, **slowly** tighten compression nut until it stops – **do not overtighten**.



**4.** Open the hot water faucet and run water for a minimum of 60 seconds and until the flow is continuous and free of air pockets. Close the faucet and install the aerator (if supplied).

Failure to install aerator will result in less-than-favorable heater performance.



### 3) ELECTRICAL HOOK-UP



#### **WARNING**

**BEFORE BEGINNING ANY WORK ON THIS INSTALLATION, CONFIRM THE ELECTRICAL BREAKER IS "OFF" AND THAT ALL MOUNTING AND PLUMBING WORK HAS BEEN COMPLETED PER THE STATED INSTRUCTIONS.**

For use on an individual branch circuit only.

The heater shall be installed using insulated, UL listed, 2 wire cable (2 wire plus ground) of the appropriate size suitable for up to 75°C and protected by the correctly rated circuit breaker. Refer to the chart below for recommended copper wiring for conductors with a temperature rating of 75°C:

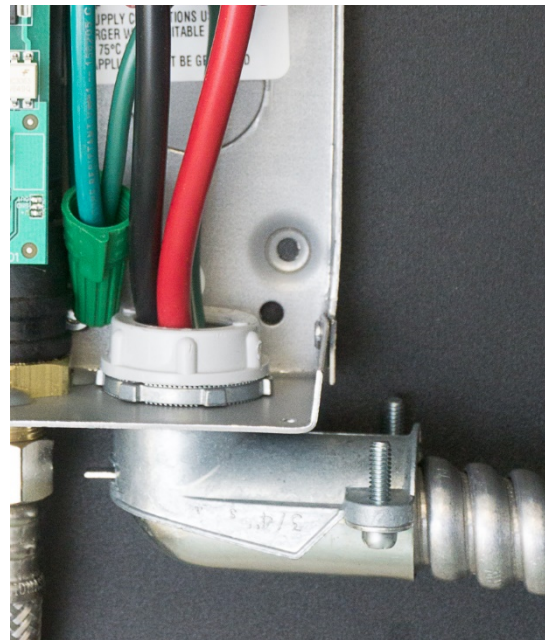
#### ELECTRICAL SPECIFICATIONS

Base Model*	Voltage (VAC)	Max power (kW)	Max current (A)	Minimum wire size (AWG) @75°C
SPEX1812	120	1.8	15	14
SPEX2412	120	2.4	20	14
SPEX3012	120	3	25	12
SPEX3512	120	3.5	29	10
SPEX35	240	3.5	15	14
SPEX48	240	4.8	20	14
SPEX55	240	5.5	23	12
SPEX65	240	6.5	27	10
SPEX75	240	7.5	32	10
SPEX95	240	9.5	40	8
SPEX3208	208	3	15	14
SPEX4208	208	4.1	20	14
SPEX8208	208	8.3	40	8
SPEX3277	277	3	11	14
SPEX4277	277	4.1	14.8	14
SPEX60	277	6	22	12
SPEX80	277	8	29	10
SPEX90	277	9	33	10
SPEX100	277	10	36	8

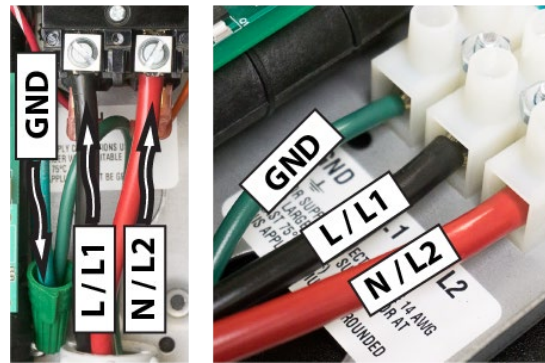
\*Special suffixed models (i.e. CA, etc.), will have identical temperature rises as their base model



**1.** Power cable entry to the heater should be made through one of the knock-out holes located on the back plate or top/bottom ends of the unit. Use the appropriate strain relief fitting.



**2.** The power leads are to be secured to the L1 and L2 or L and N connectors on the terminal block or relay. The ground lead is to be secured to the GND connector on the block or the green ground wire with the provided wire nut.



**WARNING**

**FAILURE TO GROUND THE SYSTEM MAY RESULT IN SERIOUS INJURY, DEATH AND/OR PROPERTY DAMAGE.**

**3.** Leave the breaker in the “OFF” position. Proceed to the next section:  
*COMMISSIONING THE HEATER*

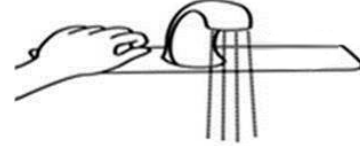


## 4) COMMISSIONING THE HEATER

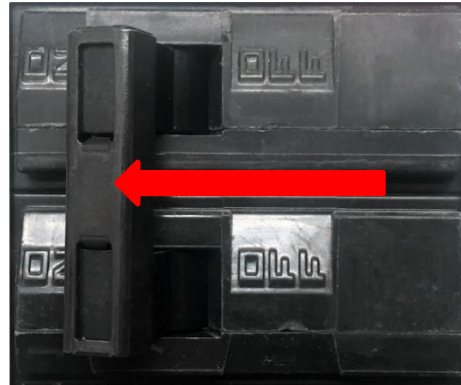
### CAUTION

**BEFORE SWITCHING THE ELECTRICAL BREAKER "ON", VERIFY THE INLET AND OUTLET BALL VALVES ARE FULLY OPEN AND WATER IS FLOWING THROUGH THE HOT WATER FAUCET FOR A MINUTE OR TWO UNTIL THE FLOW IS CONTINUOUS AND FREE FROM AIR POCKETS. DO NOT SWITCH THE BREAKER "ON" IF THERE IS A POSSIBILITY THE WATER IN THE HEATER IS FROZEN.**

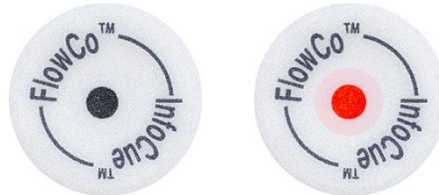
**1.** Verify water is flowing through the faucet.



**2.** Switch "ON" the electric power supply at the breaker.



**3.** The InfoCue™ will flash rapidly while water flows through the unit. Maintain flow.



**4.** After 15 seconds, the InfoCue will turn solid red and there will be an audible click.

**The heater is commissioned at this point.**

The faucet can be turned off and used as needed. With no flow, the unit will flash every 4 seconds, indicating normal stand-by mode.

## Congratulations!

Your Eemax tankless electric water heater is installed and ready for use!

### MAXIMUM TEMPERATURE RISE AT SPECIFIED FLOW RATE, °F (°C)

Base Model*	GPM (LPM)								
	0.2 (0.76)	0.25 (0.95)	0.3 (1.14)	0.4 (1.51)	0.5 (1.89)	0.7 (2.65)	0.8 (3.03)	1.0 (3.79)	1.5 (5.68)
SPEX1812	61 (34)	49 (27)	41 (23)	31 (17)	25 (14)	18 (10)	15 (8)	12 (7)	8 (4)
SPEX2412	82 (46)	66 (37)	55 (31)	41 (23)	33 (18)	23 (13)	20 (11)	16 (9)	11 (6)
SPEX3012	-	82 (46)	68 (38)	51 (28)	41 (23)	29 (16)	26 (14)	20 (11)	14 (8)
SPEX3512	-	-	80 (44)	60 (33)	48 (27)	34 (19)	30 (17)	24 (13)	16 (9)
SPEX35	-	-	80 (44)	60 (33)	48 (27)	34 (19)	30 (17)	24 (13)	16 (9)
SPEX48	-	-	-	82 (46)	66 (37)	47 (26)	41 (23)	33 (18)	22 (12)
SPEX55	-	-	-	-	75 (42)	54 (30)	47 (26)	38 (21)	25 (14)
SPEX65	-	-	-	-	-	63 (35)	55 (31)	44 (24)	30 (17)
SPEX75	-	-	-	-	-	73 (41)	64 (36)	51 (28)	34 (19)
SPEX95	-	-	-	-	-	-	81 (45)	65 (36)	43 (24)
SPEX3208	-	82 (46)	68 (38)	51 (28)	41 (23)	29 (16)	26 (14)	20 (11)	14 (8)
SPEX4208	-	-	-	70 (39)	56 (31)	40 (22)	35 (19)	28 (16)	19 (11)
SPEX8208	-	-	-	-	-	81 (45)	71 (39)	57 (32)	38 (21)
SPEX3277	-	82 (46)	68 (38)	51 (28)	41 (23)	29 (16)	26 (14)	20 (11)	14 (8)
<b>SPEX4277</b>	-	-	-	70 (39)	56 (31)	40 (22)	35 (19)	28 (16)	19 (11)
SPEX60	-	-	-	-	82 (46)	59 (33)	51 (28)	41 (23)	27 (15)
SPEX80	-	-	-	-	-	78 (43)	68 (38)	55 (31)	36 (20)
SPEX90	-	-	-	-	-	-	77 (43)	61 (34)	41 (23)
SPEX100	-	-	-	-	-	-	-	68 (38)	46 (26)

\*Special suffixed models (i.e. CA, etc.), will have identical temperature rises as their base model

"-“Flow rate below turn on flow for this model

Note: The values shown above are only for comparison purposes.

**MAXIMUM DERATED TEMPERATURE RISE AT SPECIFIED FLOW RATE, °F (°C)**

Base Model*	240VAC heaters used at 208VAC								
	GPM (LPM)								
	0.2 (0.76)	0.25 (0.95)	0.3 (1.14)	0.4 (1.51)	0.5 (1.89)	0.7 (2.65)	0.8 (3.03)	1.0 (3.79)	1.5 (5.68)
SPEX35	-	-	60 (33)	45 (25)	36 (20)	26 (14)	22 (12)	18 (10)	12 (7)
SPEX48	-	-	-	61 (34)	49 (27)	35 (19)	31 (17)	25 (14)	16 (9)
SPEX55	-	-	-	-	56 (31)	40 (22)	35 (19)	28 (16)	19 (11)
SPEX65	-	-	-	-	-	48 (27)	42 (23)	33 (18)	22 (12)
SPEX75	-	-	-	-	-	55 (31)	48 (27)	38 (21)	26 (14)
SPEX95	-	-	-	-	-	-	61 (34)	49 (27)	32 (18)

*\*Special suffixed models (i.e. CA, etc.), will have identical temperature rises as their base model*

*“-“Flow rate below turn on flow for this model*

*Note: The values shown above are only for comparison purposes.*

## 5) TROUBLESHOOTING

**CAUTION: Make certain power to unit is “OFF” before removing protective cover FOR ANY REASON.**

For status resolution, please consult the table below.

LED Pattern	Status/Problem	Possible causes	Heater response	Possible solutions
<b>Solid light</b>	Heating	N/A	N/A	N/A
<b>One flash every four seconds</b>	Idle	N/A	- unit waits for flow	N/A
<b>Two flashes once, three second pause</b>	Low heat	- outlet temperature below 90°F/32°C for 5 seconds of flow - element failure - ECO tripped/malfunctioning - relay/contacter malfunctioning - control board failure - inlet water supply out of spec	- unit keeps running, LED flashes a warning pattern	- reduce flow through unit
<b>Two flashes twice, three second pause</b>	Outlet thermistor failure	- outlet thermistor interrupted or disconnected	- unit keeps running, LED flashes a warning pattern	- inspect connections/wiring of outlet thermistor
<b>Two flashes three times, three second pause</b>	Over-temperature Warning	- outlet temperature exceeds 110°F/38°C	- unit keeps running, LED flashes a warning pattern	-increase flow through unit. If this temperature is desired no action is required
<b>Three flashes once, three second pause</b>	Over-temperature Protection	- outlet temperature exceeds 150°F/65°C	- unit stops heating until outlet temperature falls below preset minimum	- increase flow through unit to decrease the overall temperature rise
<b>Three flashes twice, three second pause</b>	Freeze warning	- inlet temperature is too low (below 35°F/2°C)	- unit shuts down*	- increase temperature of inlet water to meet product specifications

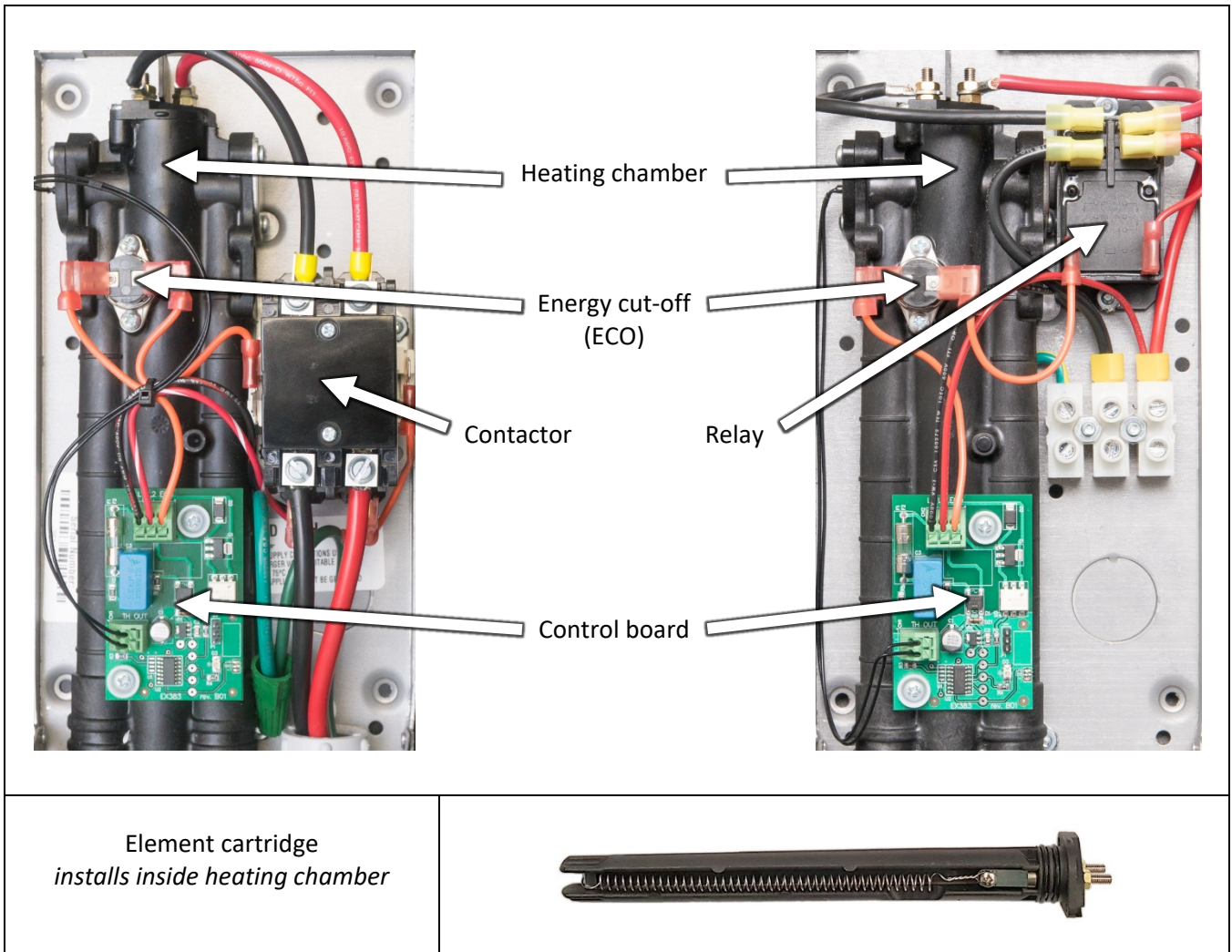
Notes:

\* “shut down” means the control board stops applying heat to the heating element, but the control board and diagnostic functions remain active

**Still having trouble? Please call our Technical Service Department.**

## 6) PERIODIC MAINTENANCE

The heater is designed for many years of carefree use. In order to maintain consistent water flow, it may be necessary to periodically clean the faucet aerator or the filter screen located in the brass inlet fitting at the heater.



## 7) REPLACEMENT PART NUMBERS

### COMPRESSION FITTINGS

3/8" NUT	EX68B
3/8" SLEEVE	EX68C

## 8) REPAIR PARTS FOR FLOWCO UNITS

Base Model	Element Cartridge	Control Board	Relay
SPEX1812	EX800 PRT	EX383	EX250B
SPEX2412	EX610	EX383	EX250B
SPEX3012	EX480	EX383	EX250B
SPEX3512	EX410	EX383	EX250B
SPEX35	EX1650	EX383	EX254
SPEX48	EX1200	EX383	EX254
SPEX55	EX1050	EX383	EX254
SPEX65	EX890	EX383	EX254
SPEX75	EX770	EX383	EX255B
SPEX95	EX630	EX383	EX255B
SPEX3208	EX1440	EX383	EX254B
SPEX4208	EX1050	EX383	EX254B
SPEX8208	EX520	EX383	EX255B
SPEX3277	EX260	EX383	EX251B
<b>SPEX4277</b>	EX1870	EX383	EX251B
SPEX60	EX1280	EX383	EX251B
SPEX80	EX960	EX383	EX251B
SPEX90	EX850	EX383	EX253B
SPEX100	EX760	EX383	EX253B

If you need any assistance from our Technical Service Department, make sure you can identify this water heater by having the model no: \_\_\_\_\_ and serial number: \_\_\_\_\_.

Call **203-267-7890** or toll free: **800-543-6163**.

Eemax Inc., 400 Captain Neville Drive, Waterbury, CT 06705

Tel: 800-543-6163, 203-267-7890, Fax: 203-267-7975, email: [support@eemaxinc.com](mailto:support@eemaxinc.com)



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Notes:

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## INSTALLATION GUIDE AND OWNER'S MANUAL

### FlowCo™

### ELECTRIC INSTANTANEOUS WATER HEATERS





***BEFORE ATTEMPTING ANY INSTALLATION, MODIFICATION OR SERVICE OF THIS HEATER, MAKE SURE THE ELECTRICAL POWER IS DISCONNECTED.***

Read and understand the instructions thoroughly before attempting the installation or service of this water heater. Failure to follow the instructions can result in serious injury, death and/or property damage. The warranty of the water heater will depend upon proper installation according to the instructions. Some heaters come supplied with separate faucet aerators. If supplied, the aerator must be installed in the faucet for optimum performance. The heater must only be used to heat water and must be installed in a location where it is not subject to freezing temperatures. The manufacturer is not liable for any damages resulting from improper installation or misuse.

The installation must conform to the latest requirements of the National Electrical Code and all applicable state and local codes. This information is available through local authorities. You must understand the requirements before beginning this installation.

This unit is not required by UL 499 to employ a temperature and pressure relief valve (T&P). You should check with local codes to find out if one is required. If it is, it must be installed in the outlet hot water pipe between the heater and the isolation valve.

## **IMPORTANT SAFETY INSTRUCTIONS**

When using this electrical equipment, basic safety precautions should always be followed, including the following:

### **READ AND FOLLOW ALL INSTRUCTIONS**

Supply this appliance only from a grounded system. A green terminal (or a wire connector marked “G”, “GR”, “Ground”, or “GROUNDING”) is provided for wiring the appliance. To reduce the risk of electric shock, connect this terminal or connector to the grounding terminal of the electric service or supply panel with a continuous copper wire in accordance with the electrical installation code.

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**CAUTION**

**DO NOT INSTALL IN A BATH ENCLOSURE OR SHOWER STALL OR CONNECT TO A SALT-REGENERATED WATER SOFTENER OR A WATER SUPPLY OF SALT WATER. ATTENTION:**

**NE PAS INSTALLER DANS UNE BAIGNOIRE OU UNE CABINE DE DOUCHE ET NE PAS BRANCHER À UN ADOUCISSEUR D'EAU RÉGÉNÉRÉ AVEC DU SEL OU À UN APPROVISIONNEMENT EN EAU SALÉE.**

**CAUTION**

**(CANADIAN INSTALLATIONS ONLY) CONNECT ONLY TO A CIRCUIT PROTECTED BY A CLASS A GROUND FAULT CIRCUIT INTERRUPTER. ATTENTION: BRANCHER UNIQUEMENT**

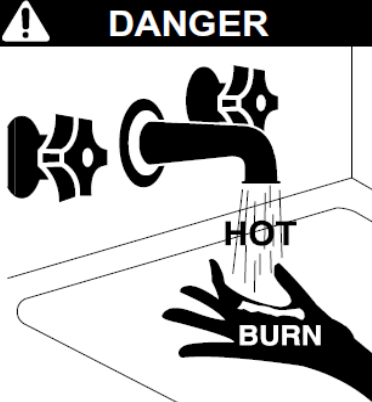
**À UN CIRCUIT PROTÉGÉ PAR UN DISJONCTEUR DE FUITE DE TERRE DE CLASSE A.**

**CAUTION**

**(CANADIAN INSTALLATIONS ONLY) USE COPPER CONDUCTORS ONLY. USE BONDING CONDUCTOR IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE PART I. UTILISEZ**

**DES CONDUCTEURS EN CUIVE UNIQUEMENT. UTILISEZ DES CONDUCTEURS DE MISE À LA MASSE CONFORMEMENT AU CODE CANADIEN DE L'ÉLECTRICITÉ, PARTIE I.**

## SAVE THESE INSTRUCTIONS

<b>! DANGER</b>	<p>Hot water can be dangerous, especially for infants or children, the elderly, or infirm. There is hot water scald potential if the thermostat is set too high.</p> <p>Water temperatures over 125° F (51° C) can cause severe burns or scalding resulting in death.</p> <p>Hot water can cause first degree burns with exposure for as little as:</p> <p>3 seconds at 140° F (60° C)          20 seconds at 130° F (54° C)          8 minutes at 120° F (48° C)</p> <p>Test the temperature of the water before placing a child in the bath or shower.</p> <p>Do not leave a child or an infirm person in the bath unsupervised.</p>
	

## GENERAL

The Eemax, Inc.™ **FlowCo** is a non-thermostatic electric tankless water heater. FlowCo is specifically designed to take in cold water and heat it to temperatures suitable for handwashing and other fixed-flow applications.

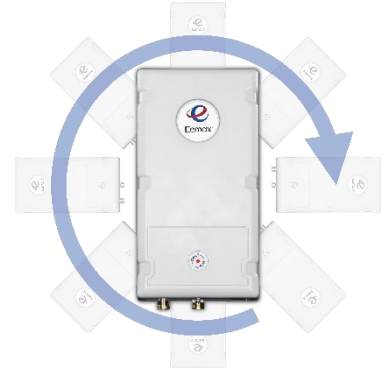
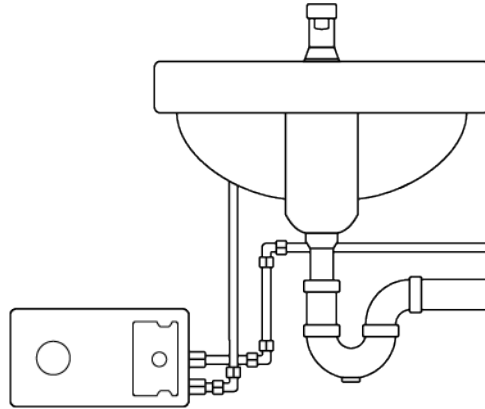
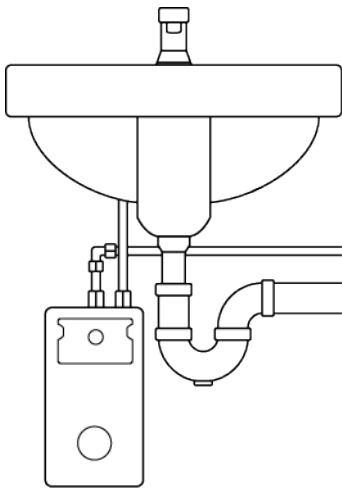
To obtain optimum performance and energy savings, the unit should be located as close as possible to the point-of-use. The unit is supplied with compression rings and nuts suitable for direct coupling to 3/8" copper or PEX™ piping. Do not use additional screwed fittings, pipe dope or teflon tape – doing so will void the warranty. **DO NOT SOLDER PIPES WHILE THE UNIT IS INSTALLED** as serious damage to the heater will result and the warranty will be voided.

## 1) MOUNTING THE UNIT TO THE WALL



**THIS HEATER MUST BE INSTALLED IN A LOCATION WHERE IT IS NOT SUBJECT TO FREEZING TEMPERATURES.**

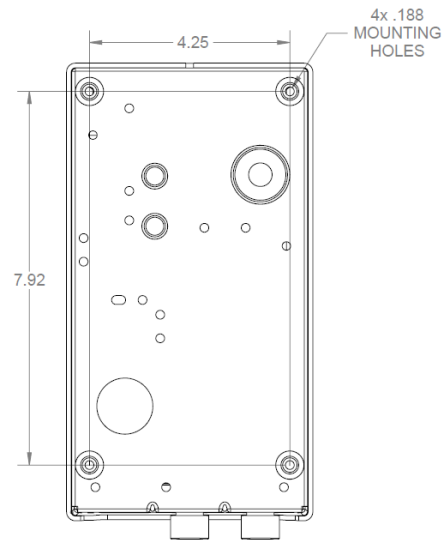
1. The heater should be mounted on the wall under the sink, as close to the point-of-use as possible. Ideal position is fittings pointed down, but the heater can be mounted in any orientation.



2. Make sure to leave a minimum of 8 inches service clearance at the end **OPPOSITE** the fittings.



3. Remove the cover and fasten to the wall using the four mounting holes at each corner of the back plate. Replace the cover.



## 2) PLUMBING HOOK-UP

The heater is supplied with 3/8" brass compression fittings that are compatible with either copper or plastic pipes. Make sure these fittings are used for this installation. Contact your Eemax representative for further information.


### CAUTION

**NEVER SUBSTITUTE THREADED PIPE FITTINGS USING PIPE DOPE OR TEFLON TAPE AND NEVER SOLDER ANY PIPE CONNECTIONS WHILE ATTACHED TO THIS HEATER BECAUSE DAMAGE TO THE HEATER WILL RESULT. DOING THIS WILL VOID THE WARRANTY!**

Eemax strongly recommends that the heater be supplied directly from the main cold water trunk line when possible. This helps to avoid a potential water flow interruption to the heater which could lead to a failure of the heating element.

### System Requirements:

- **Minimum/maximum working pressure: 30 PSI/150 PSI**
- **Optimal operating pressure range: 35 to 80 PSI**
- **Minimum turn on flow rate is model dependent (refer to the table below)**

Base Model*	Turn On Flow Rate, GPM (LPM)						
	0.2 (0.76)	0.25 (0.95)	0.3 (1.14)	0.4 (1.51)	0.5 (1.89)	0.7 (2.65)	0.8 (3.03)
SPEX1812	•						
SPEX2412		•					
SPEX3012		•					
SPEX3512			•				
SPEX35			•				
SPEX48				•			
SPEX55					•		
SPEX65						•	
SPEX75						•	
SPEX95							•
SPEX3208		•					
SPEX4208				•			
SPEX8208						•	
SPEX3277		•					
SPEX4277				•			
SPEX60						•	
 SPEX80						•	
SPEX90						•	
SPEX100							•

\*Special suffixed models (i.e. CA, etc.), will have identical temperature rises as their base model

For optimum performance, Eemax recommends the use of isolation valves (full flow ball type) on the inlet and outlet pipes.

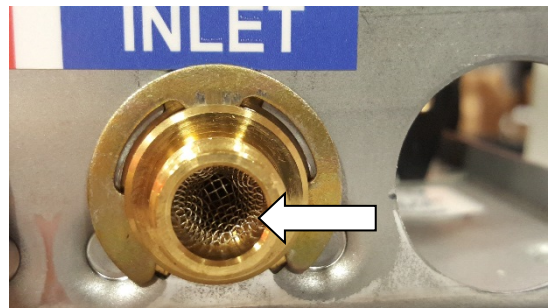


**BEFORE ATTEMPTING ANY INSTALLATION, MODIFICATION OR SERVICE OF THIS HEATER, MAKE SURE THE ELECTRICAL POWER IS DISCONNECTED.**

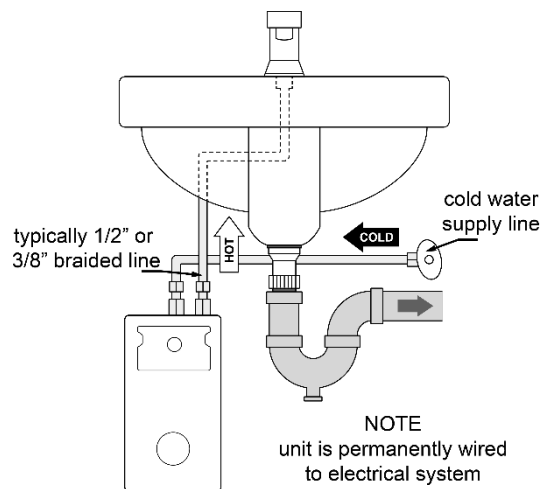
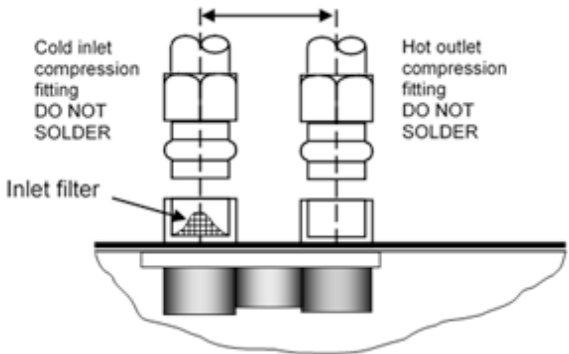
**1.** The heater's water INLET and OUTLET are labeled. Install full flow ball valves to the inlet and outlet pipes and run water through the inlet pipe into a bucket to purge it of any debris. Close the inlet ball valve.



**2.** Make sure the inlet filter screen is present in the inlet fitting and the inlet and outlet pipes are correctly aligned with the heater connections to minimize stress on the heater.

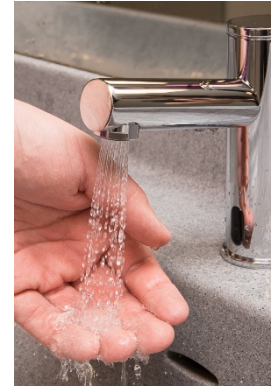


**3.** Remove the cover. Connect the pre-assembled inlet and outlet pipes to the heater (**do not overtighten compression fittings**) and fully open the inlet and outlet ball valves. Check the system for water leaks at all plumbing connections. If a leak is present at the compression fitting, **slowly** tighten compression nut until it stops – **do not overtighten**.



**4.** Open the hot water faucet and run water for a minimum of 60 seconds and until the flow is continuous and free of air pockets. Close the faucet and install the aerator (if supplied).

Failure to install aerator will result in less-than-favorable heater performance.



### 3) ELECTRICAL HOOK-UP



#### **WARNING**

**BEFORE BEGINNING ANY WORK ON THIS INSTALLATION, CONFIRM THE ELECTRICAL BREAKER IS "OFF" AND THAT ALL MOUNTING AND PLUMBING WORK HAS BEEN COMPLETED PER THE STATED INSTRUCTIONS.**

For use on an individual branch circuit only.

The heater shall be installed using insulated, UL listed, 2 wire cable (2 wire plus ground) of the appropriate size suitable for up to 75°C and protected by the correctly rated circuit breaker. Refer to the chart below for recommended copper wiring for conductors with a temperature rating of 75°C:

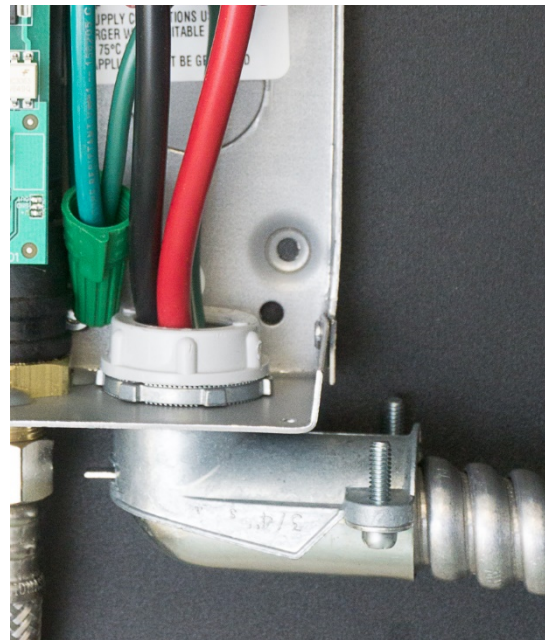
#### ELECTRICAL SPECIFICATIONS

Base Model*	Voltage (VAC)	Max power (kW)	Max current (A)	Minimum wire size (AWG) @75°C
SPEX1812	120	1.8	15	14
SPEX2412	120	2.4	20	14
SPEX3012	120	3	25	12
SPEX3512	120	3.5	29	10
SPEX35	240	3.5	15	14
SPEX48	240	4.8	20	14
SPEX55	240	5.5	23	12
SPEX65	240	6.5	27	10
SPEX75	240	7.5	32	10
SPEX95	240	9.5	40	8
SPEX3208	208	3	15	14
SPEX4208	208	4.1	20	14
SPEX8208	208	8.3	40	8
SPEX3277	277	3	11	14
SPEX4277	277	4.1	14.8	14
SPEX60	277	6	22	12
<b>SPEX80</b>	277	8	29	10
SPEX90	277	9	33	10
SPEX100	277	10	36	8

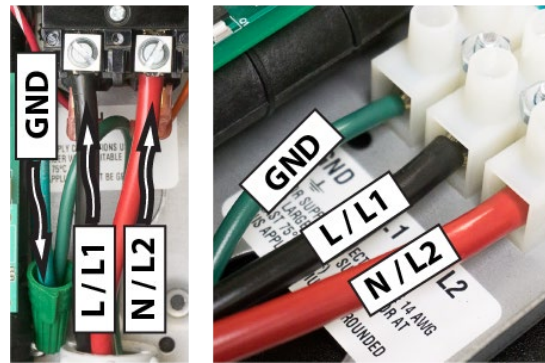
\*Special suffixed models (i.e. CA, etc.), will have identical temperature rises as their base model



**1.** Power cable entry to the heater should be made through one of the knock-out holes located on the back plate or top/bottom ends of the unit. Use the appropriate strain relief fitting.



**2.** The power leads are to be secured to the L1 and L2 or L and N connectors on the terminal block or relay. The ground lead is to be secured to the GND connector on the block or the green ground wire with the provided wire nut.



**WARNING**

**FAILURE TO GROUND THE SYSTEM MAY RESULT IN SERIOUS INJURY, DEATH AND/OR PROPERTY DAMAGE.**

**3.** Leave the breaker in the “OFF” position. Proceed to the next section:  
*COMMISSIONING THE HEATER*

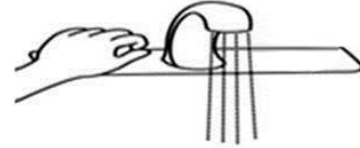


## 4) COMMISSIONING THE HEATER

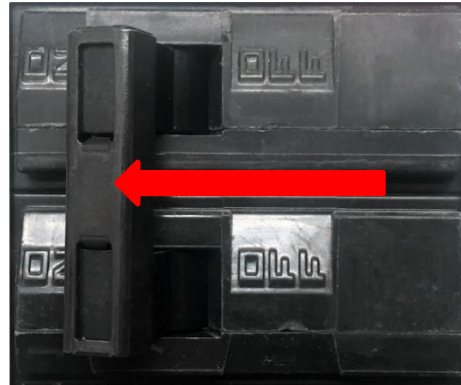
**⚠ CAUTION**

**BEFORE SWITCHING THE ELECTRICAL BREAKER "ON", VERIFY THE INLET AND OUTLET BALL VALVES ARE FULLY OPEN AND WATER IS FLOWING THROUGH THE HOT WATER FAUCET FOR A MINUTE OR TWO UNTIL THE FLOW IS CONTINUOUS AND FREE FROM AIR POCKETS. DO NOT SWITCH THE BREAKER "ON" IF THERE IS A POSSIBILITY THE WATER IN THE HEATER IS FROZEN.**

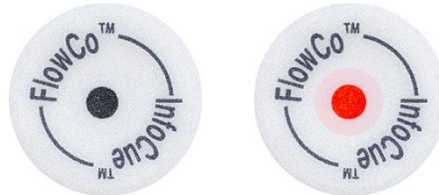
**1.** Verify water is flowing through the faucet.



**2.** Switch "ON" the electric power supply at the breaker.



**3.** The InfoCue™ will flash rapidly while water flows through the unit. Maintain flow.



**4.** After 15 seconds, the InfoCue will turn solid red and there will be an audible click.

**The heater is commissioned at this point.**

The faucet can be turned off and used as needed. With no flow, the unit will flash every 4 seconds, indicating normal stand-by mode.

## Congratulations!

Your Eemax tankless electric water heater is installed and ready for use!

### MAXIMUM TEMPERATURE RISE AT SPECIFIED FLOW RATE, °F (°C)

Base Model*	GPM (LPM)								
	0.2 (0.76)	0.25 (0.95)	0.3 (1.14)	0.4 (1.51)	0.5 (1.89)	0.7 (2.65)	0.8 (3.03)	1.0 (3.79)	1.5 (5.68)
SPEX1812	61 (34)	49 (27)	41 (23)	31 (17)	25 (14)	18 (10)	15 (8)	12 (7)	8 (4)
SPEX2412	82 (46)	66 (37)	55 (31)	41 (23)	33 (18)	23 (13)	20 (11)	16 (9)	11 (6)
SPEX3012	-	82 (46)	68 (38)	51 (28)	41 (23)	29 (16)	26 (14)	20 (11)	14 (8)
SPEX3512	-	-	80 (44)	60 (33)	48 (27)	34 (19)	30 (17)	24 (13)	16 (9)
SPEX35	-	-	80 (44)	60 (33)	48 (27)	34 (19)	30 (17)	24 (13)	16 (9)
SPEX48	-	-	-	82 (46)	66 (37)	47 (26)	41 (23)	33 (18)	22 (12)
SPEX55	-	-	-	-	75 (42)	54 (30)	47 (26)	38 (21)	25 (14)
SPEX65	-	-	-	-	-	63 (35)	55 (31)	44 (24)	30 (17)
SPEX75	-	-	-	-	-	73 (41)	64 (36)	51 (28)	34 (19)
SPEX95	-	-	-	-	-	-	81 (45)	65 (36)	43 (24)
SPEX3208	-	82 (46)	68 (38)	51 (28)	41 (23)	29 (16)	26 (14)	20 (11)	14 (8)
SPEX4208	-	-	-	70 (39)	56 (31)	40 (22)	35 (19)	28 (16)	19 (11)
SPEX8208	-	-	-	-	-	81 (45)	71 (39)	57 (32)	38 (21)
SPEX3277	-	82 (46)	68 (38)	51 (28)	41 (23)	29 (16)	26 (14)	20 (11)	14 (8)
SPEX4277	-	-	-	70 (39)	56 (31)	40 (22)	35 (19)	28 (16)	19 (11)
SPEX60	-	-	-	-	82 (46)	59 (33)	51 (28)	41 (23)	27 (15)
<b>SPEX80</b>	-	-	-	-	-	78 (43)	68 (38)	55 (31)	36 (20)
SPEX90	-	-	-	-	-	-	77 (43)	61 (34)	41 (23)
SPEX100	-	-	-	-	-	-	-	68 (38)	46 (26)

\*Special suffixed models (i.e. CA, etc.), will have identical temperature rises as their base model

"-“Flow rate below turn on flow for this model

Note: The values shown above are only for comparison purposes.

**MAXIMUM DERATED TEMPERATURE RISE AT SPECIFIED FLOW RATE, °F (°C)**

Base Model*	240VAC heaters used at 208VAC								
	GPM (LPM)								
	0.2 (0.76)	0.25 (0.95)	0.3 (1.14)	0.4 (1.51)	0.5 (1.89)	0.7 (2.65)	0.8 (3.03)	1.0 (3.79)	1.5 (5.68)
SPEX35	-	-	60 (33)	45 (25)	36 (20)	26 (14)	22 (12)	18 (10)	12 (7)
SPEX48	-	-	-	61 (34)	49 (27)	35 (19)	31 (17)	25 (14)	16 (9)
SPEX55	-	-	-	-	56 (31)	40 (22)	35 (19)	28 (16)	19 (11)
SPEX65	-	-	-	-	-	48 (27)	42 (23)	33 (18)	22 (12)
SPEX75	-	-	-	-	-	55 (31)	48 (27)	38 (21)	26 (14)
SPEX95	-	-	-	-	-	-	61 (34)	49 (27)	32 (18)

*\*Special suffixed models (i.e. CA, etc.), will have identical temperature rises as their base model*

*“-“Flow rate below turn on flow for this model*

*Note: The values shown above are only for comparison purposes.*

## 5) TROUBLESHOOTING

**CAUTION: Make certain power to unit is “OFF” before removing protective cover FOR ANY REASON.**

For status resolution, please consult the table below.

LED Pattern	Status/Problem	Possible causes	Heater response	Possible solutions
<b>Solid light</b>	Heating	N/A	N/A	N/A
<b>One flash every four seconds</b>	Idle	N/A	- unit waits for flow	N/A
<b>Two flashes once, three second pause</b>	Low heat	- outlet temperature below 90°F/32°C for 5 seconds of flow - element failure - ECO tripped/malfunctioning - relay/contacter malfunctioning - control board failure - inlet water supply out of spec	- unit keeps running, LED flashes a warning pattern	- reduce flow through unit
<b>Two flashes twice, three second pause</b>	Outlet thermistor failure	- outlet thermistor interrupted or disconnected	- unit keeps running, LED flashes a warning pattern	- inspect connections/wiring of outlet thermistor
<b>Two flashes three times, three second pause</b>	Over-temperature Warning	- outlet temperature exceeds 110°F/38°C	- unit keeps running, LED flashes a warning pattern	-increase flow through unit. If this temperature is desired no action is required
<b>Three flashes once, three second pause</b>	Over-temperature Protection	- outlet temperature exceeds 150°F/65°C	- unit stops heating until outlet temperature falls below preset minimum	- increase flow through unit to decrease the overall temperature rise
<b>Three flashes twice, three second pause</b>	Freeze warning	- inlet temperature is too low (below 35°F/2°C)	- unit shuts down*	- increase temperature of inlet water to meet product specifications

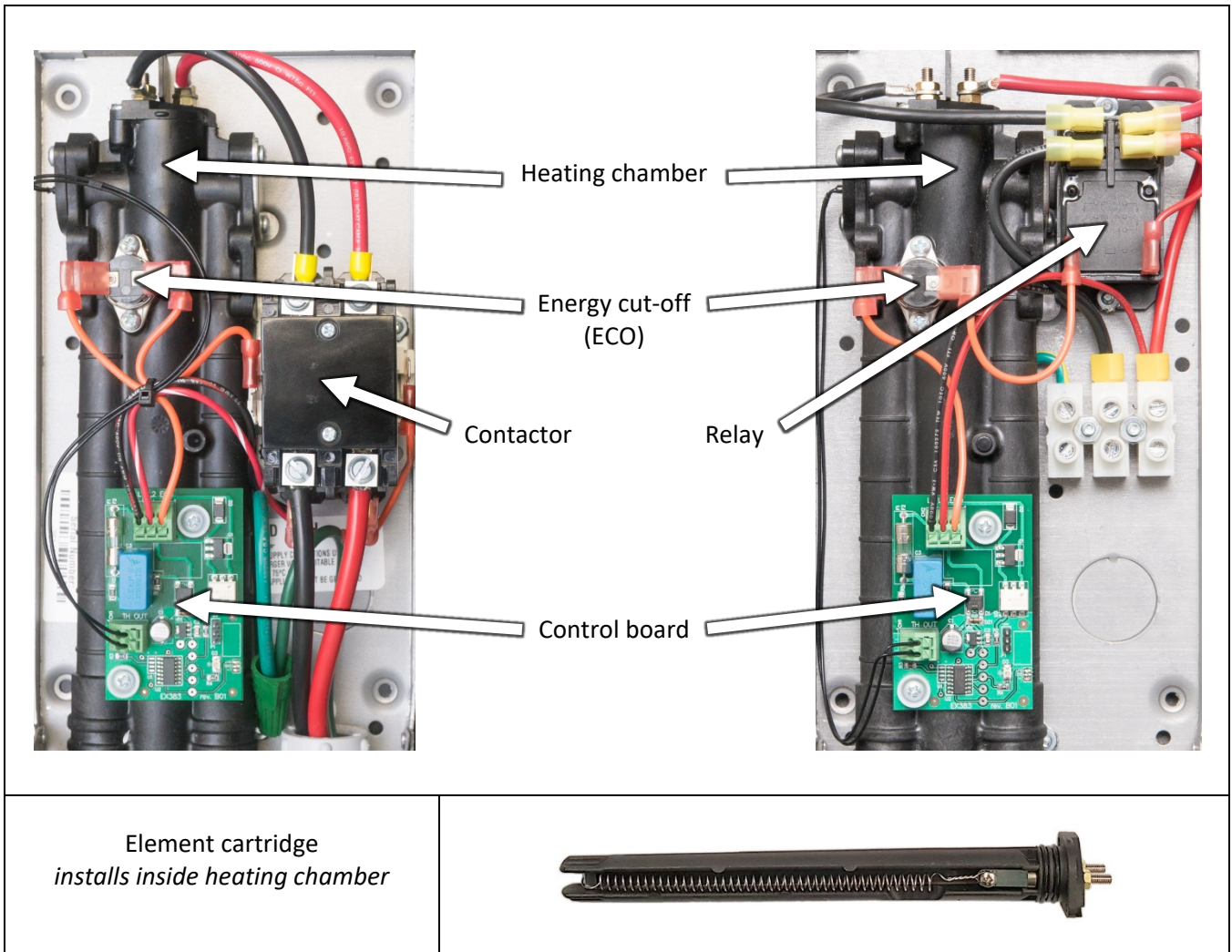
Notes:

\* “shut down” means the control board stops applying heat to the heating element, but the control board and diagnostic functions remain active

**Still having trouble? Please call our Technical Service Department.**

## 6) PERIODIC MAINTENANCE

The heater is designed for many years of carefree use. In order to maintain consistent water flow, it may be necessary to periodically clean the faucet aerator or the filter screen located in the brass inlet fitting at the heater.



## 7) REPLACEMENT PART NUMBERS

### COMPRESSION FITTINGS

3/8" NUT	EX68B
3/8" SLEEVE	EX68C

## 8) REPAIR PARTS FOR FLOWCO UNITS

Base Model	Element Cartridge	Control Board	Relay
SPEX1812	EX800 PRT	EX383	EX250B
SPEX2412	EX610	EX383	EX250B
SPEX3012	EX480	EX383	EX250B
SPEX3512	EX410	EX383	EX250B
SPEX35	EX1650	EX383	EX254
SPEX48	EX1200	EX383	EX254
SPEX55	EX1050	EX383	EX254
SPEX65	EX890	EX383	EX254
SPEX75	EX770	EX383	EX255B
SPEX95	EX630	EX383	EX255B
SPEX3208	EX1440	EX383	EX254B
SPEX4208	EX1050	EX383	EX254B
SPEX8208	EX520	EX383	EX255B
SPEX3277	EX260	EX383	EX251B
SPEX4277	EX1870	EX383	EX251B
SPEX60	EX1280	EX383	EX251B
<b>SPEX80</b>	EX960	EX383	EX251B
SPEX90	EX850	EX383	EX253B
SPEX100	EX760	EX383	EX253B

If you need any assistance from our Technical Service Department, make sure you can identify this water heater by having the model no: \_\_\_\_\_ and serial number: \_\_\_\_\_.

Call **203-267-7890** or toll free: **800-543-6163**.

Eemax Inc., 400 Captain Neville Drive, Waterbury, CT 06705

Tel: 800-543-6163, 203-267-7890, Fax: 203-267-7975, email: [support@eemaxinc.com](mailto:support@eemaxinc.com)



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Notes:

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## INSTALLATION GUIDE AND OWNER'S MANUAL

### LavAdvantage

### ELECTRIC INSTANTANEOUS WATER HEATERS





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This installation must conform to the latest requirements of the National Electrical Code and all applicable state and local codes. This information is available through your local authorities. You must understand these requirements before beginning this installation.

This unit is not required by UL 499 to have a Temperature and Pressure relief valve (T&P). You should check with local codes to find out if one is required. If it is, it must be installed in the outlet hot water pipe between the heater and the isolation valve.

## IMPORTANT SAFETY INSTRUCTIONS

When using this electrical equipment, basic safety precautions should always be followed, including the following:

### READ AND FOLLOW ALL INSTRUCTIONS

A green terminal (or a wire connector marked “G”, “GR”, “Ground”, or “GROUNDING”) is provided within the control box. To reduce the risk of electric shock, connect this terminal or connector to the grounding terminal of the electric service or supply panel with a continuous copper wire in accordance with your local electrical code.

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**⚠ CAUTION**

**(CANADIAN INSTALLATIONS ONLY) CONNECT ONLY TO A CIRCUIT PROTECTED BY A CLASS A GROUND FAULT CIRCUIT INTERRUPTER. ATTENTION: BRANCHER UNIQUEMENT À UN CIRCUIT PROTÉGÉ PAR UN DISJONCTEUR DE FUITE DE TERRE DE CLASSE A.**

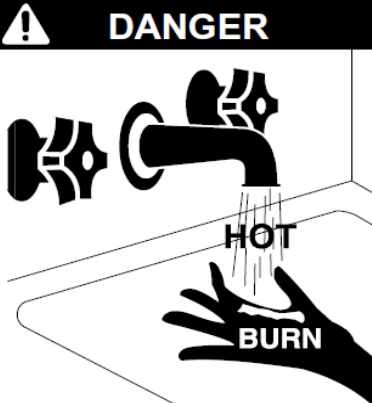
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**(CANADIAN INSTALLATIONS ONLY) DO NOT INSTALL IN A BATH ENCLOSURE OR SHOWER STALL OR CONNECT TO A SALT-REGENERATED WATER SOFTENER OR A WATER SUPPLY OF SALT WATER. ATTENTION: NE PAS INSTALLER DANS UNE BAIGNOIRE OU UNE CABINE DE DOUCHE ET NE PAS BRANCHER À UN ADOUCISSEUR D'EAU RÉGÉNÉRÉ AVEC DU SEL OU À UN APPROVISIONNEMENT EN EAU SALÉE.**

**⚠ CAUTION**

**(CANADIAN INSTALLATIONS ONLY) USE COPPER CONDUCTORS ONLY. USE BONDING CONDUCTOR IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE PART I. UTILISEZ DES CONDUCTEURS EN CUIVE UNIQUEMENT. UTILISEZ DES CONDUCTEURS DE MISE À LA MASSE CONFORMEMENT AU CODE CANADIEN DE L'ÉLECTRICITÉ, PARTIE I.**

**SAVE THESE INSTRUCTIONS**

	<p>Hot water can be dangerous, especially for infants or children, the elderly, or infirm. There is hot water scald potential if the thermostat is set too high.</p> <p>Water temperatures over 125° F (51° C) can cause severe burns or scalding resulting in death.</p> <p>Hot water can cause first degree burns with exposure for as little as:</p> <ul style="list-style-type: none"> <li>3 seconds at 140° F (60° C)</li> <li>20 seconds at 130° F (54° C)</li> <li>8 minutes at 120° F (48° C)</li> </ul> <p>Test the temperature of the water before placing a child in the bath or shower.</p> <p>Do not leave a child or an infirm person in the bath unsupervised.</p>
--	---

**GENERAL**

The Eemax “**LavAdvantage**” heaters will provide optimum performance and energy savings when located under the sink and as close as possible to the point of hot water use. For best performance, the heater should be **BELOW** the point of use. Failure to do so may void the warranty. Contact your Eemax representative for further information.

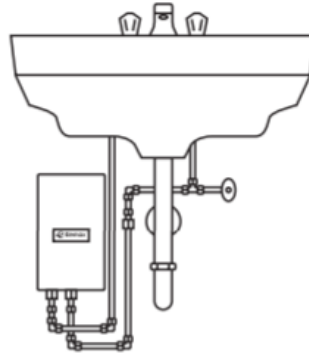
“**LavAdvantage**” heaters accept cold or preheated water and heat it to temperatures suitable for normal domestic usage up to maximum of 140°F. With the “S” option, they can be used as a temperature booster for sanitation applications up to maximum 180°F. Units built with the “ML” option are factory-set to a maximum temperature of 110°F (range 80°F - 110°F) and are recommended for hand washing applications. The “ML” option is an excellent choice for supplying hot water to sensor-type or metering faucets.

## 1) MOUNTING THE UNIT TO THE WALL

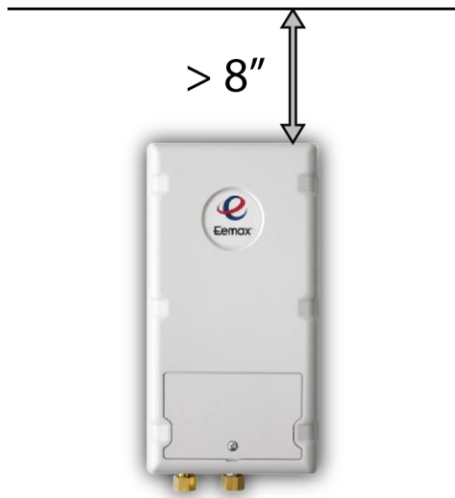


**THIS HEATER MUST BE INSTALLED IN A LOCATION WHERE IT IS NOT SUBJECT TO FREEZING TEMPERATURES.**

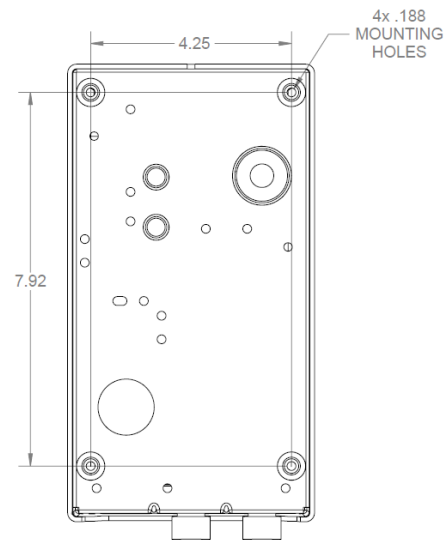
- 1.** The heater should be mounted “under the sink” as close to the point of use as possible. Ideal position is fittings pointed down, but the heater can be mounted in any orientation



- 2.** Make sure to leave a minimum of 8 inches service clearance at the end **OPPOSITE** the fittings.



- 3.** Remove the cover and fasten to the wall using the four mounting holes at each corner of the back plate. Replace the cover.



## 2) PLUMBING HOOK-UP

The heater is supplied with brass 3/8" compression fittings that are compatible with either stainless steel flex hose, copper or plastic pipe. Make sure these fittings are used for this installation. Contact your Eemax representative for further information.

### **CAUTION**

**NEVER SUBSTITUTE THREADED PIPE FITTINGS USING PIPE DOPE OR TEFLON TAPE AND NEVER SOLDER ANY PIPE CONNECTIONS WHILE ATTACHED TO THIS HEATER BECAUSE DAMAGE TO THE HEATER WILL RESULT. DOING THIS WILL VOID THE WARRANTY!**

Eemax strongly recommends that the heater be supplied directly from the main cold water line when possible. This helps to avoid a potential water flow interruption to the heater which could lead to a failure of the heating element.

**Minimum working pressure of 30psi.**

**Maximum Operating System Pressure of – 150 psi.**

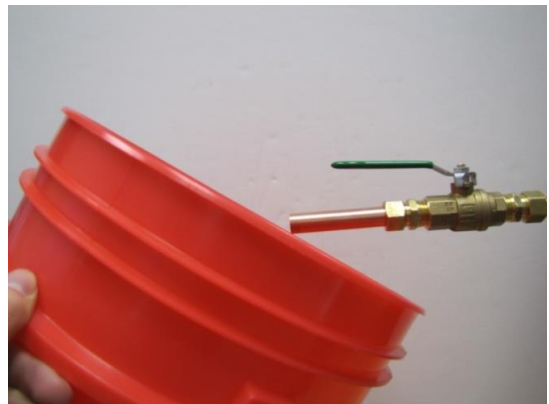
**Optimum Operating Pressure 35 - 80 PSI (Anything over 80 PSI must have pressure reducing regulator).**

For optimum performance, we recommend the use of isolation valves (full flow ball type) on the inlet and outlet pipes.

### **WARNING**

**BEFORE ATTEMPTING ANY INSTALLATION, MODIFICATION OR SERVICE OF THIS HEATER, MAKE SURE THE ELECTRICAL POWER IS DISCONNECTED.**

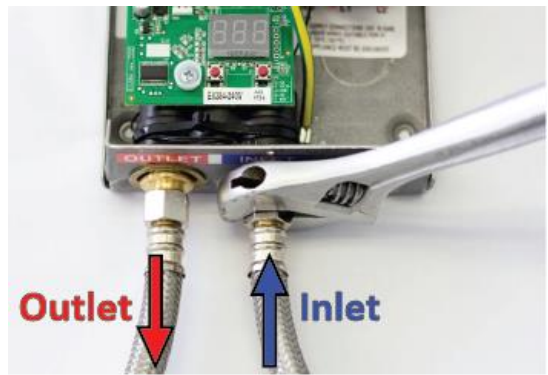
**1.** The heater's water INLET and OUTLET are labeled. Install full flow ball valves to the inlet and outlet pipes and run water through the inlet pipe into a bucket to purge it of any debris. Close the inlet ball valve.



**2.** Make sure the inlet filter screen is present in the inlet fitting and the inlet and outlet pipes are correctly aligned with the heater connections to minimize stress on the heater.



**3.** Remove the cover. Connect the pre-assembled inlet and outlet pipes to the heater and fully open the inlet and outlet ball valves. Check for water leaks. If a leak is at a compression fitting, slowly tighten the compression nut until it stops. Replace the cover.



**4.** Open the hot water faucet and run water for minimum 60 seconds and until the flow is continuous and free of air pockets. Close the faucet and install the aerator (if supplied).

Failure to install aerator (if supplied) will result in lower-than-expected heater performance\*\*.

Model	# of Aerators	Model	# of Aerators
SPEX3512T ML	2	SPEX3208T ML	2
SPEX35T ML	2	SPEX4208T ML	2
SPEX48T ML	2	SPEX3277T ML	2
SPEX55T ML	2	SPEX4277T ML	2
SPEX65T ML	2	SPEX60T ML	2
SPEX75T ML	2	SPEX80T ML	2
SPEX95T ML	3	SPEX90T ML	3
SPEX012240T ML	3	SPEX100T ML	3

\*\*ML thermostatic models are designed to deliver a minimum flow of 0.35 GPM to each lavatory. Please install the supplied aerators to ensure maximum heating performance.



### 3) ELECTRICAL HOOK-UP



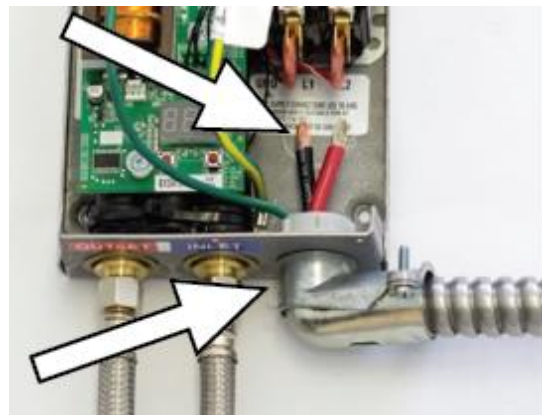
**WARNING** BEFORE BEGINNING ANY WORK ON THIS INSTALLATION, BE SURE THAT THE ELECTRICAL BREAKER IS "OFF" AND THAT ALL MOUNTING AND PLUMBING WORK HAS BEEN COMPLETED PER THESE INSTRUCTIONS.

This heater must have its own independent circuit using insulated, UL listed, 2 wire cable (2 wire plus ground) of the appropriate size suitable for up to 75°C and protected by the correctly rated circuit breaker. Refer to the chart below:

#### ELECTRICAL SPECIFICATIONS

LavAdvantage model number	Voltage (VAC)	Max power (kW)	Max current (A)	Minimum wire size (AWG)
SPEX1812T	120	1.8	15	14
SPEX2412T	120	2.4	20	14
SPEX3012T	120	3	25	12
SPEX3512T	120	3.5	29	12
SPEX35T	240	3.5	15	14
SPEX48T	240	4.8	20	14
SPEX55T	240	5.5	23	12
SPEX65T	240	6.5	27	12
SPEX75T	240	7.5	32	10
SPEX95T	240	9.5	40	8
SPEX012240T	240	11.5	48	6
SPEX3208T	208	3	15	14
SPEX4208T	208	4.1	20	14
SPEX8208T	208	8.3	40	8
SPEX3277T	277	3	11	14
SPEX4277T	277	4.1	14.8	14
SPEX60T	277	6	22	14
▶ SPEX80T	277	8	29	12
SPEX90T	277	9	33	10
SPEX100T	277	10	36	10

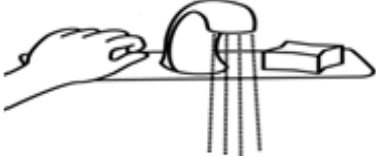

**1.** Power cable entry to the heater should be made through one of the "knock-out" holes located on the back plate or top/bottom ends of the unit. Use the appropriate strain relief fitting.



<p><b>2.</b> The power leads are to be secured to the L1 and L2 or L and N connectors on the terminal block or relay. The ground lead is to be secured to the GND connector on the block or the green ground wire with the provided wire nut.</p>	
<p><b>⚠ WARNING</b> <i>FAILURE TO GROUND THE SYSTEM MAY RESULT IN SERIOUS INJURY, DEATH AND/OR PROPERTY DAMAGE.</i></p>	
<p><b>3.</b> Leave the breaker in the “OFF” position. Proceed to the next section: <i>COMMISSIONING THE HEATER</i></p>	

### 4) COMMISSIONING THE HEATER

**⚠ CAUTION** *BEFORE SWITCHING THE ELECTRICAL BREAKER “ON”, MAKE SURE THE INLET AND OUTLET BALL VALVES ARE FULLY OPEN AND WATER IS FLOWING THROUGH THE HOT WATER FAUCET FOR A MINUTE OR TWO UNTIL THE FLOW IS CONTINUOUS AND FREE FROM AIR POCKETS. DO NOT SWITCH THE BREAKER “ON” IF THERE IS A POSSIBILITY THE WATER IN THE HEATER IS FROZEN.*

<p><b>1.</b> Make sure water is flowing through the faucet.</p>	
<p><b>2.</b> Switch “ON” the electric power supply at the breaker.</p>	



**3.** Keep water flowing through the faucet for the next step.

**4.** For 60 seconds after “power ON”, display will countdown from 60 seconds to 0. When the display timer reaches 45, the unit starts heating.

**5.** After the 60 seconds in step 4, the display will show temperature setpoint.

**The heater is considered commissioned at this point.**

Faucet can be turned off and used as needed.

**Note:** the temperature display will turn off after 5 minutes of inactivity. Display turns on when water flows through heater or if either pushbutton is pressed.



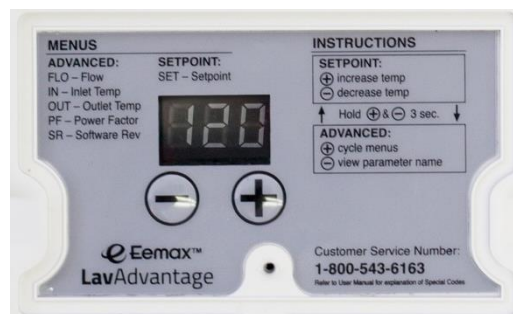
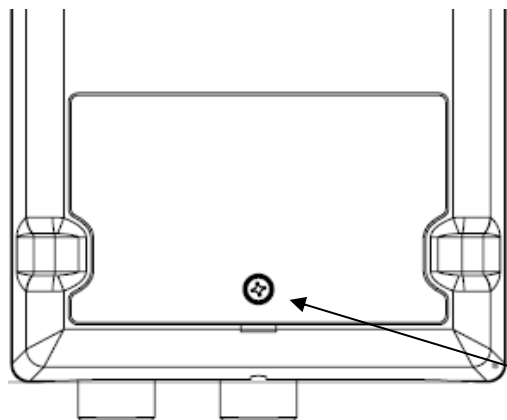
## Congratulations!

Your Eemax tankless electric water heater is fully installed and ready for use!

### MAXIMUM TEMPERATURE RISE AT SPECIFIED FLOW RATE, °F

Model	GPM						
	0.35	0.5	1	1.5	2	2.5	3
SPEX1812T	35	25	12	8	6	5	4
SPEX2412T	47	33	16	11	8	7	5
SPEX3012T	59	41	20	14	10	8	7
SPEX3512T	68	48	24	16	12	10	8
SPEX35T	68	48	24	16	12	10	8
SPEX48T	*	66	33	22	16	13	11
SPEX55T	*	75	38	25	19	15	13
SPEX65T	*	89	44	30	22	18	15
SPEX75T	*	102	51	34	26	20	17
SPEX95T	*	130	65	43	32	26	22
SPEX012240T	*	*	79	52	39	31	26
SPEX3208T	59	41	20	14	10	8	7
SPEX4208T	*	56	28	19	14	11	9
SPEX8208T	*	113	57	38	28	23	19
SPEX3277T	59	41	20	14	10	8	7
SPEX4277T	*	56	28	19	14	11	9
SPEX60T	*	82	41	27	20	16	14
<b>SPEX80T</b>	*	*	55	36	27	22	18
SPEX90T	*	*	61	41	31	25	20
SPEX100T	*	*	68	46	34	27	23

## 5) UNIT OPERATION



Remove screw to access user interface

### Using the Eemax LavAdvantage Control Functions

Using the Eemax LavAdvantage is EASY. There are only 2 buttons: “-“and “+“. Moving through the functions requires a minimum of effort – just follow along!

During operation the unit will show the current set point temperature and will display this temperature for 5 minutes after the unit is active.

Factory temperature setpoints:

- Standard heaters, S models: 120°F
- Units 3.5 kW and below: 105°F
- ML models: 110°F
- EE models: 90°F

### SETTING TEMPERATURE

To INCREASE temperature, tap the “+” button repeatedly, or hold the “+” down to INCREASE the temperature quickly. To DECREASE temperature, tap the “-” button repeatedly, or hold the “-” down to DECREASE the temperature quickly.

### ADVANCED FUNCTIONS

To access the ADVANCED FUNCTIONS menu:

With the display showing the current setpoint temperature, press BOTH “+” AND “-” buttons simultaneously for 3 seconds and the display will show:

FLOW RATE (GPM or LPM)

Pressing “-“ at any time will display screen title\*. Continue tapping the “+” button to display the following (in this order)

INLET TEMPERATURE (cold water temperature) (°F or °C)

OUTLET TEMPERATURE (hot water temperature) (°F or °C)

POWER FACTOR (how hard the heater is 'working' shown as a percentage)

SOFTWARE REVISION (For Eemax Technical Service use only)

Pressing both "+" and "-" at any time for 3 seconds returns the display to the temperature set point, or just let the heater return to set point display on its own (30 seconds timeout).

### **ERROR CODES & UNITS**

From Advanced Menu, press and hold the "+" and "-" buttons for 10 seconds.

CURRENT ERROR will display. F0 displays if no errors.

Press the "+" button for 1 second to cycle through the following screens:

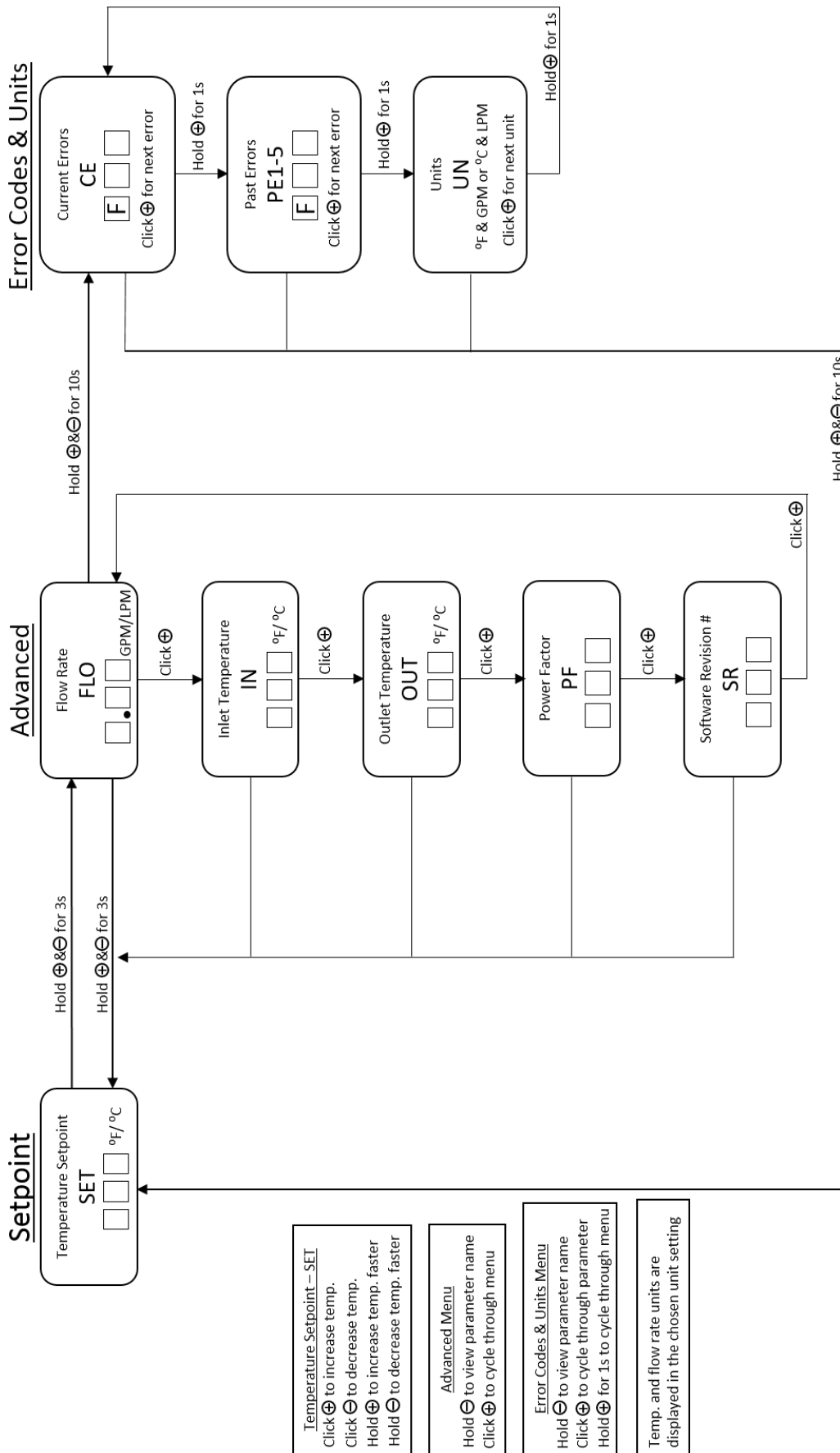
CURRENT ERROR

PAST ERRORS - Tap the "+" button to cycle through the past 5 previous errors. F0 displays if no errors.

UNITS – Tap the "+" button to cycle between °F/GPM and °C/LPM.

To return to setpoint hold "+" and "-" for 10 seconds, or just let the heater return to set point display or display turn-off on its own (30 seconds timeout).

\*Screen titles: SET, FLO, IN, OUT, PF, SR, CE, PE1-5, UN



**Temperature Setpoint – SET**  
 Click ⊕ to increase temp.  
 Click ⊖ to decrease temp.  
 Hold ⊕ to increase temp. faster  
 Hold ⊖ to decrease temp. faster

**Advanced Menu**  
 Hold ⊖ to view parameter name  
 Click ⊕ to cycle through menu

**Error Codes & Units Menu**  
 Hold ⊖ to view parameter name  
 Click ⊕ to cycle through parameter  
 Hold ⊕ for 1s to cycle through menu

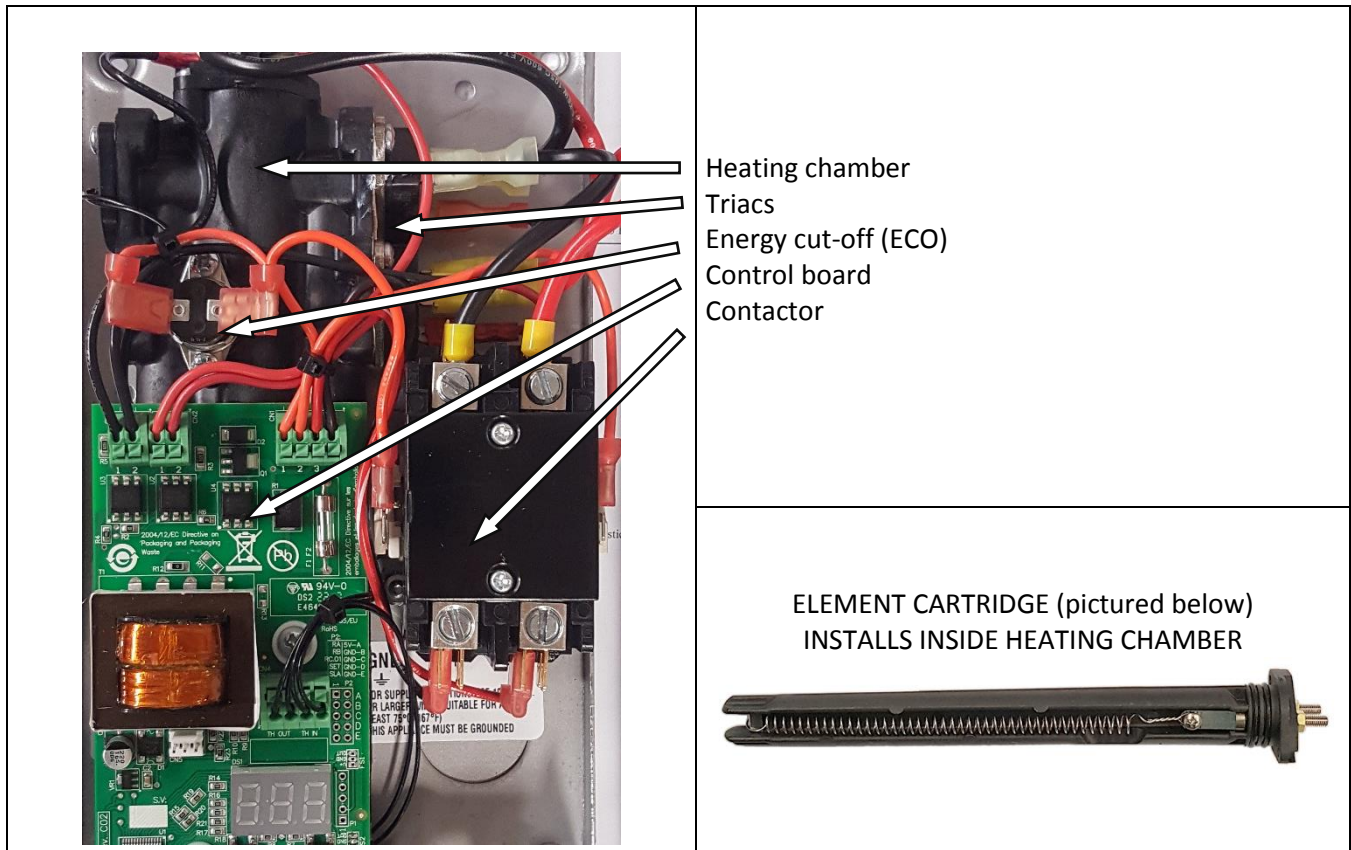
Temp. and flow rate units are displayed in the chosen unit setting

**BASIC TROUBLESHOOTING**

<b>Fault Code</b>	<b>Fault name</b>	<b>Possible causes</b>	<b>Possible Outcome</b>	<b>Reset method</b>
F23	No heat	- element burned out - ECO tripped/malfunctioning - interrupted triac - relay/contacter malfunctioning - board failure - inlet thermistor interrupted	- heater stops until the fault is cleared	- causing condition disappears
F24	Low heat	- severe undervoltage - triac failure - partial board failure - partial inlet/outlet thermistors failure	- heater keeps running while displaying the fault code	- manual fault clear or causing condition disappears
F33	Shorted triac	- both triacs (triac) failed to full conduction mode	- heater stops functioning	- fault cleared only by power cycling
F34	Overvoltage	- voltage too high compared to the specified value	- unit will cease to function	- manual fault clear
F36	Undervoltage	- voltage too low compared to the specified value	- unit keeps functioning while displaying the warning message	- causing condition disappears
F38	High flow	- flow is too high for the unit to be able to keep up with heating water to setpoint temperature	- Fault code displayed, unit continues to operate	- reduce flow below maximum limit for the current heater parameters
F47	Inlet thermistor failure	- inlet thermistor interrupted or disconnected	- heater will run based on outlet detected temperature	- causing condition disappears
F48	Outlet thermistor failure	- outlet thermistor interrupted or disconnected	- heater will run based on inlet temperature and flow	- causing condition disappears
F64	Freeze protect	- inlet temperature too low - partial inlet thermistor failure	- heater will not run	- causing condition disappears
F83	Inverted flow	- water flows through the heater in the wrong direction	- unit will cease to function	- causing condition disappears

## PERIODIC MAINTENANCE

This heater is designed for many years of care free use. In order to maintain consistent water flow, it may be necessary to periodically clean the faucet aerator or the filter screen located in the brass inlet fitting at the heater.



## PART NUMBERS FOR FITTINGS, AERATORS AND AERATOR ADAPTORS

### COMPRESSION FITTINGS:

3/8" NUT EX68B

3/8" SLEEVE EX68C

MALE 13/16"-27 X MALE 55/64"-27

FEMALE 3/4"-27 X MALE 55/64"-27

FEMALE 13/16"-24 X MALE 55/64"-27

MALE 15/16"-27 X MALE 55/64"-27

MALE 11/16"-27 X MALE 55/64"-27

MALE M24X1/FEMALE M22X1 X MALE 55/64"-27

### AERATORS:

0.35 GPM EX0061-0.3-AER

EX61-339

EX61-341

EX61-349

EX61-336

EX60-344

EX61-387

**REPAIR PARTS FOR “THERMOSTATIC” UNITS**

Model number	Element cartridge	Control board	Relay	Energy Cut-Off (ECO)
<b>SPEX1812T</b>	EX800 PRT	EX384-120	EX259B	EX278A
<b>SPEX2412T</b>	EX610	EX384-120	EX259B	EX278A
<b>SPEX3012T</b>	EX480	EX384-120	EX259B	EX278A
<b>SPEX3512T</b>	EX410	EX384-120	EX259B	EX278A
<b>SPEX3208T</b>	EX1440	EX384-240	EX255B	EX278A
<b>SPEX4208T</b>	EX1050	EX384-240	EX255B	EX278A
<b>SPEX8208T</b>	EX520	EX384-240	EX255B	EX278A
<b>SPEX35T</b>	EX1650	EX384-240	EX255B	EX278A
<b>SPEX48T</b>	EX1200	EX384-240	EX255B	EX278A
<b>SPEX55T</b>	EX1050	EX384-240	EX255B	EX278A
<b>SPEX65T</b>	EX890	EX384-240	EX255B	EX278A
<b>SPEX75T</b>	EX770	EX384-240	EX255B	EX278A
<b>SPEX95T</b>	EX630	EX384-240	EX255B	EX278A
<b>SPEX012240T</b>	EX500 PRT	EX384-240	EX1050-1	EX278A
<b>SPEX3277T</b>	EX260	EX384-277	EX253B	EX278A
<b>SPEX4277T</b>	EX1870	EX384-277	EX253B	EX278A
<b>SPEX60T</b>	EX1280	EX384-277	EX253B	EX278A
<b>SPEX80T</b>	EX960	EX384-277	EX253B	EX278A
<b>SPEX90T</b>	EX850	EX384-277	EX253B	EX278A
<b>SPEX100T</b>	EX760	EX384-277	EX253B	EX278A
* If heater has suffix “DI” order element with suffix “SS”				

If you need any assistance from our Technical Service Department, make sure you can identify this water heater by having the model no: \_\_\_\_\_ and serial number: \_\_\_\_\_.

Call **203-267-7890** or toll free: **800-543-6163**.

**Eemax Inc., 400 Captain Neville Drive, Waterbury, CT 06705**

Tel: 800-543-6163, 203-267-7890, Fax: 203-267-7975, email: [support@eemaxinc.com](mailto:support@eemaxinc.com)



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Notes:

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Eemax Inc., 400 Captain Neville Drive, Waterbury, CT 06705

Tel: 800-543-6163, 203-267-7890, Fax: 203-267-7975, email: [support@eemaxinc.com](mailto:support@eemaxinc.com)



**MB**

MATERIAL PROVIDED BY

***Winsupply***<sup>®</sup>  
THE WINSUPPLY FAMILY OF COMPANIES

# Service Sink Faucet Installation Instructions

Recommended for base fittings: 897



Geberit Group

## Overview

Chicago Faucets service sink faucets feature cast brass bodies and precision cartridges for years of reliable operation.

## Notice to the Installer

- Read this entire instruction sheet before installing to ensure proper installation.
- Installation must comply with local codes and ordinances.

Pressurized plumbing fixtures shall be installed in accordance with manufacturer's recommendations. The supply piping to these devices shall be securely anchored to the building structure to prevent installed device from unnecessary movement when operated by the user. Care shall be exercised when installing the device to prevent marring the exposed surface.

NOTE: The information in this manual is subject to change without notice.

Please leave this manual with the facility manager after completing the faucet installation. This document contains information necessary for routine maintenance and servicing.

NOTE: Before installation, turn off water supplies to existing faucet and remove faucet if replacing. Clean faucet basin and clear away debris. Flush all supply lines before connecting to faucet. Failure to do so can result in debris clogging the inlets and/or cartridges.

**NOTE: Before installing a new ceramic cartridge flush lines completely.**

## Wall Mount Single Sink Fittings

These Installation instructions apply to all products with the following fitting base numbers: 897

1. Water supplies must be shut off. Supply lines must have 1/2" NPT male threaded ends and should protrude 5/8" – 7/8" from the finished wall on 8" centers. Supply lines must be secured to support the faucet.
2. Apply pipe sealant to the 1/2" NPT threads of the supply lines.
3. Remove supply arms from faucet and screw onto supply lines. (See Fig. 1) Position the supply arms so they line up with the faucet inlets (8" center to center).  
**NOTE:** The faucet must be mounted level, adjust supply arms as necessary.
4. Place the flanges over the supply arms and against the finished wall. (See Fig. 1)
5. Make sure inlet gasket is sitting in place within the union nut. (See Fig. 1) Attach faucet to supply arms and tighten union nut securely.
6. Remove the set screw from the brace rod. Place the brace rod in the slot on the spout and reattach the set screw using 3/32" hex key wrench. (See Fig. 2)
7. Place brace flange against the finished wall and center it with the spout. Secure the flange to the wall using (2) wood screws provided.  
**NOTE:** Finished wall must be supported where the brace flange mounts to the wall to provide maximum support.
8. Turn on water supply and check supply lines and faucet connections for leaks.

## Service Instructions

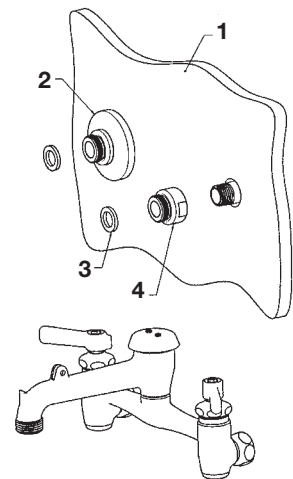
### Replacing the Check Valves

For units with integral check valves in the supply arms, follow these instructions to service the valves:

1. Turn off the water supply to the faucet, either at the wall stops or at the main.
2. Disconnect the brace rod and remove the faucet from the supply arms.
3. Using needle-nose pliers, pull the check valves out of the supply arms.
4. Insert new check valves in the supply arms. Be sure to note the flow direction arrow marked on the valve. The arrow should be pointed toward the faucet.
5. Reinstall the faucet onto the supply arms.
6. Reconnect the brace rod.
7. Turn on water supply and check supply lines and faucet connections for leaks.

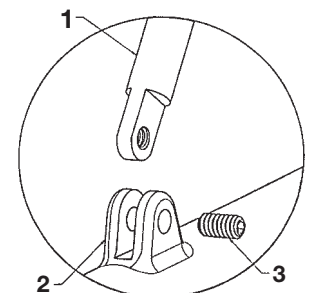


Figure 1



- 1) FINISHED WALL
- 2) FLANGE
- 3) GASKET
- 4) SUPPLY ARM

Figure 2



- 1) BRACE ROD ASSEMBLY
- 2) SPOUT
- 3) SET SCREW

For additional technical assistance, call 800/TEC-TRUE (800-832-8783) or visit our website at [chicagofaucets.com](http://chicagofaucets.com).

# Service Sink Faucet Installation Instructions

(continued)



Geberit Group

## Replacing the Cartridges

The faucet is furnished with integral supply stops that can be used to shut off the water when servicing the cartridges. To shut off the water, turn both handles to the "on" position and close the stops using a 5/16" hex key wrench until the water stops flowing. To install new cartridges, follow these steps:

1. Always place a new cartridge in the closed position when installing into valve body.
2. TO INSTALL RIGHT HAND CARTRIDGE, push cartridge into body until it seats. Add cap nut and tighten HAND TIGHT. Add handle.
3. Hold handle in CLOSED POSITION and fully tighten cap nut to 15-25 FT. LB. torque.
4. TO INSTALL LEFT HAND CARTRIDGE, push cartridge into body until it seats. Add cap nut and tighten HAND TIGHT. Add handle.
5. Hold handle in OPEN POSITION and fully tighten cap nut to 15-25 FT. LB. torque.
6. Return handle in closed position and check handle alignment.

NOTE: Cartridges are stamped "LH" to designate left hand and "RH" to designate right hand.

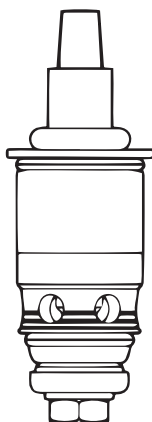
When cartridge installation is complete, open the integral supply stops no more than three (3) complete turns.

NOTES: Use caution when opening integral supply stops. The stops can unscrew completely, causing water to spray from the stop opening.  
To service or rebuild compression cartridges, follow the instructions from the cartridge rebuilding kit (#1277-DAB).

## Replacement Cartridge Options

### Quatern (Compression)

1-100XTJKABNF - Left Hand  
1-099XTJKABNF - Right Hand



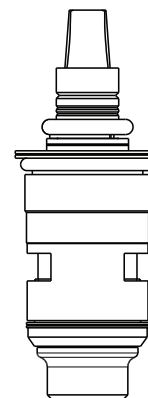
### Ceramic

1-100XKJKABNF - Left Hand  
1-099XKJKABNF - Right Hand



### Ceramic - Integrated Check Valve

1-100XKCJKABNF - Left Hand  
1-099XKCJKABNF - Right Hand



## Care and Maintenance

All Chicago Faucets fittings are designed and engineered to meet or exceed industry performance standards. Care should be taken when cleaning this product. Do not use abrasive cleaners, chemicals or solvents as they can result in surface damage. Use mild soap with warm water for cleaning and protecting the surface of Chicago Faucets fittings.

*For additional technical assistance, call 800/TEC-TRUE (800-832-8783) or visit our website at [chicagofaucets.com](http://chicagofaucets.com).*

## CHICAGO FAUCETS LIMITED WARRANTY

**TO WHOM DOES THIS WARRANTY APPLY?** — The Company extends the following limited warranty to the original user only.

### WHAT DOES THIS WARRANTY COVER AND HOW LONG DOES IT LAST?

This warranty covers the following Commercial Products:

**LIFETIME FAUCET WARRANTY** — The "Faucet," defined as any metal cast, forged, stamped or formed portion of the Product, not including electronic or moving parts or other products separately covered by this Limited Warranty or water restricting components or other components, is warranted against material manufacturing defects for the life of the Product.

**FIVE YEAR FAUCET WARRANTY** — Certain Products and portions of the Product are warranted against material manufacturing defects for a period of five (5) years from the date of Product purchase. Products warranted against material manufacturing defects for a period of five (5) years from the date of Product purchase are referred to by the product numbers 42X, 43X, 15XX and E-Tronic® - 4X, 5X, 6X, 7X, 8X and 9X. All zinc die cast portions of Product are warranted against material manufacturing defects for a period of five (5) years from the date of Product purchase.

**THREE YEAR ELECTRONICS WARRANTY** — Electronic components, including the solenoid, are warranted for three (3) years from the date of installation.

**FIVE YEAR CARTRIDGE WARRANTY** — The "Cartridge", defined as the metal portion of any Product typically referred to by the product numbers containing 1-099, 1-100, 1-310, 377X, 217X and 274X, excluding any rubber or plastic components, is warranted against material manufacturing defects for a period of five (5) years from the date of Product purchase. All Cartridges included in the Company's Single Control or Shower Products also are warranted against material manufacturing defects for a period of five (5) years from the date of Product purchase.

**ONE YEAR FINISH WARRANTY - COMMERCIAL** — For Products used in commercial applications, the finish of the Product is warranted against material manufacturing defects for a period of one (1) year from the date of Product purchase.

**OTHER WARRANTIES** — All other Products not covered above are warranted against material manufacturing defects for a period of one (1) year from the date of Product purchase.

Other restrictions and limitations apply. For complete warranty details, call Chicago Faucets Customer Service at 847-803-5000 or visit [chicagofaucets.com](http://chicagofaucets.com).

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**Control Wizards, Inc.**  
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# As-Builts

## AUTOMATIC TEMPERATURE CONTROLS

For

**Automatic Temperature Controls**

**Blackrock Community Church  
2<sup>nd</sup> Floor Addition  
3685 Black Rock Turnpike  
Fairfield, CT 06824**

**Submittal Date: 12-10-2018**

**As-Built Date: 12-31-2019**

Architect: Wiles; Bridgeport, CT

Consulting Engineer: ASW; Norwalk, CT

General Contractor: Turner Construction, Shelton, CT

Mechanical Contractor: Eastern Mechanical Services, Danbury CT

Temperature Controls: Control Wizards, Inc.

**Date: 12-31-2018**



Control Wizards, Inc.  
89 Taylor Avenue • Norwalk, CT 06854  
Ph. 203.274.5284

## Automatic Temperature Controls Sequence of Operation

**Blackrock Community Church  
2<sup>nd</sup> Floor Addition  
3685 Black Rock Turnpike  
Fairfield, CT 06824**

**Submittal Date: 12-10-2018  
As-Built: 12-31-2019**

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## **Project Overview (BMS):**

**General:** This project consists of: expanding an existing Tridium Based BMS System (Johnson FX-60) to the new equipment being installed as part of the second floor addition.

## **HVAC/Building Management System (BMS)**

**General:** The existing Base Building BMS system is a Tridium-AX based Johnson FX-60 Building Management System.

The BMS system at this property is based upon a FX-60 (JACE-600) Series (JACE) WebServer-Controller. Each individual JACE 600 Controller performs multiple functions:

- Operates as a WebServer to serve up the Graphics Pages for the site to any Browser that can “see” the webserver via an Ethernet (Intranet or Internet).
- Communicate with and manage a number of DDC Equipment Controllers and DDC Terminal Equipment Controllers (VAV Box Controllers, Rooftop BACnet Cards, etc.) via LON, BACNET, Modbus, or Proprietary network communications.
- Perform ‘global functions for all equipment: Scheduling, Data communications (for example, sending the supply air temperature from an Air Handler to all VAV boxes), trending, and alarming.

The existing WEBS DDC (JACE) 600 Controller is located in Maintenance Office/Shop

**Communications:** A connection with the buildings Router or a dedicated Internet connection (Cable or DSL) will be required for the graphics pages to be viewed via the Internet or Intranet and the alarm email system to function. This connection will remain as-is

## **Scheduling**

The system will have the following independent time of day schedules:

If the zone has associated VAV Boxes, the VAV Boxes will be scheduled to be occupied 2 minutes before the first rooftop unit in the zone is started.

Schedules A through F will all share a single Holiday/Special Days List with the rest of the Church. This list will allow for special events to turn all these units to occupied (graduation, etc.), or unoccupied (snow day).

A: RTU-21 and associated VAV Boxes

B: RTU-22 and associated VAV Boxes

- C: RTU-23 and associated VAV Boxes
- D: RTU-24 and associated VAV Boxes
- E: RTU-25 and associated VAV Boxes
- F: Common Area Schedule (for Exhaust Fans)

## **Existing Rooftop Units:**

- Typical for eight Rooftop Units that are being relocated.
- The existing control panels located in the 1<sup>st</sup> floor ceiling will remain as-is.
- Control wires from the Control Panels to the Rooftops will be extended up to the new unit locations.
- An auxiliary contact on the new Fire/Smoke Damper (installed, powered, and controlled by others) will interlock with the Rooftop to stop the RTU if the Damper closes.

## **New Rooftop Units, VAV, Factory Controls, with BACnet**

- Typical for five Variable Air Volume Rooftop Units:
  - RTU-21 to 25 which serves: 2<sup>nd</sup> Floor.
- This unit has a factory installed control package with:
  - Factory Installed Supply Duct Static Pressure Sensor
  - Factory installed DDC Communications Card BACnet
  - Full DDC Controls including factory controls of Economizer, DX, and Modulating Gas Heat.
  - Field Installed Sensors (Provided by Unit Manufacturer)
    - Space Temperature/Humidity Sensor
    - Supply and Return Air Temperature Sensors
    - CO2 Sensor
    - Field Wired Emergency Shutdown Terminals.

### **Sequence of Operation:**

In general, the unit will operate based upon its factory-installed controls, based upon setpoints provided over the DDC network from the BMS system. For details on the Aeon Setup, refer to the Aeon As-Built Documentation and BMS Graphics.

### **Emergency Shutdown**

- Emergency Shutdown Terminals on the units will be wired in to the Fire Alarm System by others, which indicated on the drawings, to override all controls and stop the unit from operating.

The Rooftop Unit will receive the following setpoints from the BMS system via Network Communications:

- Occupied/Unoccupied Command
- Duct Static Pressure Setpoint
- Discharge Air Temperature Setpoint
- Humidity Setpoint
- CO2 Setpoint.
- Occupied Heating Setpoint and Cooling Setpoint
- Unoccupied Heating Setpoint and Cooling Setpoint

NOTE: Upon loss of communications with the BMS system, the RTU will automatically default to the settings set into the RTU controls. Thus at the commissioning stage, reasonable setpoints should be entered into the unit Keypad to allow operation of the unit if there is a communications failure

The BMS system will monitor the following outputs from the unit over the DDC network – subject to these points being made available by the unit manufacturer. Refer to the Rooftop Unit Submittal for details on the available points.

- Common Alarm
- Fan Failure, Heating Failure, Cooling Failure
- Fan Status, Heating Status, Cooling Status, Economizer Status
- All temperatures (Outside, Return, Mixed, Supply) made available by the factory controls.
- All alarm points made available by the factory controls.

The unit will be switched between the Occupied Mode and Unoccupied mode based upon the Floor/RTU/Building Schedule (See scheduling above).

Unoccupied Mode:

- The unit will provide unoccupied heating and cooling based upon the BACnet Unoccupied Setpoints entered into the BMS system. These setpoints will operate based upon the temperature at the Manufacturer's wall sensor.

Optimum Start:

- Based upon the settings of the Manufacturers space sensor, the unit will start earlier than scheduled is required to bring the space to the desired temperature at the actual occupancy time. During Optimum Start, the Minimum Outside Air Damper position shall be set to Zero to perform the warm-up/cool-down with no outside air.

Unit Mode based upon outside air temperature.

- When the Outside Air Temperature has been below 50 F (adj) for at least two hours, the unit will be set to heating mode.



- When the Outside Air Temperature has been above 50 F (adj) for at least two hours, the unit will be set to the cooling mode

#### Unit Operation based upon VAV Box Requirements:

The VAV Boxes create a data point called “Terminal Load”, which indicates if the space needs heating or cooling.

- The value varies from:
  - -100, which is ‘as much heat as possible’ needed.
  - 0, which means that no heating or cooling is needed.
    - Space is at Setpoint.
  - + 100, which is ‘as much cooling as possible’.
- Thus a box with a Terminal load of -20 needs a little heat, +20 means a little cooling.

The Rooftops look at the load required from all the units associated VAV Boxes; see the VAV Box “Load” Graphics Page.

- If there is a requirement for heating, the unit is switched to heating (if the Outside Temp is below 50 F)
  - Average Terminal Load of all VAV Boxes lower than -20 OR
  - Lowest Terminal Load of all VAV boxes is lower than -30.
- If there is a requirement for cooling, the unit is switched to cooling (if the Outside Temp is above 50 F)
  - Average Terminal Load of all VAV Boxes greater than 20 OR
  - Lowest Terminal Load of all VAV boxes is greater than 30.
- Thus either the entire space needs some heating or at least one VAV requires more heating.
- Switchover between heating and cooling is down by changing the RTU Space Setpoints.
  - Heating Required: RTU Cool Setpoint is 80 F; RTU Heat Setpoint is Set to 75
  - Cooling Required: RTU Cool Setpoint is 74 F; RTU Heating Setpoint is set to 65 F

#### Heating Mode Operation:

Discharge Air Temperature Setpoint:

Base Discharge Air Setpoint is 120 F

#### Cooling Mode Operation:

Discharge Air Temperature Setpoint:

Base Discharge Air Setpoint is 55 F

Base Dehumidification Setpoint shall be 55%

**Dehumidification:**

- If the space humidification is above 55% and the unit is not in the heating mode:
  - Activate the dehumidification mode: The Unit will maintain a cold DX coil for dehumidification and use Hot Gas Reheat to maintain the actual Discharge Air Temperature based upon the setpoints determined below.
  - If the space dehumidification drops below 50%, disable the Dehumidification Mode.

**Demand Control Ventilation**

- Each Rooftop unit is provided with a CO2 Space Sensor. It will modulate the amount of outside air provided to the space (via modification of the Outside Air Minimum Damper Position) to maintain the CO2 Setpoint.

For a detailed sequence of operation, refer to the Unit Manufacturer's submittal literature:  
GBS Submittal of September 18, 2018

**BMS Monitoring:** The BMS system will monitor all the points listed above from the Rooftop Unit via the DDC Network following and take the defined actions:

- Loss of Communications: Warning Alarm
- Any Emergency Mode: Critical Alarm
- The rooftop unit Common Alarm: Warning
- Other alarms from the Rooftop: Warning.

## **VAV Boxes (Standalone Stryker VAV Damper Only)**

General: Each VAV Box has:

- VAV Box with Damper and Velocity Pressure Sensor
- Honeywell Stryker Series VAV Box Controller (CVB4022AS )
- Honeywell Wall Sensor (20 K Ohm Thermistor) with Slide Setpoint Adjustment.

Control Mode: The VAV Box will provided heating or cooling only if the central AHU is running and providing air flow and hot or cold air.

Setpoints: Each VAV Box will have the following setpoints which are adjustable from the BMS Graphics:

- Unoccupied Heating (Default 65 F)
- Occupied Heating (Default: 70 F)
- Occupied Cooling (default is 73)
- Unoccupied Cooling (Default is 85F)

The VAV Box will stay in Occupied Mode all the time. In Occupied Mode, the RTU unit is making warm or cool air. In Unoccupied Mode, the RTU Unit will start only when the RTU Space Sensors rises above its Unoccupied Cooling Setpoint or falls below Unoccupied Heating Setpoint.

Occupied Mode (see above for occupied/unoccupied control):

- The unit will operate to maintain the space occupied heating and cooling setpoints.
- The VAV Box has the following airflow setpoints and will modulate between the high and low CFM setpoints based upon the VAV Box Mode:
- If the HVAC unit is making warm air (above 75 F), the VAV Damper will be indexed to the heating mode and the damper will modulate open if the room falls below the heating setpoint and modulate closed (to the Low Flow CFM Setpoint) if the room rises above the heating setpoint.
- If the rooftop unit is not making warm air (below 75 F), the VAV Damper will be indexed to the cooling mode, and the VAV box damper will modulate open when the room air temperature is above the cooling setpoint and modulate closed when the room air temperature setpoint falls below the cooling setpoint.
- If the RTU fan is not running, the VAV Box Damper will open and await airflow from the RTU.

NOTE: See the RTU Control sequence above for the operation of the duct static reset logic for the Rooftop units, which is designed to keep the VAV Boxes Dampers open at a high percentage all the time

BMS Points:

Space Temperature  
 Space Temperature Setpoint  
 Airflow Status  
 Airflow Setpoint  
 Communications Loss.

## **Unit Heaters/Cabinet Unit Heaters (Typical of 2):**

Each Unit Heater/Cabinet Unit Heater will have a local thermostat with DDC Monitoring of the space temperature.

Typical for ECUH-1 and ECUH-2 located in the stairwells.

The thermostat (located inside the unit heater) will control the unit heater fan and heater based upon the space temperature located near the ceiling of the 1<sup>st</sup> floor stairwell.

Upon a low temperature in the space (55 F), an alarm will be generated.

## **Mini-Split Systems (SS-1, 2<sup>nd</sup> Floor IDF Room)**

Each Mini-Split system will be controlled by its own, factory provided controls, including thermostat (wall sensor or wireless remote with return air sensor) and will operate with setpoints and schedules entered into the Mini-Split control System.

There is no interface to the BMS System.

## **Exhaust Fan Control:**

NOTE: For any fan, if there is an associated motorized damper with the fan, the motorized damper will be commanded to open and an end switch on the damper motor will start the fan once the damper is actually open

1. Each of the following exhaust fans will have a time of day schedule (see schedule section above) via the BMS and will be turned on during occupied mode and turned off during unoccupied mode. If there is an associated motorized damper with the fan, the motorized damper will be commanded to open and an end switch on the damper motor will start the fan once the damper is actually open.
  - EF-18, 19 (General Exhaust Fans)
  
2. Each of the following fans will be controlled by a wall switch/occupancy Sensor (by others) and will be enabled when the switch is on/space is occupied. The fan will be interlocked with the Control Damper
  - EF-17 Toilet Fan.

---- END ----



**Control Wizards, Inc.**  
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Ph. 203.274.5284

## **Automatic Temperature Controls Valve Data**

Black Rock Community Church  
2<sup>nd</sup> Floor Addition  
3685 Blackrock Turnpike  
Fairfield, CT 06824

Consulting Engineer: ASW, Norwalk, CT

Mechanical Contractor: Eastern Mechanical Services, Danbury, CT

Temperature Controls: Control Wizards, Inc., Norwalk, CT

**We are not providing any Control Valves for this project.**

Submittal Date: 12-10-2018

---- END ----



**Control Wizards, Inc.**  
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## **Automatic Temperature Controls Damper/Damper Actuator Data**

Black Rock Community Church  
2<sup>nd</sup> Floor Addition  
3685 Blackrock Turnpike  
Fairfield, CT 06824

Consulting Engineer: ASW, Norwalk, CT

Mechanical Contractor: Eastern Mechanical Services, Danbury, CT

Temperature Controls: Control Wizards, Inc., Norwalk, CT

**There are no Control Dampers/Damper Actuators that we  
are providing on this Project.**

Submittal Date: 2-10-2018

---- END ----

## SCHEDULE OF CONTROL PRODUCTS BEING PROVIDED

**PROJECT:** Black Rock Community Church, Fairfield, CT  
**ENGINEER:** ASW, Norwalk CT  
**DATE SUBMITTED:** 12-31-2019"  
**REVISION:** As-Built

### Control Wizards, Inc

89 Taylor Avenue  
 Norwalk, CT 06854  
 203-274-5284

**Categories: A: Automation - Network Products, D: DDC Products; S: Sensors, X: Auxiliary Products.**

FILE REF	ITEM/TAG	MANUFACTURER	MODEL NUMBER	DESCRIPTION	Submittal	
					Revision	NOTES/WHERE USED
<b>Network Products: Network Managers, Switches, Routers, Workstations</b>						
A-1	JACE	Johnson Controls	FX-60	Network Manager/Web server	1	Existing To Remain
A-3	BASRouter	Contemp Controls	BASRouter	BACnet IP/MSTP Router	1	BACnet IP/MSTP Router
<b>DDC Controllers</b>						
D-1	VAV Damper	Honeywell	ML6161B	VAV Box Damper Motor	1	Floating Type
D-6	Stryker VAV	Honeywell	CVB4024S-NS-VAV	BACnet VAV Box Controller	1	Configurable VAV Box Controller
<b>Sensors, Electro Mechanical Controls</b>						
S-6	TR-22	Honeywell	TR-22	Wall Sensor/Setpoint wheel	1	VAV Box Wall Sensor
<b>X: Accessory Products: Enclosures, Relays, Transformers</b>						
X-1	Panel	Kele	RET Series	Metal Control Panel	1	See Drawings
X-2	Xformer	Functional Devices	ATvvvVAzz	Transformer	1	vv=VA Rating, zz: Configuration
X-3	Relay	Idec	RH2B-UL-VV	Plug in Panel Mount Relay	1	VV=Voltage, SH2B-05 Socket
X-6s	Socket	IDEC	SH/SR Series	Relay Socket/Base	1	As Needed 24 VAC Coil
X-6r	Panel Relay	IDEC	RR Series	Control Relay	1	As Needed 24 VAC Coil
X-7	Relay	Functional Devices	RIBUIC	Control Relay - SPDT	1	As Needed
X-8	Relay	Functional Devices	RIBUIS	Control Relay - SPST w/HOA	1	As Needed

**NOTE:** For valves and valve actuators, see Valve Section  
 For Dampers and Damper Actuators, see Damper section of submittal



# FX Supervisory Controllers

*FX Supervisory Controllers are web-based supervisory-class controllers in the Facility Explorer product family. FX Supervisory Controllers manage networks of field controllers using open communication protocols, such as such as BACnet®, LONWORKS®, and N2 protocols. FX Supervisory Controllers support a full set of building automation features, such as scheduling, alarming, histories, data sharing, energy management, totalization, and customized control routines, which are specifically designed for commercial facilities.*

*Each FX Supervisory Controller includes a graphical system user interface and configuration tool that you can access with a web browser. Remote access is easily achieved from an Internet or intranet connection. Multiple users can concurrently connect to the FX Supervisory Controller. You can manage security and presentation preferences through user profiles, login IDs, and passwords.*

*FX Supervisory Controllers are a family of controllers similar in function and overall capabilities. The FX30E, FX60E, and FX70 are compact DIN rail mountable controllers with the capability for external input and output points.*

*In addition, the FX Supervisory Controllers' hardware and software design is modular, so you can add accessories, such as communications cards, input and output modules, and software options, if needed. This design allows you to select the controller most appropriate for the size of your facility and those options best needed to control it.*



**Figure 1: FX Supervisory Controllers**

<b>Features and Benefits</b>	
<input type="checkbox"/> <b>Web-Based User Interface</b>	Provides rich, graphical displays for system operation and analysis.
<input type="checkbox"/> <b>Adoption of Industry Standard Communication Protocols</b>	Allows for the integration of a wide variety of field controllers, including Facility Explorer field controllers and controllers provided by others without intermediate gateways or translators.
<b>Continued on next page . . .</b>	



<b>Features and Benefits (Cont.)</b>	
<input type="checkbox"/> <b>Embedded Configuration Tool</b>	Requires no proprietary or desktop software to configure the FX Supervisory Controller. You only need a web browser for basic configuration and monitoring.
<input type="checkbox"/> <b>Modular Design</b>	Allows you to select only those components needed to meet specific project requirements.
<input type="checkbox"/> <b>Small Compact Design</b>	Installs easily.
<input type="checkbox"/> <b>FX Workbench</b>	Reduces engineering and installation time by easily and quickly creating the FX Supervisory Controller database from field controller configurations.

## Overvie

FX Supervisory Controllers provide integrated control supervision and network management services for one or more local networks of field controllers, and provide direct control over inputs and outputs. FX Supervisory Controllers use these interfaces to monitor and control HVAC, lighting, and other electrical systems to:

- provide system-wide coordination
- improve occupant comfort
- annunciate off-normal and alarm conditions
- reduce energy usage
- optimize operating efficiencies

FX Supervisory Controllers organize system information into displays, reports, and graphics that you can access by using a web browser.

The FX30E, FX60E, and FX70 controllers are housed in compact, DIN rail mount enclosures. Their controller capacity and performance requirements make them ideally suited for:

- supervisory control of small- to large-sized facilities
- distributed supervisory control within larger facilities or between facilities

## Communication Interfaces

FX Supervisory Controllers support multiple embedded and optional communication interfaces, which enables the FX Supervisory Controllers to integrate many different types of field controllers, as well as provide different methods of remote user access. The available embedded and optional communication interfaces include the following:

- 10/100 Mbps or 1 Gbps Ethernet
- RS-485
- RS-232 (up to 115, 200 baud rate)
- LONWORKS (78 Kbps FTT-10A)
- Wireless TEC communications (Release 6.1 and earlier)
- GPRS Modem

See Table 8 to identify the exact number and types of embedded and optional communication interfaces supported by each model of FX Supervisory Controller.

### Supported Networking Protocols

You can order the FX Supervisory controllers with the BACnet Master-Slave/Token-Passing (MS/TP) driver included for support of BACnet field controllers including:

- FX-PCA, FX-PCG, FX-PCV, and FX-PCX Programmable Controllers configured for BACnet MS/TP operation
- FX07, FX14, FX15, and FX16 field controllers configured for BACnet MS/TP operation
- Third-party BACnet devices

All FX Supervisory Controllers include an N2 driver that enables the integration of a wide variety of N2 field controllers, including:

- Facility Explorer Field Controllers fitted with an N2 Open Communication Card (for example, FX05, FX06, FX07, FX10, FX14, FX15, FX16, MD20, or FXVMA)
- FX-PCA, FX-PCG, and FX-PCV Series programmable controllers configured for N2 operation
- Metasys® Application-Specific Controller (ASC) devices (Air Handling Unit [AHU], Unitary [UNT], and Variable Air Volume [VAV])
- Metasys System 91 Devices (DX-9100)
- Metasys Variable Air Volume Modular Assembly (VMA1400)
- XTM-105 Extension Modules
- third-party devices supporting N2 Open protocol (VND)

In addition, each FX Supervisory Controller includes, by default, the oBIX and Niagara (Fox) client and server drivers. Optionally, you can add protocol drivers as needed to integrate various field devices or provide remote access. These optional drivers include the following:

- LONWORKS
- BACnet Master-Slave/Token-Passing (MS/TP) and BACnet IP
- MODBUS® Transmission Control Protocol (TCP), and Remote Terminal Unit (RTU)
- M-Bus
- Simple Network Management Protocol (SNMP)
- Short Message Service (SMS) (Release 6.1 and earlier)
- ZigBee® for wireless Terminal Equipment Controllers (TEC) (Release 6.1 and earlier)

### Direct Inputs/Outputs (I/O)

In addition to obtaining data from field devices using network communication services, FX Supervisory Controllers also support obtaining information directly, using local or remote inputs and outputs.

#### Local I/O (NDIO16 and NDIO34)

The FX30E and FX60E support optional, local I/O (NDIO) modules. These modules plug into the right side of the FX30E/FX60E providing a local interface to the field inputs and outputs.

- **NDIO34:** includes 16 universal inputs, 10 relay outputs, and 8 analog outputs. One NDIO34 module can be added to an FX30E or FX60E Supervisory Controller. This NDIO34 module also provides power to the attached FX30E/FX60E Supervisory Controller, using an externally supplied 24 VAC transformer or 24 VDC power supply.
- **NDIO16:** includes 8 universal inputs, 4 relay outputs, and 4 analog outputs. Up to four NDIO16s can be added to an FX30E or FX60E Supervisory Controller (or up to two, if combined with an NDIO34).

#### Remote I/O (RIO16)

All FX Supervisory Controllers support the optional Remote I/O (RIO) module. The RIO communicates to the FX Supervisory Controller through RS-485 and contains the following I/O:

- 8 universal inputs
- 4 relay outputs
- 4 analog outputs

See Table 8 to identify the exact number and types of direct I/O supported by each model of FX Supervisory Controller.

### Building Automation Control Features

FX Supervisory Controllers transform data obtained from network device integrations and direct I/O into a common set of data types, allowing you to apply the FX Supervisory Controllers' full set of building automation control features (including scheduling, alarming, histories, energy management, totalization, and custom control logic) consistently to all data points, regardless of their source.

## Scheduling

You can configure the FX Supervisory Controller to automate various functions within a facility based on a time schedule. Some examples include:

- determining the expected occupancy periods
- starting or stopping HVAC equipment
- turning lights on and off

You can link any writable point in the FX Supervisory Controller system database to a schedule. The scheduler interface (Figure 2) provides a visually intuitive method for you to configure the daily, weekly, and exception (holiday) schedules.

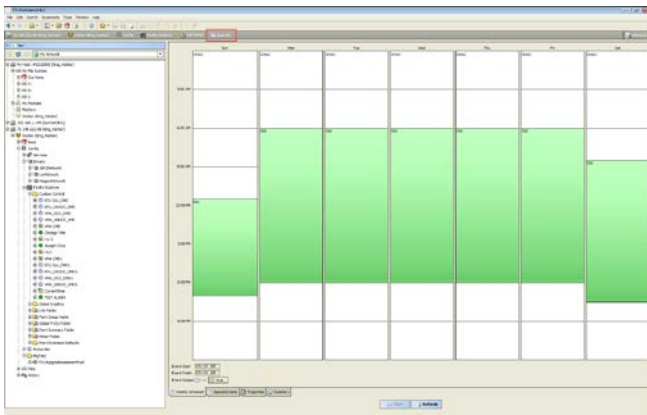


Figure 2: Scheduler

## Histories

The Histories feature (Figure 3) allows the FX Supervisory Controller to collect, store, and display pertinent system data for analysis, such as control performance indication, energy consumption, and system troubleshooting. You can configure the FX Supervisory Controller to create a history on any data point in its system database. Histories are presented either graphically or in a sortable table, and you can export the data in a TXT, PDF, or CSV format.

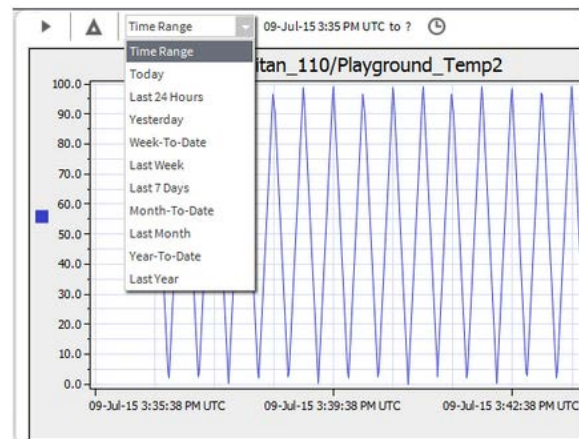


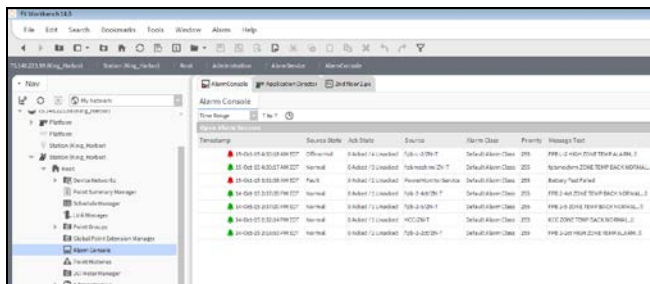
Figure 3: Histories

## Alarming

The Alarming feature (Figure 4) enables the FX Supervisory Controller to initiate, route, and manage alarms and events according to user-defined criteria. You can configure the FX Supervisory Controller to generate alarms on any data point in its system database. Each alarm record contains valuable information, including the alarm and return-to-normal time and date, time duration in current state, text description, and alarm class.

You can classify alarms so that alarms with similar characteristics are routed to common recipients. You can also create multiple alarm classes to provide a variety of alarm routing options, such as to the browser-based Alarm Console or to an e-mail address. Alarm recipients have a variety of options to manage alarms, including sorting, acknowledging, silencing, and tagging.

You can route alarms to the people who need them based on schedules and on-call lists. These lists can be prioritized and escalated based on the recipient's actions. These actions include delivery and acknowledgement through e-mail and SMS.



**Figure 4: Alarm Console**

## Energy Management

The FX Supervisory Controller features several energy management functions, which you can enable and configure, including:

- electrical demand limiting/load shedding
- optimized start/stop
- free cooling determination

## Totalization

The Totalization feature enables the FX Supervisory Controller to accumulate data over a period of time. You can add a totalization extension to any data point in the FX Supervisory Controller system database to summarize runtime, accumulate change of state counts, or summarize dynamic analog data. Totalized data is presented in a sortable table, and you can export it in a TXT, PDF, or CSV file format.

## Customized Control Logic

The FX Supervisory Controller includes a library of control logic modules that you can enable, configure, and link together to create your own customized control routines. Some examples of the available control logic modules include the following:

- Boolean logic (AND, OR, XOR, NOT)
- comparative (greater than, less than, equal, not equal)
- mathematical (add, subtract, multiply, divide, average, negative)
- sequencers
- Proportional plus Integral plus Derivative (PID) control
- on/off control

## Web-Based User Interface

The FX Supervisory Controller's web-based user interface (Web UI) provides system-wide monitoring and control capability through a web browser. The Web UI capability is embedded in every FX Supervisory Controller, allowing users to access the system through a web browser over an Ethernet LAN, Internet.

When you create your Web UI pages, you can choose from a full library of colorful, graphical symbols including:

- HVAC equipment
- duct work
- coils
- piping
- control devices (for example, dampers or valves)
- widgets (for example, buttons, tables, or hyperlinks)

In addition, you can import your own digital images (for example, a floorplan JPEG) and incorporate them into your Web UI.

FX Workbench provides you with two sets of factory-designed, standard application graphics to include in your Web UI. One set is designed for viewing with a full-sized computer screen, and the other set is optimized for viewing with a smart phone sized device like an iPhone®, iPod touch®, or an iPad® (and most other similarly sized) handheld device. When you import a controller with a standard application, both sets of graphics can be **automatically generated**.

You can view devices, points, schedules, alarms, and graphics with the convenience of a wireless handheld device. You can also acknowledge alarms, command points, and modify schedules. The user interface updates dynamically, so that when changes are made to the FX Supervisor configuration, these changes automatically appear. An automated configuration assistant is available to help set the correct screen size for many handheld devices.



Figure 5: Mobile Web UI

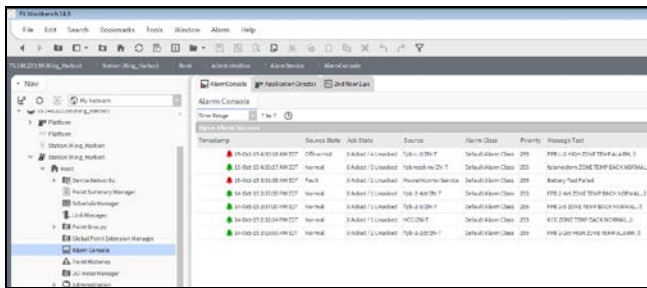


Figure 6: Full Site Web UI

## Open Automatic Demand Response (OpenADR) Driver for FX Supervisory Controllers (For Release 6.x and Earlier)

The OpenADR standard outlines a communication model that uses the Internet to send Demand Response signals to end-user facilities to reduce energy load. OpenADR programs can be used in commercial, industrial, and residential settings to reduce cost, promote interoperability among DR technologies, and allow utilities and energy providers to better manage pricing and critical load issues while actively engaging with their customers.

OpenADR programs allow utilities to collaborate with end-user facilities to curtail energy consumption during peak usage through automatic load shedding. OpenADR programs involve three parties: the utility or energy provider, the Demand Response Automation Server (DRAS), and the facility that is consuming the energy.

The OpenADR simple client driver provides the network integration functionality between the Facility Explorer building automation system and the Demand Response Automation Server (DRAS). Currently this driver is compatible only with the Akuacom DRAS.

## FX Workbench

FX Workbench is a software application that allows you to configure the FX Supervisory Controller. FX Workbench is embedded in every FX Supervisory Controller and is served up to web browsers of authorized users. In addition, you can purchase FX Workbench as a separate software application residing on a computer.

You can configure the FX Supervisory Controller online while directly or remotely connected with FX Workbench.

FX Workbench includes many labor-saving configuration features, such as:

- importing of FX-PC Series configuration files to create the point database, graphics, point and alarm summaries, Histories, and Trend graphs
- online discovery of LONWORKS and BACnet devices and points
- online discovery of N2 devices with assisted importing of N2 points
- a check box method to enable and disable points and create point extensions, such as alarms, histories, and totalizations
- intuitive managers for grouping points, creating master schedules, and linking points
- a library of predefined systems, with associated graphics, points list, and default features
- automated graphic view creation
- migration to FX Supervisory Software Version 14 and later

## FX Supervisory Software Version 14

FX Supervisory Software Version 14 introduces a new user interface, more robust security, and other features, such as an HTML5 web profile. These additions require a larger footprint, station conversion, and refactoring of certain software modules. Although many FX Supervisory Controllers can be migrated, be sure to see the *FX Supervisory Controller Upgrade and Migration Instructions Technical Bulletin (LIT-12011441)* for details regarding support, tools, and licenses to determine if migration is right for your application.

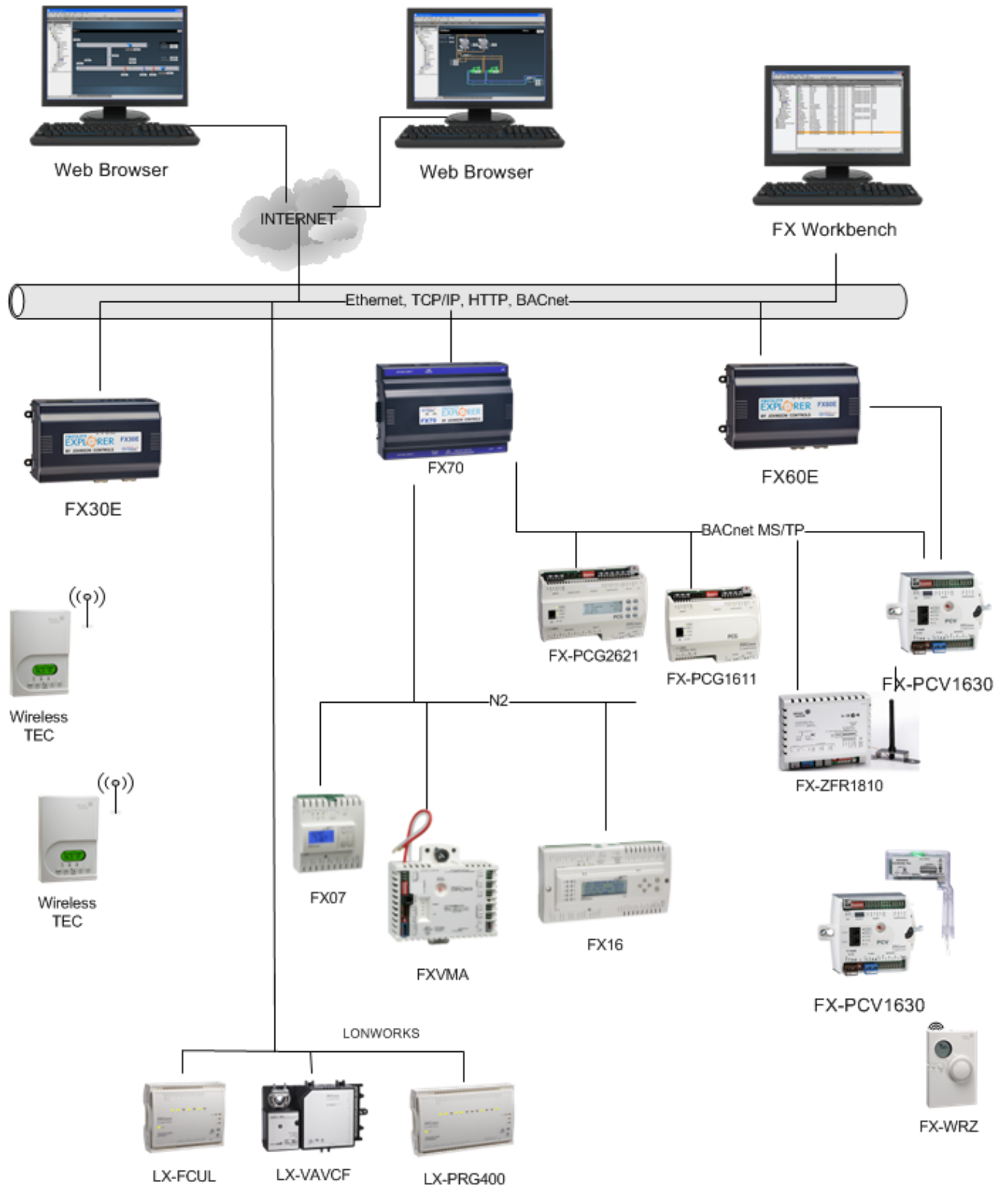


Figure 7: Example of a Facility Explorer Configuration

**Table 1: FX Supervisory Controller Ordering Information**

<b>Part Number</b>	<b>Description</b>
<b>LP-FX3011E-1</b>	FX30E: Includes 256 MB RAM/128 MB flash, 2 10/100 Mbps Ethernet ports, 1 non-isolated RS-485 port, 1 RS-232 port, 1 Niagara Direct Input/Output (NDIO) port, 2 communication card option slots, embedded FX Workbench, Web User Interface, Data Recovery Services with SRAM, Niagara driver, oBIX driver, and N2 driver.
<b>LP-FX3021E-1</b>	FX30E with BACnet MS/TP Protocol: Includes 256 MB RAM/128 MB flash, 2 10/100 Mbps Ethernet ports, 1 non-isolated RS-485 port, 1 RS-232 port, 1 NDIO port, 2 communication card option slots, embedded FX Workbench, Web User Interface, Data Recovery Services with SRAM, Niagara driver, oBIX driver, N2 driver, and BACnet MS/TP driver.
<b>LP-FX6011E-1</b>	FX60E: Includes 256 MB RAM/128 MB flash, 2 10/100 Mbps Ethernet ports, 1 non-isolated RS-485 port, 1 RS-232 port, 1 NDIO port, 2 communication card option slots, embedded FX Workbench, Web User Interface, Data Recovery Services with SRAM, Niagara driver, oBIX driver, and N2 driver.
<b>LP-FX6021E-1</b>	FX60E with BACnet MS/TP Protocol: Includes 256 MB RAM/128 MB flash, 2 10/100 Mbps Ethernet ports, 1 non-isolated RS-485 port, 1 RS-232 port, 1 NDIO port, 2 communication card option slots, embedded FX Workbench, Web User Interface, Data Recovery Services with SRAM Niagara driver, oBIX driver, N2 driver, and BACnet MS/TP driver.
<b>LP-FX7011N-0</b>	FX70: Includes 1 GB RAM/1 GB flash, 1 RS-232 port, 1 RS-485 port, 2 1 Gbps Ethernet ports, 1 NRIO port, 2 communication card option slots, embedded Niagara driver, oBIX driver, N2 driver, FX Workbench, and Web User Interface.
<b>LP-FX7021N-0</b>	FX70 with BACnet MS/TP Protocol: Includes 1 GB RAM/1 GB flash, 2 1 Gbps Ethernet ports, 1 RS-485 port, 1 RS-232 port, 1 NRIO port, 2 communication card option slots, embedded FX Workbench, Web User Interface, Niagara driver, oBIX driver, N2 driver, and BACnet MS/TP driver.
<b>LP-FX30BDEM-1</b>	Demo version of FX30E: Includes all software modules and drivers. Intended for engineering and/or demonstration purposes only (not allowed for actual project installations). You must also purchase office support and renewal fees to activate this FX30E. License expires yearly on October 31 and must be renewed yearly to continue operation.
<b>LP-FX60BDEM-2</b>	Demo version of FX60E: Includes all software modules and drivers. Intended for engineering and demonstration purposes only (not allowed for actual project installations). Office support and renewal fee must also be purchased to activate this FX60E. License expires yearly on October 31 and must be renewed yearly to continue operation.

**Table 2: FX Workbench Ordering Information (Release 6.x and Earlier)**

<b>Part Number</b>	<b>Description</b>
<b>LP-FXWB-COPY</b>	FX Supervisory Controller family software, delivered on DVD. Includes latest installation images for FX Server, FX Workbench, and FX Alarm Portal Client. Licenses not included—order licenses separately.
<b>LP-FXWBDEM-0</b>	Engineering/demo license for FX Workbench client software. Enables all features needed to engineer and demonstrate FX Supervisory Controllers and FX Server stations. Intended for installing contractors. Requires annual support fee. Expires yearly.
<b>LP-FXWBE-0</b>	End user license for FX Workbench client software. Enables those features needed to operate and reconfigure FX Supervisory Controllers and FX Server stations only through an online connection (cannot create new stations offline). Intended for end users (operators). Never expires.
<b>LP-FXWBALM-0</b>	FX Alarm Portal Client license. Enables only FX Alarm Portal and Alarm Console features. Intended for end users. Never expires.
<b>LP-FXSWUPG-0</b>	License file enabling a one-time software upgrade for one copy of FX Server or FX Tools Supervisor Pro-End User Client. Software not included (order LP-FXWB-COPY to obtain latest copy of software).

**Table 3: FX Supervisory Controller Software Accessories Ordering Information**

<b>Part Number</b>	<b>Description</b>
<b>LP-FX60EX256-0</b>	License enabling Java® heap memory expansion to 96 MB for one FX30E/FX60/FX60E
<b>LP-FXBACIPC-0</b>	License enabling BACnet IP client (import) driver for one FX Supervisory Controller
<b>LP-FXBACIPS-0</b>	License enabling BACnet IP server (export) driver for one FX Supervisory Controller
<b>LP-FXBACMS-0</b>	License enabling BACnet MS/TP driver for one FX Supervisory Controller
<b>LP-FXLONIP-0</b>	License enabling LONWORKS IP driver for one FX Supervisory Controller
<b>LP-FXLON-0</b>	License enabling LONWORKS twisted pair driver license for one FX Supervisory Controller
<b>LP-FXMBUS-0</b>	License enabling M-Bus driver for one FX Supervisory Controller
<b>LP-FXMDBRTU-0</b>	License enabling Modbus RTU client (import) driver for one FX Supervisory Controller
<b>LP-FXMDBRTUS-0</b>	License enabling Modbus RTU server (export) driver for one FX Supervisory Controller
<b>LP-FXFLEX-0</b>	License enabling Flex serial Driver over RS-232 or RS-485
<b>LP-FXMDBTCP-0</b>	License enabling Modbus TCP client (import) driver for one FX Supervisory Controller
<b>LP-FXMDBTCP-0</b>	License enabling Modbus TCP server (export) driver for one FX Supervisory Controller
<b>LP-FXSNMP-0</b>	License enabling Simple Network Management Protocol (SNMP) driver for one FX Supervisory Controller
<b>LP-FXCCN-0</b>	License enabling Carrier® Communication/Comfort Network (CCN) driver for one FX Supervisory Controller
<b>LP-FXMCQU-0</b>	License enabling McQuay® OPM driver for one FX Supervisory Controller
<b>LP-FXAINF-0</b>	License enabling Andover™ Infinity driver for one FX Supervisory Controller
<b>LP-FXSMS-0</b>	License enabling Simple Messaging Service (SMS) driver for one FX Supervisory Controller
<b>LP-FX40UPG-0</b>	License enabling one-time, new release software upgrade for one FX Supervisory Controller
<b>LP-FXAPHP-0</b>	License enabling the American Auto-Matrix Public Host Protocol (PHP) driver for one FX Supervisory Controller.
<b>LP-FXAPUP-0</b>	License enabling the American Auto-Matrix Public Unitary Protocol (PUP) driver for one FX Supervisory Controller.
<b>LP-FXAC-0</b>	License enabling the Andover AC 256 driver for one FX Supervisory Controller.
<b>Continue on next page . . .</b>	



Part Number (Continued)	Description
LP-FXGLOB-0	License enabling the Global Cache driver for one FX Supervisory Controller. Enables control of IR controlled AV equipment through an RS-232 connection to a Global Cache FC module.
LP-FXHELV-0	License enabling the Helvar Lighting Control driver for one FX Supervisory Controller.
LP-FXHORT-0	License enabling the European Hortsmann meter driver for one FX Supervisory Controller.
LP-FX OS-0	License enabling the Josam Grease Trap Sensor driver for one FX Supervisory Controller.
LP-FXLANG-0	License enabling the Lang Oven (over RS-232 or RS-485) driver for one FX Supervisory Controller.
LP-FXVDRT-0	License enabling the Veeder-Root driver for one FX Supervisory Controller.
LP-FXEIB-0	License enabling the EIB/Konnex IP Driver for one FX Supervisory Controller.
LP-FXSADR-0	License enabling Simple OpenADR driver for communication between FX Supervisory Controller and Akuacom DRAS. Limited to one client connection. Includes CRYPTO license for the SSL connection.
LP-FXSADR1-0 <sup>1</sup>	License enabling one additional connection to OpenADR compliant DRAS.

**Table 4: FX Workbench Ordering Information (Release 14.x)**

Part Number	Description
FX-DVD-COPY	FX Supervisory Controller family software, delivered on DVD. Includes latest installation images for FX Server and FX Workbench. Licenses not included—order licenses separately. <sup>1</sup>
FX-SLDEMO-0	Engineering/demo license for FX Workbench client software. Enables all features needed to engineer and demonstrate FX Supervisory Controllers and FX Server stations. Intended for installing contractors. Requires annual support fee. Expires yearly.
FX-SL001M1-0	License enabling initial 1 year of software maintenance for FX Server with 1 Niagara connections.
FX-SL001M1-6 <sup>2</sup>	License enabling 1 additional year of software maintenance for FX Server with 1 Niagara network connection.
FX-SL001M3-6 <sup>2</sup>	License enabling 3 additional years of software maintenance for FX Server with 1 Niagara network connections.
FX-SL001M5-6 <sup>2</sup>	License enabling 5 additional years of software maintenance for FX Server with 1 Niagara network connections.

1. At Facility Explorer 14.0, there is no equivalent to the Alarm Console. However, the Facility Explorer Alarm Console Release 6.x still communicates with and displays alarms from Facility Explorer servers and supervisory controllers running Facility Explorer 14.0.
2. Order these software maintenance parts to migrate a Facility Explorer Workbench 6.x to 14.0.

**Table 5: FX Supervisory Controller Software Accessories Ordering Information (Release 6.x and Earlier)**

Part Number	Description
LP-FXBACIPC-0	License enabling BACnet IP client (import) driver for one FX Supervisory Controller
LP-FXBACIPS-0	License enabling BACnet IP server (export) driver for one FX Supervisory Controller
LP-FXBACMS-0	License enabling BACnet MS/TP driver for one FX Supervisory Controller
LP-FXLONIP-0	License enabling LONWORKS IP driver for one FX Supervisory Controller
LP-FXLON-0	License enabling LONWORKS twisted pair driver license for one FX Supervisory Controller
LP-FXMBUS-0	License enabling M-Bus driver for one FX Supervisory Controller
LP-FXMDBRTU-0	License enabling Modbus RTU client (import) driver for one FX Supervisory Controller
LP-FXMDBRTUS-0	License enabling Modbus RTU server (export) driver for one FX Supervisory Controller
LP-FXMDBTCP-0	License enabling Modbus TCP client (import) driver for one FX Supervisory Controller
LP-FXMDBTCPS-0	License enabling Modbus TCP server (export) driver for one FX Supervisory Controller
LP-FXSNMP-0	License enabling Simple Network Management Protocol (SNMP) driver for one FX Supervisory Controller
LP-FXCCN-0	License enabling Carrier® Communication/Comfort Network (CCN) driver for one FX Supervisory Controller

**Table 6: FX Supervisory Controller Software Maintenance Ordering Information (Release 14.x)**

Part Number <sup>1</sup>	Description
FX-SC3EM1-6	License enabling 1 year of software license for FX30E
FX-SC3EM3-6	License enabling 3 years of software license for FX30E
FX-SC3EM5-6	License enabling 5 years of software license for FX30E
FX-SC6EM1-6	License enabling 1 year of software license for FX60E
FX-SC6EM3-6	License enabling 3 years of software license for FX60E
FX-SC6EM5-6	License enabling 5 years of software license for FX60E
FX-SC7EM1-6	License enabling 1 year of software license for FX70
FX-SC7EM3-6	License enabling 3 years of software license for FX70
FX-SC7EM5-6	License enabling 5 years of software license for FX70

1. You order these part numbers when migrating and FX30E, FX60, FX60E, and FX70 to FX Supervisory Software Version 14.

Before you migrate an FX30E, FX60, FX60E, or FX70 to FX Supervisory Software 14 and later, you must first upgrade your FX Supervisory Controller to FX Supervisory Software 6.x (using LP-FXUPG-0). Any FX Servers would also need to be upgraded as well.

Before you upgrade to FX Supervisory Software 14, review the *FX Supervisory Controller Upgrade and Migration Technical Bulletin (LIT-12011441)* to determine if migration is right for your application. If you determine that migration is a viable path for your application, you must purchase the appropriate software maintenance part. Software maintenance is available in 1, 3, or 5 years. The purchase of software maintenance allows the installation of FX software releases during the time of the software maintenance license. When the software maintenance license time has expired, new FX software releases are not allowed. In addition, if you miss a software maintenance period and want it later, you must purchase the missed software maintenance period in addition to the new requested period.

**Table 7: FX Supervisory Controller Hardware Accessories Ordering Information**


Part Number	Description
LP-FXNDIO16-0	16 channel input/output modules for the FX20/FX60 Supervisory Controllers: Includes 8 universal inputs, 4 relay outputs, and 4 0–10 V analog outputs, maximum of 4 per FX20/FX60 Supervisory Controller, or 2 if combined with NDIO34.
LP-FXNDIO34-0	34 channel input/output module for the FX20/FX60/FX70 Supervisory Controllers: Includes 16 universal inputs, 10 relay outputs, and 8 0–10 V analog outputs, maximum of 1 per FX20/FX60/FX70 Supervisory Controller. Also provides power to the FX20/FX60/FX70 Supervisory Controller using externally connected 24 VAC transformer or 24 VDC power supply.
LP-FXRIO16-0	Remote input/output module for the FX Supervisory Controllers. Includes 8 universal inputs, 4 relay outputs, and four 0–10 V analog outputs
LP-FXLONFTT-1	LONWORKS communication card for the FX Supervisory Controllers: 78 kbps, FTT-10A, 2-position removable screw-terminal connector plug. Order LONWORKS driver separately (LP-FXLON-0)
LP-FXRS485-0	Dual port RS-485 communication card for the FX Supervisory Controllers: electrically isolated, two 3-position removable screw-terminal connector plugs
LP-FXWTC-0 <sup>1</sup>	Wireless TEC Option Card includes option card, mounting bracket, and direct-mount antenna
TEC20-A-1 <sup>1</sup>	Replacement antenna for Wireless TEC Option Card
TEC20-RA-1 <sup>1</sup>	Remote antenna for Wireless TEC Option Card when it is installed inside a metal cabinet or when remote antenna mounting is required by physical installation. Includes 0.53 m (1.75 ft) cable.
LP-FXRS232-0	Single port RS-232 communication card for the FX Supervisory Controller: 115,200 max baud rate, DB-9M connector
LP-FXPMUS-0	Power module for FX Supervisory Controller: 90–240 VAC, 50/60 Hz, U.S. wall adapter
LP-FXPMEU-0	Power module for FX Supervisory Controller: 90–240 VAC, 50/60 Hz, European wall adapter
LP-FXPMUK-0	Power module for FX Supervisory Controller: 90–240 VAC, 50/60 Hz, U.K. wall adapter
LP-FXPM24-0	Power module for FX Supervisory Controller: 24 VAC/DC, DIN rail mountable
LP-FXPM263-0	Power module for FX Supervisory Controller: 90–263 VAC/DC, 50/60 Hz DIN rail mountable
LP-KITFX2BAT-0	NiMH replacement backup battery assembly for FX20 and FX60
LP-KITFX7BAT-0	FX70 replacement backup battery assembly
LP-KITFX7HW-0	Hardware Bag for FX70, containing screw terminal connector plugs (two 6-position, one 2-position, earth grounding wire)
LP-KITGPRSA-0 <sup>1</sup>	Replacement right-angle GSM/GPRS quad-band SMA coax-mounted stub antenna
LP-KITSEDAT-0	Replacement adjustable-angle 2.4 GHz RP-SMA coax-mounted stub antenna
LP-KITSED3T-0	3-terminal wiring plug for RS-485.
LP-KIT7MEM-0	1 GB DDR-2 333 MHz Small Outline Dual In-line Memory Module (SODIMM) memory module (standard replacement for FX70)
LP-FXGPRSW-0 <sup>1</sup>	GPRS Modem option card for FX20, FX60, FX70 with Wireless SIM card
LP-FXGPRSE-0 <sup>1</sup>	External mounting for GPRS modem antenna. Includes a 6.56 ft (2 m) SMA-type coax extension cable and steel bracket for wall or panel mounting
LP-FXGPRSS-0 <sup>1</sup>	GPRS Modem SIM card replacement provisioned by Wyless
LP-FXSED-0 <sup>1</sup>	Sedona Framework option card with both wireless 6LoWPAN and wired RS-485 port, based on the Jennic JN5139 wireless microcontroller. Includes stub antenna
LP-FXSEDEXT-0 <sup>1</sup>	External mounting for Sedona Framework antenna. Includes a 6.56 ft (2 m) RP-SMA type, coax extension cable and mounting bracket
LP-FXSRAM-0	Static RAM option card for battery-less FX supervisory controllers

1. Only supported at Facility Explorer 6.x and earlier.

## Technical Specifications

**Table 8: FX Supervisory Controller**

	FX30E	FX60E	FX70
<b>Enclosure/ Mounting</b>	Plastic/DIN Rail		
<b>Dimension</b>	6.313 x 4.820 x 2.438 in. (158.75 x 101.6 x 60.325 mm)		8.5 x 6 x 2.625 in. (216 x 152 x 68 mm)
<b>Power Supply</b>	DIN Rail Power modules		
<b>Battery Backup</b>	Data Recovery Services with SRAM (Static Random Access Memory) (optional Battery available for extended run time)		5-minute internal, optional external
<b>Processor</b>	Power PC 405EX at 400 MHz	PowerPC 440EP at 524 MHz	PowerPC 440EPx at 652 MHz
<b>RAM Memory</b>	256 MB RAM	256 MB RAM	1 GB RAM
<b>AVA Heap Memory</b>	24 MB heap (upgradeable to 96 MB)	48 MB heap (upgradeable to 96 MB)	384 MB heap
<b>Flash Memory</b>	128 MB flash	128 MB flash	1 GB flash
<b>Environment</b>	Operating Temperature: 0 to 50° C (32 to 122° F) Storage Temperature: 0 to 60° C (32 to 140° F) Relative Humidity: 5 to 95%, noncondensing		
<b>Communication Ports</b>			
<b>Onboard</b>	2 Ethernet 10/100 Mbps 1 RS-485 non-isolated 1 RS-232 2 option slots		2 Ethernet 1 Gbps 1 RS-485 (Isolated) 1 RS-232 2 option slots Mini PCI express slot
<b>Optional</b>	Two options slots (any two of the following, except where noted): <ul style="list-style-type: none"> <li>• Dual port RS-485</li> <li>• LON FT/TP-10</li> <li>• RS-232</li> <li>• Wireless TEC (maximum of one and disables onboard RS-232)</li> <li>• GPRS modem (maximum of one)</li> <li>• Battery-less Option Card</li> </ul>		
<b>Network Drivers</b>			
<b>Embedded</b>	N2, Niagara, oBIX		
Continued on next page . . .			

	FX30E (Cont.)	FX60E	FX70
<b>Direct I/O</b>			
<b>Onboard</b>	None		
<b>Optional</b>	Up to 66 (by using NDIO modules)		Up to 256 by using 16 Remote I/O Modules (FXRIO16)
<b>Local (NDIO)</b>	Up to 66 total I/O (through optional NDIO modules)		None
<b>Remote I/O</b>	Up to 64 I/O by using 4 Remote I/O Modules (FXRIO16)	Up to 256 I/O by using 16 Remote I/O Modules (FXRIO16)	
<b>Compliance</b>  	<b>United States</b> UL Listed, File E107041, CCN PAZX, under UL 916, Energy Management Equipment FCC compliant to CFR 47, part 15, subpart B, class A		
	<b>Canada</b> UL Listed, File E107041, CCN PAZX7, under CSA C22.2 No. 205, Signal Equipment Industry Canada compliant to ICES-003		
	<b>Europe</b> CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC. FX60E controllers used in conjunction with the LP-FXPM263-0 power module require the addition of a ferrite ring around a shielded power cord.		
	<b>BACnet International:</b> BACnet Testing Laboratories® (BTL) 135-2004 Listed BACnet Building Controller (B-BC)		

**Table 9: Local Input Output Modules**

<b>Product Codes</b>	LP-FXNDIO34-0: 16 universal inputs, 10 relay outputs, 8 analog outputs LP-FXNDIO16-0: 8 universal inputs, 4 relay outputs, 4 analog outputs
<b>Dimensions</b>	NDIO34: 6.313 x 4.820 x 2.438 in. (16.04 x 12.24 x 6.19 cm) NDIO16: 3.2 x 4.828 x 2.437 in. (8.2 x 12.24 x 6.19 cm)
<b>Universal Input Types Supported</b>	<ul style="list-style-type: none"> <li>• 10k ohm Type 3 thermistors. Thermistor Sensor Range: -23.3 to 115.5° C (-10 to 240 ° F). Input accuracy is in the range of ±1% of span. Characteristic curve is customizable.</li> <li>• 0-10 V; accuracy is ±2% of span, without user calibration; uses an external resistor for current input (four provided, mounted by installer on terminal connections)</li> <li>• 4-20 mA current loop; accuracy is ±2% of span, without user calibration; self-powered or board-powered sensors accepted</li> <li>• Dry contact: V open circuit, 300- µA short-circuit current</li> <li>• Pulsing dry contact at a rate of up to 20 Hz; 50% duty cycle</li> </ul>
<b>Digital Outputs</b>	<ul style="list-style-type: none"> <li>• Form A relay contacts suitable for on/off control only; floating control not supported</li> <li>• Max voltage 30 volts AC or DC</li> <li>• 1/2 A max current rating</li> </ul>
<b>Analog Outputs</b>	<ul style="list-style-type: none"> <li>• 0-10 V DC</li> <li>• Minimum load supported per output is 2,500 ohms minimum or 4 mA drain maximum</li> </ul>

**Table 10: Remote Input Output Modules**

<b>Product Codes</b>	LP-FXRIO16-0: 8 universal inputs, 4 relay outputs, 4 analog outputs
<b>Dimensions</b>	4 x 3.625 x 2.625 in. (10.16 x 9.2 x 6.7 cm)
<b>Universal Input Types Supported</b>	<ul style="list-style-type: none"> <li>• 10k ohm Type 3 thermistors. Thermistor Sensor Range: -23.3 to 115.5° C (-10 to 240° F). Input accuracy is in the range of <math>\pm 1\%</math> of span. Characteristic curve is customizable.</li> <li>• 0-10 V; accuracy is <math>\pm 2\%</math> of span, without user calibration; uses an external resistor for current input (four provided, mounted by installer on terminal connections)</li> <li>• 4-20 mA current loop; accuracy is <math>\pm 2\%</math> of span, without user calibration; self-powered or board-powered sensors accepted</li> <li>• Dry contact: V open circuit, 300- <math>\mu</math>A short-circuit current</li> <li>• Pulsing dry contact at a rate of up to 20 Hz; 50% duty cycle</li> </ul>
<b>Digital Outputs</b>	<ul style="list-style-type: none"> <li>• Form A relay contacts suitable for on/off control only; floating control not supported</li> <li>• Max voltage 30 volts AC or DC</li> <li>• 0.5 A max current rating</li> </ul>
<b>Analog Outputs</b>	<ul style="list-style-type: none"> <li>• 0-10 V DC</li> <li>• Minimum load supported per output is 2,500 ohms minimum or 4 mA drain maximum</li> </ul>

**Table 11: FX Workbench Requirements**

<b>Processor</b>	Intel® Pentium® 4, 1 GHz or higher
<b>Operating System</b>	<b>32-bit:</b> Windows® 8 Pro or Enterprise, Windows 7 Professional, Enterprise, or Ultimate, or Windows XP® Professional <b>64-bit:</b> Windows® 8.1 Pro or Enterprise, Windows 8 Pro or Enterprise, Windows 7 Professional, Enterprise, or Ultimate, Windows Server 2012 Standard or Enterprise with SP2, or Windows Server® 2012 R2 Standard or Enterprise with SP2
<b>Web Browser</b>	Windows Internet Explorer® version 5 or later, Mozilla® Firefox®
<b>Memory</b>	512 MB minimum
<b>Hard Disk</b>	1 GB minimum, 5 GB recommended
<b>Network Support</b>	Ethernet 10/100 Mbps with RJ-45 connector

*The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, contact a Facility Explorer technical support resource. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.*

#### **United States Emissions Compliance**

*This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the users will be required to correct the interference at their own expense.*

#### **Canadian Emissions Compliance**

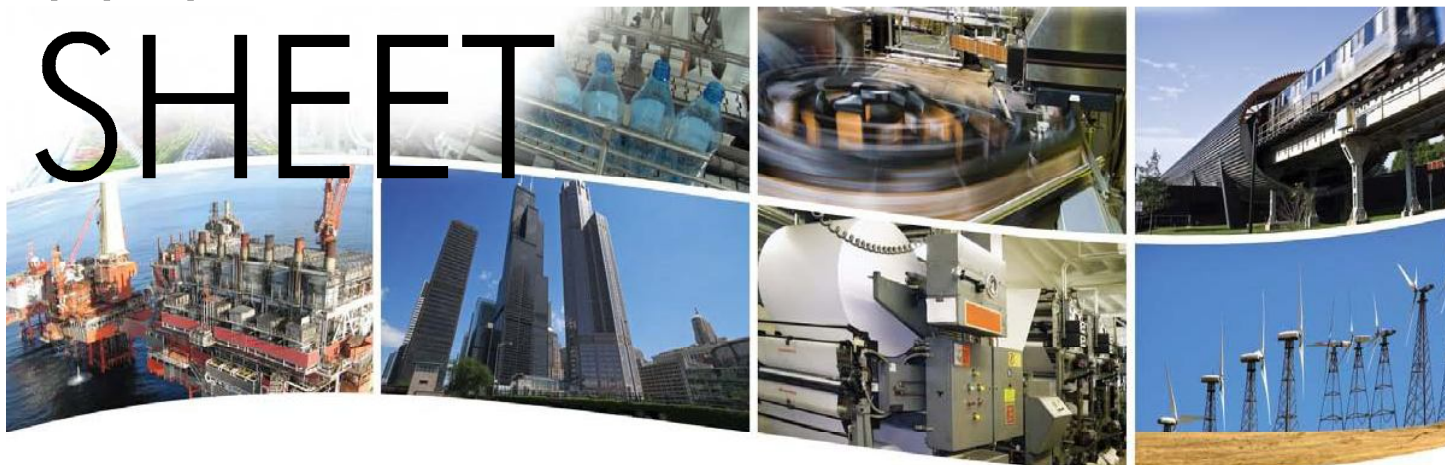
*This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations. Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.*



**Building Efficiency**  
507 E. Michigan Street, Milwaukee, WI 53202

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# data SHEET



## BAS Router — BACnet® Multi-Network Router

The BAS Router provides stand-alone routing between BACnet networks such as BACnet/IP, BACnet Ethernet, and BACnet MS/TP — thereby allowing the system integrator to mix BACnet network technologies within a single BACnet

internetwork. The BAS Router has two physical communication ports. One is a 10/100 Mbps Ethernet port and the other is an optically isolated MS/TP port. Router configuration is accomplished via a web page.

### Versatile Routing Between ...

- BACnet/IP and BACnet MS/TP
- BACnet Ethernet and BACnet MS/TP
- BACnet/IP and BACnet Ethernet
- BACnet/IP and BACnet Ethernet and BACnet MS/TP
- Two BACnet/IP networks

### IP Network Support

- Web server for commissioning and troubleshooting
- Communication diagnostic web page
- BACnet/IP Broadcast Management Device (BBMD)
- Foreign Device Registration (FDR)

### Flexible Communications

- 10/100 Mbps Ethernet with auto-negotiation and Auto-MDIX
- Optically isolated MS/TP port
- MS/TP baud rates range from 9.6–76.8 kbps
- Jumper-selectable MS/TP bias and termination

### Convenient Installation

- 24 VAC/VDC ( $\pm 10\%$ ), 47–63 Hz input voltage
- Din-rail mounted



## **BASautomation®**



## Data Sheet — BAS Router

### BAS Router — BACnet® Multi-Network Router

The BAS Router is housed in a metal case that mounts on 35-mm DIN-rail and is powered from a 24 VAC/VDC ( $\pm 10\%$ ) source. There is one MS/TP port and one 10/100 Mbps Ethernet port.

The MS/TP port offers an optically-isolated transceiver. It has a removable 3-pin terminal block for the EIA-485 connection. Logically, 255 devices can be addressed, but physically, the number of devices depends upon device loading.

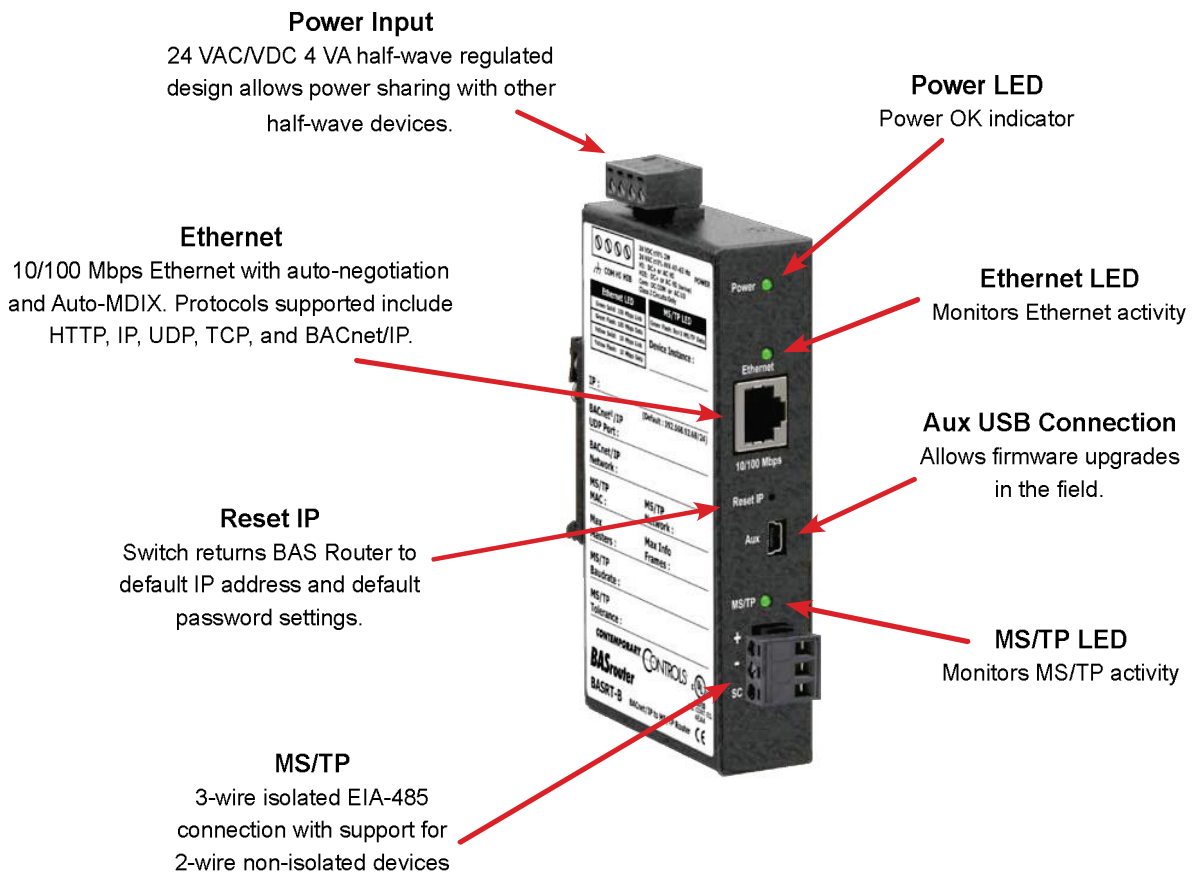
Up to 31 full-load EIA-485 devices can share the same MS/TP bus segment as the BAS Router. For half-load devices, there can be 62. All MS/TP standard baud rates are supported — from 9.6 to 76.8 kbps.

The Ethernet port offers a shielded RJ-45 connector. Through auto-negotiation and Auto-MDIX, it


automatically matches connections to the attached equipment. Therefore, either straight-through or crossover CAT5 cable can be used for hook-up.

A resident web server allows for commissioning, and troubleshooting via a standard web browser. A reset switch is provided on the router to return the unit to the factory default IP address. Three LEDs are provided: The power LED glows green when proper power is provided. A bicolour Ethernet LED glows green for 100 Mbps operation and yellow for 10 Mbps and indicates activity by flashing. A green LED flashes with MS/TP activity.


Internal MS/TP bias and termination jumpers allow flexible bias and termination options. They can be removed for mid-span installations.



## Web Page Configuration




### BASRT-B Configuration




Device Name	BASRT-B0050b6	
Device Instance	0	
Ethernet Network	0	
BACnet/IP UDP Port 1	BAC0	
BACnet/IP Network 1	1	
IP Address	192.168.92.68	<a href="#">Advanced</a>
IP Subnet	24	
IP Gateway	192.168.92.1	
MS/TP MAC	00	<a href="#">Status</a>
MS/TP Network	2001	
Max Masters	127	
Max Info Frames	100	
MS/TP Baudrate	38400	<a href="#">Security</a>
MS/TP Tolerance	<input checked="" type="radio"/> Strict <input type="radio"/> Lenient	

[Save Changes](#)

MAC Address 00-50-DB-00-50-B6  
Firmware Revision 2.6.9



### Advanced BASRT-B Configuration



BBMD Enable

BBMD UDP Port Primary

Accept FDR

[Broadcast Distribution Table](#)

[Foreign Device Table](#)

Secondary BACnet/IP UDP Port 0000

Secondary BACnet/IP Network 0

Public IP Address 0.0.0.0

[Save Changes](#)

**Data Sheet — BAS Router****BAS Router Parameters Main Settings**

<i>Device Parameters</i>	<i>Default Value</i>	<i>Description</i>
Device Name	BASRT-Bxxxxxx	The unique default value ends with the last 6 characters of the unit's Ethernet MAC address. You can edit it to be up to 20 characters.
Device Instance	0	The router device instance is a 22-bit decimal value (0–4,194,303). Each BACnet device has a unique device instance.
<b>BACnet Ethernet Parameter</b>		
<i>BACnet Ethernet Parameter</i>	<i>Default Value</i>	<i>Description</i>
BACnet Ethernet Network	0	16-bit decimal value (1–65534). Each BACnet network, regardless of technology, must have a unique network number. By retaining the default value of 0, BACnet Ethernet routing is disabled.
<b>BACnet/IP Parameters</b>		
<i>BACnet/IP Parameters</i>	<i>Default Value</i>	<i>Description</i>
BACnet/IP UDP Port	BAC0	16-bit hex value (0–FFFF) is set to BAC0 as the default value and should be used. All BACnet/IP devices on the same BACnet network must have the same UDP port assignment. For other assignments choose ports in the range from BAC1 to BACF while verifying that these ports are available.
BACnet/IP Network	1	16-bit decimal value (1–65534). Each BACnet network, regardless of technology, must have a unique network number. It is recommended that all subnets of the same BACnet/IP network be given the same BACnet network number as well.
IP Address	192.168.92.68	IP address in dotted decimal format. Select a valid address in the range from 0.0.0.1 through 255.255.255.254.
IP Subnet	24	Decimal value (0–30) in the "slash" notation is the number of bits with a "1" in the mask. The default value of 24 corresponds to 255.255.255.0 in the dotted decimal format. All devices on the same subnet which communicate via BACnet/IP should use the same subnet mask.
IP Gateway	192.168.92.1	IP Gateway address in dotted decimal format. Select a valid address in the range from 0.0.0.1 through 255.255.255.254.
<b>MS/TP Parameters</b>		
<i>MS/TP Parameters</i>	<i>Default Value</i>	<i>Description</i>
MS/TP MAC Address	0	Decimal value (0–127) represents the MAC address of the router's MS/TP port. Lower MAC address numbers are preferred.
MS/TP Network	2001	16-bit decimal value (1–65535). Each BACnet network, regardless of technology, must have a unique network number.
Max Masters	127	This 8-bit decimal value (1–127) represents the highest master MAC address in the MS/TP network. If the highest value MAC address is unknown or if additional devices are to be added in the future above the current highest MAC address, use the default setting of 127.
Max Info Frames	100	This is the maximum number of messages (1–100) that can be routed onto the MS/TP network by the router per token pass. Values above 20 are typical.
MS/TP Baud Rate	38400	The baud rate of the MS/TP network can be 9600, 19200, 38400 or 76800 bps. All MS/TP devices on the same MS/TP network must use the same baud rate. Auto-bauding devices will set their baud rates to that of the BAS Router.
MS/TP Tolerance	Lenient	Affects the degree to which interoperability with devices is successful. Lenient option causes less efficient traffic but optimises interoperability.

## BAS Router Parameters Advanced Settings — BBMD

<i>BBMD Parameters</i>	<i>Default Value</i>	<i>Description</i>
BBMD Enable	Unchecked	Check to enable BACnet/IP Broadcast Management Device (BBMD).
BBMD UDP Port	Primary	Normally the primary port is selected. The secondary port is used in very special applications.
Accept FDR	Checked	Uncheck to disable foreign devices from registering with this router.
Secondary BACnet/IP UDP Port	0000	Enter secondary UDP port as a 16-bit hex value (0-FFFF) when operating with two BACnet/IP BACnet networks. In this case use BAC1 if it is available.
Secondary BACnet/IP Net	0	Assign a unique network number from all other BACnet networks.
Public IP Address	0.0.0.0	Enter the public IP address in dotted decimal format of the IP router in the system.

## BAS Router Additional Tables and Screens

<i>Table or Screen Name</i>	<i>Description</i>
Broadcast Distribution Table (BDT)	This table must contain the entries of any other BBMDs located on the network. The IP address and subnet mask of the BBMDs must be listed.
Foreign Device Table (FDT)	This table is automatically lists all the foreign devices that have registered with this router. Information includes IP address, port number, time-to-live, and remaining time on its lease.
Status Screen	Displays a log of events (automatically refreshed each second) to facilitate troubleshooting. Use this information when discussing any routing issues with Contemporary Controls' technical support.
Security Screen	Authentication menu. Allows the user to change user name and password. Depressing the Reset IP button restores user name and password to default settings.

**Data Sheet — BAS Router****BACnet Protocol Implementation Conformance (PIC) Statement****CONTEMPORARY** CONTROLS®**BAS Router**

BACnet Multi-network Router

**BACnet Protocol Implementation Conformance Statement (Annex A)**

**Date:** 17 February 2012  
**Vendor Name:** Contemporary Controls  
**Product Name:** BAS Router  
**Product Model Number:** BASRT-B  
**Applications Software Version:**      **Firmware Revision:** 2.6      **BACnet Protocol Revision:** 2  
**Product Description:** Device to route between BACnet/IP, ISO 8802-3 and MS/TP networks.

**BACnet Standardized Device Profile (Annex L):**

- BACnet Operator Workstation (B-OWS)       BACnet Application Specific Controller (B-ASC)  
 BACnet Building Controller (B-BC)       BACnet Smart Sensor (B-SS)  
 BACnet Advanced Application Controller (B-AAC)       BACnet Smart Actuator (B-SA)

**List all BACnet Interoperability Building Block Supported (Annex K):**

DS-RP-B Data Sharing — ReadProperty – B      DM-DDB-B Device Management — Dynamic Device Binding – B  
 NM-RC-B Network Management — Router Configuration – B

**Segmentation Capability:**

- Able to transmit segmented messages      Window Size:  
 Able to receive segmented messages      Window Size:

**Standard Object Types Supported:**

Object Type Supported	Can Be Created Dynamically	Can Be Deleted Dynamically
Device	No	No

No optional properties are supported. **NOTE:** The above object is directed supported on the router. The router will pass to the appropriate network all BACnet communications not directed to the router.

**Data Link Layer Options:**

- BACnet IP, (Annex J)  
 BACnet IP, (Annex J), Foreign Device  
 ISO 8802-3, Ethernet (Clause 7)  
 ANSI/ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s):  
 MS/TP master (Clause 9), baud rate(s): 9600; 19,200; 38,400; 76,800  
 MS/TP slave (Clause 9), baud rate(s):  
 Point-To-Point, EIA 232 (Clause 10), baud rate(s):  
 Point-To-Point, modem, (Clause 10), baud rate(s):  
 LonTalk, (Clause 11, medium):  
 Other:

**Device Address Binding:**

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.)  Yes       No

**Networking Options:**

- Router, Clause 6 — routing between BACnet/IP, ISO 8802-3, and MS/TP  
 Annex H, BACnet Tunnelling Router over IP  
 BACnet/IP Broadcast Management Device (BBMD)  
 Does the BBMD support registrations by Foreign Devices?  Yes       No

**Character Sets Supported:**

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

- ANSI X3.4       IBM™/Microsoft™ DBCS       ISO 8859-1  
 ISO 10646 (UCS-2)       ISO 10646 (UCS-4)       JIS C 6226

**If this product is a communication gateway, describe the types of non-BACnet equipment/network(s) that the gateway supports:**

No gateway support.

17 February 2012

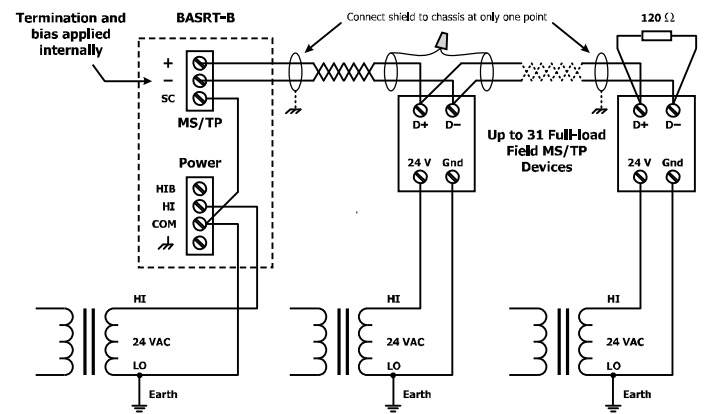
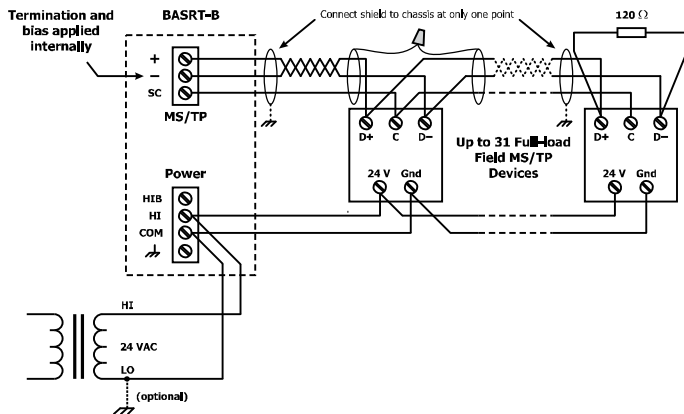
TD071200-0XD

## Wiring Diagrams

Since the BAS Router incorporates a half-wave rectifier circuit, it can share the same 24 VAC power with other half-wave rectified devices. It can also be powered from a 24 VDC source. A redundant power connection exists for back-up power schemes.

The BAS Router incorporates a 3-wire optically-isolated EIA-485 interface for the MS/TP connection, allowing better circuit protection and noise immunity. To connect to other 3-wire devices simply make a one-to-one

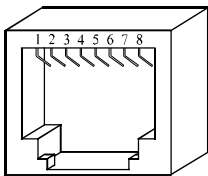
connection to the other devices. But when connecting to 2-wire non-isolated devices, the signal common (SC) on the BAS Router must share the reference used by the 2-wire devices. This is accomplished by tying the SC pin to COM on the BAS Router and by grounding the low-side of each power supply on all connected devices. In this way all EIA-485 transceivers share the same earth reference. Notice that the SC pin is signal common and not a shield pin.



## Connector Pin Assignments

### Ethernet

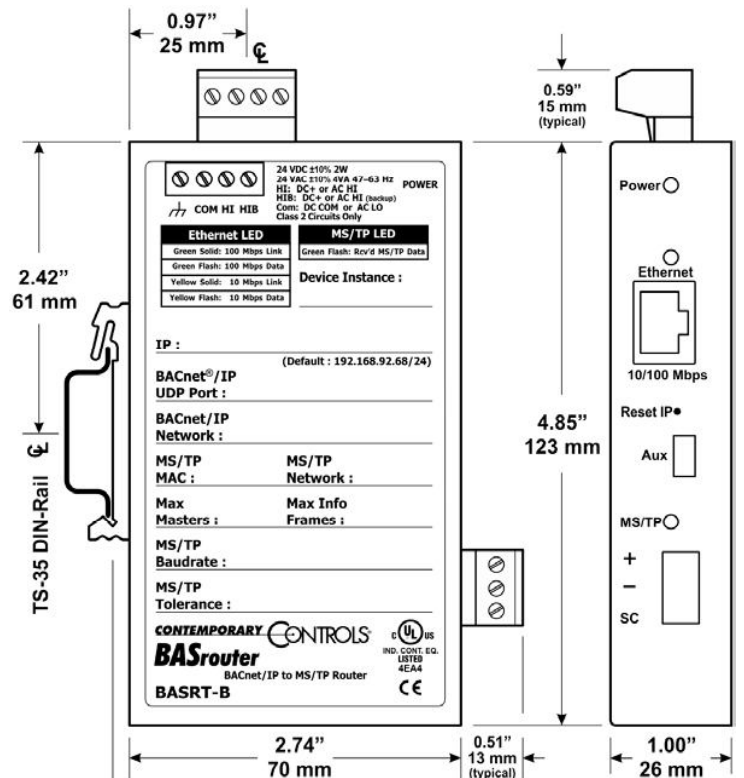
Pin	Function
1	Signal 1
2	Signal 2
3	Signal 3
4	N/C
5	N/C
6	Signal 4
7	N/C
8	N/C



### MS/TP

Pin	Function
+	Signal High
-	Signal Low
SC	Signal Common

## Mechanical Drawing



## Data Sheet — BAS Router

### Specifications

<b>Power Requirements</b>	24 VDC $\pm$ 10% 2 W or 24 VAC $\pm$ 10% 4 VA 47–63 Hz	
<b>Operating Temperature</b>	0°C to 60°C	
<b>Storage Temperature</b>	–40°C to 85°C	
<b>Relative Humidity</b>	10–95%, non-condensing	
<b>Protection</b>	IP30	
<b>Ethernet Communications</b>	IEEE 802.3 10/100 Mbps data rate 10BASE-T, 100BASE-TX physical layer 100 m (max) CAT5 cable length	
<b>MS/TP Communications</b>	ANSI/ASHRAE 135 (ISO 16484-5) 9600, 19200, 38400, 76800 bps data rate EIA-485 physical layer 1200 m (max) cable length	
<b>LEDs</b>	Power	Green = power OK
	Ethernet	Green = 100 Mbps Yellow = 10 Mbps Flash = activity
	MS/TP	Flashing Green = receive activity

### Regulatory Compliance

CE Mark; CFR 47, Part 15 Class A; RoHS  
UL 508, C22.2 No. 142-M1987



### Ordering Information

<b>Model</b>	<b>RoHS</b>	<b>Description</b>
BASRT-B	✓	BAS Router BACnet multi-network router DIN-rail mount

<b>United States</b>	<b>China</b>	<b>United Kingdom</b>	<b>Germany</b>
<b>Contemporary Control Systems, Inc.</b> 2431 Curtiss Street Downers Grove, IL 60515 USA  Tel: +1 630 963 7070 Fax: +1 630 963 0109  <a href="mailto:info@ccontrols.com">info@ccontrols.com</a> <a href="http://www.ccontrols.com">www.ccontrols.com</a>	<b>Contemporary Controls (Suzhou) Co. Ltd</b> 11 Huoju Road Science & Technology Industrial Park New District, Suzhou PR China 215009  Tel: +86 512 68095866 Fax: +86 512 68093760  <a href="mailto:info@ccontrols.com.cn">info@ccontrols.com.cn</a> <a href="http://www.ccontrols.asia">www.ccontrols.asia</a>	<b>Contemporary Controls Ltd</b> 14 Bow Court Fletchworth Gate Coventry CV5 6SP United Kingdom  Tel: +44 (0)24 7641 3786 Fax: +44 (0)24 7641 3923  <a href="mailto:info@ccontrols.co.uk">info@ccontrols.co.uk</a> <a href="http://www.ccontrols.eu">www.ccontrols.eu</a>	<b>Contemporary Controls GmbH</b> Fuggerstraße 1 B 04158 Leipzig Germany  Tel: +49 341 520359 0 Fax: +49 341 520359 16  <a href="mailto:info@ccontrols.de">info@ccontrols.de</a> <a href="http://www.ccontrols.eu">www.ccontrols.eu</a>

# 35 and 70 lb-in. Non-Spring Return Direct Coupled Actuators

ML6161, ML7161, ML6174, ML7174

## PRODUCT DATA



## FEATURES

- Selectable 45°, 60°, or 90° stroke in both clockwise (cw) or counterclockwise (ccw) directions.
- 0° to 30° minimum position adjustment (cw or ccw direction) on all models.
- Magnetic coupling eliminates the need for mechanical stops.
- Two field-addable auxiliary switches.
- Auxiliary feedback potentiometer field-addable on select models.
- Manual declutch on all models.
- ML7161 and ML7174 models include standard reverse/direct acting rotation switch on outside cover.
- W7620 Terminal Unit Controller compatibility.
- Commercial zone damper in W7600 Commercial Zone System compatibility.

## APPLICATION

The 35 and 70 lb-in. (4 Nm and 8 Nm) Non-Spring Return Direct Coupled Actuators (DCA) are control actuators that provide floating or proportioning control for valves and dampers. The proportioning actuators accept a current or voltage signal from a controller to position the damper or valve at any chosen point between fully open and fully closed.

Floating actuators are suitable for use with single pole double throw (spdt) floating thermostats or two-position control systems.

Two-position control requires installation of the 201052B Auxiliary Switch.

## Contents

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## 35 AND 70 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS

**SPECIFICATIONS****Models:** See Table 1.**Dimensions:** See Figures 1, 1A, and 1B.**Electrical Ratings:**Power Input: 24 Vac  $\pm$ 20%, 50/60 Hz.

Impedance:

2-10 Vdc: 45k ohms.

4-20 mA: 536 ohms.

Power Consumption: See Table 2.

Auxiliary Switch Ratings:

Electrical: Selective NO or NC, not simultaneous.

Pilot Duty: 50 VA, 24 Vac.

Switch Differential: Three angular degree maximum.

**Torque Ratings (at Rated Voltages):** See Table 3.**Actuator Stroke:**

Selectable: 45°, 60°, and 90°.

Rotation: Clockwise (cw) and counterclockwise (ccw).

NOTE: Reversing drive rotation of the ML7161 and ML7174 requires changing the control signal from 2-10 Vdc to 10-2 Vdc.

**Device Weight:** 1.3 lb (0.58 kg).**Actuator Timing for 90° Stroke:** See Table 4.**Mounting:** Mounts directly on 3/8 in. to 1/2 in. (10 to 13 mm) round or square shaft. Can be mounted with shaft in any position with two 1/4 in. (6 mm) 28 NF Allen screws. Minimum Shaft Length Required: 1-3/4 in. (45 mm).**Temperature Ratings:**

Ambient: 20° F to 125° F (-18° C to 50° C).

Derated Timing to: -20° F (-29° C).

Shipping and Storage: -20° F to 130° F (-29° C to 54° C).

Humidity Ratings: 5% to 95% RH noncondensing.

**Actuator Minimum Design Life:** See Table 5.**Noise Output:** 45 dBA at 1 meter maximum.**Feedback Potentiometer Ratings:**

Electrical Rating (200976A,C Potentiometer): 24 Vac, 50/60 Hz, 2.25W.

Resistance Output (Resistance Linear as Measured Between Terminals R-B):

0 ohms (at 0°, cw stroke).

250 ohms (at 45°, cw stroke).

333 ohms (at 60°, cw stroke).

500 ohms (at 90°, cw stroke).

**Environmental Protection Ratings:**

NEMA1.

ML6161E, ML6174E, ML7161E, ML7174E *only*: IP54.**Approvals:**

Underwriter's Laboratories Inc. Component Recognized: File No. E4436; Guide No. XAPX2.

UL94-5V: Meets plenum requirements.

Canadian Standards Association Certified (includes Auxiliary Switch).

ML6161E, ML6174E, ML7161E, ML7174E *only*: CE.**Accessories:**

200976A Auxiliary Potentiometer (0 to 500 ohm).

200976C Auxiliary Potentiometer (0 to 2000 ohm).

201052A Auxiliary Switch (one).

201052B Auxiliary Switch (two).

201391 Shaft Adapter (included).

4074ENJ Bag Assembly—includes stop pin, shaft adapter, and two minimum-position screws.

4074ENY Bag Assembly—includes stop pin and shaft adapter.

4074EVK Short Shaft Extender.

7640QW Metal Enclosure—for attaching conduit to actuator.

T641 Floating Thermostat—for use with seven-minute models.

T6984 Floating Thermostat—for use with 90-second and seven-minute models.

T7984 Modulating Thermostat—for use with ML7161 or ML7174.

**ORDERING INFORMATION**

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Honeywell Automation and Control Products Sales Office (check white pages of your phone directory).
2. Honeywell Customer Care  
1885 Douglas Drive North  
Minneapolis, Minnesota 55422-4386

In Canada—Honeywell Limited/Honeywell Limitée, 35 Dynamic Drive, Toronto, Ontario M1V 4Z9.

International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

35 AND 70 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS

Table 1. 35 lb-in. and 75 lb-in. DCA models.

<b>ML</b>	Motor Linkage				
<b>61</b>	Floating Control				
<b>71</b>	4-20 mA/2-10 Vdc Control				
<b>61</b>	35 lb-in. (4 Nm), Non-Spring Return				
<b>74</b>	70 lb-in. (8 Nm), Non-Spring Return				
<b>A</b>	Includes output for feedback potentiometer.				
<b>B</b>	Standard (includes minimum-position setscrews).				
<b>C</b>	Includes output for feedback potentiometer and cover with conduit connections.				
<b>D</b>	Includes cover with conduit connections.				
<b>E</b>	Standard with European ratings.				
<b>1</b>	Standard.				
<b>2</b>	Includes declutch function.				
<b>ML</b>	<b>61</b>	<b>61</b>	<b>B</b>	<b>1</b>	<b>XXX</b> Varies by model

Table 2. Power Consumption.

Model	Power Consumption
ML6161A,B,C,D	1.8 VA
ML7161A	4.8 VA
ML6174A,B	2.4 VA
ML7174A	5.4 VA

Table 3. Torque Ratings.

	35 lb-in. DCA lb-in. (Nm)	70 lb-in. DCA lb-in. (Nm)
Running	35 (4)	70 (8)
Breakaway		
Stall Minimum	45 (5)	
Stall Maximum	70 (8)	130 (14)

Table 4. Actuator 90° Stroke Timing.

	At 50 Hz	At 60 Hz
90 Second Models	108 sec	90 sec
Three-Minute Models	216 sec	180 sec
Seven-Minute Models	504 sec	420 sec

Table 5. Actuator Minimum Design Life.

	35 lb-in. (4 Nm) DCA	70 lb-in. (8 Nm) DCA
Cycles	50,000	40,000
Repositions	1,500,000	1,500,000

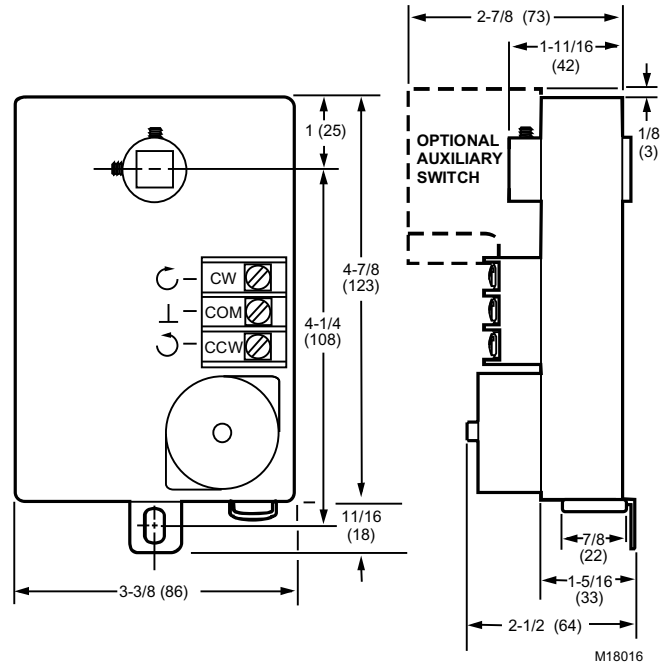


Fig. 1a. Approximate dimensions of ML6161A,B,E and ML6174A,B,E DCA in inches (mm).

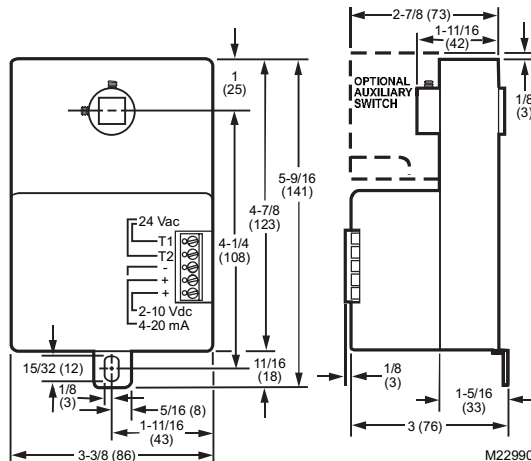


Fig. 1b. Approximate dimensions of ML7161, ML7174 DCA in inches (mm).

## 35 AND 70 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS

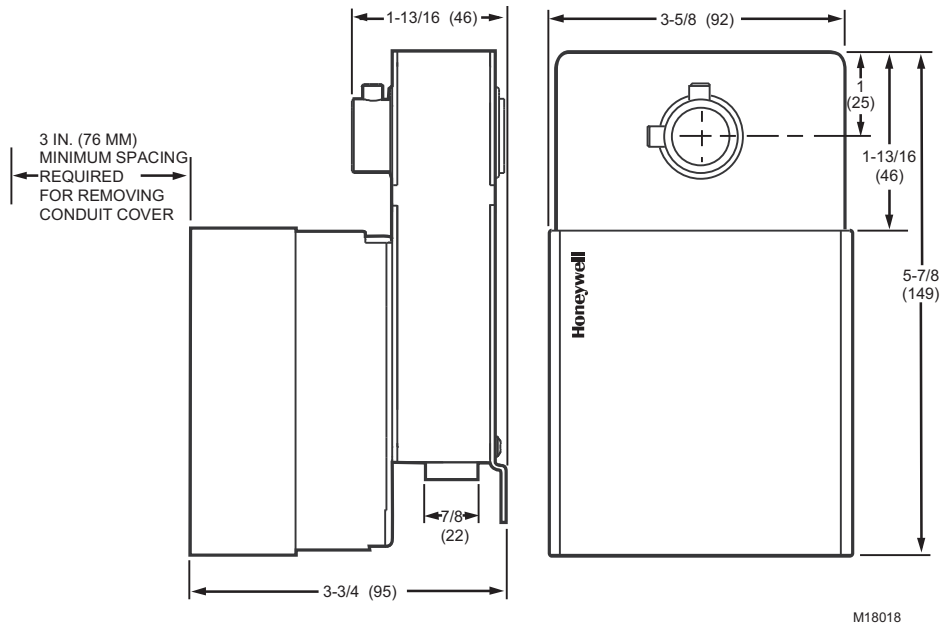


Fig. 1c. Approximate dimensions of ML6161C,D and ML6174C,D DCA in inches (mm).

## INSTALLATION

### When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

#### IMPORTANT

*All wiring must agree with applicable codes, ordinances and regulations.*

### ⚠ WARNING

#### Explosion Hazard.

**A spark from the actuator or attached accessories can result in serious injury or death.**

Install the actuator in areas free of escaping gas and other explosive vapors.

### ⚠ CAUTION

**Electrical Shock or Equipment Damage Hazard. Can shock individuals or short equipment circuitry.** Disconnect all power supplies before installation. Actuators with auxiliary switches can have more than one disconnect.

### ⚠ CAUTION

#### Actuator Damage Hazard.



**Deteriorating vapors and acid fumes can damage the actuator metal parts.**

Install actuator in areas free of acid fumes and deteriorating vapors.

#### Location

Choose a location for the actuator that allows enough clearance for mounting accessories and for servicing.

#### Mounting

These actuators are designed to open a damper or valve by driving the shaft in either the clockwise (cw)  or counterclockwise (ccw)  direction. The actuator has a mounting tab on the bottom that secures it to a damper box or valve linkage. When mounted correctly, this tab allows the actuator to float without rotating relative to the shaft. The tab is sized for 1/4 in. (6 mm) screw or pin (not included).

### ⚠ CAUTION

#### Equipment Damage Hazard.

**Tightly securing mounting tab to damper housing can damage actuator.**

Once mounted, the actuator must be allowed to float; do not fully tighten the screw.

These actuators are shipped in the fully clockwise 90° position as viewed from the end of the damper shaft.



## CAUTION

### Equipment Damage Hazard.

Mounting actuator unevenly with damper housing can damage actuator.

Mount actuator flush with damper housing or add spacer between mounting tab and damper box housing (see Fig. 2).

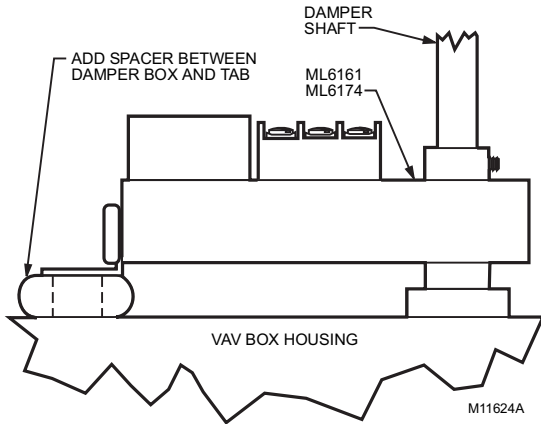


Fig. 2. Mounting actuator to VAV box when actuator is not flush with box.

## Preparation

Before mounting the actuator onto the shaft, determine the following:

1. Size of the shaft [3/8 in. to 1/2 in. (10 mm to 13 mm)].
2. Direction the shaft rotates to open the device (cw or ccw). See Fig. 4.
3. Degrees of actuator stroke for opening device (45°, 60°, or 90°).

If the shaft is 3/8 in. (10 mm) round or square, use part number 201391 Shaft Adapter provided inside the bag assembly shipped with the actuator. Place the adapter opposite the setscrews (see Fig. 3).

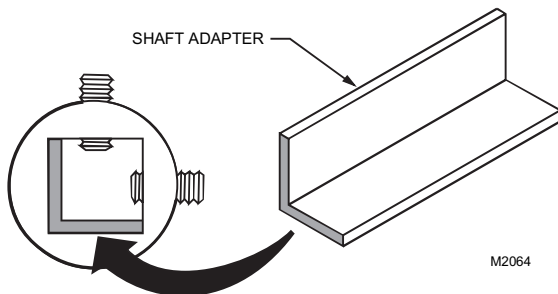


Fig. 3. Using shaft adapter for 3/8 in. (10 mm) shafts.

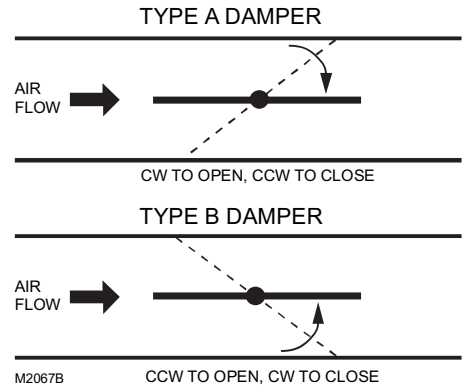


Fig. 4. Determining direction damper shaft rotates when opening.

## Manual Operation (Declutch)



## CAUTION

### Product Damage Hazard.

Do not use manual declutch without supporting the load.

Support actuator load independently immediately before and during use of manual declutch lever.

Manual declutch capability is available on some actuators. Use the manual declutch lever to manually adjust the actuator setting. Fig. 5 shows the location of the manual declutch lever. To operate, push the lever in the direction of the arrow on the lever cover.

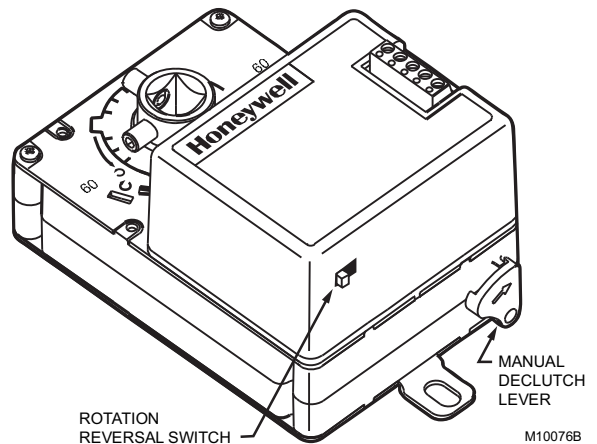


Fig. 5. Location of manual declutch lever.

35 AND 70 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS

**Installation**

After determining the direction of the shaft rotation (cw or ccw), install the device. For valve linkage mounting, refer to the instructions shipped with the linkage. For damper mounting, proceed as follows:

1. Place the actuator onto the damper shaft.

**CAUTION**

**Equipment Damage Hazard.**  
**Improper range stop selection can damage light-duty dampers.**  
 Be sure to select the proper range stop.

2. If the angle of the damper opening is either 45° or 60°, close the actuator using the manual declutch:
  - a. Disengage the hub using the declutch lever; see Manual Operation (Declutch) section.
  - b. Rotate the hub until the actuator gear train passes the proper 45° or 60° setting. (Do not insert the pin until after the actuator passes this point.)
  - c. Release the declutch lever.

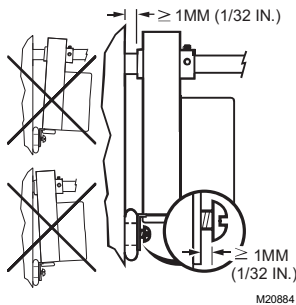
NOTE: Dampers with 90° stroke do not require the range stop pin.

3. Insert the range stop pin into the appropriate (cw or ccw) 45° or 60° slot. The range stop pin clips into its final position only after the pin passes through both actuator plates (see Fig. 7). The range stop pin should snap into position and not be removable manually (see Fig. 8).

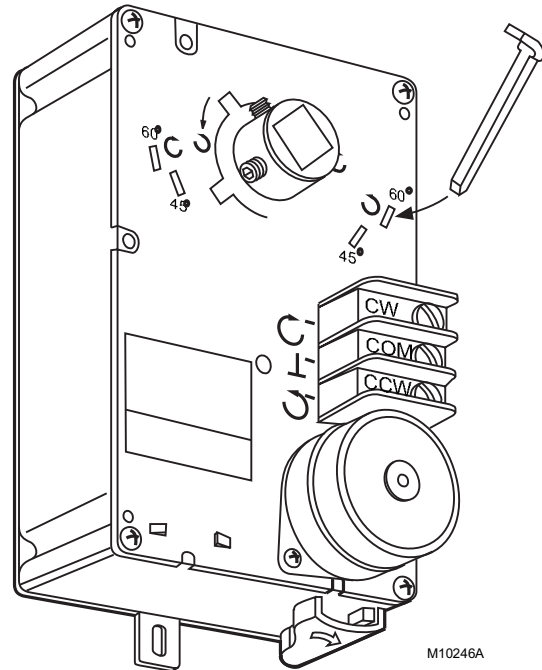
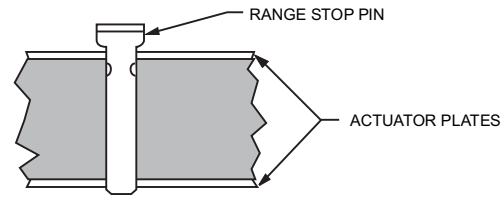
**IMPORTANT**

*Do not fully tighten the mounting screw; the actuator must be allowed to float.*

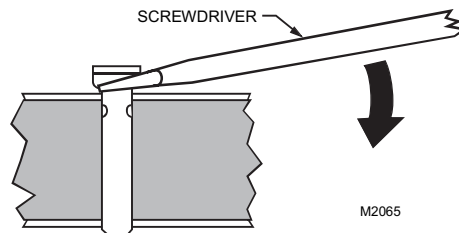
4. With the actuator placed in its final position, fix the mounting tab in position with a 1/4 in. (6 mm) screw or pin. See Fig. 6.
5. Position the damper in the open position and securely tighten the Allen screws into the damper shaft.



**Fig. 6. Proper actuator mounting to prevent rotation.**



**Fig. 7. Range stop pin properly inserted.**



**Fig. 8. Lifting range stop pin out of its slot.**

**Minimum Position Setscrew**

Certain ML6161, ML6174 and all ML7161, ML7174 models are equipped with two tapped holes located in the plastic housing at the top of the actuator. These holes can be used with the minimum position setscrew and locknut inside the 4074ENJ Bag Assembly (see Fig. 9). The setscrew provides for a 0° to 30° minimum position adjustment.

NOTE: Before starting operation, note that the 1/4 in. (6 mm) minimum position setscrew limits closing motion, while the range stop pin limits opening motion.

## 35 AND 70 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS

1. Determine the direction of the desired closing rotation.
2. Move the actuator to the position fully opposite the desired closing rotation (if cw closing rotation is desired, move the actuator to the full ccw position).
3. Determine the correct hole for the setscrew using Fig. 9 and the results of step 1.

**CAUTION**

**Equipment Damage Hazard.**  
**Improper hub positioning or hole selection can permanently damage the device.**  
 Avoid backdriving the actuator with the setscrew.

4. Remove the red cap from the desired hole. Leave the other cap in position. The caps ensure that dust and other impurities do not enter the gear train through unused holes.
5. Thread the locknut fully onto the 1/4 in. (6 mm) setscrew.
6. Insert the setscrew into the desired hole, turning clockwise until resistance is encountered or the locknut contacts the housing.
7. If resistance is met before the setscrew is fully inserted, stop and review the initial setup procedures as detailed in steps 1 through 3.
8. Determine the angle of minimum position required for the application. With the setscrew fully inserted, the minimum position is 30°. With the setscrew fully out, the minimum position is 0°.
9. Using the conversion of approximately 1.7 angular degrees per turn of the setscrew, back the screw out of the housing and stop slightly short of the calculated position. This allows the setscrew to be set accurately while taking air flow measurements.

**IMPORTANT**

*After initiating step 10, the setscrew cannot be turned into the housing without returning the actuator to the fully open position (as determined in step 1). The actuator follows the setscrew without damaging the housing only when backed out of the housing (turned ccw).*

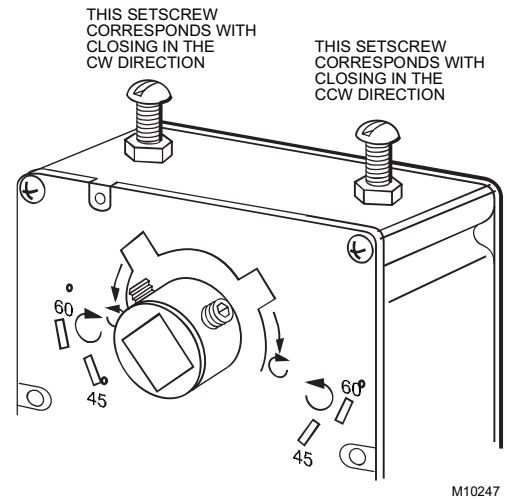
10. Rotate the actuator to minimum position using the manual declutch; see Manual Operation (Declutch) section.
11. With the actuator at minimum position, adjust the position more accurately using air flow measurements.

**NOTES:**

1. After each adjustment, ensure the actuator is completely stopped before proceeding with the next adjustment.
  2. To reduce the minimum position, turn out the setscrew (ccw). The actuator then drives toward the closed position.
  3. Turning the setscrew in (cw) damages the actuator housing.
  4. If the device is too far closed, return to step 1.
12. When proper air flow is achieved, loosen the locknut from the setscrew until it contacts the actuator housing, then turn it an additional 1/8 turn to lock the setscrew in place.

**IMPORTANT**

*Run an entire check of the operation after completing this procedure.*



**Fig. 9. Setscrew location for ML6161 and ML6174.**

**Wiring****CAUTION**

**Electrical Shock or Equipment Damage Hazard.**  
**Can shock individuals or short equipment circuitry.**  
 Disconnect all power supplies before installation.  
 Actuators with auxiliary switches can have more than one disconnect.

All wiring must comply with local electrical codes, ordinances and regulations. Voltage and frequency of the transformer used with the actuator must correspond with the characteristics of both the power supply and the actuator. Screw terminals are provided for easy hookup. See Figures 11 through 14 for typical wiring hookups.

**Connecting Wiring to Conduit Cover Actuators (Fig. 10)**

1. Remove the cover from the actuator by lifting the top and pivoting the cover to the rear of the actuator.
2. Remove the conduit knockouts with a flat-bladed screwdriver. Discard the knockouts.
3. Install the conduit connector.
4. Run the connecting wire through the conduit connector, strip the wire ends (if necessary) and connect to the CW, COM and CCW terminals using Figures 11 through 14, Figures 16 through 20, or the control manufacturer instructions.
5. Apply power to the actuator.
6. After operational checkout, replace the cover by reversing the procedure outlined in step 1.

35 AND 70 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS

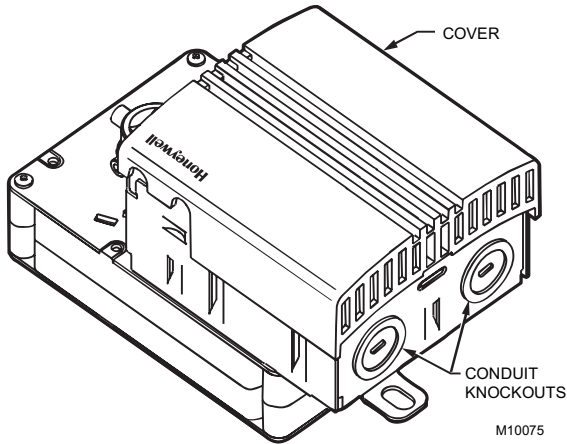


Fig. 10. Conduit cover for ML6161C,D and ML6174C,D DCA.

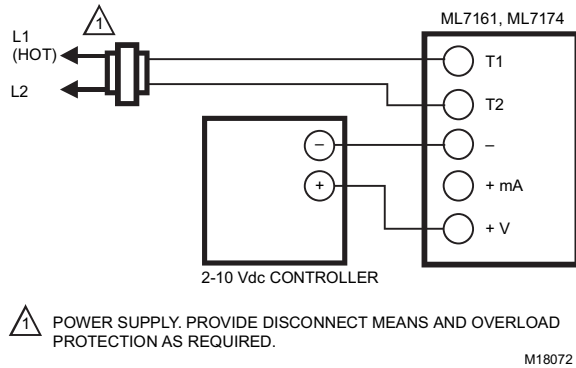


Fig. 13. ML7161 or ML7174 used with 2-10 Vdc control.

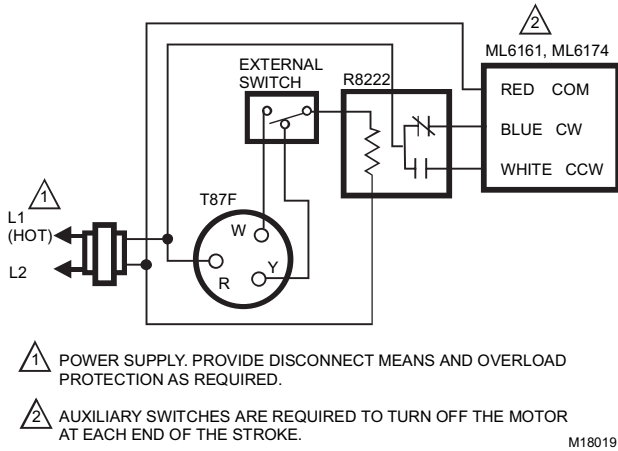


Fig. 11. ML6161 or ML6174 used with T87F in heating-only or cooling-only application.

NOTE: See Fig. 12 for the 201052B Auxiliary Switch wiring.

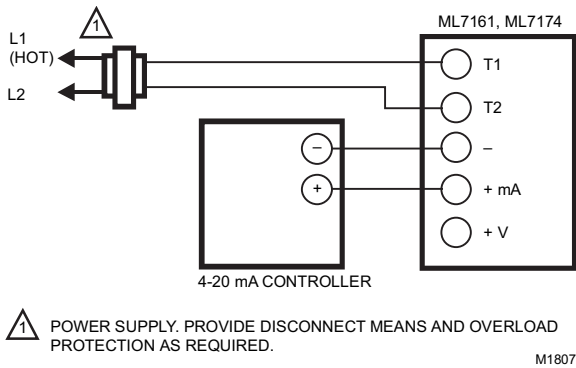


Fig. 14. ML7161 or ML7174 used with 4-20 mA control.

- ⚠ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- ⚠ AUXILIARY SWITCHES ARE REQUIRED TO TURN OFF THE MOTOR AT EACH END OF THE STROKE.

M18019

- ⚠ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

M18071

### Auxiliary Switches

The 201052A or B Auxiliary Switch is used in conjunction with the actuator. It allows for control of equipment external to the actuator (for example, electric reheat coils and fan) at an adjustable point in the stroke (0° to 90°) of the actuator.

The 201052A and B Auxiliary Switches are field-addable. For mounting instructions, see form 63-2218, provided with the device.

#### IMPORTANT

*When operating an ML6161 or ML6174 from a two-position controller, a 201052B Auxiliary Switch is required for proper operation. See Fig. 12.*

### Auxiliary Potentiometers

The 200976A,C Auxiliary Potentiometers mount on the face of the ML6161A,C or ML6174A,C (as shown in Fig. 15). The potentiometer shaft has a slipping collar. If one of the two limits of the potentiometer is exceeded, the collar continues to rotate, causing no damage to the potentiometer itself. To mount the potentiometer on the actuator:

1. Turn the potentiometer to align the shaft key with the slot in the potentiometer drive.
2. Tilt the potentiometer slightly so the key faces down toward the slot.
3. Insert the potentiometer into the slot, and push down so the potentiometer is flush with the actuator body and the bracket is aligned over the screw hole.

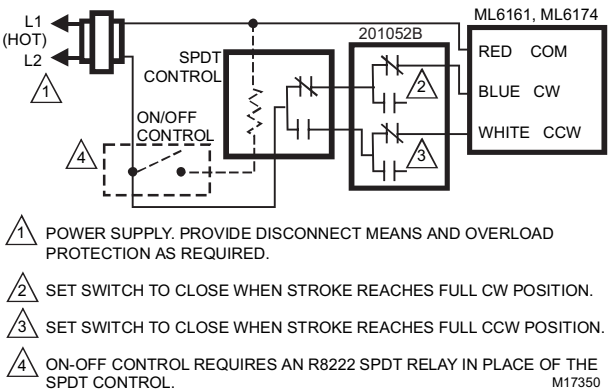


Fig. 12. 201052B Auxiliary Switch wiring.

- ⚠ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- ⚠ SET SWITCH TO CLOSE WHEN STROKE REACHES FULL CW POSITION.
- ⚠ SET SWITCH TO CLOSE WHEN STROKE REACHES FULL CCW POSITION.
- ⚠ ON-OFF CONTROL REQUIRES AN R8222 SPDT RELAY IN PLACE OF THE SPDT CONTROL.

M17350

4. Insert the screw provided into the hole and fasten securely.

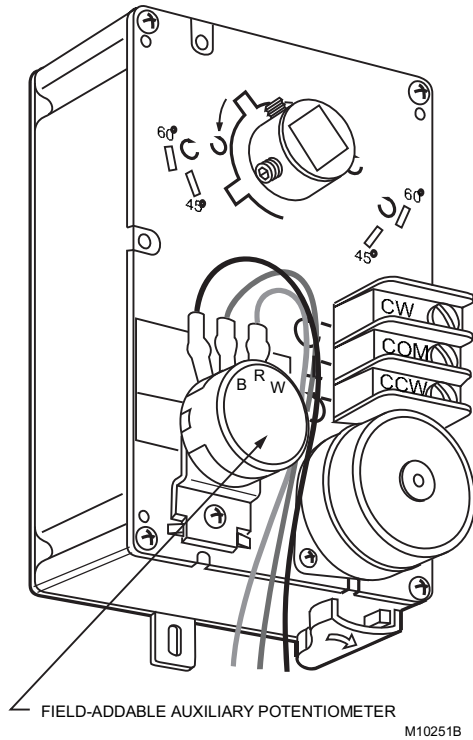
**IMPORTANT**

Failure to follow the calibration procedures can result in improper resistance values at desired stroke.

AUXILIARY POTENTIOMETER

MOTOR POSITION	RW RESISTANCE	RB RESISTANCE
FULLY CW 24V (COM-CW)	0 OHMS	500 OR 2000 OHMS
FULLY CCW 24V (COM-CCW)	500 OR 2000 OHMS	0 OHMS

MOTOR ROTATION	AUXILIARY POTENTIOMETER LEADS	
	RW OHMS	RB OHMS
CCW	INCREASE	DECREASE
CW	DECREASE	INCREASE



**Fig. 15. ML6161A,C, ML6174A,C with field-addable potentiometer.**

**To Calibrate the 200976A,C:**

**IMPORTANT**

Remove the range stop pins and minimum position setscrews prior to calibration.

1. Drive the actuator fully closed (0°) to fully open (90°) and back again to the fully closed position. This must be done to receive the correct resistance readings at the appropriate degree of stroke.
2. Check the resistance values of the potentiometer with an ohmmeter at intervals in the stroke while referring to the table in Fig. 15 and resistance information provided in the Specifications section.
3. Replace the range stop pins and/or the minimum position setscrews using the appropriate procedures.

**OPERATION**

**VAV Systems**

VAV systems control the temperature within a space by varying the volume of supply air temperature. The system delivers air to the space at a fixed temperature. The space thermostat controls the volume of supply air by modulating the supply air damper. When full heating and cooling flexibility is required in a zone, it is handled by the air temperature system, or with reheat capability in the air terminal units. As individual zones shut down, a central duct static pressure controller regulates the total air flow in the system. The fan system is sized to handle an average peak load, not the sum of the individual peaks. As each zone peaks at a different time of day, extra air is borrowed from the off-peak zones. This transfer of air from low-load to high-load zones occurs only in true VAV systems.

In pressure independent systems, individual zone airflow sensors maintain the zone air flow rate independent of fluctuation in the total system pressure. Pressure independent systems, when used with controllers such as the W7620, can react faster to changes in air flow demand; therefore, these systems can use the faster 90-second models.

Pressure dependent systems do not incorporate an individual zone air flow sensor and depend on a stable system pressure to maintain flow. These systems require slower actuators such as the seven-minute models that are typically controlled by spdt floating wall thermostats.

The T641 is a mercury bulb floating-control type thermostat designed for use with the seven-minute model on pressure-dependent systems (see Figures 16 and 17).

The T6984 is an electronic floating-control thermostat designed for use with the 90-second and seven-minute models (see Fig. 18).



35 AND 70 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS

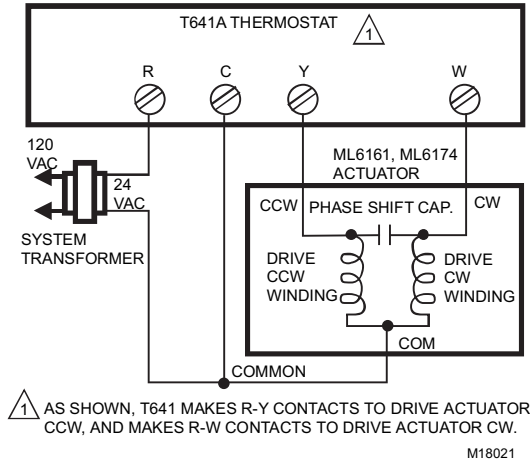


Fig. 16. T641A controlling ML6161 or M6174 Actuator.

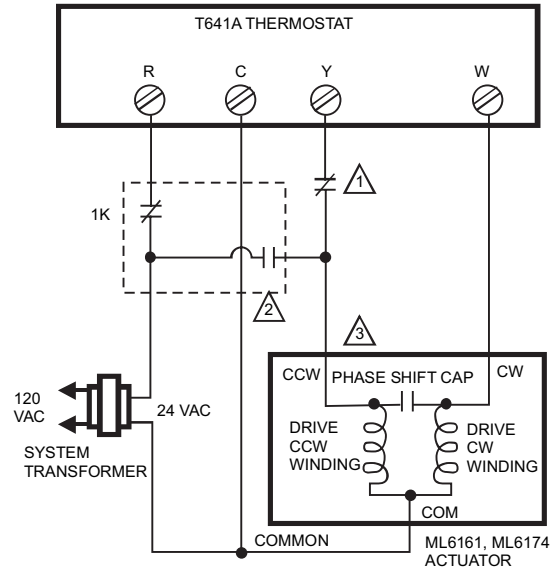


Fig. 17. Minimum position set with auxiliary switch contacts, override provided by fire and alarm contacts.

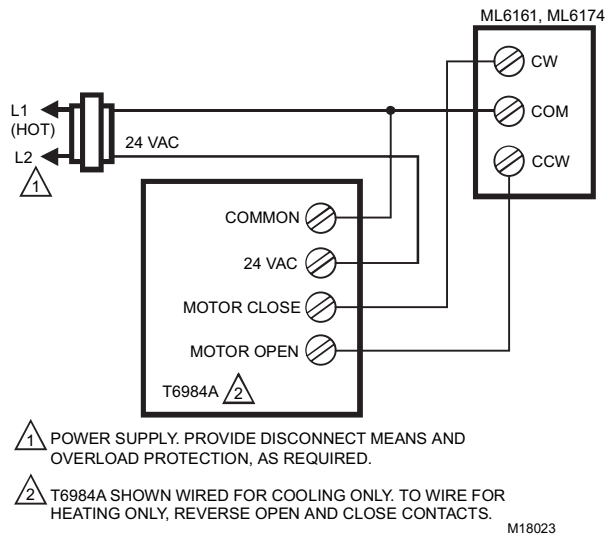


Fig. 18. T6984A controlling ML6161 or ML6174 Actuator for cooling or heating application.

### Rotation Reversal Switch (ML7161, ML7174)

Use the rotation reversal slide switch to reverse the actuator rotation. The switch is located on the bottom of the actuator housing (see Fig.5). To change rotation to counterclockwise (ccw) ↺, change the slide switch. In direct, 2 volts is fully ccw and 10 volts is fully clockwise (cw); in reverse, 2 volts is fully cw and 10 volts is fully ccw.

**IMPORTANT**

*When reversing the rotation, make sure the switch is fully to one side or the other. If the switch is left in the middle, the actuator will not operate properly.*

### Parallel Actuators

**IMPORTANT**

*Over time, parallel-driving actuators can become out of sync with each other. Normally, driving all actuators to the fully-open or fully-closed position puts them back in sync.*

### ML6161, ML6174 Actuators

Using Fig. 19, parallel the CW, COM and CCW terminals. Make certain the total connected load does not exceed the current capacity of the controller or thermostat.

### ML7161, ML7174 Actuators

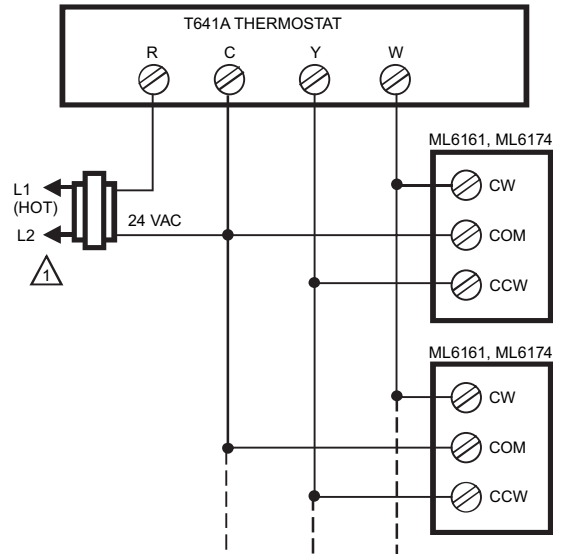
**VOLTAGE INPUT (2 TO 10 VDC)**

Wire the (+Vdc) and (-) terminals of each actuator in parallel. Make certain the total connected load does not exceed the current capacity of the input signal source.

**CURRENT INPUT (4 TO 20 MA)**

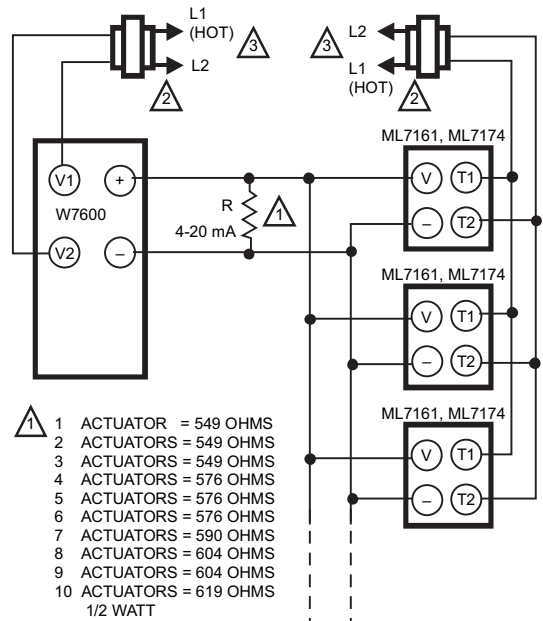
When using a current controller (such as the W7600), wire the ML7161, ML7174 voltage input terminals (+Vdc) and (-) in parallel. Use a bridging resistor in parallel with the 4 to 20 mA signal. See Fig. 20 for resistor values.

NOTE: The actuator has 45,000 ohm impedance.



⚠ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION, AS REQUIRED. ENSURE THAT EQUIPMENT TRANSFORMER IS CORRECTLY SIZED. M18024

**Fig. 19. Spdt control of parallel ML6161 or ML6174 Actuators.**



- ⚠ 1 ACTUATOR = 549 OHMS
- ⚠ 2 ACTUATORS = 549 OHMS
- ⚠ 3 ACTUATORS = 549 OHMS
- ⚠ 4 ACTUATORS = 576 OHMS
- ⚠ 5 ACTUATORS = 576 OHMS
- ⚠ 6 ACTUATORS = 576 OHMS
- ⚠ 7 ACTUATORS = 590 OHMS
- ⚠ 8 ACTUATORS = 604 OHMS
- ⚠ 9 ACTUATORS = 604 OHMS
- ⚠ 10 ACTUATORS = 619 OHMS

⚠ 2 ACTUATORS CAN USE COMMON TRANSFORMER; SEPARATE POWER SUPPLY REQUIRED FOR W7600.

⚠ 3 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED. ASSURE THAT EQUIPMENT TRANSFORMER IS SIZED CORRECTLY. M18025

**Fig. 20. 4-20 mA signal control of parallel ML7161 or ML7174 Actuators.**

## 35 AND 70 LB-IN. NON-SPRING RETURN DIRECT COUPLED ACTUATORS

**CHECKOUT****ML6161, ML6174**

To check out ML6161, ML6174 Actuators controlled by electronic control systems, such as the W7620, override the control system by programming the controller to open or close the zone damper, as appropriate.

NOTE: Using a seven-minute actuator results in a longer response time before noticeable damper movement.

To check out the ML6161 or ML6174:

1. Determine the direction the shaft moves to open the device (cw or ccw). See Fig. 3.
2. Place 24 volts across the appropriate common cw or common ccw terminals to energize the actuator. The actuator should begin to open the device.
3. If the actuator does not run, try switching the 24 volts across the opposite common cw or ccw terminals to determine if the device begins to close.
4. If the actuator does not run in either direction, replace the actuator.

For ML6161 or ML6174 issued with a spdt floating wall thermostat (for pressure dependent systems), use the following checkout procedure:

1. Adjust the setpoint of the thermostat to call for cooling.
2. Observe the operation of the actuator; if the device is closed, it should begin to open.
3. If not, adjust the setpoint of the thermostat higher to determine if the wiring is correct.
4. If no movement is observed, check for the presence of 24 volts.
5. If using the T641 Thermostat, check that 24 volts are present between terminals C and Y during a call for cooling. With proper wiring and 24 volts present, the actuator should operate correctly.
6. If not, replace the actuator.

**ML7161, ML7174**

Check input impedance on the actuator with an ohmmeter.

**IMPORTANT**

*Be sure to disconnect all wiring to the actuator before connecting the ohmmeter.*

1. Verify resistance readings are as follows:
  - 45K ohms  $\pm$ 5K ohms, across the (+Vdc) and (-) terminals.
  - 536 ohms  $\pm$ 10 ohms, across the (+mA) and (-) terminals.
2. If the resistance readings are correct, reconnect the actuator and check for 24 Vac at terminals T and T2. With the correct power present at T and T2, check the motion of the shaft/actuator by ramping the setpoint up and down. This causes the actuator to move from one limit to the other and back (from fully ccw to fully cw and back to fully ccw).

NOTE: Remember that the actuator takes 90 seconds to move from one limit to the other.

3. When the actuator is used with electronic control systems such as the W7600 Commercial Zone System, override the control system by programming the controller to open or close the damper, as appropriate.
4. If the actuator continues to operate incorrectly, check Table 6 for the proper input signal/actuator drive relationship at the (+Vdc) and (-) terminals.
5. If the actuator does not operate according to Table 6 values, replace the actuator.

**Table 6. Input Signal/Actuator Drive Relationship.**

Input Signal	Actuator Drive Relationship
1.50 $\pm$ 0.2 Vdc	Actuator drives to extreme ccw position.
2.00 $\pm$ 0.2 Vdc	Actuator remains at ccw position.
3.00 $\pm$ 0.2 Vdc	Actuator leaves ccw position.
10.70 $\pm$ 0.7 Vdc	Actuator drives to extreme cw position.
10.00 $\pm$ 0.7 Vdc	Actuator remains at cw position.
8.50 $\pm$ 0.6 Vdc	Actuator leaves cw position.

**Automation and Control Solutions**

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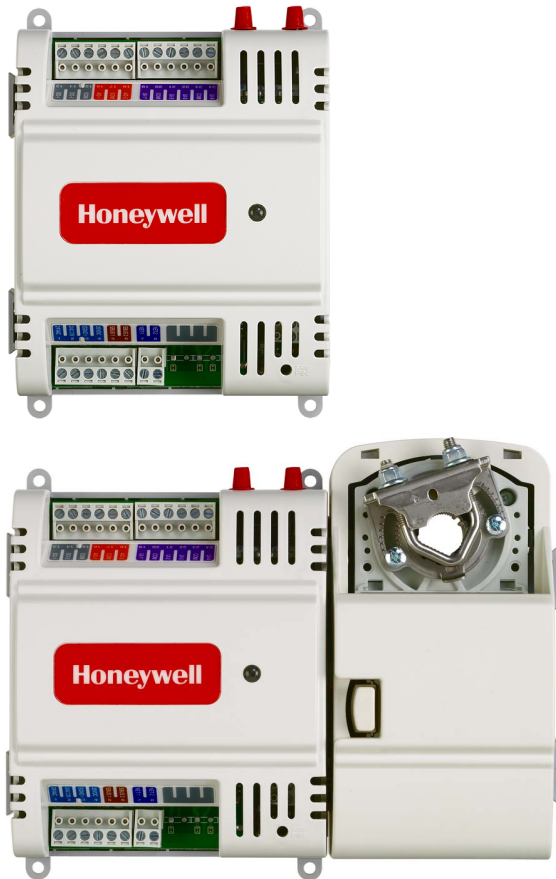
# Honeywell



# Honeywell

# Stryker™ BACnet Configurable Controllers

## SPECIFICATION DATA



## FEATURES

- Uses the BACnet MS/TP network protocol.
- EIA-485 communication network. Capable of baud rates between 9.6 and 115.2 kbits/s.
- Capable of stand-alone operation, but can also use BACnet network communications.
- Sylk™ bus for use with Sylk-enabled sensors.
- Support up to 30 controllers per BACnet MS/TP segment.
- Field configurable for control, input, and output functions using the NIAGARA FRAMEWORK® software.
- Built-in Zone Control functions include a remote wall module interface and a scheduler.
- Pressure-independent or pressure-dependent single Variable Air Volume (VAV) control.
- Microbridge air flow sensor with dual integral restrictor design.
- Easy user access to air flow sensor inputs.
- Actuator (CVB4022AS-VAV1 only) mounts directly onto VAV box damper shaft and has up to 44 lb-in. (5 Nm) torque, 90-degree stroke, and 90 second timing at 60 Hz.
- All wiring connections are made to removable terminal blocks to simplify controller installation and replacement.
- Both controller housing and actuator are UL plenum rated

## GENERAL

The CVB4022AS-VAV1, and CVB4024NSVAV1 controllers are part of the Stryker family. The controllers are BACnet MS/TP network devices designed to control HVAC equipment. These controllers provide many options and advanced system features that allow state-of-the-art commercial building control. Each controller is configurable using the NIAGARA FRAMEWORK® software.

The controllers are for use in VAV (Variable Air Volume) control applications. Each controller provides flexible, universal inputs for external sensors, digital inputs, and a combination of analog outputs and digital outputs.



## STRYKER™ BACNET CONFIGURABLE CONTROLLERS

## DESCRIPTION

The configurable VAV/Unitary controllers are available as described in Table 1.

**Table 1. Controller Configurations.**

Controller Model	Programmable Type	Universal Inputs (UI)	Digital Inputs (DI)	Analog Outputs (AO)	Digital Outputs (DO)	Velocity Pressure Sensor (Microbridge)	Series 60 Floating Actuator
CVB4022AS-VAV1	VAV	4	0	2	2	YES	YES
CVB4024NS-VAV1	VAV	4	0	2	4	YES	NO

## VAV Equipment Control

VAV controllers provide pressure-independent air flow control and pressure-dependent damper control. VAV systems generally provide cool air only to zones. However, each controller has additional programmable inputs and outputs that may be used to control devices, such as a fan or VAV box reheat coils. Heaters can be staged electric or modulating hot water. Supply and exhaust pressurization control are provided on a zone basis.

## SPECIFICATIONS

### Electrical

Rated Voltage: 20-30 Vac; 50/60 Hz

Power Consumption:

100 VA for controller and all connected loads (including the actuator on model CVB4022AS-VAV1)

Controller only Load: 5 VA maximum; model CVB4024NS-VAV1

Controller and Actuator Load: 9 VA maximum; model CVB4022AS-VAV1

External Sensors Power Output: 20 Vdc  $\pm$ 10% @ 75 mA maximum

### Environmental

VAV Operating & Storage Temperature Ambient Rating:  
(Models CVL4022AS-VAV1 and CVL4024NS-VAV1)  
Minimum 32° F (0° C); Maximum 122° F (50° C)

### Dimensions (H/W/D)

See Fig. 1 and Fig. 2 beginning on page 6 for dimension drawings.

## Approval Bodies

UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.

CSA (LR95329-3) listed.

Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.

Meets Canadian standard C108.8 (radiated emissions).

Conforms to the following requirements per European Consortium standards:

EMC Directive: 2014/30/EU:

Standards Applied:

- IEC 61000-4-8:2009
- IEC 61000-4-11:2004
- EN 61000-6-1: 2007; EN 61000-6-3:2007/A1:2011; EN 61000-6-3:2007/A1:2011/AC: 2012
- EN 60730-2-9: 2010, EN 60730-2-14: 1997 + EN60730-2-14/A1: 2001.
- In conjunction with EN 60730-2-9:2010 and in conjunction with EN 60730-2-14:1997 and amendments: EN 60730-1: 2000 + A1: 2004 + A16: 2007 + A2: 2008 -Annex H.26.

RoHS Directive: 2011/65/EU

Standards Applied:

- EN 50581: 2012

Regulatory Compliance Mark (RCM) declaration in Australia

BTL B-ASC (BACnet Testing Laboratories, BACnet Application Specific Controller)

## Real Time Clock

Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic daylight savings time adjustment to occur at 2:00 a.m. local time on configured start and stop dates

Power Failure Backup: 24 hours at 32 to 100° F (0 to 38° C), 22 hours at 100 to 122° F (38 to 50° C)

Accuracy:  $\pm$ 1 minute per month at 77° F (25° C)

## Velocity Pressure Sensor

Operating Range: 0 to 1.5 in. H<sub>2</sub>O (0 to 374 Pa)

## Series 60 Floating Actuator

Rotation Stroke: 95° ± 3° for CW or CCW opening dampers  
Torque Rating: 44 lb-in. (5 Nm)  
Run Time for 90° rotation: 90 seconds at 60 Hz

## Inputs and Outputs

Each controller has a combination of universal inputs (UI), digital inputs (DI), analog outputs (AO), and digital outputs (DO) as listed in Table 1.

### Digital Input (DI) Circuits

Voltage Rating: 0 to 30 Vdc open circuit  
Input Type: Dry contact to detect open and closed circuit  
Operating Range: Open circuit = False; Closed circuit = True  
Resistance: Open circuit > 3,000 Ohms; Closed circuit < 500 Ohms

### Digital Triac Output (DO) Circuits

Voltage Rating: 20 to 30 Vac @ 50-60Hz  
Current Rating: 25 mA to 500 mA continuous, 800 mA (AC rms) for 60 milliseconds

### Analog Output (AO) Circuits

Analog outputs can be individually configured for current or voltage.

#### ANALOG CURRENT OUTPUTS:

Current Output Range: 4.0 to 20.0 mA  
Output Load Resistance: 550 Ohms maximum

#### ANALOG VOLTAGE OUTPUTS:

Voltage Output Range: 0 to 10.0 Vdc  
Maximum Output Current: 10.0 mA

Analog outputs may be configured as digital outputs and operate as follows:

- False (0%) produces 0 Vdc, (0 mA)
- True (100%) produces the maximum 11 Vdc, (22 mA)

## Universal Input (UI) Circuits

See Table 2 for the UI specifications.

**Table 2. Universal Input Circuit Specifications.**

Input Type	Sensor Type	Operating Range
Room/Zone Discharge Air Outdoor Air Temperature	20K Ohm NTC	-40° F to 199° F (-40° C to 93° C)
Outdoor Air Temperature	C7031G <sup>a</sup>	-40° to 120°F (-40° to 49°C)
	C7041F <sup>a</sup>	-40° to 250°F (-40° to 121°C)
	PT1000 (IEC751 3850)	-40° F to 199° F (-40° C to 93° C)
TR23 Setpoint Potentiometer	500 Ohm to 10,500 Ohm	-4° DDC to 4° DDC (-8° DDF to 7° DDF) or 50° F to 90° F (10° C to 32° C)
Resistive Input	Generic	100 Ohms to 100K Ohms
Voltage Input	Transducer, Controller	0-10 Vdc
Discrete Input	Dry Contact closure	OpenCircuit ≥ 30000hms ClosedCircuit < 30000hms

<sup>a</sup> C7031G and C7041F are recommended for use with these controllers, due to improved resolution and accuracy when compared to the PT1000.

## Hardware

### CPU

Each controller uses a 32 bit ATMEL ARM 7 microprocessor.

### Memory Capacity

Flash Memory: 512 kilobytes. The controller is able to retain Flash memory settings for up to ten (10) years.

RAM: 128 kilobytes

## STRYKER™ BACNET CONFIGURABLE CONTROLLERS

## Controller Status LED

The LED on the front of the controller provides a visual indication of the status of the device. When the controller receives power, the LED appears in one of the following allowable states, as described in Table 3.

**Table 3. Status LED States.**

LED State	Blink Rate	Status or Condition
OFF	not applicable	No power to processor, LED damaged, low voltage to board, or controller damaged.
ON	ON steady; not blinking	Processor and/or controller is not operating.
Very slow blink (continuous)	1 second ON, 1 second OFF	Controller is operating normally.
Slow blink (continuous)	0.5 second ON, 0.5 second OFF	Controller alarm is active, controller in process of download, or controller lost its configuration.
Medium blink (continuous)	0.25 second ON, 0.25 second OFF	Controller firmware is loading.
Fast blink (continuous)	0.10 second ON, 0.10 second OFF	Controller is in manual mode under control of the PC-based software tool.

### BACNET STATUS LED:

The LED on the front of the controller, between the BACnet MS/TP terminals and MAC Address DIP Switches, provides a visual indication of the BACnet MS/TP communication status. When the controller receives power, the LED appears in one of the following allowable states, as described in Table 4.

**Table 4. BACnet Status LED States.**

BACnet LED Status	Status or Condition
Solid on	Controller has power, loader is not running.
Solid on, blinking off once in 2.5 sec.	Controller is in reflash mode, no MS/TP communication.
Solid on, blinking off twice in 2.5 sec.	Controller is in reflash mode, MS/TP communication present.
Solid on, blinking off three times in 2.5 sec.	Controller is in reflash mode, MS/TP communication data transfer in progress.
Solid off, there is no power	No power to processor, LED damaged, low voltage to board, or loader damaged.
Solid off, blinking on once in 2.5 sec.	Controller is running, no MS/TP communication.
Solid off, blinking on twice in 2.5 sec.	Controller is running, MS/TP communication present.
Solid off, blinking on three times in 2.5 sec.	Controller is running, MS/TP communication data transfer in progress.

## Communications

Each controller uses a BACnet MS/TP communications port. The controller's data is presented to other controllers over a twisted-pair MS/TP network, which uses the EIA-485 signaling standard capable of the following baud rates: 9.6, 19.2, 38.4, 76.8, or 115.2 kilobits per second (configured at global controller). The Stryker BACnet controllers are master devices on the MS/TP network. Each Stryker BACnet controller uses a high-quality EIA-485 transceiver and exerts 1/4 unit load on the MS/TP network.

Cabling should be selected that meets or exceeds the BACnet Standard which specifies the following: an MS/TP EIA-485 network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 130 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot). Distributed capacitance between conductors and shield shall be less than 200 pF per meter (60 pF per foot). Foil or braided shields are acceptable. The Honeywell tested and recommended MS/TP cable is Honeywell Cable 3322 (18 AWG, 1-Pair, Shielded, Low Cap, Plenum cable), alternatively Honeywell Cable 3251 (22 AWG, 1-Pair, Shielded, Plenum cable) is available and meets the BACnet Standard requirements ([www.honeywellcable.com](http://www.honeywellcable.com)).

The BACnet MS/TP network is polarity sensitive. The maximum BACnet MS/TP network Bus segment length is 4,000 ft. (1,219 m) using recommended wire. Repeaters must be used when making runs longer than 4,000 ft. (1,219 m). A maximum of three repeaters can be used between any two devices.

## MS/TP MAC Address

The MS/TP MAC address for each device must be set to a unique value in the range of 0-127 on an MS/TP network segment. DIP switches on the Stryker BACnet controller are used to set the controller's MAC address.

## Device Instance Number

The Device Instance Number must be unique across the entire BACnet system network because it is used to uniquely identify the BACnet devices. It may be used to conveniently identify the BACnet device from other devices during installation. The Stryker BACnet Controllers Device Instance Number is automatically set when it is added to a WEBStation-AX project. The Device Instance Number can be changed by the user, which may be necessary when integrating with a third party or when attempting to replace an existing controller and it is desired to maintain the existing Device Instance Number.

## Termination Resistors

Matched terminating resistors are required at each end of a segment bus wired across (+) and (-). Use matched precision resistors rated 1/4W ±1% / 80 - 130 Ohms. Ideally, the value of the terminating resistors should match the rated characteristic impedance of the installed cable. For example, if the installed MS/TP cable has a listed characteristic impedance of 120 Ohm, install 120 Ohm matched precision resistors.

NOTE: The controller does not provide any network biasing.

## Shield Terminating

Following proper MS/TP cabling shield grounding procedures is important to minimize the risk of communication problems and equipment damage caused by capacitive coupling. Capacitive coupling is caused by placing MS/TP cabling close to lines carrying higher voltage. The shield should be grounded on only one end of the MS/TP segment (typically the router end). Tie the shield through using the SHLD (terminal 4) on the Stryker BACnet Controller.

## Sylk™ Bus

Sylk is a two wire, polarity insensitive bus that provides both 18 VDC power and communications between a Sylk-enabled sensor and a Sylk-enabled controller. Using Sylk-

enabled sensors saves I/O on the controller and is faster and cheaper to install since only two wires are needed and the bus is polarity insensitive. Sylk sensors are configured using the latest release of the Stryker Tool for WEBPro and WEBStation.

## Accessories

- TR71/75 Zio LCD Wall Module
- 201052A,B,C Auxiliary Switches (one, two or three switches)
- C7041B,C,D,P,R Air Temperature Sensor (indoor)
- C7770A Air Temperature Sensor (indoor/plenum)
- C7031G Air Temperature Sensor (outdoor)
- C7041F Air Temperature Sensor (outdoor)
- Q7751A,B Router (configured as a repeater)
- TR71/75 Zio Wall Module
- TR2X Wall Module
- C7400A Enthalpy Sensor
- P7640 Pressure Transducer Family
- C7232 CO<sub>2</sub> Sensor Family
- C7600 Humidity Sensor Family
- H7625, H7635, and H7655 Humidity and Temperature Sensors

Refer to the “Sensors Product Overview,” form 63-9285, for additional accessories.

## Mounting

The controller enclosure is constructed of a plastic base plate and a plastic factory-snap-on cover. The cover does not need to be removed from the base plate for either mounting or wiring. Removable terminal blocks are used for all wiring connections, which allow the controller to be wired before or after mounting.

The controller can be mounted in any orientation. Ventilation openings are designed into the cover to allow proper heat dissipation regardless of the mounting orientation.

NOTE: The controller must be mounted in a position that allows clearance for wiring, servicing, removal, connection of the LONWORKS® Bus Jack, and access to the NEURON® Service Pin.

NOTE: For complete mounting information, refer to the “Installation Instructions,” form 31-00101-01.



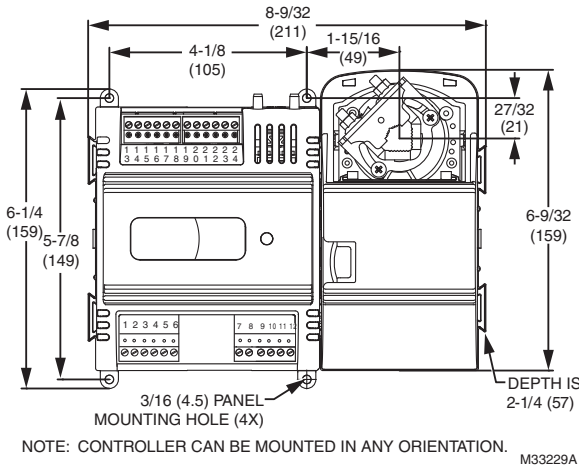
STRYKER™ BACNET CONFIGURABLE CONTROLLERS

**CVB4022AS-VAV1 Mounting (Controllers with actuators)**

The CVB4022AS-VAV1 controller includes the direct-coupled actuator with Declutch mechanism, which is shipped hard-wired to the controller.

The actuator mounts directly onto the VAV box damper shaft and has up to 44 lb-in. (5 Nm) torque, 90-degree stroke, and 90 second timing at 60 Hz. The actuator is suitable for mounting onto a 3/8 to 1/2 in. (10 to 13 mm) square or round VAV box damper shaft. The minimum VAV box damper shaft length is 1-9/16 in. (40 mm).

After the actuator is mounted onto the damper shaft, the controller mounts to a panel by using four No. 6 or No. 8 machine or sheet metal screws inserted through the corners of the base plate.

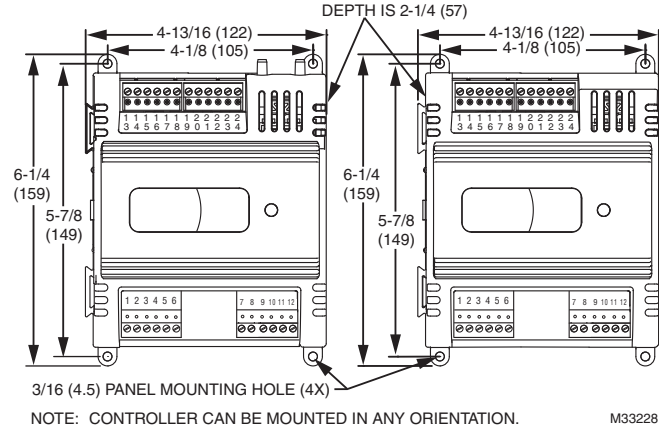


**Fig. 1. Panel mounting—controller and actuator dimensions in inches (mm) for CVB4022AS-VAV1 only.**

**CVB4024NS-VAV1—Mounting (Controllers with actuators)**

The CVB4024NS-VAV1 controller mounts to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).

- For panel mounting, use four No. 6 or No. 8 machine or sheet metal screws inserted through the corners of the base plate.
- For DIN rail mounting, refer to the “Installation Instructions,” form 31-00101-01.



**Fig. 2. Panel mounting—controller dimensions in inches (mm) for CVB4024NS-VAV1 only.**

*STRYKER™ BACNET CONFIGURABLE CONTROLLERS*

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**Honeywell**

# TR21, TR22, TR23, and TR24 Wall Modules

## INSTALLATION INSTRUCTIONS



## FEATURES

The TR21, TR22, TR23, and TR24 family of wall modules include:

- **Models with setpoint adjustment.**
- **Models with humidity output.**
- **Models with occupied/unoccupied override (bypass) with LED.**
- **Models with 3-position (auto/0/1) or 5-position (auto/0/1/2/3 speed) fan switch.**
- **LONWORKS® bus jack on all models except the TR21 and TR21-A models.**
- **Locking cover on all models.**
- **Operating range 45° to 99° F (7° to 37° C).**
- **Models (TR22 and TR23) with user-selectable temperature setpoint dials in Fahrenheit, Celsius, and Relative (- to +).**

## PRODUCT DESCRIPTION

The TR21, TR22, TR23, and TR24 are a family of direct-wired wall modules for use with:

- Honeywell Excel 800, 600, 500, 100, and 80 (all fully programmable) controllers
- Excel 10 W7750, W7751<sup>a</sup>, W7752, and W7753 controllers
- W7761 Controller
- Spyder Unitary Controllers: PUL, PVL
- ComfortPoint LON Controllers: CP-UL, CP-VL

All models have a space temperature sensor. Some models have a temperature dial, setpoint adjustment, LONWORKS bus jack, override (bypass) with LED, and fan switch.

NOTE: Refer to the *TR21, TR22, TR23, and TR24 Wall Modules – Specification Data*, form 63-1321, for specific model features and additional information.

<sup>a</sup> The TR21, TR22, TR23, and TR24 wall modules are not compatible with W7751A,C,E,G Controllers.

## SPECIFICATIONS

**Models:** For specific model information, see *TR21, TR22, TR23, and TR24 Wall Modules – Specification Data*, form 63-1321.

### Environmental Ratings:

- Operating Temperature: 45° to 99° F (7° to 37° C).
- Shipping Temperature: -40° to 150° F (-40° to 65.5° C).

**Accessories:** 50007298-001 (pack of 12) medium, cover plate; 6-7/8 x 5 in. (175 x 127 mm).

**Approvals:** CE; UL94 plastic enclosure; FCC Part 15, Class B

## Temperature Sensor

### TR21, TR22, TR23, and TR24 20K Ohm Nonlinearized Sensor:

All models are furnished with a 20K Ohm nonlinear NTC temperature sensor that follows a specific temperature resistance curve. See Fig. 1 on page 2.

NOTE: The TR21-A wall module model has two (2) 20K Ohm nonlinear NTC temperature sensors in parallel, which provide 10K NTC temperature sensing necessary for averaging.



TR21, TR22, TR23, AND TR24 WALL MODULES

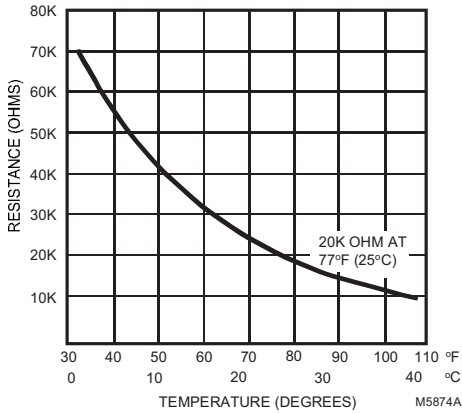


Fig. 1. Temperature vs. Resistance for Nonlinear Sensor.

Communications

All wall modules (except the TR21 and TR21-A models) have a LONMARK® bus communications port. If needed, the jack plug must be removed in the field, and terminals 3 and 4 wired according to the installation instructions.

The recommended wire size for the LONMARK® bus is Level IV, 22 AWG (0.34 sq.mm) plenum or non-plenum rated, non-shielded, twisted pair, solid conductor wire.

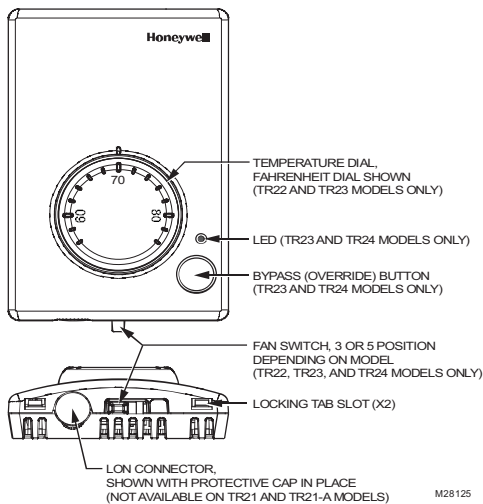


Fig. 2. Wall Module Features (TR23-F Shown).

TR22 and TR23 Setpoint Adjustment

For models TR22 and TR23 with a setpoint adjustment, the controller must be programmed for the values in Table 1.

Table 1. Wall Module Setpoint Configuration

Model	Setpoint	Resistance (Ohms)
F Absolute	55° F	9574
	85° F	1426
Relative	-9° F offset from 70° F	9574
	+9° F offset from 70° F	1426
C Absolute	12° C	9945
	30° C	1150

BEFORE INSTALLATION

**CAUTION**

**Erratic System Operation Hazard.**  
**Failure to follow proper wiring practices can introduce disruptive electrical interference (noise).**  
 Keep wiring at least one foot away from large inductive loads such as motors, line starters, lighting ballasts, and large power distribution panels.  
 Shielded cable is required in installations where these guidelines cannot be met.  
 Ground shield only to grounded controller case.

**IMPORTANT**

*All wiring must comply with local electrical codes and ordinances or as specified on installation wiring diagrams.*

- Wall module wiring can be sized from 16 to 22 AWG (1.31 to 0.33 sq. mm) depending on the application.
- The maximum length of wire from a device to a wall module is 1000 ft. (305 m).
- Twisted pair wire is recommended for wire runs longer than 100 ft. (30.5 m).

INSTALLATION

Mount the wall module on an inside wall approximately 54 in. (1372 mm) from the floor (or in the specified location) to allow exposure to the average zone temperature. Do not mount the wall module on an outside wall, on a wall containing water pipes, or near air ducts. Avoid locations that are exposed to discharge air from registers or radiation from lights, appliances, or the sun. See "Cover Disassembly" on page 3.

The wall module can be mounted on a wall, on a standard utility conduit box using No. 6 (3.5 mm) screws or on a 60 mm wall outlet box (see Fig. 3). When mounting directly on a wall, use the type of screws appropriate for the wall material.

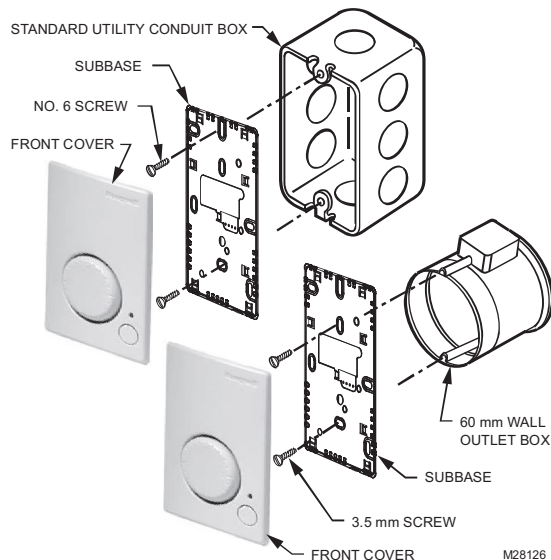


Fig. 3. Mounting on Standard Utility Conduit Box or 60 mm Wall Outlet Box (TR23 Shown).

# ENCLOSURES

## KELE NEMA 1 ENCLOSURES RET SERIES



### DESCRIPTION

The **RET Series** includes attractive, economical NEMA 1 enclosures designed to house controls and instruments in areas which do not require oil-tight and dust-tight ratings. The **RET Series** enclosures are furnished with a perforated metal subpanel for easy mounting of components. No drilling or layout is needed. Simply set the control components on the panel and attach with #7 or #8 self-tapping screws in the pre-punched holes. The **RET Series** is also available in a UL listed version.

### FEATURES

- **Low-cost NEMA 1 enclosure**
- **Mounted with door hinged on left or right side**
- **Removable door**
- **Attractive powder-coated finish, standard brown enclosure with tan door**
- **Optional colors available**
- **Key lock, two keys, and attractive gray powder-coated perf panel furnished**
- **Mounting of control components simplified with perf panel**
- **Optional UL-listed enclosures available**
- **UL listed, File #E155405, for RET UL-listed panels**



5

ENCLOSURES

### RET OPTIONAL COLOR CHART

<b>Dark Blue</b>	<b>Powder Blue</b>	<b>Orange</b>	<b>Green</b>	<b>Gray</b>

Optional colors shown in approximate hue

### DIMENSIONS

**in (cm)**

- 7.0 (17.78)
- 0.64 (1.63)
- 0.5 (1.27)

Labels: Knockouts, Perf Panel, #10-32 Washers, Screws, and Standoffs, Keylock, A, B, C, D.

⚠ Knockouts are for 3/4" conduit, two knockouts on both sides, three knockouts top and bottom (except two on RET 1812).  
 ⚠ Perf Panel is 16-ga powder-coated steel.  
 ⚠ Standard color is brown enclosure with tan door.

### ORDERING INFORMATION

ENCLOSURE MODEL	DIMENSIONS in (cm)				ENCLOSURE MATERIAL	PERF PANEL	WEIGHT lb (kg)	PERF PANEL H x W in (cm)
	A	B	C	D				
RET2620†	26 (66)	20 (51)	18.75 (47)	17.75 (51)	16-ga steel	Included	36 (16.4)	23.5 x 17.5 (60 x 44)
RET3826†	38 (97)	26 (66)	24.75 (62)	29.75 (81)	16-ga steel	Included	61 (27.8)	35.5 x 23.5 (90 x 60)
RET4230†	42 (107)	30 (76)	28.75 (66)	33.75 (97)	14-ga steel	Included	83 (37.8)	39.5 x 27.5 (100 x 70)
RET1812ULP†	18 (46)	12 (31)	10.75 (28)	9.75 (36)	16-ga steel	Included	16 (7.3)	15.5 x 9.0 (39 x 23)
RET2018ULP†	20 (51)	18 (46)	16.75 (42)	11.75 (36)	16-ga steel	Included	27 (12.3)	17.5 x 15.5 (44 x 39)
RET2620ULP†	26 (66)	20 (51)	18.75 (47)	17.75 (51)	14-ga steel	Included	41 (18.6)	23.5 x 17.5 (60 x 44)
RET3626ULP†	36 (91)	26 (66)	24.75 (62)	27.75 (76)	14-ga steel	Included	69 (31.3)	33.5 x 23.5 (85 x 60)

† -DB: Dark Blue, -PB: Powder Blue, -OR: Orange, -GN: Green, -GY: Gray (Note: No suffix - Brown/Tan)

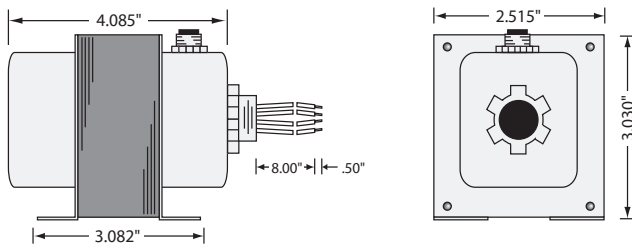
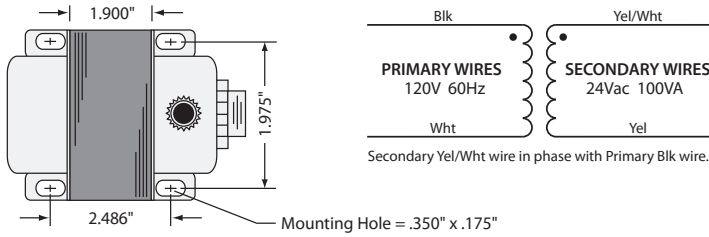
### ACCESSORIES

**RET-KEY** Replacement Key for Ret-Lock  
**RET-LOCK** Lock with key for RET enclosure

**TRANSFORMER**

**TR100VA001**

Transformer 100 VA, 120 to 24 Vac, Circuit Breaker, Foot and Single Threaded Hub Mount



**SPECIFICATIONS**

- VA Rating:** 100
- Frequency:** 50/60 Hz
- Mounting:** Foot & Single Threaded Hub
- Over Current Protection:** Circuit Breaker
- Dimensions:** 4.085" x 2.515" x 3.030" (w/ .500" NPT Hub)
- Wire Length:** 8" Typical w/ .5" Strip
- Operating Temperature:** -30 to 140° F
- MTBF:** 100,000 Hours @ 77° F
- Construction:** Split-Bobbin
- Weight:** 3.80 lbs.
- Approvals:** Class 2 UL5085-3 Listed, C-UL, CE, RoHS

TRANSFORMERS



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sales@functionaldevices.com

www.functionaldevices.com

## TRANSFORMERS

MODEL #	UL	VA RATING	STYLE	OVER CURRENT PROTECTION	CLASS 2	PRIMARY VOLTAGE (VAC)	SEC. VOLTAGE (VAC)	FOOT MOUNT	HUBS	L	W	H	A	B	C	D	WEIGHT
TR20VA001	•	20VA	1	Inherent	•	120	24	•	1 Threaded	2.226"	1.877"	2.595"	1.612"	1.619"	1.013"	2.125"	1.20 lbs.
TR20VA002	•	20VA	4	Inherent	•	208	24	•	2 Threaded	2.296"	1.902"	2.616"	1.604"	1.665"	1.020"	2.114"	1.40 lbs.
TR20VA003	•	20VA	1	Inherent	•	24	24	•	1 Threaded	2.272"	1.900"	2.628"	1.635"	1.686"	1.023"	2.153"	1.40 lbs.
TR20VA004	•	20VA	4	Inherent	•	277/240/208/120	24	•	2 Threaded	2.310"	1.890"	2.625"	1.540"	1.625"	1.000"	2.100"	1.40 lbs.
TR20VA007	•	20VA	1	Inherent	•	277	24	•	1 Threaded	2.302"	1.895"	2.607"	1.608"	1.685"	1.019"	2.107"	1.20 lbs.
TR40VA001	•	40VA	1	Inherent	•	120	24	•	1 Threaded	2.607"	2.169"	2.906"	2.020"	1.786"	1.204"	2.545"	2.00 lbs.
TR40VA002	•	40VA	4	Inherent	•	120	24	•	2 Threaded	2.634"	2.177"	2.886"	2.007"	1.775"	1.206"	2.564"	2.00 lbs.
TR40VA003	•	40VA	1	Inherent	•	24	24	•	1 Threaded	2.653"	2.171"	2.882"	2.033"	1.779"	1.185"	2.580"	2.00 lbs.
TR40VA004	•	40VA	4	Inherent	•	277/240/208/120	24	•	2 Threaded	2.631"	2.177"	2.882"	1.998"	1.774"	1.189"	2.553"	2.20 lbs.
TR40VA013	•	40VA	2	Circuit Brkr.	•	480/277/240/208	120	•	1 Threaded	3.267"	2.505"	3.000"	1.699"	1.986"	1.114"	2.325"	2.65 lbs.
TR40VA015	•	40VA	1	Internal Thermal	•	240/208/120	24	•	1 Threaded	2.628"	2.175"	2.907"	2.040"	1.780"	1.188"	2.590"	2.20 lbs.
TR40VA022 #	•	40VA	4	Inherent	•	120	24	•	2 Threaded	2.660"	2.172"	2.891"	1.980"	1.786"	1.201"	2.526"	2.00 lbs.
TR40VA040 ^	•	40VA	9	Internal Thermal	•	240/208/120	24	•	1 Threaded	2.728"	2.171"	2.890"	1.995"	1.792"	1.215"	2.550"	2.20 lbs.
TR50VA001	•	50VA	1	Fuse	•	120	24	•	1 Threaded	2.677"	2.178"	2.879"	2.109"	1.793"	1.253"	2.664"	2.00 lbs.
TR50VA002	•	50VA	4	Fuse	•	120	24	•	2 Threaded	2.696"	2.181"	2.908"	2.053"	1.788"	1.278"	2.614"	2.00 lbs.
TR50VA003	•	50VA	4	Fuse	•	240/208	24	•	2 Threaded	2.695"	2.181"	2.899"	2.082"	1.778"	1.294"	2.646"	2.00 lbs.
TR50VA004	•	50VA	5	Circuit Brkr.	•	480/277/240/120	24	•	2 Threaded	3.475"	2.513"	3.014"	1.858"	1.970"	1.291"	2.490"	3.00 lbs.
TR50VA005	•	50VA	2	Circuit Brkr.	•	120	24	•	1 Threaded	3.489"	2.515"	3.008"	1.870"	1.971"	1.294"	2.463"	2.40 lbs.
TR50VA006	•	50VA	1	Fuse	•	277	24	•	1 Threaded	2.763"	2.182"	2.898"	2.135"	1.790"	1.322"	2.698"	2.00 lbs.
TR50VA007	•	50VA	4	Fuse	•	277	24	•	2 Threaded	2.715"	2.173"	2.886"	2.148"	1.784"	1.276"	2.661"	2.00 lbs.
TR50VA008	•	50VA	5	Circuit Brkr.	•	480/277/240/208	120	•	2 Threaded	3.440"	2.510"	3.012"	1.932"	1.945"	1.346"	2.523"	3.04 lbs.
TR50VA009	•	50VA	5	Circuit Brkr.	•	240/208/120	24	•	2 Threaded	3.412"	2.504"	3.014"	1.864"	1.961"	1.313"	2.485"	2.80 lbs.
TR50VA014	•	50VA	2	Circuit Brkr.	•	277	24	•	1 Threaded	3.479"	2.509"	3.009"	1.873"	1.965"	1.285"	2.480"	2.60 lbs.
TR50VA015	•	50VA	2	Circuit Brkr.	•	480/277/240/208/120	24	•	1 Threaded	3.405"	2.517"	3.013"	1.875"	1.985"	1.316"	2.484"	2.80 lbs.
TR50VA016	•	50VA	2	Circuit Brkr.	•	240/208/120	24	•	1 Threaded	3.345"	2.510"	3.028"	1.842"	1.978"	1.325"	2.454"	2.80 lbs.
TR50VA017	•	50VA	2	Circuit Brkr.	•	480/277/208	24	•	1 Threaded	3.470"	2.520"	3.031"	1.880"	1.872"	1.292"	2.460"	2.40 lbs.
TR50VA018	•	50VA	13		•	480/277/240/208	120		1, 90° Conduit Connector, 1 Mounting Plate Opening	Refer to data sheet on website.							3.00 lbs.
TR50VA019 #	•	50VA	11	Inherent	•	277/120	24	•	2 Side Openings	2.470"	2.170"	2.896"	1.850"	1.740"	1.130"	2.512"	2.00 lbs.
TR75VA001	•	75VA	2	Circuit Brkr.	•	120	24	•	1 Threaded	3.743"	2.506"	3.016"	2.256"	1.974"	1.711"	2.873"	3.40 lbs.
TR75VA002	•	75VA	5	Circuit Brkr.	•	120	24	•	2 Threaded	3.890"	2.508"	3.013"	2.290"	1.952"	1.701"	2.882"	3.60 lbs.
TR75VA003	•	75VA	2	Circuit Brkr.	•	277	24	•	1 Threaded	3.875"	2.507"	3.037"	2.269"	1.978"	1.684"	2.860"	3.60 lbs.
TR75VA004	•	75VA	6	Circuit Brkr.	•	480/240/208/120	24	•	1 Threaded 1 Side Opening	3.802"	2.515"	3.050"	2.244"	1.990"	1.665"	2.850"	3.60 lbs.
TR75VA005	•	75VA	2	Circuit Brkr.	•	480/240/208/120	24	•	1 Threaded	3.880"	2.515"	3.030"	2.270"	1.975"	1.700"	2.854"	3.80 lbs.
TR75VA007	•	75VA	5	Circuit Brkr.	•	480/240/208/120	24	•	2 Threaded	3.883"	2.504"	3.034"	2.287"	1.981"	1.708"	2.887"	3.97 lbs.
TR100VA001	•	100VA	2	Circuit Brkr.	•	120	24	•	1 Threaded	4.085"	2.515"	3.030"	2.486"	1.975"	1.900"	3.082"	3.80 lbs.
TR100VA002	•	100VA	5	Circuit Brkr.	•	120	24	•	2 Threaded	4.077"	2.504"	3.023"	2.470"	1.975"	1.888"	3.095"	4.00 lbs.
TR100VA002-20 #	•	100VA	5	Circuit Brkr.	•	120	24	•	2 Threaded	3.973"	2.518"	3.033"	2.486"	1.865"	1.924"	3.060"	4.00 lbs.
TR100VA004	•	100VA	5	Circuit Brkr.	•	480/277/240/120	24	•	2 Threaded	4.173"	2.523"	3.041"	2.647"	1.976"	2.086"	3.268"	4.40 lbs.
TR100VA005	•	100VA	2	Circuit Brkr.	•	480/277/240/120	24	•	1 Threaded	4.258"	2.510"	3.030"	2.670"	1.968"	2.065"	3.260"	4.40 lbs.
TR100VA008	•	100VA	5	Circuit Brkr.	•	480/277/240/208	120	•	2 Threaded	4.220"	2.525"	3.022"	2.690"	1.970"	2.082"	3.272"	4.40 lbs.
TR100VA009 NEW	•	100VA	5	Circuit Brkr.	•	480/277/240/208/120	24	•	2 Threaded	4.270"	2.500"	3.060"	2.750"	1.975"	2.000"	2.252"	4.40 lbs.
TR100VA015 NEW	•	100VA	2	Circuit Brkr.	•	480/277/240/208/120	24	•	1 Threaded	4.270"	2.500"	3.060"	2.699"	2.030"	2.065"	2.252"	4.74 lbs.
TR150VA001	•	150VA	3	Circuit Brkr.	•	120	24	•	1 Threaded	3.650"	3.800"	3.183"	2.560"	3.150"	1.438"	3.514"	5.00 lbs.
TR150VA002	•	150VA	5	Circuit Brkr.	•	120	24	•	2 Threaded	3.620"	3.785"	3.160"	2.568"	3.147"	1.456"	3.511"	5.00 lbs.
TR150VA008	•	150VA	12	Circuit Brkr.	•	480/277/240/208	120	•	2 Threaded	4.283"	3.786"	3.161"	3.211"	3.260"	2.116"	4.177"	7.20 lbs.
TR175VA001	•	175VA	7		•	240/208	24	•	2 Bottom Openings	3.801"	3.790"	3.163"	3.264"	3.141"	2.151"	4.197"	7.00 lbs.
TR175VA002	•	175VA	4		•	120	24	•	2 Threaded	3.800"	3.790"	3.189"	3.220"	3.150"	2.100"	4.180"	7.10 lbs.
TR175VA003	•	175VA	1	Thermal Fuse on Primary	•	120	24	•	1 Threaded	4.030"	3.786"	3.161"	3.189"	3.155"	2.127"	4.153"	7.44 lbs.
TR240VA001	•	240VA	8		•	120	24	•	1 Threaded 1 Bottom Opening	3.957"	3.750"	4.530"	3.350"	3.180"	1.932"	4.025"	8.60 lbs.
TR300VA002	•	300VA	10	Circuit Brkr.	•	480/240/208/120	24	•	2 End-Bell Openings	5.499"	3.750"	4.500"	3.859"	3.187"	2.526"	4.526"	11.60 lbs.
TR375VA001	•	375VA	7		•	120	24	•	2 Bottom Openings	4.592"	3.747"	4.504"	3.933"	3.181"	2.516"	4.630"	11.20 lbs.

= UL Listed : UL5085-2 or UL5085-3 ; USA & Canada

# = Refer to website for more wire length information.

= UL Component Recognized : UL5085-2 or UL5085-3 ; USA & Canada

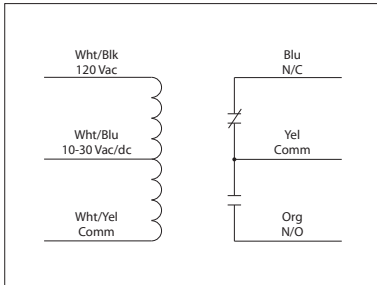
^ = Dual Terminal Secondary



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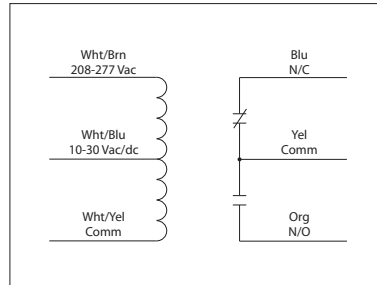
### RIBU1C

Enclosed Relay 10 Amp SPDT with  
10-30 Vac/dc/120 Vac Coil

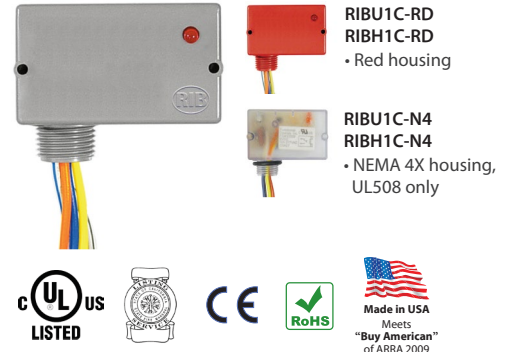


### RIBH1C

Enclosed Relay 10 Amp SPDT with  
10-30 Vac/dc/208-277 Vac Coil



### 10 Amp Pilot Control Relays



### Specifications

**# Relays & Contact Type:** One (1) SPDT Continuous Duty Coil  
**Expected Relay Life:** 10 million cycles minimum mechanical  
**Operating Temperature:** -30 to 140° F  
**Humidity Range:** 5 to 95% (noncondensing)  
**Operate Time:** 20mS  
**Relay Status:** LED On = Activated  
**Dimensions:** 1.70" x 2.80" x 1.50" with .50" NPT nipple  
**Wires:** 16", 600V Rated  
**Approvals:** UL Listed, UL916, UL864, C-UL  
 California State Fire Marshal, CE, RoHS  
**Housing Rating:** UL Accepted for Use in Plenum, NEMA 1  
**Gold Flash:** Yes  
**Override Switch:** No

**Contact Ratings:**  
 10 Amp Resistive @ 277 Vac  
 10 Amp Resistive @ 28 Vdc  
 480 VA Pilot Duty @ 240-277 Vac  
 480 VA Ballast @ 277 Vac  
 600 Watt Tungsten @ 120 Vac N/O  
 240 Watt Tungsten @ 120 Vac N/C  
 1/3 HP for N/O @ 120-240 Vac  
 1/6 HP for N/C @ 120-240 Vac  
 1/4 HP for N/O @ 277 Vac  
 1/8 HP for N/C @ 277 Vac

**Coil Current:**  
 33 mA @ 10 Vac      13 mA @ 10 Vdc  
 35 mA @ 12 Vac      15 mA @ 12 Vdc  
 46 mA @ 24 Vac      18 mA @ 24 Vdc  
 55 mA @ 30 Vac      20 mA @ 30 Vdc  
 28 mA @ 120 Vac (RIBU1C)  
 39 mA @ 208-277 Vac (RIBH1C)

**Coil Voltage Input:**  
 10-30 Vac/dc ; 120 Vac ; 50-60 Hz (RIBU1C)  
 10-30 Vac/dc ; 208-277 Vac ; 50-60 Hz (RIBH1C)  
 Drop Out = 2.1 Vac / 2.8 Vdc  
 Pull In = 9 Vac / 10 Vdc

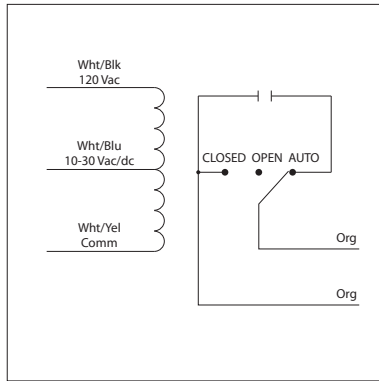




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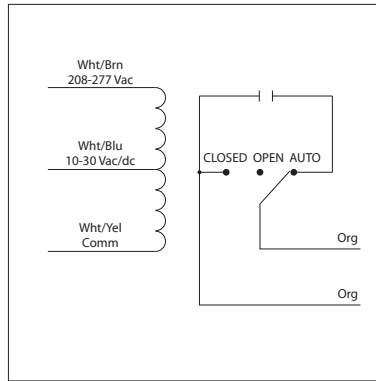
### RIBU1S

Enclosed Relay 10 Amp SPST-N/O + Override with 10-30 Vac/dc/**120 Vac Coil**



### RIBH1S

Enclosed Relay 10 Amp SPST-N/O + Override with 10-30 Vac/dc/**208-277 Vac Coil**



### 10 Amp Pilot Control Relays



### Specifications

**# Relays & Contact Type:** One (1) SPST Continuous Duty Coil  
**Expected Relay Life:** 10 million cycles minimum mechanical  
**Operating Temperature:** -30 to 140° F  
**Humidity Range:** 5 to 95% (noncondensing)  
**Operate Time:** 20mS  
**Relay Status:** LED On = Activated  
**Dimensions:** 2.30" x 3.20" x 1.80" with .50" NPT nipple  
**Wires:** 16", 600V Rated  
**Approvals:** UL Listed, UL916, UL864, C-UL California State Fire Marshal, CE, RoHS  
**Housing Rating:** UL Accepted for Use in Plenum, NEMA 1  
**Gold Flash:** Yes  
**Override Switch:** Yes

**Contact Ratings:**  
 10 Amp Resistive @ 277 Vac  
 480 VA Pilot Duty @ 277 Vac  
 480 VA Ballast @ 277 Vac  
*Not rated for Electronic Ballast*  
 600 Watt Tungsten @ 120 Vac (N/O)  
 240 Watt Tungsten @ 120 Vac (N/C)  
 1/3 HP @ 120-240 Vac (N/O)  
 1/6 HP @ 120-240 Vac (N/C)  
 1/4 HP @ 277 Vac (N/O)  
 1/8 HP @ 277 Vac (N/C)  
**Coil Voltage Input:**  
 10-30 Vac/dc ; 120 Vac ; 50-60 Hz (RIBU1S)  
 10-30 Vac/dc ; 208-277 Vac ; 50-60 Hz (RIBH1S)  
 Drop Out = 2.1 Vac / 2.8 Vdc  
 Pull In = 9 Vac / 10 Vdc

**Coil Current:**  
 33 mA @ 10 Vac      13 mA @ 10 Vdc  
 35 mA @ 12 Vac      15 mA @ 12 Vdc  
 46 mA @ 24 Vac      18 mA @ 24 Vdc  
 55 mA @ 30 Vac      20 mA @ 30 Vdc  
 28 mA @ 120 Vac (RIBU1S)  
 39 mA @ 208-277 Vac (RIBH1S)

**Notes:**  
 • Order Normally Closed by adding "-NC" to end of model number  
 • Order with Momentary Override Switch by adding "-MNO" to end of model number

# RELAYS & CONTACTORS



## IDEC GENERAL-PURPOSE RELAYS

**RH, RJ, RR SERIES**



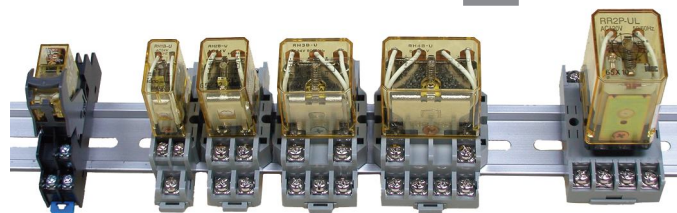
### DESCRIPTION

IDEC general-purpose relays are available in the **RH Series** blade-style relays and the **RR Series** pin-style relays and the **RJ Series** compact relays.

The **RH Series** features a 10A switching capacity. They are available in SPDT, DPDT, 3PDT, and 4PDT contact configurations, driven by AC or DC coils, and they have blade terminals for socket mounting.

The **RR Series** has a 10A contact rating. The **RR Series** relays are available in SPDT, DPDT, and 3PDT configurations driven by AC or DC coils, and they have pin or blade terminals for socket mounting.

The **RJ Series** is compact to reduce space requirements. They are available in a 12A SPDT version and an 8A DPDT version. They are driven by AC or DC coils and have blade terminals for socket mounting.



RJ Series

RH Series

RR Series

### FEATURES

- Blade style, pin style, and compact models
- Indicator light and/or check button available
- Surface or DIN rail mount
- UL recognized, CSA certified



RELAYS & CONTACTORS

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### SPECIFICATIONS

#### COIL RATINGS

RH SERIES																	
RATED VOLTAGE	RATED CURRENT (mA) ±15% @ 20°C								COIL RESISTANCE (Ω) ±10% @ 20°C								
	60 Hz				50 Hz												
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT					
AC	12	75	100	140	165	86	121	165	196	165	39.3	25.3	21.2				
	24	37	50	70	83	42	60.5	81	98	83	153	103	84.5				
	120	7.5	—	14.2	16.5	8.6	—	16.4	19.5	16.5	—	10,800	7,360				
	240	4.3	—	7.1	8.3	4.9	—	8.2	9.8	8.3	—	12,100	9,120				
DC	SPDT		DPDT		3PDT		4PDT		SPDT		DPDT		3PDT		4PDT		
	12	64	75	120	125	188	160	100	96	24	32	36.9	60	62	750	650	400

RR Series					
RATED VOLTAGE	Rated Current (mA) ±15% @ 20°C				COIL RESISTANCE (Ω) ±10% @ 20°C
	60 Hz		50 Hz		
	SPDT	DPDT	3PDT	4PDT	
AC	12	210	—	245	365
	24	105	—	121	182
	120	20.5	—	24	35
	240	10.5	—	12.1	18
DC	12	—	120	—	—
	24	—	60	—	—

RJ Series							
MODELS	Rated Current (mA) ±15% @ 20°C				COIL RESISTANCE (Ω) ±10% @ 20°C		
	WITHOUT LED <sup>1</sup>		WITH LED <sup>1</sup>				
	60 Hz	50 Hz	60 Hz	50 Hz			
AC	BLADE & PCB	24V	37.5	43.9	41.1	47.5	243
		120V	7.5	8.8	7.4	8.7	6,400
DC	BLADE PCB	24V	22.1	—	25.7	—	1,080
		24V	22.1	—	—	—	1,080

1. LED indicator is only available on Blade relays.

<b>Maximum continuous applied voltage</b>	
RH, RR	110% of rated voltage
RJ	140% of rated voltage
<b>Pull-in voltage</b>	
RH, RR, RJ/AC	80% of rated voltage
RJ, RJ/DC	70% of rated voltage
<b>Drop-out voltage</b>	
AC	30% or more of rated voltage
DC	10% or more of rated voltage
<b>Contact material</b>	
RH	Silver cadmium oxide
RR	Silver
RJ	Silver nickel alloy

#### CONTACT RATINGS

RH SERIES (UL ratings)										
VOLTAGE	RESISTIVE				GENERAL USE			HORSEPOWER RATING		
	RH1 RH2	RH3	RH4	RH4	RH1 RH2	RH3	RH4	RH1 RH2	RH3	RH4
240V AC	10A	7.5A	7.5A	7A	6.5A	5A	1/3 hp	1/3 hp	—	—
120V AC	—	10A	10A	—	7.5A	7.5A	1/6 hp	1/6 hp	—	—
30V DC	10A	10A	—	7A	—	—	—	—	—	—
28V DC	—	—	10A	—	—	—	—	—	—	—

RR SERIES (UL ratings)			
VOLTAGE	RESISTIVE (A)	INDUCTIVE (A) cosφ= 0.3	MOTOR LOAD (hp)
240 AC	10	7	1/3
120 AC	10	7.5	1/4
30 DC	10	7	—

RJ Series (UL ratings)			
Resistive Load (Maximum)	CONTACT	RJ1S	RJ2S
		N.O.	12A @ 250 VAC/30 VDC
	N.C.	12A @ 250 VAC; 6A @ 30 VDC	8A @ 250 VAC; 4A @ 30 VDC
Inductive Load (Maximum)	N.O.	7.5A @ 250 VAC; 6A @ 30 VDC	4A @ 250 VAC; 4A @ 30 VDC
	N.C.	7.5A @ 250 VAC; 3A @ 30 VDC	4A @ 250 VAC; 2A @ 30 VDC

<b>Contact resistance</b>	
RH	50 mΩ maximum
RR	30 mΩ maximum
RJ	50 mΩ maximum
<b>Operate time</b>	
RH, RR	25 ms maximum
RJ	15 ms maximum
<b>Release time</b>	
RH, RR	25 ms maximum
RJ	10 ms maximum
<b>Min load</b>	
RH	24 VDC/30 mA, 5 VDC/100 mA
RR	24 VDC/10 mA, 5 VDC/20 mA
RJ	5 VDC/100 mA
<b>Operating temp</b>	-22° to 158°F (-30° to 70°C)
<b>Agency approvals</b>	UL-recognized component, (RH, RR): File #E66043, (RJ): File #E55996
	CSA certified, File #LR35144; CE certified (not RR blade style)
<b>Warranty</b>	1 year

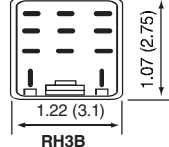
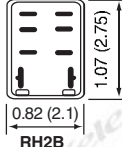
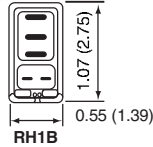
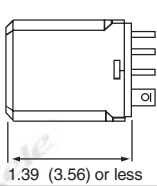
# RELAYS & CONTACTORS

## IDEC GENERAL-PURPOSE RELAYS

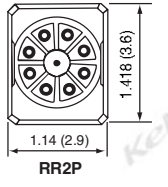
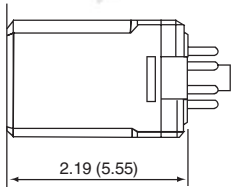
### RH, RJ, RR SERIES

#### DIMENSIONS

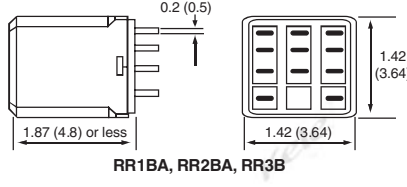
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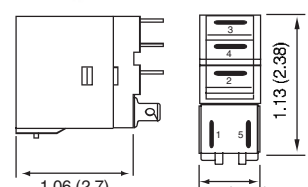
**RH Series Relays (blade)**



**RR Series Relays (pin)**



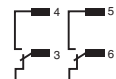
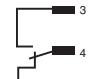
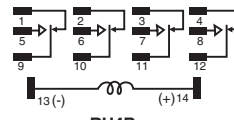
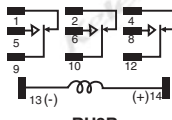
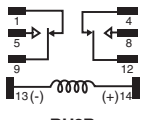
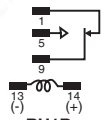
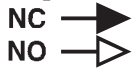
**RR Series Power Relays (blade)**



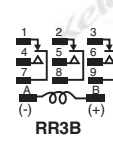
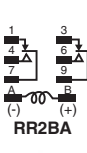
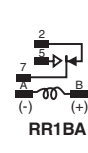
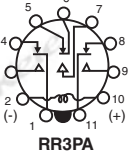
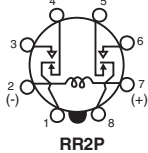
**RJ Series Relays (blade)**

#### WIRING

##### Legend



##### Bottom View



#### ORDERING INFORMATION

MODEL	DESCRIPTION
RH1B	Relay, SPDT, blade (use SH1B-05 socket)
RH2B	Relay, DPDT, blade (use SH2B-05 socket)
RH3B	Relay, 3PDT, blade (use SH3B-05 socket)
RH4B	Relay, 4PDT, blade (use SH4B-05 socket)
U	Standard relay
UL	Indicator light
ULC	Indicator light and check button
AC12V	12 VAC coil voltage
AC24V	24 VAC coil voltage
AC120V	120 VAC coil voltage
AC240V	240 VAC coil voltage
DC12V	12 VDC coil voltage
DC24V	24 VDC coil voltage

RH1B U AC24V

MODEL	DESCRIPTION
RJ1S	Relay, SPDT (use SJ1S-05B socket)
RJ2S	Relay, DPDT (use SJ2S-05B socket)
C	No options
CL	LED indicator
A24	24 VAC coil voltage
A120	120 VAC coil voltage
D24	24 VDC coil voltage

RJ1S C A24

MODEL	DESCRIPTION
RR2P	Relay, DPDT, 8 pin (use SR2P-05 or SR2P-06)
RR3PA	Relay, 3PDT, 11 pin (use SR3P-06 socket)
RR1BA	Relay, SPDT, 11 blade (use SR3B-05 socket)
RR2BA	Relay, DPDT, 11 blade (use SR3B-05 socket)
RR3B	Relay, 3PDT, 11 blade (use SR3B-05 socket)
U	Standard relay
UL	Indicator light
ULC	Indicator light and check button
AC12V	12 VAC coil voltage
AC24V	24 VAC coil voltage
AC120V	120 VAC coil voltage
AC240V	240 VAC coil voltage
DC12V	12 VDC coil voltage
DC24V	24 VDC coil voltage

RR2P U AC24V

**Example: RR2PUAC24V** DPDT relay 8 pin with 24VAC coil

#### RELATED PRODUCTS

DIN-3F	35 mm DIN rail, steel, 39.4" (1m), RoHS compliant
DIN-3F, BAM-1000	DIN rail
SH, SR, SJ Series	Relay sockets

#### PAGE

860
860
1123

# RELAYS & CONTACTORS

## IDEC GENERAL-PURPOSE RELAYS RH, RR SERIES



### DESCRIPTION

IDEC **General-Purpose Relays** are available in the **RH Series Midget Relays** and the **RR Series Power Relays**. The **RH Series** is compact to reduce space requirements and features a full 10A switching capacity. They are available in SPDT, DPDT, 3PDT, and 4PDT contact configurations driven by AC or DC coils and have blade-mount terminals.

The **RR Series** has a 10A contact rating and is characterized by high reliability and long life. They are suited for use in industrial-grade equipment, control equipment, communications, and motor loads up to 1/4 horsepower. The **RR Series** relays are available in SPDT, DPDT, and 3PDT configurations driven by AC or DC coils and have pin or blade type terminals.



### FEATURES

- **General-purpose power and midget styles**
- **10A contact rating**
- **Indicator light and/or check button available**
- **Surface or DIN rail mount**
- **UL recognized, CSA certified**

SPECIFICATIONS													
<b>COIL RATINGS</b>						<b>CONTACT RATINGS</b>							
<b>RH Series</b>						<b>RH Series (UL ratings)</b>							
Rated Voltage	Rated Current (mA) ±15% @ 20°C								Coil Resistance (Ω) ±15% @ 20°C				
	60 Hz				50 Hz								
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	
AC	12	75	100	140	165	86	118	165	196	176.8	39.3	25.3	21.2
	24	37	50	70	83	42	59.7	81	98	300	153	103	84.5
	120	7.5	11	14.2	16.5	8.6	12.9	16.4	19.5	7680	4170	2770	2220
	240	3.2	5.5	7.1	8.3	3.7	6.5	8.2	9.8	31200	15210	12100	9120
DC		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
	12	64		75		120		125		188	160	100	96
24	32		36.9		60		62		750	650	400	388	
<b>RR Series</b>						<b>RR Series (UL ratings)</b>							
Rated Voltage	Rated Current (mA) ±15% @ 20°C				Coil Resistance (Ω) ±10% @ 20°C								
	60 Hz		50 Hz										
AC	12	210		245		18							
	24	105		121		79							
	120	20.5		24		2100							
	240	10.5		12.1		8330							
DC	12	120				100							
	24	60				400							
<b>Max continuous applied voltage</b>	110% of rated voltage, AC/DC @ 20°C												
<b>Min operating voltage</b>	80% of rated voltage, AC/DC @ 20°C												
<b>Drop-out voltage</b>													
AC	30% or more of rated voltage												
DC	10% or more of rated voltage												
<b>Contact material</b>													
RH	Silver cadmium oxide												
RR	Silver												
<b>Contact resistance</b>													
RH	50 mΩ max (initial)												
RR	30 mΩ max (initial)												
<b>Operate time</b>	25 ms max												
<b>Release time</b>	25 ms max												
<b>Min load</b>													
RH	24 VDC/30 mA, 5 VDC/100 mA												
RR	24 VDC/10 mA, 5 VDC/20 mA												
<b>Operating temp</b>	-22° to 158°F (-30° to 70°C)												
<b>Approvals</b>	UL recognized, File #E67770, E59804, E64245												
	CSA certified, File #LR35144												
	CE certified												



# RELAYS & CONTACTORS

## IDEC GENERAL-PURPOSE RELAYS

### RH, RR SERIES

#### DIMENSIONS

**RH Series Midget Relays**

- RH1B:** 1.07 (2.75) height, 0.55 (1.39) width, 1.39 (3.56) or less depth, 0.02 (0.05) mounting offset.
- RH2B:** 1.07 (2.75) height, 0.82 (2.1) width.
- RH3B:** 1.07 (2.75) height, 1.22 (3.1) width.
- RH4B:** 1.07 (2.75) height, 1.60 (4.1) width.

**RR Series Power Relays (PIN)**

- RR2P:** 1.418 (3.6) height, 1.14 (2.9) width.
- RR3PA:** 1.418 (3.6) height, 1.42 (3.6) width.

**RR Series Power Relays (blade)**

- RR1BA, RR2BA, RR3B:** 1.42 (3.64) height, 1.42 (3.64) width, 1.87 (4.8) or less depth, 0.2 (0.5) mounting offset.

#### WIRING

**Bottom View**

Wiring diagrams showing terminal connections and internal contact configurations for each relay model.

#### ORDERING INFORMATION

MODEL	DESCRIPTION
RH1B	Midget Relay, SPDT, Blade (use SH1B-05 socket)
RH2B	Midget Relay, DPDT, Blade (use SH2B-05 socket)
RH3B	Midget Relay, 3PDT, Blade (use SH3B-05 socket)
RH4B	Midget Relay, 4PDT, Blade (use SH4B-05 socket)
RR2P	Power Relay, DPDT, 8-Pin (use SR2P-05 or SR2P-06 socket)
RR3PA	Power Relay, 3PDT, 11-Pin (use SR3P-06 socket)
RR1BA	Power Relay, SPDT, Blade (use SR3B-05 socket)
RR2BA	Power Relay, DPDT, Blade (use SR3B-05 socket)
RR3B	Power Relay, 3PDT, Blade (use SR3B-05 socket)
U	Standard relay, UL recognized
UT	Top-bracket mounting (RH Series only)
UL	Indicator light (RH1B-L not UL recognized)
UC	Check button (Not RH1B)
ULC	Indicator light and check button (not RH1B)
AC	AC coil
DC	DC coil
12V	12V
24V	24V
120V	120V
240V	240V

**Example:** RH3B-ULAC24V 3PDT midget blade relay with indicator light and 24 VAC coil

**Related Products**

- SH, SR Series Relay sockets
- BAM-1000 or DIN-3F Mounting DIN rail



# RELAYS & CONTACTORS

## IDEC RELAY SOCKETS SH, SR SERIES



GENERAL SPECIFICATIONS (SH, SR SERIES)			
<b>Mounting</b>	DIN rail or surface mount	<b>Material grade</b>	UL94V-0
<b>Rated voltage</b>	300V, <b>SH1B</b> 250V	<b>Terminals</b>	M3.5 screws with captive wire clamp M3 screws on <b>SH1B</b> coil
<b>Rated current</b>	10A, <b>SR3B</b> 15A (UL rating)	<b>Wire size</b>	Up to two - #12 AWG
<b>Insulation resistance</b>	100 MΩ min	<b>Approvals</b>	UL recognized, File #E62437 CSA certified, File #LR35144 CE certified
<b>Dielectric strength</b>	2000 VAC, 1 min.		

### INDIVIDUAL SPECIFICATIONS

**SH1B-05**  
Use with relay: RH1B

Socket type: Blade  
Hold-down spring: SY2S-02F1  
Hold-down clip: SFA-101, SFA-202  
Weight: 0.06 lb (0.03 kg)

Dimensions (in): 0.17 (0.44), 0.22 (0.55), 0.31 (0.79), 0.14 dia. (0.36), 0.66 (1.7), 0.32 (0.8), 1.12 (2.85), 2.62 (6.7), 0.16 dia. (0.42), 1.83 (4.8), 0.10 (0.25), 0.63 (1.6), 0.78 (2.0), 0.57 (1.5), 0.98 (2.5), 0.63 (1.6).  
Dimensions (cm): 0.44, 0.55, 0.79, 0.36, 1.7, 0.8, 2.85, 6.7, 0.42, 4.8, 0.25, 1.6, 2.0, 1.5, 2.5, 1.6.

**SH2B-05**  
Use with relay: RH2B

Socket type: Blade  
Hold-down spring: SY4S-02F1  
Hold-down clip: SFA-101, SFA-202  
Weight: 0.10 lb (0.05 kg)

Dimensions (in): 0.17 (0.44), 0.22 (0.55), 0.31 (0.79), 0.14 dia. (0.36), 0.86 (2.2), 0.32 (0.8), 1.12 (2.85), 2.62 (6.7), 0.16 dia. (0.42), 1.83 (4.8), 0.10 (0.25), 1.03 (2.6), 1.17 (3.0), 0.57 (1.5), 0.98 (2.5), 1.03 (2.6).  
Dimensions (cm): 0.44, 0.55, 0.79, 0.36, 2.2, 0.8, 2.85, 6.7, 0.42, 4.8, 0.25, 2.6, 3.0, 1.5, 2.5, 2.6.

**SH3B-05**  
Use with relay: RH3B, RH2LB (latching relay)

Socket type: Blade  
Hold-down spring: SH3B-05F1  
Hold-down clip: SFA-101, SFA-202  
Weight: 0.13 lb (0.06 kg)

Dimensions (in): 0.17 (0.44), 0.22 (0.55), 0.31 (0.79), 0.14 dia. (0.36), 0.32 (0.8), 1.25 (3.2), 1.12 (2.85), 2.62 (6.7), 0.16 dia. (0.42), 1.83 (4.8), 0.10 (0.25), 1.42 (3.6), 1.56 (4.0), 0.57 (1.5), 0.98 (2.5), 1.42 (3.6).  
Dimensions (cm): 0.44, 0.55, 0.79, 0.36, 0.8, 3.2, 2.85, 6.7, 0.42, 4.8, 0.25, 3.6, 4.0, 1.5, 2.5, 3.6.

**SH4B-05**  
Use with relay: RH4B

Socket type: Blade  
Hold-down spring: SH4B-02F1  
Hold-down clip: SFA-101, SFA-202  
Weight: 0.16 lb (0.07 kg)

Dimensions (in): 0.17 (0.44), 0.22 (0.55), 0.31 (0.79), 0.14 dia. (0.36), 0.32 (0.8), 1.65 (4.2), 1.12 (2.85), 2.62 (6.7), 0.16 dia. (0.42), 1.83 (4.8), 0.10 (0.25), 1.81 (4.6), 1.97 (5.0), 0.57 (1.5), 0.98 (2.5), 1.81 (4.6).  
Dimensions (cm): 0.44, 0.55, 0.79, 0.36, 0.8, 4.2, 2.85, 6.7, 0.42, 4.8, 0.25, 4.6, 5.0, 1.5, 2.5, 4.6.



# RELAYS & CONTACTORS

## IDEC RELAY SOCKETS SH, SR SERIES

### INDIVIDUAL SPECIFICATIONS (CONT.)

#### SR2P-05

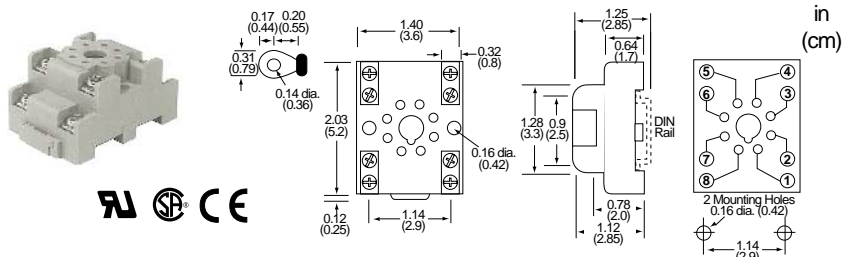
Use with relay: RR2P, RTE-P1 (timer)

Socket type: 8-pin octal

Hold-down spring: SR2B-02F1

Hold-down clip: SFA-203

Weight: 0.10 lb (0.05 kg)



#### SR2P-06

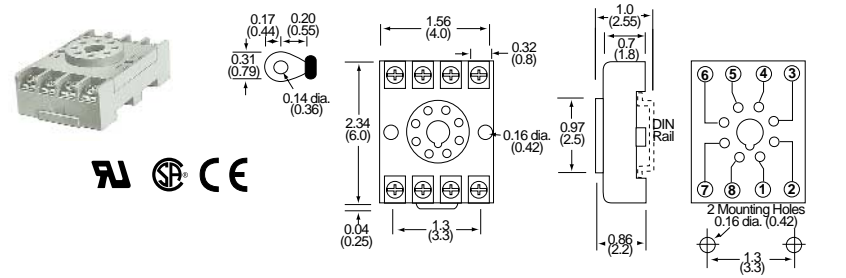
Use with relay: RR2P, RTE-P1 (timer)

Socket type: 8-pin octal

Hold-down spring: SR2B-02F1

Hold-down clip: SFA-202

Weight: 0.10 lb (0.05 kg)



#### SR3P-06

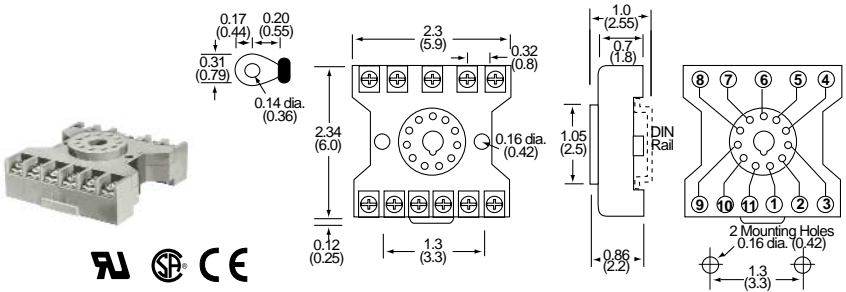
Use with relay: RR3PA, RTE-P2 (timer)

Socket type: 11-pin

Hold-down spring: SR3B-02F1

Hold-down clip: SFA-202

Weight: 0.13 lb (0.06 kg)



#### SR3B-05

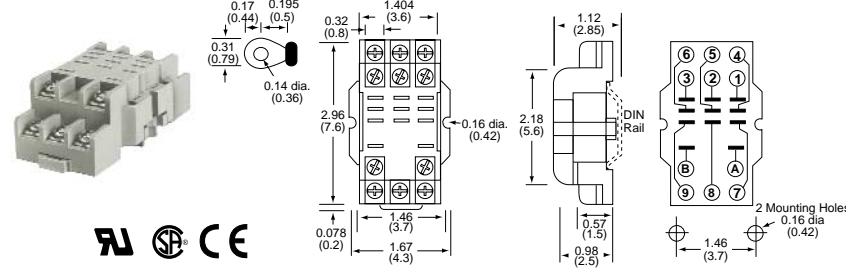
Use with relay: RR1BA, RR2BA, RR3B RTE-B (timer)

Socket type: 11-blade

Hold-down spring: SR3B-02F1

Hold-down clip: SFA-202

Weight: 0.14 lb (0.06 kg)



### ORDERING INFORMATION

MODEL	DESCRIPTION
SH1B-05	Relay Socket, SPDT Blade Type, DIN/Surface Mount
SH2B-05	Relay Socket, DPDT Blade Type, DIN/Surface Mount
SH3B-05	Relay Socket, 3PDT Blade Type, DIN/Surface Mount
SH4B-05	Relay Socket, 4PDT Blade Type, DIN/Surface Mount
SR2P-05	Relay Socket, DPDT Pin Type, DIN/Surface Mount
SR2P-06	Relay Socket, DPDT Pin Type, DIN/Surface Mount
SR3P-06	Relay Socket, 3PDT Pin Type, DIN/Surface Mount
SR3B-05	Relay Socket, Three Pole Blade Type, DIN/Surface Mount

For touchsafe sockets, add -C to the end of the SH Series socket model numbers.  
Order hold down springs and clips separately by model number.

#### Related Products

RH/RR Series  
RTE Series

Idec relays  
Idec timers

BAM-1000  
DIN-3F

Aluminum DIN rail  
Steel DIN rail

# ***BLACKROCK COMMUNITY CHURCH***

***3685 Black Rock Turnpike***

***Fairfield, CT 06825***

***2<sup>nd</sup> Floor Addition***

***Automatic Temperature Controls***

***Johnson Controls/Honeywell System***

**For: Eastern Mechanical Services,  
Danbury, CT**



**Control Wizards**  
Control Wizards, Inc.

***89 Taylor Avenue  
Norwalk, CT 06854  
Phone: 203-274-5284***

REV.	DATE	DESCRIPTION
1	03/27/2019	SUBMITTAL DRAWING
2	12/31/2019	As-Built
PROJECT NAME: <b>Blackrock Community Church, Fairfield CT: Temp Controls</b>		
DESCRIPTION: <b>COVER PAGE</b>		
PROJ MGR: CB	PROJ ENG: CB	DRAWN BY: ZJ
DRAWING No: 1 OF 8		





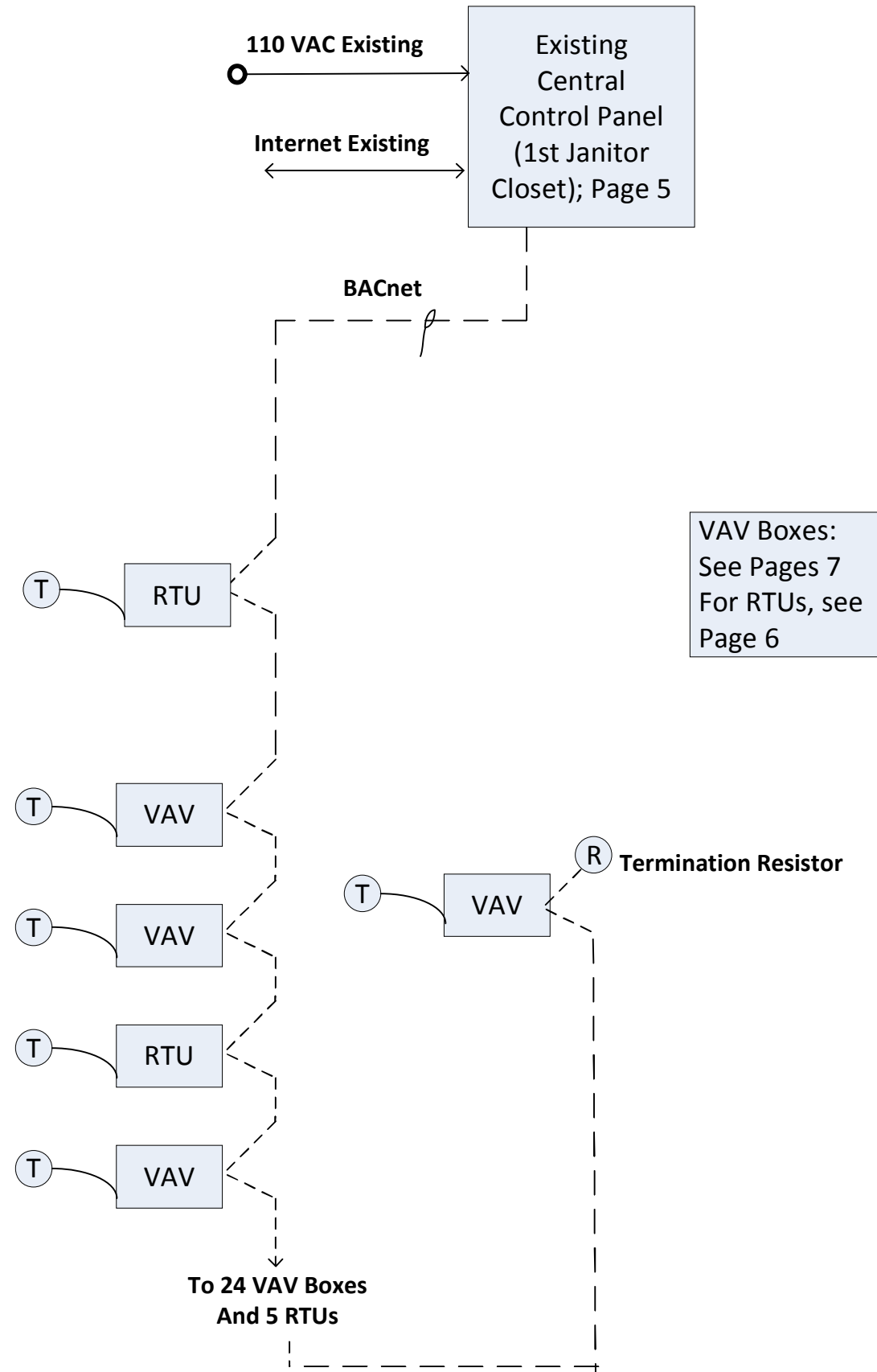
## REVISIONS

REV	DRAWING REVISIONS	DATE	BY	CHECKED BY
1	SUBMITTAL DRAWING	03/27/2019	JZ	CB
2	As-Built	12/31/2019	JZ	CB

## ABBREVIATIONS

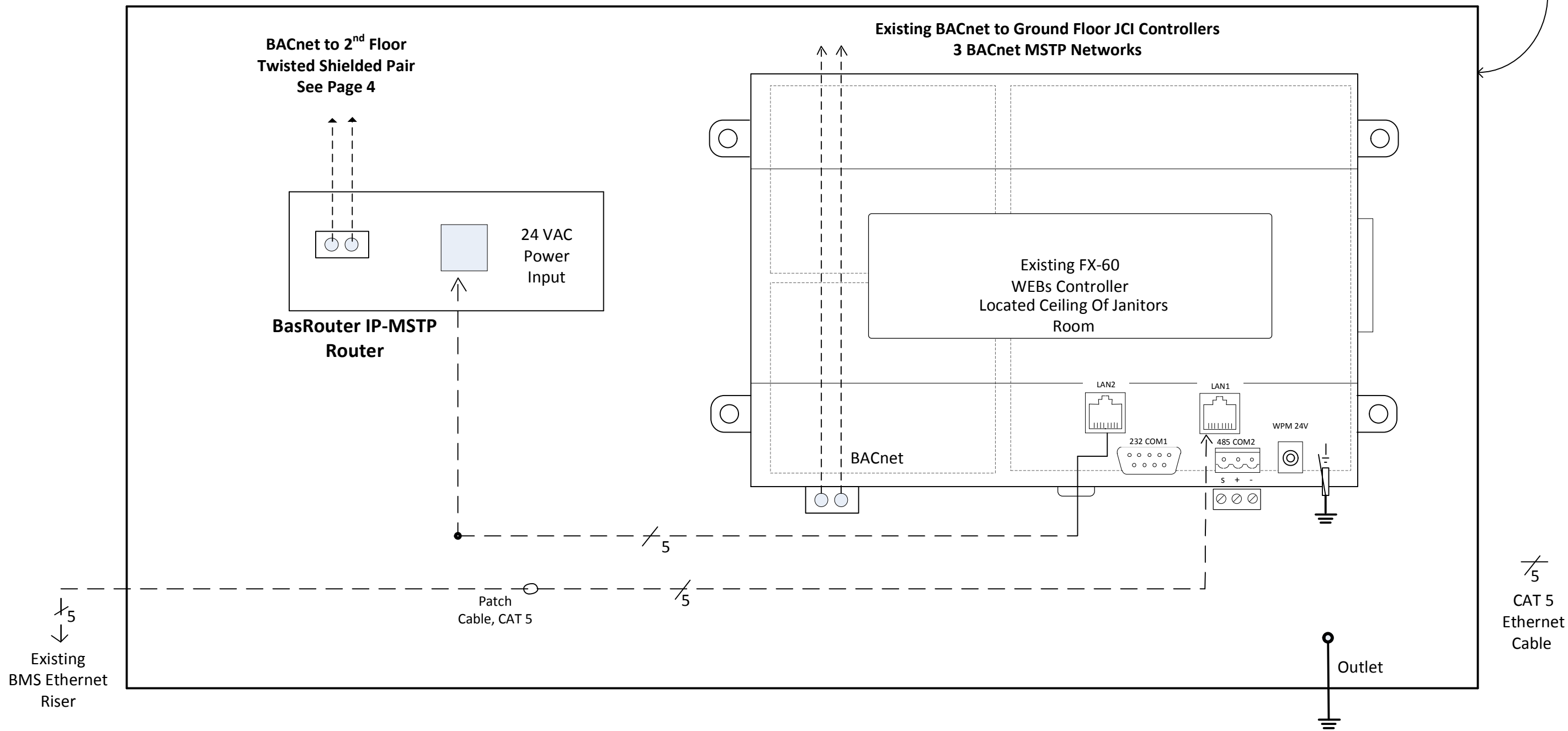
ABBREVIATION	COMPLETE NAME
AHU	AIR HANDLER UNIT
CUH	CABINET UNIT HEATER
CT	CURRENT SWITCH
EF	EXHAUST FAN
ERV	ENERGY RECOVERY VENTILATOR
FCU	FAN COIL UNIT
HOA	HAND – OFF – AUTOMATIC SELECTOR SWITCH
J	JUMPER WIRE
J BOX	JUNCTION BOX
PHT	PRE-HEAT AIR TEMPERATURE
PS	POWER SUPPLY
RAT	RETURN AIR TEMPERATURE
RHT	RE-HEAT AIR TEMPERATURE
SAT	SUPPLY AIR TEMPERATURE
TR-X	TRANSFORMER (X) = NUMBER
VAC	VOLTS A/C
VDC	VOLTS D/C
VRV	VARIABLE REFRIGERANT FLOW
<del>X</del>	PROVIDED BY OTHERS
X XFRMR, XFORMER	X TRANSFORMER (X=NUMBER)
UPS	UN-INTERRUPTIBLE POWER SUPPLY

REV.	DATE	DESCRIPTION
1	03/27/2019	SUBMITTAL DRAWING
2	12/31/2019	As-Built
PROJECT NAME: <b>Blackrock Community Church, Fairfield CT: Temp Controls</b>		
DESCRIPTION: <b>REVISIONS &amp; ABBREVIATIONS</b>		
PROJ MGR: CB	PROJ ENG: CB	DRAWN BY: ZJ
DRAWING No: 3 OF 8		



REV.	DATE	DESCRIPTION
1	03/27/2019	SUBMITTAL DRAWING
2	12/31/2019	As-Built
PROJECT NAME: <b>Blackrock Community Church, Fairfield CT: Temp Controls</b>		
DESCRIPTION: <b>BACNET NETWORK</b>		
PROJ MGR: CB	PROJ ENG: CB	DRAWN BY: ZJ
DRAWING No: 4 OF 8		

Existing Control Cabinet 1<sup>st</sup> Level

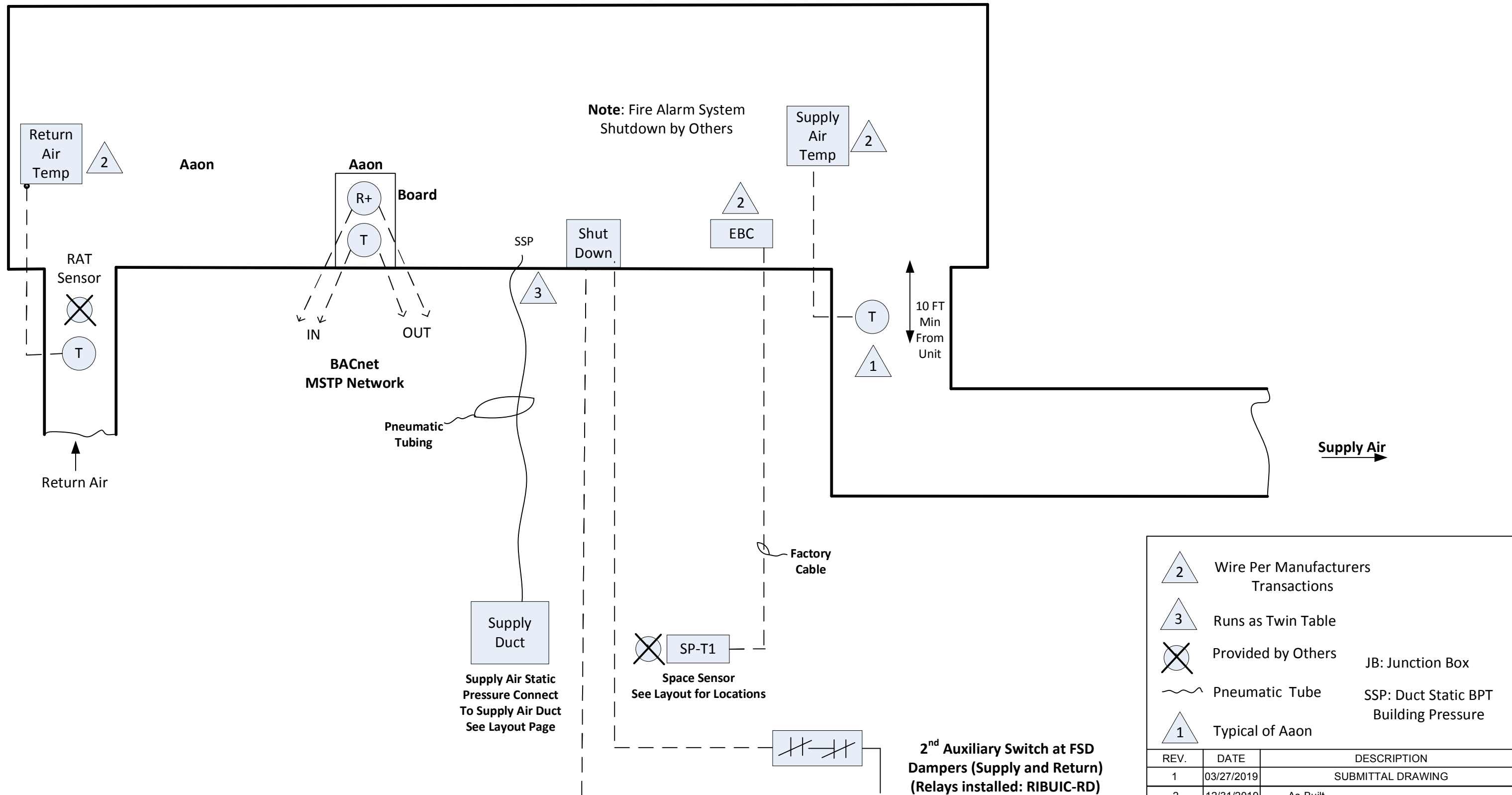


BMS Interface Control Panel  
Johnson Controls JACE

H N

REV.	DATE	DESCRIPTION
1	03/27/2019	SUBMITTAL DRAWING
2	12/31/2019	As-Built
PROJECT NAME: <b>Blackrock Community Church, Fairfield CT: Temp Controls</b>		
DESCRIPTION: <b>WEB-600 WITH SWITCH</b>		
PROJ MGR: CB	PROJ ENG: CB	DRAWN BY: ZJ
DRAWING No: 5 OF 8		

**AAON RTU – VAV WITH BACNET**

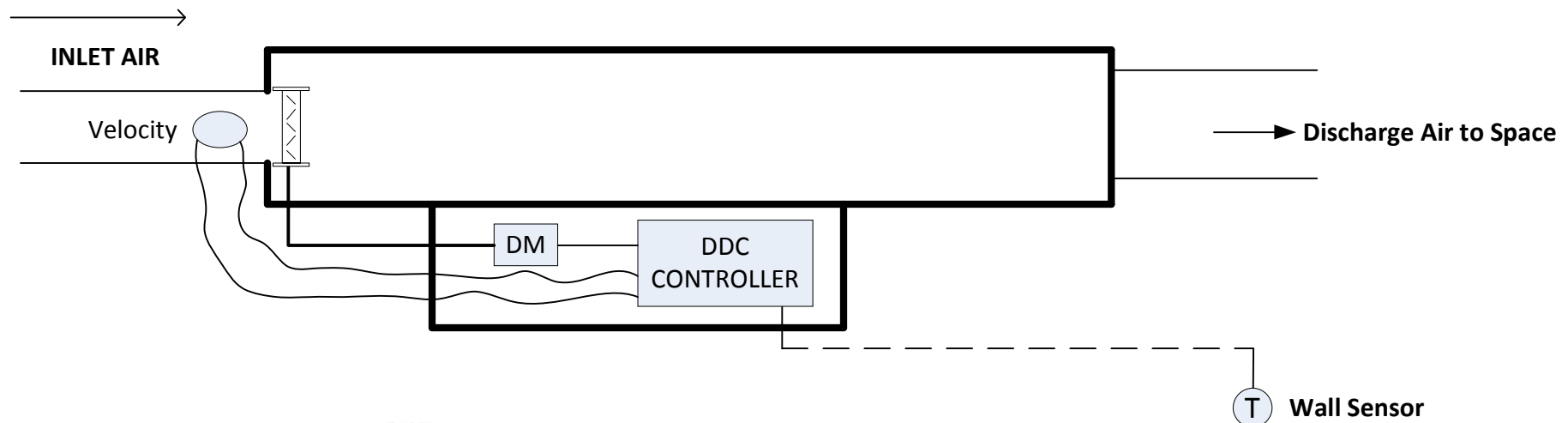


**TYPICAL OF AAON ROOF UNIT VAV WITH BACNET**

	Wire Per Manufacturers Transactions	
	Runs as Twin Table	
	Provided by Others	JB: Junction Box
	Pneumatic Tube	SSP: Duct Static BPT Building Pressure
	Typical of Aaon	

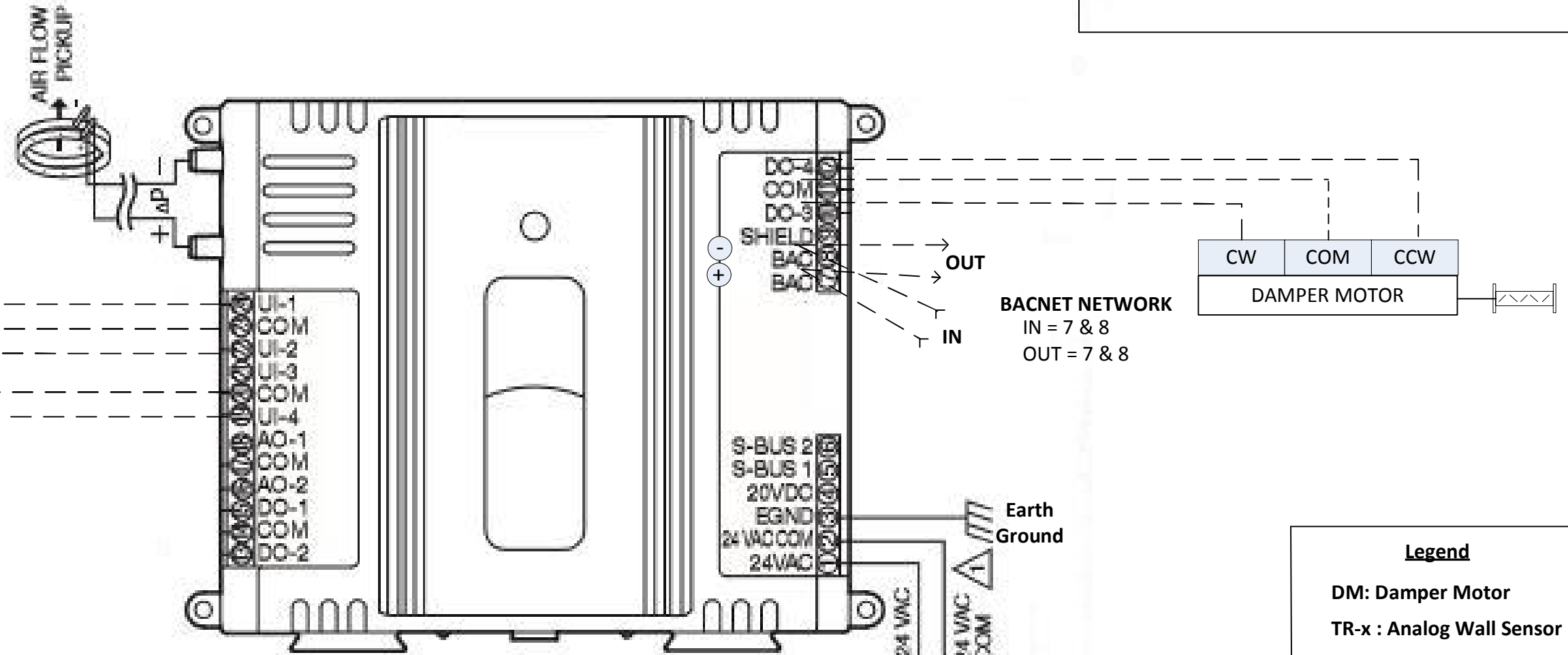
REV.	DATE	DESCRIPTION
1	03/27/2019	SUBMITTAL DRAWING
2	12/31/2019	As-Built

PROJECT NAME: <b>Blackrock Community Church, Fairfield CT: Temp Controls</b>			
DESCRIPTION: <b>ROOFTOP UNIT</b>			
PROJ MGR: CB	PROJ ENG: CB	DRAWN BY: ZJ	DRAWING No: 6 OF 8



**APPLICATION NOTES : Blackrock**  
**\_ BACNET NETWORK**  
**\_ SEE SCHEDULE FOR ADDRESS / SETTINGS**

**CONFIGURATION:**  
**FAN : No**  
**REHEAT : NONE**  
**PERIMETER HEAT : NONE**  
**WALL SENSOR : TR-22**



**TR-22 Wall Sensor**  
 Space Temp (UI-1)  
 Com  
 Setpoint Knob (UI-2)  
 To Space Temp (Stairwell)  
 VAV 3 and VAV 24 only

**CVB4024-NS/AS-VAV-1**  
**STRYKER VAV BOX CONTROLLER**

**NS Models: Field installed Damper Motor**  
**With ML6161B Damper Motor**

**AS Models: Factory Installed Damper Motor**  
**With internal Wiring to Damper Motor.**

**XFORMER install in**  
**VAV Box**

**Typical of 24 VAV Boxes**

**Legend**

**DM: Damper Motor**

**TR-x : Analog Wall Sensor**

**(R) Relay**

**Table 5. DIP Switch Values For MS/TP MAC Address.**

<b>DIP</b>	7	6	5	4	3	2	1
<b>VALUE</b>	64	32	16	8	4	2	1

REV.	DATE	DESCRIPTION
1	03/27/2019	SUBMITTAL DRAWING
2	12/31/2019	As-Built

PROJECT NAME: **Blackrock Community Church, Fairfield CT: Temp Controls**

DESCRIPTION: **VAV BOX**

PROJ MGR:	PROJ ENG:	DRAWN BY:	DRAWING No:
CB	CB	ZJ	7 OF 8

### Single Duct Terminal Unit Schedule

Black Rock Church

Tag	Room	Model	Size		CFM		Static Pressure			NC Levels		Unit Information
			Unit	Outlet	Max	Min	Inlet	Down	Min	Rad.	Disch.	
VAV-01	232 Kids	DESV	16	24x18	2500	1250	1	0.25	0.02	22	21	RH
VAV-02	233 Resource	DESV	08	12x10	505	253	1	0.25	0.01	20	20	RH
VAV-03	242 Green Rm	DESV	08	12x10	570	285	1	0.25	0.01	22	21	RH
VAV-04	224 Class Rm	DESV	09	14x12.5	660	330	1	0.25	0.03	18	18	RH
VAV-05	224 Class Rm	DESV	09	14x12.5	660	330	1	0.25	0.03	18	18	RH
VAV-06	226 Class Rm	DESV	14	20x17.5	1290	645	1	0.25	0.01	20	15	RH
VAV-07	201 Corr	DESV	07	12x10	405	203	1	0.25	0.06	20	17	RH
VAV-08	225 Class Rm	DESV	08	12x10	520	260	1	0.25	0.01	22	20	RH
VAV-09	239 Corr	DESV	05	12x8	100	50	1	0.25	0.01	-	11	RH
VAV-10	201 Corr	DESV	07	12x10	405	203	1	0.25	0.06	20	17	RH
VAV-11	222 Work Rm	DESV	05	12x8	200	100	1	0.25	0.02	18	19	RH
VAV-12	217 Office	DESV	05	12x8	130	65	1	0.25	0.01	11	14	RH
VAV-13	223 Conf	DESV	08	12x10	520	260	1	0.25	0.01	22	20	RH
VAV-14	224 Conf	DESV	09	14x12.5	640	320	1	0.25	0.03	18	18	RH
VAV-15	207 Open Office S	DESV	07	12x10	500	250	1	0.25	0.09	23	21	RH
VAV-16	207 Open Office S	DESV	10	14x12.5	810	405	1	0.25	0.01	24	19	RH
VAV-17	207 Open Office N	DESV	07	12x10	440	220	1	0.25	0.07	22	18	RH
VAV-18	208 Office	DESV	09	14x12.5	670	335	1	0.25	0.03	18	18	RH
VAV-19	202 Class Rm	DESV	08	12x10	560	280	1	0.25	0.01	22	21	RH
VAV-20	216 Office	DESV	05	12x8	200	100	1	0.25	0.02	18	19	RH
VAV-21	214 Office	DESV	05	12x8	300	150	1	0.25	0.04	25	20	RH
VAV-22	207 Open Office N	DESV	06	12x8	400	200	1	0.25	0.13	24	22	RH
VAV-23	207 Open Office N	DESV	06	12x8	400	200	1	0.25	0.13	24	22	RH
VAV-24	201 Corr	DESV	05	12x8	300	150	1	0.25	0.04	25	20	RH

6" DUCT INLET

REV.	DATE	DESCRIPTION
1	03/27/2019	SUBMITTAL DRAWING
2	12/31/2019	As-Built
PROJECT NAME: <b>Blackrock Community Church, Fairfield CT: Temp Controls</b>		
DESCRIPTION: <b>VAV Box Schedule</b>		
PROJ MGR: CB	PROJ ENG: CB	DRAWN BY: ZJ
DRAWING No: 8 OF 8		

WEBPro-AX

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brcc-hq-fw01-cdvbrhnbmn.dynamic-m.com : 148.76.110.202 (BlackRockCongregationalChurch) Station (BlackRockCongregationalChurch) Files px RTU FloorPlan.px Wb Px View

## BLACKROCK CONGREGATIONAL CHURCH

**2nd Floor**
Back
HOME
2nd Floor
Page Jumps
Help/Colors
SCHEDULES
Tech Info
ALARMS

VAV Report

RTU Report

	RTU 21	RTU 22	RTU 23	RTU 24	RTU 25
Aaon Space Temp					
Aaon Space Humidity					
Supply Air Temp					
Static Pressure					
Mode					

OAT: RTUs will only Heat:

OAT: RTUs will only Cool:

**Attic Space**    Left    Right

Attic Space

Alarm SetPt (+/- 2 F)

Alarm (15 Min Delay)

Attic Space (VAV 2-24)

Link to file: ^px/RTU/FloorPlan.px |

Blackrock Community Church, Fairfield CT: Drawing showing thermostat locations for VAV boxes and Aaon RTUs. Zoning layout for VAV Boxes. Control Wizards, 3-2-2020



**CFM TEST & BALANCE CORPORATION**

14 DEPOT SQUARE  
BETHEL, CONNECTICUT 06801

(203) 778-1900

TESTING AND BALANCING SUBMITTAL  
FOR

**BLACK ROCK CONGREGATIONAL CHURCH**

---

**2ND FLOOR ADDITION**

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**3685 BLACK ROCK TURNPIKE**

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**FAIRFIELD, CT**

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**AUGUST 23, 2019**

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CFM # 6288

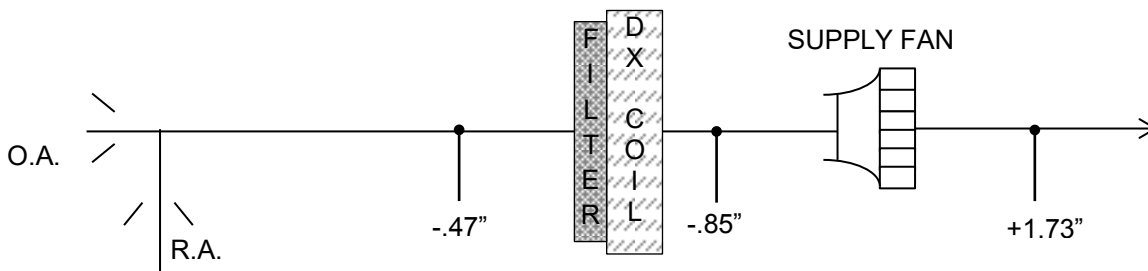
<b>CFM TEST &amp; BALANCE CORPORATION</b> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900 CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT	DATA SHEET #  1 CFM 6288
	DATE: 7/29/19	BY: RW

<b>SYSTEM</b>	RTU-21
<b>FAN LOCATION</b>	ROOF
<b>FAN SERVES</b>	KIDS WORSHIP/MULTI-PURPOSE
<b>FAN MANUFACTURER</b>	AAON
<b>MODEL</b>	R N - 0 1 5 - 3 - 0 - E A 0 9 - 3 F B
<b>SHEAVE POSITION</b>	DIRECT DRIVE
<b>MOTOR SPEED SET POINT</b>	66 HZ

	SPECIFIED	ACTUAL
TOTAL CFM	3575	3635
R/A CFM	1805	1829
O/A CFM – 50%	1770	1806
FAN TSP	3.60"	2.58"
FAN ESP	2.50"	2.2"
FAN RPM	1940	1936

	SPECIFIED	ACTUAL
MOTOR MFG.		
MOTOR FRAME	184T	
MOTOR HP	5	5
MOTOR BHP	3.27	2.3
VOLTS/PHASE	460/3	480/3
AMPERAGE	7.6	3.5
MOTOR RPM	1760	1936
SERVICE FACTOR	1.15	

STATIC PRESSURE SETPOINT = .50".



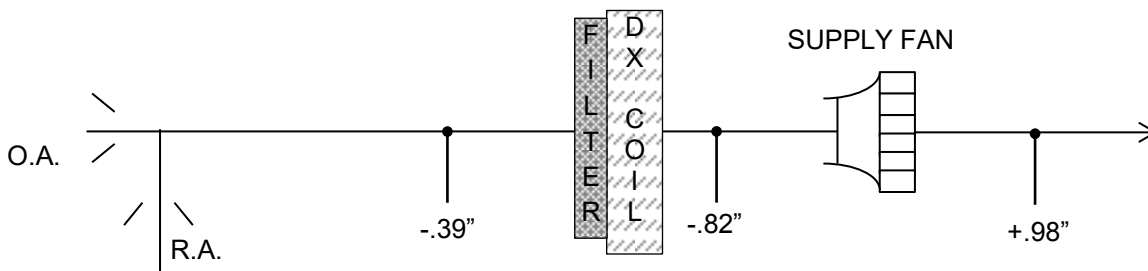
<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900 CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT	DATA SHEET #  2  CFM 6288
	DATE: 7/29/19	BY: RW

<b>SYSTEM</b>	RTU-22
<b>FAN LOCATION</b>	ROOF
<b>FAN SERVES</b>	CLASSROOMS
<b>FAN MANUFACTURER</b>	AAON
<b>MODEL</b>	R N - 0 1 6 - 3 - 0 - E B 0 9 - 3 4 B
<b>SHEAVE POSITION</b>	DIRECT DRIVE
<b>MOTOR SPEED SET POINT</b>	48 HZ

	<b>SPECIFIED</b>	<b>ACTUAL</b>
<b>TOTAL CFM</b>	3635	3680
<b>R/A CFM</b>	1625	1652
<b>O/A CFM – 50%</b>	2010	2028
<b>FAN TSP</b>	3.34"	1.80"
<b>FAN ESP</b>	2.50"	1.37"
<b>FAN RPM</b>	1403	1408

	<b>SPECIFIED</b>	<b>ACTUAL</b>
<b>MOTOR MFG.</b>		
<b>MOTOR FRAME</b>	184T	
<b>MOTOR HP</b>	5	5
<b>MOTOR BHP</b>	2.89	2.96
<b>VOLTS/PHASE</b>	460/3	370/3
<b>AMPERAGE</b>	7.6	4.5
<b>MOTOR RPM</b>	1760	1408
<b>SERVICE FACTOR</b>	1.15	

STATIC PRESSURE SETPOINT = .95".



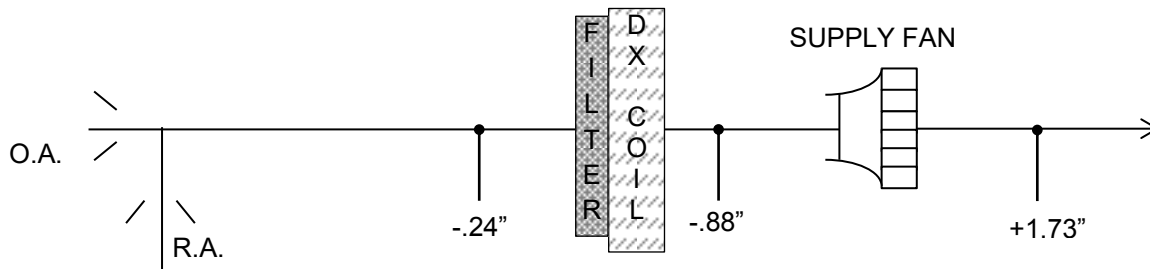
<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900 CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT	DATA SHEET #  3  CFM 6288
	DATE: 7/29/19	BY: RW

<b>SYSTEM</b>	RTU-23
<b>FAN LOCATION</b>	ROOF
<b>FAN SERVES</b>	WEST OFFICES
<b>FAN MANUFACTURER</b>	AAON
<b>MODEL</b>	R N - 0 0 8 - 3 - 0 - E A 0 9 - 3 2 B
<b>SHEAVE POSITION</b>	DIRECT DRIVE
<b>MOTOR SPEED SET POINT</b>	69 HZ

	<b>SPECIFIED</b>	<b>ACTUAL</b>
<b>TOTAL CFM</b>	1895	1895
<b>R/A CFM</b>	1155	1105
<b>O/A CFM – 30%</b>	740	790
<b>FAN TSP</b>	3.31"	2.61"
<b>FAN ESP</b>	2.50"	1.97"
<b>FAN RPM</b>	2030	2024

	<b>SPECIFIED</b>	<b>ACTUAL</b>
<b>MOTOR MFG.</b>		
<b>MOTOR FRAME</b>	145T	
<b>MOTOR HP</b>	2	2
<b>MOTOR BHP</b>	1.75	1.12
<b>VOLTS/PHASE</b>	460/3	479/3
<b>AMPERAGE</b>	3.9	2.2
<b>MOTOR RPM</b>	1760	2024
<b>SERVICE FACTOR</b>	1.15	

STATIC PRESSURE SETPOINT = .25".



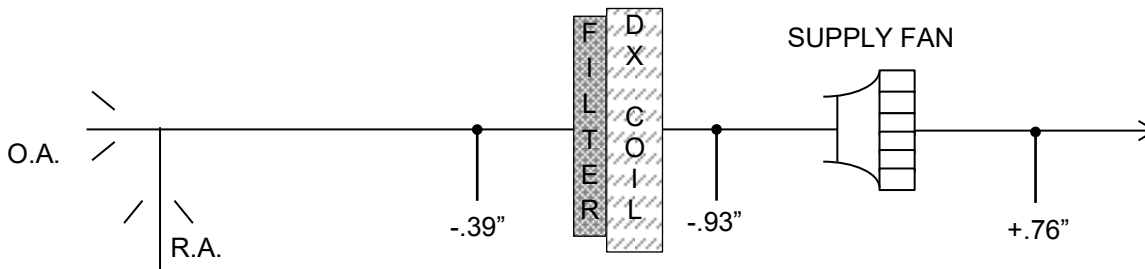
<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	<b>BLACK ROCK CONGR. CHURCH</b> <b>2ND FLOOR ADDITION</b> <b>3685 BLACK ROCK TURNPIKE</b> <b>FAIRFIELD, CT</b>	<b>DATA SHEET #</b>  4
	<b>DATE:</b> 7/29/19 <b>BY:</b> RW	<b>CFM</b> 6288

<b>SYSTEM</b>	RTU-24
<b>FAN LOCATION</b>	ROOF
<b>FAN SERVES</b>	NORTH OFFICES
<b>FAN MANUFACTURER</b>	AAON
<b>MODEL</b>	R N - 0 1 0 - 3 - 0 - E A 0 9 - 3 2 B
<b>SHEAVE POSITION</b>	DIRECT DRIVE
<b>MOTOR SPEED SET POINT</b>	69 HZ

	<b>SPECIFIED</b>	<b>ACTUAL</b>
<b>TOTAL CFM</b>	2260	2305
<b>R/A CFM</b>	1300	1313
<b>O/A CFM – 35%</b>	960	992
<b>FAN TSP</b>	3.51"	1.69"
<b>FAN ESP</b>	2.50"	1.15"
<b>FAN RPM</b>	1876	1877

	<b>SPECIFIED</b>	<b>ACTUAL</b>
<b>MOTOR MFG.</b>		
<b>MOTOR FRAME</b>	182T	
<b>MOTOR HP</b>	3	3
<b>MOTOR BHP</b>	2.05	1.6
<b>VOLTS/PHASE</b>	460/3	480/3
<b>AMPERAGE</b>	4.8	2.6
<b>MOTOR RPM</b>	1760	1877
<b>SERVICE FACTOR</b>	1.15	

STATIC PRESSURE SETPOINT = .70"



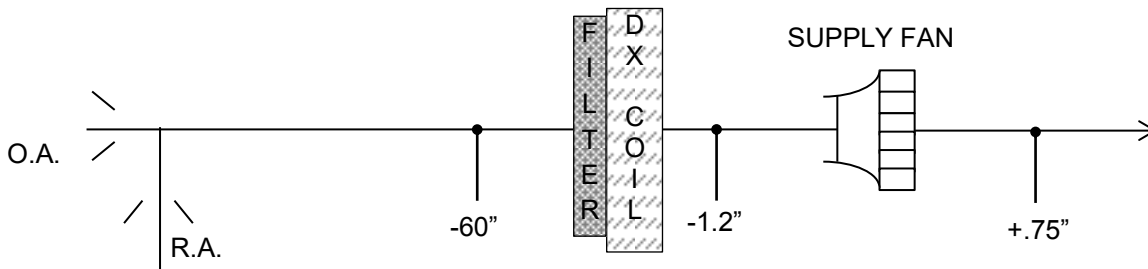
<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900 CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT	DATA SHEET #  5  CFM 6288
	DATE: 7/29/19	BY: RW

<b>SYSTEM</b>	RTU-25
<b>FAN LOCATION</b>	ROOF
<b>FAN SERVES</b>	EAST OFFICES
<b>FAN MANUFACTURER</b>	AAON
<b>MODEL</b>	R N - 0 0 7 - 3 - 0 - E B 0 9 - 3 2 B
<b>SHEAVE POSITION</b>	DIRECT DRIVE
<b>MOTOR SPEED SET POINT</b>	66 HZ

	<b>SPECIFIED</b>	<b>ACTUAL</b>
<b>TOTAL CFM</b>	2420	2420
<b>R/A CFM</b>	2200	2207
<b>O/A CFM – 10%</b>	220	213
<b>FAN TSP</b>	3.61"	1.95"
<b>FAN ESP</b>	2.50"	1.35"
<b>FAN RPM</b>	1926	1934

	<b>SPECIFIED</b>	<b>ACTUAL</b>
<b>MOTOR MFG.</b>		
<b>MOTOR FRAME</b>	182T	
<b>MOTOR HP</b>	3	3
<b>MOTOR BHP</b>	2.23	1.7
<b>VOLTS/PHASE</b>	460/3	480/3
<b>AMPERAGE</b>	4.8	2.75
<b>MOTOR RPM</b>	1760	1934
<b>SERVICE FACTOR</b>	1.15	

STATIC PRESSURE SETPOINT = .25".



<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT	DATA SHEET #  6
	DATE: 8/23/19	BY: RW

## EXHAUST FAN TEST SHEET

<b>FAN</b>	<b>EF-18</b>	<b>EF-19</b>			
<b>LOCATION</b>	ROOF	ROOF			
<b>SERVES</b>	TOILETS	TOILETS			
<b>MFG.</b>	GREENHECK	GREENHECK			
<b>MODEL</b>	GB-071-4-X	GB-101-3-X			
<b>SHEAVE</b>	½ OPEN	½ OPEN			
<b>DESIGN RPM</b>	N.A.	N.A.			
<b>TEST RPM</b>	1373	1313			
<b>SPECIFIED CFM</b>	200	800			
<b>TEST CFM</b>	220	860			
<b>MOTOR MFG.</b>	GREENHECK	MARATHON			
<b>MOTOR HP</b>	1/4	1/3			
<b>SERVICE FACTOR</b>	1.5	1.35			
<b>VOLTS/Ø</b>	115/1	115/1			
<b>AMP RATING</b>	4.6	5.5			
<b>AMP DRAW</b>	4.1	4.9			
<b>BHP</b>	.22	.29			






<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT		DATA SHEET #  8
	DATE: 7/29/19	BY: RW	CFM 6288

FAN	ROOM	REG/ DIFF	SIZE	CFM		REMARKS
				DESIGN	TEST	
RTU-21	SUPPLY					
	VAV-1		16	2500	2570	
	KIDS WORSHIP    232	1	12X6	250	255	
	KIDS WORSHIP    232	2	12X6	250	260	
	KIDS WORSHIP    232	3	12X6	250	250	
	KIDS WORSHIP    232	4	12X6	250	265	
	KIDS WORSHIP    232	5	12X6	250	255	
	KIDS WORSHIP    232	6	12X6	250	250	
	KIDS WORSHIP    232	7	12X6	250	250	
	KIDS WORSHIP    232	8	12X6	250	260	
	KIDS WORSHIP    232	9	12X6	250	270	
	KIDS WORSHIP    232	10	12X6	250	255	
	VAV-2		8	505	510	
	RESOURCE WORKRM    233	1	12X6	215	215	
	RESOURCE WORKRM    233	2	12X6	215	220	
	STORAGE    242	3	2408	75	75	
	VAV-3		8	570	555	
	STORAGE BALCONY    237	1	10X3	75	75	
	STORAGE BALCONY    237	2	10X3	75	75	
	STORAGE BALCONY    237	3	10X3	75	75	
	STORAGE BALCONY    237	4	10X3	75	70	
	LAV.    236	5	1205	50	55	
	GREEN ROOM    241	6	2408	220	205	

VAV BOX MINIMUM AIR FLOW WAS SET AT 50% OF THE ABOVE INDICATED MAXIMUM AIR FLOW RATES.

 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT		DATA SHEET #  9
	DATE: 8/23/19	BY: RW	CFM 6288

FAN	ROOM	REG/ DIFF	SIZE	CFM		REMARKS
				DESIGN	TEST	
RTU-21	RETURN					
	KIDS WORSHIP	232	1	20X6	440	445 *
	KIDS WORSHIP	232	2	20X6	435	440 *
	KIDS WORSHIP	232	3	20X6	435	440 *
	RESOURCE WORKRM	233	4	8X6	110	120 *
	RESOURCE WORKRM	233	5	8X6	115	120 *
	GREEN ROOM	241	6	12X6	115	105 *
	STORAGE BALCONY	237	7	8X8	155	170 *

\* DESIGN CFM WAS REDUCED TO ACCOUNT FOR MINIMUM OUTSIDE AIR REQUIREMENT.

<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT		DATA SHEET #
	DATE:	BY:	10 CFM    6288
	7/29/19	RW	

FAN	ROOM	REG/ DIFF	SIZE	CFM		REMARKS
				DESIGN	TEST	
RTU-22 SUPPLY						
	VAV-4		9	660	680	
	CLASSROOM #4      246	1	10X6	110	115	
	CLASSROOM #4      246	2	10X6	110	120	
	CLASSROOM #4      246	3	10X6	110	110	
	CLASSROOM #4      246	4	10X6	110	110	
	CLASSROOM #4      246	5	10X6	110	110	
	CLASSROOM #4      246	6	10X6	110	115	
	VAV-5		9	660	655	
	CLASSROOM #4      246	1	10X6	110	100	
	CLASSROOM #4      246	2	10X6	110	110	
	CLASSROOM #4      246	3	10X6	110	110	
	CLASSROOM #4      246	4	10X6	110	115	
	CLASSROOM #4      246	5	10X6	110	105	
	CLASSROOM #4      246	6	10X6	110	115	
	VAV-6		14	1290	1300	
	CLASSROOM #3      226	1	12X6	215	220	
	CLASSROOM #3      226	2	12X6	215	220	
	CLASSROOM #3      226	3	12X6	215	215	
	CLASSROOM #3      226	4	12X6	215	210	
	CLASSROOM #3      226	5	12X6	215	220	
	CLASSROOM #3      226	6	12X6	215	215	

VAV BOX MINIMUM AIR FLOW WAS SET AT 50% OF THE ABOVE INDICATED MAXIMUM AIR FLOW RATES.



<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT		DATA SHEET #  12
	DATE:                                      8/23/19	BY:    RW	CFM    6288

FAN	ROOM	REG/ DIFF	SIZE	CFM		REMARKS	
				DESIGN	TEST		
RTU-22 RETURN							
	CLASSROOM #2	225	1	10X6	115	110	*
	CLASSROOM #2	225	2	10X6	115	120	*
	CORRIDOR #2	238	3	12X12	180	185	*
	CORRIDOR #2	238	4	12X12	45	50	*
	CLASSROOM #4	246	5	12X6	200	205	*
	CLASSROOM #4	246	6	12X6	200	210	*
	CLASSROOM #4	246	7	12X6	200	200	*
	CLASSROOM #3	226	8	12X6	190	190	*
	CLASSROOM #3	226	9	12X6	190	195	*
	CLASSROOM #3	226	10	12X6	190	195	*

\* DESIGN CFM WAS REDUCED TO ACCOUNT FOR MINIMUM OUTSIDE AIR REQUIREMENT.

<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT		DATA SHEET #  13
	DATE: 7/29/19	BY: RW	CFM 6288

FAN	ROOM	REG/ DIFF	SIZE	CFM		REMARKS
				DESIGN	TEST	
RTU-23 SUPPLY						
	VAV-10		7	405	400	
	CORRIDOR #1	201	1	2406	135	130
	CORRIDOR #1	201	2	2406	135	140
	CORRIDOR #1	201	3	2406	135	130
	VAV-11		5	200	205	
	WORK ROOM	222	1	10X6	100	105
	WORK ROOM	222	2	10X6	100	100
	VAV-12		5	130	135	
	OFFICE #9	217	1	10X3	65	65
	OFFICE #9	217	2	10X3	65	70
	VAV-13		8	520	515	
	INTERN WORK RM #1	223	1	10X6	130	135
	INTERN WORK RM #1	223	2	10X6	130	130
	INTERN WORK RM #1	223	3	10X6	130	130
	INTERN WORK RM #1	223	4	10X6	130	120
	VAV-14		9	640	640	
	INTERN WORK RM #2	224	1	10X6	160	155
	INTERN WORK RM #2	224	2	10X6	160	165
	INTERN WORK RM #2	224	3	10X6	160	160
	INTERN WORK RM #2	224	4	10X6	160	160

VAV BOX MINIMUM AIR FLOW WAS SET AT 50% OF THE ABOVE INDICATED MAXIMUM AIR FLOW RATES.



<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900 CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT		DATA SHEET #  15 CFM 6288
	DATE: 7/29/19	BY: RW	

FAN	ROOM	REG/ DIFF	SIZE	CFM		REMARKS
				DESIGN	TEST	
RTU-24 SUPPLY						
	VAV-19		8	560	560	
	CLASSROOM #1	202	1	2406	140	135
	CLASSROOM #1	202	2	2406	140	135
	CLASSROOM #1	202	3	2406	140	145
	CLASSROOM #1	202	4	2406	140	145
	VAV-20		5	200	205	
	OFFICE #8	216	1	10X3	50	50
	OFFICE #8	216	2	10X3	50	55
	OFFICE #7	215	3	10X3	50	50
	OFFICE #7	215	4	10X3	50	50
	VAV-21		5	300	305	
	OFFICE #6	214	1	10X3	50	55
	OFFICE #6	214	2	10X3	50	55
	OFFICE #7	213	3	10X3	50	50
	OFFICE #7	213	4	10X3	50	55
	OFFICE #4	212	5	10X3	100	90
	VAV-22		6	400	415	
	OPEN OFFICE	207	1	10X6	100	105
	OPEN OFFICE	207	2	10X6	100	100
	OPEN OFFICE	207	3	10X6	100	105
	OPEN OFFICE	207	4	10X6	100	105

VAV BOX MINIMUM AIR FLOW WAS SET AT 50% OF THE ABOVE INDICATED MAXIMUM AIR FLOW RATES.





<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT		DATA SHEET #  17 CFM 6288
	DATE: 7/29/19	BY: RW	

FAN	ROOM	REG/ DIFF	SIZE	CFM		REMARKS
				DESIGN	TEST	
RTU-24 RETURN						
	CLASSROOM #1	202	1	12X12	370	335 *
	OFFICE #8	216	2	8X4	65	70 *
	OFFICE #7	215	3	8X4	65	65 *
	OFFICE #6	214	4	8X4	65	70 *
	OFFICE #5	213	5	8X4	65	70 *
	OFFICE #4	212	6	8X4	65	70 *
	CORRIDOR #1	201	7	12X12	65	80 *
	OPEN OFFICE	207	8	10X6	270	260 *
	OPEN OFFICE	207	9	10X6	270	265 *

\* DESIGN CFM WAS REDUCED TO ACCOUNT FOR MINIMUM OUTSIDE AIR REQUIREMENT.

<b>CFM TEST &amp; BALANCE CORPORATION</b> <hr/> 14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900    CFM@SNET.NET	BLACK ROCK CONGR. CHURCH 2ND FLOOR ADDITION 3685 BLACK ROCK TURNPIKE FAIRFIELD, CT		DATA SHEET #  18
	DATE: 7/29/19	BY: RW	CFM 6288

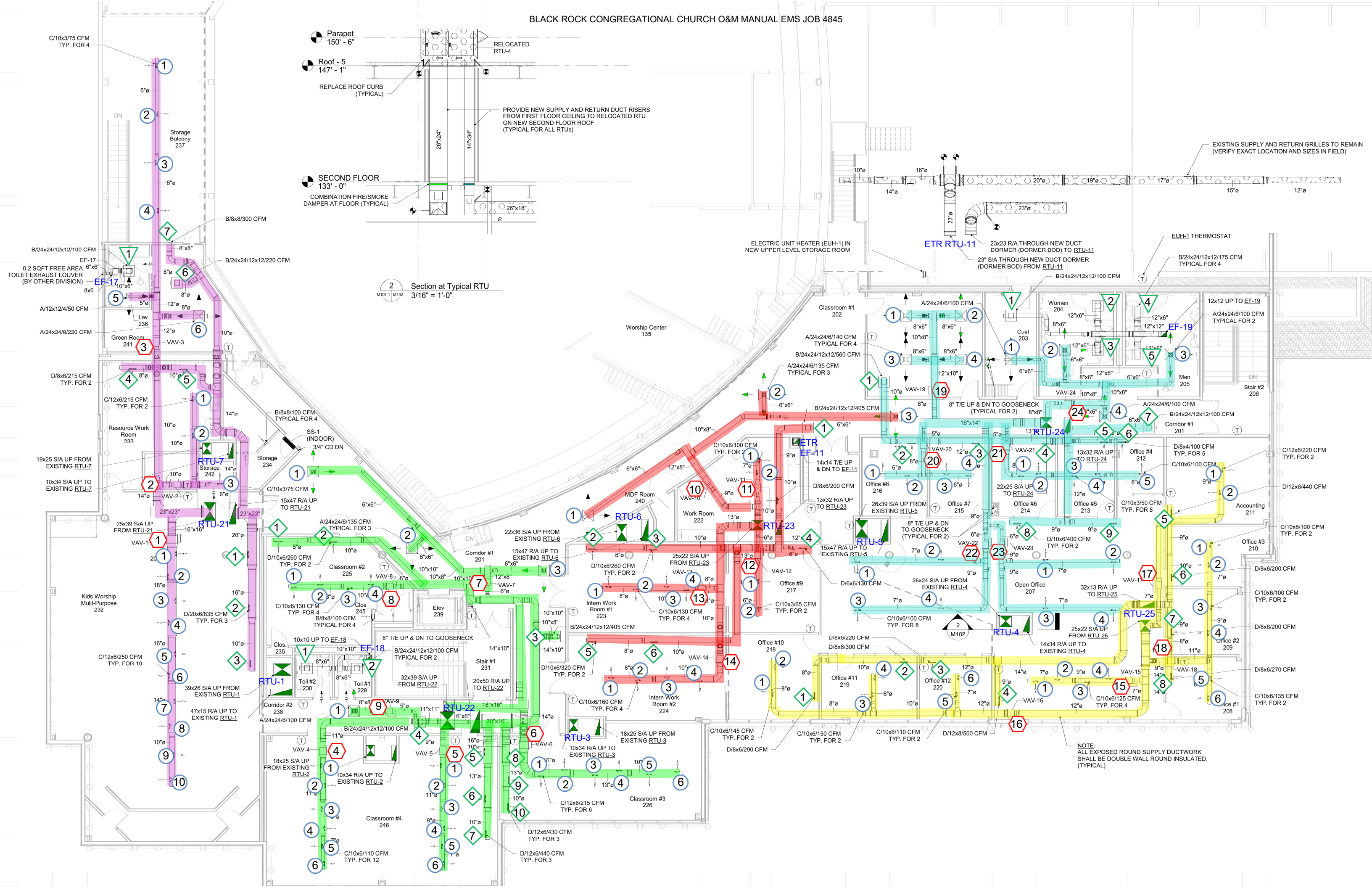
FAN	ROOM	REG/ DIFF	SIZE	CFM		REMARKS
				DESIGN	TEST	
RTU-25 SUPPLY						
	VAV-15		7	500	495	
	OPEN OFFICE      207	1	10X6	125	125	
	OPEN OFFICE      207	2	10X6	125	125	
	OPEN OFFICE      207	3	12X6	125	125	
	OPEN OFFICE      207	4	10X6	125	120	
	VAV-16		10	810	800	
	OFFICE #10      218	1	10X6	145	140	
	OFFICE #10      218	2	10X6	145	140	
	OFFICE #11      219	3	10X6	150	150	
	OFFICE #11      219	4	10X6	150	145	
	OFFICE #12      220	5	10X6	110	115	
	OFFICE #12      220	6	10X6	110	110	
	VAV-17		7	440	445	
	ACCOUNTING      211	1	12X6	220	220	
	ACCOUNTING      211	2	12X6	220	225	
	VAV-18		9	670	680	
	OFFICE #3      210	1	10X6	100	100	
	OFFICE #3      210	2	10X6	100	105	
	OFFICE #2      209	3	10X6	100	105	
	OFFICE #2      209	4	10X6	100	105	
	OFFICE #1      208	5	10X6	135	130	
	OFFICE #1      208	6	10X6	135	135	

VAV BOX MINIMUM AIR FLOW WAS SET AT 50% OF THE ABOVE INDICATED MAXIMUM AIR FLOW RATES.





BLACK ROCK CONGREGATIONAL CHURCH O&M MANUAL EMS JOB 4845



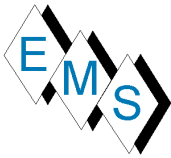
Parapet  
150' - 6"

Roof - 5  
147' - 1"

SECOND FLOOR  
133' - 0"

2 Section at Typical RTU  
3/16" = 1'-0"

NOTE:  
ALL EXPOSED ROUND SUPPLY DUCTWORK  
SHALL BE DOUBLE WALL ROUND INSULATED.  
(TYPICAL)



**Eastern Mechanical Services, Inc.**

3 Starr Street  
Danbury, CT 06810  
Phone: 203.792.7668 Fax: 203.748.0385

October 24, 2019

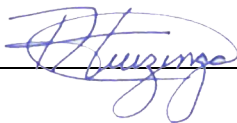
**WARRANTY**

We hereby warrant that the HVAC and Plumbing work

Which we have performed at the Black Rock Congregational Church Second Floor Addition / Alterations

Has been done in strict accordance with International Mechanical Code, 2015 edition and International Plumbing Code, 2015 edition. The work installed will fulfill the requirements of these codes. We agree to repair or replace or cause to be repaired or replaced any or all of work which may prove to be defective in workmanship or materials, together with any adjacent work which requires repair or replacement because of our defective work, within a period of 1 year from August 3, 2019 ordinary wear and tear and unusual abuse or neglect excepted.

If we fail to commence to comply with the above paragraph within ten (10) days after receipt of written notice from Owner to do so or fail to pursue such as compliance with diligence, we, jointly, and severally, do hereby authorize the Owner to proceed to have the defects repaired and made good at our sole expense, and we will honor and pay the costs and charges for it together with interest at the maximum rate permitted by law upon demand. If we fail to fulfill the preceding obligations, and if the Owner brings an action to enforce this warranty, we agree to pay the Owner's reasonable attorney's fees incurred in connection therewith.

Signed: 

Printed: Ted Huizinga

Date: 10/24/19

Contracting in Plumbing, HVAC, and Sprinkler  
CT Licenses: F1-40126, P1-277842, SM1-3935, MG1-0000572 and S1-303124