Eastern Mechanical Services, Inc
3 Starr Street
Danbury, CT 06810
Phone: 203.792.7668 Fax: 203.748.0385 Web: www.emsinc.us

20 HORSENECK LANE HX PROJECT

HVAC

ELECTRICAL

CONTROLS

OPERATIONS AND MAINTENANCE MANUAL

GD GUY DEFEO ASSOCIATES
A Division of Emerson Swan

EMERSON SWAN
A Swan Group Company

ENGINEERED PRODUCTS: Connecticut

Mike DeFeo 203-257-5086 | mdefeo@emersonswan.com

AERMEC	Air to Water and Water to Water Heat Pumps, Fan Coils, Chillers
AEROFIN Heat Transfer Products	Hydronic, Steam and IFB Coils for Commercial Applications.
ALFA LAVAL	Plate and Frame Heat Exchangers, Brazed Heat Exchangers, Plate Reconditioning and Regasketing
anden	Dehumidifiers designed specifically for cultivation
AURORA Pentair Water	Fire Pumps and Pump Package Systems
BAC	Open and Closed Circuit Cooling Towers, Evaporative Condensers, Thermal Ice Storage and Hybrid Closed Circuit Cooling Towers
CANARIIS CORPORATION	Packaged Pumping Systems for Domestic Water, HVAC, Chiller & Boiler Plants; Fire Pump Applications.
CARNES Only Nature Moves and Conditions Air Better!	Ventilation - Centrifugal fans, Air Distribution, Terminal Units, or Energy Recovery.
CCSolutions Composite Cooling Solutions, L.P.	Fiberglass or Concrete Field Erected Cooling Towers; Parts, Repairs, Rebuilds, Upgrades and Inspections
CEMLINE CORPORATION	A.S.M.E. Storage, Buffer, Flash and Blowdown Tanks, Packaged Water Heaters, Unfired Clean Steam Generators, and Replacement Tube Bundles
driSteem	Electric, Gas-fired, Steam-To-Steam, Steam Injection Commercial Humidification Systems
DuraVent	Air / Gas Venting Systems, Grease Duct
IMI FLOW DESIGN	Automatic / Manual Flow Control Valves, Coil Hookups, Pressure Independent Valves

GD GUY DEFEO ASSOCIATES
A Division of Emerson Swan

EMERSON SWAN
A Swan Group Company

ENGINEERED PRODUCTS: Connecticut

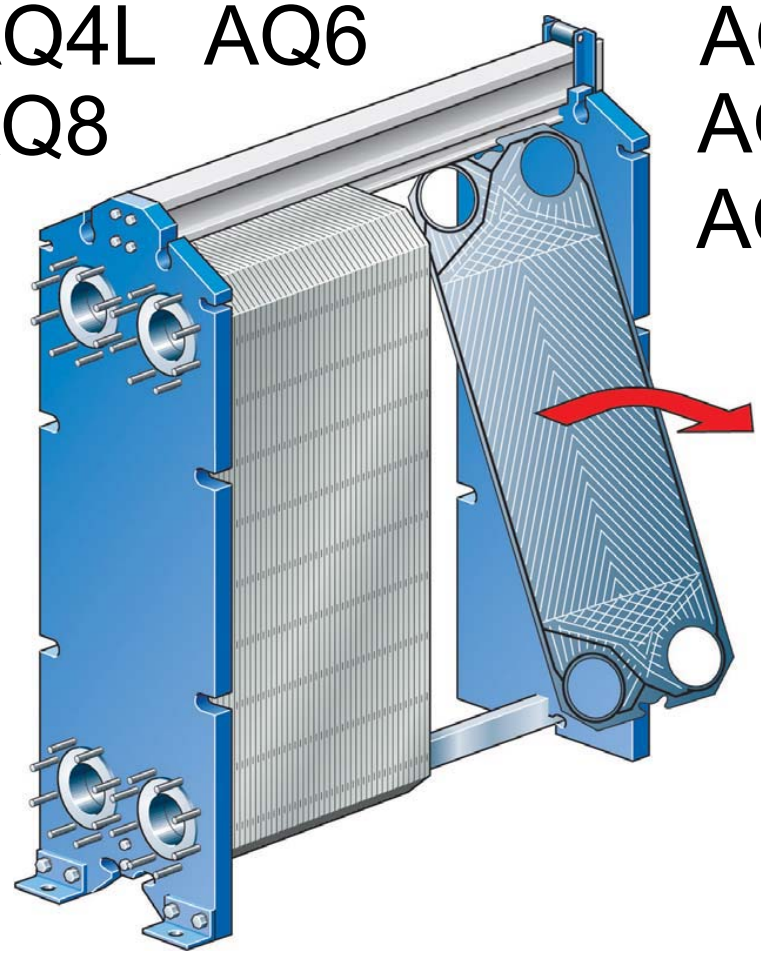
Mike DeFeo 203-257-5086 | mdefeo@emersonswan.com

FLOW-TECH WATER TREATMENT SYSTEM	Chemical free water treatment systems.
FRANKLIN CONTROL SYSTEMS	Variable Speed Drives, Building Automation Starters, Soft Starters, Cooling Tower Control Panels.
GRANBY COMPOSITES	100% Fiberglass Fire Protection Tanks, Potable Water Tanks, Waste Water Tanks, Rain Water Tanks, Grease Interceptor Tanks, Wash Water Tanks, Stormwater Tanks, Etc.
HTP	Condensing Boilers and Domestic Water Heating Options
J.L. WINGERT CO.	Glycol Feed Systems, Bypass Filter and Bromine Feeders, Separator Systems and Corrosion Coupon Racks.
LJ ING	Steam or Hot Water Integral Face and Bypass Coils, Unit Heaters, Make-up Air and Combustion Air Units, Door Heaters, and Air Curtains
MODINE	Modine COMMERCIAL Atherion dedicated outside air systems (DOAS) and DCV / DVV direct fired units
PEP™ Filters	Media Filters and Centrifugal Separators
Sellers MANUFACTURING CO	Steam / Hot Water Boilers and Water Heaters, Blow Down Separators, Boiler Feed Systems, Deaerators and Economizers
Skidmore A Swan Group Company	Condensate Return Pumps, Boiler Feed Systems, Glycol Feed Systems, Magnetic Filters, Vacuum Systems and accessories
Taco Comfort Solutions A Taco Group Company	Centrifugal Pumps, Heat Exchangers and Hydronic Accessories
TCH TWIN CITY HOSE INC.	Corrugated Flexible Metal Hose, Metal Braided Flex Connectors, Metal, Rubber and PTFE Expansion Joints
WATER CONTROL	Water Treatment Systems Including Softening, Disinfection, Water Reclamation / Rain Water Harvesting, High Purity, Legionella and Pathogen Control and Specialty Filtration,

Emerson Swan 2307 Silas Deane Highway, Rocky Hill, CT 06067 ~ www.emersonswan.com

Instruction Manual
Plate Heat Exchangers

M15 TL10 T20 TS20
MX25 M30 MA30 TL35
AQ4L AQ6 AQ10
AQ8 AQ14
AQ14L



Part number 34500621-01
0808

Table of contents

eng

How to contact Alfa Laval:

Contact details for all countries are continually updated on our website.

Please visit **www.alfalaval.com** and contact your local Alfa Laval Representative.

Except for this Instruction Manual, the following documents are also included in this shipment:

– Plate Heat Exchanger (PHE) drawing

– Plate hanging list

– Parts list with exploded view drawing.

eng

Environmental compliance

AlfaLaval endeavours to perform its own operations as cleanly and efficiently as possible, and take environmental aspects into consideration when developing, designing, manufacturing, servicing and marketing its products.

Unpacking

Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.

- Wood and cardboard boxes can be reused, recycled or used for energy recovery.
- Plastics should be recycled or burnt at a licensed waste incineration plant.
- Metal straps should be sent for material recycling.

Maintenance

During maintenance oil and wear parts in the machine are replaced.

- All metal parts should be sent for material recycling.
- Worn out or defective electronic parts should be sent to a licensed handler for material recycling.
- Oil and all non metal wear parts must be taken care of in agreement with local regulations.

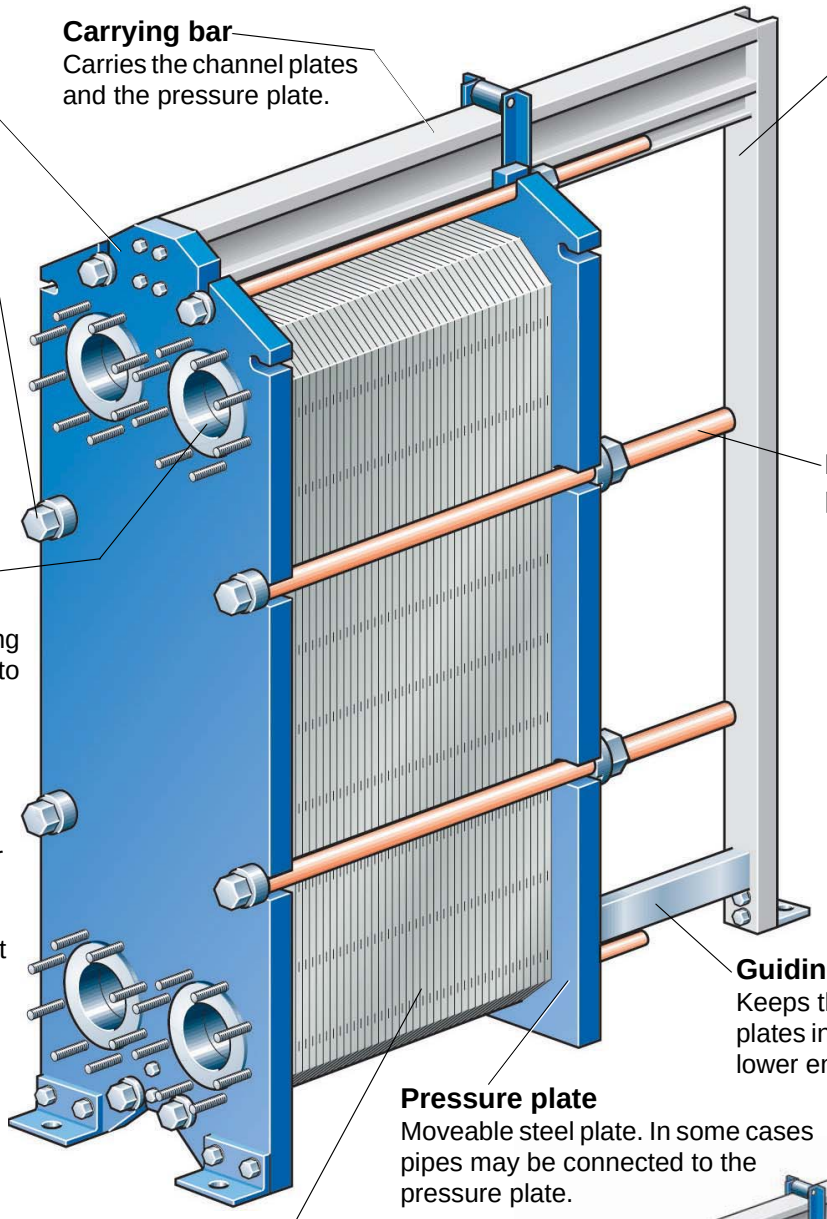
Scrapping

At end of use, the equipment shall be recycled according to relevant, local regulations. Beside the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in absence of local regulations, please contact the local AlfaLaval sales company.

eng

Description

Main components



Carrying bar
Carries the channel plates and the pressure plate.

Frame plate

Support column

Tightening bolts
Press the channel plates together.

Bolt protection

Connections
Holes through the frame plate, permitting the media to enter into the heat exchanger.

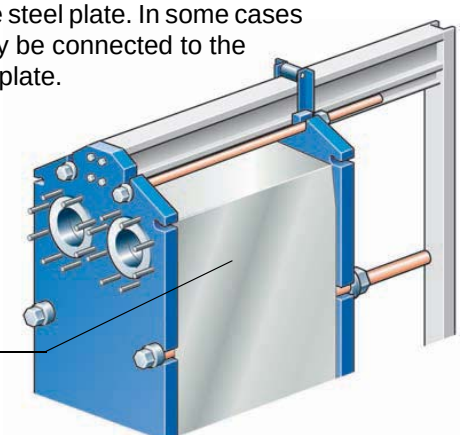
Threaded studs around the holes secure the pipes to the apparatus. Metallic or rubber-type linings may be used to protect the holes against corrosion.

Guiding bar
Keeps the channel plates in line at their lower end.

Pressure plate
Moveable steel plate. In some cases pipes may be connected to the pressure plate.

Channel plates
Heat is transferred from one medium to the other through the thin channel plates.

The number of plates determines the total heat transfer surface.



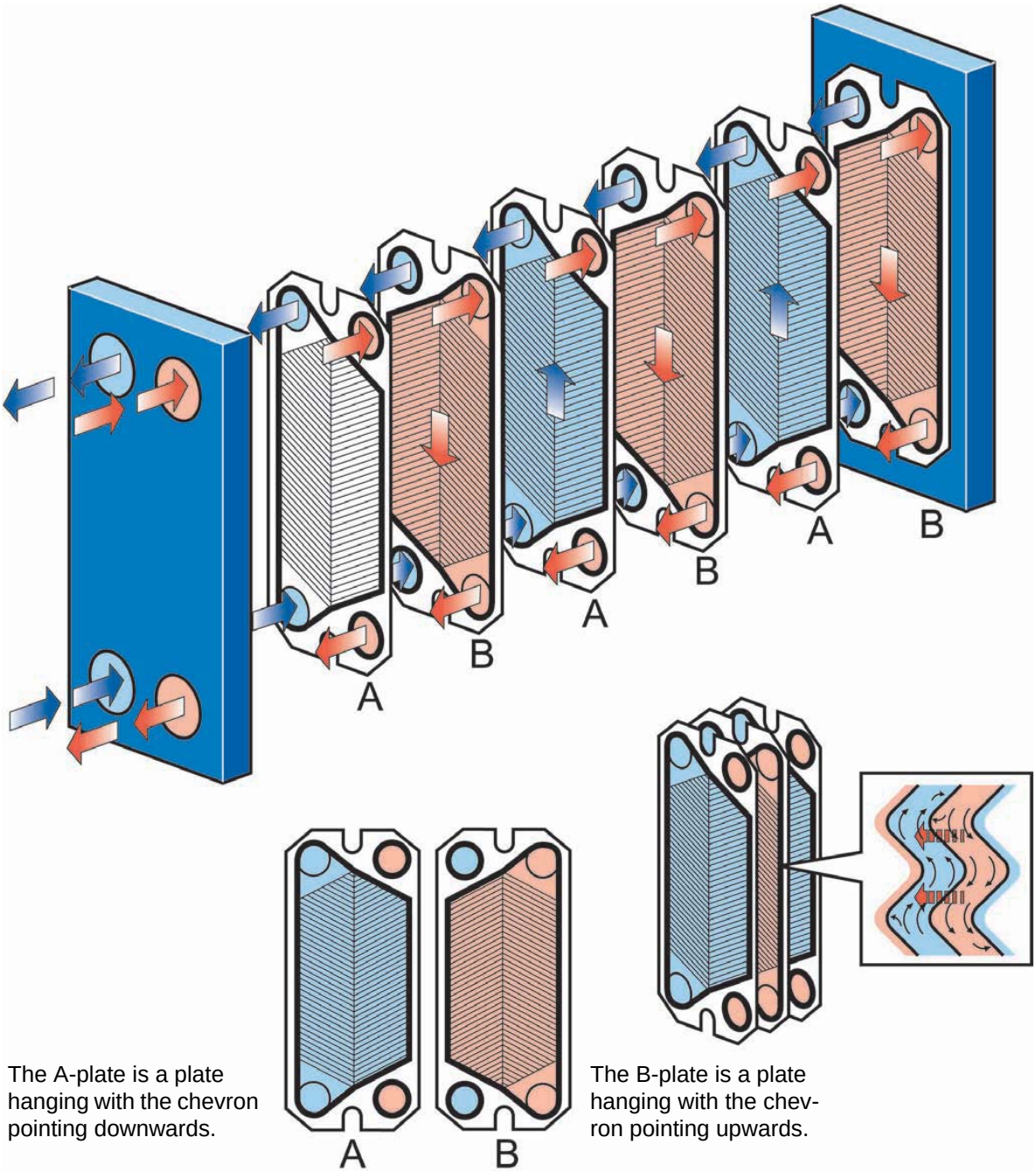
Protective sheets
Supplied on request.

eng

Function

The plate heat exchanger consists of a pack of corrugated metal plates with portholes for the passage of the two fluids between which heat transfer will take place.

The plate pack is assembled between a frame plate and a pressure plate and compressed by tightening bolts. The plates are fitted with a gasket which seals the channel and directs the fluids into alternate channels. The plate corrugation promotes fluid turbulence and supports the plates against differential pressure.



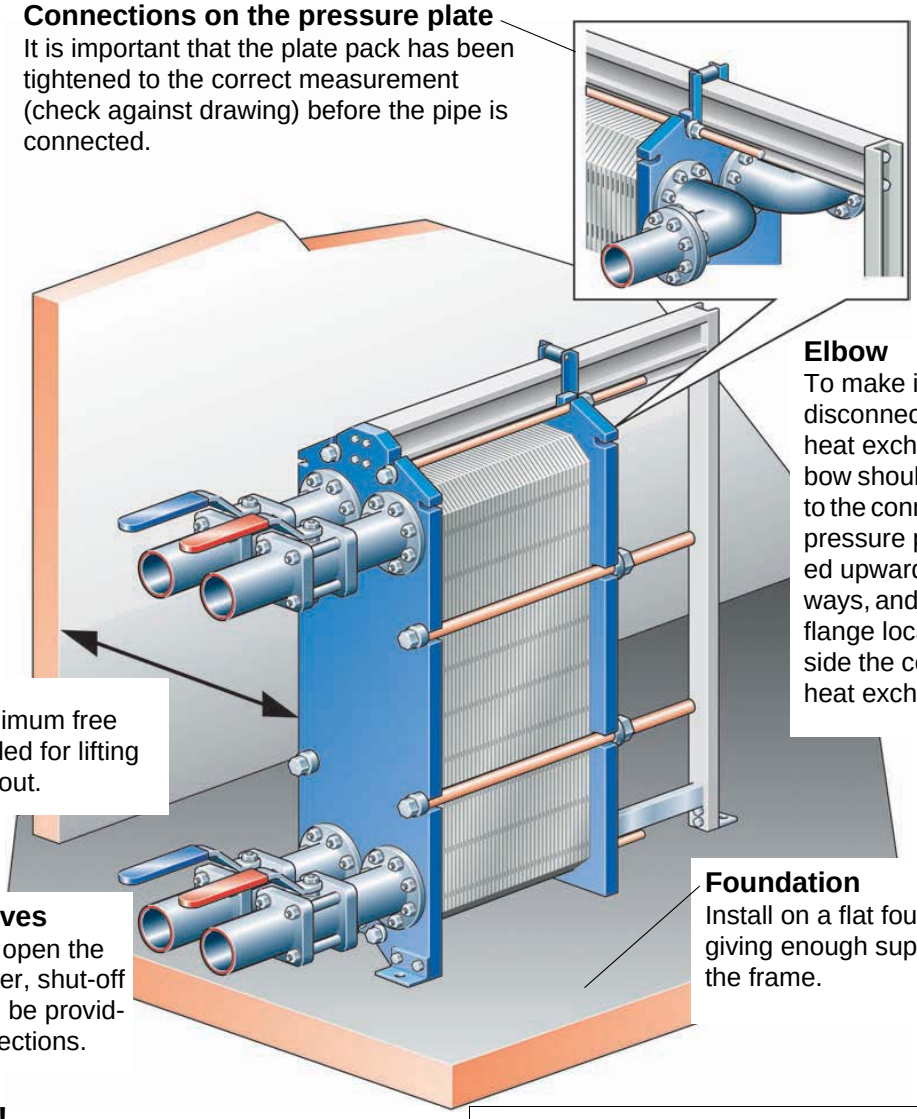
The A-plate is a plate hanging with the chevron pointing downwards.

The B-plate is a plate hanging with the chevron pointing upwards.

Installation

Requirements

Multi-pass units:
Connections on the pressure plate
It is important that the plate pack has been tightened to the correct measurement (check against drawing) before the pipe is connected.



Elbow
To make it easier to disconnect the plate heat exchanger, an elbow should be flanged to the connection in the pressure plate, directed upwards or sideways, and with another flange located just outside the contour of the heat exchanger.

Space
1500 mm minimum free space is needed for lifting plates in and out.

Shut-off valves
To be able to open the heat exchanger, shut-off valves should be provided in all connections.

Foundation
Install on a flat foundation giving enough support to the frame.

Note!

- Before connecting any piping, make sure all foreign objects have been rinsed out of the system.
- When connecting the pipe system make sure the pipes do not subject the plate heat exchanger to stress or strain.
- To avoid water hammer, do not use fast-closing valves.

Safety valves should be installed according to current pressure vessel regulations.

If PHE surface temperature is expected to be hot or cold, the PHE should be isolated.

It is recommended that protective sheets are used to cover the PHE.

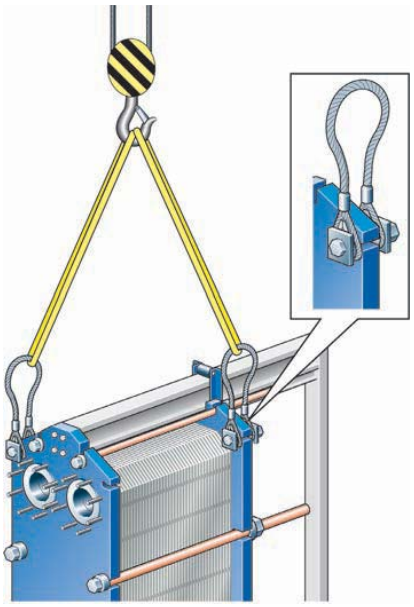
For each model, design pressures and temperatures are marked on the identification plate. Those must not be exceeded.

eng

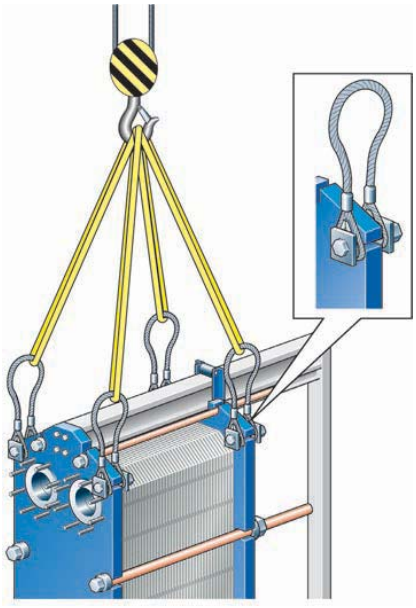
Lifting

Warning!
Never lift by the connections or the studs around them. Straps should be used when lifting. Place straps according to picture.

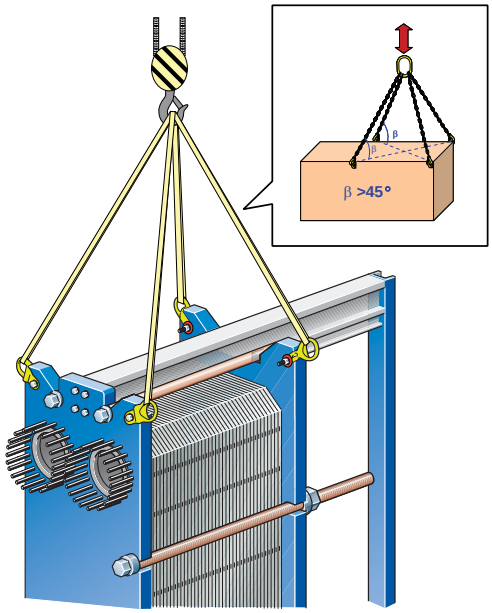
M15,AQ6,TL10,AQ4L,T20,AQ8,TS20



MX25,AQ10,M30,AQ14,MA30

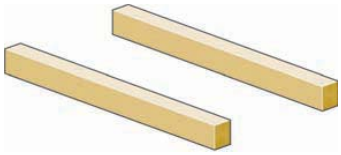


TL35,AQ14L

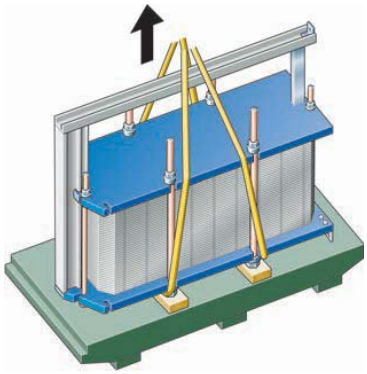


Raising

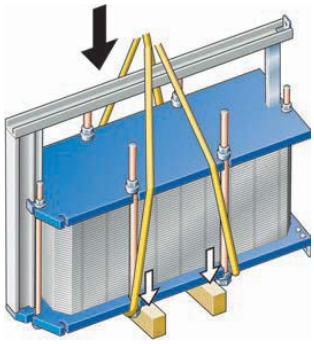
1 Place two timber beams on the floor.



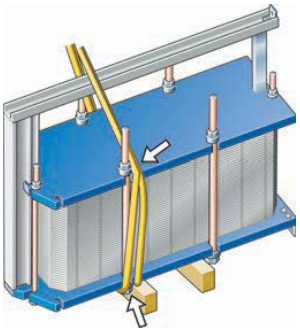
2 Lift the heat exchanger off pallet using e.g. straps.



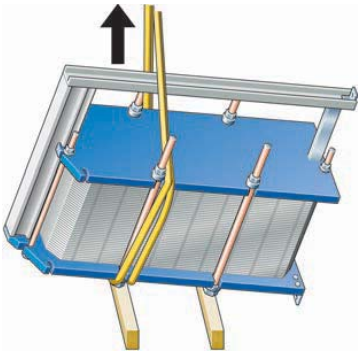
3 Place the heat exchanger on the timber beams.



4 Place straps around one bolt on each side.



5 Lift the heat exchanger off the timber beams.



6 Lower the heat exchanger to horizontal position and place it on the floor.

eng

Operation

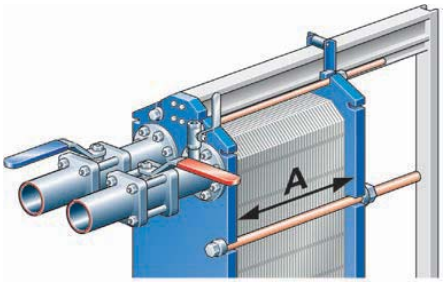
Start-up

Note!
If several pumps are included in the system, make sure you know which one should be activated first.

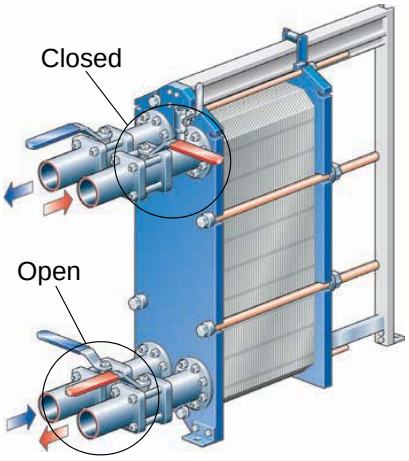
Note!
Adjustments of flowrates should be made slowly in order to avoid the risk of **water hammer**.

Water hammer is a shortlasting pressure peak that can appear during start-up or shut-down of a system, causing liquids to travel along a pipe as a wave at the speed of sound. This can cause considerable damage to the equipment.

1. Check that measurement A is correct. For A, see enclosed PHE-drawing.

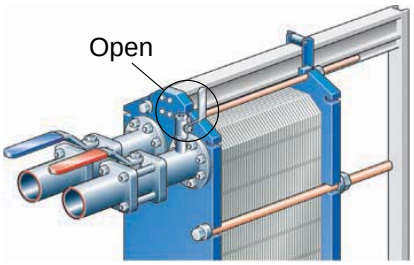


2. Check that the valve is closed between the pump and the unit controlling the system flowrate.

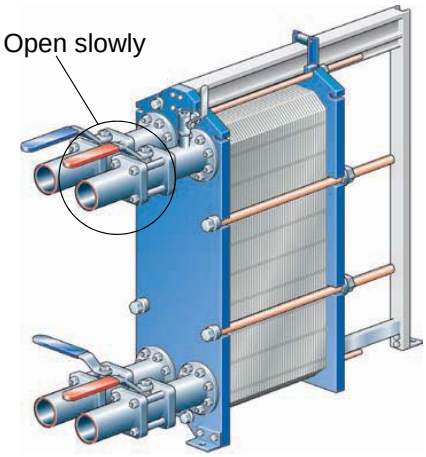


3. If there is a valve at the exit, make sure it is fully open.

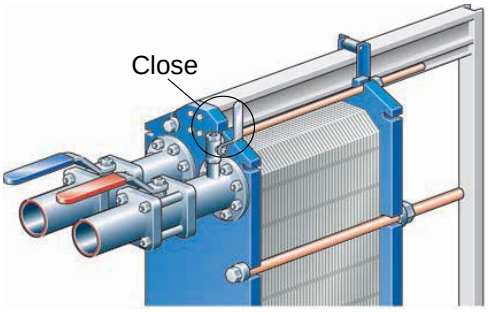
4. Open the vent and start the pump.



5. Open the valve slowly.



6. When all air is out, close the vent.



7. Repeat steps 1–6 for the second media.

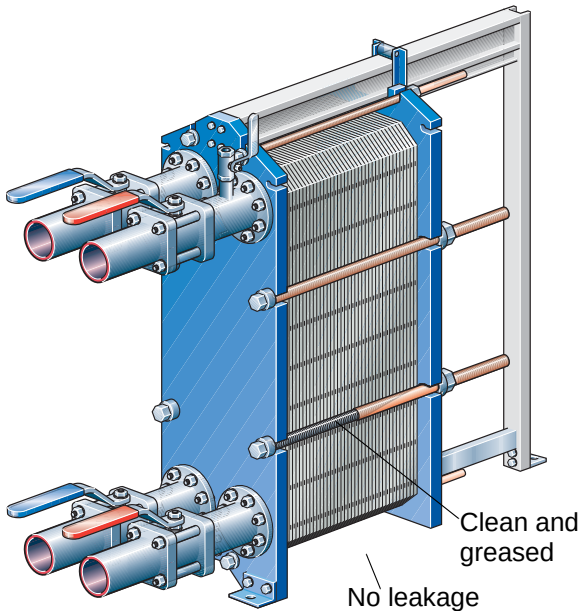
eng

Unit in operation

Note!
Adjustments of flowrates should be made slowly in order to protect the system against sudden and extreme variations of temperature and pressure.

During operation, check that

- media temperatures and pressures are within the limits stated on the PHE-drawing
- no leakages appear due to faulty tightening of the plate pack or to defective or damaged gaskets
- carrying bar and guiding bar are kept clean and greased
- the bolts are kept clean and greased.



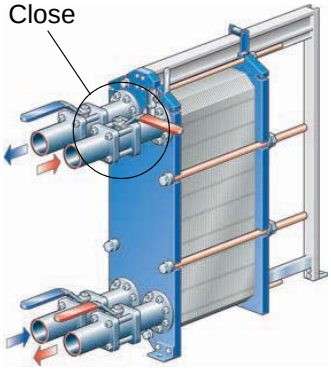
Always consult your local Alfa Laval office for advice on

- new plate pack dimensions if you intend to change number of plates
- selection of gasket material if operating temperatures and pressures are permanently changed, or if another medium is to be processed in the PHE.

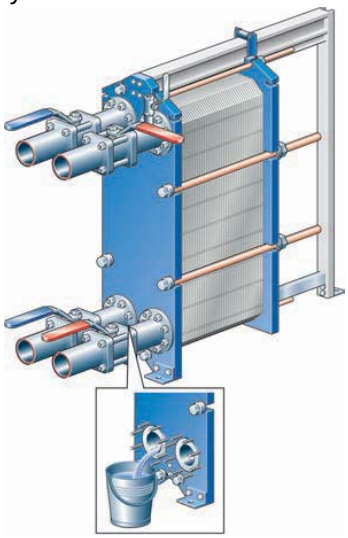
Shut-down

Note!
If several pumps are included in the system, make sure you know which one should be stopped first.

1. Slowly close the valve controlling the flow-rate of the pump you are about to stop.



2. When the valve is closed, stop the pump.
3. Repeat steps 1–2 for the other side.
4. If the heat exchanger is shut down for several days or longer, it should be drained. Draining should also be done if the process is shut down and the ambient temperature is below freezing temperature of the media. Depending on the media processed, it is also recommended to rinse and dry it.



eng

Maintenance

Cleaning-In-Place (CIP)

The Cleaning-In-Place (CIP) equipment permits cleaning of the plate heat exchanger without opening it.

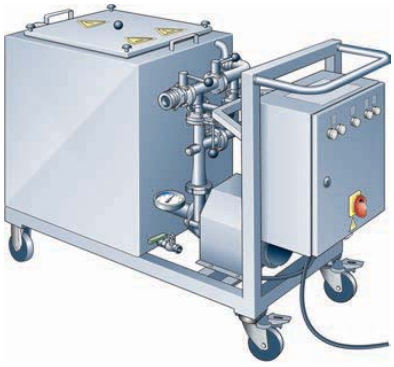
If CIP cannot be done, cleaning must be performed manually, see section “Manual cleaning”

CIP performs

- cleaning of fouling and descaling of lime deposits
- passivation of cleaned surfaces to reduce susceptibility to corrosion
- neutralization of cleaning liquids before draining.

Follow the instructions of the CIP equipment.

The following CIP models can be used: CIP75, CIP200, CIP400 and CIP800.

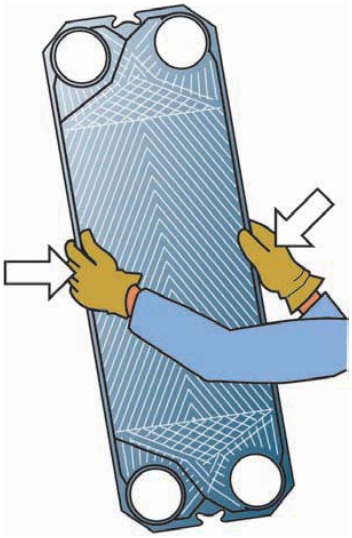


Cleaning liquids

Cleaning liquid	Description
AlfaCaus	A strong alkaline liquid, for removing paint, fat, oil and biological deposits.
AlfaPhos	An acid cleaning liquid for removing metallic oxides, rust, lime and other inorganic scale.
AlfaPass	An alkaline liquid for passivation (inhibition of corrosion).
AlfaNeutra	A strong alkaline liquid for neutralization of AlfaPhos before drainage.
Alfa P-Scale	An acidic cleaning powder with a corrosion inhibitor particularly effective for removing of calcium carbonate and other inorganic scale.
Alfa P-Neutra	An alkaline powder for neutralization of used Alfa P-Scale prior to disposal.
AlfaAdd	A neutral cleaning strengthener to be used with AlfaPhos, AlfaCaus and Alfa P-Scale. Provides better cleaning results on oily, fatty surfaces and where biological growth occurs. AlfaAdd also reduces any foaming.
Alpacon Descalant	An acidic, water based, non-hazardous cleaning agent designed for removal of scale, magnetite, algae, humus, mussels, shellfish, lime and rust. Containing BIOGEN ACTIVE, a biological mixture made from renewable materials, as an active ingredient.
Alpacon Degreaser	A neutral degreaser to be used with Alpacon Descalant. Effectively removes oil, fat or grease layers, but also reduces foaming. Containing BIOGEN ACTIVE, a biological mixture made from renewable materials, as an active ingredient.

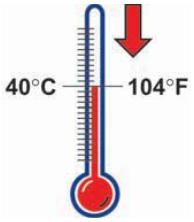
Manual cleaning

Warning!
To avoid hand injuries owing to sharp edges, protective gloves should always be worn when handling plates and protective sheets.

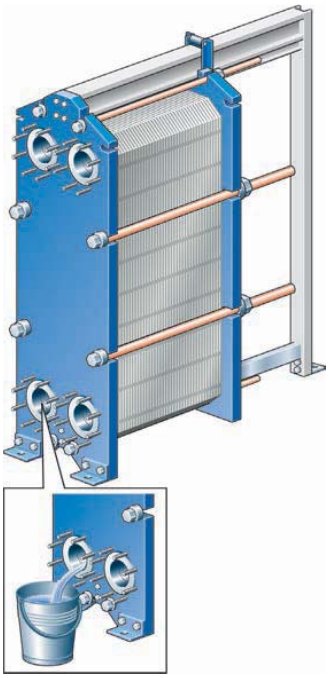


Opening

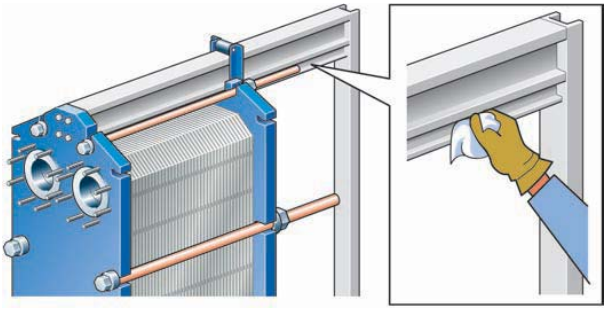
Warning!
If the heat exchanger is hot, wait until it has cooled down to about 40 °C (104 °F).



1. Drain the plate heat exchanger.

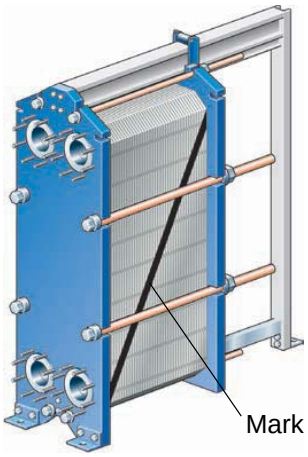


2. Inspect the sliding surfaces of the carrying bar and wipe clean.

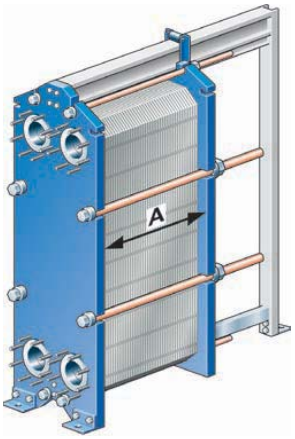


eng

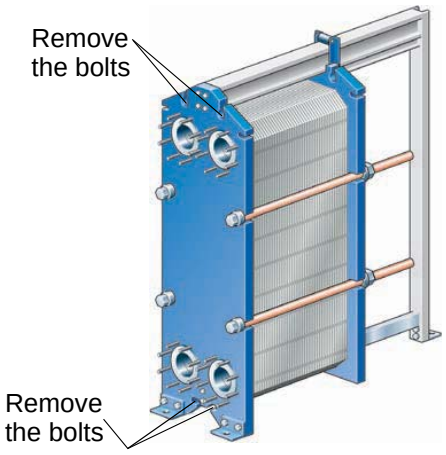
3 Mark the plate assembly on the outside by a diagonal line.



4 Measure and note down the dimension A.



5 Loosen the bolts which are not fitted with bearing boxes and remove them.

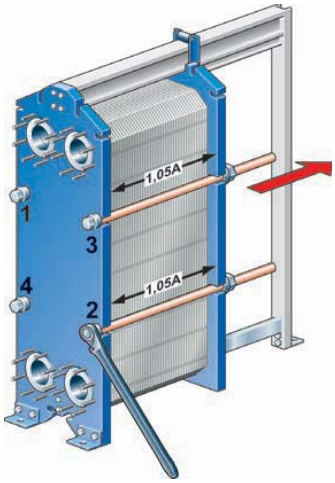


6 The pairs of bolts that are fitted with bearing boxes are opened alternately and diagonally in two steps, see figures below.

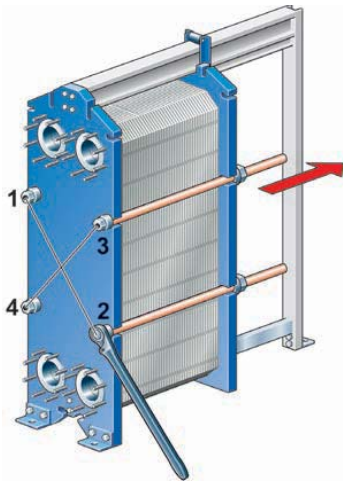
Step	Bolt No.	To dimension
1	1–2–3–4	1,05A
2	1–2 or 3–4	Opening

Be careful so that the frame plate and pressure plate are always in parallel. Skewing of the pressure plate during opening must not exceed 10 mm (**2 turns per bolt**) across the width and 25 mm (**5 turns per bolt**) vertically.

Step 1: Loosen the four bolts alternately and diagonally until the plate package measures 1,05A.



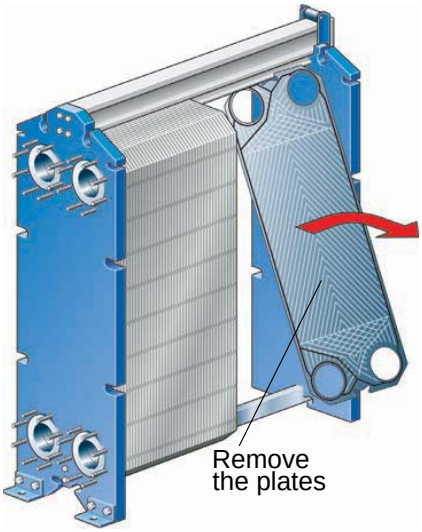
Step 2: Loosen the two diagonal pairs of bolts are loosened alternately, as shown in the figure below.



7 Open the plate pack by letting the pressure plate glide on the carrying bar.

If plates are to be numbered, do this before removing the plates.

Plates need not to be removed if cleaning is done using only water, i.e. without cleaning agent.



eng

Manual cleaning of opened units

Caution!
Never use hydrochloric acid with stainless steel plates. Water of more than 330 ppm Cl may not be used for the preparation of cleaning solutions. It is very important that carrying bars and support columns in aluminium are protected against chemicals.

Note!
Be careful not to damage the gasket during manual cleaning.

Deposits removable with water and brush

Plates need not to be removed from the plate heat exchanger during cleaning.

1. Remove deposits using a soft brush and running water.

2. Rinse with water using a high pressure hose.

Deposits not removable with water and brush

Plates must be removed from the plate heat exchanger during cleaning.

1. Brush with cleaning agent.

2. Rinse with water.

Cleaning agents – Incrustation, scaling
Concentration max 4 %
Temperature max 60 °C (140 °F)

Incrustation – Scaling	Sediment	Cleaning agent
Calcium carbonate	Corrosion products	Nitric acid
Calcium sulphate	Metal oxides	Sulfamic acid
Silicates	Silt	Citric acid
	Alumina	Phosphoric acid
	Diatomic organisms and their excrement of various colours	Complexing agents (EDTA, NTA) Sodium polyphosphates

Cleaning agents – Biological growth, slime
Concentration max 4 %
Temperature max 80 °C (176 °F)

Biological growth – Slime	Cleaning agent
Bacteria	Sodium hydroxide
Nematodes	Sodium carbonate
Protozoa	Cleaning effect can be considerably increased by the addition of small quantities of hypochlorite or agents for the formation of complexes and surfactants.

Cleaning agents – Oil residues, asphalt, fats

Deposit	Cleaning agent
Oil residues Asphalt Fats	Paraffinic naphta-based solvent (e.g. kerosine). **Note**! Gaskets in EPDM rubber qualities swell in these media. Contact time should be limited to 30 minutes.

Caution!

The following solutions should not be used:

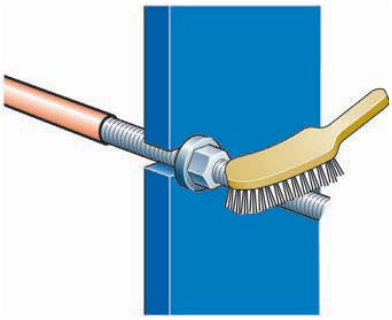
- Ketones (e.g. Acetone, Methyletylketone, Methylisobutylketone
- Esters (e.g. Ethylacetate, Butylacetate)
- Halogenated hydrocarbons (e.g. Chlorothene, Carbon tetrachloride, Freons)
- Aromatics (e.g. Benzene, Toluene).

eng

Closing

1 Check that all the sealing surfaces are clean.

2 Brush the threads of the bolts clean, using a steel wire brush. Lubricate the threads with a thin layer of grease, e.g. Gleitmo 800 or equivalent.

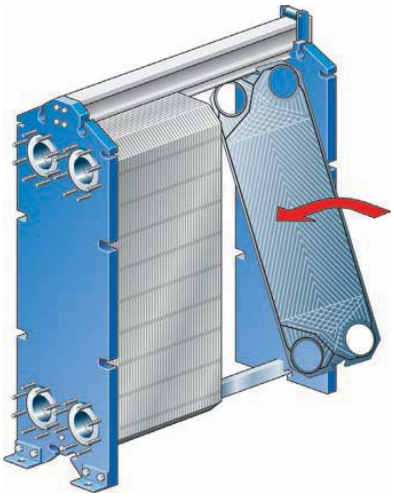


3 Attach gaskets to the plates or check that all the gaskets are properly attached.

Note!

If the gasket is wrongly positioned, it will show by the fact that it rises out of the gasket groove or that it is positioned outside the groove.

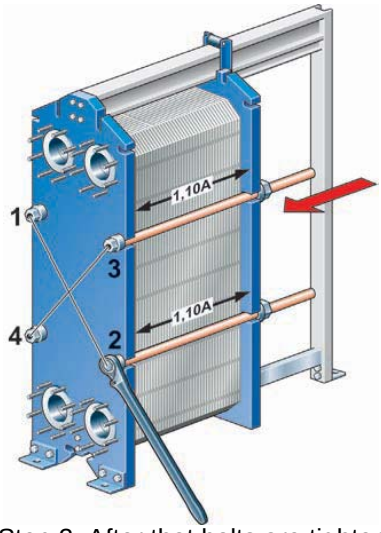
4 Insert the plates with the herring bone pattern positioned in alternate directions and with the gaskets turned towards the frame plate.



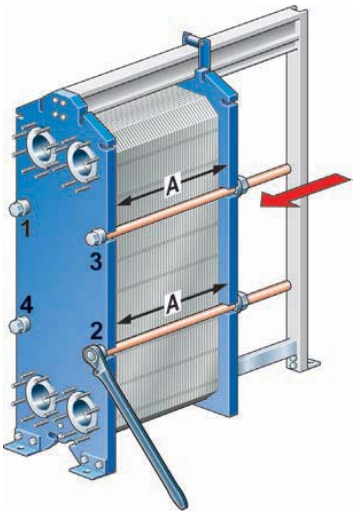
5 Press the plate assembly together. Tightening is done in two steps, see figures below. Be careful so that the frame plate and the pressure plate are always in parallel.

Step	Bolt No.	To dimension
1	1–2 or 3–4	1,10A
2	1–2–3–4	A

Step 1: Tighten the two diagonal pairs of bolts alternately until the plate package measures 1,10A.



Step 2: After that bolts are tightened alternately and diagonally, as shown in the figure below. Check the dimension A during tightening at the positions of the bolts that are being used.



Max tightening torque

Note!
When a pneumatic tightening device is used, see table below for maximum torque. Measure dimension A during tightening.

Bolt size	Bolt with bearing box		Bolt with washers	
	N·m	kpm	N·m	kpm
M24			450	45
M30			900	90
M39	1300	130	2000	200
M48	2100	210	3300	330

For manual tightening, the tightening torque has to be estimated.

If dimension A cannot be reached

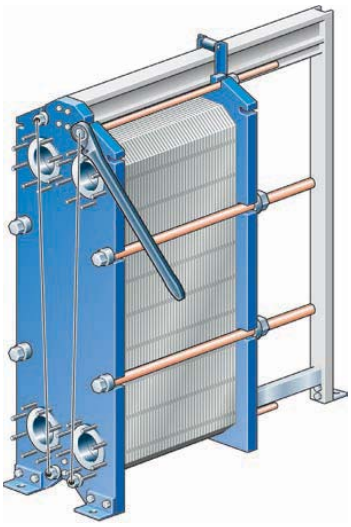
- Check the number of plates and the dimension A.
- Check that all the nuts and bearing boxes are running freely. If not, clean and lubricate, or replace.

The dimension A can be exceeded in exceptional cases. The following plate package lengths could then be accepted:

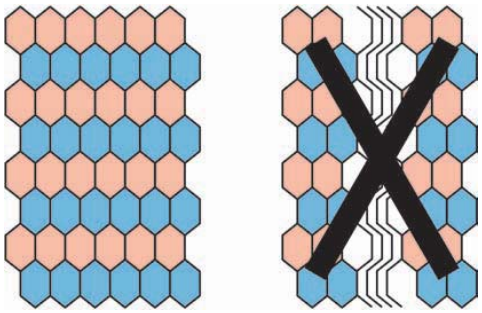
Plate package length/plate	Plate package length (dimension A)
>4 mm	A + 1 %
3–4 mm	A + 1,5 %
<3 mm	A + 2 %

6 Place the other bolts in position.

- Inspect the washers.
- When fully tightened, the bolts should all be equally tensioned.
- The difference between the plate package lengths (the dimension A) measured at adjacent bolts should not exceed:
  – 2 mm when A <1000 mm
  – 4 mm when A >1000 mm.
- The plate package length at all bolts must not differ more than 1 %.
- If the unit does not seal fully, it can be tightened to give dimension A – 1 %. The maximum tightening torque must not, however, be exceeded.



7 If the plates are correctly assembled, the edges form a “honeycomb” pattern, see picture below.



eng

Pressure test after maintenance

Before start-up of production, whenever plates or gaskets have been removed, inserted or exchanged, it is strongly recommended to perform a pressure test to confirm the internal and external sealing function of the PHE. At this test, one media side at the time must be tested with the other side open to the atmosphere.

The pressure testing shall be performed at a pressure equal to the operating pressure of the actual unit but never above the design pressure as stated on the nameplate.

The recommended test time is 10 minutes.

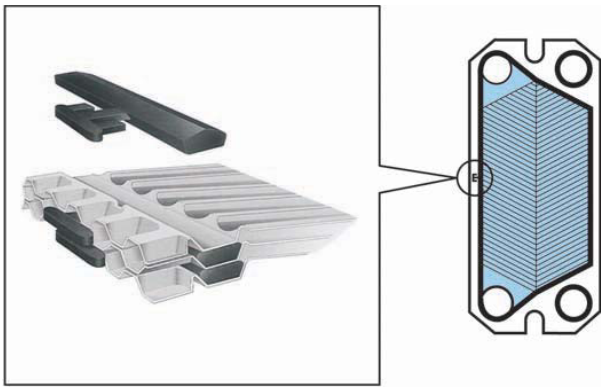
Please note that PHE units for refrigeration applications and units with media not mixable with water must be dried after hydrostatic pressure testing.

Please consult the local office/representative of the supplier for advice on the pressure testing procedure.

Regasketing

Clip-on gaskets

1. Open the plate heat exchanger according to page 9, and remove the plate that is to have a new gasket.
2. Remove the old gasket.
3. Assure that all sealing surfaces are dry, clean and free of foreign matters.
4. Attach the clip-on gasket to the plate. Slip the gasket prongs under the edge of the plate.



Note!
Make sure the two gasket prongs are in correct position.

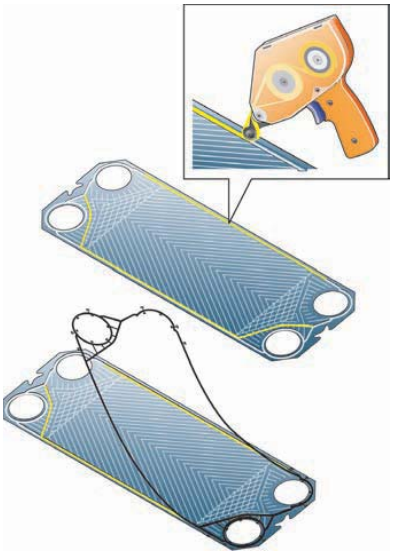
5. Proceed with the next plate to be regasketed until all plates in need of regasketing are done with.
6. Close the plate heat exchanger according to page 14.

Clip-AD gaskets (MX25,AQ10)

The Clip-AD gasket represents a system with the conventional Clip-on fastening around the ports and fastening by means of adhesive tape along the sides of the plates.

The use of the adhesive tape (GC1) is a simple way to obtain secure gasket positioning. It is adhered to the gasket groove by means of a special tape pistol, making it easy to apply the tape exactly where wanted.

1. Open the plate heat exchanger according to page 9, and remove the plate that is to have a new gasket.
2. Remove the old gasket.
3. It is not necessary to remove old tapes as the film is very thin. Make sure, however, that the gasket groove is clean and dry.
4. Adhere tape, using the pistol.



eng

5 Attach the gasket to the plate. Slip the gasket prongs under the edge of the plate.

6 Close the plate heat exchanger according to page 14.

Glued gaskets
Separate gluing instructions will be delivered together with the glue.

ACH550

Installation, Operation and Maintenance Manual (I, O & M)
ACH550-UH HVAC Drives (1...550 HP)
ACH550-BCR/BDR/VCR/VDR E-Clipse Bypass Drives (1...400 HP)
ACH550-PCR/PDR Packaged Drives with Disconnect (1...550 HP)

Safety

Use of warnings and notes

There are two types of safety instructions throughout this manual:

- Notes draw attention to a particular condition or fact, or give information on a subject.
- Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment. They also tell you how to avoid the danger. The warning symbols are used as follows:

Electricity warning warns of hazards from electricity which can cause physical injury and/or damage to the equipment.

- **WARNING!** The ACH550 adjustable speed AC drive should ONLY be installed by a qualified electrician.
- **WARNING!** Even when the motor is stopped, dangerous voltage is present at the power circuit terminals U1, V1, W1 (L1, L2, L3) and U2, V2, W2 (T1, T2 T3) and, depending on the frame size, UDC+ and UDC-, or BRK+ and BRK-.
- **WARNING!** Dangerous voltage is present when input power is connected. After disconnecting the supply, wait at least 5 minutes (to let the intermediate circuit capacitors discharge) before removing the cover.
- **WARNING!** Even when power is switched off from the input terminals of the ACH550, there may be dangerous voltage (from external sources) on the terminals of the relay outputs.
- **WARNING!** When the control terminals of two or more drives are connected in parallel, the auxiliary voltage for these control connections must be taken from a single source which can either be one of the drives or an external supply.
- **WARNING!** Disconnect the internal EMC filter when installing the drive on an IT system (an ungrounded power system or a high-resistance-grounded [over 30 ohm] power system).
- **WARNING!** Do not attempt to install or remove EM1, EM3, F1 or F2 screws while power is applied to the drive's input terminals.

General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.

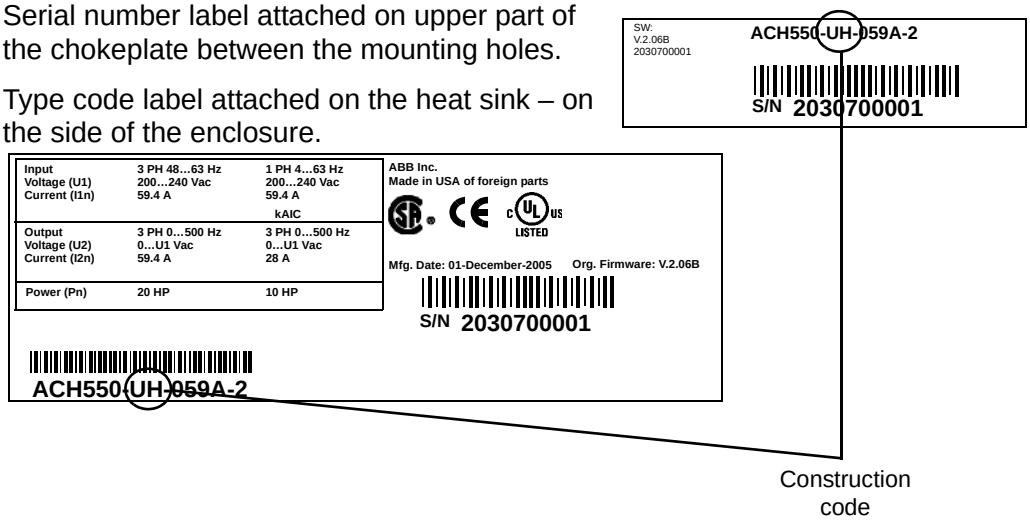
- **WARNING!** Do not control the motor with the disconnecting device (disconnecting means); instead, use the control panel keys or commands via the I/O board of the drive. The maximum allowed number of charging cycles of the DC capacitors (i.e. power-ups by applying power) is five in ten minutes.
- **WARNING!** Never attempt to repair a malfunctioning ACH550; contact the factory or your local Authorized Service Center for repair or replacement.
- **WARNING!** The ACH550 will start up automatically after an input voltage interruption if the external run command is on.
- **WARNING!** The heat sink may reach a high temperature.

Note: For more technical information, contact the factory or your local ABB representative.

Contents

This manual is the Operation and Maintenance Manual for the ACH550 Drives. Complete technical details and programming information are available in the *ACH550 User's Manual*, publication number 3AUA0000081823.

1. To determine the type of your drive, refer to its construction code on either:
   - Serial number label attached on upper part of the chokeplate between the mounting holes.
   - Type code label attached on the heat sink – on the side of the enclosure.



2. According to the construction code, proceed to your drive's installation, operation, diagnostics and maintenance information:
   - UH – Below.
   - VCR, VDR, BCR, BDR (E-Clipse Bypass) – page *39*.
   - PCR, PDR (Packaged Drives with Disconnect) – page *79*.

ACH550-UH

Installation

Study these installation instructions carefully before proceeding. **Failure to observe the warnings and instructions may cause a malfunction or personal hazard.**

WARNING! Before you begin read *Safety* on page *2*.

Note: Keep a minimum of 50 mm (2") of free space on each side and 200 mm (8") of free space above and below all units from non-heat producing sources. Double these distances from heat producing sources.

1. Prepare for installation

Lifting R1…R6

Lift the drive only by the metal chassis.

Lifting R7…R8

WARNING! Handle and ship floor mounted enclosures only in the upright position. These units are not designed to be laid on their backs.

1. Use a pallet truck to move the transport package/enclosure to the installation site.
2. Remove the cabinet side panels for access to the cabinet/pallet mounting bolts. (6 torx screws hold each cabinet side panel in place. Leave the side panels off until later.)
3. Remove the 4 bolts that secure the cabinet to the shipping pallet.

WARNING! Use the lifting lugs/bars at the top of the unit to lift R7/R8 drives.

4. Use a hoist to lift the drive. (Do not place drive in final position until mounting site is prepared.)

Unpack the drive

1. Unpack the drive.
2. Check for any damage and notify the shipper immediately if damaged components are found.
3. Check the contents against the order and the shipping label to verify that all parts have been received.

Tools required

To install the ACH550 you need the following:

- Screwdrivers (as appropriate for the mounting hardware used)
- Wire stripper
- Tape measure
- Drill
- Frame sizes R5…R8 with UL type 12 enclosure: Punch for conduit mounting holes
- Frame sizes R7/R8: pallet truck and hoist
- For installations involving frame size R6…R8: The appropriate crimping tool for power cable lugs.

- Mounting hardware: screws or nuts and bolts, four each. The type of hardware depends on the mounting surface and the frame size:

Frame Size	Mounting Hardware		Note
R1…R4	M5	#10	
R5	M6	1/4 in	
R6	M8	5/16 in	
R7…R8	M10	7/16	Secures free standing cabinets if required.

- For installations involving frame size R7…R8: Hoist.

WARNING! Before installing the ACH550, ensure the input power supply to the drive is off.

WARNING! Metal shavings or debris in the enclosure can damage electrical equipment and create a hazardous condition. Where parts, such as conduit plates require cutting or drilling, first remove the part. If that is not practical, cover nearby electrical components to protect them from all shavings or debris.

Flange Mounting Instructions

Frame size	IP21 / UL type 1		IP54 / UL type 12	
	Kit	Code (English)	Kit	Code (English)
R1	FMK-A-R1	100000982	FMK-B-R1	100000990
R2	FMK-A-R2	100000984	FMK-B-R2	100000992
R3	FMK-A-R3	100000986	FMK-B-R3	100000994
R4	FMK-A-R4	100000988	FMK-B-R4	100000996
R5	AC8-FLNGMT-R5	ACS800-PNTG01U-EN	-	-
R6	AC8-FLNGMT-R6		-	-

2. Prepare the mounting location

1. Mark the position of the mounting holes.

Note: Frame sizes R3 and R4 have four holes along the top. Use only two. If possible, use the two outside holes (to allow room to remove the fan for maintenance).

Note: ACH400 drives can be replaced using the original mounting holes. For R1 and R2 frame sizes, the mounting holes are identical. For R3 and R4 frame sizes, the inside mounting holes on the top of ACH550 drives match ACH400 mounts.

Note: Frame sizes R7 and R8 have mounting holes inside the enclosure base.

Where it is not possible to use either mounting hole at the back of the base, use an L-bracket at the top of the enclosure to secure the cabinet to a wall or to the back of another enclosure. Bolt the L-bracket to the enclosure using the lifting lug bolt hole on the top of the enclosure.

2. Drill holes of appropriate size in the mounting location.

3. Remove front cover

R1…R6, *UL type 1*

1. Remove the control panel, if attached.
2. Loosen the captive screw at the top.
3. Pull near the top to remove the cover.

R1…R6, *UL type 12*

1. If hood is present: Remove screws (2) holding the hood in place.
2. If hood is present: Slide hood up and off of the cover.
3. Loosen the captive screws around the edge of the cover.
4. Remove the cover.

R7…R8, *Cabinet Door*

1. To open the cabinet door, loosen the quarter-turn screws that hold the cabinet door closed.

R7…R8, *Side Panels*

The side panels were removed to take the cabinet off the pallet. Installation access is easier if these panels are kept off throughout the installation.

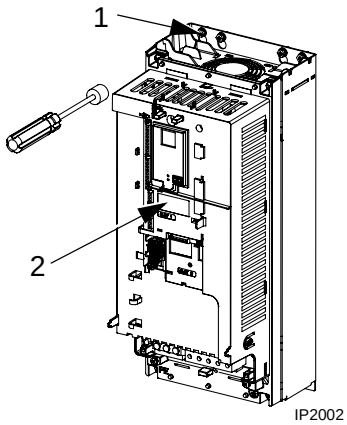
4. Mount the drive

R1…R6, *UL type 1*

1. Position the ACH550 onto the mounting screws or bolts and securely tighten in all four corners.

Note: Use mounting hardware that permits fan replacement without removal.

Note: Lift the ACH550 by its metal chassis.

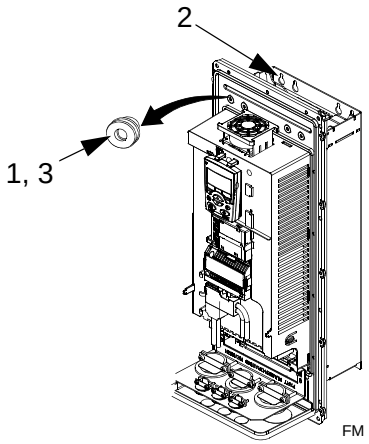


2. Non-English speaking locations: Add a warning sticker in the appropriate language over the existing warning on the top of the module.

***R1…R6,** UL type 12*

For the UL type 12 enclosures, rubber plugs are required in the holes provided for access to the drive mounting slots.

1. As required for access, remove the rubber plugs. Push plugs out from the back of the drive.
2. R5 & R6: Align the sheet metal hood (not shown) in front of the drive's top mounting holes. (Attach as part of next step.)
3. Position the ACH550 onto the mounting screws or bolts and securely tighten in all four corners.



Note: Lift the ACH550 by its metal chassis (frame size R6 by the lifting holes on both sides at the top).

4. Re-install the rubber plugs.
5. Non-English speaking locations: Add a warning sticker in the appropriate language over the existing warning on the top of the module.

R7…R8

1. Use a hoist to move the cabinet into position.

Note: If the cabinet location does not provide access to the cabinet sides, be sure to re-mount side panels before positioning cabinet.

2. Install and tighten mounting bolts.

5. Install wiring

WARNING! Ensure the motor is compatible for use with the ACH550. The ACH550 must be installed by a competent person. If in doubt, contact your local ABB sales or service office.

Conduit kit

Wiring R1…R6 drives with the UL type 1 Enclosure requires a conduit kit with the following items:

- conduit box
- screws
- cover

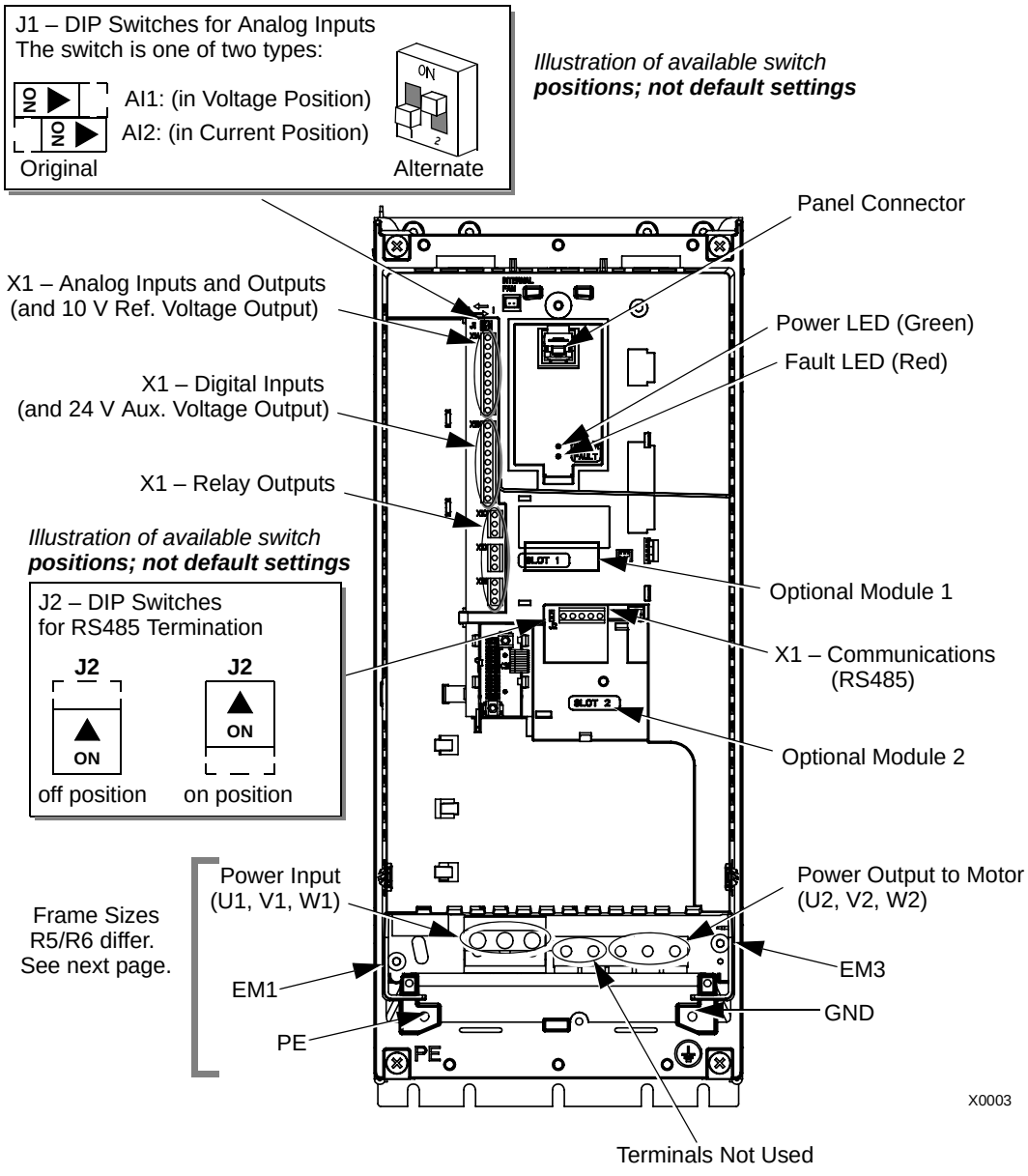
The kit is included with UL type 1 Enclosures.

Connection diagrams

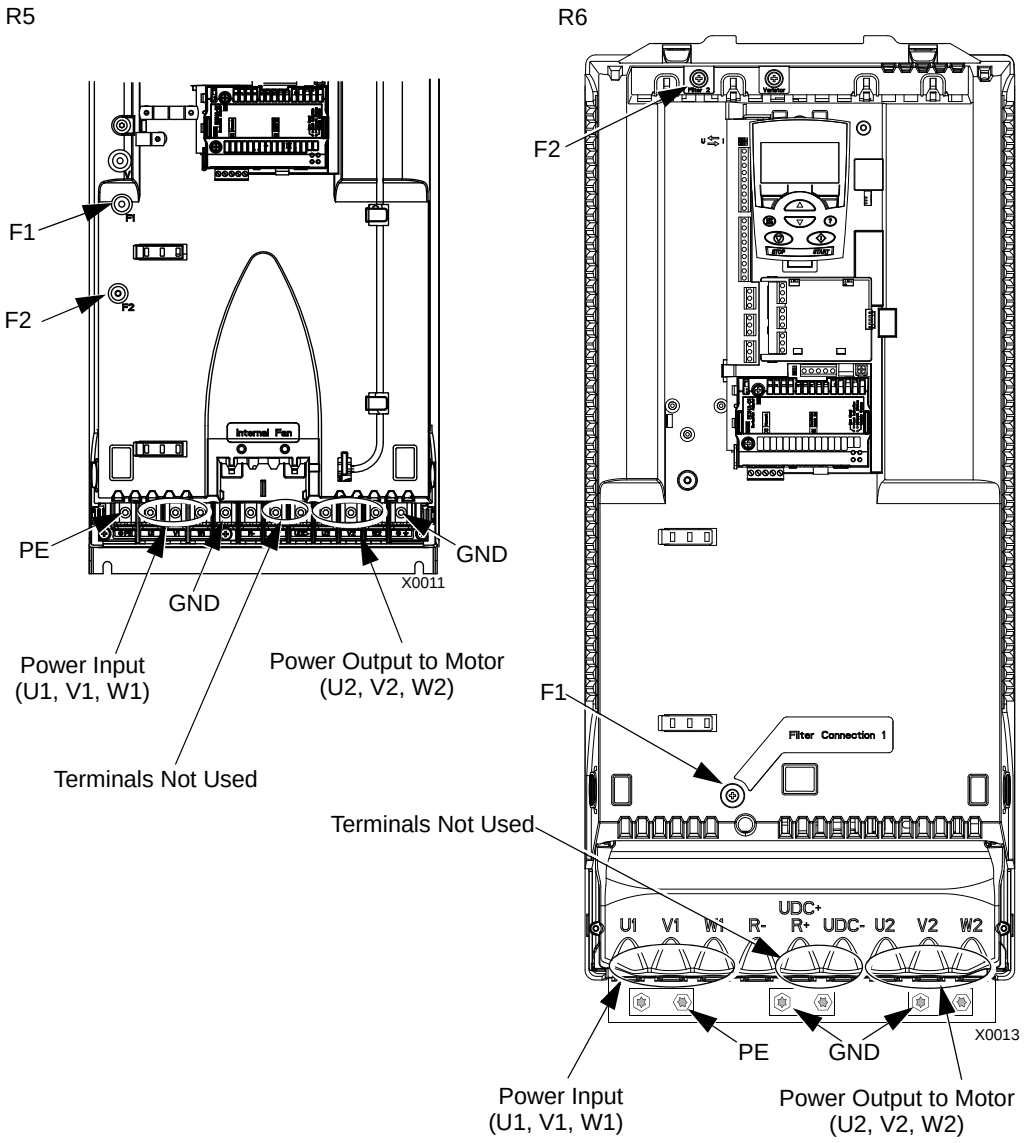
The following diagrams show:

- The terminal layout for frame size R3, which, in general, applies to frame sizes R1...R6, except for the R5/R6 power and ground terminals.
- The R5/R6 power and ground terminals.
- The terminal layout for R7/R8.

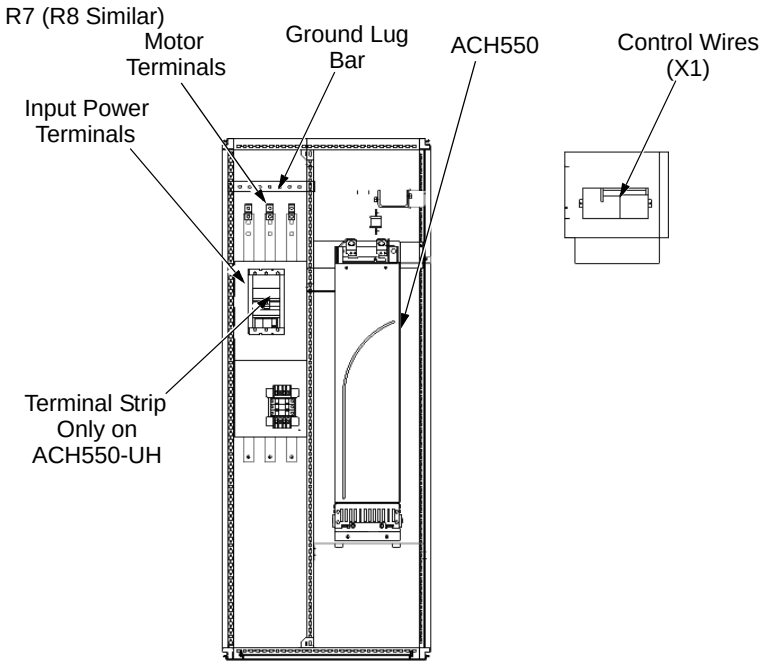
R1...R4 (Diagram shows the R3 frame.)



WARNING! To avoid danger, or damage to the drive, on IT systems and corner grounded TN systems, see section *Disconnecting the internal EMC filter* on page *10*.



WARNING! To avoid danger, or damage to the drive, on IT systems and corner grounded TN systems, see section *Disconnecting the internal EMC filter* on page *10*.



Disconnecting the internal EMC filter

On certain types of systems, you must disconnect the internal EMC filter, otherwise the system will be connected to ground potential through the EMC filter capacitors, which might cause danger, or damage the drive.

Note: When the internal EMC filter is disconnected, the drive is not EMC compatible.

The following table shows the installation rules for the EMC filter screws in order to connect or disconnect the filter, depending on the system type and the frame size. For more information on the different system types, see *Floating networks* on page *12* and *Unsymmetrically grounded networks* on page *11*.

The locations of screws EM1 and EM3 are shown in the diagram on page *8*. The locations of screws F1 and F2 are shown in the diagram on page *9*.

Frame sizes	Screw	Symmetrically grounded TN systems (TN-S systems)	Corner grounded TN systems	IT systems (ungrounded or high-resistance-grounded [> 30 ohm])
R1…R3	EM1	x	x	–
	EM3	x	•	•
R4	EM1	x	x	–
	EM3	x	•	•
R5…R6	F1	x	x	–
	F2	x	x	–

x = Use the provided metal screw which may already be installed. (EMC filter(s) will be connected.)
• = Use the installed polyamide screw. (EMC output filter will be disconnected.)
– = Remove the installed metal screw. (EMC filter(s) will be disconnected.)
EM1 and EM3 screws are M4 x 12
F1 and F2 screws are M4 x 16

Ground connections

For personnel safety, proper operation and to reduce electromagnetic emission/pick-up, the drive and the motor must be grounded at the installation site.

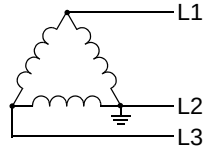
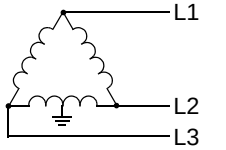
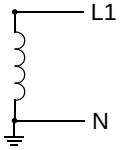
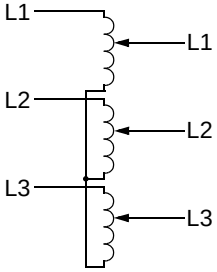
- Conductors must be adequately sized as required by safety regulations.
- Power cable shields must be connected to the drive PE terminal in order to meet safety regulations.
- Power cable shields are suitable for use as equipment grounding conductors only when the shield conductors are adequately sized as required by safety regulations.
- In multiple drive installations, do not connect drive terminals in series.

Unsymmetrically grounded networks

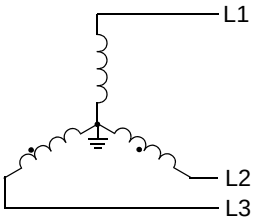
WARNING! Do not attempt to install or remove EM1 or EM3 screws while power is applied to the drive's input terminals.

Unsymmetrically grounded networks are defined in the following table. In such networks, the internal connection provided by the EM3 screw (on frame sizes R1…R4 only) must be disconnected by removing EM3. If the grounding configuration of the network is unknown, remove EM3.

Note: ACH550-UH drives are shipped with the screw removed (but included in the conduit box).

Unsymmetrically Grounded Networks – EM3 Must Be Out			
Grounded at the corner of the delta		Grounded at the mid point of a delta leg	
Single phase, grounded at an end point		Three phase "Variac" without solidly grounded neutral	

EM3 (an M4x16 screw) makes an internal ground connection that reduces electro-magnetic emission. Where EMC (electro-magnetic compatibility) is a concern, and the network is symmetrically grounded, EM3 may be installed. For reference, the diagram at right illustrates a symmetrically grounded network.



Floating networks

WARNING! Do not attempt to install or remove EM1, EM3, F1 or F2 screws while power is applied to the drive's input terminals.

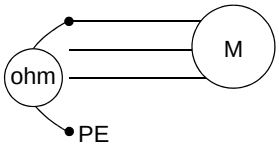
For floating networks (also known as IT, ungrounded, or impedance/resistance grounded networks):

- Disconnect the ground connection to the internal RFI filters:
  - Frame sizes R1…R4: Remove the EM1 screw (unit is shipped with EM3 removed, see *Connection diagrams* on page *8*).
  - Frame sizes R5…R6: Remove both the F1 and F2 screws (see page *9*).
- Where EMC requirements exist, check for excessive emission propagated to neighboring low voltage networks. In some cases, the natural suppression in transformers and cables is sufficient. If in doubt, use a supply transformer with static screening between the primary and secondary windings.
- Do NOT install an external RFI/EMC filter. Using an RFI filter grounds the input power through the filter capacitors, which could be dangerous and could damage the unit.

Checking motor and motor cable insulation

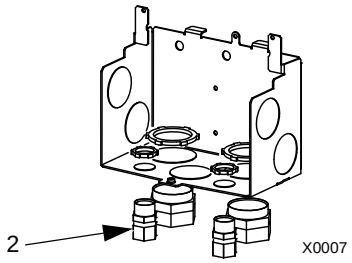
WARNING! Check the motor and motor cable insulation before connecting the drive to input power. For this test, make sure that motor cables are NOT connected to the drive.

1. Complete motor cable connections to the motor, but NOT to the drive output terminals (U2, V2, W2).
2. At the drive end of the motor cable, measure the insulation resistance between each motor cable phase and Protective Earth (PE): Apply a voltage of 1 kV DC and verify that resistance is greater than 1 Mohm.

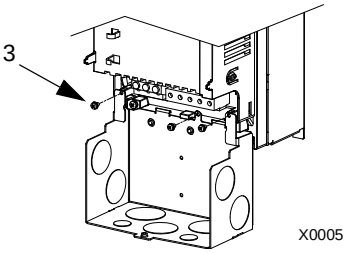


R1…R6, wiring UL type 1 enclosure

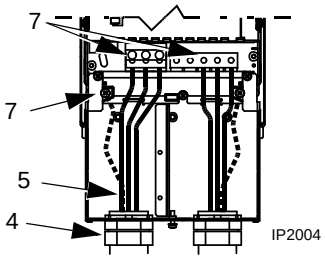
1. Open the appropriate knockouts in the conduit box. (See *Conduit kit* on page *7*.)
2. Install thin-wall conduit clamps (not supplied).



3. Install conduit box.
4. Connect conduit runs for input power, motor and control cables to the box.



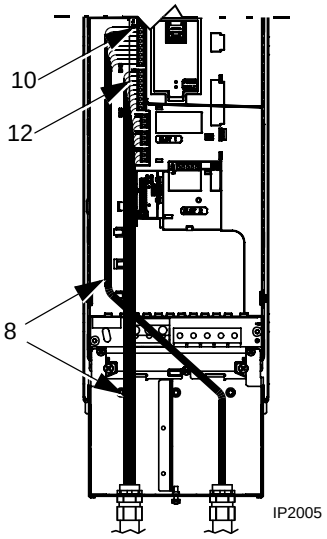
5. Route input power and motor wiring through separate conduits.
6. Strip wires.
7. Connect power, motor, and ground wires to the drive terminals.



Note: For R5 frame size, the minimum power cable size is 25 mm^2 (4 AWG). For R6 frame size, refer to *Power terminal considerations – R6 Frame size* on page *16*.

---

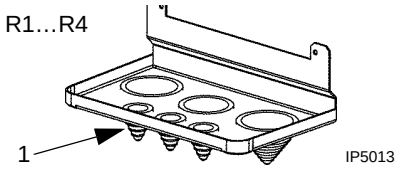
8. Route the control cables through the conduit (not the same conduit as either input power or motor wiring).
9. Use available secure points and tie strap landings to permanently secure control wiring at a minimum distance of 6 mm (1/4") from power wiring.
10. Strip the control cable sheathing and twist the copper screen into a pig-tail.
11. Connect the ground screen pig-tail for digital and analog I/O cables at X1-1. (Ground only at drive end.)
12. Connect the ground screen pig-tail for RS485 cables at X1-28 or X1-32. (Ground only at drive end.)

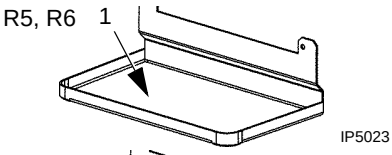


13. Strip and connect the individual control wires to the drive terminals.
14. Install the conduit box cover (1 screw).

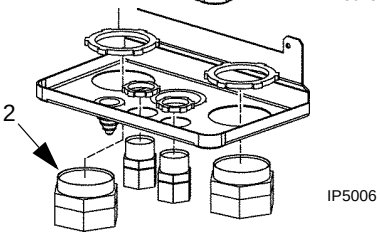
R1…R6, wiring UL type 12 enclosure

1. Step depends on Frame Size:
   - Frame Sizes R1…R4: Remove and discard the cable seals where conduit will be installed. (The cable seals are cone-shaped, rubber seals on the bottom of the drive.)
   - Frame Sizes R4 and R5: Use punch to create holes for conduit connections as needed.

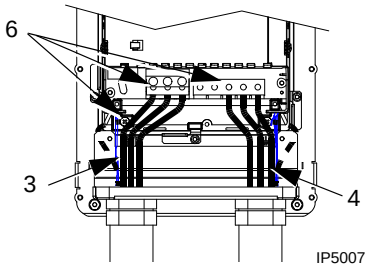




2. For each conduit run (input power, motor and control wiring must be separate), install liquid tight conduit connectors (not supplied).



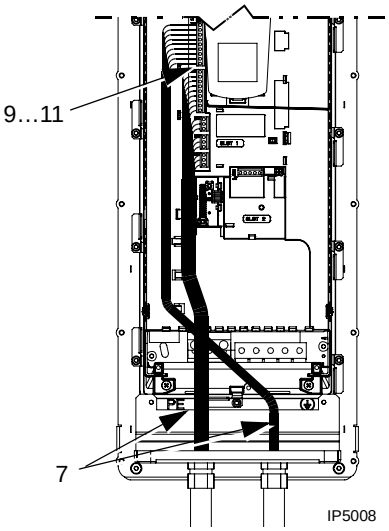
3. Route the power wiring through conduit.
4. Route the motor wiring through conduit (not the same conduit as input power wiring run). Use a separate, metal conduit run for each motor.
5. Strip the wires.
6. Connect the power, motor, and ground wires to the drive terminals.



Note: For R5 frame size, the minimum power cable size is 25 mm^2 (4 AWG). For R6 frame size, refer to *Power terminal considerations – R6 Frame size* on page *16*.

---

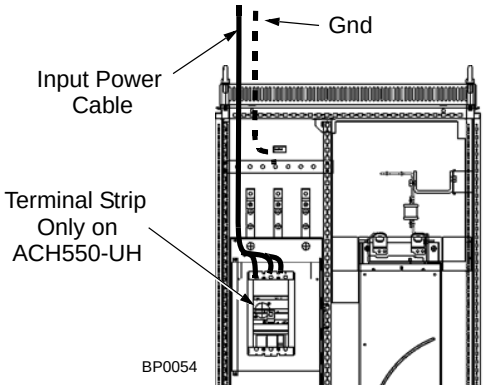
7. Route the control cables through the conduit (not the same conduit as either input power or motor wiring runs).
8. Use available secure points and tie strap landings to permanently secure control wiring at a minimum distance of 6 mm (1/4") from power wiring.
9. Strip the control cable sheathing and twist the copper screen into a pig-tail.
10. Connect the ground screen pig-tail for digital and analog I/O cables at X1-1. (Ground only at drive end.)
11. Connect the ground screen pig-tail for RS485 cables at X1-28 or X1-32. (Ground only at drive end.)
12. Strip and connect the individual control wires to the drive terminals.
13. Install the conduit box cover (1 screw).



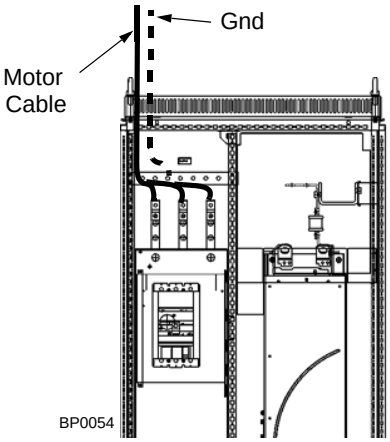
R7…R8, wiring (both enclosure types)

The figures show connections in the R7 cabinet, the R8 cabinet is similar.

1. Remove the conduit connection plate from the top of the left bay.
2. Route the input power, motor and control cables to the top of the cabinet. Each cable type (input power, motor, and control) must be in separate conduit. Use a separate, metal conduit run for each motor.
3. Use punch to create holes for conduit connections as needed.
4. UL type 12 Enclosure: For each conduit run (input power, motor and control wiring must be separate), install liquid tight conduit connectors (not supplied).



5. Connect input power and motor cables to the bus terminals.
6. Connect grounds to ground bar.
7. Use available secure points and tie strap landings to permanently secure control wiring at a minimum distance of 6 mm (1/4") from power wiring.
8. Strip the control cable sheathing and twist the copper screen into a pig-tail.
9. Connect the ground screen pig-tail for digital and analog I/O cables at X1-1. (Ground only at drive end.)
10. Connect the ground screen pig-tail for RS485 cables at X1-28 or X1-32. (Ground only at drive end.)



11. Strip and connect the individual control wires to the drive terminals.

Drive's power connection terminals

The following table provides specifications for the drive's power connection terminals.

Frame Size	U1, V1, W1 U2, V2, W2 BRK+, UDC+ Terminals						Earthing PE Terminal			
	Min. Wire Size		Max. Wire Size		Torque		Max. Wire Size		Torque	
	mm²	*AWG*	*mm²*	*AWG*	Nm	lb-ft	*mm²*	*AWG*	Nm	lb-ft
R1[Note 1]	0.75	18	10	8	1.4	1	10	8	1.4	1
R2[Note 1]	0.75	18	10	8	1.4	1	10	8	1.4	1
R3[Note 1]	2.5	14	25	3	2.5	1.8	16	6	1.8	1.3
R4[Note 1]	6	10	50	1/0	5.6	4	25	3	2	1.5
R5	6	10	70	2/0	15	11	70	2/0	15	11
R6	95[Note 2]	3/0	185	350 MCM	40	30	95	3/0	8	6
R7	16	6	185	350 MCM	40	30	Attach appropriate ring lugs to ground wires and mount with, up to five 13/32 bolts.			
R8	16	6	2x240	2x500 MCM	57	42				

1. Do not use aluminum cable with frame sizes R1…R4.
2. See the following section for smaller wire sizes on frame size R6.

Power terminal considerations – R6 Frame size

WARNING! For R6 power terminals, if compression lugs are supplied, they can only be used for wire sizes that are 95 mm^2 (3/0 AWG) or larger. Smaller wires will loosen and may damage the drive, and require ring lugs as described below.

On the R6 frame size, if the cable size used is less than 95 mm^2 (3/0 AWG) or if no compression lugs are supplied, use ring lugs.

Drive's control connection terminals

The following table provides specifications for the drive's control terminals

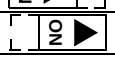
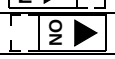
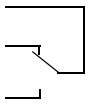
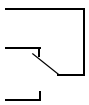
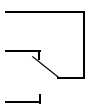
Frame Size	Control			
	Maximum Wire Size		Torque	
	mm²	*AWG*	Nm	lb-ft
All	1.5	16	0.4	0.3

Control terminal descriptions

The following full-page diagram provides a general description of the control terminals on the drive.

Note: Terminals 3, 6, and 9 are at the same potential.

Note: For safety reasons the fault relay signals a "fault" when the ACH550 is powered down.

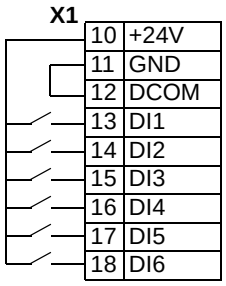
	X1		Drive Control Terminal Description
Analog I/O	1	SCR	Terminal for signal cable screen. (Connected internally to chassis ground.)
	2	AI1	Analog input channel 1, programmable. Default[2] = external reference. Resolution 0.1%, accuracy ±1%.
			J1:AI1 OFF: 0(2)…10 V (R_i = 312 kΩ)  or, for OFF  for ON 
			J1:AI1 ON: 0(4)…20 mA (R_i = 100 Ω) 
	3	AGND	Analog input circuit common (connected internally to chassis gnd. through 1 MΩ).
	4	+10 V	Potentiometer reference source: 10 V ±2%, max. 10 mA (1kΩ ≤ R ≤ 10kΩ).
	5	AI2	Analog input channel 2, programmable. Default[2] = PID feedback. Resolution 0.1%, accuracy ±1%.
			J1:AI2 OFF: 0(2)…10 V (R_i = 312 kΩ)  or, for OFF  for ON 
			J1:AI2 ON: 0(4)…20 mA (R_i = 100 Ω) 
	6	AGND	Analog input circuit common (connected internally to chassis gnd. through 1 MΩ).
	7	AO1	Analog output, programmable. Default[2] = frequency. 0…20 mA (load < 500 Ω). Accuracy ±3% full scale.
	8	AO2	Analog output, programmable. Default[2] = current. 0…20 mA (load < 500 Ω). Accuracy ±3% full scale.
	9	AGND	Analog output circuit common (connected internally to chassis gnd. through 1 MΩ).
Digital Inputs[1]	10	+24V	Auxiliary voltage output 24 VDC / 250 mA (reference to GND), short circuit protected.
	11	GND	Auxiliary voltage output common (connected internally as floating).
	12	DCOM	Digital input common. To activate a digital input, there must be ≥+10 V (or ≤-10 V) between that input and DCOM. The 24 V may be provided by the ACH550 (X1-10) or by an external 12…24 V source of either polarity.
	13	DI1	Digital input 1, programmable. Default[2] = start/stop.
	14	DI2	Digital input 2, programmable. Default[2] = not configured.
	15	DI3	Digital input 3, programmable. Default[2] = constant (preset) speed.
	16	DI4	Digital input 4, programmable. Default[2] = safety interlock.
	17	DI5	Digital input 5, programmable. Default[2] = not configured.
	18	DI6	Digital input 6, programmable. Default[2] = not configured.
Relay Outputs	19	RO1C	 Relay output 1, programmable. Default[2] = Ready Maximum: 250 VAC / 30 VDC, 2 A Minimum: 500 mW (12 V, 10 mA)
	20	RO1A	
	21	RO1B	
	22	RO2C	 Relay output 2, programmable. Default[2] = Running Maximum: 250 VAC / 30 VDC, 2 A Minimum: 500 mW (12 V, 10 mA)
	23	RO2A	
	24	RO2B	
	25	RO3C	 Relay output 3, programmable. Default[2] = Fault (-1) Maximum: 250 VAC / 30 VDC, 2 A Minimum: 500 mW (12 V, 10 mA)
	26	RO3A	
	27	RO3B	

1 Digital input impedance 1.5 kΩ. Maximum voltage for digital inputs is 30 V.

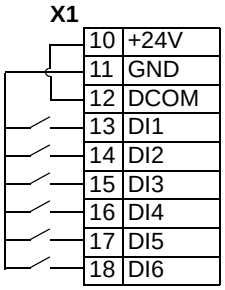
2 Default values depend on the macro used. Values specified are for the HVAC default macro.

You can wire the digital input terminals in either a PNP or NPN configuration.

PNP connection (source)



NPN connection (sink)



Serial communications

Terminals 28...32 provide RS485 serial communication connections used to control or monitor the drive from a fieldbus controller.

6. Check installation

Before applying power, perform the following checks.

✓	Check
	Installation environment conforms to the drive's specifications for ambient conditions.
	The drive is mounted securely.
	Space around the drive meets the drive's specifications for cooling.
	The motor and driven equipment are ready for start.
	For floating networks (R1…R6): The internal RFI filter is disconnected (screws EM1 & EM3 or F1 & F2).
	The drive is properly grounded.
	The input power voltage matches the drive nominal input voltage range.
	The input power connections at U1, V1, and W1 are connected and tightened as specified.
	The input power branch circuit protection is installed.
	The motor connections at U2, V2, and W2 are connected and tightened as specified.
	The input power, motor and control wiring are routed through separate conduit runs.
	NO power factor compensation capacitors are in the motor cable.
	The control connections are connected and tightened as specified.
	NO tools or foreign objects (such as drill shavings) are inside the drive.
	NO alternate power source for the motor (such as a bypass connection) is connected – no voltage is applied to the output of the drive.

7. Re-install cover

8. Apply power

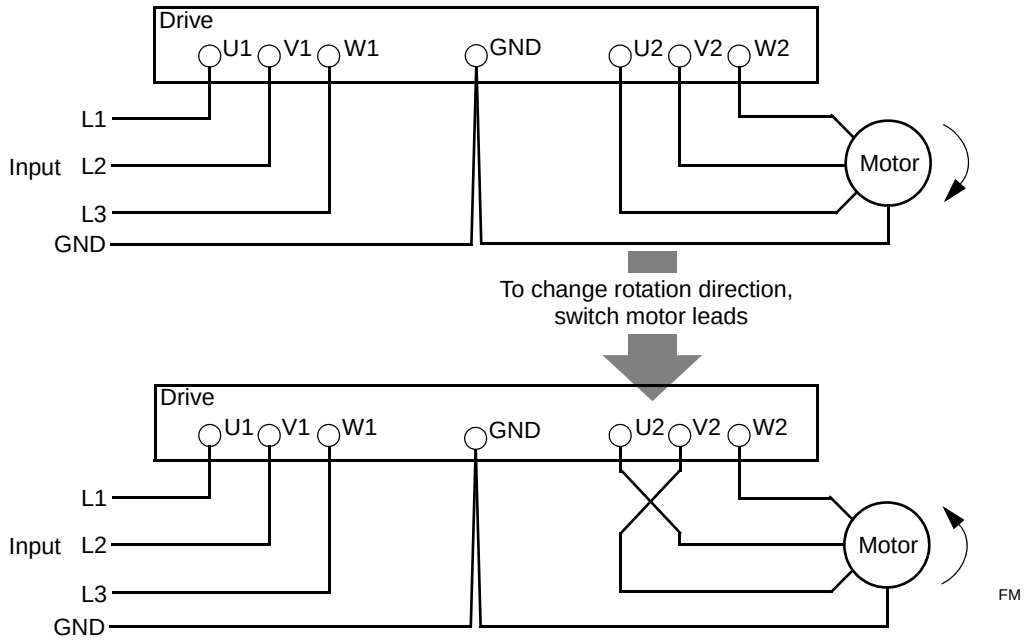
Always re-install the covers before turning power on.

WARNING! The ACH550 will start up automatically at power up, if the external run command is on.

Apply input power. When power is applied to the ACH550, the green LED comes on.

WARNING! Even when the motor is stopped, dangerous voltage is present at the power circuit terminals U1, V1, W1 (L1, L2, L3) and U2, V2, W2 (T1, T2, T3) and, depending on the frame size, UDC+ and UDC-, or BRK+ and BRK-.

Note: Before increasing motor speed, check that the motor is running in the desired direction. To change rotation direction, switch motor leads as shown below. Power circuit terminal designation and location varies depending on the frame size and some terminals are not used (UDC+ and UDC-, or BRK+ and BRK-). Refer to pages *8* and *9* for specific terminal layouts



9. Before Start-up

The ACH550 has default parameter settings that are sufficient for many situations. However, review the following situations. Perform the associated procedures as appropriate.

Spin motor

When first installed and started the control panel displays a welcome screen with the following options.

- Press Exit to commission the drive as described in section *Start-up by changing the parameters individually* on page *23*.
- Press Enter to move to the following options:
  - Select “Commission Drive” to commission the drive as described in section Start-Up by *Start-up by using the Start-Up Assistant* on page *23*.
  - Select “Spin Motor” to operate the motor prior to commissioning. This option operates the motor without any commissioning, except entry of the motor data as described below. Spin Motor is useful, for example, to operate ventilation fans prior to commissioning.

Note: When using Spin Motor, the motor speed is limited to the range 1/3…2/3 of maximum speed. Also, no interlocks are activated. Finally, once the drive is commissioned, the welcome screen and this option no longer appear.

Motor data

The motor data on the ratings plate may differ from the defaults in the ACH550. The drive provides more precise control and better thermal protection if you enter the rating plate data.

1. Gather the following from the motor ratings plate:
   - Voltage
   - Nominal motor current
   - Nominal frequency
   - Nominal speed
   - Nominal power
2. Edit parameters 9905…9909 to the correct values.
   - Assistant Control Panel: The Start-Up Assistant walks you through this data entry.
   - Basic Control Panel: Refer to *ACH550 User’s Manual*, for parameter editing instructions.

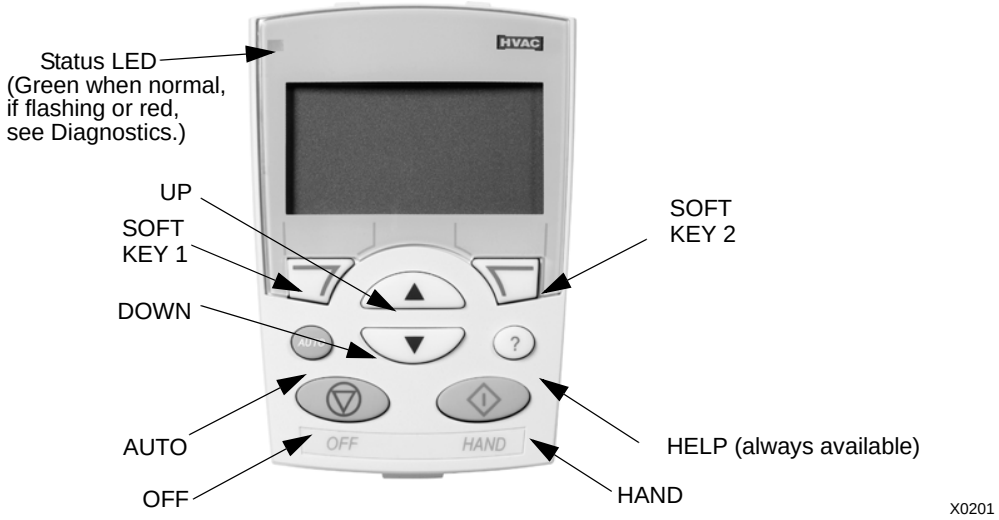
Fault and alarm adjustments

The ACH550 can detect a wide variety of potential system problems. For example, initial system operation may generate faults or alarms that indicate set-up problems.

1. Faults and alarms are reported on the control panel with a number. Note the number reported.
2. Review the description provided for the reported fault/alarm:
   - Use the fault and alarm listings on pages *24* and *29* respectively, or
   - Press the help key (Assistant Control Panel only) while fault or alarm is displayed.
3. Adjust the system or parameters as appropriate.

Operation

The ACH550 HVAC control panel (ACH-CP-B) features:



General display features

Soft key functions

The soft key functions are defined by text displayed just above each key.

Display contrast

To adjust display contrast, simultaneously press  and  or  , as appropriate.

HVAC control panel modes

The HVAC control panel has several different modes for configuring, operating and diagnosing the drive. To reach the Standard Display Mode, press EXIT until the LCD display shows status information. Select MENU and use UP/DOWN buttons to select other modes. The modes are:

- **Standard Display Mode –** Shows drive status information and operates the drive.
- **Parameters Mode –** Edits parameter values individually.
- **Start-up Assistant Mode –** Guides the start-up and configuration.
- **Changed Parameters Mode –** Shows changed parameters.
- **Fault Logger Mode –** Shows the drive fault history.
- **Drive Parameter Backup Mode –** Stores or uploads the parameters.
- **Clock Set Mode –** Sets the time and date for the drive.
- **I/O Settings Mode –** Checks and edits the I/O settings.
- **Alarm Mode –** Reporting mode triggered by drive alarms.

Operating the drive

AUTO/HAND – The very first time the drive is powered up, it is in the auto control (AUTO) mode, and is controlled from the Control terminal block X1.

To switch to hand control (HAND) and control the drive using the control panel, press and hold the  or  button.

- Pressing the HAND button switches the drive to hand control while keeping the drive running.
- Pressing the OFF button switches to hand control and stops the drive.

To switch back to auto control (AUTO), press and hold the  button.

Hand/Auto/Off – To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

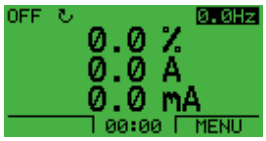
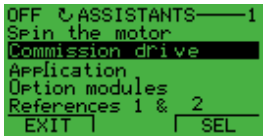
Reference – To modify the reference (only possible if the display in the upper right corner is in reverse video) press the UP or DOWN buttons (the reference changes immediately).

The reference can be modified in the local control mode (HAND/OFF), and can be parameterized (using Group 11 reference select) to also allow modification in the remote control mode.

Note: The Start/Stop, Shaft direction and Reference functions are only valid in local control (HAND/OFF) mode.

Start-up by using the Start-Up Assistant

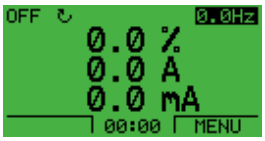
To start the Start-Up Assistant, follow these steps:

1	Select MENU to enter the main menu.		
2	Select ASSISTANTS with the Up/Down buttons and select ENTER.		
3	Scroll to COMMISSION DRIVE with the Up/Down buttons.		
4	Change the values suggested by the assistant to your preferences and then press SAVE after every change.		

The Start-Up Assistant will guide you through the start-up.

Start-up by changing the parameters individually

To change the parameters, follow these steps:

1	Select MENU to enter the main menu.		
2	Select the Parameters mode with the UP/DOWN buttons and select ENTER to select the Parameters mode.		
3	Select the appropriate parameter group with the UP/DOWN buttons and select SEL		
4	Select the appropriate parameter in a group with the UP/DOWN buttons. Select EDIT to change the parameter value.		
5	Press the UP/DOWN buttons to change the parameter value.		
6	Select SAVE to store the modified value or select CANCEL to leave the set mode. Any modifications not saved are cancelled.		
7	Select EXIT to return to the listing of parameter groups, and again to return to the main menu.		

Complete the control connections by manually entering the parameters.

Note: The current parameter value appears below the highlighted parameter. To view the default parameter value, press the UP/DOWN buttons simultaneously. To restore the default factory settings, select the application macro HVAC Default.

Diagnostics

Fault listing

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
1	OVERCURRENT	Output current is excessive. Check for and correct: • Excessive motor load. • Insufficient acceleration time (parameters 2202 ACCELER TIME 1 and 2205 ACCELER TIME 2). • Faulty motor, motor cables or connections. • Output disconnect device not interlocked. • Interaction with external input filter.
2	DC OVERVOLT	Intermediate circuit DC voltage is excessive. Check for and correct: • Static or transient overvoltages in the input power supply. • Insufficient deceleration time (parameters 2203 DECELER TIME 1 and 2206 DECELER TIME 2). • Verify that overvoltage controller is ON (using parameter 2005). • Interaction with external input filter.
3	DEV OVERTEMP	Drive heatsink is overheated. Temperature is at or above limit. R1…R4 & R7/R8: 115 °C (239 °F) R5/R6: 125 °C (257 °F) Check for and correct: • Fan failure. • Obstructions in the air flow. • Dirt or dust coating on the heat sink. • Excessive ambient temperature. • Excessive motor load.
4	SHORT CIRC	Fault current. Check for and correct: • A short-circuit in the motor cable(s) or motor. • Supply disturbances.
5	RESERVED	Not used.
6	DC UNDERVOLT	Intermediate circuit DC voltage is not sufficient. Check for and correct: • Missing phase in the input power supply. • Blown fuse. • Undervoltage on mains.
7	AI1 LOSS	Analog input 1 loss. Analog input value is less than AI1FLT LIMIT (3021). Check for and correct: • Source and connection for analog input. • Parameter settings for AI1FLT LIMIT (3021) and 3001 AI<MIN FUNCTION.
8	AI2 LOSS	Analog input 2 loss. Analog input value is less than AI2FLT LIMIT (3022). Check for and correct: • Source and connection for analog input. • Parameter settings for AI2FLT LIMIT (3022) and 3001 AI<MIN FUNCTION.
9	MOT TEMP	Motor is too hot, based on either the drive's estimate or on temperature feedback. • Check for overloaded motor. • Adjust the parameters used for the estimate (3005…3009). • Check the temperature sensors and Group 35 parameters.

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
10	PANEL LOSS	Panel communication is lost and either: • Drive is in local control mode (the control panel displays HAND or OFF), or • Drive is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check: • Communication lines and connections • Parameter 3002 PANEL COMM ERROR. • Parameters in Group 10: START/STOP/DIR and Group 11: REFERENCE SELECT (if drive operation is AUTO).
11	ID RUN FAIL	The motor ID run was not completed successfully. Check for and correct: • Motor connections • Motor parameters 9905…9909 do not match motor nameplate.
12	MOTOR STALL	Motor or process stall. Motor is operating in the stall region. Check for and correct: • Excessive load. • Insufficient motor power. • Parameters 3010…3012.
14	EXTERNAL FLT 1	Digital input defined to report first external fault is active. See parameter 3003 EXTERNAL FAULT 1.
15	EXTERNAL FLT 2	Digital input defined to report second external fault is active. See parameter 3004 EXTERNAL FAULT 2.
16	EARTH FAULT	Possible ground fault detected in the motor or motor cables. The drive monitors for ground faults while the drive is running and while the drive is not running. Detection is more sensitive when the drive is not running and can produce false positives. Possible corrections: • Check for/correct faults in the input wiring. • Verify that motor cable does not exceed maximum specified length. • A delta grounded input power supply and motor cables with high capacitance may result in erroneous error reports during non-running tests. To disable response to fault monitoring when the drive is not running, use parameter 3023 WIRING FAULT. To disable response to all ground fault monitoring, use parameter 3017 EARTH FAULT.
17	UNDERLOAD	Motor load is lower than expected. Check for and correct: • Disconnected load. • Group 37: USER LOAD CURVE.
18	THERM FAIL	Internal fault. The thermistor measuring the internal temperature of the drive is open or shorted. Contact your local ABB sales representative.
19	OPEX LINK	Internal fault. A communication-related problem has been detected on the fiber optic link between the OITF and OINT boards. Contact your local ABB sales representative.
20	OPEX PWR	Internal fault. Low voltage condition detected on OINT power supply. Contact your local ABB sales representative.
21	CURR MEAS	Internal fault. Current measurement is out of range. Contact your local ABB sales representative.

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
22	SUPPLY PHASE	Ripple voltage in the DC link is too high. Check for and correct: • Missing mains phase. • Blown fuse. • Interaction with external input filter. Set parameter 2619 to “ON”.
23	ENCODER ERR	Not used (Available only with encoder and parameter Group 50).
23	ENCODER ERR	The drive is not detecting a valid encoder signal. Check for and correct: • Encoder presence and proper connection (reverse wired, loose connection, or short circuit). • Voltage logic levels are outside of the specified range. • A working and properly connected Pulse Encoder Interface Module, OTAC-01. • Wrong value entered in parameter 5001 PULSE NR. A wrong value will only be detected if the error is such that the calculated slip is greater than 4 times the rated slip of the motor. • Encoder is not being used, but parameter 5002 ENCODER ENABLE = 1 (ENABLED).
24	OVERSPEED	Motor speed is greater than 120% of the larger (in magnitude) of 2001 MINIMUM SPEED or 2002 MAXIMUM SPEED. Check for and correct: • Parameter settings for 2001 and 2002. • Adequacy of motor braking torque. • Applicability of torque control. • Brake chopper and resistor.
25	RESERVED	Not used as of the publication of this manual.
26	DRIVE ID	Internal fault. Configuration Block Drive ID is not valid. Contact your local ABB sales representative.
27	CONFIG FILE	Internal configuration file has an error. Contact your local ABB sales representative.
28	SERIAL 1 ERR	Fieldbus communication has timed out. Check for and correct: • Fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). • Communication settings (Group 51 or 53 as appropriate). • Poor connections and/or noise on line.
29	EFB CONFIG FILE	Error in reading the configuration file for the embedded fieldbus.
30	FORCE TRIP	Fault trip forced by the fieldbus. See the fieldbus User’s Manual.
31	EFB 1	Fault code reserved for the embedded fieldbus (EFB) protocol application. These codes are not used as of the publication of this manual.
32	EFB 2	
33	EFB 3	
34	MOTOR PHASE	Fault in the motor circuit. One of the motor phases is lost. Check for and correct: • Motor fault. • Motor cable fault. • Thermal relay fault (if used). • Internal fault.

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
35	OUTPUT WIRING	Possible power wiring error detected. When the drive is not running it monitors for an improper connection between the drive input power and the drive output. Check for and correct: • Proper input wiring – line voltageis NOT connected to drive output. • The fault can be erroneously declared if the input power is a delta grounded system and motor cable capacitance is large. This fault can be disabled using parameter 3023 WIRING FAULT.
36	INCOMP SWTYPE	The drive cannot use the software. • Internal Fault. • The loaded software is not compatible with the drive. • Call support representative.
37	CB OVERTEMP	Drive control board is overheated. Check for and correct: • Excessive ambient temperatures • Fan failure. • Obstructions in the air flow.
38	USER LOAD CURVE	Condition defined by parameter 3701 USER LOAD C MODE has been valid longer than the time defined by 3703 USER LOAD C TIME.
101	SERF CORRUPT	Error internal to the drive. Contact your local ABB sales representative and report the error number.
102	RESERVED	
103	SERF MACRO	
104	RESERVED	
105	RESERVED	
201	DSP T1 OVERLOAD	Error in the system. Contact your local ABB sales representative and report the error number.
202	DSP T2 OVERLOAD	
203	DSP T3 OVERLOAD	
204	DSP STACK ERROR	
205	RESERVED (obsolete)	
206	OMIO ID ERROR	
207	EFB LOAD ERR	
1000	PAR HZRPM LIMITS	Parameter values are inconsistent. Check for any of the following: • 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED. • 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ. • 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50) • 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside proper range (> 50) • 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50) • 2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside proper range (> 50)
1001	PAR PFAREFNG	Parameter values are inconsistent. Check for the following: • 2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.

Fault Code	Fault Name In Panel	Description and Recommended Corrective Action
1002	RESERVED (Obsolete)	
1003	PAR AI SCALE	Parameter values are inconsistent. Check for any of the following: • 1301 AI 1 MIN > 1302 AI 1 MAX. • 1304 AI 2 MIN > 1305 AI 2 MAX.
1004	PAR AO SCALE	Parameter values are inconsistent. Check for any of the following: • 1504 AO 1 MIN > 1505 AO 1 MAX. • 1510 AO 2 MIN > 1511 AO 2 MAX.
1005	PAR PCU 2	Parameter values for power control are inconsistent: Improper motor nominal kVA or motor nominal power. Check for the following: • 1.1 ≤ (9906 MOTOR NOM CURR * 9905 MOTOR NOM VOLT * 1.73 / P_N) ≤ 3.0 • Where: P_N = 1000 * 9909 MOTOR NOM POWER (if units are kW) or P_N = 746 * 9909 MOTOR NOM POWER (if units are HP, e.g. in US)
1006	EXT ROMISSING	Parameter values are inconsistent. Check for the following: • Extension relay module not connected and • 1410…1412 RELAY OUTPUTS 4…6 have non-zero values.
1007	PAR FBUSMISSING	Parameter values are inconsistent. Check for and correct: • A parameter is set for fieldbus control (e.g. 1001 EXT1 COMMANDS = 10 (COMM)), but 9802 COMM PROT SEL = 0.
1008	PAR PFAWOSCALAR	Parameter values are inconsistent – 9904 MOTOR CTRL MODE must be = 3 (SCALAR: SPEED), when 8123 PFA ENABLE is activated.
1009	PAR PCU1	Parameter values for power control are inconsistent: Improper motor nominal frequency or speed. Check for both of the following: • 1 ≤ (60 * 9907 MOTOR NOM FREQ / 9908 MOTOR NOM SPEED ≤ 16 • 0.8 ≤ 9908 MOTOR NOM SPEED / (120 * 9907 MOTOR NOM FREQ / Motor Poles) ≤ 0.992
1010	PAR PFA OVERRIDE	Both the override mode and PFA are activated at the same time. These modes are mutually incompatible, because PFA interlocks cannot be observed in the override mode.
1011	PAR OVERRIDE PARS	Overeride is enabled, but parameters are incompatible. Verify that 1701 is not zero, and (depending on 9904 value) 1702 or 1703 is not zero.
1012	PAR PFA IO 1	IO configuration is not complete – not enough relays are parameterized to PFA. Or, a conflict exists between Group 14, parameter 8117, NR OF AUX MOT, and parameter 8118, AUTOCHNG INTERV.
1013	PAR PFA IO 2	IO configuration is not complete – the actual number of PFA motors (parameter 8127, MOTORS) does not match the PFA motors in Group 14 and parameter 8118 AUTOCHNG INTERV.
1014	PAR PFA IO 3	IO configuration is not complete – the drive is unable to allocate a digital input (interlock) for each PFA motor (parameters 8120 INTERLOCKS and 8127 MOTORS).

Fault history

For reference, the last three fault codes are stored into parameters 0401, 0412, 0413. For the most recent fault (identified by parameter 0401), the drive stores additional data (in parameters 0402…0411) to aid in troubleshooting a problem. For example, parameter 0404 stores the motor speed at the time of the fault.

To clear the fault history (all of the Group 04, Fault History parameters):

1. Using the control panel in Parameters mode, select parameter 0401.
2. Press EDIT.
3. Press UP and Down simultaneously.
4. Press SAVE.

Alarm listing

The following table lists the alarms by code number and describes each.

Alarm Code	Display	Description
2001	OVERCURRENT	Current limiting controller is active. Check for and correct: • Excessive motor load. • Insufficient acceleration time (parameters 2202 ACCELER TIME 1 and 2205 ACCELER TIME 2). • Faulty motor, motor cables or connections. • Output disconnect device not interlocked. • Interaction with external input filter.
2002	OVERVOLTAGE	Over voltage controller is active. Check for and correct: • Static or transient overvoltages in the input power supply. • Insufficient deceleration time (parameters 2203 DECELER TIME 1 and 2206 DECELER TIME 2). • Interaction with external input filter.
2003	UNDERVOLTAGE	Under voltage controller is active. Check for and correct: • Undervoltage on mains.
2004	DIR LOCK	The change in direction being attempted is not allowed. Either: • Do not attempt to change the direction of motor rotation, or • Change parameter 1003 DIRECTION to allow direction change (if reverse operation is safe).
2005	I/O COMM	Fieldbus communication has timed out. Check for and correct: • Fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). • Communication settings (Group 51 or 53 as appropriate). • Poor connections and/or noise on line.
2006	AI1 LOSS	Analog input 1 is lost, or value is less than the minimum setting. Check: • Input source and connections • Parameter that sets the minimum (3021) • Parameter that sets the Alarm/Fault operation (3001)
2007	AI2 LOSS	Analog input 2 is lost, or value is less than the minimum setting. Check: • Input source and connections • Parameter that sets the minimum (3022) • Parameter that sets the Alarm/Fault operation (3001)

Alarm Code	Display	Description
2008	PANEL LOSS	Panel communication is lost and either: • Drive is in local control mode (the control panel displays HAND or OFF), or • Drive is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check: • Communication lines and connections • Parameter 3002 PANEL LOSS. • Parameters in Groups 10 START/STOP/DIR and 11: REFERENCE SELECT (if drive operation is AUTO).
2009	DEVICE OVERTEMP	Drive heatsink is hot. This alarm warns that a DEVICE OVERTEMP fault may be near. R1…R4 & R7/R8: 100 °C (212 °F) R5/R6: 110 °C (230 °F) Check for and correct: • Fan failure. • Obstructions in the air flow. • Dirt or dust coating on the heat sink. • Excessive ambient temperature. • Excessive motor load.
2010	MOT OVERTEMP	Motor is hot, based on either the drive's estimate or on temperature feedback. This alarm warns that a Motor Underload fault trip may be near. Check: • Check for overloaded motor. • Adjust the parameters used for the estimate (3005…3009). • Check the temperature sensors and Group 35 parameters.
2011	UNDERLOAD	Motor load is lower than expected. This alarm warns that a Motor Underload fault trip may be near. Check: • Motor and drive ratings match (motor is NOT undersized for the drive) • Settings Group 37: USER LOAD CURVE
2012	MOTOR STALL	Motor is operating in the stall region. This alarm warns that a Motor Stall fault trip may be near.
2013 (note 1)	AUTORESET	This alarm warns that the drive is about to perform an automatic fault reset, which may start the motor. • To control automatic reset, use parameter Group 31: AUTOMATIC RESET.
2014 (note 1)	AUTOCHANGE	This alarm warns that the PFA autochange function is active. • To control PFA, use parameter Group 81: PFA CONTROL
2015	PFA INTERLOCK	This alarm warns that the PFA interlocks are active, which means that the drive cannot start the following: • Any motor (when Autochange is used), • The speed regulated motor (when Autochange is not used).
2016	Reserved	
2017 (note 1)	OFF BUTTON	This alarm warns that parameter 1606 LOCAL LOCK is active and the drive is in the AUTO mode. When the OFF key is pressed, the drive remains in the AUTO mode but coasts to stop.

Alarm Code	Display	Description
2018 (note 1)	PID SLEEP	This alarm warns that the PID sleep function is active, which means that the motor could accelerate when the PID sleep function ends. • To control PID sleep, use parameters 4022…4026 or 4122…4126.
2019	ID RUN	Performing ID run.
2020	OVERRIDE	This alarm warns that the Override function is active, which may start the motor.
2021	START ENABLE 1 MISSING	This alarm warns that the Start Enable 1 signal is missing. • To control Start Enable 1 function, use parameter 1608. To correct, check: • Digital input configuration. • Communication settings.
2022	START ENABLE 2 MISSING	This alarm warns that the Start Enable 2 signal is missing. • To control Start Enable 2 function, use parameter 1609. To correct, check: • Digital input configuration. • Communication settings.
2023	EMERGENCY STOP	Emergency stop activated.
2024	ENCODER ERROR	The drive is not detecting a valid encoder signal. Check for and correct: • Encoder presence and proper connection (reverse wired, loose connection, or short circuit). • Voltage logic levels are outside of the specified range. • A working and properly connected Pulse Encoder Interface Module, OTAC-01. • Wrong value entered in parameter 5001 PULSE NR. A wrong value will only be detected if the error is such that the calculated slip is greater than 4 times the rated slip of the motor. • Encoder is not being used, but parameter 5002 ENCODER ENABLE = 1 (ENABLED).
2025	FIRST START	Signals that a the drive is performing a First Start evaluation of motor characteristics. This is normal the first time the motor is run after motor parameters are entered or changed. See parameter 9910 (MOTOR ID RUN) for a description of motor models.
2026	RESERVED	Not used.
2027	USER LOAD CURVE	This alarm warns that the condition defined by parameter 3701 USER LOAD C MODE has been valid longer that half of the time difined by 3703 USER LOAD C TIME.
2028	START DELAY	Shown during the Start delay. See parameter 2113 START DELAY.

Note 1. Even when the relay output is configured to indicate alarm conditions (e.g. parameter 1401 RELAY OUTPUT 1 = 5 (ALARM) or 16 (FLT/ALARM)), this alarm is not indicated by a relay output.

Maintenance

Warning! Read *Safety* on page *2* before performing any maintenance on the equipment. Ignoring the safety instructions can cause injury or death.

Maintenance intervals

If installed in an appropriate environment, the drive requires very little maintenance. This table lists the routine maintenance intervals recommended by ABB.

Maintenance	Application	Interval	Instruction
Check/replace R7/R8 enclosure inlet air filter	R7/R8 UL type 12 enclosures	Check every 3 months. Replace as needed.	*Frame Sizes R7/R8 – UL type 12 enclosure inlet air filter on page 35*
Check/replace R7/R8 enclosure exhaust air filter.	R7/R8 UL type 12 enclosures	Check every 6 months. Replace as needed.	*Frame Sizes R7/R8 – UL type 12 enclosure exhaust filters on page 37*
Check and clean heatsink.	All	Depends on the dustiness of the environment (every 6…12 months)	See *Heatsink* below.
Check cable connections are secure and tighten as specified.	All	Every year.	See *Power & Control Connections on page 16*.
Replace enclosure fan.	UL type 12 enclosures	Every three years.	See *Enclosure fan replacement – UL Type 12 enclosures on page 34*.
Replace drive module fan.	All	Every six years.	See *Drive module fan replacement on page 33*.
Change capacitor.	Frame sizes R5, R6 and R8	Every ten years.	See *Capacitors on page 38*.
Replace battery in the Assistant control panel	All	Every ten years.	See *Control panel on page 38*.

Heatsink

The heatsink fins accumulate dust from the cooling air. Since a dusty heatsink is less efficient at cooling the drive, overtemperature faults become more likely. In a “normal” environment (not dusty, not clean) check the heatsink annually, in a dusty environment check more often.

Clean the heatsink as follows (when necessary):

1. Remove power from drive.
2. Remove the cooling fan (see section *Drive module fan replacement* on page *33*).
3. Blow clean compressed air (not humid) from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust.

Note: If there is a risk of the dust entering adjoining equipment, perform the cleaning in another room.

---

4. Replace the cooling fan.
5. Restore power.

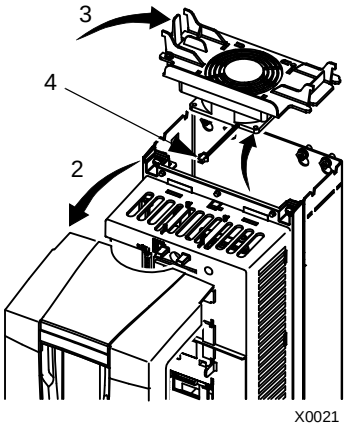
Drive module fan replacement

The drive module fan cools the heatsink. Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heatsink temperature in spite of heatsink cleaning. If the drive is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing. Replacement fans are available from ABB. Do not use other than ABB specified spare parts.

To monitor the running time of the cooling fan, see *Group 29: MAINTENANCE TRIG* instructions.

Frame Sizes R1...R4

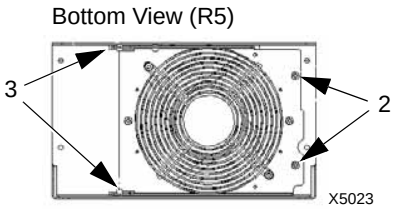
To replace the fan:



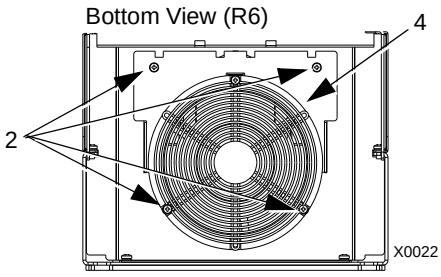
1. Remove power from drive.
2. Remove drive cover.
3. For Frame Size:
   - R1, R2: Press together the retaining clips on the fan cover sides, and lift.
   - R3, R4: Press in on the lever located on the left side of the fan mount, and rotate the fan up and out.
4. Disconnect the fan cable.
5. Install the fan in reverse order.
6. Restore power.

Frame Sizes R5 and R6

To replace the fan:



1. Remove power from drive.
2. Remove the screws attaching the fan.
3. Remove the fan:
   - R5: Swing the fan out on its hinges.
   - R6: Pull the fan out.
4. Disconnect the fan cable.
5. Install the fan in reverse order.
6. Restore power.



Frame Sizes R7 and R8

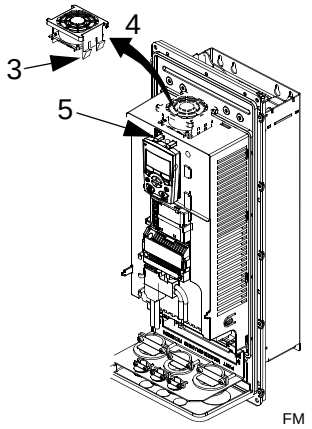
Refer to the installation instructions supplied with the fan kit.

Enclosure fan replacement – UL Type 12 enclosures

UL type 12 enclosures include an additional fan (or fans) to move air through the enclosure.

Frame Sizes R1 to R4

To replace the internal enclosure fan in frame sizes R1 to R4:



1. Remove power from drive.
2. Remove the front cover.
3. The housing that holds the fan in place has barbed retaining clips at each corner. Press all four clips toward the center to release the barbs.
4. When the clips/barbs are free, pull the housing up to remove from the drive.
5. Disconnect the fan cable.
6. Install the fan in reverse order, noting that:
   - The fan air flow is up (refer to arrow on fan).
   - The fan wire harness is toward the front.
   - The notched housing barb is located in the right-rear corner.
   - The fan cable connects just forward of the fan at the top of the drive.

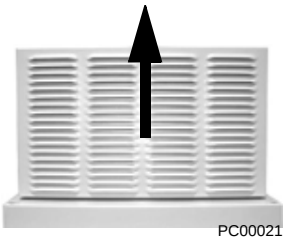
Frame Sizes R5 and R6

To replace the internal enclosure fan in frame sizes R5 or R6:

- Remove power from drive.
- Remove the front cover.
- Lift the fan out and disconnect the cable.
- Install the fan in reverse order.
- Restore power.

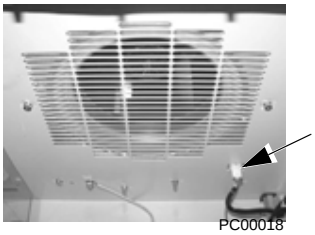
Frame Sizes R7/R8 – UL type 12 enclosures

The enclosure fan is located in the exhaust box on top of the UL type 12 enclosure.

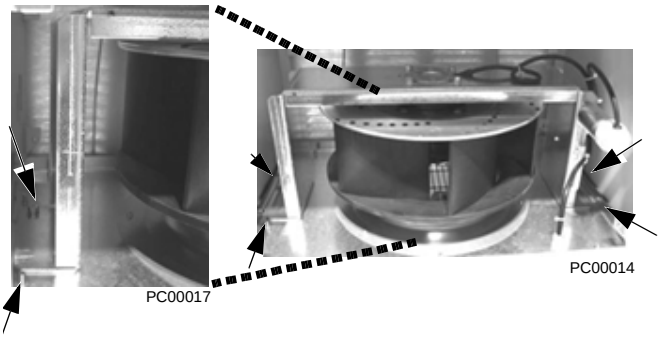


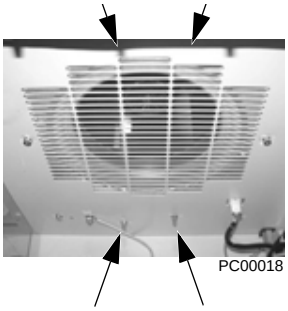
1. Remove the left and right filter frames of the exhaust fan box by lifting them upwards.

2. Disconnect the fan's electrical connector from the cabinet roof (top right inside the cabinet).

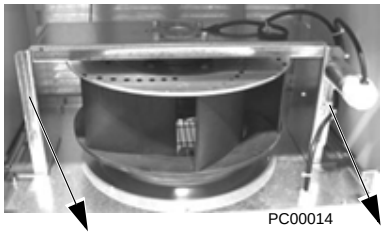


3. Undo the four fastening screws at the corners of the fan frame. The screws are through bolts with nuts on the inside of the cabinet. (Do not drop the hardware into the drive).

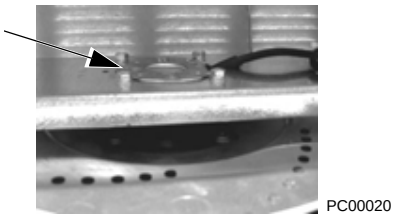




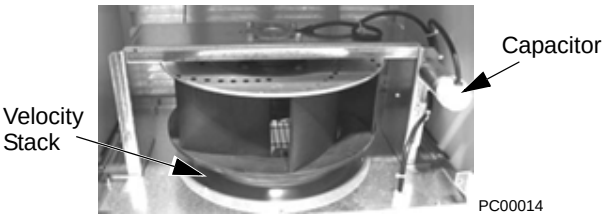
4. Remove the fan and fan frame as one unit.



5. Disconnect the fan wiring and capacitor from the fan frame. Then remove the four screws attaching the fan to the fan frame. Remove the old fan.



6. Install the new fan and capacitor with the replacement part for ABB in the reverse order of the above. Ensure the fan is centered on the velocity stack and rotates freely.



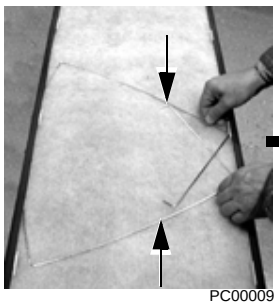
Enclosure air filter replacement – UL Type 12 enclosures

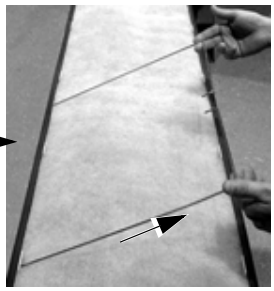
Frame Sizes R7/R8 – UL type 12 enclosure inlet air filter

The inlet air filter for the R7/R8 UL type 12 enclosure is located in the enclosure front door.

1. While holding the top of the filter frame, pull up on the bottom of the frame. The filter frame will slide up approximately 3/4 inch and can then safely removed by tilting away from the cabinet and lifting up.

2. Lay the filter frame on a flat work surface. Remove the 3 retaining brackets by squeezing the tabbed corners in towards the middle of each bracket until the bracket clears the filter frame. Save these brackets for replacement. Remove and inspect the filter.

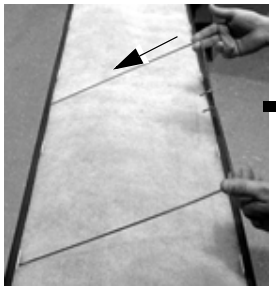

PC00009

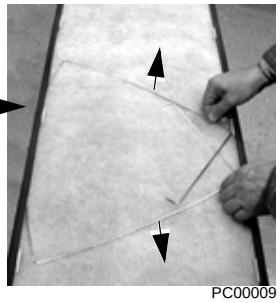

PC00007

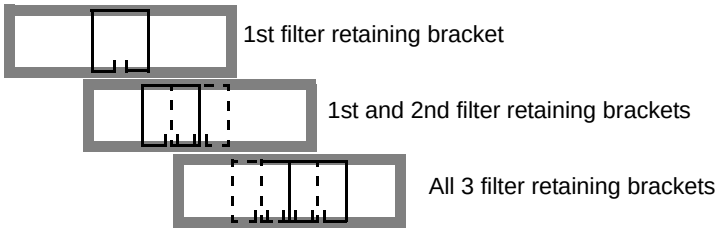
3. Install the replacement filter. Be sure to tuck the filter into the grove around the entire filter frame. This is very important for proper installation.


PC00013

4. Reinstall the 3 filter restraining brackets. These will prevent the filter from being pulled out of the filter frame.
   - Install the center bracket first.
   - Install the 2nd bracket overlapping the center bracket by 1/2 to the left.
   - Install the 3nd bracket overlapping the center bracket by 1/2 to the right.


PC00007


PC00009

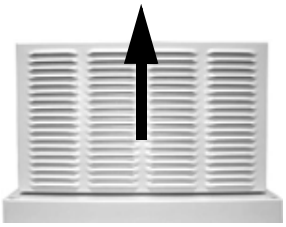


5. Install the filter frame back to the cabinet door. Carefully align the mounting hooks to the slots in the cabinet door. The hooks should be pointing down. Press in at the center of the filter frame with your knee and gently press down with your hands at the top of the frame. The filter frame will slide down approximately 3/4 inch and should be sealed securely to the door around the entire filter frame.

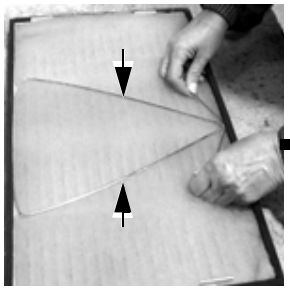
Frame Sizes R7/R8 – UL type 12 enclosure exhaust filters

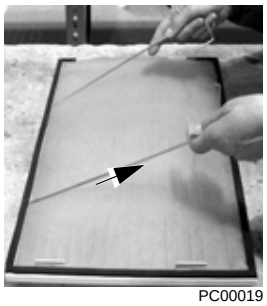
The exhaust filters in the R7/R8 UL type 12 enclosure are located in the exhaust box at the top of the enclosure.

There are 2 filter frames attached to the exhaust box.


PC00021

1. Remove power from drive.
2. Wait 5 minutes to ensure the fan has stopped.
3. Remove each filter frame:
   - Lift up on the filter frame until it slides approximately 3/4 inch.
   - Pull away from the exhaust box to remove.
4. For each filter frame, remove the wire retainers that hold the filters in place:
   - Lay the filter frames on a flat work surface.
   - The wire retainers have a square “U” shape. Remove by squeezing the open end of the “U” towards the middle of the “square” until the retainer top (open end of “U”) clears the filter frame.


PC00001

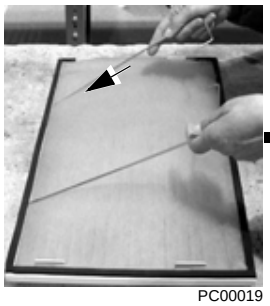

PC00019

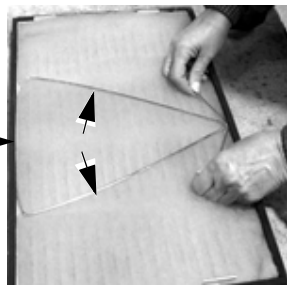
   - Save the retainers for reinstallation.
5. Remove and inspect the filter.
6. Install clean filters.

Note: When installing DUSTLOK® filter media, the white side must face to outside of the cabinet, and the orange side faces in.
Be sure to tuck the filter edges into the groove around the entire filter frame. This detail is very important for proper operation.


PC00022

7. Reinstall the filter restrainers.
   - Insert the base of a retainer (bottom of “U” shape) into a filter frame channel.
   - Squeeze the open end of the “U” until it clears the filter frame.
   - Seat the open end of the “U” in the filter frame channel.


PC00019


PC00001

   - Release the retainer to its relaxed, square shape.

8. Install each filter frame to the bonnet on top of the cabinet.
   - Carefully align the frame's mounting hooks with the slots in the bonnet. (The hooks should be pointing down.)
   - Press down at the top of the filter frame. (The filter frame slides down approximately 3/4 inch).
   - Check all around the filter frame for a secure seal to the exhaust box.


PC00012


PC00011

Capacitors

The drive intermediate circuit employs several electrolytic capacitors. Their life span is from 35,000...90,000 hours depending on drive loading and ambient temperature. Capacitor life can be prolonged by lowering the ambient temperature.

It is not possible to predict a capacitor failure. Capacitor failure is usually followed by a input power fuse failure or a fault trip. Contact ABB if capacitor failure is suspected. Replacements for frame size R5, R6 and R8 are available from ABB. Do not use other than ABB specified spare parts.

Control panel

Cleaning

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

Battery

A battery is only used in Assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions.

The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with type CR2032.

Note: The battery is NOT required for any control panel or drive function, except the clock.

ACH550 E-Clipse Bypass

Installation – drive

Follow the *Installation* instructions for the drive on page *3*. **Failure to observe the warnings and instructions may cause a malfunction or personal hazard.**

WARNING! Before you begin read *Safety* on page *2*.

Installation – bypass

WARNING! When the ACH550 with E-Clipse Bypass is connected to the line power, the Motor Terminals T1, T2, and T3 are live even if the motor is not running. Do not make any connections when the ACH550 with E-Clipse Bypass is connected to the line. Disconnect and lock out power to the drive before servicing the drive. Failure to disconnect power may cause serious injury or death.

1. Install wiring – bypass

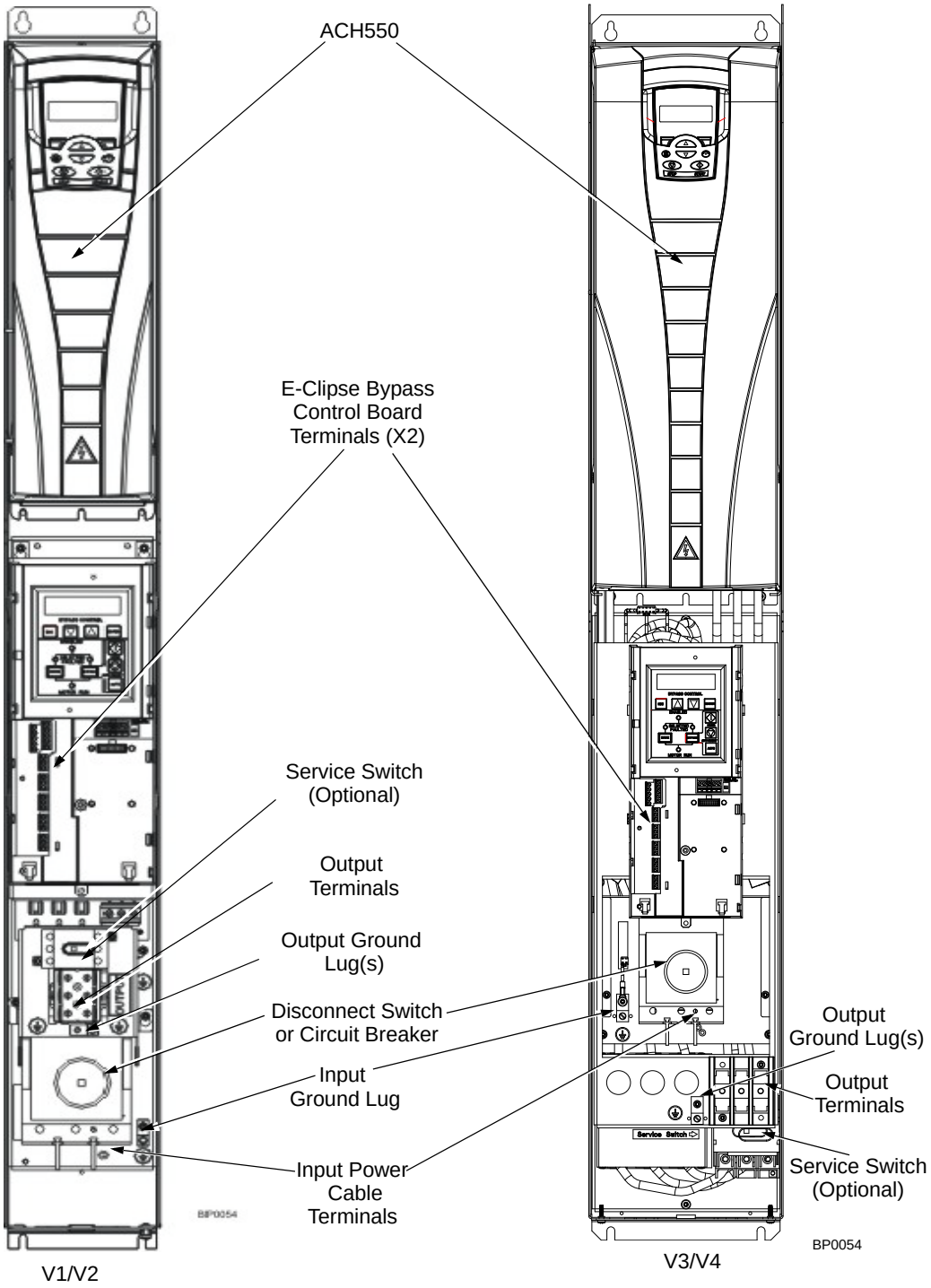
WARNING!

- Do not connect or disconnect input or output power wiring, or control wires, when power is applied.
- Never connect line voltage to drive output Terminals T1, T2, and T3.
- Do not make any voltage tolerance tests (Hi Pot or Megger) on any part of the unit. Disconnect motor wires before taking any measurements in the motor or motor wires.
- Make sure that power factor correction capacitors are not connected between the drive and the motor.

Enclosure Designation	Horsepower Range by Voltage Rating		
	208/240V	480V	600V
V1/V2	1 to 7.5 HP	1 to 15 HP	2 to 15 HP
V3/V4	10 to 25 HP	20 to 60 HP	20 to 60 HP
B1	1 to 7.5 HP	1 to 15 HP	2 to 15 HP
B2	10 to 25 HP	20 to 60 HP	20 to 60 HP
B3	30 to 100 HP	75 to 200 HP	75 to 150 HP
B4	N/A	250 to 550 HP	N/A

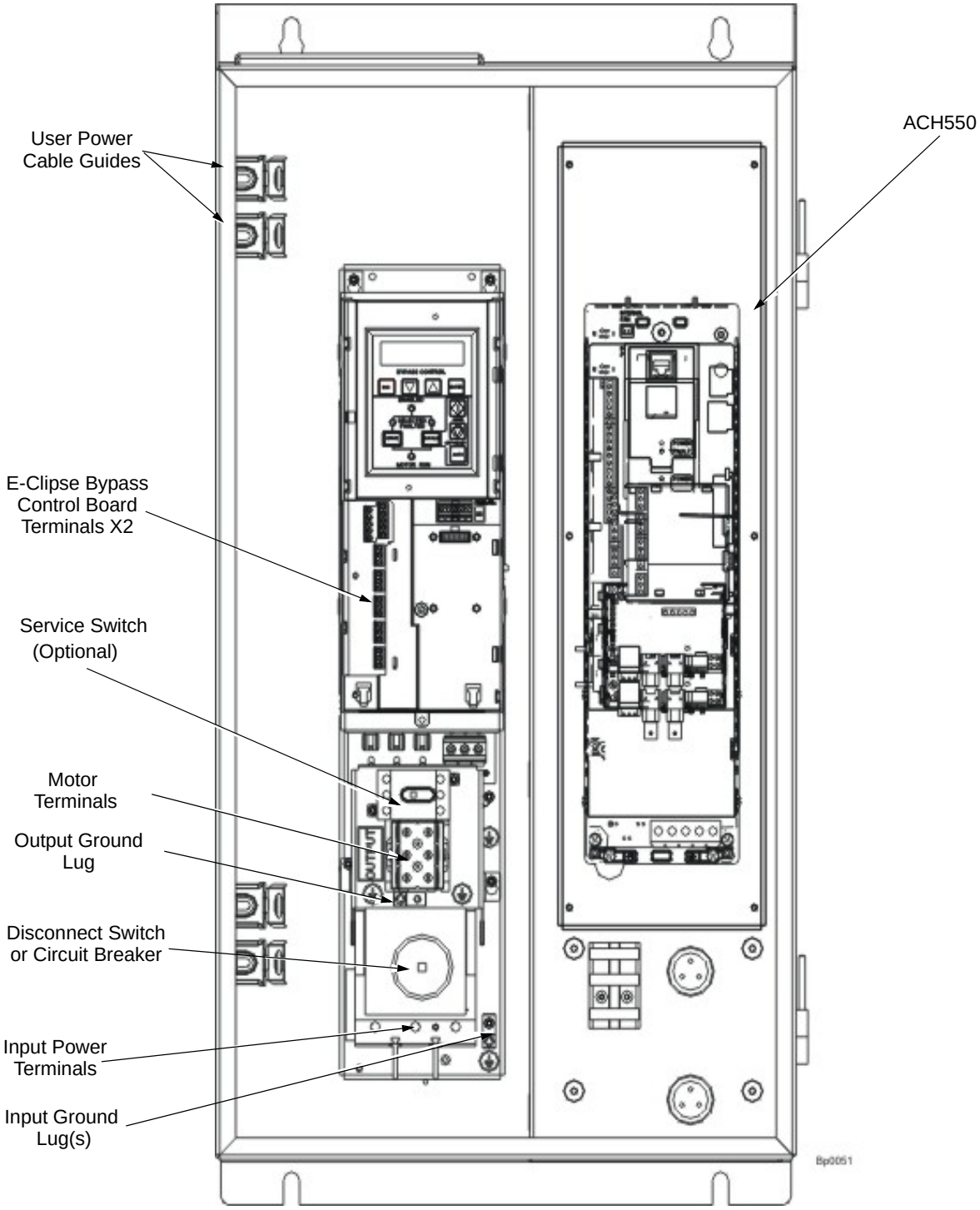
Connection diagrams – Vertical E-Clipse Bypass

ACH550 Vertical E-Clipse Bypass units are configured for wiring access from the bottom only. The following figure shows the Vertical E-Clipse Bypass wiring connection points.

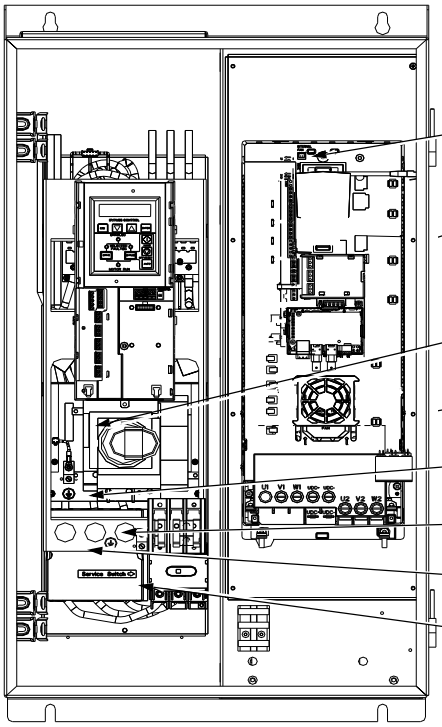


Connection diagrams – Standard E-Clipse Bypass (wall mounted)

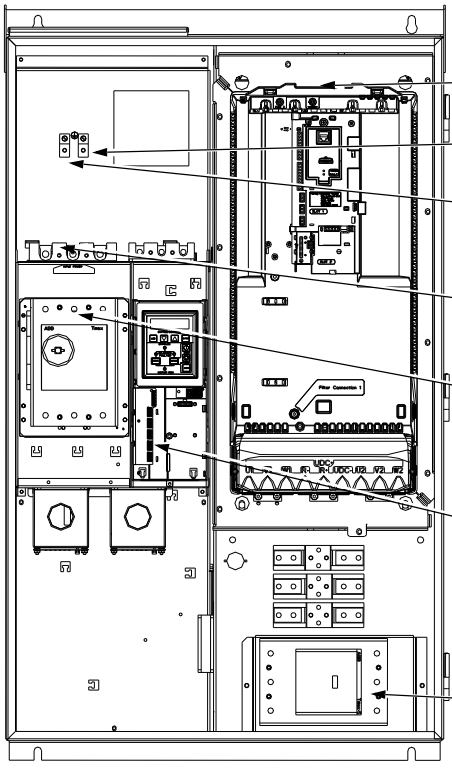
ACH550 Standard E-Clipse Bypass units are configured for wiring access from the top. The following figure shows the Standard E-Clipse Bypass (wall mounted) wiring connection points.



B1


User Power Cable Guides
ACH550 Drive
E-Clipse Bypass Control Board Terminals (X2)
Disconnect Switch or Circuit Breaker
Input Ground Lug
Input Power Terminals
Motor Terminals
Output Ground Lug
Service Switch (optional)

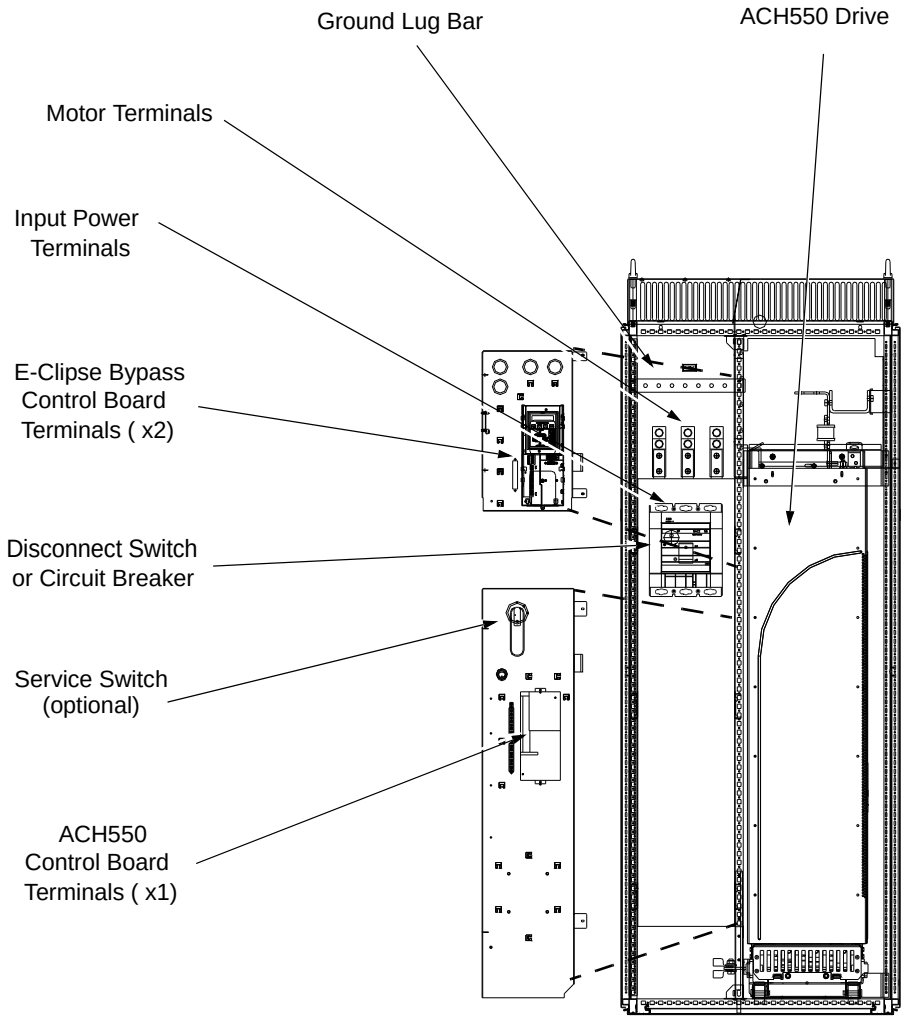
B2


ACH550 Drive
Output Ground Lug
Input Ground Lug
Motor Terminals
Input Power Terminals
E-Clipse Bypass Control Board Terminals (X2)
Service Switch (optional)

B3

Connection diagrams – Standard E-Clipse Bypass (R8, floor mounted)

ACH550 Standard E-Clipse Bypass units are configured for wiring access from the top. The following figure shows the Standard E-Clipse Bypass (floor mounted) wiring connection points.



B4

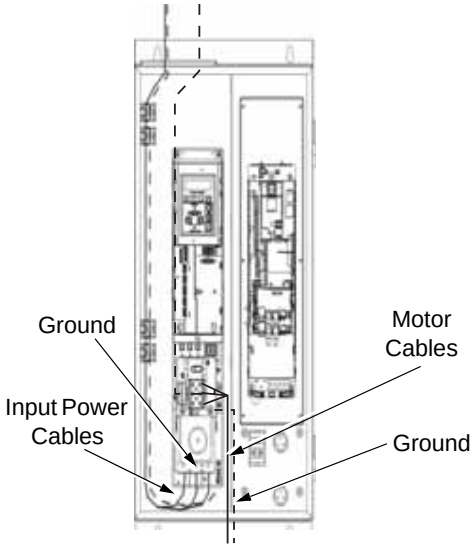
Power connections – Vertical E-Clipse Bypass configurations

Line input connections

Connect the input power to the terminals at the bottom of the disconnect switch or circuit breaker as shown below. Also see *Connection diagrams – Vertical E-Clipse Bypass* on page *40*. Connect the equipment grounding conductor to the ground lug near the input power connection point.

Motor connections

Connect the motor cables to the terminals at the bottom of the bypass section as shown in the figure. Also see *Connection diagrams – Vertical E-Clipse Bypass* on page *43*. Connect the motor grounding conductor to the ground lug near the motor cable terminal block connection point.



Power connections – Standard E-Clipse Bypass configurations (wall mounted)

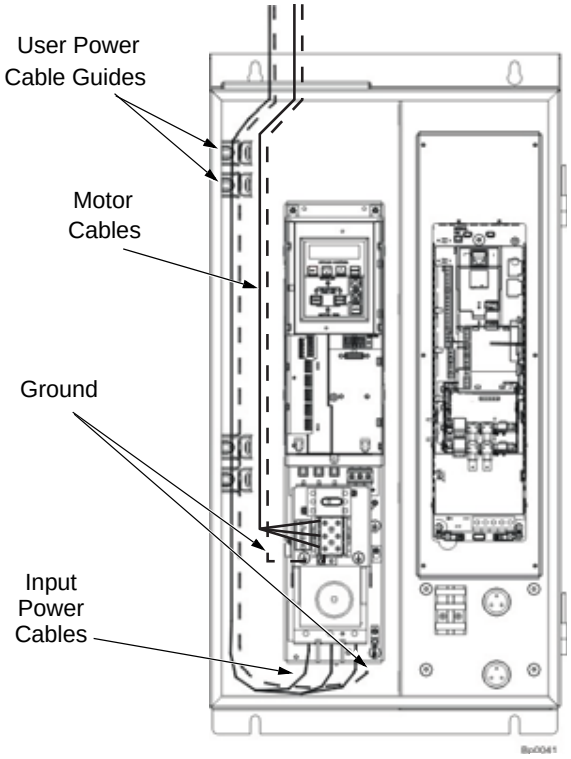
Line input connections

Connect input power to the terminals of the disconnect switch or circuit breaker. Connect the equipment grounding conductor to the ground lug at the top of the enclosure. The figure below shows the connection points for Standard E-Clipse Bypass configurations. Also see *Connection diagrams – Standard E-Clipse Bypass (wall mounted)* on page *41* and *Connection diagrams – Standard E-Clipse Bypass (R8, floor mounted)* on page *43*.

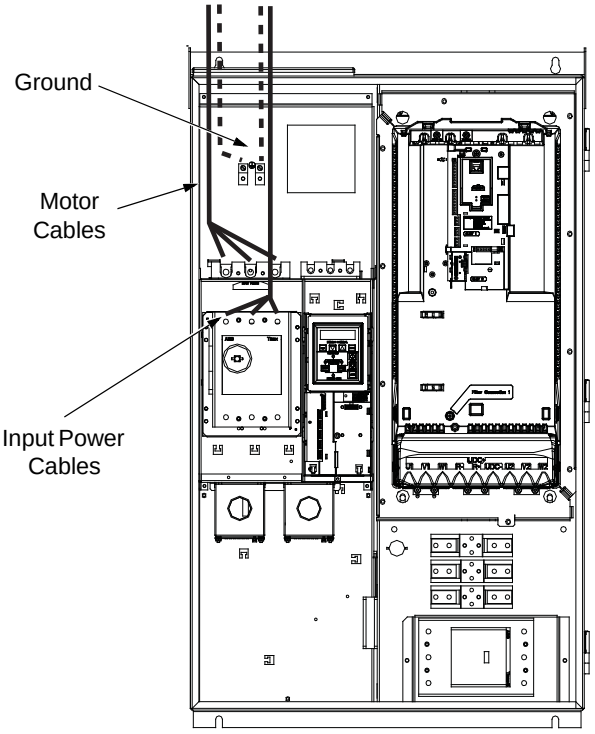
Motor connections

Connect the motor cables to the output terminal block as shown in the figure below. Also see *Connection diagrams – Standard E-Clipse Bypass (wall mounted)* on page *41* and *Connection diagrams – Standard E-Clipse Bypass (R8, floor mounted)* on page *43*. The motor grounding conductor can be connected to the ground lug near the terminal block.

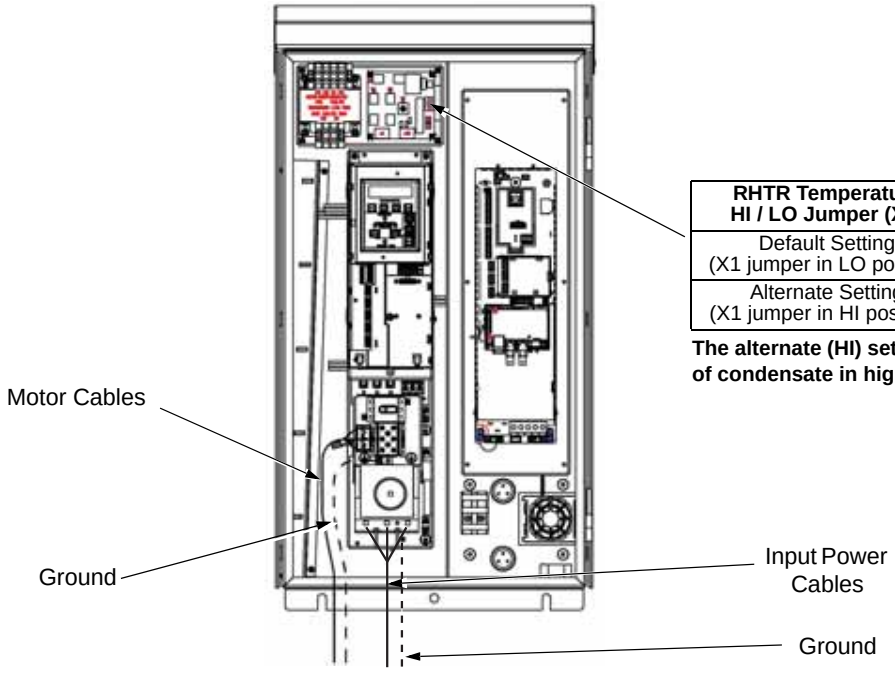
Note: Route cables through the cable guides on the left side of the enclosure. Use separate conduits for input power and motor cables. Follow the guides to separate the cables from each other.



Standard Configuration (B1/B2)



Standard Configuration (B3)



UL Type 3R Configuration (B1/B2)

RHTR Temperature HI / LO Jumper (X1)	Heater ON Temperature	Heater OFF Temperature
Default Setting (X1 jumper in LO position)	14.4 °C 58 °F	21.4 °C 70.5 °F
Alternate Setting (X1 jumper in HI position)	17.8 °C 64 °F	24.7 °C 76.5 °F

The alternate (HI) setting further reduces the likelihood of condensate in high humidity environments.

Note: UL Type 3R, B1/B2 enclosures are designed to be mounted on a wall. Mounting these 3R enclosures on an open rack system requires the use of the supplied 3R enclosure back plates to maintain 3R integrity.

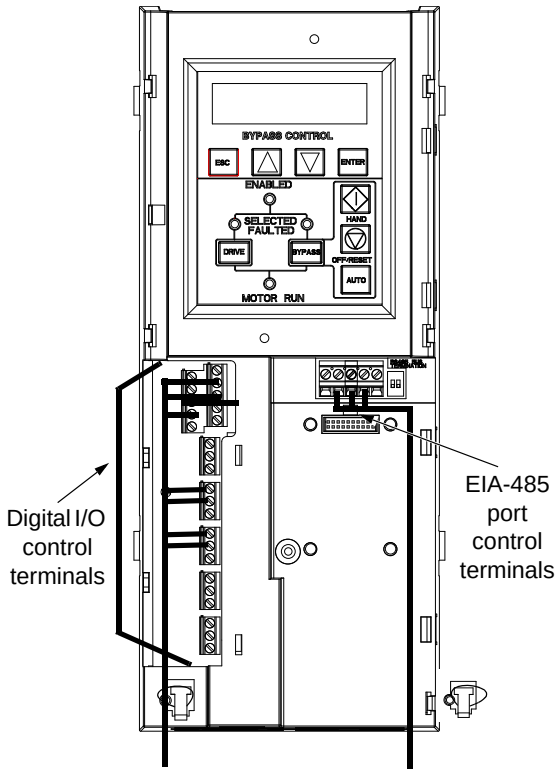
WARNING! Check the motor and motor wiring insulation before connecting the ACH550 to line power. Follow the procedure on page *12*. Before proceeding with the insulation resistance measurements, check that the ACH550 is disconnected from incoming line power. Failure to disconnect line power could result in death or serious injury.

Install the control wiring

Connect control wiring to terminal block X1 on the ACH550 control board and to terminal block X2 on the E-Clipse Bypass control board. For more information on these connections, refer to the following:

- X1 terminal block location and terminal data are defined in the *ACH550-UH User's Manual*.
- X2 terminal block location is illustrated in the figures starting with *Connection diagrams – Vertical E-Clipse Bypass* on page *40*.
- X2 terminal data are provided in *Basic control connections for E-Clipse HVAC Default* on page *53*.
- Basic connections are described in the following paragraphs. Alternate configurations using the E-Clipse Bypass macro are described in the *ACH550 User's Manual*.
- On Terminal Block X1 inside the ACH550, analog inputs and outputs and additional digital input and relay output connections (AI1, AI2, AO1, AO2, DI1…DI6 and RO1…RO6) are available for use.

Note: The E-Clipse Bypass control circuitry uses serial communications connections (X1:28…X1:32) inside the ACH550. These connections are not available for any other purpose and must not be reconfigured.



Basic connections

The figure on page *53* shows the basic control connections for use with the E-Clipse Bypass HVAC Default macro. These connections are described in the following paragraphs.

In typical installations, only analog input wires connect to the ACH550 terminal block, with other control connections made on the E-Clipse Bypass control board.

Use wire ties to permanently affix control/ communications wiring to the hooked wire race tie points provided, maintaining a minimum 6 mm (1/4") spacing from power wiring.

Drive's power connection terminals

The following tables list power and motor cable terminal sizes for connections to an input circuit breaker or disconnect switch, a motor terminal block and ground lugs. The tables also list torque that should be applied when tightening the terminals.

Vertical enclosure terminals

HP	Identification	Frame Size	Maximum Wire Size Capacities of Power Terminals			
			Circuit Breaker	Disconnect Switch	Motor Termination	Ground Lugs
208…240 Volt						
1	ACH550-VxR-04A6-2	R1	#10 35 in-lbs	#10 7 in-lbs	#6 30 in-lbs	#4 35 in-lbs
1.5	ACH550-VxR-06A6-2	R1				
2	ACH550-VxR-07A5-2	R1				
3	ACH550-VxR-012A-2	R1				
5	ACH550-VxR-017A-2	R1				
7.5	ACH550-VxR-024A-2	R2	#8 40 in-lbs	#8 7 in-lbs		
10	ACH550-VxR-031A-2	R2	#2 50 in-lbs		#2 50 in-lbs	#2 50 in-lbs
15	ACH550-VxR-046A-2	R3		#4 18 in-lbs	#2/0 120 in-lbs	
20	ACH550-VxR-059A-2	R3				
25	ACH550-VxR-075A-2	R4	#1 50 in-lbs	#1 55 in-lbs		
380…480 Volt						
1/1.5	ACH550-VxR-03A3-4	R1	#10 35 in-lbs	#10 7 in-lbs	#6 30 in-lbs	#4 35 in-lbs
2	ACH550-VxR-04A1-4	R1				
3	ACH550-VxR-06A9-4	R1				
5	ACH550-VxR-08A8-4	R1				
7.5	ACH550-VxR-012A-4	R1				
10	ACH550-VxR-015A-4	R2	#8 40 in-lbs	#8 7 in-lbs		
15	ACH550-VxR-023A-4	R2				
20	ACH550-VxR-031A-4	R3	#3 50 in-lbs		#2 50 in-lbs	#2 50 in-lbs
25	ACH550-VxR-038A-4	R3		#4 18 in-lbs		
30	ACH550-VxR-045A-4	R3				
40	ACH550-VxR-059A-4	R4	#1 50 in-lbs		#2/0 120 in-lbs	
50	ACH550-VxR-072A-4	R4		#1 55 in-lbs		
60	ACH550-VxR-078A-4	R4		#1 70 in-lbs		

<table>
<tr><th rowspan="2">HP</th><th rowspan="2">Identification</th><th rowspan="2">Frame Size</th><th colspan="4">Maximum Wire Size Capacities of Power Terminals</th></tr>
<tr><th>Circuit Breaker</th><th>Disconnect Switch</th><th>Motor Termination</th><th>Ground Lugs</th></tr>
<tr><td colspan="7">500…600 Volt</td></tr>
<tr><td>2</td><td>ACH550-VxR-02A7-6</td><td>R2</td><td rowspan="6">#8
62 in-lbs</td><td rowspan="6">#4
18 in-lbs</td><td rowspan="6">#6
30 in-lbs</td><td rowspan="6">#4
35 in-lbs</td></tr>
<tr><td>3</td><td>ACH550-VxR-03A9-6</td><td>R2</td></tr>
<tr><td>5</td><td>ACH550-VxR-06A1-6</td><td>R2</td></tr>
<tr><td>7.5</td><td>ACH550-VxR-09A0-6</td><td>R2</td></tr>
<tr><td>10</td><td>ACH550-VxR-011A-6</td><td>R2</td></tr>
<tr><td>15</td><td>ACH550-VxR-017A-6</td><td>R2</td></tr>
<tr><td>20</td><td>ACH550-VxR-022A-6</td><td>R3</td><td rowspan="2">#4
62 in-lbs</td><td rowspan="4">#1
55 in-lbs</td><td>#2
50 in-lbs</td><td rowspan="5">#2
50 in-lbs</td></tr>
<tr><td>25</td><td>ACH550-VxR-027A-6</td><td>R3</td><td rowspan="4">#2/0
120 in-lbs</td></tr>
<tr><td>30</td><td>ACH550-VxR-032A-6</td><td>R4</td><td rowspan="4">#1
62 in-lbs</td></tr>
<tr><td>40</td><td>ACH550-VxR-041A-6</td><td>R4</td></tr>
<tr><td>50</td><td>ACH550-VxR-052A-6</td><td>R4</td></tr>
<tr><td>60</td><td>ACH550-VxR-062A-6</td><td>R4</td><td>#1
70 in-lbs</td></tr>
</table>

Standard enclosure terminals

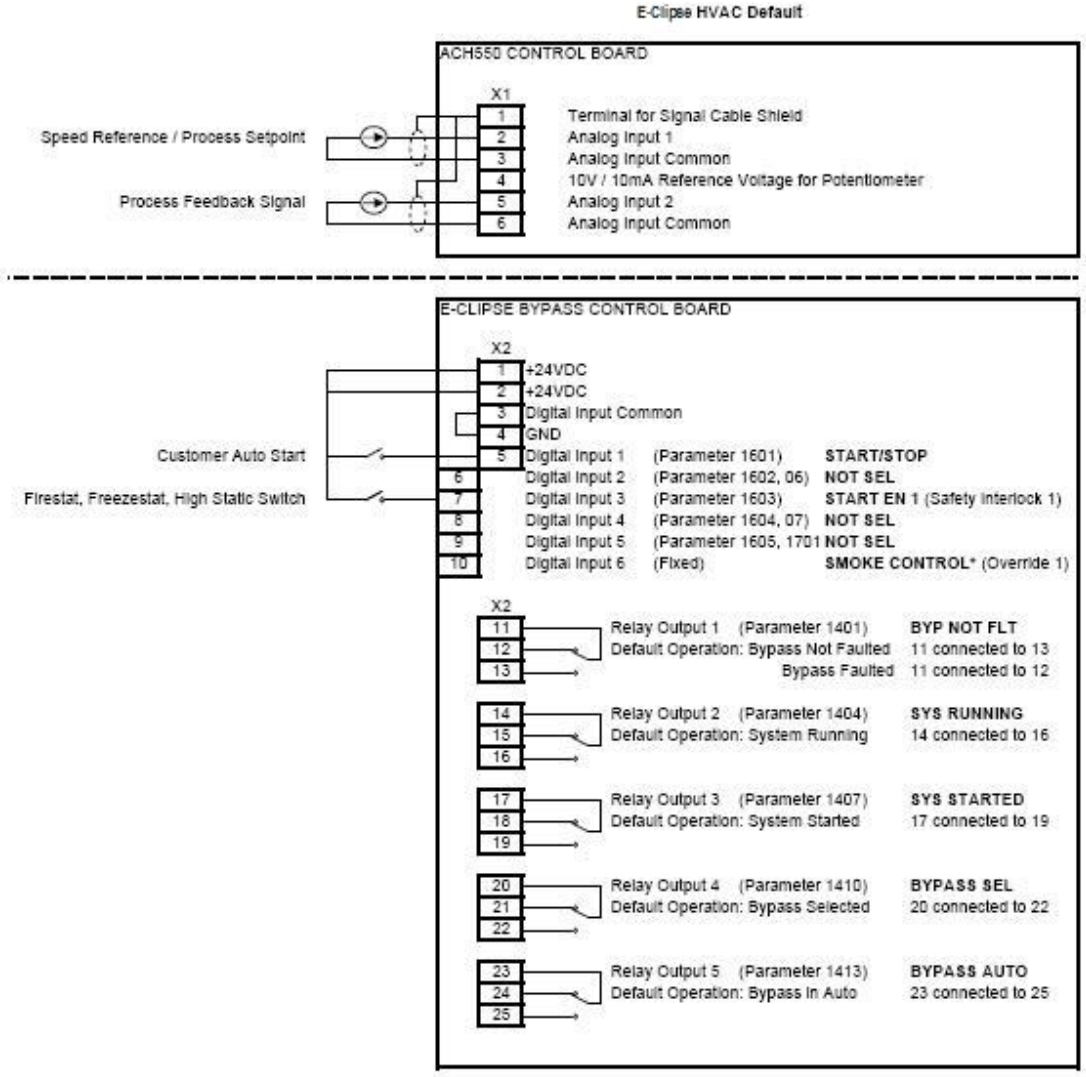
HP	Type Code[1]	Base Drive Frame Size	Power Wiring Data[2]							
			Circuit Breaker UL Type/ NEMA 1 & 12	Circuit Breaker UL Type/ NEMA 3R	Disconnect Switch UL Type/ NEMA 1 & 12	Disconnect Switch UL Type/ NEMA 3R	Motor Terminals UL Type/ NEMA 1 & 2	Motor Terminals UL Type/ NEMA 3R	Ground Lugs UL Type/ NEMA 1 & 2	Ground Lugs UL Type/ NEMA 3R
208…240 Volt										
1	ACH550-BxR-04A6-2	R1	#8 40 in-lbs	#8 40 in-lbs	#8 7 in-lbs	#8 7 in-lbs	#6 30 in-lbs	#6 30 in-lbs	#4 35 in-lbs	#4 35 in-lbs
1.5	ACH550-BxR-06A6-2	R1								
2	ACH550-BxR-07A5-2	R1								
3	ACH550-BxR-012A-2	R1								
5	ACH550-BxR-017A-2	R1								
7.5	ACH550-BxR-024A-2	R2								
10	ACH550-BxR-031A-2	R2	#1 50 in-lbs	#1 50 in-lbs			#3 50 in-lbs	#3 50 in-lbs	#2 50 in-lbs	#2 50 in-lbs
15	ACH550-BxR-046A-2	R3			#4 18 in-lbs	#4 18 in-lbs	#2/0 120 in-lbs	#2/0 120 in-lbs		
20	ACH550-BxR-059A-2	R3								
25	ACH550-BxR-075A-2	R4			#1 55 in-lbs	#1 55 in-lbs				
30	ACH550-BxR-088A-2	R4	350 MCM 274 in-lbs	350 MCM 274 in-lbs	#1/0 70 in-lbs	#1/0 70 in-lbs	#1 53 in-lbs	#1 53 in-lbs	2 x #3/0 250 in-lbs	
40	ACH550-BxR-114A-2	R4			300 MCM 275 in-lbs	300 MCM 275 in-lbs	250 MCM 300 in-lbs	250 MCM 300 in-lbs		#2/0 375 in-lbs
50	ACH550-BxR-143A-2	R6								
60	ACH550-BxR-178A-2	R6					400 MCM 375 in-lbs	400 MCM 375 in-lbs		
75	ACH550-BxR-221A-2	R6	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 375 in-lbs	2 x 500 MCM 375 in-lbs		350 MCM 100 in-lbs
100	ACH550-BxR-248A-2	R6								

HP	Type Code[1]	Base Drive Frame Size	Power Wiring Data[2]							
			Circuit Breaker UL Type/ NEMA 1 & 12	Circuit Breaker UL Type/ NEMA 3R	Disconnect Switch UL Type/ NEMA 1 & 12	Disconnect Switch UL Type/ NEMA 3R	Motor Terminals UL Type/ NEMA 1 & 2	Motor Terminals UL Type/ NEMA 3R	Ground Lugs UL Type/ NEMA 1 & 2	Ground Lugs UL Type/ NEMA 3R
480 Volt										
1/ 1.5	ACH550-BxR-03A3-4	R1	#8 40 in-lbs	#8 40 in-lbs	#8 7 in-lbs	#8 7 in-lbs	#6 30 in-lbs	#6 30 in-lbs	#4 35 in-lbs	#4 35 in-lbs
2	ACH550-BxR-04A1-4	R1								
3	ACH550-BxR-06A9-4	R1								
5	ACH550-BxR-08A8-4	R1								
7.5	ACH550-BxR-012A-4	R1								
10	ACH550-BxR-015A-4	R2								
15	ACH550-BxR-023A-4	R2								
20	ACH550-BxR-031A-4	R3	#1 50 in-lbs	#1 50 in-lbs			#2 50 in-lbs	#2 50 in-lbs	#2 50 in-lbs	#2 50 in-lbs
25	ACH550-BxR-038A-4	R3			#4 18 in-lbs	#4 18 in-lbs				
30	ACH550-BxR-045A-4	R3								
40	ACH550-BxR-059A-4	R4					#2/0 120 in-lbs	#2/0 120 in-lbs		
50	ACH550-BxR-072A-4	R4			#1 55 in-lbs	#1 55 in-lbs				
60	ACH550-BxR-078A-4	R4			#1 70 in-lbs	#1 70 in-lbs				
75	ACH550-BxR-097A-4	R4	350 MCM 274 in-lbs	350 MCM 274 in-lbs	#1/0 70 in-lbs	#1/0 70 in-lbs	#1 53 in-lbs	#1 53 in-lbs	2 x #3/0 250 in-lbs	
100	ACH550-BxR-125A-4	R5			300 MCM 275 in-lbs	300 MCM 275 in-lbs	250 MCM 300 in-lbs	250 MCM 300 in-lbs		#2/0 375 in-lbs
125	ACH550-BxR-157A-4	R6								
150	ACH550-BxR-180A-4	R6					400 MCM 375 in-lbs	400 MCM 375 in-lbs		
200	ACH550-BxR-246A-4	R6	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 375 in-lbs	2 x 500 MCM 375 in-lbs		350 MCM 100 in-lbs
250	ACH550-BxR-316A-4	R8					2 x 600 MCM 500 in-lbs		5 Bus bar holes (13/32" bolts)	
300	ACH550-BxR-368A-4	R8								
350	ACH550-BxR-414A-4	R8								
400	ACH550-BxR-486A-4	R8								

HP	Type Code[1]	Base Drive Frame Size	Power Wiring Data[2]							
			Circuit Breaker UL Type/ NEMA 1 & 12	Circuit Breaker UL Type/ NEMA 3R	Disconnect Switch UL Type/ NEMA 1 & 12	Disconnect Switch UL Type/ NEMA 3R	Motor Terminals UL Type/ NEMA 1 & 2	Motor Terminals UL Type/ NEMA 3R	Ground Lugs UL Type/ NEMA 1 & 2	Ground Lugs UL Type/ NEMA 3R
600 Volt										
2	ACH550-BxR-02A7-6	R2	#8 62 in-lbs	#8 62 in-lbs	#4 18 in-lbs	#4 18 in-lbs	#6 30 in-lbs	#6 30 in-lbs	#4 35 in-lbs	#4 35 in-lbs
3	ACH550-BxR-03A9-6	R2								
5	ACH550-BxR-06A1-6	R2								
7.5	ACH550-BxR-09A0-6	R2								
10	ACH550-BxR-011A-6	R2								
15	ACH550-BxR-017A-6	R2								
20	ACH550-BxR-022A-6	R3	#1 62 in-lbs	#1 62 in-lbs	#1 55 in-lbs	#1 55 in-lbs	#2 50 in-lbs	#2 50 in-lbs	#2 50 in-lbs	#2 50 in-lbs
25	ACH550-BxR-027A-6	R3								
30	ACH550-BxR-032A-6	R4					#2/0 120 in-lbs	#2/0 120 in-lbs		
40	ACH550-BxR-041A-6	R4								
50	ACH550-BxR-052A-6	R4								
60	ACH550-BxR-062A-6	R4			#1 75 in-lbs	#1 75 in-lbs				
75	ACH550-BxR-077A-6	R6	300 MCM 274 in-lbs	300 MCM 274 in-lbs	#1/0 70 in-lbs	#1/0 70 in-lbs	#1 53 in-lbs	#1 53 in-lbs	3 x #3/0 250 in-lbs	
100	ACH550-BxR-099A-6	R6								
125	ACH550-BxR-125A-6	R6			300 MCM 275 in-lbs	300 MCM 275 in-lbs	250 MCM 300 in-lbs	250 MCM 300 in-lbs		#2/0 375 in-lbs
150	ACH550-Bx-R144A-6	R6								

1. “BxR” represents both BCR and BDR.
2. Torque values shown relate to current production. Check component labels on previously installed units for required tightening torque.

Basic control connections for E-Clipse HVAC Default



Parameters Changed Relative to E-Clipse HVAC Default

Parameter Number	Description	Setting

* Smoke Control (Override1) is a fixed input. Closing Digital Input 6 **will** place the E-Clipse Bypass in Smoke Control mode which may reassign the function of the other Digital Inputs. Refer to the Smoke Control (Override1) documentation.

2. Check installation – bypass

Control panel settings and checks

Apply power to the E-Clipse Bypass unit. The ACH550 Control Panel should show the operating status of the drive. If the E-Clipse Bypass Control Panel displays a PHASE SEQ (Phase Sequence) fault, remove power, wait at least 5 minutes and then swap any two input phase wires. If the motor is a standard 208 V, 60 Hz motor connected to a 208 V drive or a 460 V, 60 Hz motor connected to a 480 V drive, the default parameter settings should be suitable for the initial tests described below. If the motor's rating is not 208 V or 460 V, 60 Hz, the MOTOR NOM VOLT and MOTOR NOM FREQ parameters will need to be properly set before proceeding. Refer to the *ACH550-UH User's Manual* and set the parameters as required.

Note: The settings for ALL external serial communication between the ACH550 with E-Clipse Bypass and any Building Automation System are configured using the E-Clipse Bypass operator panel. DO NOT attempt to configure the external serial communication connection using the ACH550 operator panel!

The settings for internal communication between the ACH550 and the E-Clipse Bypass are configured at the factory and require no adjustment.

Drive Link recovery procedure

If the ACH550 Drive communication settings are unintentionally changed during setup a "Drive Link Fault", "Drive Link Error" or "Drive Setup" alarm may be displayed. Should this occur, accomplish the following steps in order.

Using the ACH550 Drive Keypad

1. Set Parameter 9802 to "STD MODBUS"
2. Set Parameter 9902 to "E-CLIPSE"
3. Cycle Power

Following the above steps, in order, should restore proper communications between the ACH550 Drive and the E-Clipse Bypass. Should the E-Clipse Keypad continue to display a "Drive Link Fault", "Drive Link Error" or "Drive Setup" alarm, check the following parameter settings to ensure they have been recovered. If necessary, individually set the correct parameter settings as indicated below and cycle power.

The only ACH550 Drive macro that provides the proper configuration settings by default is the E-Clipse Bypass macro. If any other ACH550 Drive macro is used, that macro should be selected after completing the initial tests. When using any other macro the following ACH550 Drive parameter values must be set and power cycled or the E-Clipse Bypass will not function properly:

- Parameter 9802 must be set to "STD MODBUS"
- Parameter 1001 must be set to "Comm"
- Parameter 1002 must be set to "Comm"
- Parameter 1601 must be set to "Comm"

- Parameter 1608 must be set to “Comm”
- Parameter 5303 must be set to “76.8 kb/s”
- Parameter 5304 must be set to “8 EVEN 1”
- Parameter 5305 must be set to “DCU PROFILE”
- Parameter 5310 must be set to “103”
- Parameter 5311 must be set to “104”
- Power must be cycled

Refer to the *ACH550-UH User’s Manual* for additional information.

Note: Run motor from drive before attempting bypass operation.

System check: motor connected to ACH550 with E-Clipse Bypass

After performing the control panel checks and setting the ACH550 Drive Start-up Data parameters, check the operation of the ACH550 Drive with E-Clipse Bypass with the motor connected as follows:

1. Disconnect and lock out power to the E-Clipse Bypass unit, wait at least five minutes before disconnecting power.
2. Connect the motor to the output terminals.

CAUTION: If the Advanced Override (Override 2) input contact is closed, the motor will start across the line as soon as power is applied.

If the Safety Interlock and Run Enable input contacts are closed and the Smoke Control (Override 1) input contact is closed, the motor will start across the line as soon as power is applied.

If the Start/Stop, Safety Interlock and Run Enable input contacts are closed and the system is in the Bypass mode and in either Hand or Auto, the motor will start across the line as soon as power is applied.

If the Start/Stop, Safety Interlock and Run Enable input contacts are closed and the system is in the Drive mode with the drive in either Hand or Auto mode, the motor will start on the drive as soon as power is applied.

In order to prevent the motor from starting, the system should be in the Drive mode and the drive should be OFF when the power is disconnected at the end of the previous series of control panel settings and checks.

In order to prevent the motor from running without disconnecting the motor, open the Run Enable and Safety Interlock contacts on bypass control board terminals X2:2, X2:3 and X2:4 before applying power. Set the bypass to Drive mode and the drive to OFF.

---

3. Apply power to the E-Clipse Bypass unit. The ACH550 Control Panel display should be illuminated. On the bypass control panel, both the display and Enabled LED should be illuminated. If the Enabled LED is not illuminated solid green, check to see that closed contacts or jumpers connect terminal X2:3 to X2:4 and X2:2 to X2:7 on the bypass control board.
4. The Drive Selected LED should be illuminated. If not, press the Drive Select key to switch to Drive mode. Leave the system in the Drive mode when proceeding to the next step.
5. Press the Hand key on the ACH550 Control Panel. Press and hold the UP key until the motor just starts rotating.

Note: If the ACH550 Control Panel displays an OVERCURRENT or EARTH FAULT, disconnect and lock out power to the E-Clipse Bypass unit. Wait at least 5 minutes. Disconnect the motor leads from the E-Clipse Bypass unit and Megger each motor lead to ground to determine if the motor is good. Check the power leads from the Drive / Bypass to the motor for damaged or improper wiring. If the ACH550 Control Panel displays any other drive faults, correct the fault condition before proceeding to the next step.

CAUTION: Check motor rotation direction as soon as the motor begins to move. If motor does not rotate in the correct direction, shut down the drive, disconnect and lock out power to the drive and wait five minutes. Swap any two motor output wires (T1, T2, and T3). Incorrect motor rotation direction may cause equipment damage.

---

6. Increase the speed to 60 Hz or the highest safe operating speed.
7. Press the OFF key on the drive control panel. The motor should stop.

   If the drive does not operate according to these steps, refer to the ACH550-UH User's Manual.

   If the drive operates according to these steps, your ACH550 with E-Clipse Bypass is ready to use with preset or modified macro settings.

Note: The settings for ALL external serial communication between the ACH550 with E-Clipse Bypass and any Building Automation System are configured using the E-Clipse Bypass operator panel. DO NOT attempt to configure the external serial communication connection using the ACH550 operator panel!

The settings for internal communication between the ACH550 and the E-Clipse Bypass are configured at the factory and require no adjustment.

Note: Both the ACH550 Drive and the E-Clipse Bypass include preset application macros. The only ACH550 Drive macro that provides the proper configuration settings by default is the *E-Clipse HVAC Default macro* (9902 = 15). If any other ACH550 drive macro or any modified setting of the *E-Clipse HVAC Default macro* is used the following ACH550 Drive parameter values must be set and power cycled or the E-Clipse Bypass will not function properly:

- Parameter 9802 must be set to “STD MODBUS”
- Parameter 1001 must be set to “Comm”
- Parameter 1002 must be set to “Comm”
- Parameter 1601 must be set to “Comm”
- Parameter 1608 must be set to “Comm”
- Parameter 5303 must be set to “76.8 kb/s”
- Parameter 5304 must be set to “8 EVEN 1”
- Parameter 5305 must be set to “DCU PROFILE”
- Parameter 5310 must be set to “103”
- Parameter 5311 must be set to “104”
- Power must be cycled

Refer to the *ACH550-UH User’s Manual* for programming instructions.

Note: Run motor from drive before attempting bypass operation.

System check: motor disconnected from the ACH550 with E-Clipse Bypass

If you are familiar with the E-Clipse Bypass operation, you may skip the following section. Otherwise, after performing the system checks and setting the ACH550 Drive Start-up Data parameters, become familiar with the operation of the ACH550 Drive with E-Clipse Bypass without the motor connected as follows:

1. Disconnect and lock out power to the E-Clipse Bypass unit, wait at least five minutes after disconnecting power.
2. Disconnect the motor from the E-Clipse Bypass unit.
3. Apply power to the E-Clipse Bypass unit by turning on the branch circuit disconnect device and the bypass disconnect switch or circuit breaker.
4. The ACH550 Control Panel display should be illuminated. On the E-Clipse Bypass control panel, both the display and *Enabled* LED should be illuminated. If the *Enabled* LED is not illuminated solid green, check to see that closed contacts or jumpers connect terminal X2:3 to X2:4 and X2:2 to X2:7 on the bypass control board.

5. On the E-Clipse Bypass control panel, either the *Drive Selected* or *Bypass Selected* LED should be illuminated. Pressing the *Drive Select* or *Bypass Select* key should switch the bypass back and forth between the *Drive* mode and the *Bypass* mode as indicated by the LEDs above each button. Check that the bypass control panel switches the system between modes. Leave the system in the Bypass mode when proceeding to the next step.
6. Check to see that pressing the:
   - *Auto* key on the bypass control panel causes the bottom line on the E-Clipse Bypass display to indicate "*Bypass in Auto*"
   - Hand key on the bypass control panel generates a Motor Phase Fault.
   - Under normal conditions (motor connected) pressing the Hand key on the bypass control panel causes the bottom line on the E-Clipse Bypass display to indicate "Hand #A Run"
   - OFF key on the bypass control panel causes the bottom line on the E-Clipse Bypass display to indicate "Off Stop"
7. For Steps 8 through 14, ACH550 Drive Parameter 9904 must be set to "Scalar: Freq". After successful completion of Step 13, Parameter 9904 may be set to "Vector: Speed" if very specific application requirements make it necessary to use this type of motor control. Operation using the "Vector: Speed" setting is unnecessary for control of almost all fan and pump applications. Refer to the *ACH550-UH User's Manual* for details on setting parameters.
8. Press the *Drive Select* key on the E-Clipse Bypass control panel. The *Drive Select* LED should be illuminated.
9. Check to see that pressing the:
   - *Auto* key on the bypass control panel causes the E-Clipse Bypass display to indicate "*Bypass in Auto*"
   - *Hand* key on the bypass control panel causes no change to the E-Clipse Bypass display
   - *OFF* key on the bypass control panel causes the E-Clipse Bypass display to indicate "*Bypass in Off"*
10. Press the *HAND* key on the drive control panel. Note that the top line of the control panel display indicates "HAND" and run as a clockwise rotating arrow. The *Drive Run* LED on the E-Clipse Bypass control panel should be illuminated.
11. Press the *UP* arrow on the drive control panel. Note that the speed reference indication in the top line of the drive control panel display increases from "0.0% SP."
12. In the middle line of the drive control panel display, the output current indication should indicate "0.0 A."
13. Press the *DOWN* arrow on the drive control panel until the speed and frequency indications return to "0.0."
14. Press the *OFF* key on the drive control panel. Note that the bottom line of the drive contol panel display indicates "Off."

If the ACH550 Drive and E-Clipse Bypass operate according to these steps, and you have familiarized yourself with their operation, disconnect and lock out power to prepare for the next test.

WARNING! Wait at least five minutes after disconnecting power from the drive before you attempt to service the drive. Bus capacitors in the intermediate DC circuit must discharge before servicing the drive. Using a meter rated for 1000 VDC, check for zero volts at:

- Terminals BRK+ to GND and BRK- to GND (frame size R1/R2)
- Terminals UC+ and UC- (frame size R3…R8).

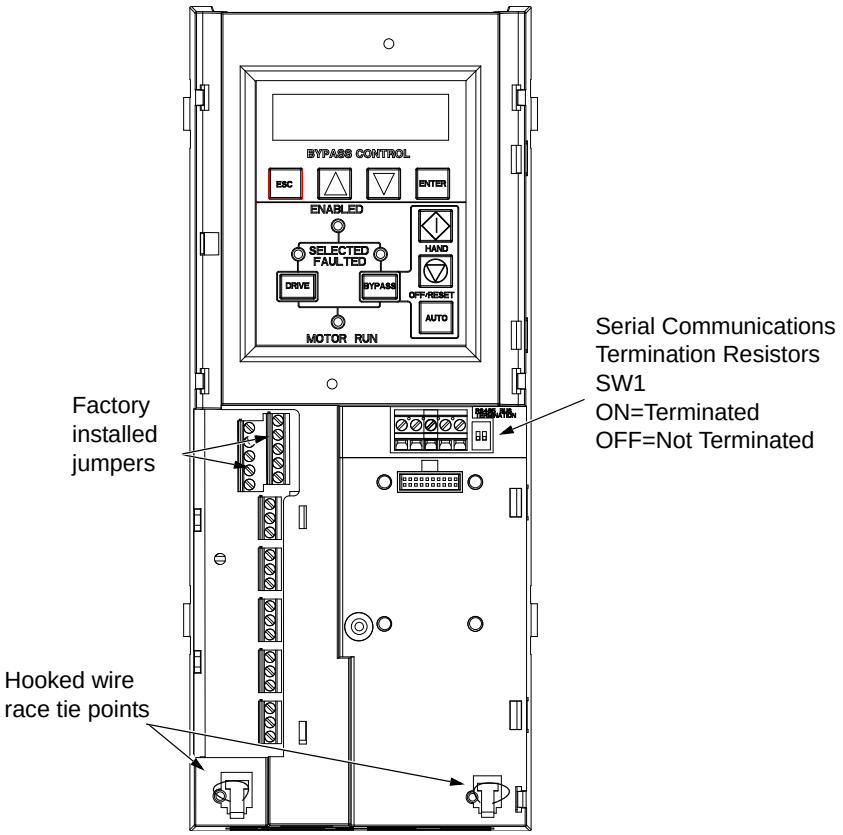
If the drive does not operate according to these steps, refer to the ACH550-UH User's Manual.

3. Check jumpers and switches

The settings described in this section are factory set and, for most situations, do not require adjustment. However, it is a good practice to review these settings to confirm that they are appropriate for the configuration installed.

Jumper and switch locations

The figure below shows the locations of the SW1 DIP switch on the E-Clipse Bypass control board. The function and setting of this switch is explained in the following paragraph.



DIP switch settings

The DIP switch is used to configure the serial communications termination resistors.

To reduce noise on the serial communications network, terminate the EIA-485 network using 120 ohm resistors at both ends of the network. Use the DIP switches to connect or disconnect the on-board termination resistors. Both switches must be positioned in the ON or OFF position to correctly configure the termination resistors.

Note: When using embedded protocols, set SW1 in the OFF position.

Circuit breaker settings

On some ACH550 E-Clipse Bypasses, the circuit breaker has adjustable settings for instantaneous current protection. The factory default settings are practical for most applications. Refer to the “ABB SACE Instruction Sheet” (supplied with these units) for additional information on the adjustment of these settings.

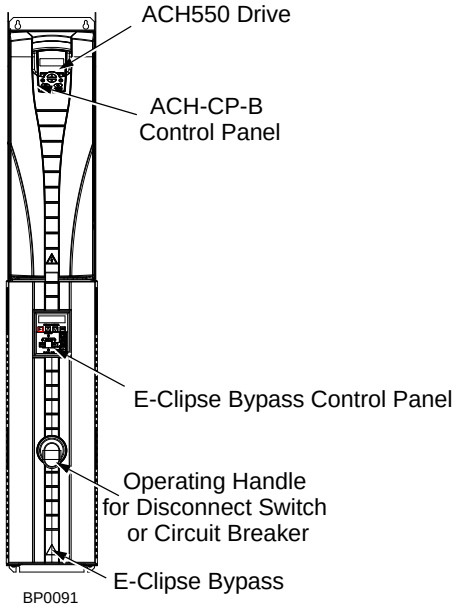
Operation

E-Clipse bypass configurations

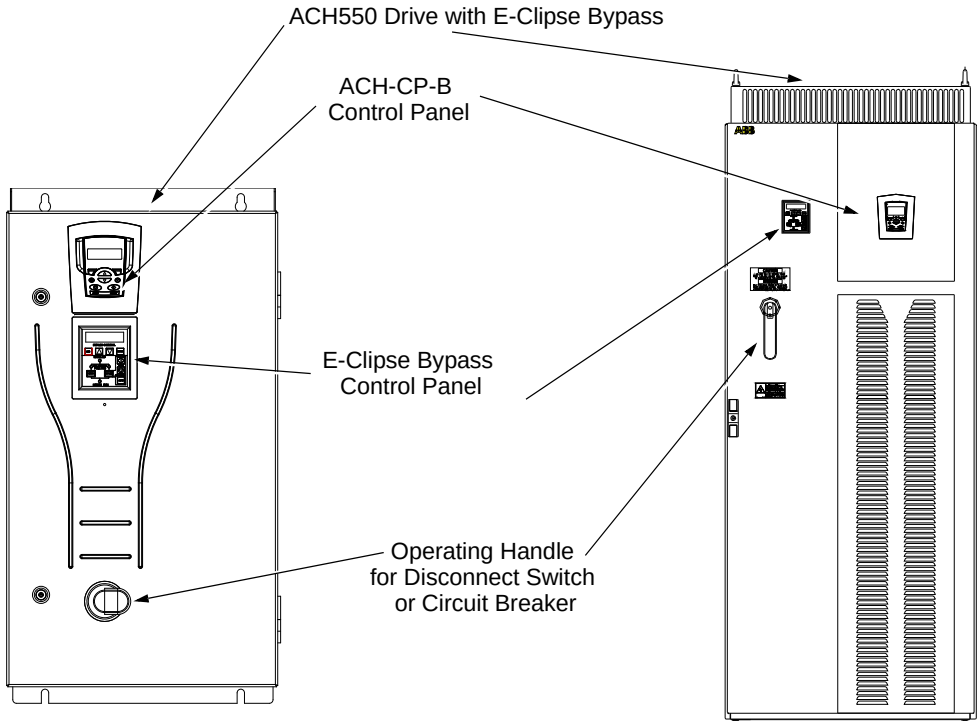
The ACH550 with E-Clipse Bypass is an ACH550 AC adjustable frequency drive in an integrated UL type 1, UL type 12 or UL type 3R package with a bypass motor starter. The ACH550 with E-Clipse Bypass provides:

- Disconnect switch or circuit breaker with door mounted control lever. The lever can be padlocked in the OFF position (padlock not supplied).
- Bypass starter.
- Motor overload protection.
- Local operator panel with indicating lights and multifunction display.
- Provisions for external control connections.
- Embedded communications for major BMS protocols including BACnet, Johnson Controls International N2, Siemens Building Technologies FLN, and Modbus
- Optional fieldbus adapters for connection to additional BMS protocols including LonWorks and Ethernet
- Optional drive service switch (drive input disconnect), the functional equivalent of a three-contactor bypass arrangement.

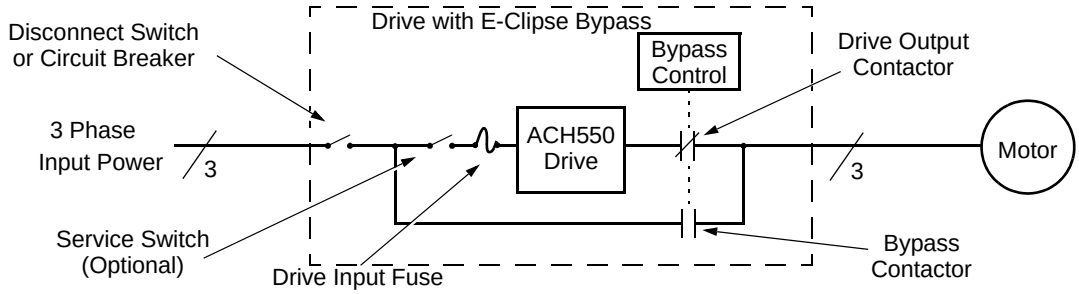
The following shows the front view of the ACH550 E-Clipse Bypass vertical configuration, and identifies the major components.



The following shows the front view of the ACH550 E-Clipse Bypass standard configurations, and identifies the major components.

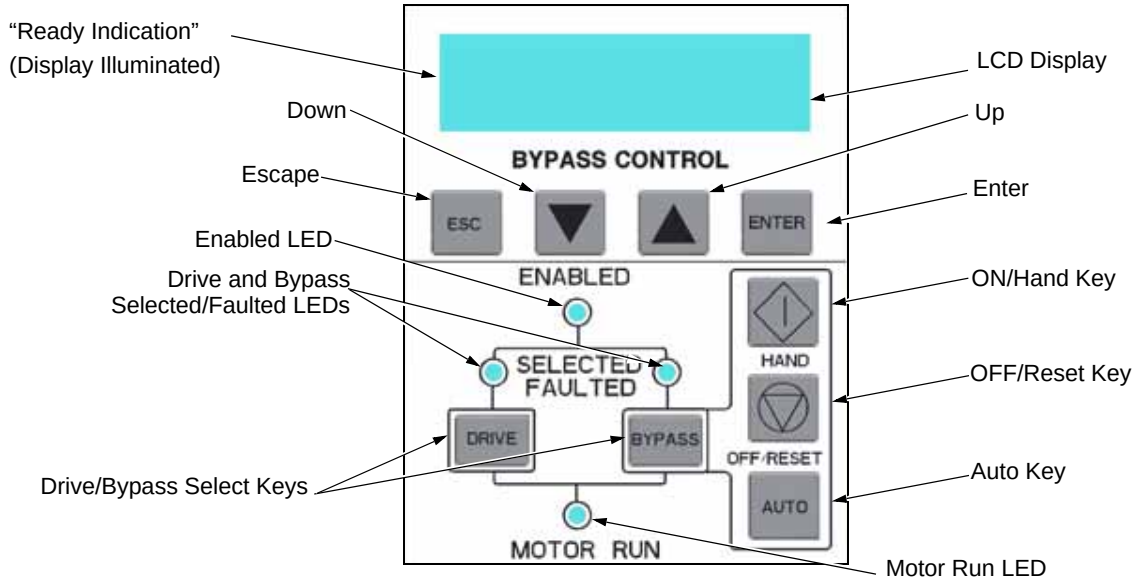


The following is a typical power diagram.



Bypass control

The bypass control panel features:



Ready (Power On) Indication

The *Ready (Power On) indication* is provided by the bypass control panel. The bypass control panel display will be illuminated and text will be displayed when the disconnect switch or circuit breaker is closed and control power is applied to the bypass.

Enabled LED

The *Enabled LED* is illuminated green under the following conditions:

- Both the Safety Interlock(s) and Run Enable contacts are closed.
- The Safety Interlock contact(s) are closed with no Start command present.

The Enabled LED flashes green if the Run Enable contact is open and when the Safety Interlock contact(s) are closed and a Start command is present.

The Enabled LED is illuminated red when the Safety Interlock contact(s) are open.

Motor Run LED

The *Motor Run LED* is illuminated green when the motor is running in either bypass mode or in drive mode. The Motor Run LED flashes green to indicate the system has been placed in an Override condition.

Bypass Faulted LED

The *Bypass Faulted LED* is illuminated or flashes red when the motor or bypass protection functions have shut down the bypass. The specific nature of the fault is indicated on the bypass control display. Refer to the *Diagnostics* section of this manual for more details.

Drive Selected LED

The *Drive Selected LED* is illuminated green when the drive has been selected as the power source for the motor and no drive fault is present.

Bypass Selected LED

The *Bypass Selected LED* is illuminated or flashes green when the bypass has been selected as the power source for the motor and no bypass fault is present.

Drive Faulted LED

The *Drive Faulted LED* is illuminated red when the bypass has lost its communications link with the drive or when the motor or drive protection functions have shut down the drive. The specific nature of the fault is indicated on the drive control panel display. Refer to the *Diagnostics* section on page *66* of the ACH550-UH User's Manual for more details.

Automatic Transfer

The *Automatic Transfer* indication is provided on the bypass control panel. The bypass control display will continuously flash an alarm to indicate the system has automatically transferred to Bypass after a Drive fault. The Bypass Selected LED flashes green when the system has automatically transferred to bypass operation. The bypass event log will also record this event.

Auto Indication

The *Auto Indication* is provided on the bypass control panel default display when the bypass control panel Auto key is pressed. Normally this indicates that the Auto Start contact or serial communications has been selected as the means for starting and stopping the motor in the bypass mode.

Off Indication

The *Off Indication* is provided on the bypass control panel default display when bypass control panel Off key is pressed.

Hand Indication

The *Hand Indication* is provided on the bypass control panel default display when the motor has been started manually in the bypass mode.

Drive Select Key

The *Drive Select Key* selects the drive as the power source for the motor.

Bypass Select Key

The *Bypass Select Key* selects the bypass as the power source for the motor.

Off/Reset Key

The *Off/Reset Key* may be used to manually stop the motor if the motor has been running on bypass power. The Off/Reset key also resets most bypass faults. It may take several minutes before the bypass can be reset after an overload trip. If a bypass fault condition is present the second press of this key places the bypass in the OFF mode.

Auto Key

The *Auto Key* selects the Auto Start contact or serial communications as the means for starting and stopping the motor in the bypass mode.

Hand Key

The *Hand Key* can be used to manually start the motor when the bypass has been selected as the power source for the motor.

Bypass control panel modes

The HVAC Bypass Control Panel has several different modes for configuring, operating and diagnosing the bypass. Select MENU and use the UP/DOWN buttons to select modes. The modes are:

- Default Display mode – Provides (HAND/OFF/AUTO) indication of the bypass operating control mode.
- Bypass Status mode – Provides status indications of the current system operating conditions.
- Start-Up Parameter Mode – Provides a list of parameters or operating conditions that may be configured or viewed during startup.
- Parameter List mode – Used to edit parameter values individually.
- Changed Parameter mode – Displays changed parameters.
- Bypass Fault Display mode – If there is an active bypass fault, the control panel will flash the fault number and fault diagnostic indication in English.
- Bypass Alarm Display mode – If there is an active bypass alarm, the control panel will flash the alarm number and alarm diagnostic indication in English.

Start-up by changing the parameters from the start-up list

To change the parameters, follow these steps:

1	The **Default Display** indicates the **Bypass Control** mode.		DRIVE SELECTED BYPASS IN OFF
2	Press **ENTER** to enter the **Main Menu.**	ENTER	*BYPASS STATUS STARTUP PARAMS

3	Select the **Startup Params** with the **Up/Down** arrows and press **ENTER**.	▼ ▲ ENTER	BYPASS STATUS *STARTUP PARAMS
4	Select the appropriate **Parameter** with the **Up/Down** arrows and press **ENTER**.	▼ ▲ ENTER	*1601 START/STOP 1613 BP DISABLE
5	Press the **Up/Down** arrows to change the **Parameter Value**.	▼ ▲	1601 START/STOP [1:DI1]
6	Press **ENTER** to store the modified value or press **ESC** to leave the **Parameter Edit** mode.	ENTER or ESC	*1601 START/STOP 1613 BP DISABLE
7	Press **ESC** to return to the **Main Menu**, and again to return to the. **Default Display**.	ESC	DRIVE SELECTED BYPASS IN OFF

Start-up by changing the parameters individually from the parameter list

To change the parameters, follow these steps:

1	The **Default Display** indicates the **Bypass Control** mode.		DRIVE SELECTED BYPASS IN OFF
2	Press **ENTER** to enter the **Main Menu.**	ENTER	*BYPASS STATUS STARTUP PARAMS
3	Select the **Parameter List** with the **Up/Down** arrows and press **ENTER**.	▼ ▲ ENTER	STARTUP PARAMS *PARAMETER LIST
4	Select the appropriate **Parameter Group** with the **Up/Down** arrows and press **ENTER**.	▼ ▲ ENTER	14 RELAY OUT *16 SYSTEM CTRL
5	Select the appropriate **Parameter** in a group with the **Up/Down** arrows and press **ENTER**.	▼ ▲ ENTER	*1601 START/STOP 1602 RUN ENABLE
6	Press the **Up/Down** arrows to change the **Parameter Value**.	▼ ▲	1601 START/STOP [1:DI1]
7	Press **ENTER** to store the modified value or press **ESC** to leave the **Parameter Edit** mode.	ENTER or ESC	*1601 START/STOP 1602 RUN ENABLE
8	Press **ESC** to return to the listing of **Parameter Groups**, and again to return to the **Main Menu**.	ESC ESC	*16 SYSTEM CTRL 17 OVERRIDE

9	Press **ESC** to return to the **Default Display** from the **Main Menu.**	ESC	DRIVE SELECTED BYPASS IN OFF

Note: In the Parameter Edit mode the current parameter value appears below the parameter name.

Note: To view the default parameter value, press the **Up/Down** arrows simultaneously. Press **Enter** to restore the default parameter value or press **ESC** to leave the **Parameter Edit** mode.

Diagnostics

Fault listing

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
3001	COIL CURR FBK	RBCU is sensing abnormal current feedback when neither contactor should be energized	Defective component on RBCU	Change RBCU
3002	BYP CNTACT STUCK	M2 contactor indicates it is not prepared to move on a power up check of the contactor or after contact is commanded to open	Defective Contactor Defective RBCU	Disconnect incoming power from unit Check if contactor armature moves freely. If armature moves freely, then change the RBCU. If armature does not move freely, then change individual contactor (M2) or the complete assembly (RCSA-0x)
3003	DRV CNTACT STUCK	M1 contactor indicates it is not prepared to move on a power up check of the contactor or after contact is commanded to open	Defective Contactor Defective RBCU	Disconnect incoming power from unit Check if contactor armature moves freely. If armature moves freely, then change the RBCU. If armature does not move freely, then change individual contactor (M1) or the complete assembly (RCSA-0x)

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
3004	BYPASS COIL OPEN	M2 contactor will not close when commanded to do so	Loose J8 connector on RBCU Loose wires on contactor terminals A1 and/or A2 Bad Output on RBCU Bad Contactor	Verify that J8 connector is firmly seated. With incoming power disconnected, check for tightness of A1 and A2 terminals Swap RBCU Change Contactor/ Assembly
3005	DRIVE COIL OPEN	M1 contactor will not close when commanded to do so	Loose J8 connector on RBCU Loose wires on contactor terminals A1 and/or A2 Bad Output on RBCU Bad Contactor	Verify that J8 connector is firmly seated. With incoming power disconnected, check for tightness of A1 and A2 terminals Swap RBCU Change Contactor/ Assembly
3006	UNDERVOLTAGE	Fault will be generated only if the drive is controlling the motor and the power to the bypass is removed before the drive shuts down. This fault is generated when the drive contactor opens while the drive is operating.	Loose J7 connector on RBCU unit Loose input wiring Incoming power problems	Check that J7 connector is firmly seated in RBCU Check tightness of incoming connections Check Parameter 0413 to view voltage level at time of trip Check upstream protection
3008	DRIVE AI2 LOSS	Only displayed when in Supervisory mode. Indicates that AI2 on the drive has failed.	Check ACH550 manual for AI2 loss	Check ACH550 manual for AI2 loss
3009	MTR OVERLOAD	Bypass opens on motor overload conditions defined in the drive	Drive Mode: Bad Motor Bad CT's Bad RBCU Bypass mode: Bad motor Bad CT's Bad RBCU Either mode: low input voltage	Check if overload condition exists Drive Mode: Refer to 550 manual for proper troubleshooting techniques Bypass Mode: Check that J2 connector is firmly seated in RBCU Use clamp meter to verify mtr current vs. display in parameter 0101 Check input voltage

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
3010	INP PHASE A LOSS	Fault will be generated when the bypass contactor is requested to be closed and the RBCU does not sense voltage on Phase A	Loose J7 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J7 connector Check yellow wire on input block Check incoming voltage, phase to ground
3011	INP PHASE B LOSS	Fault will be generated when the bypass contactor is requested to be closed and the RBCU does not sense voltage on Phase B	Loose J7 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J7 connector Check black wire on input block Check incoming voltage, phase to ground
3012	INP PHASE C LOSS	Fault will be generated when the bypass contactor is requested to be closed and the RBCU does not sense voltage on Phase C	Loose J7 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J7 connector Check red on input block Check incoming voltage, phase to ground
3013	DRIVE 1ST START	Fault generated if attempting to close the bypass contactor with out running the bypass in drive mode first.	NA	Run bypass unit in drive mode before attempting bypass mode
3014	COIL POW SUPPLY	Coil power supply has failed to reach rated voltage	Internal failure on RBCU unit Shorted contactor coil	Cycle power on bypass unit. If contactor coil is shorted, fault 3023 or 3024 will be generated. If 3023 or 3024 is generated, replace respective contactor If 3023 or 3024 is not generated on power up, replace RBCU unit.
3016	EARTH FAULT	Declared if attempting to close the bypass contactor when the drive has earth fault declared	Earth fault in motor	Refer to the fault code 16 on page *25*.
3017	MTR UNDERLOAD	If motor power(%) level falls below minimum power level establish in parameter 3003 for the time (s) set in parameter 3002 fault will be generated. Parameter 3003 is a percentage of motor power as defined in the drive via parameter 9909. Fault only applies to bypass mode	Broken belt	Check load Reset bypass keypad Check fault code 17 on page *25*, for further action

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
3018	MAX CYCLE FAULT	Supervisory Mode only. Declared if bypass contactor is closed by supervisory control 16 times within a 1 hour period.	High and low levels of hysteresis band are too tight	Check parameters 3202-3205. Increase time delays on parameters 3204 and 3205
3019	DRIVE LINK FAULT	Supervisory Mode Only. Fault generated if RS-485 link between drive and bypass stops communicating.	Bad cable/connection between drive and bypass. Communication improperly set in drive Parameter 9802. Application Macro improperly set in drive parameter 9902.	Proper seating of cable in drive and RBCU(connector J3) Check drive parameter 9802 (Modbus) and 9902 (E-Clipse) Check drive Group 53 Follow DriveLink recovery procedure
3020	PHASE SEQ	Sequence of 3 phase voltage input is such that bypass operation will result in motor rotation opposite of drive forward operation.	Phase sequence unknown at time of wiring	Swap any two of the three input wires to the bypass unit
3021	PH A CURR FBK	Fault is generated when current in Phase A is detected and the bypass contactor is open	Loose CT connection Bad RBCU Bad CT	Check J2 connector for proper seating Check connector on Current Assembly Replace RBCU Replace RCSA unit
3022	PH C CURR FBK	Fault is generated when current in Phase C is detected and the bypass contactor is open	Loose CT connection Bad RBCU Bad CT	Check J2 connector for proper seating Check connector on Current Assembly Replace RBCU Replace RCSA unit
3023	BYP COIL SHORTED	Coil characteristics are checked only on power up and coil current is greater than allowable values	Shorted contactor coil Shorted/damaged cable Bad RBCU	Replace RBCU Replace RCSA unit
3024	DRV COIL SHORTED	Coil characteristics are checked only on power up and coil current is greater than allowable values	Shorted contactor coil Shorted/damaged cable Bad RBCU	Replace RBCU Replace RCSA unit
3027	INVALID SUB ASM	Contactor assembly as recorded in the RBCU unit does not match drive information communicated via 485 link	RBCU unit from a different size bypass used to replace a defective RBCU. Parameters not matched after Firmware change.	Contact ABB at 1-800-HELP-365 Option 4

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
3028	EXT COMM LOSS	Time between fieldbus messages has exceeded timeout interval set with parameter 3005	Incorrect Communication settings in Group 51 & 53. Poor Connections Noise on Communication Line	Check Group 51 & 53 Tighten Connections Check Communication Cable Grounding
3029	EFB CONFIG FILE	Error reading configuration file for embedded fieldbus	Internal Startup error	Cycle Power Replace RBCU
3030	FORCE TRIP	Fault trip forced by external fieldbus	Overriding Control System tripped E-Clipse unit via fieldbus.	Check Overriding Control System
3031 ... 3033	EFB 1...EFB 3	Fault code reserved for embedded fieldbus.	For Bacnet: Device object instances for the drive and or bypass are set greater than 4194302 in paramters 5011 5017 and or 5311 5317 respectively	Check Parameters 5011, 5017 and/or 5311, 5317
3034	MTR PHASE	Detects open motor phase. Detection is done by current transformers in bypass unit.	Internal problem Cable problem Motor problem	Check wiring in E-Clipse Unit Check motor cabling Check Motor Check if 3006 is Disabled
3037	PCB TEMP	RBCU unit has reached 190 degrees Fahrenheit, 88 degrees Celsius	Cabinet cooling has failed Ambient conditions too high Bad RBCU unit	Stop drive and let cool down and restart Add additional cooling Replace RBCU
3038	NO DRIVE DATA	No drive data available (Group 112)	Bypass not able to extract drive data on initial power up due to: Bad cable/connection between drive and bypass. Communication improperly set in drive Parameter 9802. Application Macro improperly set in drive parameter 9902.	Proper seating of cable in drive and RBCU (connector J3) Check drive parameter 9802 (Modbus) and 9902 (E-Clipse) Check drive Group 53 Follow DriveLink recovery procedure then cycle power to bypass.
3039	FBA PAR CONF	Non embedded fieldbus has detected an error in Group 51 parameters	Incorrect settings in Group 51	Verify Group 51 parameters
3101	SFLASH CORRUPT	Internal checksum error	NA	Cycle power Replace RBCU Upgrade firmware

Fault Code	Fault Name In Panel	Fault	Possible Cause	Corrective Action
3102	PMAP FILE	Parameter file is corrupt		Cycle Power Contact ABB with information that preceeded fault
3201	T1 OVERLOAD	T1 program cycle is overloaded	NA	Contact ABB with information that proceeded fault Cycle Power Replace RBCU
3202	T2 OVERLOAD	T2 program cycle is overloaded	NA	Contact ABB with information that proceeded fault Cycle Power Replace RBCU
3203	T3 OVERLOAD	T3 program cycle is overloaded	NA	Contact ABB with information that proceeded fault Cycle Power Replace RBCU
3204	STACK OVERFLOW	Program cycle is overloaded	NA	Contact ABB with information that proceeded fault Cycle Power Replace RBCU
3205	UNKNOWN CB	Bypass control board type is unknown.	Firmware is not compatible with control board in RBCU.	Firmware 93F and greater compatible with all RCBU hardware. Firmware 93D and earlier can only be loaded in RBCU Rev D and earlier.
3206	UNKNOWN DRIVE	Drive reports rating not found in bypass software	Drive does not match drives configured in bypass RBCU	Replace RBCU or reload with most current firmware
3207	UNKNOWN BYPASS	NA	NA	Replace RBCU or load most current firmware Contact ABB at 1-800-HELP-365 option 4 Replace RBCU or load most current firmware

Fault History

See page *28*.

Alarm listing

The following table lists the alarms by code number and describes each.

Alarm Code	Alarm Name In Panel	Alarm	Possible Cause	Corrective Action
4001	INP PHASE A LOSS	Alarm will occur in drive mode. In bypass, alarm will occur if bypass contactor has not closed. Unit will trip on Fault 3010 if the bypass contactor is closed	Loose J8 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J8 connector Check yellow wire on input block Check incoming voltage, phase to ground
4002	INP PHASE B LOSS	Alarm will occur in drive mode. In bypass, alarm will occur if bypass contactor has not closed. Unit will trip on Fault 3011 if the bypass contactor is closed	Loose J8 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J8 connector Check black wire on input block Check incoming voltage, phase to ground
4003	INP PHASE C LOSS	Alarm will occur in drive mode. In bypass, alarm will occur if bypass contactor has not closed. Unit will trip on Fault 3012 if the bypass contactor is closed	Loose J8 connector Loose wiring on Contactor assembly. Blown upstream fuse	Check J8 connector Check red wire on input block Check incoming voltage, phase to ground
4004	AUTO TRANSFER	Message is displayed when the drive faults and the bypass switches to bypass mode as configured in Parameter 1608	Drive fault	Check drive
4005	EXT COMM ERR	Time between fieldbus messages has exceeded timeout interval set with parameter 3005	Incorrect Communication settings in Group 51 & 53. Poor Connections Noise on Communication Line	Check Group 51& 53 Tighten Connections Check Communication Cable Grounding
4006	Selected by PAR 1620: RUN ENABLE DAMPER END SWITCH VALVE OPENING PRE-LUBE CYCLE	Alarm will occur when start order is given and the “RUN Enable” is not present	Run Enable condition is not satisfied. Bad 24v supply Bad digital input	Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 for status of digital input
4007	PCB TEMP	RBCU unit reached 181 degrees Fahrenheit, 83 degrees Celsius	Cabinet cooling has failed Ambient conditions too high Bad RBCU unit	Stop drive and let cool down and restart Add additional cooling Replace RBCU

Alarm Code	Alarm Name In Panel	Alarm	Possible Cause	Corrective Action
4008	DRIVE SETUP	Alarm generated when configuration of drive is such that bypass can not properly control the drive. Specifically, drive parameters 1001,1002,1601, 1608	Incorrect parameters settings	Set Parameter 1001 to “COMM” Set Parameter 1002 to “COMM” Set Parameter 1601 to “COMM” Set Parameter 1608 to “COMM”
4009	BYPASS RUN DELAY	Alarm is generated when a bypass start command is issued and there is non zero time value in bypass parameter 1614	NA	NA
4010	MTR OVERLOAD	Bypass warning if motor overload conditions exist as defined in the drive	Drive Mode: Bad Motor Bad Ct’s Bad RBCU Bypass mode: Bad motor Bad CT’s Bad RBCU Either mode: low input voltage	Drive Mode: Refer to 550 manual for proper troubleshooting techniques Bypass Mode: Check that J2 connector is firmly seated in RBCU Check input voltage Does overload condition exist?
4011	MTR UNDERLOAD	Alarm comes at half the time of a mtr underload fault. See fault 3017 for further text	NA	Parameter 3002 is the time Parameter 3003 is the level
4012	BYPASS DISABLED	Alarm will be generated if parameter 1613 is set to “Disable”	NA	NA
4013	DRIVE LINK ERROR	Same as Fault 3019 however will occur when not in supervisory mode	Bad cable between drive and bypass Communication improperly set in drive Parameter 98.02(Modbus) Application Macro in 99.02 set to 15 (text)	Proper seating of cable in drive and RBCU(connector J3) Check drive parameter 98.02 and 99.02 Check drive Group 53 Follow DriveLink recovery procedure
4014	DRIVE TEST	Alarm is generated when bypass parameter 1617 is set to “enable”	NA	NA
4015	START DRIVE 1ST	Message displayed on initial “out of box” power up sequence	NA	Run drive in Hand

Alarm Code	Alarm Name In Panel	Alarm	Possible Cause	Corrective Action
4016	INP VOLTAGE LOW	3-Phase input voltage has not reached a sufficient level to enable editing of parameters via the keypad. This message is generated within a few seconds of power up	NA	Loose J7 connector Low input voltage. Incoming voltage has not reached at least 155 VAC within a few seconds of powerup
4019	OVERRIDE 1	Alarm is generated when override 1 is active	NA	Check Parameter 0103 and 0104 for digital input status
4020	OVRD2 BYP	Alarm is generated when override 2 is active and the bypass is controlling the motor	NA	Check Parameter 0103 and 0104 for digital input status
4021	Selected by PAR 1621 START ENABLE 1 VIBRATION SWITCH FIRESTAT FREEZESTAT OVERPRESSURE VIBRATION TRIP SMOKE ALARM SAFETY OPEN LOW SUCTION PRES	Alarm will occur when start order is given and the “RUN Enable” is not present	Run Enable condition is not satisfied. Bad 24v supply Bad digital input 24 V common is not tied to Digital input common on bypass when using external 24 v supply	Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 For status of digital input
4022	Selected by PAR 1622 START ENABLE 2 VIBRATION SWITCH ... LOW SUCTION PRES	Alarm will occur when start order is given and the “RUN Enable” is not present	Run Enable condition is not satisfied. Bad 24v supply Bad digital input 24 V common is not tied to Digital input common on bypass when using external 24 v supply	Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 For status of digital input
4023	Selected by PAR 1623 START ENABLE 3 VIBRATION SWITCH ... LOW SUCTION PRES	Alarm will occur when start order is given and the “RUN Enable” is not present	Run Enable condition is not satisfied. Bad 24v supply Bad digital input 24 V common is not tied to Digital input common on bypass when using external 24 v supply	Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 For status of digital input

Alarm Code	Alarm Name In Panel	Alarm	Possible Cause	Corrective Action
4024	Selected by PAR 1624 START ENABLE 4 VIBRATION SWITCH ... LOW SUCTION PRES	Alarm will occur when start order is given and the “RUN Enable” is not present	Run Enable condition is not satisfied. Bad 24v supply Bad digital input 24 V common is not tied to Digital input common on bypass when using external 24 v supply	Check 24 Volts on RBCU unit Check for 24 volts on respective DI when condition is satisfied Check Parameter 0103 For status of digital input
4025	LOCAL DISABLED	Alarm is displayed if MODE LOCK (16.29) is set to AUTO MODE and the Hand or Off key is pressed		
4026	AUTO DISABLED	This alarm is displayed if MODE LOCK (1629) is set to LOCAL MODE and the Auto key is pressed.		
4027	COMM CONFIG ERR	Alarm is displayed if the drive and bypass MAC addresses are equal or invalid.	E-Clipse parameters 5002(BP MAC ID) & 5302 (DV MAC ID) are set to the same value	Change MAC address to unique values
4028	FBA PAR CONF	Non embedded fieldbus has detected an error in Group 51 parameters		Verify Group 51 parameters
4029	DRIVE FAULTED	The drive is faulted.		Reset drive
4030	OVRD2 VFD	Alarm is generated when override 2 is active and the drive is controlling the motor	NA	Check Parameter 0103 and 0104 for digital input status
4031	OVRD2 STOP	Alarm is generated when override 2 is active and both the bypass and drive output contactors are deenergized	NA	Check Parameter 0103 and 0104 for digital input status

Bypass status listing

Bypass Status (16 Characters)	Condition	Description
DRIVE/BYPASS?	DRIVE SELECTED BYPASS SELECTED	Displays which one is selected, drive or bypass
SAFETIES?	OPEN CLOSED	Displays if safeties (=START ENABLE 1 and/ or START ENABLE 2) have been applied, or if they are missing
RUN PERMISSIVES?	OPEN CLOSED	Displays if RUN ENABLE is present or not
START REQUEST?	NOT PRESENT PRESENT	Displays if start request has been applied to the system
AUTO TRANSFER?	NOT TRANSFERRED TRANSFERRED	Displays if the system is in Auto Transfer state or not. Does not reflect to PAR 16.08 AUTO XFER value itself
BYP OVERRIDE 1?	NOT ACTIVATED ACTIVATED	Status of Override 1
BYP OVERRIDE 2?	NOT ACTIVATED ACTIVATED	Status of Override 2
DRIVE FAULTED?	NO YES	Displays if drive is faulted or not
BYPASS FAULTED?	NO YES	Displays if bypass is faulted or not
SYSTEM STARTED?	NO YES	Displays if system is started or not
SYSTEM RUNNING?	NO YES	Displays if system is running or not
BYPASS ALARMS?	NO ALARMS ALARM ACTIVE	Displays if there is an active alarm(s) in bypass or not
HAND/OFF/AUTO?	OFF MODE HAND MODE AUTO MODE	Displays operating mode of the bypass - OFF, HAND or AUTO

Error messages

#	Error Message	Description
1	CAN'T EDIT PAR IS READ ONLY	Try to save value (=press the ENTER key in Parameter Edit State) of a read-only parameter. E.g. try to change value PAR 01.02 INPUT VOLT
2	CAN'T EDIT WHEN STARTED	Try to change value of a parameter, which is allowed to be changed only when system is not started. E.g. PAR 16.02 RUN ENABLE
3	CAN'T EDIT UP+DOWN ONLY	Try to change value of a "reset only" parameter other than zero. UP+DOWN buttons must be pressed simultaneoulsy for requesting default value of the PAR on the display (value zero), and after that ENTER pressed for saving it (reset the parameter). E.g. PAR 04.01 LAST FAULT
4	CAN'T EDIT INP VOLTAGE LOW	Input voltage too low. Changing of parameters prohibited since system cannot save values to nv-mem w/ insufficient voltage.
5	CAN'T EDIT PAR IS HIDDEN	Try to save value (=press the ENTER key in Parameter Edit State) of a hidden parameter. Should not be possible. If hidden parameters are turned visible, this message is not given.
6	CAN'T EDIT UNDER LO-LIMIT	Try to save value which is over LO-LIMIT of the parameter. Should not be possible when changing parameters from control panel.
7	CAN'T EDIT UNDER HI-LIMIT	Try to save value which is over HI-LIMIT of the parameter. Should not be possible when changing parameters from control panel.
8	CAN'T EDIT ENUM VAL ONLY	Try to save value which is out of enumerated value list. Should not be possible when changing parameters from control panel.
9	CAN'T EDIT NO DEFAULT	Try to request default value (=press UP and DOWN buttons simultaneously) for a parameter which is defined not to have a default value. Should not be possible when changing parameters from control panel.
10	CAN'T EDIT TRY AGAIN.	Parameter system is busy, e.g. application macro change is in process at the same time when someone is trying to save a value for a parameter. Should not be possible when changing parameters from control panel.

Maintenance

See *Maintenance* for the ACH550-UH on page *31*.

ACH550-PCR/PDR

Installation

This information is unique to ACH550 input disconnect configurations (PCR or PDR). The ACH550 with Input Disconnect is an ACH550 AC adjustable frequency drive packaged with an input disconnect switch or circuit breaker. Refer to the *Installation* instructions on page *3*, for all other information. **Failure to observe the warnings and instructions may cause a malfunction or personal hazard.**

WARNING! Before you begin read *Safety* on page *2*.

WARNING! When the ACH550 with Input Disconnect is connected to the line power, the Motor Terminals T1, T2, and T3 are live even if the motor is not running. Do not make any connections when the ACH550 with Input Disconnect is connected to the line. Disconnect and lock out power to the drive before servicing the drive. Failure to disconnect power may cause serious injury or death.

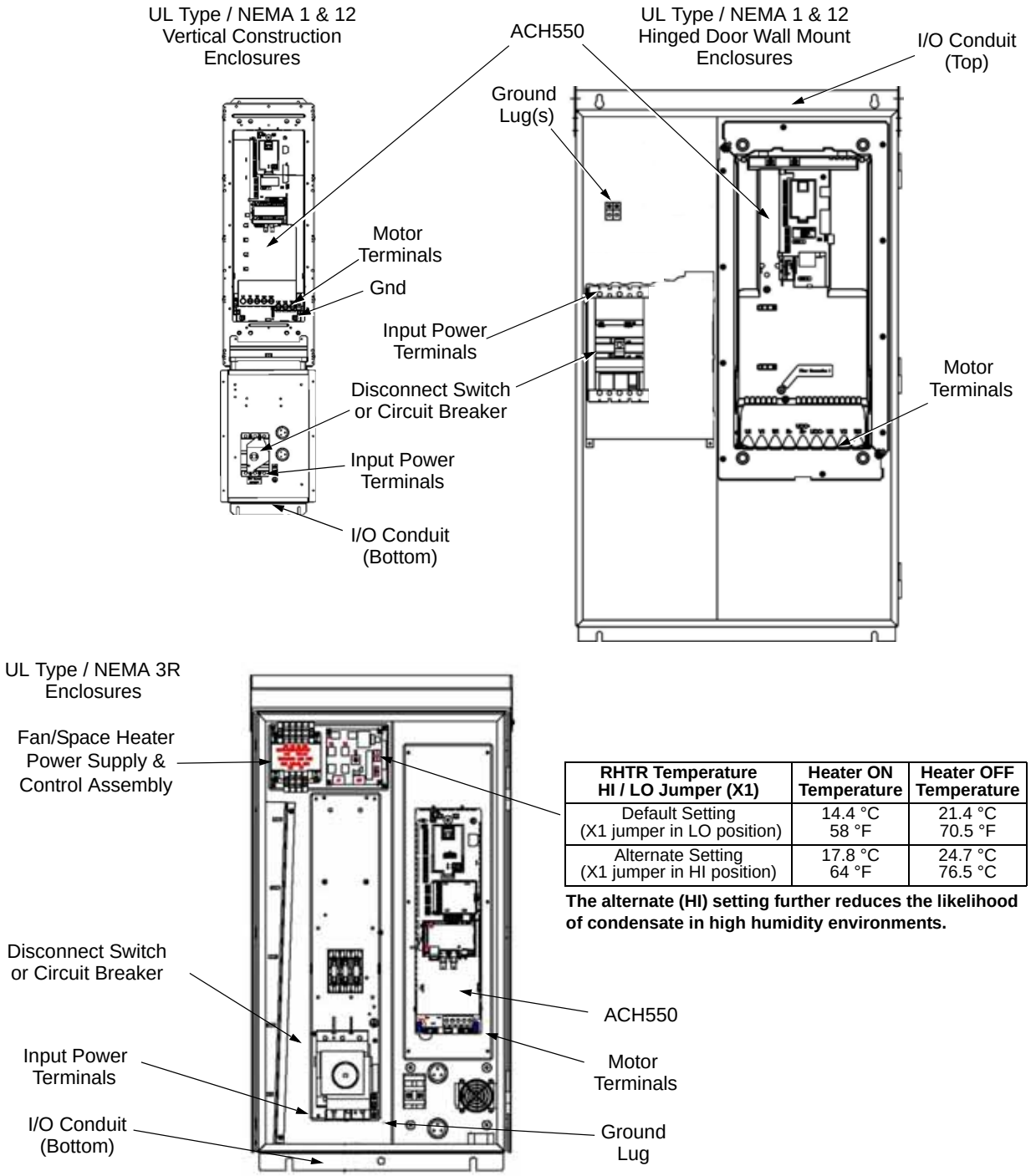
1. Install wiring

WARNING!

- Metal shavings or debris in the enclosure can damage electrical equipment and create a hazardous condition. Where parts, such as conduit plates require cutting or drilling, first remove the part. If that is not practical, cover nearby electrical components to protect them from all shavings or debris.
- Do not connect or disconnect input or output power wiring, or control wires, when power is applied.
- Never connect line voltage to drive output Terminals T1, T2, and T3.
- Do not make any voltage tolerance tests (Hi Pot or Megger) on any part of the unit. Disconnect motor wires before taking any measurements in the motor or motor wires.
- Make sure that power factor correction capacitors are not connected between the drive and the motor.

Connection diagrams – standard drive with input disconnect (wall mounted)

The following figure shows the Standard Drive with Input Disconnect (wall mounted) wiring connection points.



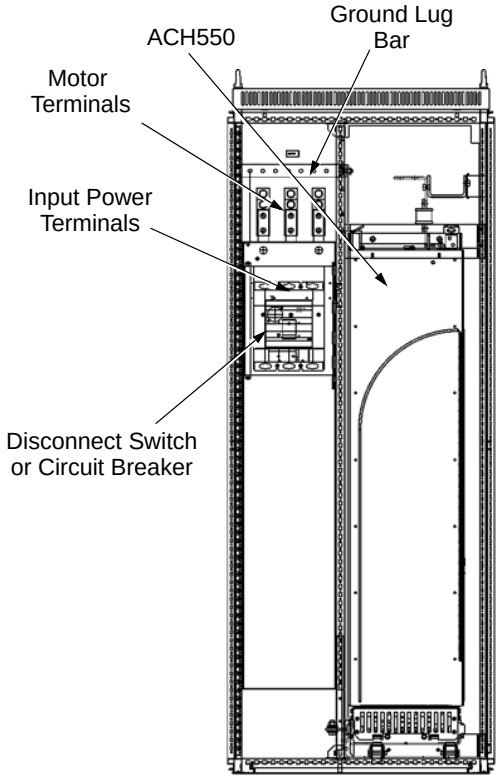
RHTR Temperature HI / LO Jumper (X1)	Heater ON Temperature	Heater OFF Temperature
Default Setting (X1 jumper in LO position)	14.4 °C 58 °F	21.4 °C 70.5 °F
Alternate Setting (X1 jumper in HI position)	17.8 °C 64 °F	24.7 °C 76.5 °F

The alternate (HI) setting further reduces the likelihood of condensate in high humidity environments.

Note: Some UL Type 3R enclosures are designed to be mounted on a wall. Mounting some of these 3R enclosures on an open rack system requires the use of the supplied 3R enclosure back plates to maintain 3R integrity.

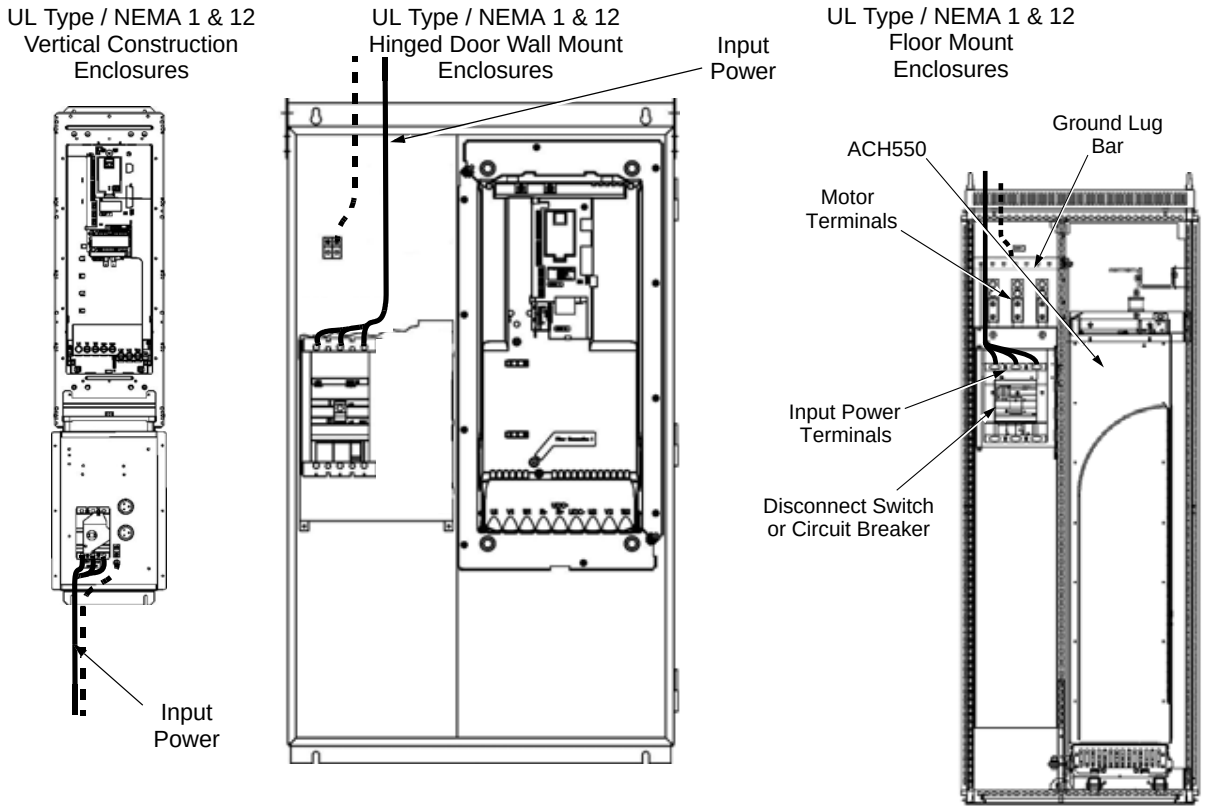
Connection diagrams – standard drive with input disconnect (floor mounted)

Floor mounted UL Type / NEMA 1 & 12 Drive with Input Disconnect units are configured for wiring access from the top and include a removable conduit mounting plate. The following figure shows the wiring connection points.



Line input connections – standard drive with input disconnect configurations

Connect input power to the terminals of the disconnect switch or circuit breaker. Connect the equipment grounding conductor to the ground lug at the top of the enclosure. The figure below shows the connection points for Standard Drive with Input Disconnect configurations.



Dashed line is ground run.

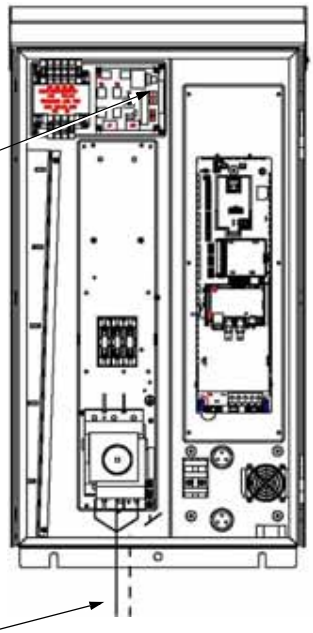
Note: The terminals on disconnect switches for the following rated ACH550-PDR products is 7 in-lbs. Do not use a power driver or over tighten to prevent breaking screw heads or stripping the terminal.

230 VAC	460 VAC	600 VAC
-04A6-2	-03A3-4	-02A7-6
-06A6-2	-04A1-4	-03A9-6
-07A5-2	-06A9-4	-06A1-6
-012A-2	-08A8-4	-09A0-6
-017A-2	-012A-4	-011A-6
-024A-2	-015A-4	-017A-6
-031A-2	-023A-4	

UL Type / NEMA 3R
Enclosures

RHTR Temperature HI / LO Jumper (X1)	Heater ON Temperature	Heater OFF Temperature
Default Setting (X1 jumper in LO position)	14.4 °C 58 °F	21.4 °C 70.5 °F
Alternate Setting (X1 jumper in HI position)	17.8 °C 64 °F	24.7 °C 76.5 °F

The alternate (HI) setting further reduces the likelihood of condensate in high humidity environments.



Input
Power

WARNING! Check the motor and motor wiring insulation before connecting the ACH550 to line power. Follow the procedure on page *12*. Before proceeding with the insulation resistance measurements, check that the ACH550 is disconnected from incoming line power. Failure to disconnect line power could result in death or serious injury.

Note: For the remainder of the wiring (motor and control wiring) refer to page *7*.

Power connection terminals

The following tables show maximum wire size and required tightening torque for incoming power, grounding and motor terminals.

208/240 Volt		Base Drive Frame Size	Power Wiring Data[2]						
HP	Type Code[1]		Circuit Breaker UL Type/ NEMA 1 &12	Circuit Breaker UL Type / NEMA 3R	Disconnect Switch UL Type/ NEMA 1&12	Disconnect Switch UL Type/ NEMA 3R	Motor Terminals	Ground Lugs UL Type/ NEMA 1&12	Ground Lugs UL Type / NEMA 3R
1	ACH550-PxR-04A6-2	R1	#10 35 in-lbs	#10 35 in-lbs	#10 7 in-lbs	#10 7 in-lbs	Refer to Drive's power connection terminals	#10 35 in-lbs	#10 35 in-lbs
1.5	ACH550-PxR-06A6-2	R1							
2	ACH550-PxR-07A5-2	R1							
3	ACH550-PxR-012A-2	R1							
5	ACH550-PxR-017A-2	R1							
7.5	ACH550-PxR-024A-2	R2	#6 45 in-lbs	#6 45 in-lbs	#8 7 in-lbs	#8 7 in-lbs		#6 35 in-lbs	#6 35 in-lbs
10	ACH550-PxR-031A-2	R2							
15	ACH550-PxR-046A-2	R3	#3 50 in-lbs	#3 50 in-lbs	#4 18 in-lbs	#4 18 in-lbs		#3 50 in-lbs	#3 50 in-lbs
20	ACH550-PxR-059A-2	R3							
25	ACH550-PxR-075A-2	R4	#1 50 in-lbs	#1 50 in-lbs	#1 55 in-lbs	#1 55 in-lbs		#2 50 in-lbs	#2 50 in-lbs
30	ACH550-PxR-088A-2	R4	350 MCM 274 in-lbs	300 MCM 200 in-lbs	#1/0 70 in-lbs	#1/0 70 in-lbs			
40	ACH550-PxR-114A-2	R4			300 MCM 275 in-lbs	300 MCM 200 in-lbs			
50	ACH550-PxR-143A-2	R6						3 x #3/0 250 in-lbs	#2/0 275 in-lbs
60	ACH550-PxR-178A-2	R6							
75	ACH550-PxR-221A-2	R6	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs			350 MCM 100 in-lbs
100	ACH550-PxR-248A-2	R6							

1. "PxR" represents both PCR and PDR.

2. Torque values shown relate to current production. Check component labels on previously installed units for required tightening torque.

480 Volt		Base Drive Frame Size	Power Wiring Data[2]						
HP	Type Code[1]		Circuit Breaker UL Type/ NEMA 1 &12	Circuit Breaker UL Type/ NEMA 3R	Disconnect Switch UL Type/ NEMA 1&12	Disconnect Switch UL Type/ NEMA 3R	Motor Terminals	Ground Lugs UL Type/ NEMA 1&12	Ground Lugs UL Type / NEMA 3R
1/1.5	ACH550-PxR-03A3-4	R1	#10 35 in-lbs	#10 35 in-lbs	#10 7 in-lbs	#10 7 in-lbs	Refer to Drive's power connection terminals	#10 35 in-lbs	#10 35 in-lbs
2	ACH550-PxR-04A1-4	R1							
3	ACH550-PxR-06A9-4	R1							
5	ACH550-PxR-08A8-4	R1							
7.5	ACH550-PxR-012A-4	R1							
10	ACH550-PxR-015A-4	R2	#6 45 in-lbs	#6 45 in-lbs	#8 7 in-lbs	#8 7 in-lbs		#6 35 in-lbs	#6 35 in-lbs
15	ACH550-PxR-023A-4	R2							
20	ACH550-PxR-031A-4	R3	#3 50 in-lbs	#3 50 in-lbs				#3 50 in-lbs	#3 50 in-lbs
25	ACH550-PxR-038A-4	R3			#4 18 in-lbs	#4 18 in-lbs			
30	ACH550-PxR-045A-4	R3							
40	ACH550-PxR-059A-4	R4	#1 50 in-lbs	#1 50 in-lbs				#1 50 in-lbs	#1 50 in-lbs
50	ACH550-PxR-072A-4	R4			#1 55 in-lbs	#1 55 in-lbs			
60	ACH550-PxR-078A-4	R4			#1 50 in-lbs	#1 62 in-lbs			
75	ACH550-PxR-097A-4	R4	350 MCM 274 in-lbs	300 MCM 200 in-lbs	#1/0 70 in-lbs	#1/0 70 in-lbs		3 x #3/0 250 in-lbs	#2 50 in-lbs
100	ACH550-PxR-125A-4	R5			300 MCM 275 in-lbs	300 MCM 200 in-lbs			
125	ACH550-PxR-157A-4	R6							#2/0 375 in-lbs
150	ACH550-PxR-180A-4	R6							
200	ACH550-PxR-246A-4	R6	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs	2 x 500 MCM 274 in-lbs			350 MCM 100 in-lbs
250	ACH550-PxR-316A-4	R8	2 x 500 MCM 274 in-lbs		2 x 500 MCM 274 in-lbs			5 Bus Bar Holes (13/32")	
300	ACH550-PxR-368A-4	R8							
350	ACH550-PxR-414A-4	R8							
400	ACH550-PxR-486A-4	R8							
450	ACH550-PxR-526A-4	R8	3 x 400 MCM 375 in-lbs		3 x 400 MCM 375 in-lbs				
500	ACH550-PxR-602A-4	R8							
550	ACH550-PxR-645A-4	R8							

1. "PxR" represents both PCR and PDR.

2. Torque values shown relate to current production. Check component labels on previously installed units for required tightening torque.

600 Volt		Frame Size	Power Wiring Data[2]						
HP	Type Code[1]		Circuit Breaker UL Type / NEMA 1 &12	Circuit Breaker UL Type / NEMA 3R	Disconnect Switch UL Type / NEMA 1&12	Disconnect Switch UL Type / NEMA 3R	Motor Terminals	Ground Lugs UL Type / NEMA 1&12	Ground Lugs UL Type / NEMA 3R
2	ACH550-PxR-02A7-6	R2	#6 62 in-lbs	#6 62 in-lbs	#8 7 in-lbs	#8 7 in-lbs	Refer to Drive's power connection terminals	#6 35 in-lbs	#6 35 in-lbs
3	ACH550-PxR-03A9-6	R2							
5	ACH550-PxR-06A1-6	R2							
7.5	ACH550-PxR-09A0-6	R2							
10	ACH550-PxR-011A-6	R2							
15	ACH550-PxR-017A-6	R2							
20	ACH550-PxR-022A-6	R3	#3 62 in-lbs	#3 62 in-lbs				#3 50 in-lbs	#3 50 in-lbs
25	ACH550-PxR-027A-6	R3							
30	ACH550-PxR-032A-6	R4	#1 62 in-lbs	#1 62 in-lbs	#4 18 in-lbs	#4 18 in-lbs		#2 50 in-lbs	#2 50 in-lbs
40	ACH550-PxR-041A-6	R4							
50	ACH550-PxR-052A-6	R4			#1 55 in-lbs	#1 55 in-lbs			
60	ACH550-PxR-062A-6	R4			#1 62 in-lbs	#1 62 in-lbs			
75	ACH550-PxR-077A-6	R6	350 MCM 274 in-lbs	300 MCM 275 in-lbs	#1/0 70 in-lbs	#1/0 70 in-lbs		3 x #3/0 250 in-lbs	
100	ACH550-PxR-099A-6	R6							
125	ACH550-PxR-125A-6	R6			300 MCM 275 in-lbs	300 MCM 200 in-lbs			#2/0 375 in-lbs
150	ACH550-PxR-144A-6	R6							

1. "PxR" represents both PCR and PDR.

2. Torque values shown relate to current production. Check component labels on previously installed units for required tightening torque.

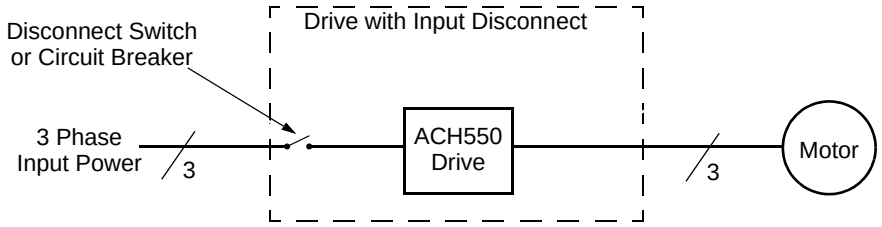
Operation

This information is unique to ACH550 input disconnect configurations (PCR or PDR). Refer to the *Operation* instructions on page *21* for all other information.

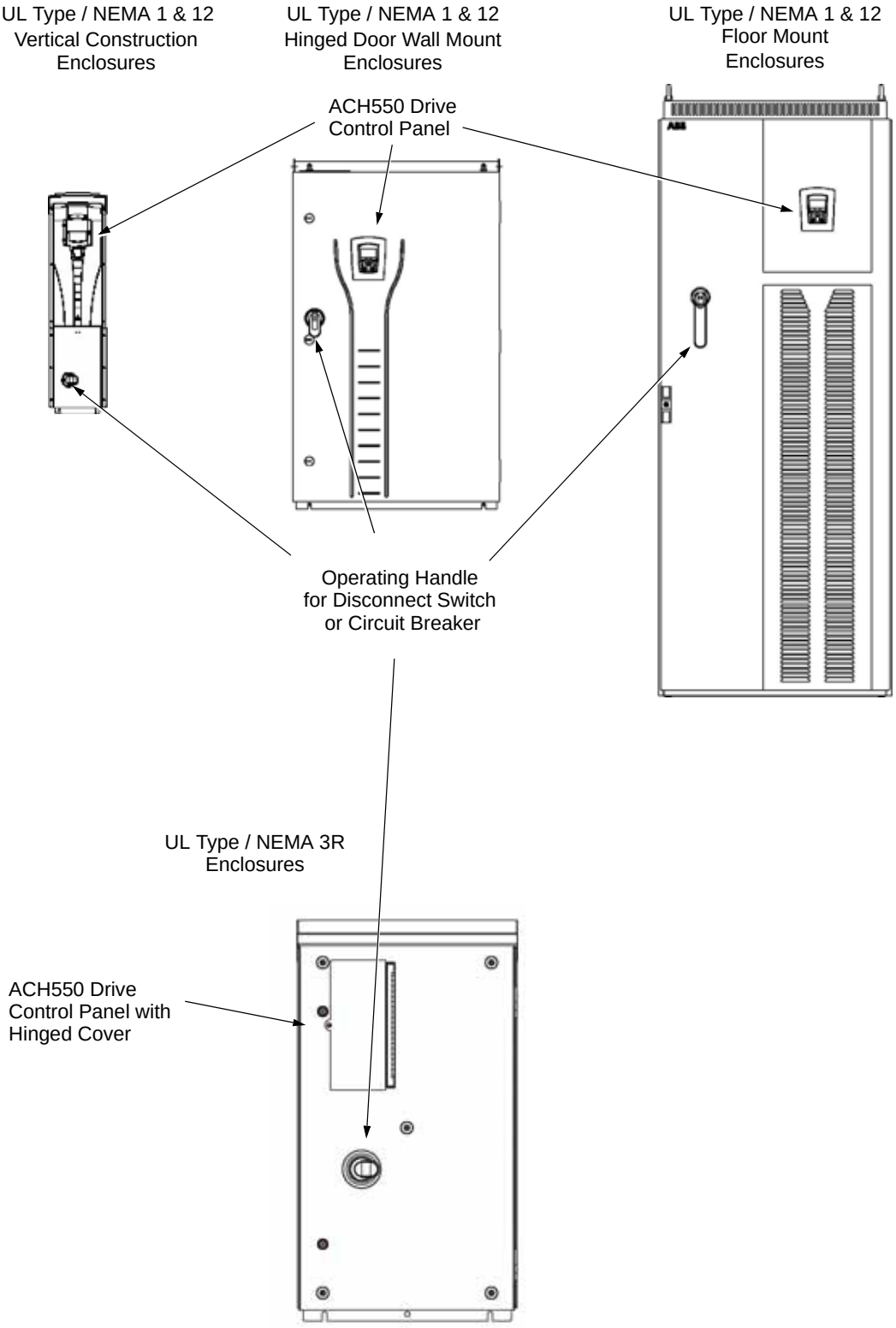
Input disconnect configuration

The ACH550 with Input Disconnect is an ACH550 AC adjustable frequency drive packaged with an input disconnect switch or circuit breaker, and with a door interlocked, external operating handle. The operating handle can be padlocked in the OFF position (padlock not supplied). Enclosure options are UL Type 1, UL Type 12, and UL Type 3R (NEMA 1, NEMA 12, and NEMA 3R).

The following is a typical power diagram.



The following shows the front view of the ACH550 Drive with Input Disconnect standard configurations, and identifies the major components.



Maintenance

Maintenance intervals

If installed in an appropriate environment, the drive requires very little maintenance. This table lists the routine maintenance intervals recommended by ABB for ACH550 enclosures in addition to the intervals on page *31*.

Maintenance	Configuration	Interval	Instruction
Check/replace hinged door wall mount enclosure inlet air filter	Hinged door wall mount UL Type / NEMA 12 enclosures	Check every 3 months. Replace as needed.	*Enclosure air filter replacement – UL Type / NEMA 12 hinged door wall mount enclosures* on page *89*.
Check/replace floor mount enclosure inlet air filter	Floor mount UL Type / NEMA 12 enclosures	Check every 3 months. Replace as needed.	See *Maintenance* on page *34* and *Enclosure air filter replacement – UL Type / NEMA 12 hinged door wall mount enclosures* on page *89*.
Check/replace NEMA 3R enclosure air filters	UL Type / NEMA 3R enclosures - PX3R-5 and higher	Check every 3 months. Replace as needed.	See PX3R dimensional information.
Check/replace floor mount enclosure exhaust air filter.	Floor mount UL Type / NEMA 12 enclosures	Check every 6 months. Replace as needed.	See *Maintenance* on page *35* and *Enclosure air filter replacement – UL Type / NEMA 12 hinged door wall mount enclosures* on page *89*.

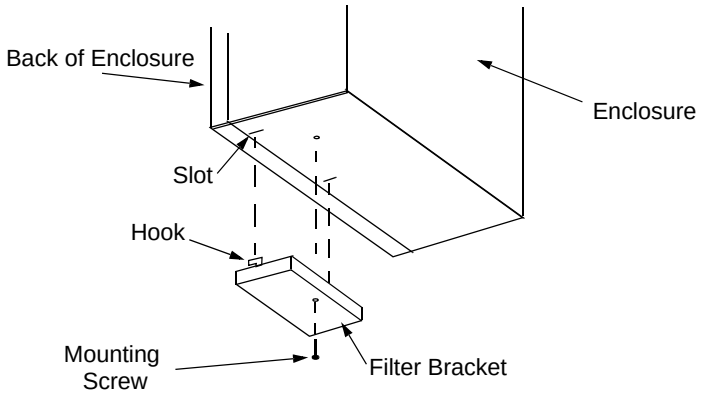
Enclosure air filter replacement – UL Type / NEMA 12 hinged door wall mount enclosures

Filter material

Material	Filter Type
American Air Filter (358-35-06A-12A)	Polykleon White 12.7 mm x 152.4 mm x 304.6 mm stk

This procedure applies to drive with input disconnect configurations in UL Type / NEMA 12 hinged door wall mount enclosures. This filter is located at the bottom of the enclosure. Use the following procedure to check and replace filters.

1. On the enclosure, remove the screw holding the filter bracket in place.
2. Slide the filter bracket forward until the hooks on the bracket clear the slots on the enclosure base. This step allows the filter and bracket to drop free from the enclosure.



3. Lift the filter out of the filter bracket and replace as appropriate.
4. With the filter in the filter bracket, align the hooks on the bracket with the slots in the enclosure base, and press the hooks up into the slots.
5. Slide the filter bracket back, making sure that the hooks catch on the enclosure.
6. Replace the mounting screw. Tighten until the gasket on the bracket is about 50% compressed.

Enclosure air filter replacement – UL Type / NEMA 12 floor mount enclosures

Filter material

Enclosure Type	Inlet (door)	Outlet (roof)
UL Type / NEMA 12	3AUA0000006723 (qty 1)	3AUA0000006722 (qty 2)

Note: When installing the filter media, the white side must face the outside of the cabinet and the colored side must face the inside of the cabinet. Refer to page *34*.

Diagnostics

Refer to the *Diagnostics* instructions on page *24*.

Complete ACH550 Drive Parameter List

GROUP 01	
OPERATING DATA	
101	SPEED & DIR
102	SPEED
103	OUTPUT FREQ
104	CURRENT
105	TORQUE
106	POWER
107	DC BUS VOLTAGE
109	OUTPUT VOLTAGE
110	DRIVE TEMP
111	EXTERNAL REF 1
112	EXTERNAL REF 2
113	CTRL LOCATION
114	RUN TIME (R)
115	KWH COUNTER (R)
116	APPL BLK OUTPUT
118	DI 1-3 STATUS
119	DI 4-6 STATUS
120	AI 1
121	AI 2
122	RO 1-3 STATUS
123	RO 4-6 STATUS
124	AO 1
125	AO 2
126	PID 1 OUTPUT
127	PID 2 OUTPUT
128	PID 1 SETPNT
129	PID 2 SETPNT
130	PID 1 FBK
131	PID 2 FBK
132	PID 1 DEVIATION
133	PID 2 DEVIATION
134	COMM RO WORD
135	COMM VALUE 1
136	COMM VALUE 2
137	PROCESS VAR 1
138	PROCESS VAR 2
139	PROCESS VAR 3
140	RUN TIME
141	MWH COUNTER
142	REVOLUTION CNTR
143	DRIVE ON TIME HI
144	DRIVE ON TIME LO
145	MOTOR TEMP
150	CB TEMP
153	MOT THERM STRESS
158	PID COMM VALUE 1
159	PID COMM VALUE 2
174	SAVED KWH
175	SAVED MWH
176	SAVED AMOUNT 1
177	SAVED AMOUNT 2
178	SAVED CO2
GROUP 03	
FB ACTUAL SIGNALS	
301	FB CMD WORD 1
302	FB CMD WORD 2
303	FB STS WORD 1
304	FB STS WORD 2
305	FAULT WORD 1
306	FAULT WORD 2
307	FAULT WORD 3
308	ALARM WORD 1
309	ALARM WORD 2
GROUP 04	
FAULT HISTORY	
401	LAST FAULT
402	FAULT TIME 1
403	FAULT TIME 2
404	SPEED AT FLT
405	FREQ AT FLT
406	VOLTAGE AT FLT
407	CURRENT AT FLT
408	TORQUE AT FLT
409	STATUS AT FLT
410	DI 1-3 AT FLT
411	DI 4-6 AT FLT
412	PREVIOUS FAULT 1
413	PREVIOUS FAULT 2
GROUP 10	
START/STOP/DIR	
1001	EXT1 COMMANDS
1002	EXT2 COMMANDS
1003	DIRECTION

GROUP 11	
REFERENCE SELECT	
1101	KEYPAD REF SEL
1102	EXT1/EXT2 SEL
1103	REF1 SELECT
1104	REF 1 MIN
1105	REF 1 MAX
1106	REF2 SELECT
1107	REF 2 MIN
1108	REF 2 MAX
GROUP 12	
CONSTANT SPEEDS	
1201	CONST SPEED SEL
1202	CONST SPEED 1
1203	CONST SPEED 2
1204	CONST SPEED 3
1205	CONST SPEED 4
1206	CONST SPEED 5
1207	CONST SPEED 6
1208	CONST SPEED 7
1209	TIMED MODE SEL
GROUP 13	
ANALOG INPUTS	
1301	MINIMUN AI1
1302	MAXIMUM AI1
1303	FILTER AI1
1304	MINIMUM AI2
1305	MAXIMUM AI2
1306	FILTER AI2
GROUP 14	
RELAY OUTPUTS	
1401	RELAY OUTPUT 1
1402	RELAY OUTPUT 2
1403	RELAY OUTPUT 3
1404	RO 1 ON DELAY
1405	RO 1 OFF DELAY
1406	RO 2 ON DELAY
1407	RO 2 OFF DELAY
1408	RO 3 ON DELAY
1409	RO 3 OFF DELAY
1410	RELAY OUTPUT 4
1411	RELAY OUTPUT 5
1412	RELAY OUTPUT 6
1413	RO 4 ON DELAY
1414	RO 4 OFF DELAY
1415	RO 5 ON DELAY
1416	RO 5 OFF DELAY
1417	RO 6 ON DELAY
1418	RO 6 OFF DELAY
GROUP 15	
ANALOG OUTPUTS	
1501	AO1 CONTENT
1502	AO1 CONTENT MIN
1503	AO1 CONTENT MAX
1504	MINIMUM AO1
1505	MAXIMUM AO1
1506	FILTER AO1
1507	AO2 CONTENT
1508	AO2 CONTENT MIN
1509	AO2 CONTENT MAX
1510	MINIMUM AO2
1511	MAXIMUM AO2
1512	FILTER AO2
GROUP 16	
SYSTEM CONTROLS	
1601	RUN ENABLE
1602	PARAMETER LOCK
1603	PASS CODE
1604	FAULT RESET SEL
1605	USER PAR SET CHG
1606	LOCAL LOCK
1607	PARAM SAVE
1608	START ENABLE 1
1609	START ENABLE 2
1610	DISPLAY ALARMS
1611	PARAMETER VIEW
1612	FAN CONTROL
1613	FAULT RESET
GROUP 17	
OVERRIDE	
1701	OVERRIDE SEL
1702	OVERRIDE FREQ
1703	OVERRIDE SPEED
1704	OVERR PASS CODE
1705	OVERRIDE

1706	OVERRIDE DIR
1707	OVERRIDE REF
GROUP 20	
LIMITS	
2001	MINIMUM SPEED
2002	MAXIMUM SPEED
2003	MAX CURRENT
2006	UNDERVOLT CTRL
2007	MINIMUM FREQ
2008	MAXIMUM FREQ
2013	MIN TORQUE SEL
2014	MAX TORQUE SEL
2015	MIN TORQUE 1
2016	MIN TORQUE 2
2017	MAX TORQUE 1
2018	MAX TORQUE 2
GROUP 21	
START/STOP	
2101	START FUNCTION
2102	STOP FUNCTION
2103	DC MAGN TIME
2104	DC HOLD CTL
2105	DC HOLD SPEED
2106	DC CURR REF
2107	DC BRAKE TIME
2108	START INHIBIT
2109	EM STOP SEL
2110	TORQ BOOST CURR
2113	START DELAY
GROUP 22	
ACCEL/DECEL	
2201	ACC/DEC 1/2 SEL
2202	ACCELER TIME 1
2203	DECELER TIME 1
2204	RAMP SHAPE 1
2205	ACCELER TIME 2
2206	DECELER TIME 2
2207	RAMP SHAPE 2
2208	EM DEC TIME
2209	RAMP INPUT 0
GROUP 23	
SPEED CONTROL	
2301	PROP GAIN
2302	INTEGRATION TIME
2303	DERIVATION TIME
2304	ACC COMPENSATION
2305	AUTOTUNE RUN
GROUP 25	
CRITICAL SPEEDS	
2501	CRIT SPEED SEL
2502	CRIT SPEED 1 LO
2503	CRIT SPEED 1 HI
2504	CRIT SPEED 2 LO
2505	CRIT SPEED 2 HI
2506	CRIT SPEED 3 LO
2507	CRIT SPEED 3 HI
GROUP 26	
MOTOR CONTROL	
2601	FLUX OPT ENABLE
2602	FLUX BRAKING
2603	IR COMP VOLT
2604	IR COMP FREQ
2605	U/F RATIO
2606	SWITCHING FREQ
2607	SW FREQ CTRL
2608	SLIP COMP RATIO
2609	NOISE SMOOTHING
2619	DC STABILIZER
2625	OVERMODULATION
GROUP 29	
MAINTENANCE TRIG	
2901	COOLING FAN TRIG
2902	COOLING FAN ACT
2903	REVOLUTION TRIG
2904	REVOLUTION ACT
2905	RUN TIME TRIG
2906	RUN TIME ACT
2907	USER MWH TRIG
2908	USER MWH ACT
GROUP 30	
FAULT FUNCTIONS	
3001	AI<MIN FUNCTION
3002	PANEL COMM ERR
3003	EXTERNAL FAULT 1

3004	EXTERNAL FAULT 2
3005	MOT THERM PROT
3006	MOT THERM TIME
3007	MOT LOAD CURVE
3008	ZERO SPEED LOAD
3009	BREAK POINT FREQ
3010	STALL FUNCTION
3011	STALL FREQUENCY
3012	STALL TIME
3017	EARTH FAULT
3018	COMM FAULT FUNC
3019	COMM FAULT TIME
3021	AI1 FAULT LIMIT
3022	AI2 FAULT LIMIT
3023	WIRING FAULT
3024	CB TEMP FAULT
3028	EARTH FAULT LVL
GROUP 31	
AUTOMATIC RESET	
3101	NR OF TRIALS
3102	TRIAL TIME
3103	DELAY TIME
3104	AR OVERCURRENT
3105	AR OVERVOLTAGE
3106	AR UNDERVOLTAGE
3107	AR AI<MIN
3108	AR EXTERNAL FLT
GROUP 32	
SUPERVISION	
3201	SUPERV 1 PARAM
3202	SUPERV 1 LIM LO
3203	SUPERV 1 LIM HI
3204	SUPERV 2 PARAM
3205	SUPERV 2 LIM LO
3206	SUPERV 2 LIM HI
3207	SUPERV 3 PARAM
3208	SUPERV 3 LIM LO
3209	SUPERV 3 LIM HI
GROUP 33	
INFORMATION	
3301	FW VERSION
3302	LP VERSION
3303	TEST DATE
3304	DRIVE RATING
3305	PARTABLE VERSION
GROUP 34	
PANEL DISPLAY	
3401	SIGNAL 1 PARAM
3402	SIGNAL 1 MIN
3403	SIGNAL 1 MAX
3404	OUTPUT 1 DSP FORM
3405	OUTPUT 1 UNIT
3406	OUTPUT 1 MIN
3407	OUTPUT 1 MAX
3408	SIGNAL 2 PARAM
3409	SIGNAL 2 MIN
3410	SIGNAL 2 MAX
3411	OUTPUT 2 DSP FORM
3412	OUTPUT 2 UNIT
3413	OUTPUT 2 MIN
3414	OUTPUT 2 MAX
3415	SIGNAL 3 PARAM
3416	SIGNAL 3 MIN
3417	SIGNAL 3 MAX
3418	OUTPUT 3 DSP FORM
3419	OUTPUT 3 UNIT
3420	OUTPUT 3 MIN
3421	OUTPUT 3 MAX
GROUP 35	
MOTOR TEMP MEAS	
3501	SENSOR TYPE
3502	INPUT SELECTION
3503	ALARM LIMIT
3504	FAULT LIMIT
GROUP 36	
TIMED FUNCTIONS	
3601	TIMERS ENABLE
3602	START TIME 1
3603	STOP TIME 1
3604	START DAY 1

3605	STOP DAY 1
3606	START TIME 2
3607	STOP TIME 2
3608	START DAY 2
3609	STOP DAY 2
3610	START TIME 3
3611	STOP TIME 3
3612	START DAY 3
3613	STOP DAY 3
3614	START TIME 4
3615	STOP TIME 4
3616	START DAY 4
3617	STOP DAY 4
3622	BOOST SEL
3623	BOOST TIME
3626	TIMER 1 SRC
3627	TIMER 2 SRC
3628	TIMER 3 SRC
3629	TIMER 4 SRC
GROUP 37	
USER LOAD CURVE	
3701	USER LOAD C MODE
3702	USER LOAD C FUNC
3703	USER LOAD C TIME
3704	LOAD FREQ 1
3705	LOAD TORQ LOW 1
3706	LOAD TORQ HIGH 1
3707	LOAD FREQ 2
3708	LOAD TORQ LOW 2
3709	LOAD TORQ HIGH 2
3710	LOAD FREQ 3
3711	LOAD TORQ LOW 3
3712	LOAD TORQ HIGH 3
3713	LOAD FREQ 4
3714	LOAD TORQ LOW 4
3715	LOAD TORQ HIGH 4
3716	LOAD FREQ 5
3717	LOAD TORQ LOW 5
3718	LOAD TORQ HIGH 5
GROUP 40	
PROCESS PID SET 1	
4001	GAIN
4002	INTEGRATION TIME
4003	DERIVATION TIME
4004	PID DERIV FILTER
4005	ERROR VALUE INV
4006	UNITS
4007	DSP FORMAT
4008	0% VALUE
4009	100% VALUE
4010	SET POINT SEL
4011	INTERNAL SETPNT
4012	SETPOINT MIN
4013	SETPOINT MAX
4014	FBK SEL
4015	FBK MULTIPLIER
4016	ACT1 INPUT
4017	ACT2 INPUT
4018	ACT1 MINIMUM
4019	ACT1 MAXIMUM
4020	ACT2 MINIMUM
4021	ACT2 MAXIMUM
4022	SLEEP SELECTION
4023	PID SLEEP LEVEL
4024	PID SLEEP DELAY
4025	WAKE-UP DEV
4026	WAKE-UP DELAY
4027	PID 1 PARAM SET
GROUP 41	
PROCESS PID SET 2	
4101	GAIN
4102	INTEGRATION TIME
4103	DERIVATION TIME
4104	PID DERIV FILTER
4105	ERROR VALUE INV
4106	UNITS
4107	UNIT SCALE
4108	0% VALUE
4109	100% VALUE
4110	SET POINT SEL
4111	INTERNAL SETPNT
4112	SETPOINT MIN
4113	SETPOINT MAX
4114	FBK SEL
4115	FBK MULTIPLIER
4116	ACT1 INPUT

4117	ACT2 INPUT
4118	ACT1 MINIMUM
4119	ACT1 MAXIMUM
4120	ACT2 MINIMUM
4121	ACT2 MAXIMUM
4122	SLEEP SELECTION
4123	PID SLEEP LEVEL
4124	PID SLEEP DELAY
4125	WAKE-UP DEV
4126	WAKE-UP DELAY
GROUP 42	
EXT / TRIM PID	
4201	GAIN
4202	INTEGRATION TIME
4203	DERIVATION TIME
4204	PID DERIV FILTER
4205	ERROR VALUE INV
4206	UNITS
4207	DSP FORMAT
4208	0% VALUE
4209	100% VALUE
4210	SET POINT SEL
4211	INTERNAL SETPNT
4212	SETPOINT MIN
4213	SETPOINT MAX
4214	FBK SEL
4215	FBK MULTIPLIER
4216	ACT1 INPUT
4217	ACT2 INPUT
4218	ACT1 MINIMUM
4219	ACT1 MAXIMUM
4220	ACT2 MINIMUM
4221	ACT2 MAXIMUM
4228	ACTIVATE
4229	OFFSET
4230	TRIM MODE
4231	TRIM SCALE
4232	CORRECTION SRC
GROUP 45	
ENERGY SAVING	
4502	ENERGY PRICE
4507	CO2 CONV FACTOR
4508	PUMP POWER
4509	ENERGY RESET
GROUP 51	
EXT COMM MODULE	
5101	FBA TYPE
5102	FBA PAR 2…26
5127	FBA PAR REFRESH
5128	FILE CPI FW REV
5129	FILE CONFIG ID
2130	FILE CONFIG REV
5131	FBA STATUS
5132	FBA CPI FW REV
5133	FBA APPL FW REV
GROUP 52	
PANEL COMM	
5201	STATION ID
5202	BAUD RATE
5203	PARITY
5204	OK MESSAGES
5205	PARITY ERRORS
5206	FRAME ERRORS
5207	BUFFER OVERRUNS
5208	CRC ERRORS
GROUP 53	
EFB PROTOCOL	
5301	EFB PROTOCOL ID
5302	EFB STATION ID
5303	EFB BAUD RATE
5304	EFB PARITY
5305	EFB CTRL PROFILE
5306	EFB OK MESSAGES
5307	EFB CRC ERRORS
5308	EFB UART ERRORS
5309	EFB STATUS
5310	EFB PAR 10-18
5319	EFB PAR 19-20
GROUP 64	
LOAD ANALYZER	
6401	PVL SIGNAL
6402	PVL FILTER TIME
6403	LOGGERS RESET
6404	AL2 SIGNAL
6405	AL2 SIGNAL BASE
6406	PEAK VALUE
6407	PEAK TIME 1
6408	PEAK TIME 2
6409	CURRENT AT PEAK
6410	UDC AT PEAK
6411	FREQ AT PEAK
6412	TIME OF RESET 1
6413	TIME OF RESET 2
6414	AL1RANGE0TO10
6415	AL1RANGE10TO20
6416	AL1RANGE20TO30
6417	AL1RANGE30TO40
6418	AL1RANGE40TO50
6419	AL1RANGE50TO60
6420	AL1RANGE60TO70
6421	AL1RANGE70TO80
6422	AL1RANGE80TO90
6423	AL1RANGE90TO
6424	AL2RANGE0TO10
6425	AL2RANGE10TO20
6426	AL2RANGE20TO30
6427	AL2RANGE30TO40
6428	AL2RANGE40TO50
6429	AL2RANGE50TO60
6430	AL2RANGE60TO70
6431	AL2RANGE70TO80
6432	AL2RANGE80TO90
6433	AL2RANGE90TO
GROUP 81	
PFA CONTROL	
8103	REFERENCE STEP 1
8104	REFERENCE STEP 2
8105	REFERENCE STEP 3
8109	START FREQ 1
8110	START FREQ 2
8111	START FREQ 3
8112	LOW FREQ 1
8113	LOW FREQ 2
8114	LOW FREQ 3
8115	AUX MOT START D
8116	AUX MOT STOP D
8117	NR OF AUX MOT
8118	AUTOCHNG INTERV
8119	AUTOCHNG LEVEL
8120	INTERLOCKS
8121	REG BYPASS CTRL
8122	PFA START DELAY
8123	PFA ENABLE
8124	ACC IN AUX STOP
8125	DEC IN AUX START
8126	TIMED AUTOCHNG
8127	MOTORS
8128	AUX START ORDER
GROUP 98	
OPTIONS	
9802	COMM PROT SEL
GROUP 99	
START-UP DATA	
9901	LANGUAGE
9902	APPLIC MACRO
9904	MOTOR CTRL MODE
9905	MOTOR NOM VOLT
9906	MOTOR NOM CURR
9907	MOTOR NOM FREQ
9908	MOTOR NOM SPEED
9909	MOTOR NOM POWER
9915	MOTOR COSPHI

For E-Clipse Bypass Drive

GROUP 01	
ACTUAL DATA	
0101	MOTOR CURR
0102	INPUT VOLT
0103	DI STATUS
0104	RO STATUS
0105	PCB TEMP
0106	KW HOURS
0107	COMM RO
0108	RUN TIME
0109	ON TIME 1
0110	ON TIME 2
0111	A-B VOLT
0112	B-C VOLT
0113	C-A VOLT
0114	MWH SAVED
0115	COST SAVED
0116	CO2 SAVED
0117	KWH SAVE L
0118	KWH SAVE H
GROUP 03	
STATUS	
0301	FBUS CW 1
0303	FBUS SW 1
0305	FLT WORD 1
0306	FLT WORD 2
0307	FLT WORD 3
0308	ALR WORD 1
0309	ALR WORD 2
GROUP 04	
FAULT LOG	
0401	LAST FAULT
0402	F1 TIME 1
0403	F1 TIME 2
0404	F1 VOLTAGE
0405	F1 CURRENT
0406	F1 EVENT 1
0407	F1 E1 TIME
0408	F1 EVENT 2
0409	F1 E2 TIME
0410	FAULT 2
0411	F2 TIME 1
0412	F2 TIME 2
0413	F2 VOLTAGE
0414	F2 CURRENT
0415	F2 EVENT 1
0416	F2 E1 TIME
0417	F2 EVENT 2
0418	F2 E2 TIME
0419	FAULT 3
0420	FAULT 4
0421	FAULT 5
GROUP 05	
EVENT LOG	
0501	LAST EVENT
0502	E1 TIME 1
0503	E1 TIME 2
0504	EVENT 2
0505	E2 TIME 1
0506	E2 TIME 2
0507	EVENT 3
0508	E3 TIME 1
0509	E3 TIME 2
0510	EVENT 4
0511	E4 TIME 1
0512	E4 TIME 2
GROUP 14	
RELAY OUT	
1401	RO1 SELECT
1402	R1 ON DLY
1403	R1 OFF DLY
1404	RO2 SELECT
1405	R2 ON DLY
1406	R2 OFF DLY
1407	RO3 SELECT
1408	R3 ON DLY
1409	R3 OFF DLY
1410	RO4 SELECT
1411	R4 ON DLY
1412	R4 OFF DLY
1413	RO5 SELECT
1414	R5 ON DLY
1415	R5 OFF DLY
GROUP 16	
SYSTEM CTRL	
1601	START/STOP
1602	RUN ENABLE
1603	START EN 1
1604	START EN 2
1605	START EN 3
1606	START EN 4
1607	RESET SRC
1608	AUTO XFR
1609	OC TRANSFR
1610	OV TRANSFR
1611	UV TRANSFR
1612	AI TRANSFR
1613	BP DISABLE
1614	BP RUN DLY
1615	SAVE PARAM
1616	DISP ALRMS
1617	DRIVE TEST
1618	PASS CODE
1619	PAR LOCK
1620	RUN EN TXT
1621	ST EN1 TXT
1622	ST EN2 TXT
1623	ST EN3 TXT
1624	ST EN4 TXT
1625	COMM CTRL
1626	MODE LOCK
1627	COST/KWH
1628	LEARN MODE
1629	LEARN TIME
1630	REVERSE REQ
1631	DRV/BYPASS
GROUP 17	
OVERRIDE 2	
1701	OVERRIDE 2
1702	RUN EN OVR
1703	ST EN1 OVR
1704	ST EN2 OVR
1706	ST EN4 OVR
1707	FAULTS OVR
1708	OVRD2 MODE
GROUP 30	
FLT FUNCTION	
3001	UL ACTION
3002	UL TIME
3003	UL TRIP %
3004	COMM LOSS
3005	COMM TIME
3006	PHASE LOSS
3007	PHASE SEQ
3008	BYPASS MOL
GROUP 32	
SUPERV CTRL	
3201	SUPER CTRL
3202	START LVL
3203	STOP LEVEL
3204	START DLY
3205	STOP DLY
3206	FBK LOSS
GROUP 33	
INFORMATION	
3301	FW VERSION
3302	PT VERSION
3303	LP VERSION
3304	CB VERSION
3305	TEST DATE
3306	DRIVE TYPE
3307	SUB ASMBLY
3308	PLANT CODE
3309	MFG DATE
3310	UNIT NUM
GROUP 50	
BYPASS EFB	
5001	BP PROT ID
5002	BP MAC ID
5003	BAUD RATE
5004	EFB PARITY
5005	PROFILE
5006	BP OK MSG
5007	BP CRC ERR
5008	UART ERROR
5009	BP STATUS
5010	BP PAR 10
5011	BP PAR 11
5012	BP PAR 12
5013	BP PAR 13
5014	BP PAR 14
5015	BP PAR 15
5016	BP PAR 16
5017	BP PAR 17
5018	BP PAR 18
5019	BP PAR 19
5020	BP PAR 20
GROUP 51	
EXT COMM MOD	
5101	FBA TYPE
5102	FBA PAR 2
5103	FBA PAR 3
5104	FBA PAR 4
5105	FBA PAR 5
5106	FBA PAR 6
5107	FBA PAR 7
5108	FBA PAR 8
5109	FBA PAR 9
5110	FBA PAR 10
5111	FBA PAR 11
5112	FBA PAR 12
5113	FBA PAR 13
5114	FBA PAR 14
5115	FBA PAR 15
5116	FBA PAR 16
5117	FBA PAR 17
5118	FBA PAR 18
5119	FBA PAR 19
5120	FBA PAR 20
5121	FBA PAR 21
5122	FBA PAR 22
5123	FBA PAR 23
5124	FBA PAR 24
5125	FBA PAR 25
5126	FBA PAR 26
5127	REFRESH
5128	FBA PAR 28
5129	FBA PAR 29
5130	FBA PAR 30
5131	FBA STATUS
5132	FBA PAR 32
5133	FBA PAR 33
GROUP 53	
DRIVE EFB	
5301	DV PROT ID
5302	DV MAC ID
5303	BAUD RATE
5304	EFB PARITY
5305	PROFILE
5306	DV OK MSG
5307	DV CRC ERR
5308	UART ERROR
5309	DV STATUS
5310	DV PAR 10
5311	DV PAR 11
5312	DV PAR 12
5313	DV PAR 13
5314	DV PAR 14
5315	DV PAR 15
5316	DV PAR 16
5317	DV PAR 17
5318	DV PAR 18
5319	DV PAR 19
5320	DV PAR 20
GROUP 54	
FBA DATA IN	
5401	DATA IN 1
5402	DATA IN 2
5403	DATA IN 3
5404	DATA IN 4
5405	DATA IN 5
5406	DATA IN 6
5407	DATA IN 7
5408	DATA IN 8
5409	DATA IN 9
GROUP 55	
FBA DATA OUT	
5501	DATA OUT 1
5502	DATA OUT 2
5503	DATA OUT 3
5504	DATA OUT 4
5505	DATA OUT 5
5506	DATA OUT 6
5507	DATA OUT 7
5508	DATA OUT 8
5509	DATA OUT 9
5510	DATA OUT10
GROUP 98	
OPTIONS	
9802	COMM PROT SEL
GROUP 99	
STARTUP DATA	
9902	B.P. MACRO

3AUA0000081824 REV C
Effective: 12/01/2014
Supersedes: 04/15/2012

ABB Inc.
16250 West Glendale Drive
New Berlin, WI 53151
USA
Telephone +1 800 752-0696
Fax +1 262 785-0397
Internet www.abb.us/drives

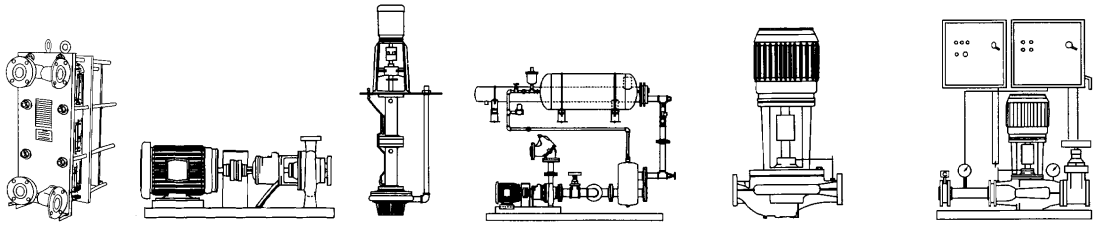
2/11/2020

Mechanical Solutions Inc.

130 Utopia Road
PO Box 848
Manchester, CT 06042

Phone 860-290-1564
Fax 860-290-1825
mladouceur@msipump.com
www.msipump.com

PROJECT:	**20 HORSENECK LANE HX PROJECT**
ENGINEER:	**SOUTHPORT ENGINEERING ASSOCIATES**
CONTRACTOR:	**EASTERN MECHANICAL SERVICES**
SPECIFICATION SECTION:	
EQUIPMENT DESCRIPTION:	**Operation & Maintenance Manuals** **Refer To Attached Equipment List**



2/11/2020

BILL OF MATERIAL

Item	Qty	Description	Weight
A	2	(P-3,4) Armstrong Model 4380 4x4x6 Vertical In Line Pump rated for 400 GPM at 110' of head with a 20 HP, ODP Premium Efficient Motor, 460V-3P and 3600RPM	493
B	2	6x4 Armstrong Model SG64 Suction Diffuser.	87
D	1	Armstrong Model AX-120V Vertical Diaphragm Type Expansion Tank, ASME, 70 Gallon Tank, 56.5 Gallon Acceptance.	259
E	1	3/4" Armstrong Model HRD-70 Pressure Reducing Valve.	20

ARMSTRONG

FILE NO.:	43.80
DATE:	Sept. 15, 2010
SUPERSEDES:	43.80
DATE:	Oct. 2, 2008

P-3,4

INSTALLATION AND OPERATING INSTRUCTIONS

COMMERCIAL PUMPS

Series 4300, 4360 & 4380 Vertical In-Line Pumps

INTRODUCTION

This document contains specific information regarding the safe installation, operating and maintenance of Vertical In-Line pumps and should be read and understood by installing, operating and maintenance personnel. The equipment supplied has been designed and constructed to be safe and without risk to health and safety when properly installed, operated and maintained. The instructions following must be strictly adhered to. If clarification is needed on any point please contact Armstrong quoting the equipment serial number.

WARNING SYMBOLS

Safety instruction where an electrical hazard is involved.

Safety instruction where non-compliance would affect safety risk.

Safety instruction relating to safe operation of the equipment. (ATTENTION)

INSTRUCTIONS FOR SAFE USE

No installation of this equipment should take place unless this document has been studied and understood. Handling, transportation and installation of this equipment should only undertaken by trained personnel with proper use of lifting equipment. See later diagrams for lifting advice. Refer to the pump nameplate for pump speed, pressure and temperature limitations. The limits stated must not be exceeded without written permission from Armstrong.

TEMPERATURE

Where under normal operating conditions the limit of 68°C/155°F (Restricted Zone) for normal touch, or 80°C/176°F (Unrestricted Zone) for unintentional touch, may be experienced, steps should be taken to minimize contact or warn operators/users that normal operating conditions will be exceeded. In certain cases where the temperature of the pumped liquid exceeds the above stated temperature levels, pump casing temperatures may exceed 100°C/212°F and not withstanding pump insulation techniques appropriate measures must be taken to minimize risk for operating personnel.

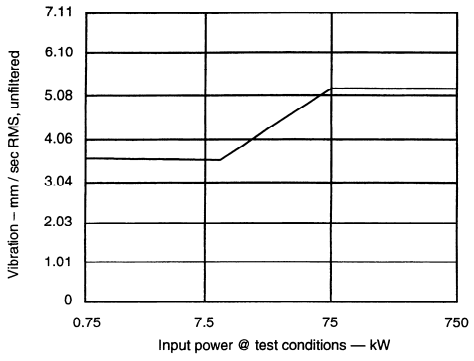
NOISE LEVELS

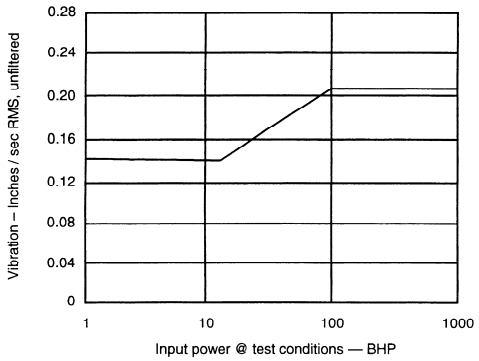
Typical Pumping Unit Sound Pressure Level, Decibels, A-Weighted, at 1 m (3 ft.) from unit.

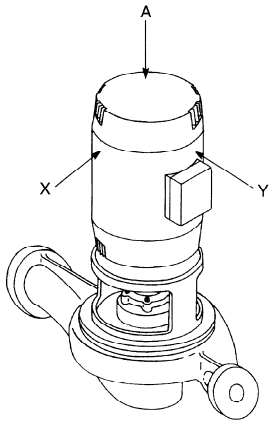
	1200 rpm				1800 rpm				3600 rpm			
Frame	ODP		TEFC		ODP		TEFC		ODP		TEFC	
Designation	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A
140	0.75 - 1	59	0.75 - 1	58	1 - 3	64	1 - 2	64	1.5 - 3	70	1.5 - 2	79
180	1.5 - 2	61	1.5 - 2	61	3 - 5	66	3 - 5	68	5 - 7.5	74	3 - 5	82
210	3 - 5	66	3 - 5	65	7.5 - 10	70	7.5 - 10	73	10 - 15	76	7.5 - 10	85
250	7.5 - 10	70	7.5 - 10	69	15 - 20	74	15 - 20	78	20 - 25	78	15 - 20	88
280	15 - 20	75	15 - 20	74	25 - 30	74	25 - 30	82	30 - 40	80	25 - 30	89
320	25 - 30	77	25 - 30	77	40 - 50	78	40 - 50	83	50 - 60	83	40 - 50	94
360	40 - 50	80	40 - 50	80	60 - 75	80	60 - 75	89	75 - 100	88	60 - 75	95
400	60 - 75	82	60 - 75	84	100 - 125	83	100	92	125 - 150	92	100	96
440	100 - 125	85	100 - 125	88	150 - 200	87	125 - 150	96	200 - 250	95	125 - 150	98

VIBRATION LEVELS

Armstrong Vertical In-Line pumps are designed to meet vibration levels set by Hydraulic Institute Standard HI Pump Vibration 9.6.4. Standard levels are as detailed below:







Vertical In-Line

STORAGE

Pumps not immediately placed into service, or removed from service and stored, must be properly prepared to prevent excessive rusting. Pump port protection plates must not be removed until the pump is ready to connect to the piping.
Rotate the shaft periodically (at least monthly) to keep rotating element free and bearings fully functional.
For long term storage (longer than 3 months), the pump must be placed in a vertical position in a dry environment.
Internal rusting can be prevented by removing the plugs at the top and bottom of the casing and drain or air blow out all water to prevent rust buildup or the possibility of freezing. Be sure to reinstall the plugs when the unit is made operational. Rustproofing or packing the casing with moisture absorbing material and covering the flanges is acceptable. When returning to service be sure to remove the drying agent from the pump.

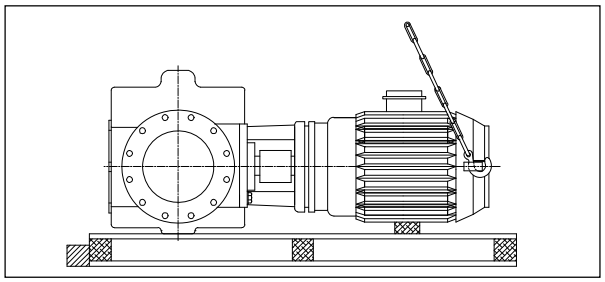
UNCRATING

Armstrong Vertical In-Line pumps are thoroughly inspected before shipment to assure they meet with your order requirements. After removing the pump from the crate, make sure the equipment is in good order and that all components are received as called for on the packing list. Any shortages or damage should be reported immediately. Use extreme care in handling the unit, placing slings and hooks carefully so that stress will not be imposed on the pump. NEVER PLACE CABLE SLINGS AROUND THE PUMP SHAFT. The eye bolts or lifting lugs on the motor are intended for lifting only the motor and not the complete unit.

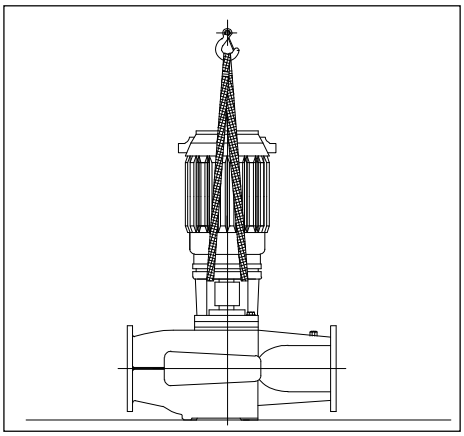
ARMSTRONG

HANDLING LARGE VIL UNITS

One effective way of lifting a large Series 4300 unit from the shipment pallet following uncovering the unit is to place lifting hooks through the motor lifting rings or straps around the upper part of the motor and carefully lift sufficiently to stand the pump vertically. Lift only sufficiently to remove the pallet then lower onto a flat surface. The pump and motor unit will free-stand on the casing ribs. Remove the coupling guard and place (2) lifting straps through the pump/motor pedestal, one on each side of the motor shaft and secure to the lifting device. With the straps in place, using a spacer bar if necessary to protect the motor fan cover, the whole assembly can now be lifted securely and placed in position in the piping.



Secure pallet and lift pump vertical using motor eye-bolts lift only to clear pallet then sit on the flat surface



Remove coupling guard and place lifting straps on each side of coupling, use spacer bar if necessary to protect motor fan cover.

IMPORTANT:
Do not run the pump for any length of time under very low flow conditions or with the discharge valve closed. To do so could cause the water in the casing to reach super heated steam conditions and will cause premature failure and could cause serious and dramatic damage to the pump and surrounding area.

INSTALLATION

1. LOCATION

- In open systems, locate the unit as close as practical to the liquid being pumped, with a short, direct suction pipe. Ensure adequate space is left above and around the unit for operation, maintenance, service and inspection of parts.
- In closed systems, where possible, the pumps should be installed immediately downstream of the expansion tank / make-up connection. This is the point of zero pressure change and is necessary for effective pump operation. Do not install more than one expansion tank connection into any closed hydronic system.
- Electric motor driven pumps should not be located in damp or dusty location without special protection.
- Airflow into the motor and/or motor fan should not be obstructed.

2. INSTALLATION

- *When installing vertical in-line pumps, an important consideration to accrue full added-value from the pump design is to ensure that the pump is pipe-mounted and free to 'float' with any movement, expansion and contraction of the piping. Should any vertical in-line pump use supports to the structure it is imperative that no pipe strain is imposed on the pump flanges. Tell-tale pieces of equipment such as springs or 'waffle' style neoprene isolation pads that distort with pressure to indicate added piping weight, should be used under pump supports should the pump not be truly pipe mounted.*
- Various installation arrangements are detailed on Pages 7 & 8:
  - 2.1 Vertical In-Line pumps may be installed directly in the system piping with no additional support. Pipe hangers are simply sized for the additional weight of the pumping unit. Many pumps are installed in this manner and are mounted at sufficient height to take zero floor space. (Fig. 2.1)
  - 2.2 Piping in many mechanical rooms is hung close to the ceiling and larger pumps are mounted near ground level for ease of maintenance. Fig 2.2 illustrates such an arrangement with the piping supported at the ceiling and the VIL unit installed with an Armstrong Suction Guide and triple function Flo-Trex valve. Many very large VIL pumps are installed in this manner.
  - 2.3 Should additional space saving be required the discharge spool piece and Flo-Trex valve may be replaced by a long-radius elbow and the Flo-Trex valve field converted to a straight-through valve and installed in the vertical discharge pipe. (Fig 2.3)

ARMSTRONG

2.4 Fig 2.4 illustrates a similar arrangement to Fig 2.2 with additional floor mounted pipe-stools isolated from the structure by 'waffle' style neoprene isolation pads under the Armstrong Suction Guide and Flo-Trex Valve.

2.5 Floor mounted saddle supports (Fig. 2.5) are typical for condenser water pumps where cooling tower base is near mechanical room elevation.

2.6 Where required, additional floor support may be used as shown in Fig. 2.6. Note that the pump should not be rigidly attached to the column. Leave a small gap between pump and column or install a 'waffle' isolation pad under the pump. It is critical that piping be installed in such a manner that the pump does not become a pipe support.

2.7 Fig. 2.7 illustrates stanchion plates at the pump inlet and outlet ports that may be supplied for installation convenience. Isolation pads must be used under the legs and monitored as pipe hangers are adjusted to ensure the pump flanges are not supporting the piping. Bolting to the floor or housekeeping pad is not recommended. If the stanchions are bolted down the bolts must be isolated from the stanchion or an inertia base and flexible pipe connectors used.

2.8 Fig. 2.8 illustrates installations with stanchion plates for seismically active regions. Seismically rated isolation pads or snubbers with bolts isolated from the stanchion plates are installed to restrain the pump during a seismic event. Pipe hangers carry the weight of the equipment as seismic components are designed only to restrain the equipment during a seismic event.

2.9 Close coupled in-line units (Series 4360 & 4380) up to 15 hp / 11 kW may be installed with the shaft horizontal. (Fig. 2.9) For horizontal mounting of large units or Series 4300 Split-Coupled style consult the factory.

2.10 Many Vertical In-Line pumps are piped successfully into grooved piping systems. In-line pumps are supported well by grooved piping however flange adapter locking devices or a welded flange at the pump should be used to prevent the possibility of pipe mounted pumps rotating in the piping. Armstrong offers grooved suction guides with cast-in outlet flanges and triple function Flo-Trex valves with inherent locking devices to prevent this possibility. (Fig. 2.10)

2.11 DO NOT support the unit by the motor eye bolts (Fig. 2.11) or by any other part of the motor.

2.12 Connecting the pump to a permanent rigid base (Fig. 2.12) is not recommended unless isolated from the piping by flexible connectors and the base isolated from the building structure on an inertia base. (Fig. 2.12 is generally acceptable when using plastic piping).

IMPORTANT:
All Series 4300 pumps contain a tapped hole in the motor bracket above the discharge flange (see Fig. 2.13) for draining the well. Pipe this drain hole to a floor drain to avoid overflow of the cavity caused by collecting chilled water condensate or from seal failure.

3. PUMP PIPING - GENERAL

- Never connect a pump to piping, unless extra care is taken to measure and align the piping flanges well. Always start piping from pump.
- Use as few bends as possible and preferably long radius elbows.
- Do not use flexible connectors on the suction or discharge of a vertical in-line pump, unless the pump is rigidly mounted to a foundation.
- Ensure piping exerts no strain on pump as this could distort the casing causing breakage or early failure due to pump misalignment.
- All conecting pipe flanges must be square to the pipework and parallel to the pump flanges.
- Suction and discharge pipes may be increased or decreased at pump nozzle to suit pump capacity and particular conditions of installation. Use eccentric reducers on suction connection with flat side uppermost.
- Layout the suction line with a continual rise towards the pump without high points, thus eliminating possibility of air pockets that may prevent the pump from operating effectively.
- A strainer of three or four times the area of the suction pipe, installed in the suction line, will prevent the entrance of foreign materials into the pump. 3/16" (5 mm) diameter perforations in the strainer is typical.
- In open systems, test suction line for air leaks before starting; this becomes essential with long suction line or static lift.
- Install, at the pump suction, a straight pipe of a length equivalent to 4 or 6 times its diameter; this becomes essential when handling liquids above 120°F (49°C). Armstrong suction guides may be used in place of the straight pipe run and in-line strainer.
- Install an isolation valve in both suction and discharge lines on flooded suction application; these valves are used primarily to isolate the pump for inspection or repair
- Install a non-slam non-return check valve in discharge line between pump and isolation valve to protect pump from excessive back pressure and to prevent water running back through the pump in case of driver failure on open systems. An Armstrong Flo-Trex valve may be used in place of non-return check valve and isolation valve on pump discharge.

A **CAUTION:**
The discharge valve only is to be used to throttle pump flow, not the suction valve. Care must be taken in the suction line layout and installation, as it is usually the major source of concern in centrifugal pump applications

4. ALIGNMENT

- Alignment is unnecessary on close-coupled pumps, Series 4360 & 4380, as there is no shaft coupling.
- Series 4300 units are accurately aligned at the factory prior to being shipped and do not need re-aligning when installed.
- Alignment on a Series 4300 unit may be verified by assuring an equal and parallel gap between coupling halves on both sides of the coupling.

ARMSTRONG

OPERATION

5. STARTING PUMP

- Ensure that the pump turns freely by hand, or with some gentle mechanical help such as a strap or Allen key in coupling bolt.
- Ensure that all protective guarding is securely fixed in position.
- The pump must be fully primed on start up. Fill the pump casing with liquid and rotate the shaft by hand to remove any air trapped in the impeller. On Series 4300 any air trapped in the casing as the system is filled must be removed by the manual air vent in the seal flush line. **ENSURE ENTRAINED AIR IS REMOVED FROM SERIES 4300 PUMPS, PRIOR TO STARTING, THROUGH THE AIR VENT ON THE SEAL FLUSH LINE – OPEN VENT UNTIL CLEAR OF AIR**. Series 4360 & 4380 units are fitted with seal flush/vent lines piped to the pump suction area. When these units operate residual air is drawn out of the pump towards the suction piping.
- "Bump" or energize the motor momentarily and check that the rotation corresponds with the directional arrow on the pump casing.
- To reverse rotation of a three phase motor, interchange any two power leads.
- Start the pump with the discharge valve closed and the suction valve open, then gradually open the discharge valve when the motor is at operating speed. The discharge valve may be "cracked" or open slightly at start up to help eliminate trapped air.
- When stopping the pump: Close the discharge valve and de-energize the motor.
- DO NOT run the pump against a closed discharge valve for an extended period of time. (A few minutes maximum)
- Star-Delta motor starters should be fitted with electronic/mechanical interocks that have a timed period of no more than 40 mili-seconds before switching from star (Starting) to delta (Run) connection yet allow the motor to reach full star (Starting) speed before switching to delta (Run).
- Should the pump be noisy or vibrate on start-up a common reason is overstated system head. Check this by calculating the pump operating head by deducting the suction pressure gauge value from the discharge gauge reading. Convert the result into the units of the pump head as stated on the pump nameplate and compare the values. Should the actual pump operating head be significantly less than the nameplate head value it is typically permissable to throttle the discharge isolation valve until the actual operating head is equal to the nameplate value. Any noise or vibration usually disappears. The system designer or operator should be made aware of this soon as some adjustment may be required to the pump impeller diameter or drive settings, if applicable, to make the pump suitable for the system as installed.

CAUTION:
Check rotation arrow prior to operating the unit. The rotation of all Armstrong Vertical In-Line units is "clockwise" when viewed from the drive end. (Looking from on top of / behind the motor)

6. GENERAL CARE

- Vertical In-Line pumps are built to operate without periodic maintenance, other than motor lubrication on larger units. A systematic inspection made at regular intervals, will ensure years of trouble-free operation, giving special attention to the following:
  - Keep unit clean
  - Provide the motor with correctly sized overload protection
  - Keep moisture, refuse, dust or other loose particles away from the pump and ventilating openings of the motor.
  - Avoid operating the unit in overheated surroundings (Above 100ºF/40ºC).

WARNING:
Whenever any service work is to be performed on a pumping unit, disconnect the power source to the driver, LOCK it OFF and tag with the reason. Any possibility of the unit starting while being serviced must be eliminated.

- If mechanical seal environmental accessories are installed, ensure water is flowing through the sight flow indicator and that filter cartridges are replaced as recommended. (See Armstrong files 43.85 & 43.86 for seal environmental instructions).

ARMSTRONG

7. LUBRICATION

Pump
- Lubrication is not required. There are no bearings in the pump that need external lubrication service.
- Large Series 4300 units are installed with a shaft bushing located beneath the impeller that is lubricated from the pump discharge. This bearing is field removable for service on the 20x20x19 size without disturbing the motor or other major pump components.
- Service instructions for the lower bearing is to be found on File No: 43.805.

Motor
- Follow the lubrication procedures recommended by the motor manufacturer. Many small and medium sized motors are permanently lubricated and need no added lubrication. Generally if there are grease fittings evident the motor needs periodic lubrication. None if not.
- Check the lubrication instructions supplied with the motor for the particular frame size indicated on the motor nameplate.

Mechanical Seal
- Mechanical seals require no special attention. The mechanical seal is fitted with a flush line. The seal is flushed from discharge of the pump casing on Series 4300 pumps and is flushed/vented to the suction on close coupled pumps, Series 4360 & 4380.
- The Series 4300 pump is flushed from the pump discharge because the mechanical seal chamber is isolated from the liquid in the pump by a throttle bushing. Because the seal chamber is isolated, seal environmental controls such as filters and separators, when installed in the Series 4300 flush line are very effective, as only the seal chamber needs cleansing, and will prolong seal life in HVAC systems.
- Do not run the pump unless properly filled with water as the mechanical seals need a film of liquid between the faces for proper operation.
- Mechanical seals may ‘weep’ slightly at start-up. Allow the pump to continue operating for several hours and the mechanical seal to ‘seat’ properly prior to calling for service personnel.
- The following Armstrong files are available for mechanical seal replacement instructions:
  - Series 4360 & 4380: File 43.81
  - Series 4300: P-Base and TCZ Motor Frames – File 43.84
TC Motor Frame – File 43.88

8. SYSTEM CLEANLINESS
- Before starting the pump the system must be thoroughly cleaned, flushed and drained and replenished with clean liquid.
- Welding slag and other foreign materials, “Stop Leak” and cleaning compounds and improper or excessive water treatment are all detrimental to the pump internals and sealing arrangement.
- Proper operation cannot be guaranteed if the above conditions are not adhered to.

NOTE:
Particular care must be taken to check the following before the pump is put into operation:
A. Pump primed?
B. Rotation OK?
C. Lubrication OK?
D. Pipe work properly supported?
E. Voltage supply OK?
F. Overload protection OK?
G. Is the system clean?
H. Is the area around the pump clean?

WARRANTY
Does not cover any damages to the equipment resulting from failure to observe the above precautions. Refer to Armstrong General Terms and Warranty sheet. Contact your local Armstrong representative for full information.

ARMSTRONG

INSTALLATION LAYOUTS

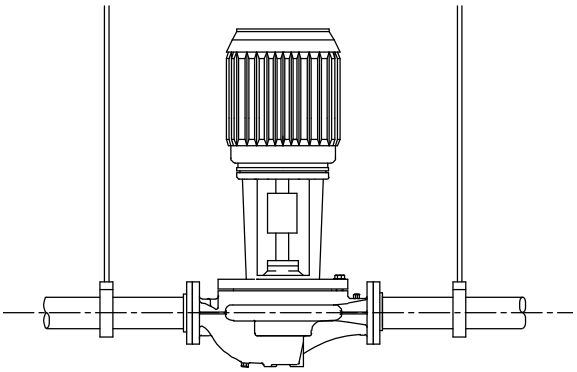


Fig. 2.1 Hanger supported pipe mounted

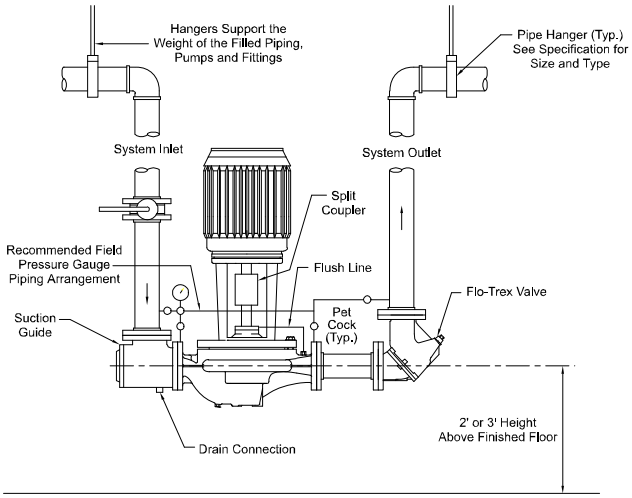


Fig. 2.2 Pipe mounted supported at ceiling

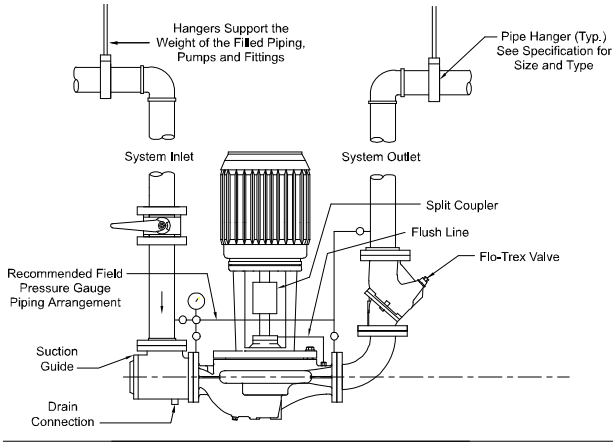


Fig. 2.3 Discharge elbow for minimum footprint

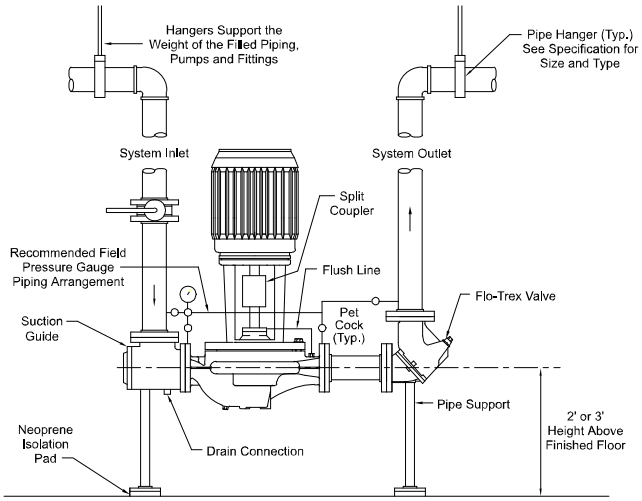


Fig. 2.4 With additional pipe supports

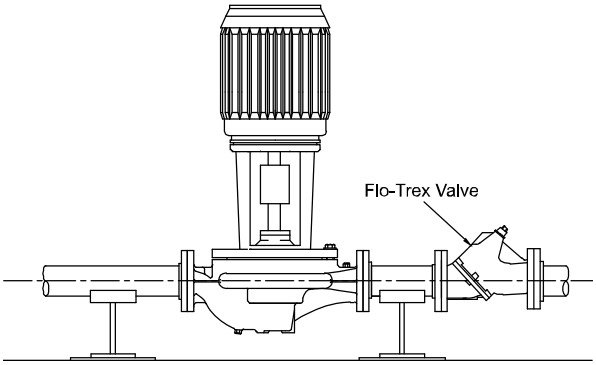


Fig. 2.5 Floor saddle support

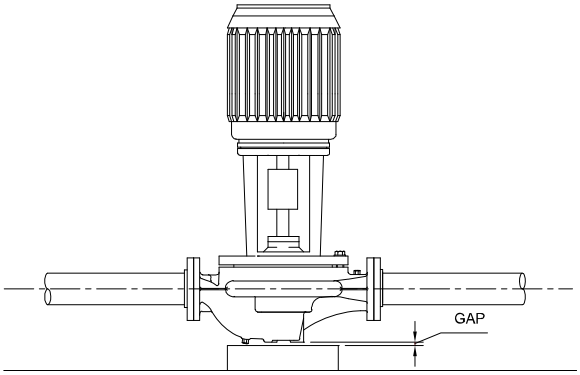


Fig. 2.6 Additional floor support

ARMSTRONG

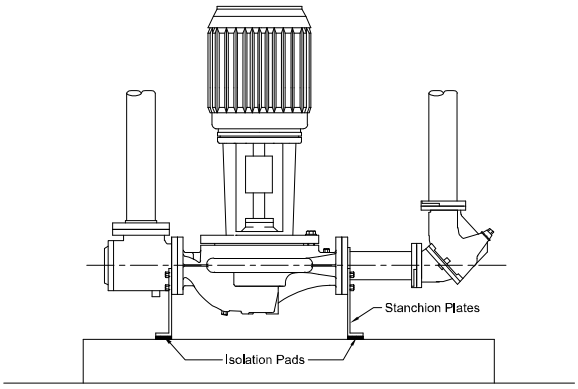


Fig. 2.7 With stanchion plates

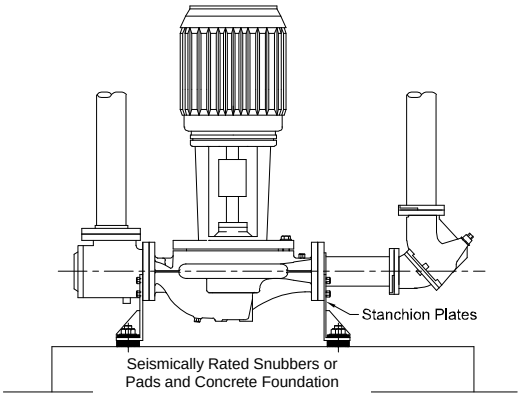


Fig. 2.8 Seismic region installation

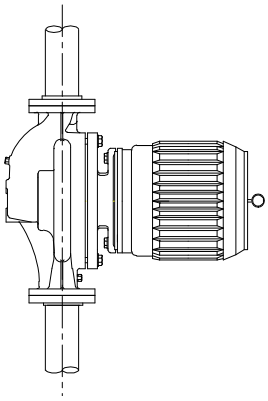


Fig. 2.9 Horizontal mounting – 4360/4380 only to 15 hp (11 kW)

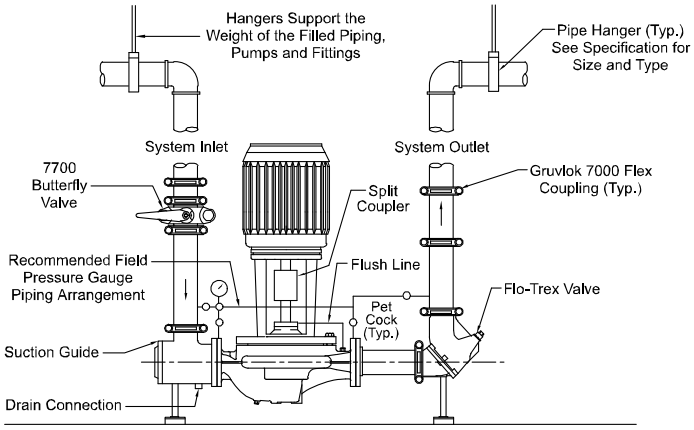


Fig. 2.10 Mounting in grooved pipe systems

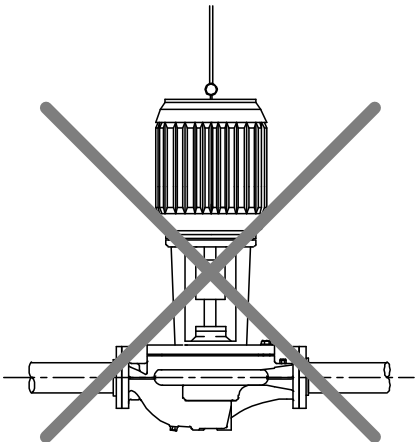


Fig. 2.11 Motor lifting hook supported

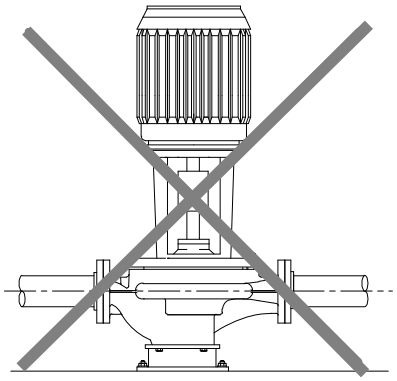


Fig. 2.12 Mounted on rigid base without flexible connectors

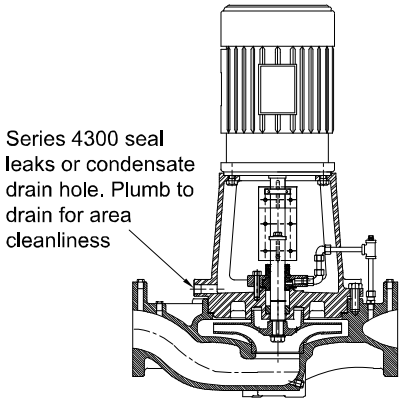


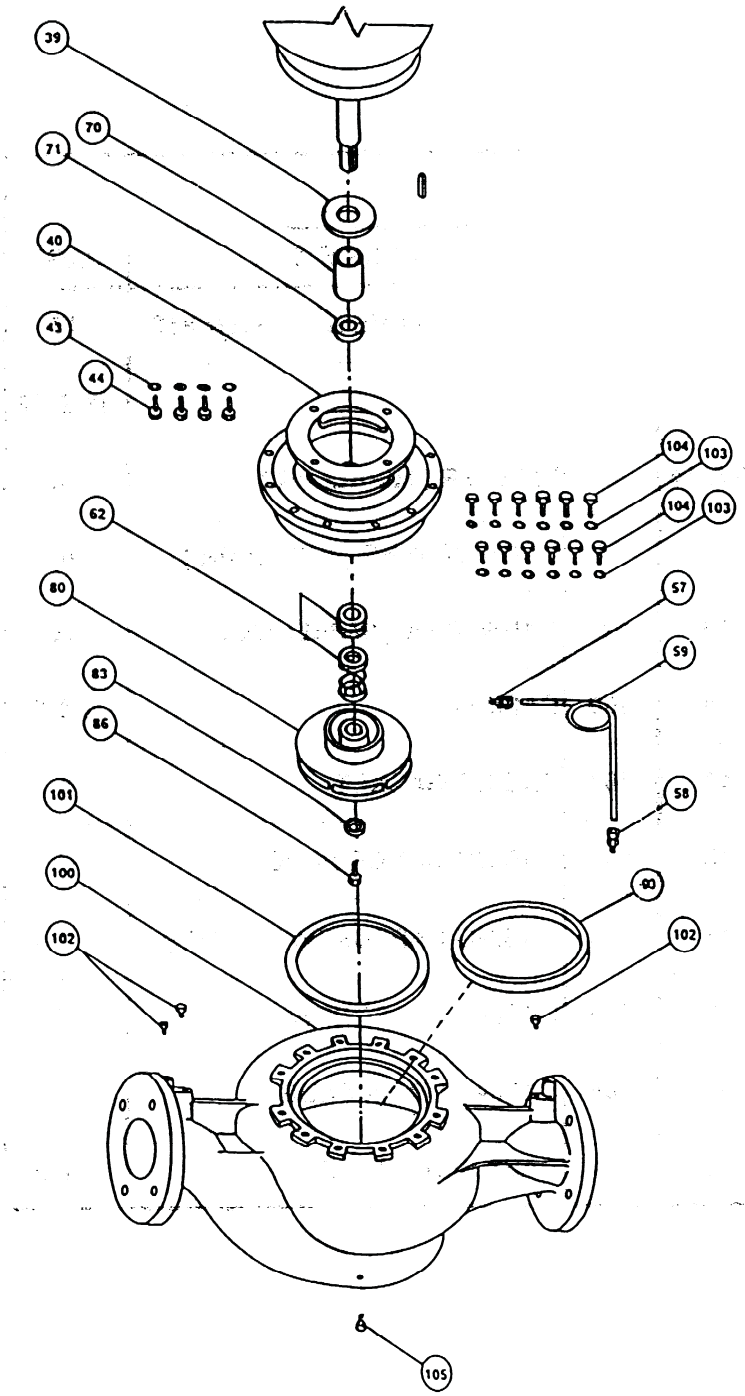
Fig. 2.13 Tapped collection well on Series 4300

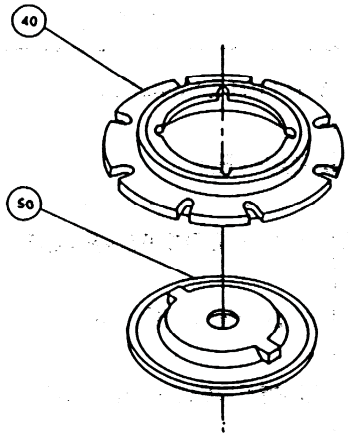
S. A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
T: 416-755-2291
F: 416-759-9101

Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A. 14120-6594
T: 716-693-8813
F: 716-693-8970

Armstrong Integrated Limited
Wenlock Way
Manchester
United Kingdom, M12 5JL
T: +44 (0) 8444 145 145
F: +44 (0) 8444 145 146

4380 NEW STYLE VERTICAL PUMP
EQUAL SUCTION AND DISCHARGE
"M" DESIGNATION
1 1/4" IMPELLER BORE -- 1 5/8" MECHANICAL SEAL





Separate Adapter and Stuffing Box
For Pumps:- 3 X 3 X 13
4 X 4 X 13
6 X 6 X 13
FRAME 213-215JP ONLY

SEE PAGE 3 FOR PARTS INDEX

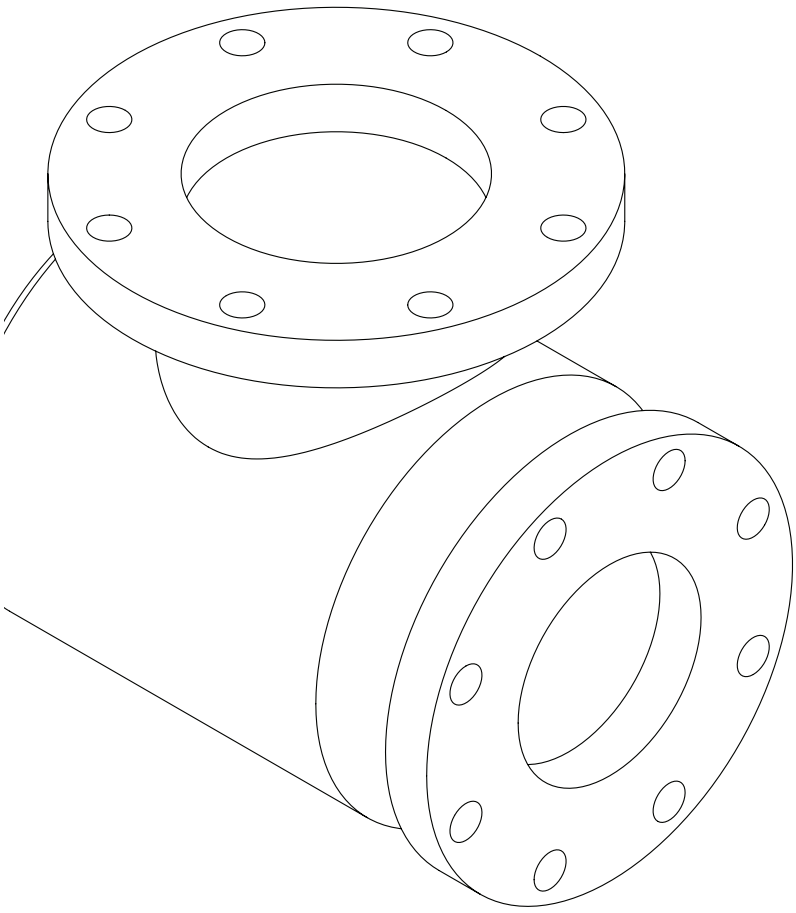
MODEL 4380 VERTICAL IN-LINE

EQUAL SUCTION AND DISCHARGE

PUMP PARTS

INDEX

ARMSTRONG



Suction Guides

Installation and operating instructions

File No: 35.82
Date: OCTOBER 03, 2013
Supersedes: 35.82
Date: AUGUST 16, 2013

CONTENTS

1.0 INTRODUCTION

Armstrong Suction Guides are designed for bolting directly onto the suction flange of horizontal or vertical shaft centrifugal pumps.

2.0 OPERATING LIMITS

Armstrong Suction Guides are designed in five series:

SERIES DESIGNATION	INLET CONNECTION	PUMP CONNECTION
SG	ANSI 125 / PN16 flange	ANSI 125 / PN16 flange
SG–TF	NPTF / BSPT	ANSI 125 / PN16 flange
SGG	GROOVED*	ANSI 125 / PN16 flange
SGHH	ANSI 250 / PN25 flange	ANSI 250 / PN25 flange
SGH–TF	NPTF / BSPT	ANSI 250 / PN25 flange

*Suitable for straight cut grooved anvil or victaulic fittings.

Each series is designed to be a four-function fitting. Each Suction Guide is a 90º elbow, a pipe strainer and a flow stabilizer. It may also be used as a reducing elbow, should the suction piping be larger than the pump inlet.

3.0 INSPECTION

Armstrong Suction Guides are thoroughly tested and inspected before shipment to assure they meet with your order requirements. All units must be carefully examined upon arrival for possible damage during transit. Any evidence of mishandling should be reported immediately to the carrier and noted on the freight bill.

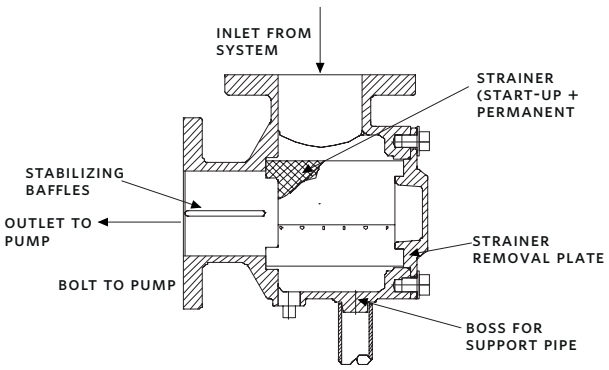


FIG. 1 Armstrong Suction Guide

4.0 INSTALLATION

Install the Suction Guide with the directional arrow, indicated on the body, being aligned with the system flow direction.

Armstrong Suction Guides may be installed in any position, providing the guide vanes are facing the pump inlet flange.

Centrifugal pumps need a minimum of 5 pipe diameters of straight pipe before the pump suction. This length of straight pipe, after the last elbow, tee or fitting, helps to ensure that the flow is stable when entering the pump suction.

Crosspiece guide vanes are fitted into the Armstrong Suction Guide outlet, where it bolts to the pump flange, to stabilize the flow and eliminate the need of long straight suction pipe.

Space must be allowed to remove the end cover and remove the strainer.

A blow–down valve may be installed on the Suction Guide drain connection. Should the Suction Guide be installed with the inlet port facing vertically down: The inlet piping configuration should include a blow–down valve at the lowest point on the down-pipe to exhaust any debris that may fall from the Suction Guide strainer.

The Suction Guide must not be used to support the suction piping. Piping must be supported independently.

On base mounted pumps, a flexible piping connections may allow the Suction Guide to be supported by the pump suction flange. A boss is cast on every SG allowing a supporting pipe-stool to be located under the fitting, thereby removing the weight of the Suction Guide from the pump suction flange.

Suction Guides are supplied with an inlet tapped gauge connection. Monitoring the differential pressure across the fitting, from the suction guide inlet gauge to the pump inlet gauge, will alert the operator should the strainer need to be removed and cleaned.

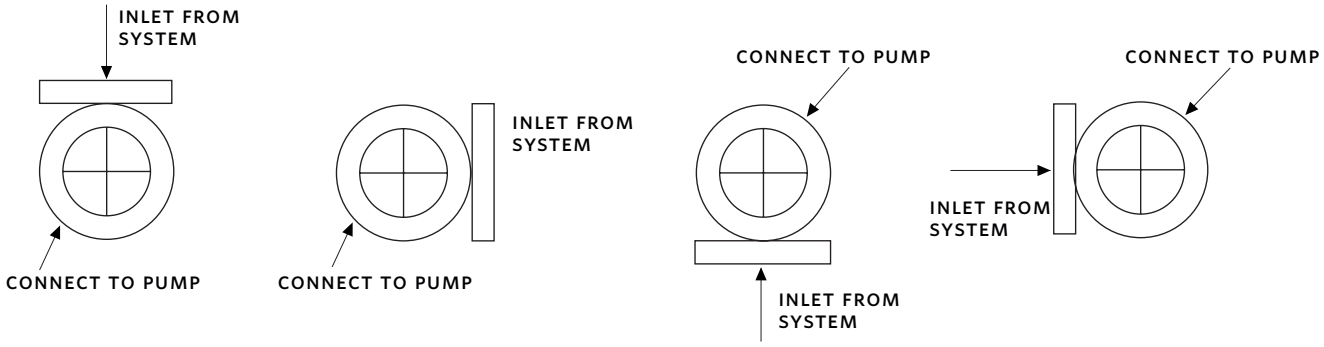


FIG. 2 Armstrong Suction Guide may be installed in any arrangement feasible by pump flange boltholes arrangement.

5.0 OPERATION

No special attention need be paid to the Suction Guide at start-up. The fitting is stationary and will strain the pumped fluid and stabilize the flow into the pump automatically.

Temporary strainer must be removed following system clean up.

After all debris has been removed from the system, or a maximum of 24 running hours, stop the pump and close the pump isolation valves. Drain the Suction Guide by removing the drain plug or opening the blowdown valve, if installed. Remove the Suction Guide cover and remove the strainer assembly from the valve body.

A temporary fine-mesh start-up strainer is tack-welded to the permanent stainless steel strainer. This temporary strainer should now be removed from the permanent strainer. The fine-mesh strainer is designed to remove small particulate from new piping systems and could easily clog with debris if left in place. This will be detrimental to the operation of the pump.

Replace the permanent strainer into the fitting body, once the temporary strainer is removed.

Inspect the cover O-ring and replace if necessary. Replace the cover into the body. Ensuring that the strainer is properly seated, tighten the cover bolts diagonally, evenly and firmly.

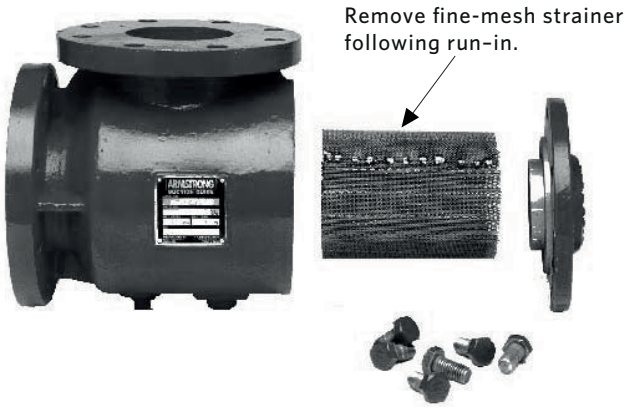
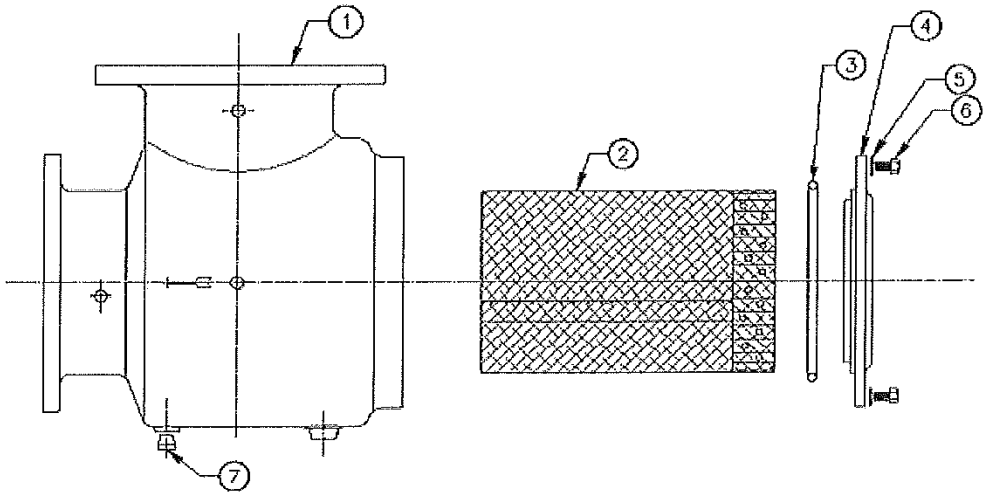


FIG. 3 Remove fine-mesh strainer

SUCTION GUIDE PARTS

MODEL NUMBER SG-64



ITEM NO.	PART DESCRIPTION	PART NUMBER	ARMSTRONG BAR CODE
1	BODY	516849-211	
2	STRAINER ASSEMBLY	516854-000	
3	O-RING - edpm, 4.984I.D.x.139cs	AS1270-250	
4	COVER	516887-231	
5	WASHER - stl 5/8" plain (SAE)	927121-100	
6	HEX HEAD CAP SCREW - 5/8"-11 x 1"	911129-108	
7	PIPE PLUG - 3/4" npt sq hd	939021-204	

NOTES:

SUPPORT PIPE NOT FURNISHED USE UNTHREADED STEEL PIPE

START-UP STRAINER MUST BE REMOVED AFTER A SHORT RUNNING PERIOD

STRAINER ASSEMBLY INCLUDES PERMANENT AND START-UP STRAINER

PERMANENT STRAINER PERFORATION HOLE SIZE --- .125" DIA.

ARMSTRONG®

FILE NO.:	37.870
DATE:	Sept. 5, 2003
SUPERSEDES:	New
DATE:	New

INSTALLATION AND OPERATING INSTRUCTIONS

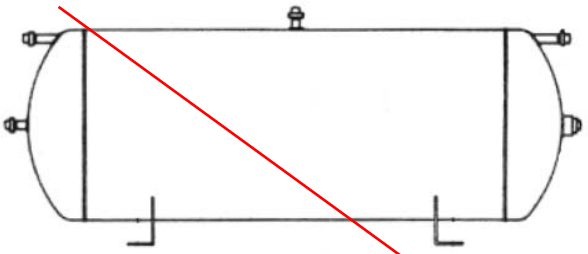
AX (Horizontal) and AX-V Series

ASME PRE-PRESSURIZED DIAPHRAGM EXPANSION TANKS FOR HEATING & COOLING SYSTEMS

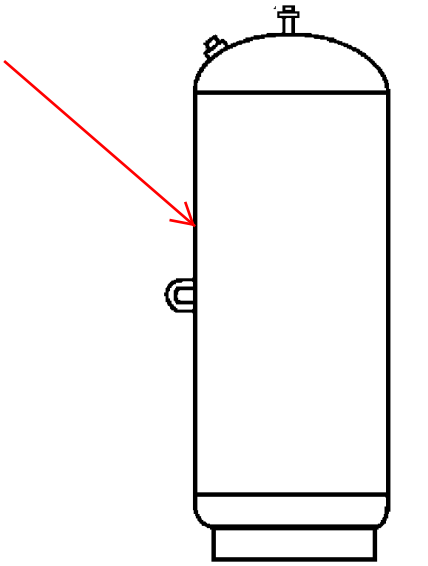
VESSEL DESCRIPTION

Armstrong AX Series Tanks are ASME constructed, pre-charged expansion tanks. They are designed to absorb the expansion forces and control the pressure in heating/cooling systems. The system's expanded water (is contained behind a heavy-duty diaphragm fully compatible with water/glycol mixtures) preventing tank corrosion and waterlogging problems.

The factory set pre-charge for these tanks is **12 psig (83 kPa).**



AX Series – Fixed Diaphragm



AX-V Series – Fixed Diaphragm

CONSTRUCTION DETAILS

MATERIALS OF CONSTRUCTION	
Shell	Carbon Steel
Diaphragm	Heavy Duty Butyl

MAXIMUM OPERATING CONDITIONS	
Working Temperature	240°F (115°C)
Working Pressure	125 psi (862 kPa)

STEPS & PROCEDURE

- Visually inspect tank for damage, which may occur during transit.
- Factory pre-charge pressure may not be correct for the installation. Tank MUST be pre-charged to system design fill pressure BEFORE placing into operation. Remove pipe plug covering the valve enclosure. Check and adjust the charge pressure by adding or releasing air for each application.

- If the system has been filled, the tank must be isolated from the system and the tank emptied before charging. This ensures all fluid has exited the diaphragm area and proper charging will occur.

- If the pre-charge adjustment is necessary, oil and water free compressed air or nitrogen gas may be used. Check the pre-charge using an accurate pressure gauge at the charging valve and adjust as required. Check air valve for leakage. If evident, replace the Schrader-type tire valve core. Do not depend on the valve cap to seal the leak. After making sure air charge is correct, replace pipe plug over the charging valve for protection.
- Set tank in place and pipe system connection to system. Be sure to include isolation valve(s) and drain.
- Purge air from system BEFORE placing tank into operation. All models have system water contained behind diaphragm.
- When filling the system with water, open valves to tank to ensure that any residual air in the tank is displaced by water.
- It is recommended that the pre-charge be checked annually to ensure proper system protection and long life for the vessel.

Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A. 14120-6594
Tel: (716) 693-8813
Fax: (716) 693-8970

S.A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
Tel: (416) 755-2291
Fax: (416) 759-9101

Armstrong Pumps Limited
Peartree Road, Stanway
Colchester, Essex
United Kingdom, CO3 0LP
Tel: +44 (0) 1206 579491
Fax: +44 (0) 1206 760532

Armstrong Darling
9001 De L'Innovation, Suite 200
Montreal, Quebec
Canada, H1J 2X9
Tel: (514) 352-2424
Fax: (514) 352-2425

www.armstrongpumps.com

FILE NO.:	11.85
DATE:	May 13, 2008
SUPERSEDES:	New
DATE:	New

Installation and Operating Instructions and Parts List

PRESSURE REDUCING VALVES

MODELS RD-11, RD-40, RD-50, & HRD-70

INSTALLATION:
The pressure reducing valve should be installed with the flow arrow on the body pointing in the direction of the flow. Install the union fittings, supplied with the valve (Model RD-11 and C-11), on the inlet side of the valve body, for quick installation and removal if necessary. A shut-off valve should be installed on the city water side of the pressure reducing valve. If the pressure reducing valve is not equipped with a fast fill feature, a by-pass may be used. A three valve by-pass around the pressure reducing valve will also serve as a fast fill option and is recommended for service.

CAUTION:
The use of Teflon tape when installing a valve provides lubricity. Care should be taken to avoid over tightening, which may crack the valve body.

OPERATION:
Model RD-11, RD-40 and RD-50 are preset at 12 psi, and the HRD-70 is preset at 45 psi. Open the cold water fill valve and the system will be filled until the boiler gauge indicates the preset valve pressure has been obtained.

Model RD-11 is preset at 12 psi and is equipped with a fast fill feature. When filling the system as noted above, the fast fill thumbscrew should be manually turned in completely. This overrides the pressure regulating function of the valve. The system should be filled until the boiler gauge indicates the preset pressure of the valve and then the fast fill thumbscrew should be backed off completely until it spins freely.

WARNING:
THE FAST FILL THUMBSCREW MUST NEVER BE LEFT IN THE DOWN POSITION AFTER THE SYSTEM HAS BEEN FILLED. THE THUMBSCREW MUST BE PLACED IN THE FREE POSITION TO AVOID OVER PRESSURIZATION AND UNNECESSARY RELIEF VALVE DISCHARGE**.**

ADJUSTMENT:
Allow system water to cool to ambient temperature. If necessary, adjust valve pressure setting as follows: pressure setting can be raised or lowered by loosening the jam nut and turning the slotted adjusting screw clockwise to increase the set pressure or counter-clockwise to lower the set pressure. This should be done slowly until the boiler pressure gauge indicates the required system pressure. A screw driver should be used to hold the adjusting stem stationary while the jam nut is secured.

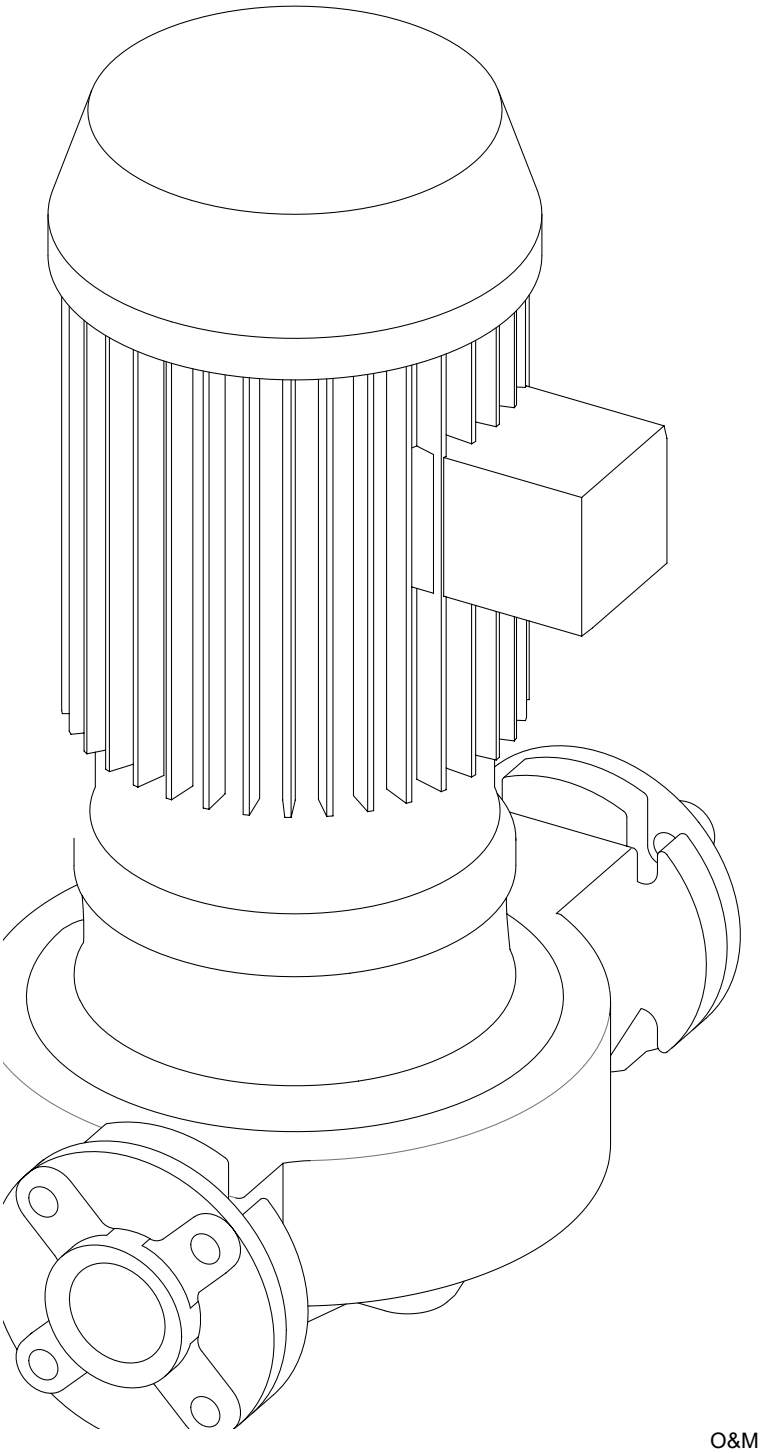
SERVICE:
If the pressure reducing valve fails to maintain the set cold fill pressure, the sediment strainer may be clogged. To service the strainer, shut-off city water supply and the isolation valve on the discharge of the pressure reducing valve. Remove and clean or replace the strainer, strainer gasket and nut. Open both the city water shut-off valve and the isolation valve to resume normal system operation.

S. A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
T: (416) 755-2291
F (Main): (416) 759-9101

Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A. 14120-6594
T: (716) 693-8813
F: (716) 693-8970

Armstrong Holden Brooke Pullen
Wenlock Way
Manchester
United Kingdom, M12 5JL
T: +44 (0) 161 223 2223
F: +44 (0) 161 220 9660

ARMSTRONG



Commercial pumps Series 4300, 4360 and 4380

Vertical In-Line pumps

Installation and operating instructions

File No: 43.80
Date: NOVEMBER 14, 2017
Supersedes: 43.80
Date: SEPTEMBER 14, 2012

CONTENTS

1.0 INTRODUCTION

This document contains specific information regarding the safe installation, operating and maintenance of Vertical In-Line pumps and should be read and understood by installing, operating and maintenance personnel. The equipment supplied has been designed and constructed to be safe and without risk to health and safety when properly installed, operated and maintained. The following instructions must be strictly adhered to. If clarification is needed on any point please contact Armstrong quoting the equipment serial number.

WARNING SYMBOLS


Safety instruction where an electrical hazard is involved.


Safety instruction where non-compliance would affect safety risk.

Safety instruction relating to safe operation of the equipment. (ATTENTION)

1.1 INSTRUCTIONS FOR SAFE USE


No installation of this equipment should take place unless this document has been studied and understood. Handling, transportation and installation of this equipment should only be undertaken by trained personnel with proper use of lifting equipment. See later diagrams for lifting advice. Refer to the pump nameplate for pump speed, pressure and temperature limitations. The limits stated must not be exceeded without written permission from Armstrong.

1.2 TEMPERATURE

Where under normal operating conditions the limit of 68°C/155°F (restricted zone) for normal touch, or 80°C/176°F (unrestricted zone) for unintentional touch, may be experienced, steps should be taken to minimize contact or warn operators/users that normal operating conditions will be exceeded. In certain cases where the temperature of the pumped liquid exceeds the above stated temperature levels, pump casing temperatures may exceed 100°C/212°F and not withstanding pump insulation techniques appropriate measures must be taken to minimize risk for operating personnel.

1.3 NOISE LEVELS

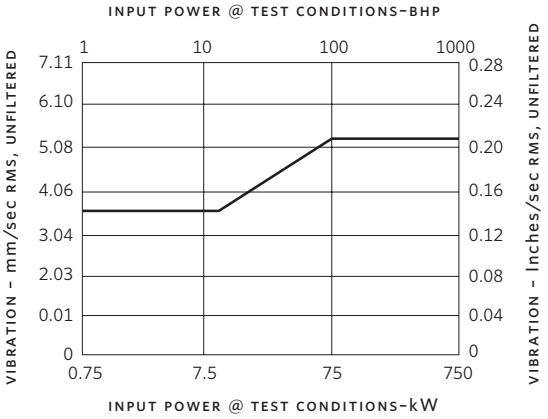
Typical Pumping Unit Sound Pressure Level, Decibels, A-Weighted, at 1 m (3 ft.) from unit.

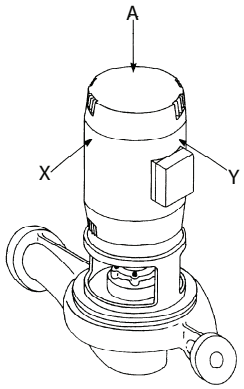
FIG. 1 Noise levels.

	1200 RPM				1800 RPM				3600 RPM			
FRAME DESIGNATION	ODP		TEFC		ODP		TEFC		ODP		TEFC	
	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A	hp	dB-A
140	0.75 - 1	59	0.75 - 1	58	1 - 3	64	1 - 2	64	1.5 - 3	70	1.5 - 2	79
180	1.5 - 2	61	1.5 - 2	61	3 - 5	66	3 - 5	68	5 - 7.5	74	3 - 5	82
210	3 - 5	66	3 - 5	65	7.5 - 10	70	7.5 - 10	73	10 - 15	76	7.5 - 10	85
250	7.5 - 10	70	7.5 - 10	69	15 - 20	74	15 - 20	78	20 - 25	78	15 - 20	88
280	15 - 20	75	15 - 20	74	25 - 30	74	25 - 30	82	30 - 40	80	25 - 30	89
320	25 - 30	77	25 - 30	77	40 - 50	78	40 - 50	83	50 - 60	83	40 - 50	94
360	40 - 50	80	40 - 50	80	60 - 75	80	60 - 75	89	75 - 100	88	60 - 75	95
400	60 - 75	82	60 - 75	84	100 - 125	83	100	92	125 - 150	92	100	96
440	100 - 125	85	100 - 125	88	150 - 200	87	125 - 150	96	200 - 250	95	125 - 150	98

1.4 VIBRATION LEVELS

Armstrong Vertical In-Line pumps are designed to meet vibration levels set by Hydraulic Institute Standard HI Pump vibration 9.6.4. standard levels are as detailed below:





VERTICAL IN–LINE

1.5 STORAGE

Pumps not immediately placed into service, or removed from service and stored, must be properly prepared to prevent excessive rusting. Pump port protection plates must not be removed until the pump is ready to connect to the piping.

Rotate the shaft periodically (at least monthly) to keep rotating element free and bearings fully functional.

For long term storage (longer than 3 months), the pump must be placed in a vertical position in a dry environment.

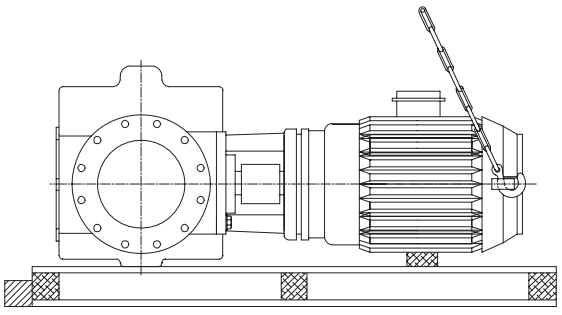
Internal rusting can be prevented by removing the plugs at the top and bottom of the casing and drain or air blow out all water to prevent rust buildup or the possibility of freezing. Be sure to reinstall the plugs when the unit is made operational. Rust-proofing or packing the casing with moisture absorbing material and covering the flanges is acceptable. When returning to service be sure to remove the drying agent from the pump.

1.6 UNCRATING

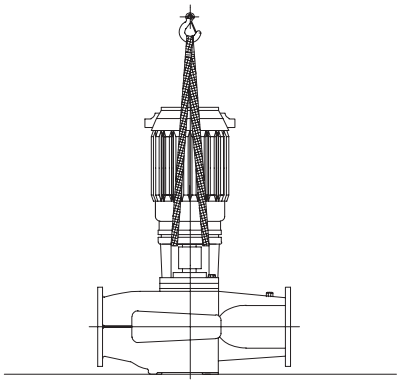
Armstrong Vertical In-Line pumps are thoroughly inspected before shipment to assure they meet with your order requirements. After removing the pump from the crate, make sure the equipment is in good order and that all components are received as called for on the packing list. Any shortages or damage should be reported immediately. Use extreme care in handling the unit, placing slings and hooks carefully so that stress will not be imposed on the pump. **Never place cable slings around the pump shaft.** The eye bolts or lifting lugs on the motor are intended for lifting the motor only and not the complete unit.

1.7 HANDLING LARGE VIL UNITS

One effective way of lifting a large Series 4300 unit from the shipment pallet following uncovering the unit is to place lifting hooks through the motor lifting rings or straps around the upper part of the motor and carefully lift sufficiently to stand the pump vertically. Lift only enough to remove the pallet then lower onto a flat surface. The pump and motor unit will free-stand on the casing ribs. Remove the coupling guard and place (2) lifting straps through the pump/motor pedestal (one on each side of the motor shaft) and secure to the lifting device. With the straps in place, using a spacer bar if necessary to protect the motor fan cover, the whole assembly can now be lifted securely and placed in position in the piping.



Secure pallet and lift pump vertical using motor eye-bolts lift only to clear pallet then sit on the flat surface.



Remove coupling guard and place lifting straps on each side of coupling, use spacer bar if necessary to protect motor fan cover.

IMPORTANT:

Do not run the pump for any length of time under very low flow conditions or with the discharge valve closed. This could cause the water in the casing to reach super heated steam conditions, cause premature failure and cause serious and dramatic damage to the pump and surrounding area.

2.0 INSTALLATION

2.1 LOCATION

In open systems, locate the unit as close as practical to the liquid being pumped, with a short, direct suction pipe. Ensure adequate space is left above and around the unit for operation, maintenance, service and inspection of parts.

In closed systems, where possible, the pumps should be installed immediately downstream of the expansion tank/make-up connection. This is the point of zero pressure change and is necessary for effective pump operation. Do not install more than one expansion tank connection into any closed hydronic system.

Electric motor driven pumps should not be located in damp or dusty locations without special protection.

Airflow into the motor and/or motor fan should not be obstructed.

2.2 INSTALLATION

When installing Vertical In-Line pumps, an important consideration to accrue full added-value from the pump design is to ensure that the pump is pipe-mounted and free to 'float' with any movement, expansion and contraction of the piping. Should any Vertical In-Line pump use supports to the structure it is imperative that no pipe strain is imposed on the pump flanges. Telltale pieces of equipment such as springs or 'waffle' style neoprene isolation pads that distort with pressure to indicate added piping weight, should be used under pump supports should the pump not be truly pipe mounted.

Various installation arrangements are detailed on Pages 6 and 7:

2.2.1
Vertical In-Line pumps may be installed directly in the system piping with no additional support. Pipe hangers are simply sized for the additional weight of the pumping unit. Many pumps are installed in this manner and are mounted at sufficient height to take zero floor space. (Fig. 2.1)

2.2.2
Piping, in many mechanical rooms, is hung close to the ceiling and larger pumps are mounted near ground level for ease of maintenance. Fig 2.2 illustrates such an arrangement with the piping supported at the ceiling and the VIL unit installed with an Armstrong Suction Guide and triple function Flo-Trex valve. Many very large VIL pumps are installed in this manner.

2.2.3
Should additional space saving be required the discharge spool piece and Flo-Trex valve may be replaced by a long-radius elbow and the Flo-Trex valve field converted to a straight-through valve and installed in the vertical discharge pipe. (Fig. 2.3)

2.2.4
Fig 2.4 illustrates a similar arrangement to Fig 2.2 with additional floor mounted pipe-stools isolated from the structure by 'waffle' style neoprene isolation pads under the Armstrong Suction Guide and Flo-Trex valve.

2.2.5
Floor mounted saddle supports (Fig. 2.5) are typical for condenser water pumps where the cooling tower base is near mechanical room elevation.

2.2.6
Where required, additional floor support may be used as shown in Fig. 2.6. Note that the pump should not be rigidly attached to the column. Leave a small gap between pump and column or install a 'waffle' isolation pad under the pump. It is critical that piping be installed in such a manner that the pump does not become a pipe support.

2.2.7
Fig. 2.7 illustrates stanchion plates at the pump inlet and outlet ports that may be supplied for installation convenience. Isolation pads must be used under the legs and monitored as pipe hangers are adjusted to ensure the pump flanges are not supporting the piping. Bolting to the floor or housekeeping pad is not recommended. If the stanchions are bolted down the bolts must be isolated from the stanchion or an inertia base and flexible pipe connectors should be used.

2.2.8
Fig. 2.8 illustrates installations with stanchion plates for seismically active regions. Seismically rated isolation pads or snubbers with bolts isolated from the stanchion plates are installed to restrain the pump during a seismic event. Pipe hangers carry the weight of the equipment as seismic components are designed only to restrain the equipment during a seismic event.

2.2.9
Close coupled in-line units (Series 4360 & 4380) up to 15 hp / 11 kW may be installed with the shaft horizontal. (Fig. 2.9) For horizontal mounting of large units or Series 4300 Split-Coupled style consult the factory. (Fig. 2.9)

2.2.10
Many Vertical In-Line pumps are piped successfully into grooved piping systems. In-line pumps are supported well by grooved piping however flange adapter locking devices or a welded flange at the pump should be used to prevent the possibility of pipe mounted pumps rotating in the piping. Armstrong offers grooved suction guides with cast-in outlet flanges and triple function Flo-Trex valves with inherent locking devices to prevent this possibility. (Fig. 2.10)

2.2.11
Do not support the unit by the motor eye bolts (Fig. 2.11) or by any other part of the motor.

2.2.12
Connecting the pump to a permanent rigid base (Fig. 2.12). is not recommended unless isolated from the piping by flexible connectors and the base isolated from the building structure on an inertia base. (Fig. 2.12 is generally acceptable when using plastic piping).

IMPORTANT:

All Series 4300 pumps contain a tapped hole in the motor bracket above the discharge flange (see Fig. 2.13) for draining the well. Pipe this drain hole to a floor drain to avoid overflow of the cavity caused by collecting chilled water condensate or from seal failure.

2.3 PUMP PIPING – GENERAL

Never connect a pump to piping, unless extra care is taken to measure and align the piping flanges well. Always start piping from pump.

Use as few bends as possible and preferably long radius elbows.

Do not use flexible connectors on the suction or discharge of a Vertical In-Line pump, unless the pump is rigidly mounted to a foundation.

Ensure piping exerts no strain on pump as this could distort the casing causing breakage or early failure due to pump misalignment.

All conecting pipe flanges must be square to the pipework and parallel to the pump flanges.

Suction and discharge pipes may be increased or decreased at pump nozzle to suit pump capacity and particular conditions of installation. Use eccentric reducers on suction connection with flat side uppermost.

Layout the suction line with a continual rise towards the pump without high points, thus eliminating possibility of air pockets that may prevent the pump from operating effectively.

A strainer of three or four times the area of the suction pipe, installed in the suction line, will prevent the entrance of foreign materials into the pump. $^{3}/_{16}$" (5 mm) diameter perforations in the strainer is typical.

In open systems, test suction line for air leaks before starting; this becomes essential with long suction line or static lift. Install, at the pump suction, a straight pipe of a length equivalent to 4 or 6 times its diameter; this becomes essential when handling liquids above 120°F (49°C). Armstrong suction guides may be used in place of the straight pipe run and in-line strainer.

Install an isolation valve in both suction and discharge lines on flooded suction application; these valves are used primarily to isolate the pump for inspection or repair.

Install a non-slam non-return check valve in discharge line between pump and isolation valve to protect pump from excessive back pressure and to prevent water running back through the pump in case of driver failure on open systems. An Armstrong Flo-Trex valve may be used in place of non-return check valve and isolation valve on pump discharge.

CAUTION:

Only the discharge valve is to be used to throttle pump flow, not the suction valve. Care must be taken in the suction line layout and installation, as it is usually the major source of concern in centrifugal pump applications.

2.4 ALIGNMENT

Alignment is unnecessary on close-coupled pumps, Series 4360 & 4380, as there is no shaft coupling.

Series 4300 units are accurately aligned at the factory prior to being shipped and do not need re-aligning when installed.

Alignment on a Series 4300 unit may be verified by assuring an equal and parallel gap between coupling halves on both sides of the coupling.

OPERATION

2.5 STARTING THE PUMP

Ensure that the pump turns freely by hand, or with some gentle mechanical help such as a strap or Allen key in coupling bolt.

Ensure that all protective guarding is securely fixed in position.

The pump must be fully primed on start up. Fill the pump casing with liquid and rotate the shaft by hand to remove any air trapped in the impeller. On Series 4300 any air trapped in the casing as the system is filled must be removed by the manual air vent in the seal flush line. **Ensure entrained air is removed from series 4300 pumps, prior to starting, through the air vent on the seal flush line. Open vent until clear of air.** Series 4360 & 4380 units are fitted with seal flush/vent lines piped to the pump suction area. When these units operate residual air is drawn out of the pump towards the suction piping.

'Bump' or energize the motor momentarily and check that the rotation corresponds with the directional arrow on the pump casing.

To reverse rotation of a three phase motor, interchange any two power leads.

Start the pump with the discharge valve closed and the suction valve open, then gradually open the discharge valve when the motor is at operating speed. The discharge valve may be open slightly at start up to help eliminate trapped air.

When stopping the pump: Close the discharge valve and de-energize the motor.

Do not run the pump against a closed discharge valve for an extended period of time (a few minutes maximum).

Star-Delta motor starters should be fitted with electronic/mechanical interocks that have a timed period of no more than 40 miliseconds before switching from star (starting) to delta (run) connection yet allow the motor to reach full star (starting) speed before switching to delta (run).

Should the pump be noisy or vibrate on start-up a common reason is overstated system head. Check this by calculating the pump operating head by deducting the suction pressure gauge value from the discharge gauge reading. Convert the result into the units of the pump head as stated on the pump nameplate and compare the values. Should the actual pump operating head be significantly less than the nameplate head value it is typically permissable to throttle the discharge isolation valve until the actual operating head is equal to the nameplate value. Any noise or vibration usually disappears. The system designer or operator should be made aware of this as some adjustment may be required to the pump impeller diameter or drive settings, if applicable, to make the pump suitable for the system as installed.

CAUTION:

Check rotation arrow prior to operating the unit. The rotation of all Armstrong Vertical In-Line units is clockwise when viewed from the drive end. (Looking from on top of/behind the motor).

2.6 GENERAL CARE

Vertical In-Line pumps are built to operate without periodic maintenance, other than motor lubrication on larger units. A systematic inspection made at regular intervals, will ensure years of trouble-free operation, giving special attention to the following:

- Keep unit clean.
- Provide the motor with correctly sized overload protection.
- Keep moisture, refuse, dust or other loose particles away from the pump and ventilating openings of the motor.
- Avoid operating the unit in overheated surroundings (above 100°F/40°C).

WARNING:

Whenever any service work is to be performed on a pumping unit, disconnect the power source from the driver, **lock it off** and tag with the reason. Any possibility of the unit starting while being serviced must be eliminated.

- If mechanical seal environmental accessories are installed, ensure water is flowing through the sight flow indicator and that filter cartridges are replaced as recommended. (See Armstrong files 43.85 & 43.86 for seal environmental instructions).

2.7 LUBRICATION

Pump
Lubrication is not required. There are no bearings in the pump that need external lubrication service.

Large Series 4300 units are installed with a shaft bushing located beneath the impeller that is lubricated from the pump discharge. This bearing is field removable for service on the 20 × 20 × 19 size without disturbing the motor or other major pump components.

Service instructions for the lower bearing is to be found in File no: 43.805.

Motor
Follow the lubrication procedures recommended by the motor manufacturer. Many small and medium sized motors are permanently lubricated and need no added lubrication. Generally if there are grease fittings evident the motor needs periodic lubrication. None if not.

Check the lubrication instructions supplied with the motor for the particular frame size indicated on the motor nameplate.

Mechanical Seal
Mechanical seals require no special attention. The mechanical seal is fitted with a flush line. The seal is flushed from discharge of the pump casing on Series 4300 pumps and is flushed/vented to the suction on close coupled pumps, Series 4360 & 4380.

The Series 4300 pump is flushed from the pump discharge because the mechanical seal chamber is isolated from the liquid in the pump by a throttle bushing. Because the seal chamber is isolated, seal environmental controls such as filters and separators, when installed in the Series 4300 flush line are very effective, as only the seal chamber needs cleansing, and will prolong seal life in HVAC systems.

Do not run the pump unless properly filled with water as the mechanical seals need a film of liquid between the faces for proper operation.

Mechanical seals may 'weep' slightly at start-up. Allow the pump to continue operating for several hours and the mechanical seal to 'seat' properly prior to calling for service personnel.

The following Armstrong files are available for mechanical seal replacement instructions:

- Series 4360 & 4380: File no. 43.81
- Series 4300: P-Base and TCZ Motor Frame – File no. 43.84
  TC Motor Frame – File no. 43.88

2.8 SYSTEM CLEANLINESS

Before starting the pump the system must be thoroughly cleaned, flushed and drained and replenished with clean liquid.

Welding slag and other foreign materials, Stop Leak and cleaning compounds and improper or excessive water treatment are all detrimental to the pump internals and sealing arrangement.

Proper operation cannot be guaranteed if the above conditions are not adhered to.

NOTE:
Particular care must be taken to check the following before the pump is put into operation:

- **A** Pump primed?
- **B** Rotation ok?
- **C** Lubrication ok?
- **D** Pipe work properly supported?
- **E** Voltage supply ok?
- **F** Overload protection ok?
- **G** Is the system clean?
- **H** Is the area around the pump clean?

WARRANTY
Does not cover any damages to the equipment resulting from failure to observe the above precautions. Refer to Armstrong General Terms and Warranty sheet. Contact your local Armstrong representative for full information.

2.9 INSTALLATION LAYOUTS

FIG. 2.1 Hanger supported pipe mounted.

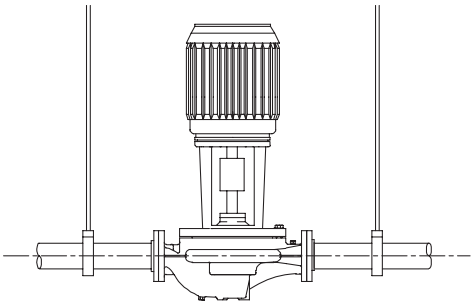


FIG. 2.2 Pipe mounted supported at ceiling.

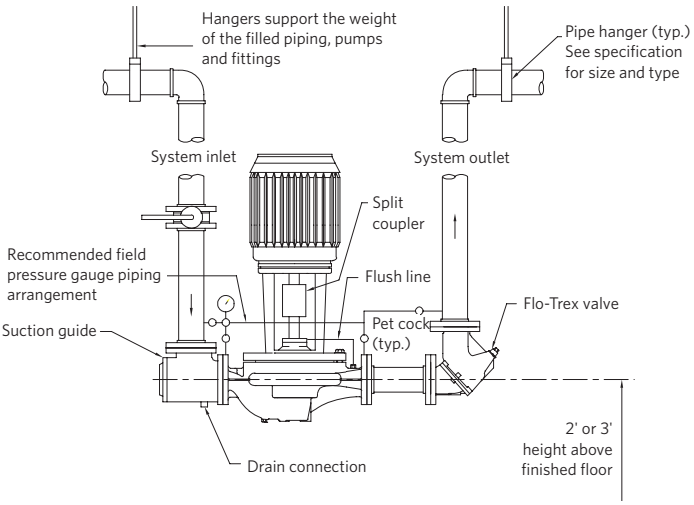


FIG. 2.3 Discharge elbow for minimum footprint.

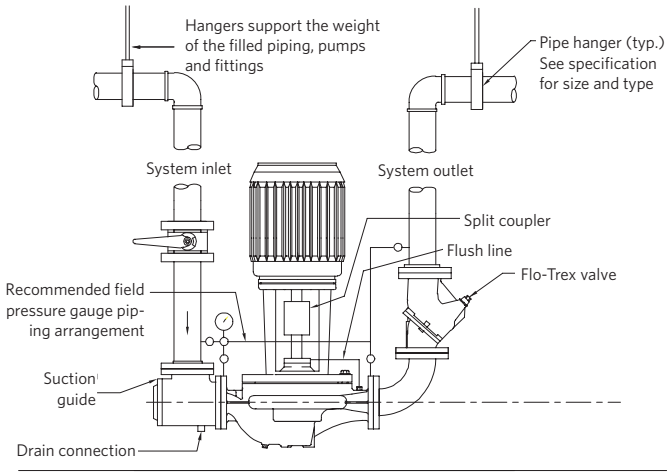


FIG. 2.4 With additional pipe supports.

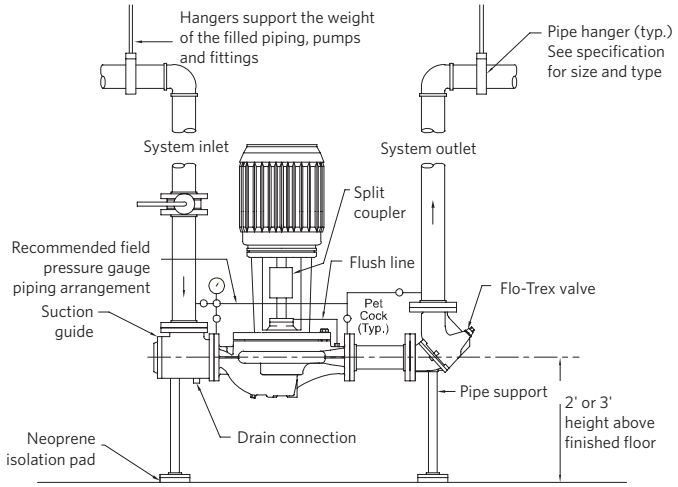


FIG. 2.5 Floor saddle support.

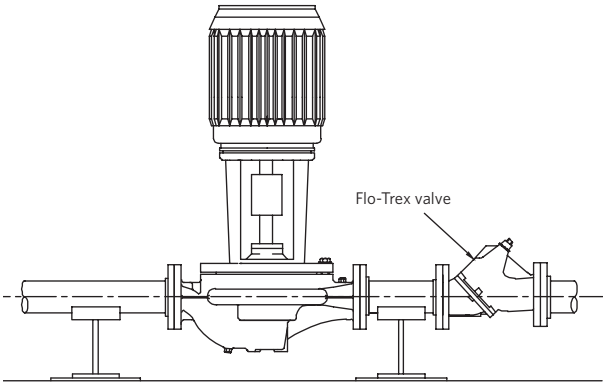


FIG. 2.6 Additional floor support.

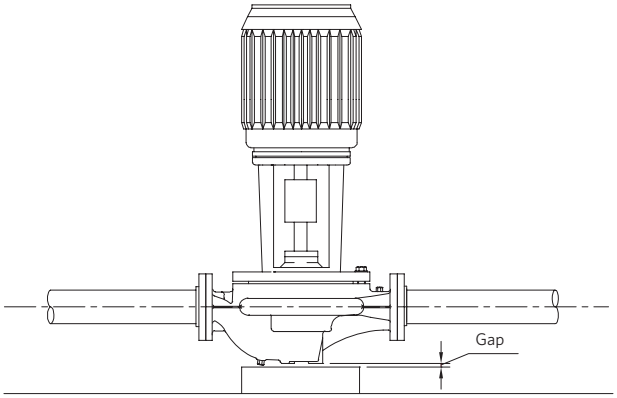


FIG. 2.7 With stanchion plates.

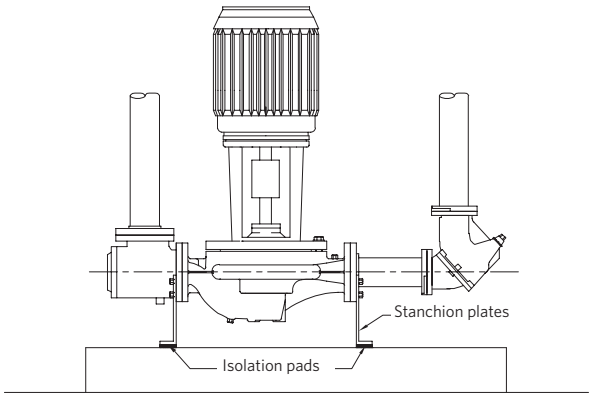


FIG. 2.8 Seismic region installation.

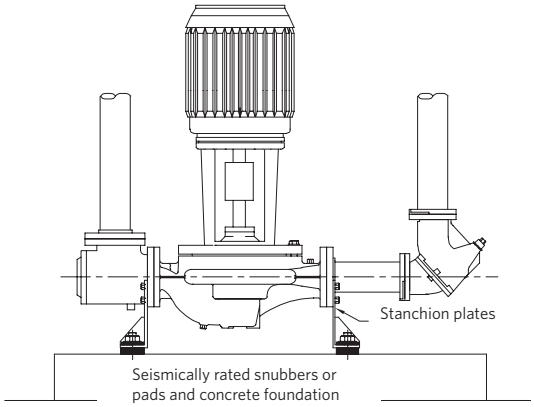


FIG. 2.9 Horizontal mounting – 4360/4380 only to 15 hp (11 kW).

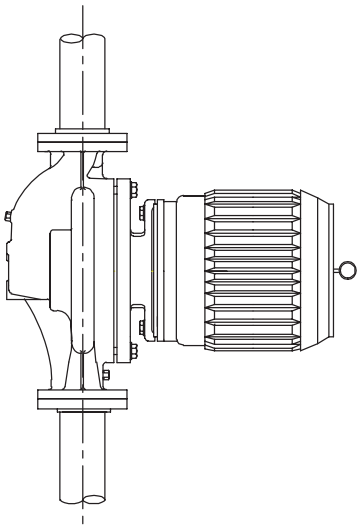


FIG. 2.10 Mounting in grooved pipe systems.

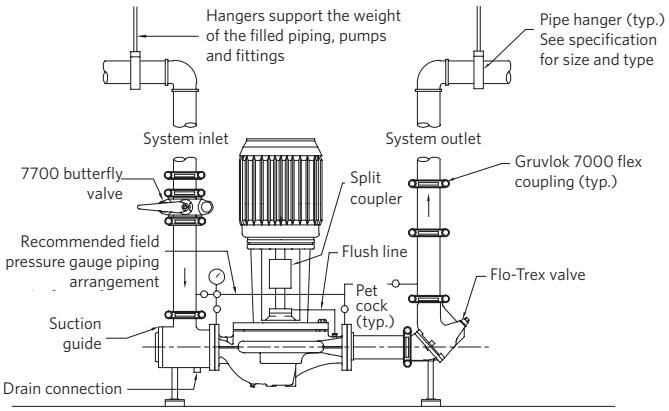


FIG. 2.11 Motor lifting hook supported.

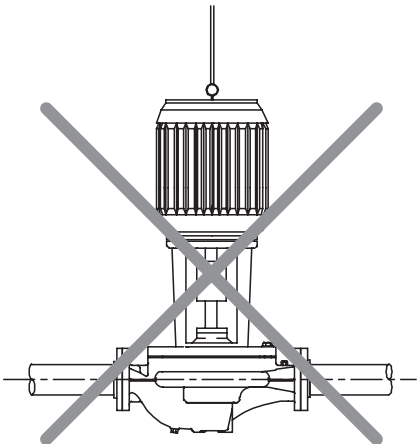


FIG. 2.12 Mounted on rigid base without flexible connectors; **though suitable for plastic piping, such as Aquatic Centers.**

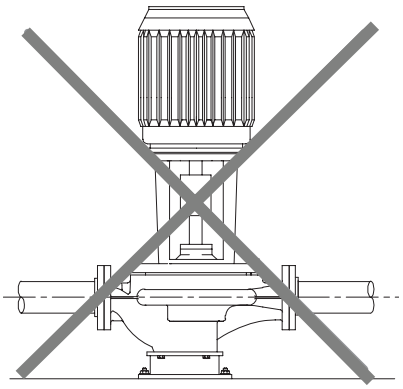
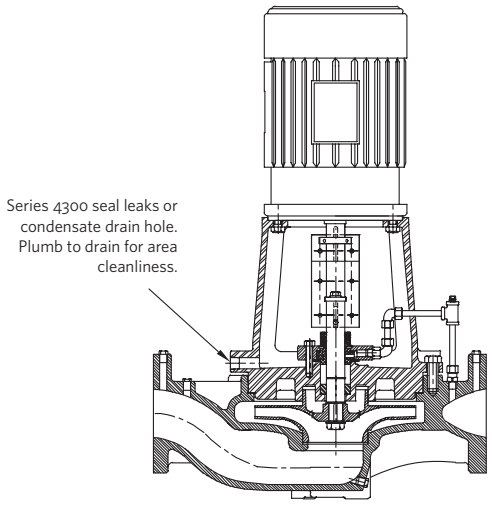


FIG. 2.13 Tapped collection well.



TORONTO

23 BERTRAND AVENUE
TORONTO, ONTARIO
CANADA
M1L 2P3
+1 416 755 2291

BUFFALO

93 EAST AVENUE
NORTH TONAWANDA, NEW YORK
U.S.A.
14120-6594
+1 716 693 8813

BIRMINGHAM

HEYWOOD WHARF, MUCKLOW HILL
HALESOWEN, WEST MIDLANDS
UNITED KINGDOM
B62 8DJ
+44 (0) 8444 145 145

MANCHESTER

WOLVERTON STREET
MANCHESTER
UNITED KINGDOM
M11 2ET
+44 (0) 8444 145 145

BANGALORE

#59, FIRST FLOOR, 3RD MAIN
MARGOSA ROAD, MALLESWARAM
BANGALORE, INDIA
560 003
+91 (0) 80 4906 3555

SHANGHAI

NO. 1619 HU HANG ROAD, XI DU TOWNSHIP
FENG XIAN DISTRICT, SHANGHAI
P.R.C.
201401
+86 21 3756 6696

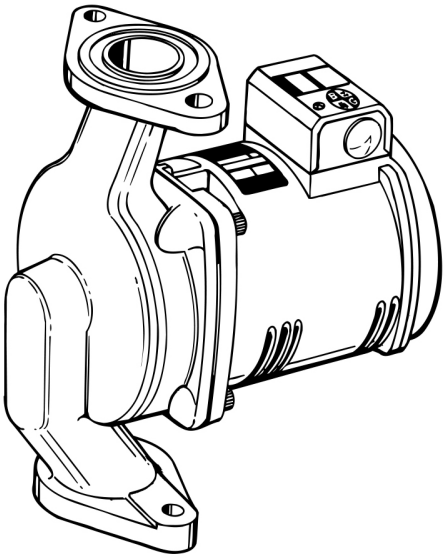
ARMSTRONG FLUID TECHNOLOGY
ESTABLISHED 1934

ARMSTRONGFLUIDTECHNOLOGY.COM

MAKING ENERGY MAKE SENSE™

Bell & Gossett
a xylem brand

INSTRUCTION MANUAL
P81884
REVISION I



c UL us LISTED

SERIES PL™ Booster Pumps

INSTALLER: PLEASE LEAVE THIS MANUAL FOR THE OWNER'S USE.

NOTE: Bell & Gossett recommends Bronze Booster Pumps be used for pumping potable water.

This pump is nonsubmersible, for indoor use only.

⚠ SAFETY INSTRUCTIONS

This safety alert symbol will be used in this manual and on the pump safety instructions decal to draw attention to safety related instructions. When used, the safety alert symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.

Your Series PL™ Booster Pump should have the warning/caution label and nonsubmersible warning label (Fig. 1) displayed on the pump conduit box. If this warning and caution is missing or illegible, contact your local Bell & Gossett Representative for a replacement.

DESCRIPTION

The Series PL™ Booster Pump features permanently lubricated bearings, non-overloading permanent split capacitor motor with thermal protection and quiet operating construction.

OPERATIONAL LIMITS

These pumps are designed to pump liquids compatible with their iron or bronze body construction.

Maximum Working Pressure:	150 psi (10 bar)
Maximum Operating Temperature:	225°F (107°C)
Electrical Rating:	115V, 60 Hz, 1PH
	230V, 60 Hz, 1PH
	277V, 60 Hz, 1PH

Do not exceed these values.

⚠ WARNING

BEFORE INSTALLING, USING OR SERVICING THIS PRODUCT, READ THE INSTRUCTIONS. TO REDUCE RISK OF ELECTRICAL SHOCK SEE INSTRUCTIONS FOR PROPER INSTALLATION. P48405

⚠ CAUTION

FOR SUPPLY CONNECTIONS USE WIRE SUITABLE FOR AT LEAST 90°C. USE COPPER CONDUCTORS ONLY. EMPLOYER DES FILS D'ALIMENTATION ADEQUATS POUR 90°C. FOR INDOOR USE ONLY. EMPLOYER UNIQUEMENT A L'INTERIEUR.

⚠ WARNING

RISK OF ELECTRIC SHOCK; THIS PUMP HAS NOT BEEN INVESTIGATED FOR USE IN SWIMMING POOL AND MARINE AREAS. -NONSUBMERSIBLE PUMP- P86313

FIG. 1

PUMP APPLICATION

The Series PL™ Booster Pump may be used for water circulating applications in hydronic and solar systems.

It has not been investigated, nor is it intended for use in swimming pool and marine areas.

SAFETY REQUIREMENTS

MECHANICAL SAFETY

WARNING: EXCESSIVE SYSTEM PRESSURE HAZARD
The maximum working pressure of the pump is listed on the nameplate – DO NOT EXCEED THIS PRESSURE. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: EXCESSIVE PRESSURE HAZARD – VOLUMETRIC EXPANSION
The heating of water and other fluids causes volumetric expansion. The associated forces may cause failure of system components and the release of high temperature fluids. This can be prevented by installing properly sized and located expansion tanks and pressure relief valves. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

THERMAL SAFETY

WARNING: EXTREME TEMPERATURE HAZARD
If the pump, motor, or piping are operating at extremely high or low temperature, guarding or insulation is required. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

ELECTRICAL SAFETY

WARNING: ELECTRICAL SHOCK HAZARD
Electrical connections are to be made by a qualified electrician in accordance with all applicable codes, ordinances and good practices. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: ELECTRICAL GROUNDING HAZARD
Adequate electrical grounding is required for the safe operation of B&G Pumps. The use of grounded metal conduit assures this requirement. If the means of connection to the supply-connection box (wiring compartment) is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor at least the size of the circuit conductors supplying the pump to the green grounding screw provided within the wiring compartment. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: RISK OF ELECTRIC SHOCK
Do not install this pump in swimming pool or marine areas. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

REMOVAL OF THE PUMP FROM EXISTING SYSTEM FOR REPLACEMENT

WARNING: ELECTRICAL SHOCK HAZARD
Disconnect and lockout the power before servicing. Failure to follow these instructions could result in serious personal injury or death.

1. Close the valves on the suction and discharge sides of the pump. If no valves have been installed, it may be necessary to drain the system.

WARNING: HOT WATER HAZARD
Before draining the system, allow water to cool to 100°F max. open the drain valve (take precautions against water damage) and leave the drain valve open until servicing is complete. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: ELECTRICAL SHOCK HAZARD
Be certain the electrical power is not present at the motor leads before continuing. Failure to follow these instructions could result in serious personal injury or death.

2. Loosen the conduit box cover screw and remove the cover.

WARNING: UNEXPECTED START-UP HAZARD
Single phase motors are equipped with automatic reset overload protectors. The pump can restart without warning. Disconnect and lockout power before servicing. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

3. Disconnect the electrical supply lines to the pump.

WARNING: HIGH PRESSURE HAZARD
Pressure may be present in the pump body. This pressure can be relieved by loosening the flange bolts and shifting the pump assembly slightly to allow the pressurized water to escape. Failure to follow these instructions could result in serious personal injury or death.

4. Remove the flange bolts and nuts and then remove the pump from the piping.

PUMP INSTALLATION

Locate the pump so there is sufficient room for inspection, maintenance and service. Bell & Gossett recommends the installation of service valves on the suction and discharge of all pumps to facilitate servicing or replacement of the pump without draining the system.

Install suction and discharge flanges on the pipe ends. The use of teflon tape sealer or a high quality thread sealant is recommended.

Be sure to minimize any pipe-strain on the pump. Support the suction and discharge piping by the use of pipe hangers near the pump. Line up the vertical and horizontal piping so that the bolt-holes in the pump flanges match the bolt-holes in the pipe flanges. (DO NOT ATTEMPT TO SPRING THE SUCTION OR DISCHARGE LINES IN POSITION. THIS MAY RESULT IN UNWANTED STRESS IN THE PUMP BODY, FLANGE CONNECTIONS AND PIPING.) The code for Pressure Piping (ANSI B31.1) lists many types of supports available for various applications.

Bell & Gossett flange gaskets must be installed between the Series PL™ pump body flanges and the suction and discharge pipe flanges. Use $^{7}/_{16}$" diameter x $1^{1}/_{2}$" long capscrew and matching nut to connect the pump to the flanges.

WARNING: HOT WATER HAZARD
When disassembling a gasketed joint, always use a new gasket upon reassembly. NEVER RE-USE OLD GASKETS. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: HOT WATER HAZARD
Make sure that each flange gasket remains seated in the flange groove during and after installation. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

Apply torque in even increments to both flange bolts until a value of 96-132 in-lbs. is reached. Both the suction and discharge flange bolts must be torqued in this manner.

WARNING: WATER LEAKAGE HAZARD
To prevent leakage, make certain that the flange bolts have been adequately torqued. Failure to follow these instructions could result in serious personal injury and/or property damage.

WIRING INSTRUCTIONS

WARNING: ELECTRICAL SHOCK HAZARD
Disconnect and lockout the power before making electrical connections. Failure to follow these instructions could result in serious personal injury or death.

A. Loosen the screw securing the conduit box cover (wiring compartment), and remove the screw & cover.

B. Attach the appropriate size connector to the hole on the side of the conduit box.

C. Using a minimum size 14 AWG copper electrical wire (refer to your local code for wiring restrictions), wire the motor to a single phase power source as listed on the pump nameplate. See Fig. 3.

D. Connect the ground wire to the inside of the conduit box with one of the green screws provided inside the box. See Fig. 4.

NOTE: Electrical supply and grounding wires must be suitable for at least 90°C (194°F).

NOTE: Series PL™ Booster Pumps are thermally protected and do not require external overload protection.

WARNING: ELECTRICAL SHOCK HAZARD
Be certain that all connections are secure and the conduit box cover is closed before electrical power is connected. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

SYSTEM PREPARATION

Prior to pump start up, closed heating and cooling systems should be cleaned, drained and refilled with clean water. System ph must be maintained between 7 and 9.

STARTUP

CAUTION: SEAL DAMAGE HAZARD
Do not run pump dry, seal damage may occur. Failure to follow these instructions could result in property damage and/or moderate personal injury.

Do not start pump until the system has been filled and vented. Air should be vented from the system by means of an air vent located at a high point in the system, or by an alternate method. The system must be completely vented prior to pump operation. Do not run pumps dry. Pump operation without water circulation could result in pump and motor damage.

WARNING: HOT WATER LEAKAGE HAZARD
Pressurize the body slowly while checking for leaks at all joints with gaskets. Failure to follow these instructions could result in serious personal injury and/or property damage.

MODE OF DISCHARGE

The Series PL™ pump can be installed to discharge up or down, horizontally, left or right, but the motor shaft must remain in the horizontal position, the arrow on the body must point in the direction of flow and the conduit box must be positioned on the top of the motor housing (see figure 2).

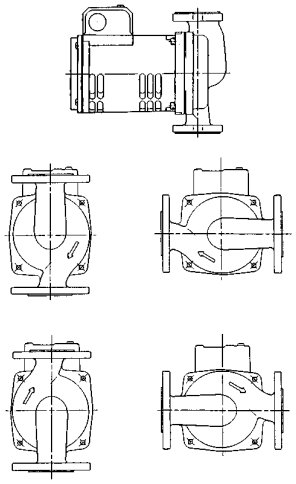


FIG. 2

PUMP BODY MAY BE ROTATED AS SHOWN, BUT CONDUIT BOX MUST REMAIN AT TOP.

TYPICAL WIRING INSTALLATION SCHEMATIC FOR 1Ø POWER SOURCE

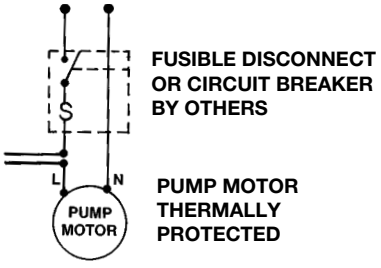


FIG. 3

CONDUIT BOX WIRING DETAIL

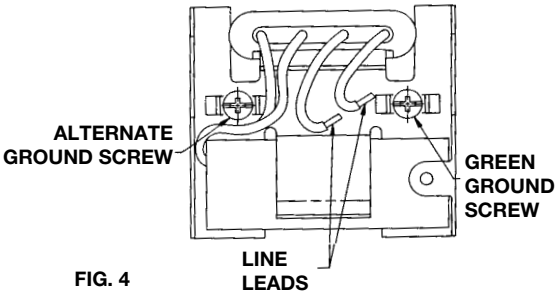


FIG. 4

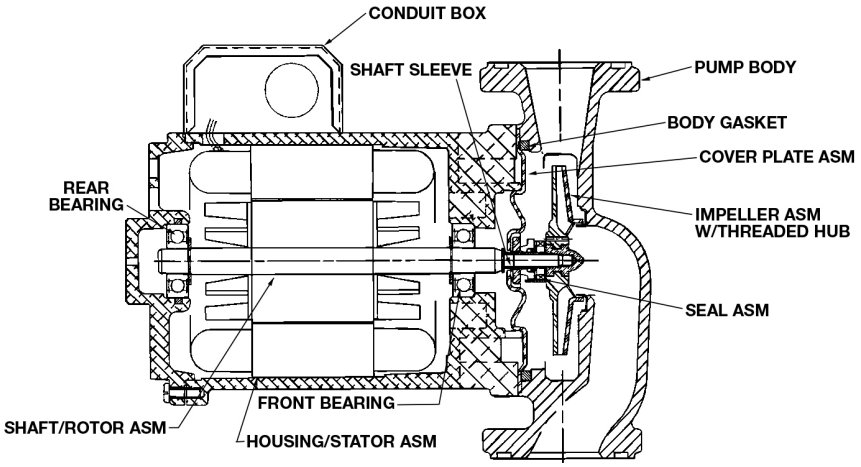
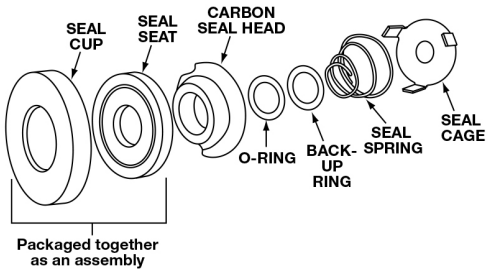


FIG. 5



INSTRUCTIONS FOR REPAIRING MECHANICAL SEAL

1. Follow steps 1 through 4 of section titled “REMOVAL OF PUMP FROM EXISTING SYSTEM FOR REPLACEMENT.”
2. Loosen the four capscrews that hold the motor housing to the pump body. Remove these screws and remove the housing from the pump body.
3. Place the pump on a flat work surface and insert a screwdriver into one of the endplate ventilation slots until it engages one of the rotor cooling fins. While holding the rotor with the screwdriver, turn the impeller clockwise. Note that the impeller is molded around a metal hub with a left hand thread. Remove the impeller from the shaft.
4. Remove the seal assembly from the shaft by sliding it off the shaft sleeve.
5. Clean the seal seat with a clean rag and inspect for grooving or cracks. If it shows no grooving or cracks, it may be cleaned and reused.
6. If the seal seat is to be replaced, the face plate must be removed from the motor housing. Remove it by gently prying it away from the housing.
7. Remove the seal seat and cup. Lubricate the cup with soapy water and install new parts in the face plate recess. Reposition the face plate on the motor housing. Gently tap the face plate evenly around its diameter to drive it into the recess provided in the motor housing.
8. Clean the shaft and sleeve before installing the new seal.
9. Slide the new carbon seal head onto the shaft sleeve until it contacts the seal seat. Slide the new “O-Ring” and back-up ring along the shaft sleeve until they fit inside the counter bore in the seal head. Place the seal spring between the back-up ring and the seal cage while positioning the seal cage flush with the end of the sleeve. Place the small end of the spring against the back-up ring. The three driving legs of the seal cage should engage the three slots on the seal head. While holding the rotor assembly with the screwdriver, thread the impeller onto the shaft in a counter clockwise direction. Tighten the impeller with light hand pressure. Take care to avoid bending a rotor cooling fin or damaging the shaft sleeve.
10. Clean the recess in the pump body and install a new body gasket.
11. Install the pump in the body and secure with four capscrews. Apply torque evenly in a criss cross pattern in 40 in-lb (4.52 N•m) increments to a torque of 80 in-lb (9.04 N•m).
12. Reinstall into the system using new flange gaskets. For instructions, see sections “PUMP INSTALLATION” and “WIRING INSTRUCTIONS” on pages 2 and 3.

PERIODIC INSPECTION

Bell & Gossett Booster Pumps are designed to provide years of trouble free service. It is recommended that periodic inspections be made to check for potential problems with the pump. If any leakage or evidence of leakage is present repair or replace the unit.

xylem
Let’s Solve Water

Xylem Inc.
8200 N. Austin Avenue
Morton Grove, Illinois 60053
Phone: (847) 966-3700
Fax: (847) 965-8379
www.bellgossett.com

Automated Control Logic

a.c.l.

578 Commerce Street
Thornwood, NY 10594
(914) 769-8880 (914) 769-2753 Fax
www.automatedcontrollogic.com

LETTER OF TRANSMITTAL

To: Eastern Mechanical Services
3 Starr Street
Danbury, CT 06810

Attn: Ted Huizinga <Ted@emsinc.us>

Date: 02/12/2020

Project: 20 Horseneck Lane - Heat Exchanger

We are sending you the following items:

COPIES	DATED	NUMBER	DESCRIPTION
PDF	02/12/2020	2019071	Building Management System As-Built Documentation

These are transmitted as checked below:

[ ] **FOR APPROVAL**
[X] **AS REQUESTED**
[ ] **FOR YOUR USE**
[ ] **FOR REVIEW & COMMENT**

REMARKS:

SIGNED: JH

Notice of Privacy and Confidentiality:
The information contained in this transmittal is intended for the named recipient only.

EcoXpert BMS Certified by Schneider Electric

20 Horseneck Lane – Heat Exchanger

20 Horseneck Lane
Greenwich, CT 06830

Building Management System
As-Built Documentation

Designed, installed, and serviced by:

Automated Control Logic, Inc.
578 Commerce Street
Thornwood, New York 10594

(914) 769-8880 (914) 769-2753 Fax

info@automatedcontrollogic.com
www.automatedcontrollogic.com

EcoXpert™ BMS Certified by Schneider Electric

ACL Project #: 2019071
Submittal Issue Date: 09/16/2019
Submittal #2 Issue Date: 10/07/2019
Submittal #3 Issue Date: 10/16/2019
As-Built Documentation Issue: 02/12/2020

SYSTEM OVERVIEW

General

The Building Management System (BMS) for 20 Horseneck Lane, as designed and installed by Automated Control Logic (ACL), shall consist of a distributed, microprocessor-based system of direct digital controls (DDC), from the Andover Continuum product line, as manufactured by Schneider Electric. The BMS will provide control, alarm detection, scheduling, and reporting for the entire facility.

Automated Control Logic will provide all instruments, transducers, relays, control valves, damper actuators, panel enclosures, and other accessory equipment required to fill the intent of the specification and provide for a complete and operable Building Management System.

Andover Continuum Building Management System

The Andover Continuum Building Management System is a two-tiered network comprised of a central communication network controller (Andover Continuum bCX), a series of stand-alone DDC controllers, and a PC based graphical user interface. The Continuum System allows for future expansion of both input/output points and control functions, and is backward compatible with Andover Infinity hardware.

The Andover Continuum network controller communicates with other network controllers and Andover Continuum Cyberstation Workstations over a high-speed (10/100 MB/s) Ethernet Local Area Network (LAN) using TCP/IP protocol. The network controller communicates with its associated stand-alone DDC controllers on a Level 2 network known as the Infinet (RS485 - 19.2K Baud).

A new BMS controller will replace the existing BMS controller for the Condenser Water System. See the BMS Network Architecture drawing for the complete network layout.

Andover Continuum Infinet II Series Controllers

Andover Continuum Infinet II Series (i2) stand-alone DDC controllers communicate with the NetController over the Infinet RS-485 communications network. All Infinet II controllers are equipped with a 32-bit processor, a minimum of programmable 128K non-volatile flash memory for control and trending purposes, battery back up, service port, and an input for an Andover Continuum Smart Sensor.

Andover Continuum Infinet II System Controllers are used for large systems such as air handling units, roof top units, and mechanical plant equipment. System Controllers can also be equipped with xP Expansion Modules for extra I/O points or for an LCD Display. (See Infinet II i2920 System Controllers data sheets)

Andover Continuum Infinet II Series Controllers – Continued

All Andover Continuum Infinet II Series Controllers will be mounted in NEMA1 hinged or screw cover enclosures, or within the controlled equipment where space allows. The control panels will be pre-wired in their enclosure, with the corresponding transformers, DC power supplies, isolation control relays and terminal strips.

Operator Interface

Operator interface with the BMS is accomplished with the existing dedicated PC workstation running Andover Continuum Cyberstation software. Cyberstation is a Windows based graphical user interface capable of manipulating all control functions and storing all facility data. The Cyberstation graphics will be updated to include the new work.

Warranty

Automated Control Logic will warranty the Building Management System for 12 months after acceptance and beneficial use by the owner. During the warranty period, ACL will be responsible for all necessary maintenance and service revisions to the hardware and software as required to provide a complete and workable system consistent with the Sequence of Operations.

SEQUENCE OF OPERATIONS

Schedule

The BMS has an operator adjustable 7 Day, 24 hour schedule of occupancy for the building. During occupied hours space temperature set points will be indexed to their occupied values. During unoccupied hours space temperature set points will be indexed to their unoccupied values.

A global holiday schedule screen will allow BMS operators to define up to 14 dates in advance as holidays or unoccupied time periods. Upon an unscheduled unoccupancy, a BMS operator can simply define that date as a holiday and the building's mechanical systems will go to their unoccupied mode of operation. Initial schedule and holidays will be coordinated with the owner.

The BMS will automatically optimize the start time to attain occupied space temperature set points by the time of scheduled occupancy. The BMS will also automatically take into account daylight savings time.

Condenser Water System

Condenser Water System Pumps (P-1&2):

The BMS will command the Condenser Water pumps (P-1&2) to run continuously on a lead/lag basis. Should the lead pump fail, as sensed by a differential pressure switch, the BMS will index the lag pump into lead operation and generate an alarm. When no flow is sensed for (1) minutes (adj), the BMS will command both pumps to run. Once flow returns, the BMS will cycle the pumps to determine which pump is operational and set that pump to lead. The lead/lag pump designations will rotate on a weekly basis (adj) to equalize the runtime of each pump. Manual override switches on the controller will allow for switchover from automatic to manual control of the pumps.

Cooling Mode - Cooling Tower System:

The BMS will maintain the condenser water temperature between 65°F to 90°F. If cooling is required and the condenser water temperature is above 90°F (adj), the system will operate in the cooling mode until the condenser water temperature drops to 85°F (adj).

Condenser Water System - Continued

In the cooling mode, the BMS will cycle the Tower Water pumps (P-3&4) on a lead/lag basis to maintain condenser water supply temperature at setpoint. The BMS will start the lead pump when the condenser water supply temperature is above 90°F (adj) and stop it when the condenser water supply temperature drops to 80°F (adj). The pumps will be subject to their minimum run times. The BMS will modulate the tower water heat exchanger bypass valve to maintain condenser water supply temperature at setpoint (70°F, adj).

Should the lead pump fail, as sensed by a differential pressure switch, the BMS will index the lag pump into lead operation and generate an alarm. When no flow is sensed for (1) minutes (adj), the BMS will command both pumps to run. Once flow returns, the BMS will cycle the pumps to determine which pump is operational and set that pump to lead. The lead/lag pump designations will rotate on a weekly basis (adj) to equalize the runtime of each pump. Manual override switches on the controller will allow for switchover from automatic to manual control of the pumps.

Heating Mode - Boiler System:

The BMS will maintain the condenser water temperature between 65°F to 90°F.If heating is required and the condenser water temperature is below 65°F (adj), the system will operate in the heating mode until the condenser water temperature rises to 70°F (adj). The tower water heat exchanger bypass valve will be open.

The BMS will stage the boilers on a lead/lag basis to maintain condenser water supply temperature at setpoint (65°F, adj). Whenever a boiler is required to run, the BMS will start it's associated circulation pump. Upon failure of the lead boiler, the BMS will automatically index the lag boiler into lead operation and generate an alarm at the operator workstation. Boiler failure is a result of flame failure, manual shutdown or loss of status signal. The lead/lag boiler designations will be interchanged on a weekly basis to equalize runtime on the boilers.

When commanded to start, the boiler will start in low fire. Upon reaching the boiler low fire hold water temperature setpoint (adj), the BMS will modulate the boiler flame to maintain condenser water supply temperature at setpoint (65°F, adj).

No Mode:

If the condenser water supply temperature is between 70°F (adj) and 85°F (adj), the BMS will command the cooling tower system and the boiler system off.

Condenser Water System - Continued

Alarms generated at the operator workstation (adjustable):

- Condenser water pump flow status (2)
- Condenser water supply temperature out of bounds: +/-10°F, adj.
- Tower water pump flow status (2)
- Tower water supply temperature out of bounds: +/-10°F, adj.
- Cooling tower fan status
- Sand filter low differential pressure
- Boiler alarm (2)
- Boiler status (2)
- Boiler pump flow status (2)
- Hot water supply temperature out of bounds: +/-10°F, adj.

(END OF SEQUENCE OF OPERATIONS)

BUILDING MANAGEMENT SYSTEM

Project: 20 Horseneck Lane - Heat Exchanger

POINT / MATERIAL LIST INDEX PAGE

Automated Control Logic, Inc.

Condenser Water System Control Panel Point List

Project: 20 Horseneck Lane - Heat Exchanger
Controller: i2920-D **Drawing #** 2019071-02

INPUTS			
Channel	Type	Point Name	Device
1	AI	Outside Air Temp.	ETO500 (existing)
2	AI	Condenser Water Supply Temp.	ETI500-4, ETI-WELL-4S (existing)
3	AI	Condenser Water Return Temp.	ETI500-4, ETI-WELL-4S (existing)
4	DI	Condenser Water Pump P-1 Flow Status	P74FA-5 (existing)
5	DI	Condenser Water Pump P-2 Flow Status	P74FA-5 (existing)
6	AI	Tower Water Supply Temp.	ETI500-4, ETI-WELL-4S
7	AI	Tower Water Return Temp.	ETI500-4, ETI-WELL-4S
8	DI	Tower Water Pump P-3 Flow Status	P74FA-5
9	DI	Tower Water Pump P-4 Flow Status	P74FA-5
10	AI	Sand Filter Differential Pressure	629-4 (existing)
11	AI	Hot Water Supply Temp.	ETI500-4, ETI-WELL-4S
12	AI	Hot Water Return Temp.	ETI500-4, ETI-WELL-4S
13		Spare	
14		Spare	
15		Spare	
16		Spare	
17		Spare	
18	DI	Boiler B-1 Status	N.O. Contact
19	DI	Boiler B-1 Fault	N.C. Contact
20	DI	Boiler B-1 Hot Water Flow Status	P74FA-5
21	DI	Boiler B-2 Status	N.O. Contact
22	DI	Boiler B-2 Fault	N.C. Contact
23	DI	Boiler B-2 Hot Water Flow Status	P74FA-5
24	DI	Spare	
25	DI	Spare	

OUTPUTS			
Channel	Type	Point Name	Device
1	DO	Condenser Water Pump P-1 Start/Stop	N.C. Relay
2	DO	Condenser Water Pump P-2 Start/Stop	N.C. Relay
3	DO	Tower Water Pump P-3 Start/Stop	N.O. Relay
4	DO	Tower Water Pump P-4 Start/Stop	N.O. Relay
5	DO	Boiler B-1 Circ. Pump Start/Stop	N.C. Relay
6	DO	Boiler B-1 Start/Stop	N.C. Relay
7	DO	Boiler B-2 Circ. Pump Start/Stop	N.C. Relay
8	DO	Boiler B-2 Start/Stop	N.C. Relay
9	AO	CT Heat Exchanger Bypass Valve Mod.	Existing control valve
10	AO	Boiler B-1 Flame Mod.	0-10 VDC
11	AO	Boiler B-2 Flame Mod.	0-10 VDC
12	AO	Spare	
13	AO	Spare	
14	AO	Spare	
15	AO	Spare	
16	AO	Spare	
17			
18			

Condenser Water System Control Panel Material List

Project: 20 Horseneck Lane - Heat Exchanger
Controller: i2920-D **Drawing # 2019071-02**

Description	Qty.	Part Number	Manufacturer
DDC Controller (16UI, 8DO, 8AO, 1SM, Display)	1	i2920-D	Schneider Electric
Digital Input Expansion Module(8)	1	xPDI8	Schneider Electric
Midget Fuse (1.5 Amp)	1	FLM-1.5	Little Fuses
Transformer (100VA, 120VAC - 24VAC)	1	241-8-24	Signal
DC Power Supply (120VAC - 24VDC)	1	SLS-24-012T	Kele
Voltage Transient Supressor (120 VAC)	1	V130LA1	Kele
Voltage Transient Supressor (24 VAC)	9	V39ZA1	Kele
Single Pole Relay (24 VAC)	8	RH1B-U	IDEC
Single Pole Relay Base	8	SH1B-05	IDEC
Imersion 10k ohm Type 3 Thermistor (4")	4	ETI500-4	Schneider Electric
4" Stainless Steel Well	4	ETI-WELL-4S	Schneider Electric
Differential Pressure Switch (Liquid)	4	P74FA-5	Penn

Note: Quantities for new material only.

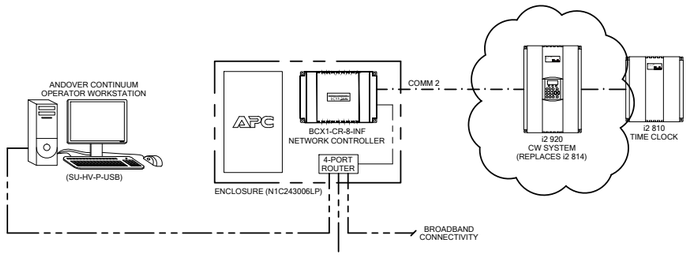
BUILDING MANAGEMENT SYSTEM

Project: 20 Horseneck Lane - Heat Exchanger

DRAWING LIST

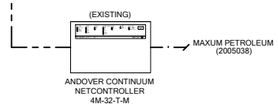
2019071-01	-	Building Management System Network Architecture
2019071-02	-	Condenser Water System Control Panel
2019071-03	-	Miscellaneous Flow Diagrams

Automated Control Logic, Inc.



PENTHOUSE

2ND FLOOR



1ST FLOOR

LEGEND

— — —	ETHERNET TCP/IP COMM. NETWORK
— · —	INFINET COMMUNICATIONS NETWORK

NOTES -

1 - INFINET COMMUNICATIONS CABLE TO BE BELDON TYPE 9730 OR EQUIV. PLENUM RATED WHERE REQUIRED.

2 - ALL PANELS REQUIRE 120 VAC - BY OTHERS.

3 - SPLICES ARE SHOWN FOR DRAWING CLARITY. ALL SPLICES SHALL BE MADE WITHIN CONTROL PANELS ONLY.

DESIGNED, INSTALLED, & SERVICED BY:

AUTOMATED CONTROL LOGIC, INC.
578 COMMERCE STREET
THORNWOOD, NEW YORK 10594
(914) 769-8880 (914) 769-2753 FAX
www.automatedcontrollogic.com

EcoXpert BMS Certified by Schneider Electric

PROJECT:

20 HORSENECK LANE
HEAT EXCHANGER

LOCATION:

20 HORSENECK LANE
GREENWICH, CT 06830

REV:	DATE:	ISSUE DESCRIPTION:
	09/16/2019	BMS SUBMITTAL

SCALE: NONE

DRAWN BY: J. HOFF, P.E.

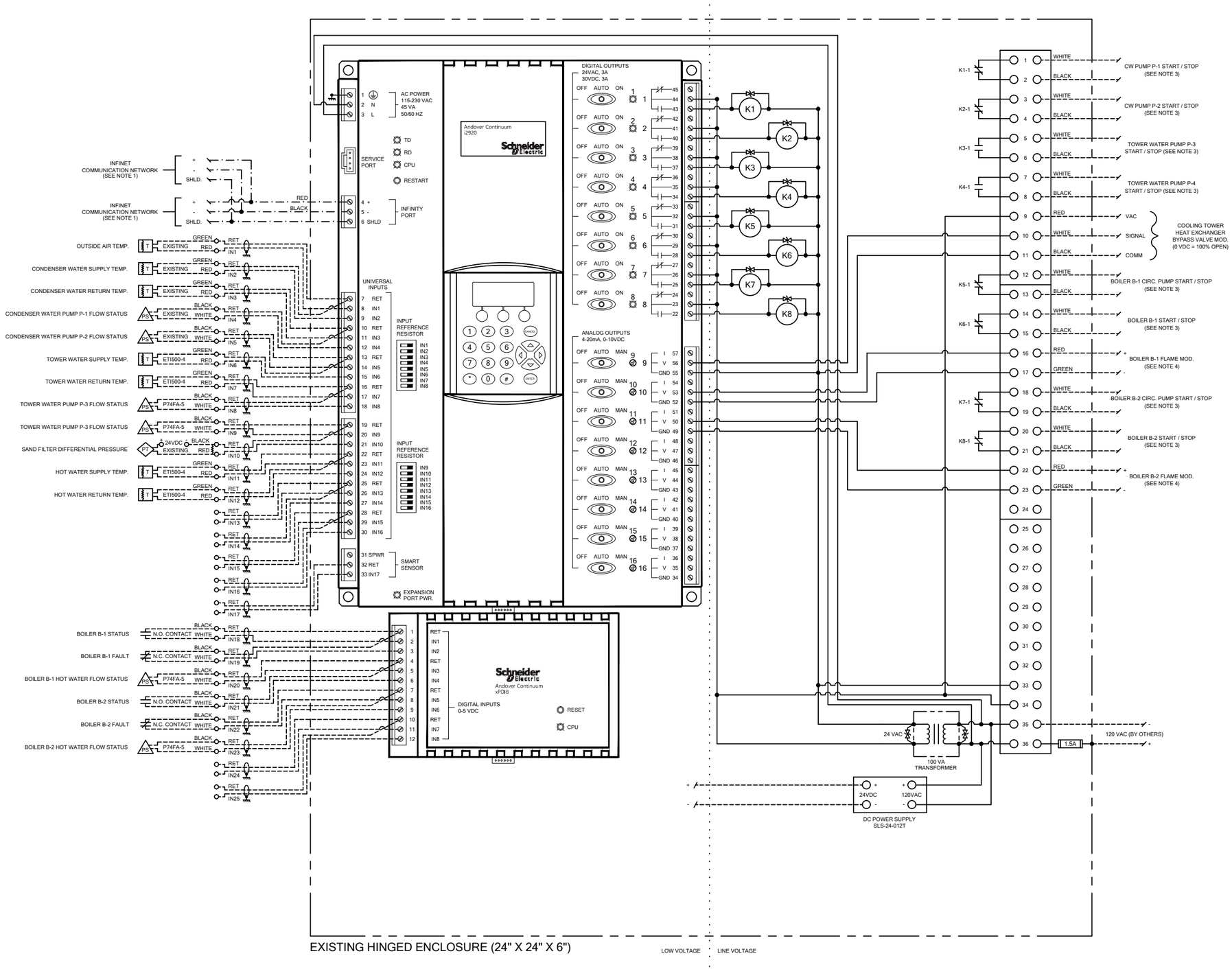
APPROVED BY: P. M. BRUENN

DRAWING TITLE:

BUILDING MANAGEMENT SYSTEM
NETWORK ARCHITECTURE

DRAWING NUMBER:

2019071-01



LEGEND

— · —	INFINET COMMUNICATIONS NETWORK
———	PANEL WIRING
- - -	FIELD WIRING
(K)	24VAC DPDT RELAY
⋈	VAC VARISTOR

NOTES -

1 - INFINET COMMUNICATIONS CABLE TO BE BELDON TYPE 9730 OR EQUIV. PLENUM RATED WHERE REQUIRED.
2 - LINE VOLTAGE WIRING TO BE 14 AWG 600V RATED LOW VOLTAGE WIRING TO BE 18 AWG 300V SHIELDED PLENUM RATED. FIELD WIRING IN MECHANICAL ROOMS TO BE IN CONDUIT. PNEUMATIC TUBING TO BE FIRE RATED POLY TUBING.
3 - WIRE TO AUTO LEG OF H-O-A SWITCH IN MOTOR STARTER.
4 - WIRE TO UNIT CONTROL CIRCUITRY.
5 - WIRE TO LOW VOLTAGE TERMINAL STRIP IN VARIABLE FREQUENCY DRIVE.

DESIGNED, INSTALLED, & SERVICED BY:

Automated Control Logic

AUTOMATED CONTROL LOGIC, INC.
578 COMMERCE STREET
THORNWOOD, NEW YORK 10594
(914) 769-8880 (914) 769-2753 FAX
www.automatedcontrollogic.com

EcoXpert BMS Certified by Schneider Electric

PROJECT:

20 HORSENECK LANE HEAT EXCHANGER

LOCATION:

20 HORSENECK LANE
GREENWICH, CT 06830

REV:	DATE:	ISSUE DESCRIPTION:
	09/16/2019	BMS SUBMITTAL
1	10/07/2019	BMS SUBMITTAL #2

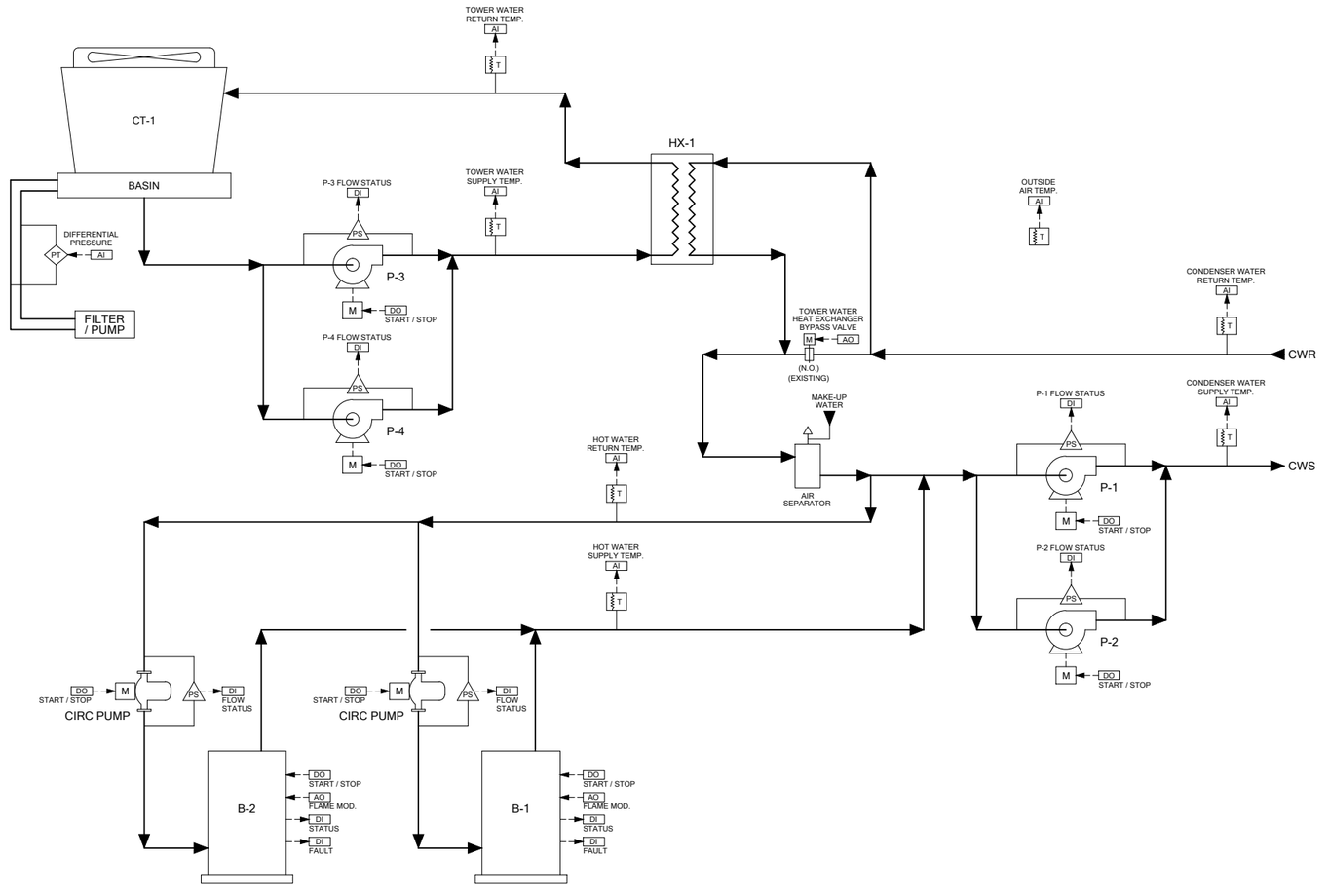
SCALE: NONE
DRAWN BY: J. HOFF, P.E.
APPROVED BY: P. M. BRUENN

DRAWING TITLE:

CONDENSER WATER SYSTEM CONTROL PANEL
(REPLACES i2 814)

DRAWING NUMBER:

2019071-02



1 CONDENSER WATER SYSTEM FLOW DIAGRAM

(2019071-02) NOTE: I/O WIRED TO CONDENSER WATER SYSTEM CONTROLLER.

LEGEND

AI/DI / AO/DO	ANALOG/DIGITAL INPUT TO BAS / ANALOG/DIGITAL OUTPUT FROM BAS
- - - - -	FIELD WIRING
T	10K OHM THERMISTOR
	CURRENT SWITCH
PS	PRESSURE SWITCH
PT	PRESSURE SENSOR/TRANSMITTER

NOTES -

DESIGNED, INSTALLED, & SERVICED BY:
Automated Control Logic
AUTOMATED CONTROL LOGIC, INC.
578 COMMERCE STREET
THORNWOOD, NEW YORK 10594
(914) 769-8880 (914) 769-2753 FAX
www.automatedcontrollogic.com
EcoXpert BMS Certified by Schneider Electric

PROJECT:
20 HORSENECK LANE
HEAT EXCHANGER

LOCATION:
20 HORSENECK LANE
GREENWICH, CT 06830

REV:	DATE:	ISSUE DESCRIPTION:
	09/16/2019	BMS SUBMITTAL
1	10/07/2019	BMS SUBMITTAL #2

SCALE: NONE
DRAWN BY: J. HOFF, P.E.
APPROVED BY: P. M. BRUENN

DRAWING TITLE:
MISCELLANEOUS FLOW DIAGRAMS

DRAWING NUMBER:
2019071-03

BUILDING MANAGEMENT SYSTEM

Project: 20 Horseneck Lane - Heat Exchanger

PRODUCT SPECIFICATION SHEETS

Schneider Electric Andover Continuum Infinet II i2920 System Controllers
Schneider Electric Andover Continuum xP Expansion I/O Family (xPDI8)
1.5 Amp Midget Fuse (FLM-1.5)
Signal 100 VA Control Transformer (241-8-24)
120 VAC - 24 VDC Power Supply (SLS-24-012T)
Voltage Transient Supressor (V130LA1, V39ZA1)
IDEC Single Pole 24 VAC Relays (RH1B-U)
IDEC Single Pole Relay Base (SH1B-05)
ET Series Thermistor Temperature Sensors (ETI500-4, ETI-WELL-4S)
Penn Liquid Differential Pressure Switch (P74FA-5)

Automated Control Logic, Inc.

Andover Continuum™ Infinet II

i2920 System Controllers

The Andover Continuum Infinet II i2920 System Controller is designed to meet the needs of your most demanding control and monitoring applications with its versatile input/output mix and its ability to add additional points using xP Expansion Modules.

Schneider Electric

Andover Continuum Infinet II i2920 System Controllers Features

PRODUCT AT A GLANCE

- Compatible with Both Andover Continuum and Infinity Systems
- Powerful, Flexible System Controller for the Most Demanding Applications
- Expandable I/O Meets Additional Point Count Needs
- Non-Volatile Flash Memory Provides Utmost Reliability — Stores Both Application Program and Operating System
- Optional Local Display/Keypad Provides Easy Operator Interface
- Local, Extended Storage of Log Data
- View and Modify Information with Optional Smart Sensor Display
- Local, On-Board Service Port

Designed for control of large Air Handling Units, chillers, boilers, and other mechanical plant equipment, the i2920 features plenty of dynamic memory for application programs as well as for expanded local data logging of critical data.

The i2920 also features a fast 32-bit processor, universal inputs, override switches on all outputs, two-piece removable connectors, and an optional 4-line display with keypad. Similar to other Andover Continuum Infinet II controllers, the i2920 has an additional room sensor input, which supports Andover Continuum Smart Sensor, or any standard room temperature sensor.

The i2920 communicates with the entire Andover Continuum Infinet RS-485 field bus; i.e., both Andover Continuum Infinet and Andover Continuum Infinet II controllers, and is compatible with both the Andover Continuum CyberStation™ and Infinity™ SX 8000 front-ends. Up to 254 Andover Andover Continuum Infinet devices can be networked to any Andover Continuum network controller.

Increased Reliability with Flash Memory

The i2920's non-volatile Flash memory stores your operating system and application programs, so that in the event of a power loss, your application will be restored when power is returned. In addition, the Flash memory allows for easy upgrades of your operating system via software downloads, eliminating the need to swap out proms. The i2920 controllers include an on-board battery to safeguard your runtime data — protecting all point data and log data from being lost if power is removed.

Inputs

The input configuration on the i2920 series consists of sixteen full range, 12-bit Universal inputs that accept voltage (0-10VDC), digital (on/off), counter signals (up to 4Hz), temperature signals, or supervised alarm circuits for security applications. The i2920 offers an additional input to support the Andover Continuum Smart Sensor, or any standard room temperature sensor.

Andover Continuum Infinet II i2920 System Controllers Features (continued)

Outputs

The i2920 contains 16 outputs - eight Form C relay outputs, each rated for 24 VAC/VDC, 3 amp, and eight analog outputs (0-10V, 4-20mA). Both the relay and analog outputs have manual override switches, with software feedback of the switch position.

I/O Expansion

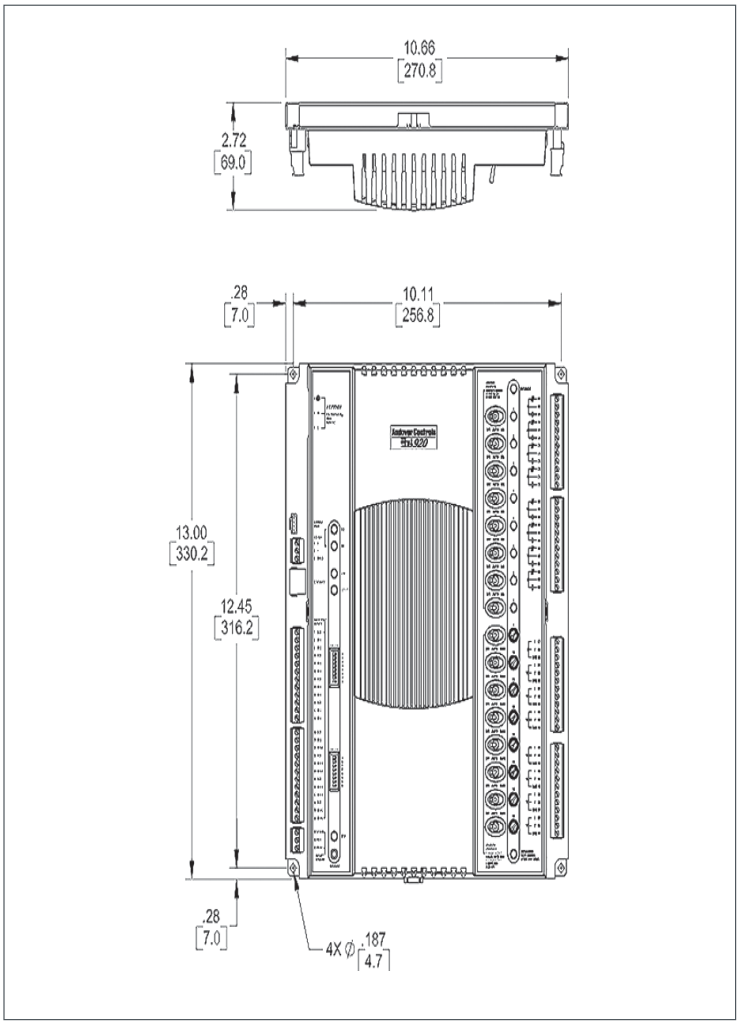
The i2920 contains an I/O expansion port for the addition of up to two xP Expansion Modules directly on the bottom of the controller. The xP family of modules includes the DI-8, DO-2, DO-4, UI-4, AO-2, and AO-4. In addition, the I/O bus supports the xP Local Display Module, which allows the user to view and change point values. The Local Display Module is also available factory-mounted directly onto the i2920.

Software Capabilities

The dynamic memory of the i2920 can be allocated for any combination of programs, scheduling, alarming, and data logging using the powerful Andover Plain English™ programming language. Our object-oriented Plain English language with intuitive keywords provides an easy method to tailor the controller to meet your exact requirements. Programs are entered into the i2920 using the Andover Continuum CyberStation™. Programs are then stored and executed by the i2920 controllers.

Programming multiple i2920 controllers is inherently easy with Plain English. A complete copy of one i2920's programs can be loaded directly into other i2920s without changing any point names or programs.

Dimensional Drawings

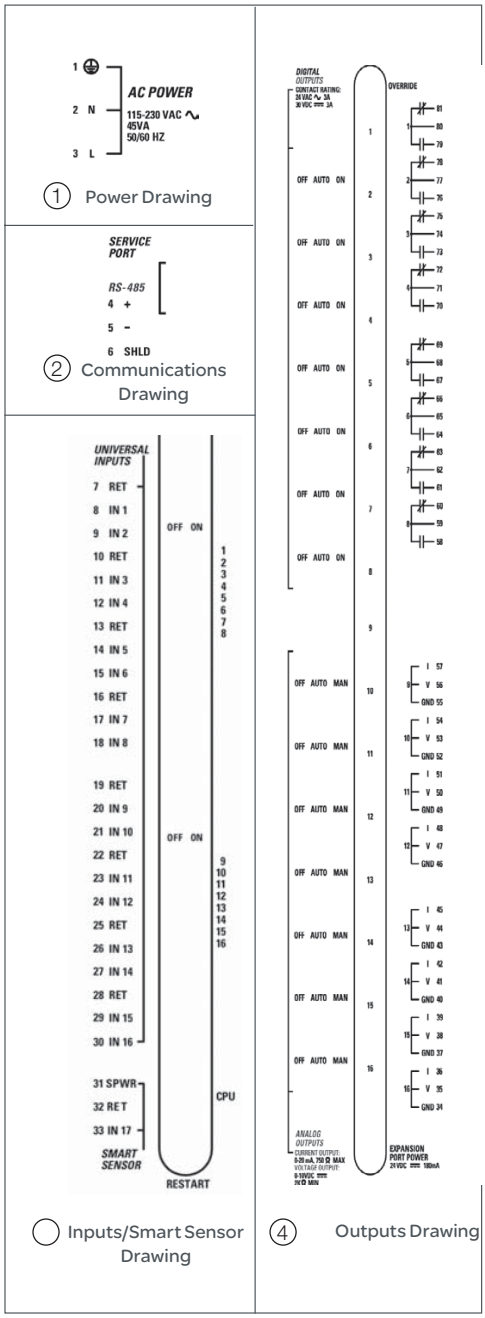


Andover Continuum Infinet II i2920 System Controllers Features (continued)

Smart Sensor Interface

The i2920 provides a built-in connection for Andover Continuum Smart Sensor. The Smart Sensor provides a 2-character LED display and a 6-button programmable keypad that enables operators and occupants to change setpoints, balance VAV boxes, monitor occupancy status, and turn equipment on and off. An enhanced version of the Smart Sensor is also available with a 4-digit custom LCD that provides the following icons: PM, %, °, Setpoint, Cool, Heat, CFM, Fan, OA, and SP.a

Dimensional Drawings



① Power Drawing

② Communications Drawing

③ Inputs/Smart Sensor Drawing

④ Outputs Drawing

Andover Continuum Infinet II i2920 System Controllers
Specifications

05

i2920 System Controller

Electrical

Power
115/230 VAC, +10% -15%, 50/60 Hz
Power Consumption
45 VA
Overload Protection
Fused with 3 amp fuse. MOV protected
Real-Time Clock
Battery-backed real-time clock

Mechanical

Operating Environment
32°–120°F (0–49°C),
10–95% RH (non-condensing)
Size
13.00˝ H x 10.66˝ W x 2.72˝ D
(330.2H x 270.8 W x 69.0 D) mm
Weight
3.5 lbs. (1.58 kg)
Enclosure Type
UL Open class, IP 10.
Flammability rating of UL94-5V
Mounting
Panel mount

Battery backup

Replaceable, non-rechargeable, lithium battery. Provides 5 years typical accumulated power failure backup of RAM memory

Communications

Communications Interface
Through Andover Continuum Infinet RS-485 field bus to network controller
Communications Speed
1200 to 19.2K baud
Bus Length
4,000 ft. (1,220m) standard for Andover Continuum Infinet, I2 Infilink module allows extension to longer distances and is required after every group of 32 units on the network
Bus Media
Andover Continuum Infinet: twisted, shielded pair, low capacitance cable
Comm. Error Checking
International Standard CRC 16
Compatibility
Andover Continuum Cyberstation and Infinity SX 8000 systems

Inputs/Outputs

Inputs
16 Universal inputs: Voltage (0-10 VDC); Temperature -30°F to 230°F (-34°C to 110°C), Digital (on/off), Counter (up to 4Hz at 50% duty cycle, 125 ms min. pulse width). Supervised Alarm (single or double resistor). Current input (0 -20 mA) using external 500 ohm resistor
1 Smart Sensor Temperature Input (32°F to 105°F) (0°C to 41°C)
Input Voltage Range
0-10 volts DC
Input Impedance
30.1K ohm to 10V or 5M ohm with pull-up resistor disabled
Input Protection
24 VAC or 24 VDC temporarily on any single channel, ±1000V transients (Tested according to EN61000-4-4)
Input Resolution
2.5 mV
Input Accuracy
±7.5mV (±0.25°C from -23°C to +54°C) or (±0.46°F from -10°F to +130°F)

Andover Continuum Infinet II i2920 System Controllers Specifications (continued)

i2920 System Controller

Digital Outputs

8 Single Pole Double Throw (SPDT) Form C relays (Any two consecutive Form C outputs can be configured as one Form K Tri-state)

Output Rating

Maximum 3A, 24VAC/VDC, ±1500V transients (Tested according to EN61000-4-4)

Output Accuracy

0.1 sec. for pulse width modulation

Analog Outputs

8 analog outputs

Output Rating

0-10 VDC, or 4-20mA per channel

Output Resolution

0.1V for 0-10V; 0.1mA for 4-20mA

Output Overrides

Each output is equipped with a manual override switch. Software feedback of the switch position is provided, for display and alarming

Expansion Bus

Interfaces to optional xP I/O Expansion Modules

Connections

Power

3-position fixed screw terminal connector

Inputs

Removable two-piece terminal strip

Outputs

Removable two-piece terminal strip

Smart Sensor

Removable two-piece terminal strip

Communications

Removable two-piece terminal strip

Expansion Port

6-position shrouded connector

Service Port

4-position shrouded connector

User LEDs/Switches

Status Indicator LEDs

CPU	CPU Active
TD	Transmit Data
RD	Receive Data
Output	Output Status (per output)
EXPANSION	
PORT PWR	Power Status
OVERRIDE	Override Status

Switches

RESET

Input Pull-up Resistor Switch (per input)

Individual Output Override Switches

General

Memory

1MB SRAM, 2MB FLASH

Processor

Motorola 32-bit Coldfire

Agency Listings

UL/CUL 916, FCC CFR 47 Part 15, ICES-003, EN55022, AS/NZS 3548, Class A, CE

Options

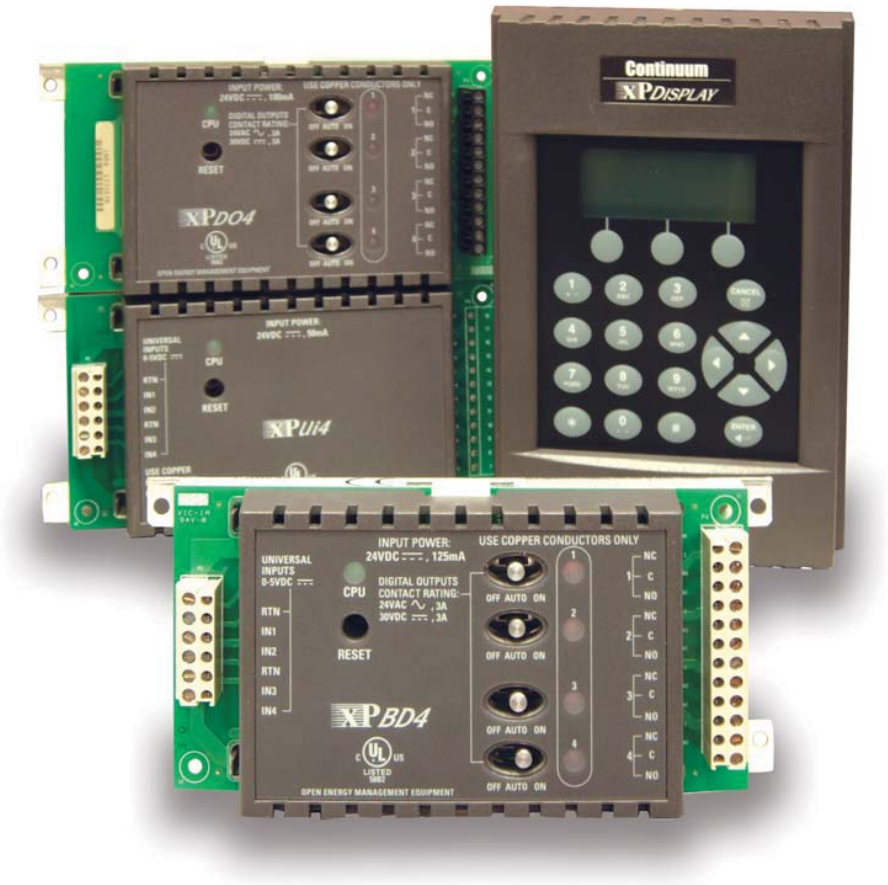
UL864, Smoke Control System Equipment, UUKL (i2920-S) i2920-D, i2920 with factory mounted display

Schneider Electric One High Street, North Andover, MA 01845 USA Telephone: +1 978 975 9600 Fax: +1 978 975 9674 www.schneider-electric.com/buildings

Andover Continuum™

xP Expansion I/O Family

The Andover Continuum xP Expansion I/O Family provides a convenient and cost-effective means to add additional inputs, outputs, or a local display to the Andover Continuum Infinet™ II and BACnet™ family of distributed controllers.



Schneider Electric

Andover Continuum xP Expansion I/O Family Features

Up to two modules plus a local display can be powered directly from any of the following controllers in the Andover Continuum Infinet II (i2) or BACnet (b3) families: i2/b3 920, i2/b3 810, i2/b3 814, i2/b3 850, i2/b3 851, or i2/b3 853.

The bCX1 Controller/Router models can also be used to connect xP Expansion Modules (and Display) and are the only controllers that support the xPBA4 and xPBD4 module types. No external power supply is required to power the Module(s). Consult the xP Modules and Local Display Modules User Guide for valid configurations.

PRODUCT AT A GLANCE

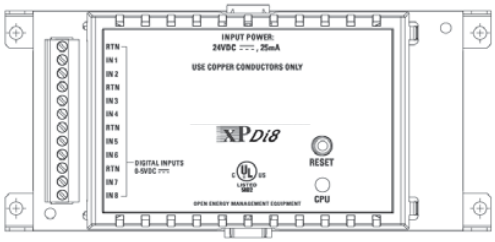
- Powerful, Flexible System Allows for Simple Addition of a Few I/O Points
- Individual Overrides of All Digital Outputs
- Universal Inputs Provide the Most Flexibility, Including a Single High Speed Counter Input
- Individual Overrides and Potentiometers for All Analog Outputs
- Full Function Manual Overrides Provide Status Feedback
- 4-Line, 16-character Display with Keypad Provides Simple and Convenient Operator Interface
- Locally Mounted or Remote Mount of Modules and Display
- Module Power Supplied by the Controller, Reducing Installation Time and Cost

- **xPDI8 –** The xPDI8 module allows the addition of 8 Digital Inputs in a small enclosure.
- **xPUI4 –** The xPUI4 module allows the addition of 4 Universal Inputs. Each can be configured independently based on your needs for Digital, Temperature, Motion Sensor, or Pulse Counter Inputs, etc., providing built-in flexibility for your different application requirements.
- **xPAO2/xPAO4 –** Both the xPAO2 (2 Analog Outputs) and the xPAO4 (4 Analog Outputs) allow the addition of Analog Outputs. Each output has individual manual override switches to select Manual, Off, or Auto for program control. When in Manual mode, each output also has a potentiometer to allow control of the override point.
- **xPDO2/xPDO4 –** Both the xPDO2 (2 Digital Outputs) and the xPDO4 (4 Digital Outputs) allow the addition of Digital Outputs. Each output has individual manual override switches to select On, Off, or Auto for program control.
- **xPBA4/xPBD4 –** Both the xPBA4 and the xPBD4 combine the functions of two xP Expansion modules. Similar to the xPUI4, both allow the addition of 4 Universal Inputs. The xPBA4 allows the addition of 4 Analog Outputs (like the xPAO4), and the xPBD4 allows for the addition of 4 Digital Outputs (like the xPDO4). (Note: The xPBA4 and xPBD4 Expansion Modules can only be connected to the bCX1 Controller/Routers and ACX Series Access Controllers.)

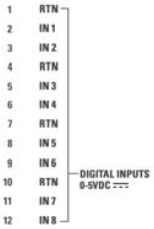
Andover Continuum xP Expansion I/O Family Features (continued)

Expansion I/O Family

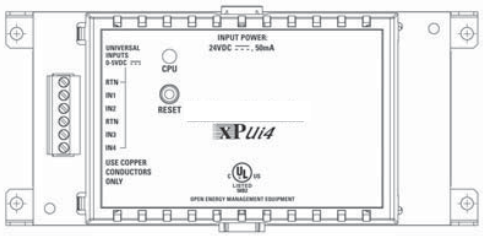
xPDI8



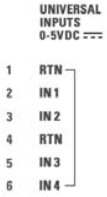
INPUTS



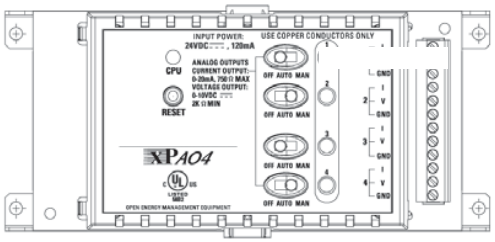
xPUI4



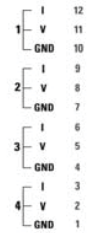
INPUTS



xPAO4

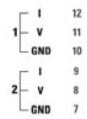


OUTPUTS



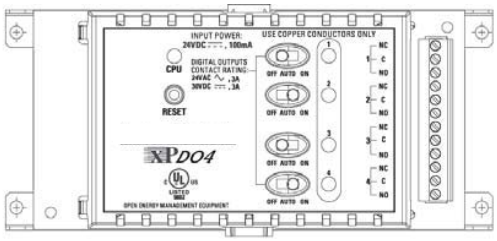
xPAO2

OUTPUTS

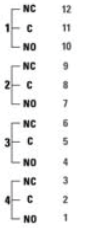


Similar to xPAO4; however only the first 2 outputs are populated.

xPDO4

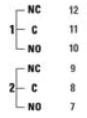


OUTPUTS



xPDO2

OUTPUTS



Similar to xPDO4; however only the first 2 outputs are populated.

Local Display

The local display with keypad (xP Display) allows for the addition of a fully programmable local display module that can be mounted within 10 feet (3 meters) of the controller. Connected via a ribbon cable, the xP Display easily allows the Operator Interface to be mounted on the door of an enclosure or on a wall below or next to the controller.

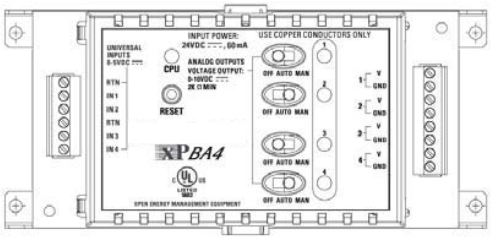
Programming

Programming with the Expansion Modules points are treated in the same manner as the built-in I/O points on the controller. Once the points have been configured, they are available for graphics, Plain EnglishTM programming, or for displaying data on the display.

Andover Continuum xP Expansion I/O Family Features (continued)

Expansion I/O Family

xPBA4



INPUTS

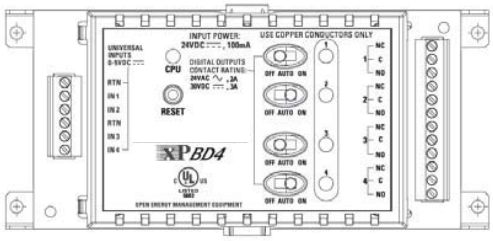
UNIVERSAL INPUTS 0-5VDC ⎓

1	RTN
2	IN 1
3	IN 2
4	RTN
5	IN 3
6	IN 4

OUTPUTS

1	V		14
	GND		13
2	V		12
	GND		11
3	V		10
	GND		9
4	V		8
	GND		7

xPBD4



INPUTS

UNIVERSAL INPUTS 0-5VDC ⎓

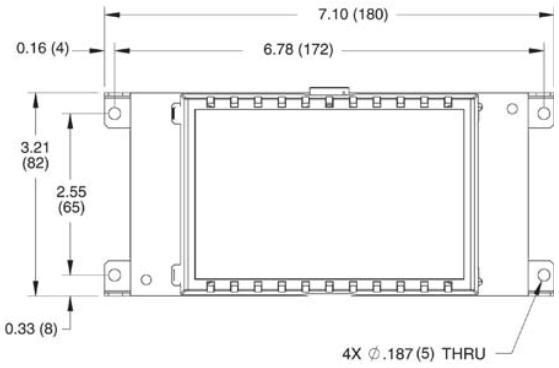
1	RTN
2	IN 1
3	IN 2
4	RTN
5	IN 3
6	IN 4

OUTPUTS

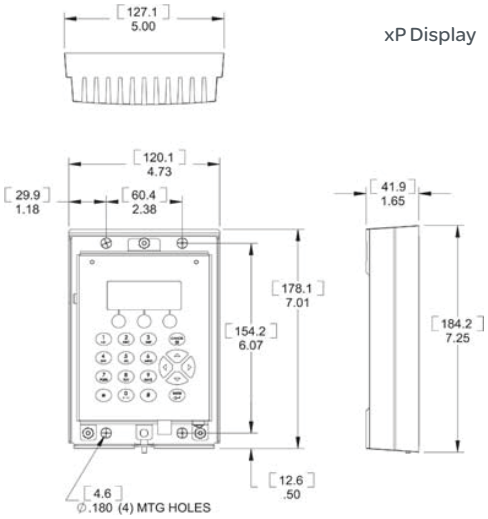
1	NC	18
	C	17
	NO	16
2	NC	15
	C	14
	NO	13
3	NC	12
	C	11
	NO	10
4	NC	9
	C	8
	NO	7

Dimensional Drawings

xP Module



xP Display



Models

xP-Display
(includes 3 foot cable)

xP-Display-10
(includes 10 foot cable)

Power Consumption
70 mA

Display Properties
4 lines x 16 characters, backlit

Enclosure Type
IP54 Rating

Installation

Modules can be connected to the bottom of the controller with the built-in expansion port connector or they may be connected remotely via a 3-foot (~1 m) or 10-foot (~3m) ribbon cable. A total of 10 feet of cable may be used for all Expansion Modules. Mounting and securing of the xP modules is provided through four mounting holes in the base plate.

Andover Continuum xP Expansion I/O Family Specifications

xP Expansion I/O

Electrical

Power

Up to two I/O module and an xP-Display may be connected to a controller. All controllers provide a total of 180 mA of power, the bCX1 controller/router has 400 mA of power, for the modules. Each module's power consumption is listed below. Reference installation sheet for valid combinations.

Mechanical

Operating Environment

32°–120°F (0–49°C),
10–95% RH (non-condensing)

Size

Module: 3.21˝ H x 7.10˝ W x 1.60˝ D
(82H x 180 W x 41 D) mm
Display: 7.25˝ H x 5.00˝ W x 1.65˝ D
(184H x 127 W x 42 D) mm

Weight

Module: 0.48 lb (0.22 kg)
Display: 1lb (0.45 kg)

Enclosure Type

Modules: UL Open class, IP 10.
Flammability rating of UL94-5V
Display: IP54

Communications

Communications Interface

Through built-in Expansion Port on controller

Connections

Fixed Terminal Connectors

Reference specific module on previous page for terminal point assignments

Input (top)

6-pin shrouded connector

Output (bottom)

6-pin shrouded connector

User LEDs/Switches

Status Indicator LEDs

CPU Module is Active

Switches

RESET

General

xP Modules

Consult the xP Module Installation Guide for the maximum number of inputs/outputs allowed on each controller.

Cable Options

xP-Mod-Cable-3

3-foot (~1m) ribbon cable terminated

xP-Mod-Cable-10

10-foot (~3m) ribbon cable terminated

Agency Listings

UL/CUL 916, FCC CFR 47 Part 15, ICES-003, EN55022, AS/NZS 3548, Class A, CE

xPDI8 (Digital Inputs)

Points

8 Digital Inputs

Power Consumption

25 mA

Voltage

0-5 VDC, or contact closure

Input Impedance

10K ohm ref to +5VDC

Frequency

140Hz, 50% duty cycling, 3.57 ms pulse width min.

Overvoltage Protection

24 VAC/DC +/- 1500 V transients

Andover Continuum xP Expansion I/O Family Specifications (continued)

N1831

xP Expansion I/O

xPUI4/xPBA4/xPBD4 (Universal Inputs)

Points

4 Universal Inputs

Power Consumption

50 mA (xPUI4)

60 mA (xPBA4)

125 mA (xPBD4)

Voltage

0-5.115 VDC

Input Impedance

10K ohm ref to +5VDC

Frequency

4Hz, 50% duty cycling,

125 ms pulse width min. (Inputs 1-3)

140Hz, 50% duty cycling, 3.57 ms pulse width min. (Input 4)

Overvoltage Protection

24 VAC/DC +/- 1500 V transients

xPAO2/xPAO4/xPBA4 (Analog Outputs)

Points

2 Analog Outputs (xPAO2)

4 Analog Outputs (xPAO4, xPBA4)

Power Consumption

80 mA (xPAO2)

120 mA (xPAO4)

60 mA (xPBA4)

Output Rating

0-10 VDC

4-20mA per channel (xPAO2, xPAO4)

Output Resolution

0.1V for 0-10V

0.1mA for 4-20mA (xPAO2, xPAO4)

Overrides

yes – per output point. Software feedback of the switch position is provided, for display and alarming

Potentiometer

yes – per output point

xPDO2/xPDO4/xPBD4 (Digital Outputs)

Points

2 Digital Outputs (xPDO2)

4 Digital Outputs (xPDO4, xPBD4)

Type

2 or 4 single pole single throw (SPST) Form C relays

Power Consumption

60 mA (xPDO2)

100 mA (xPDO4)

125 mA (xPBD4)

Output Rating

Maximum 3A, 24 VAC/VDC, +/- 1500 V transients (tested according to EN61000-4-4)

Output Accuracy

0.1 sec for pulse width modulation

Output Overrides

Each Output is equipped with a manual override switch. Software feedback of the switch position is provided, for display and alarming

Schneider Electric One High Street, North Andover, MA 01845 USA Telephone: +1 978 975 9600 Fax: +1 978 975 9674 www.schneider-electric.com/buildings

SDS-XPEXPANSION-I/O-US.BU.N.EN.8.2007.0.00.CC

August 2007 pdw

PANEL FABRICATION

FUSES

FLM, FLQ, FNQ, GF, K235, 251 SERIES

DESCRIPTION

The **Littelfuse FLM, FLQ, FNQ series midget fuses** are slow-acting fuses used with **6SC30** & **6SM30** Series, **6M30** Series, **6W30** Series, and **FB2X** Series fuse holders. The **KLK-3** series fuses are fast-acting fuses.

FLM/FLQ/KLK Series

FNQ-R

SPECIFICATIONS/ORDERING INFORMATION

AMP RATING	250V MODEL	500V MODEL	600V MO
0.5	FLM-0.5	FLQ-0.5	FNQ-R-0.
0.8	FLM-0.8	FLQ-0.8	FNQ-R-0.
1.0	FLM-1	FLQ-1	FNQ-R-1
1.25	FLM-1.25	FLQ-1.25	FNQ-R-1.
1.5	FLM-1.5	FLQ-1.5	FNQ-R-1.
2.0	FLM-2	FLQ-2	FNQ-R-2
2.5	FLM-2.5	FLQ-2.5	FNQ-R-2.
3.0	FLM-3	FLQ-3	FNQ-R-3
4.0	FLM-4	FLQ-4	FNQ-R-4
5.0	FLM-5	FLQ-5	FNQ-R-5
7.0	FLM-7	FLQ-7	FNQ-R-7
10.0	FLM-10	FLQ-10	FNQ-R-1(
15.0	FLM-15 (125 VAC)	FLQ-15	FNQ-R-1:
20.0	FLM-20 (32 VAC)	FLQ-20	FNQ-R-2(
30.0	FLM-30 (32 VAC)	FLQ-30	FNQ-R-3(

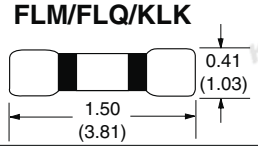
AMP RATING	600V MODEL
3.0A	KLK-3

APPLICATION

- ***FLM/FLQ/FNQ Series - Inductive loads, power supplies, control transformers, control circuits with high inrush currents***
- ***KLK-3 - Watt meters, watt transducers, and control circuits without high inrush currents***
- ***FLM/FLQ/KLK UL File E19180; FNQ UL File E4273***

DIMENSIONS

FLM/FLQ/KLK



DESCRIPTION

The **Littelfuse GF and K235 Series** glass fuses are available in slow-blow and fast-acting models.

FEATURES

- ***GF Series for use with M10/16SFL fuse holder, HKP-HH and HRK***
- ***K235 Series for use with M4/8 and ZS4 Series Disconnect Switch and Fuse Holders***
- ***GF & K235 UL File E19180; HKP-HH & HRK UL File E72169***

GF, K235 Series

HKP-HH

HRK

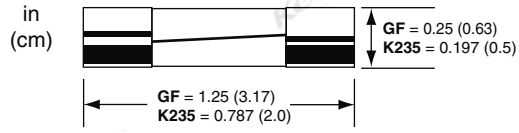
SPECIFICATIONS / ORDERING INFORMATION
(Order QTY 1 = Standard package of 5)

AMP RATING	VOLTAGE	FAST-ACTING FUSE	SLOW-BLOW FUSE	FAST-ACTING
0.5	250	GF-0.5	GF-0.5S	K235-0.5
1	250	GF-1	GF-1S	K235-1
1.5	250	GF-1.5	GF-1.5S	K235-1.5
2	250	GF-2	GF-2S	K235-2
2.5	250	GF-2.5	GF-2.5S	K235-2.5
3	250	GF-3	GF-3S	K235-3
5	250	GF-5	GF-5S	K235-5 (125V)
7	250	GF-7	GF-7S	K235-7 (125V)
10	250	GF-10	GF-10S*	K235-10 (125V)
15	250	GF-15*	GF-15S*	

HRK	Inline fuseholder, 32V, 15A, for 1/4" fuses 7/8"-1-1/4"
HKP-HH	Panel mount fuseholder, 250V, 15A, for 1/4" x 1-1/4" fuses

* Ceramic tube fuse

DIMENSIONS



DESCRIPTION

The **Littelfuse 251 Series fast-acting circuit board type fuses** are sold in packs of 5 and range from 0.125 A to 2.0 A ratings.

251 Series

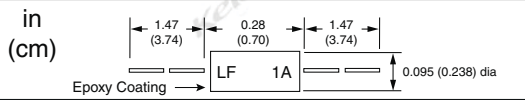
FEATURES

- ***UL FIle E19180eps***

SPECIFICATIONS / ORDERING INFORMATION
(Order QTY 1 = Standard package of 5)

AMP RATING	125V MODEL
1/8	#251.125
1/2	#251.500
1	#251001
2	#251002

DIMENSIONS



Two-4-One™ Power Transformers
Chassis Mount

Split Bobbin Construction Providing Superior Isolation.

Signal's 241 transformers use a split bobbin construction that provides superior isolation and low capacitive coupling.

General Specifications

- Power - 2.4 VA to 100 VA
- Dielectric Strength - 2500 Vrms Hipot
- Primaries - Single or dual primaries (115V or 115/230 V - 50/60 Hz)
- Secondary - Single center tapped secondary
- Terminals - Solder lug / quick connect type terminals
- Insulation - Class B (130º C) UL 1446 E66312

Agency Certifications

- UL recognized to UL 506 / UL 5085-1, File # E63829
- CSA certified to C22.2 #66.1, File # 221070

RoHS 2002/95/EC

Part Number		Secondary RMS Rating	Part Number		Secondary RMS Rating
Single 115V	Dual 115/230V		Single 115V	Dual 115/230V	
241-3-10	Not Available	10.0 VCT @ 0.25A	241-3-28	Not Available	28 VCT @ 0.085A
241-4-10	DP-241-4-10	10.0 VCT @ 0.60A	241-4-28	DP-241-4-28	28 VCT @ 0.20A
241-5-10	DP-241-5-10	10.0 VCT @ 1.2A	241-5-28	DP-241-5-28	28 VCT @ 0.42A
241-6-10	DP-241-6-10	10.0 VCT @ 3.0A	241-6-28	DP-241-6-28	28 VCT @ 1.1A
241-7-10	DP-241-7-10	10.0 VCT @ 5.0A	241-7-28	DP-241-7-28	28 VCT @ 2.0A
241-8-10	DP-241-8-10	10.0 VCT @ 10A	241-8-28	DP-241-8-28	28 VCT @ 3.6A
241-3-12	Not Available	12.6 VCT @ 0.20A	241-3-36	Not Available	36 VCT @ 0.065A
241-4-12	DP-241-4-12	12.6 VCT @ 0.50A	241-4-36	DP-241-4-36	36 VCT @ 0.17A
241-5-12	DP-241-5-12	12.6 VCT @ 1.0A	241-5-36	DP-241-5-36	36 VCT @ 0.35A
241-6-12	DP-241-6-12	12.6 VCT @ 2.5A	241-6-36	DP-241-6-36	36 VCT @ 0.85A
241-7-12	DP-241-7-12	12.6 VCT @ 4.0A	241-7-36	DP-241-7-36	36 VCT @ 1.5A
241-8-12	DP-241-8-12	12.6 VCT @ 8.0A	241-8-36	DP-241-8-36	36 VCT @ 2.8A
241-3-16	Not Available	16.0 VCT @ 0.15A	241-3-48	Not Available	48 VCT @ 0.05A
241-4-16	DP-241-4-16	16.0 VCT @ 0.40A	241-4-48	DP-241-4-48	48 VCT @ 0.125A
241-5-16	DP-241-5-16	16.0 VCT @ 0.80A	241-5-48	DP-241-5-48	48 VCT @ 0.25A
241-6-16	DP-241-6-16	16.0 VCT @ 2.0A	241-6-48	DP-241-6-48	48 VCT @ 0.63A
241-7-16	DP-241-7-16	16.0 VCT @ 3.5A	241-7-48	DP-241-7-48	48 VCT @ 1.2A
241-8-16	DP-241-8-16	16.0 VCT @ 6.25A	241-8-48	DP-241-8-48	48 VCT @ 2.0A
241-3-20	Not Available	20.0 VCT @ 0.12A	241-3-56	Not Available	56 VCT @ 0.045A
241-4-20	DP-241-4-20	20.0 VCT @ 0.30A	241-4-56	DP-241-4-56	56 VCT @ 0.11A
241-5-20	DP-241-5-20	20.0 VCT @ 0.60A	241-5-56	DP-241-5-56	56 VCT @ 0.22A
241-6-20	DP-241-6-20	20.0 VCT @ 1.5A	241-6-56	DP-241-6-56	56 VCT @ 0.54A
241-7-20	DP-241-7-20	20.0 VCT @ 2.8A	241-7-56	DP-241-7-56	56 VCT @ 1.00A
241-8-20	DP-241-8-20	20.0 VCT @ 5.0A	241-8-56	DP-241-8-56	56 VCT @ 1.8A
241-3-24	Not Available	24.0 VCT @ 0.10A	241-3-120	Not Available	120VCT @ 0.02A
241-4-24	DP-241-4-24	24.0 VCT @ 0.25A	241-4-120	DP-241-4-120	120VCT @ 0.05A
241-5-24	DP-241-5-24	24.0 VCT @ 0.50A	241-5-120	DP-241-5-120	120VCT @ 0.10A
241-6-24	DP-241-6-24	24.0 VCT @ 1.25A	241-6-120	DP-241-6-120	120VCT @ 0.25A
241-7-24	DP-241-7-24	24.0 VCT @ 2.4A	241-7-120	DP-241-7-120	120VCT @ 0.50A
241-8-24	DP-241-8-24	24.0 VCT @ 4.0A	241-8-120	DP-241-8-120	120VCT @ 0.85A

Custom versions available upon request.

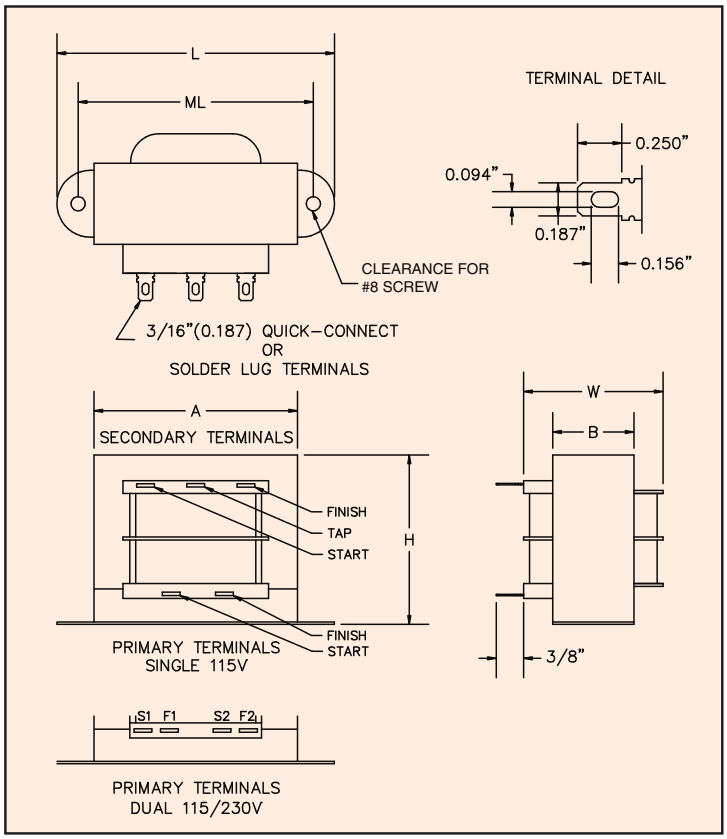
Signal Transformer
www.signaltransformer.com

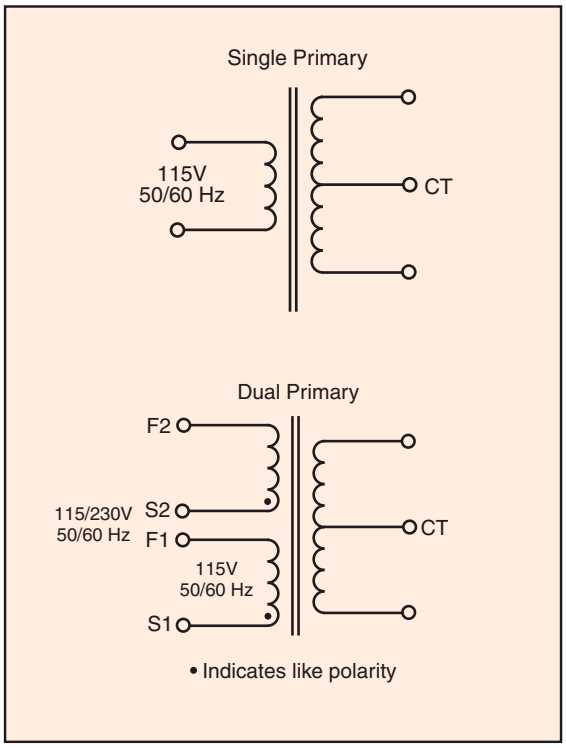
500 Bayview Avenue, Inwood, NY 11096
Toll Free 866-239-5777 • Tel 516-239-5777 • Fax 516-239-7208
sales@signaltransformer.com • techhelp@signaltransformer.com

Two-4-One™ Power Transformers
Chassis Mount

Split Bobbin with High Isolation

RoHS 2002/95/EC





Note: Agency certified 241 Series transformers with standard length and color lead wires are readily available. See website for 241-L product series.

Size	VA	Dimensions						Weight
		L	W	H	A	B	ML typ	
		Inches (mm)						lbs (kg)
3	2.4	2.07 (52.6)	1.17 (29.6)	1.23 (31.2)	1.62 (41.3)	0.59 (15)	1.75 (44.5)	0.25 (0.11)
4	6	2.37 (60.3)	1.31 (33.3)	1.43 (36.2)	1.71 (43.4)	0.72 (18.3)	2.00 (50.8)	0.44 (0.20)
5	12	2.81 (71.4)	1.43 (36.3)	1.69 (42.8)	1.97 (49.9)	0.89 (22.6)	2.37 (60.3)	0.7 (0.32)
6	30	3.25 (82.6)	1.74 (44.3)	1.96 (49.8)	2.35 (59.3)	1.14 (28.9)	2.81 (71.4)	1.1 (0.50)
7	56	3.68 (93.7)	1.94 (49.2)	2.28 (57.8)	2.70 (68.4)	1.14 (28.9)	3.12 (79.4)	1.7 (0.77)
8	100	4.03 (102.4)	2.30 (58.5)	2.67 (67.7)	3.08 (78.2)	1.43 (36.2)	3.6 (91.4)	2.75 (1.25)

Custom versions available upon request.

Signal Transformer
www.signaltransformer.com

500 Bayview Avenue, Inwood, NY 11096
Toll Free 866-239-5777 • Tel 516-239-5777 • Fax 516-239-7208
sales@signaltransformer.com • techhelp@signaltransformer.com

POWER SUPPLIES

DC POWER SUPPLIES
SLS SERIES

DESCRIPTION

The **SLS Series** of **DC Power Supplies** from Sola/Hevi-Duty is used to transform various AC voltage inputs into a regulated DC output. Multiple mounting surfaces simplify installation by providing different mounting options. Units have built-in remote sensing capability for better load regulation.

FEATURES

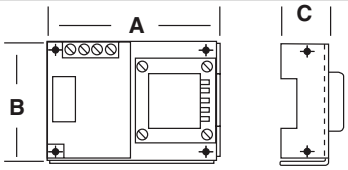
- ***Screw terminal connections, no soldering***
- ***Multiple input voltages***
- ***Regulated 24 VDC output up to 7.2A***
- ***Remote sensing***

SPECIFICATIONS

Input voltage	100, 120, 220, 230, 240 VAC, ±10%
Frequency	47-63 Hz
Output voltage	24 VDC (12 VDC on **SLS-12-017T**) Adjustable ±5% of rated voltage
Output current	See Ordering Information below
Terminations	Screw terminals, input and output 16-gauge wire max
Operating temp	32° to 122°F (0° to 50°C)
Line regulation	±0.05% for 10% line change
Load regulation	±0.05% for 50% load change
Ripple	3 mV p-p max
Agency approvals	UL, CUL-recognized component, File #E137632; CE certified

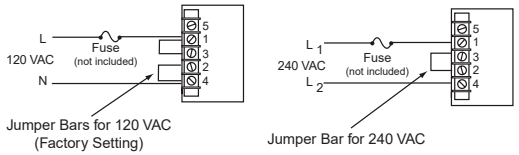
DIMENSIONS

in (cm)



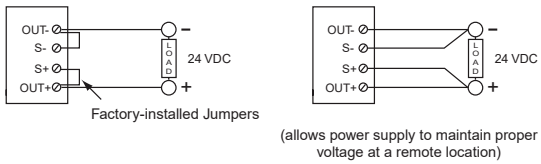
MODEL	DIMENSIONS A	B	C	WEIGHT lb (kg)
SLS-12-017T **SLS-24-012T**	4.87 (12.57)	4.00 (10.16)	2.07 (5.25)	2.43 (1.10)
SLS-24-024T	5.62 (14.27)	4.87 (12.37)	2.95 (7.49)	4.06 (1.84)
SLS-24-036T	7.00 (17.78)	4.87 (12.37)	3.20 (8.13)	7.28 (3.30)
SLS-24-048T	9.00 (22.86)	4.87 (12.37)	3.20 (8.13)	7.88 (3.57)
SLS-24-072T	14.00 (35.56)	4.87 (12.37)	3.20 (8.13)	14.00 (6.35)

WIRING AC INPUT



120V Input **240V Input**

WIRING DC OUTPUT



Without Remote Sensing

(allows power supply to maintain proper voltage at a remote location)

With Remote Sensing

ORDERING INFORMATION

MODEL	DESCRIPTION	RECOMMENDED FUSES (order separately) 100-120V INPUT	220/230/240V INPUT
SLS-12-017T	**Power supply, 12 VDC, 1.7A**	**FLM-1, 1A**	**FLM-0.5, 0.5A**
SLS-24-012T	**Power supply, 24 VDC, 1.2A**	**FLM-1, 1A**	**FLM-0.5, 0.5A**
SLS-24-024T	**Power supply, 24 VDC, 2.4A**	**FLM-1.5, 1.5A**	**FLM-0.8, 0.8A**
SLS-24-036T	**Power supply, 24 VDC, 3.6A**	**FLM-2, 2A**	**FLM-1, 1A**
SLS-24-048T	**Power supply, 24 VDC, 4.8A**	**FLM-2.5, 2.5A**	**FLM-1.25, 1.25A**
SLS-24-072T	**Power supply, 24 VDC, 7.2A**	**FLM-4, 4A**	**FLM-2, 2A**

RELATED PRODUCTS

6M30 Series	**Fuse blocks**
FLM Series	**Fuses**

POWER MONITORING & PROTECTION

METAL OXIDE VARISTOR, TRANSZORB

MODELS V130LA1, V39ZA1, V47ZA1, 1.5KE56CA

DESCRIPTION

Metal Oxide Varistor (MOV) and **Transzorb Voltage Transient Suppressors** reduce high voltage spikes that could damage or confuse sensitive electronic circuits. Voltage spikes will often cause digital logic circuits to select an incorrect logic state or to lock up entirely.

CAUSES OF VOLTAGE SPIKES

Voltage spikes appear in the user's circuit in three main ways:

1. Voltage spikes come in on the power distribution bus and are coupled to the user's circuits by the winding-to-winding capacitance of the user's power transformers.
2. Voltage spikes are generated in the power transformer secondary when the power transformer primary is turned off and the transformer's magnetic field collapses.
3. Voltage spikes are generated within the user's circuits when an inductive load is switched off and the load's magnetic field collapses. Voltage noise is also generated at the switched contacts and is radiated to the wires leading to the user's microprocessor.

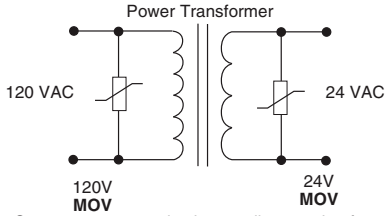
OPERATION

When a voltage at or below the suppressor's nominal voltage is applied, the suppressor acts essentially like an open circuit. When a high-voltage spike appears across the suppressor, however, the suppressor conducts or turns on, shunting the excess energy to the circuit return path, thereby reducing the amplitude of the voltage spike. When the voltage spike subsides, the suppressor reverts back to its open circuit state.

MOV suppressors are bidirectional and can be used to protect both AC and DC circuits. They provide a somewhat soft clamping action in that the amplitude of the reduced voltage spike rises noticeably with the amount of energy contained in the spike. **Transzorb** suppressors come in unidirectional and bidirectional versions. The unidirectional versions are polarity-sensitive and can only be used in DC applications. The bidirectional versions may be used in both AC and DC circuits just like the **MOV**. **Transzorbs** have a faster response time and a much harder clamping action than **MOVs** because voltage spikes are clipped at a more consistent level independent of their energy content. The **transzorb** sold by Kele is a bidirectional version.

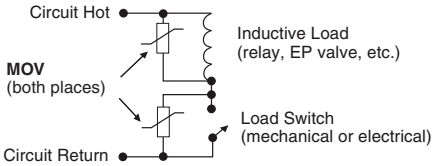
Note: Kele carries the varistors and transzorbs most often specified by the BAS manufacturers. They are general-purpose in nature and should cover most applications at the recommended voltage.

WIRING



Suppresses external voltage spikes coming from the power distribution bus and the spikes from switching the power transformer off.

Transformer Installation



Reduces mechanical switch arcs and electronic switch over-voltage breakdown. MOV voltage should match load circuit voltage.

Coil and Switch Installation

Agency approvals

V130LA1	UL-recognized component, File #E75961 and E56529
V39ZA1/V47ZA1	UL-recognized component, File #E135010
1.5KE56CA	UL-recognized component, File #E116110

ORDERING INFORMATION

MODEL	DESCRIPTION
V130LA1	**130 VAC/175 VDC varistor voltage transient suppressor**
V39ZA1	**25 VAC/31 VDC varistor voltage transient suppressor**
V47ZA1	**30 VAC/38 VDC varistor voltage transient suppressor**
1.5KE56CA	**24 VAC/VDC transzorb voltage transient suppressor***
	*56V nominal breakdown voltage

RELAYS & CONTACTORS

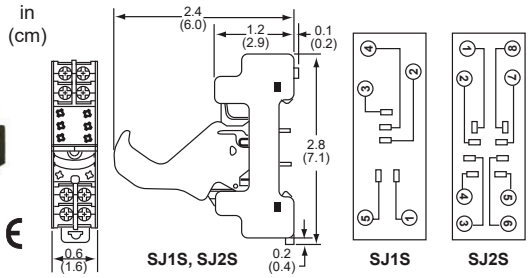
IDEC RELAY SOCKETS
SH, SR, SJ SERIES

IDEC

SPECIFICATIONS / DIMENSIONS

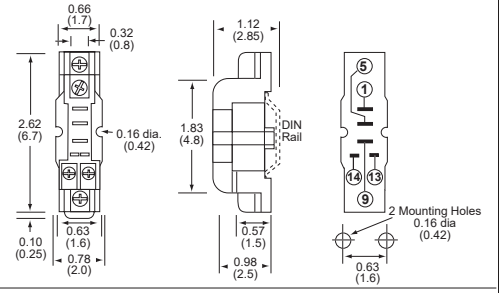
SJ1S, SJ2S for use with relays RJ1S and RJ2S

Socket type	Blade, DIN rail or surface mount
Electrical rating	**SJ1S:** 250V, 12A; **SJ2S:** 250V, 8A
Hold-down lever	Provided **SJ9Z-C**
Weight	**SJ1S:** 0.06 lb (0.03 kg) **SJ2S:** 0.07 lb (0.034 kg)
Wire size	Two 14 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR84913, CE



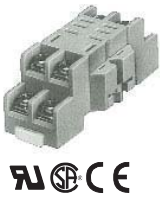
SH1B-05 for use with relay RH1B

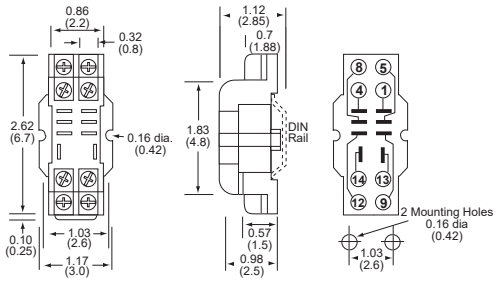
Socket type	Blade, DIN rail or surface mount
Electrical rating	250V, 10A
Hold-down spring	**SY2S-02F1**
Hold-down clip	**SFA-101, SFA-202**
Weight	0.06 lb (0.03 kg)
Wire size	Two 12 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR35144, CE



SH2B-05 for use with relay RH2B

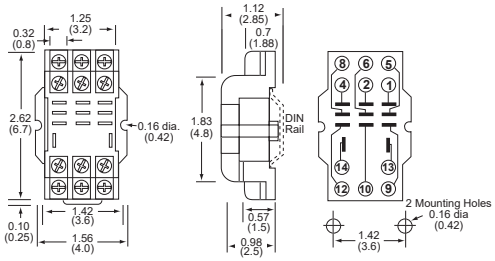
Socket type	Blade, DIN rail or surface mount
Electrical rating	300V, 10A
Hold-down spring	**SY4S-02F1**
Hold-down clip	**SFA-101, SFA-202**
Weight	0.10 lb (0.05 kg)
Wire size	Two 12 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR35144, CE





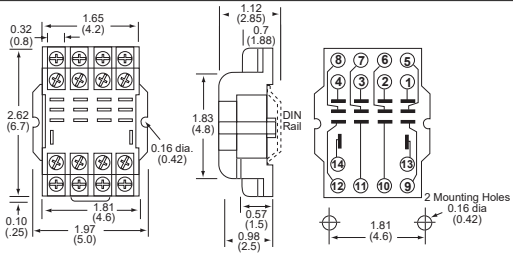
SH3B-05 for use with relays RH3B, RH2LB (latching relay)

Socket type	Blade, DIN rail or surface mount
Electrical rating	300V, 10A
Hold-down spring	**SH3B-05F1**
Hold-down clip	**SFA-101, SFA-202**
Weight	0.13 lb (0.06 kg)
Wire size	Two 12 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR35144, CE



SH4B-05 for use with relay RH4B

Socket type	Blade, DIN rail or surface mount
Electrical rating	300V, 10A
Hold-down spring	**SH4B-02F1**
Hold-down clip	**SFA-101, SFA-202**
Weight	0.16 lb (0.07 kg)
Wire size	Two 12 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR35144, CE



RELAYS & CONTACTORS

RELAYS & CONTACTORS

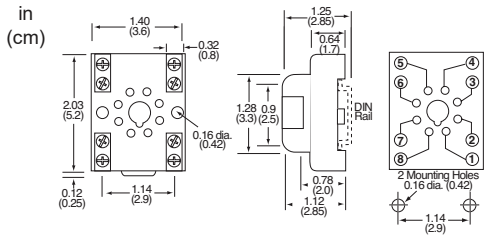
IDEC RELAY SOCKETS

SH, SR, SJ SERIES

SPECIFICATIONS (CONTINUED)

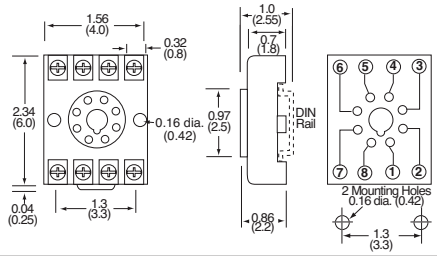
SR2P-05 for use with relays RR2P, RTE-P1 (timer)

Socket type	8-pin octal, DIN rail or surface mount
Hold-down spring	**SR2B-02F1** for **RR2P**
Hold-down clip	**SFA-203** for **RTE-P1**
Weight	0.10 lb (0.05 kg)
Wire size	Two 12 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR35144, CE



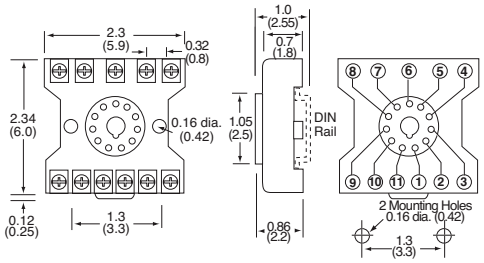
SR2P-06 for use with relays RR2P, RTE-P1 (timer)

Socket type	8-pin octal, DIN rail or surface mount
Electrical rating	300V, 10A
Hold-down spring	**SR2B-02F1** for **RR2P**
Hold-down clip	**SFA-202** for **RTE-P1**
Weight	0.10 lb (0.05 kg)
Wire size	Two 12 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR35144, CE



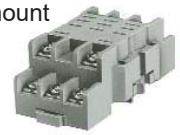
SR3P-06 for use with relays RR3PA, RTE-P2 (timer)

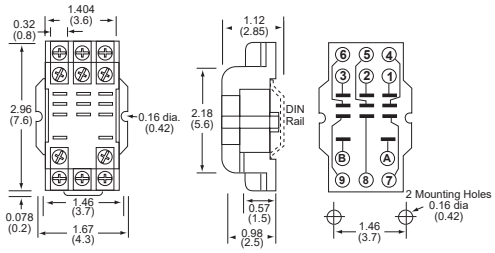
Socket type	11-pin, DIN rail or surface mount
Electrical rating	300V, 10A
Hold-down spring	**SR3B-02F1** for **RR3PA**
Hold-down clip	**SFA-202** for **RTE-P2**
Weight	0.13 lb (0.06 kg)
Wire size	Two 12 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR35144, CE



SR3B-05 for use with relays RR1BA, RR2BA, RR3B, RTE-B (timer)

Socket type	11-blade, DIN rail or surface mount
Electrical rating	300V, 10A
Hold-down spring	**SR3B-02F1** for **RR**
Hold-down clip	**SFA-202** for **RTE-B**
Weight	0.14 lb (0.06 kg)
Wire size	Two 12 AWG
Agency approvals	UL recognized File #E62437, CSA certified File #LR35144, CE





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**
SJ1S-05B	**Relay socket, SPDT blade type, DIN/surface mount**
SJ2S-05B	**Relay socket, DPDT 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**

Order hold-down springs and clips separately by model number.

RELATED PRODUCTS

RH/RR/RJ Series	**Idec relays**	**BAM-1000**	**Aluminum DIN rail**	**NBS Series**	**Block spades**
RTE Series	**Idec timers**	**DIN-3F**	**Steel DIN rail**		

RELAYS & CONTACTORS

IDEC GENERAL-PURPOSE RELAYS

RH, RR, RJ SERIES

DESCRIPTION

IDEC **General-Purpose Relays** are available in the **RH Series Blade Style Relays**, **RR Series Pin Style Relays,** and **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.

RJ1S RH Series RR2P

FEATURES

- ***Blade-style, pin-style, and compact models***
- ***Indicator light and/or check button available***
- ***Surface or DIN rail mount***
- ***UL recognized, CSA certified***

SPECIFICATIONS

COIL RATINGS

RH SERIES

RATED VOLTAGE		RATED CURRENT (mA) ±15% @ 20°C 60 Hz SPDT	DPDT	3PDT	4PDT	50 Hz SPDT	DPDT	3PDT	4PDT	INRUSH CURRENT (mA) SPDT	DPDT	3PDT	4PDT
AC	12	75	100	140	165	86	118	165	196	120	170	260	310
	24	37	50	70	83	42	59.7	81	98	56	85	130	165
	120	7.5	11	14.2	16.5	8.6	12.9	16.4	19.5	12	16	26	33
	240	3.2	5.5	7.1	8.3	3.7	6.5	8.2	9.8	7	8	12	16
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
DC	12	64		75		120		125		–	–	–	–
	24	32		36.9		60		62		–	–	–	–

RR Series

Rated Voltage		Rated Current (mA) ±15% @ 20°C 60 Hz	50 Hz	INRUSH CURRENT (mA)
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

Coil Sensitivity	Nominal Voltage	Nominal Current	Coil Resistance
DC Coil	24V	25.7 mA	1080Ω
AC Coil (60 Hz)	24V	41.1 mA	243Ω
	120V	8.1 mA	5270Ω

CONTACT RATINGS

RH SERIES (UL ratings)

VOLTAGE	RESISTIVE (A) SPDT	DPDT	3PDT	4PDT	INDUCTIVE (A) cosΘ= 0.3 SPDT	DPDT	3PDT	4PDT	MOTOR LOAD (hp) SPDT	DPDT	3PDT
240 AC	10	10	–	7.5	7	7	*	5	1/3	1/3	1/3
120 AC	10	10	10	10	7.5	–	–	7.5	1/6	1/6	1/6
30 DC	10	10	10	–	7	7	–	–	–	–	–
28 DC	10	10	10	10	7.5	–	–	7.5	–	–	–

* Note: 6.5A, 20A Total

RR SERIES (UL ratings)

VOLTAGE	RESITIVE (A)	INDUCTIVE (A) cosΘ= 0.3	MOTOR LOAD (hp)
240 AC	10	7	1/3
120 AC	10	7.5	1/4
30 DC	10	7	–

	CONTACT	RJ1S	RJ2S
Resistive Load (Maximum)	N.O.	12A @ 250 VAC/30 VDC	8A @ 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

Maximum continuous applied voltage
- **RH, RR** 110% of rated voltage
- **RJ** 140% of rated voltage

Pull-in voltage 80% of rated voltage, 70% for RJ DC coil

Drop-out voltage
- **AC** 30% or more of rated voltage
- **DC** 10% or more of rated voltage

Contact material
- **RH** Silver cadmium oxide
- **RR** Silver
- **RJ** Silver nickel alloy

Contact resistance
- **RH** 50 mΩ maximum
- **RR** 30 mΩ maximum
- **RJ** 50 mΩ maximum

Operate time
- **RH, RR** 25 ms maximum
- **RJ** 15 ms maximum

Release time
- **RH, RR** 25 ms maximum
- **RJ** 10 ms maximum

Min load
- **RH** 24 VDC/30 mA, 5 VDC/100 mA
- **RR** 24 VDC/10 mA, 5 VDC/20 mA
- **RJ** 5 VDC/100 mA

Operating temp -22° to 158°F (-30° to 70°C)

Agency approvals UL-recognized component, **(RH, RR):** File #E66043, **(RJ):** File #E55996, CSA certified, File #LR35144; CE certified (not RR blade style)

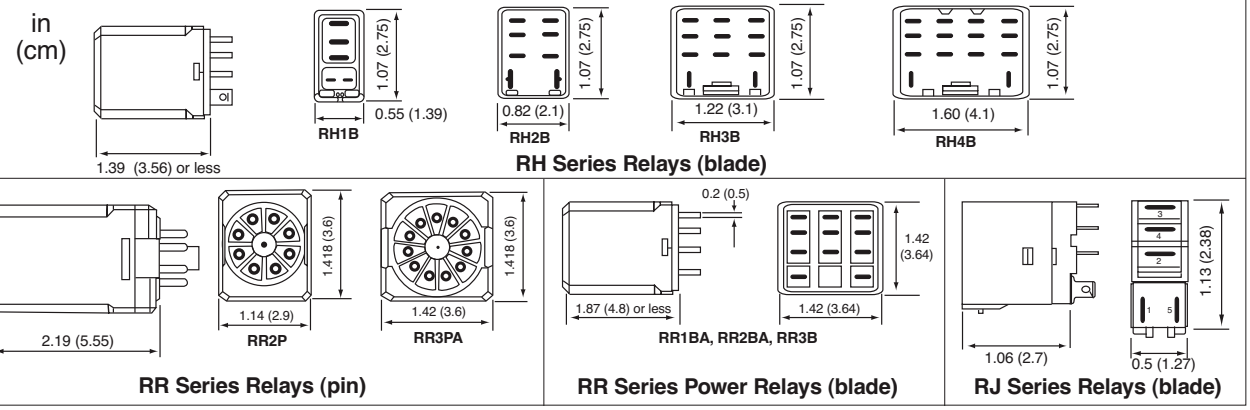
Warranty 1 year

RELAYS & CONTACTORS

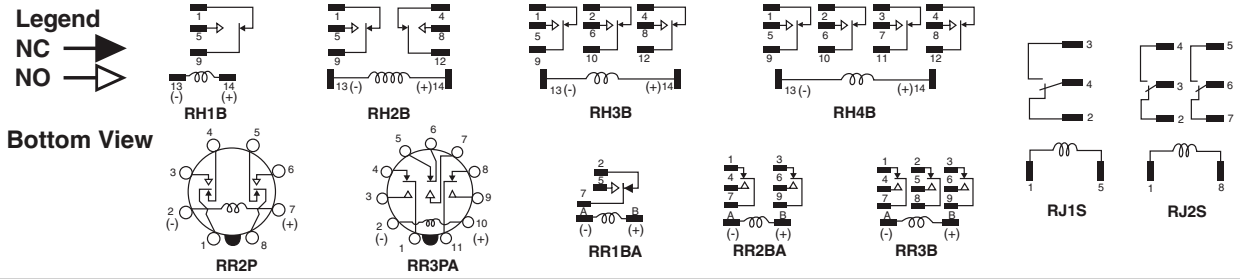
IDEC GENERAL-PURPOSE RELAYS

RH, RR, RJ SERIES

DIMENSIONS



WIRING



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

SH, SR, SJ Series Relay sockets **BAM-1000 or DIN-3F** Mounting DIN rail

[Temperature Sensors]

ET Series

SPECIFICATIONS

	For TAC Vista, I/NET, Continuum, and I/A	1000 Ohm Platinum	1000 Ohm BALCO
Output	1.8K Ohms @ 77° F (25° C) Vista 10K Ohms @ 77° F (25° C) I/Net 10K Ohms @ 77° F (25° C) Continuum 10K Ohms @ 77° F (25° C) with 11K Ohms shunt resistor I/A	1K Ohms @ 32°F (0°C)	1000 Ohms @ 70°F (21°C)
Temperature Range	-40° to 302° F (-40° to 150° C)	-58° to 392°F (-50 to 200°C) -50° to 275°F (-45.5° to 134.8°C)	-40° to 240°F (-40° to 116°C)
Interchangeability	+/- 0.2 C (0° to 70° C)		
Temperature Coefficient		0.00385 Ohm/Ohm/°C	2.2 Ohms/°F
Dissipation Constant Stability	3 mW / C		
Accuracy	+/- 0.2° C (0° to 70° C) +/- 0.4° F (32° to 158° C)	+/- 0.06% @ 32°F (0°C) Single Point +/- 1.0 Ohm @ 70°F (Averaging)	+/- 0.1%
Operating Humidity	0 to 90% RH non-condensing		

Application

Thermistors offer high accuracy and interchangeability over a wide temperature range. The ET series can be used in the following applications:

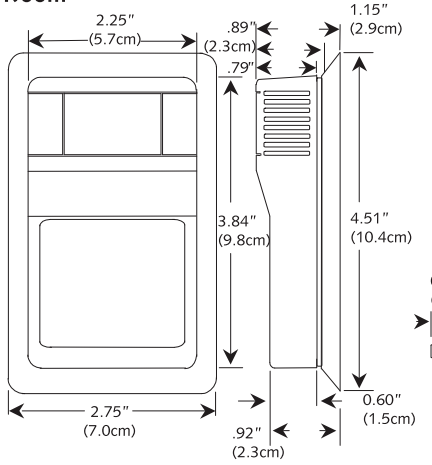
- Space
- Duct
- Immersion
- Averaging
- Strap-On
- Bead/Bullet
- Outdoor Air

Features

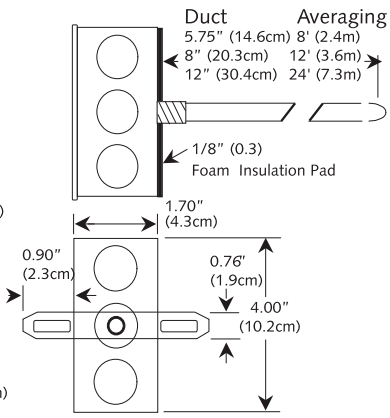
- Offer high accuracy and interchangeability over a wide temperature range.
- Non-polarity sensitive

DIMENSIONS

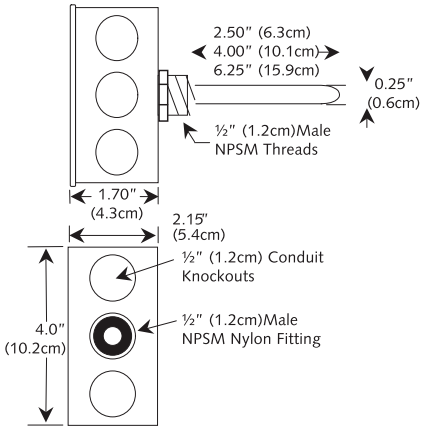
Room



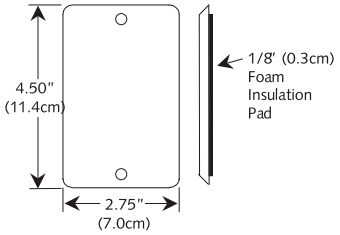
Duct / Averaging



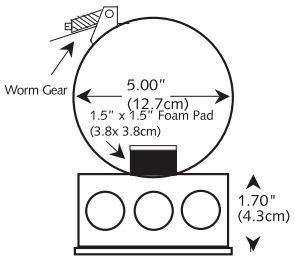
Immersion



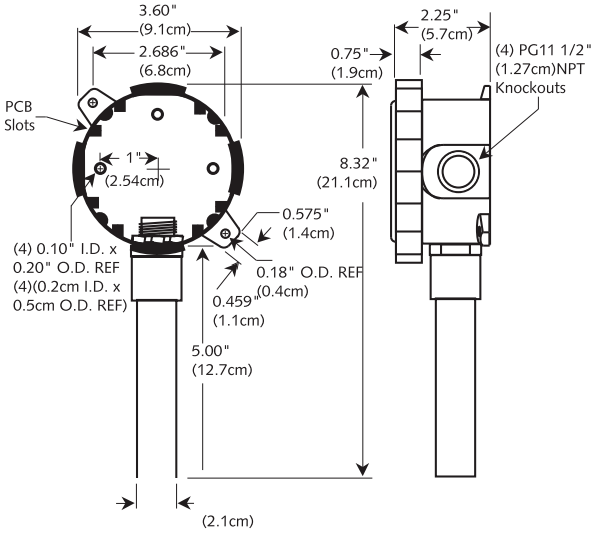
Stainless Plate



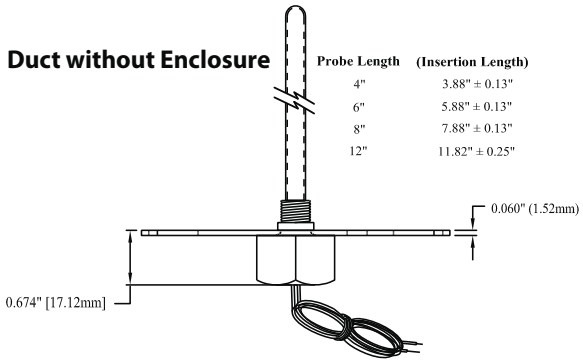
Strap-On



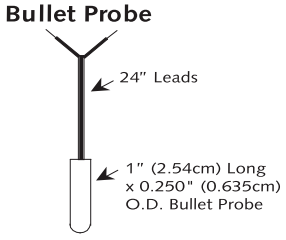
Outside Air



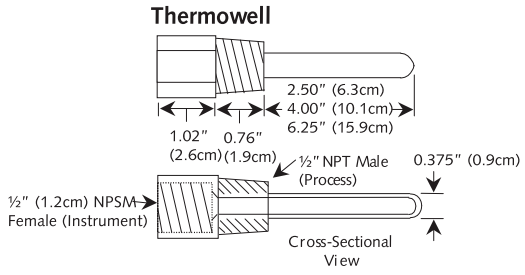
Duct without Enclosure



Bullet Probe



Thermowell



INSTALLATION

Room Temperature Sensors

This unit is suitable for either drywall mounting or junction box mounting. The room sensor is provided with screw terminal blocks for all connections. Remove the cover from the unit and mount the housing base to the wall using the (2) 6/32" x 1" machine screws. Replace the cover and tighten down, using the (2) 1/16" Allen Screws located on the bottom of the enclosure.

Duct and Duct Averaging Sensors

Duct temperature sensors - drill a 3/8" hole in the duct and insert the probe through the hole until the foam pad is tight to the duct. Now insert (2) screws through the mounting holes in flange and tighten them until the unit is held firmly to the duct. Duct Averaging sensors - Drill a 3/8" hole in the duct and insert the averaging element through the hole until the foam pad is tight to the duct. Now insert the (2) screws through the holes in the mounting flange and tighten until the unit is held firmly to the duct. The sensor should then be strung in a criss-cross pattern throughout the duct using the mounting clips provided, in a pattern that covers the greatest surface area of the duct, to insure that there is no stratification. When bending the copper tubing, be careful that you use a gradual bend and that you DO Not kink the copper tubing.

Immersion Temperature Sensors

The Fluid Immersion-type sensors are provided with a 2 ½", 4", or 6 ¼" insertion length, 304 series stainless steel thermowell. The thermowell has a 1/2" NPT external or process thread and a 1/2" NPS Female process thread. Heat transfer compound may be used but it is not necessary.

Strap-On Temperature Sensors

The TAC Strap-On sensors, are provided in a NEMA 1 rated junction box with an adjustable 2" to 5" pipe clamp. The unit should be mounted on the bottom side of the pipe to ensure proper heat transfer and a true temperature reading. Heat transfer compound and insulating the sensor will help the overall accuracy of the sensor. By ordering extra straps, and fastening them together, it is possible to make them fit larger pipes.

Outside Air Temperature Sensors

The TAC Outdoor Air temperature sensors are provided in a weatherproof enclosure. An optional weatherproof Aluminum Bell Box or NEMA 4X Polycarbonate enclosure is also available upon request for an additional charge. All of the mounting hardware is provided with the sensor. Be sure to mount the sensor out of direct sunlight, with the sensor probe pointing downward.

Stainless Plate Temperature Sensors

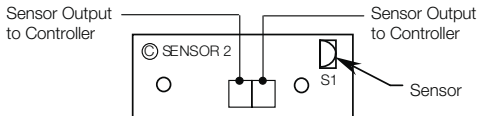
The TAC Stainless Plate temperature sensors are mounted on the back of a 1 Gang stainless steel plate. The foam pad will insulate the sensor from any drafts in the wall. (2) 6/32" x 1" machine screws are provided for junction box mounting. Be sure that the sensor is not mounted on an outside wall, due to the extreme temperature changes from either drafts or heat transfer.

WIRING

For wiring Information on room temperature sensors, please refer to the following documents:

System	F-Number
Vista	F-27616
I/NET	F-27617
Continuum	F-27618
I/A	F-27619

Diagram for ET Sensors Except ETR



ORDERING INFORMATION

Temperature Sensor Description	TAC Vista	I/NET	Continuum	I/A	1000 Ohm Platinum	1000 Ohm BALCO
Room	ETR100	ETR200	ETR500	ETR800	-	-
Room with Setpoint	ETR101	ETR201	ETR501	ETR801	-	-
Room with Override Pushbutton	ETR102	ETR202	ETR502	ETR802	-	-
Room with Setpoint and Override Pushbutton	ETR103	ETR203	ETR503	ETR803	-	-
Wallplate (Stainless Steel)	ETP100	ETP200	ETP500	ETP800		
4” Duct (Galvanized Steel Enclosure)	ETD100-4	ETD200-4	ETD500-4	ETD800-4	ETDPK0-4	ETDBK0-4
6” Duct Galvanized Steel Enclosure)	ETD100-6	ETD200-6	ETD500-6	ETD800-6	ETDPK0-6	ETDBK0-6
8” Duct (Galvanized Steel Enclosure)	ETD100-8	ETD200-8	ETD500-8	ETD800-8	ETDPK0-8	ETDBK0-8
12” Duct (Galvanized Steel Enclosure)	ETD100-12	ETD200-12	ETD500-12	ETD800-12	ETDPK0-12	ETDBK0-12
4” Duct without Enclosure	ETD100-NE-4	ETD200-NE-4	ETD500-NE-4	ETD800-NE-4	ETDPK0-NE-4	ETDBK0-NE-4
6” Duct without Enclosure	ETD100-NE-6	ETD200-NE-6	ETD500-NE-6	ETD800-NE-6	ETDPK0-NE-6	ETDBK0-NE-6
8” Duct without Enclosure	ETD100-NE-8	ETD200-NE-8	ETD500-NE-8	ETD800-NE-8	ETDPK0-NE-8	ETDBK0-NE-8
12” Duct without Enclosure	ETD100-NE-12	ETD200-NE-12	ETD500-NE-12	ETD800-NE-12	ETDPK0-NE-12	ETDBK0-NE-12
2.5” Immersion (Galvanized Steel Enclosure)*	ETI100-2	ETI200-2	ETI500-2	ETI800-2	ETIPK0-2	ETIBK0-2
4” Immersion (Galvanized Steel Enclosure)*	ETI100-4	ETI200-4	ETI500-4	ETI800-4	ETIPK0-4	ETIBK0-4
6.25” Immersion (Galvanized Steel Enclosure)*	ETI100-6	ETI200-6	ETI500-6	ETI800-6	ETIPK0-6	ETIBK0-6
8’ Averaging (Flexible Copper)	ETA100-8	ETA200-8	ETA500-8	ETA800-8	-	-
12’ Averaging (Flexible Copper)	ETA100-12	ETA200-12	ETA500-12	ETA800-12	ETAPK0-12	ETABK0-12
24’ Averaging (Flexible Copper)	ETA100-24	ETA200-24	ETA500-24	ETA800-24	ETAPK0-24	ETABK0-24
Outside Air	ETO100	ETO200	ETO500	ETO800	-	-
Strap On	ETS100	ETS200	ETS500	ETS800	-	-
Bead / Bullet	ETB100	ETB200	ETB500	ETB800	-	-

* Length indicates immersion depth.

Miscellaneous Options	Code
LCD Display in Fahrenheit (for room units only)	-LCD
LED Indicator* (for room units with override only)	-LED
Thermometer Indicator (for room units only)	-TI
RS232 Communication Jack (for use with I/NET systems only)	-RS232
Four-Pin RJ11 Communication Jack (for use with TAC Vista and Continuum systems only)	-RJ4

* Not available on I/A, 1000 Ohm Platinum, or 1000 Ohm BALCO.

Well Type	Part Number
2.5” Stainless Steel Well*	ETI-WELL-2S
4” Stainless Steel Well*	ETI-WELL-4S
6.25” Stainless Steel Well*	ETI-WELL-6S

* Length indicates immersion depth.

PRESSURE

DIFFERENTIAL PRESSURE SWITCHES

P74 SERIES

DESCRIPTION

The **Model P74 Differential Pressure Switch** measures the difference in pressure exerted upon its two sensing elements and operates an SPDT switch at the differential pressure setpoint. The setpoint may be adjusted without removing the cover and is visible on a calibrated scale.

P74FA-1

FEATURES

- ***Brass bellows***
- ***Completely enclosed contact mechanism***
- ***Externally adjustable with visual setpoint scale***
- ***Universal mounting bracket supplied***
- ***Heavy-duty elements withstand high overrun pressure***
- ***For air, oil, or other liquids***
- ***One-year warranty***

APPLICATIONS

These differential pressure controls are used as operating controls and/or alarm controls. They are available for applications sensing air, oil, or liquid. Typical applications include proof-of-flow across a chiller or water-cooled condenser, proof-of-flow in a heating system, and lube oil pressure sensing on refrigeration compressors. In the water chiller application, the control provides low temperature protection. On proof-of-flow applications, the control measures pressure drop across two different points in either a closed water circulating system or a city water supply system. On a proof-of-flow application in a water chiller system, the control activates an alarm or signal light to warn the operator if a loss of water flow occurs.

SPECIFICATIONS

Model*	Pressure differential range psid (kPa)	Connector size	Switch action	Electrical rating	Switch differential psig (kPa)	Maximum overrun pressure psig (kPa)
P74FA-1	8-60 (55-414)	1/4" male flare	SPDT snap-acting	6A 120V, 50/60 Hz	1.5 (10)	180 (1241)
P74FA-5		1/4" FNPT	SPDT snap-acting	6A 120V, 50/60 Hz		
P74JA-2		1/4" male flare	SPDT floating	1A 24V, 50/60 Hz		
P74EA-8	2-30 (14-207)	36" capillary with 1/4" flare nut	SPDT snap-acting	16A 120V, 50/60 Hz	3.5 (24)	

* Add **-C** to the end of the model number to request specific calibration. Please specify the setpoint.

ORDERING INFORMATION

Specify model number as shown in specifications above.

JAMESTOWN TECHNOLOGIES
Water Resource Specialists

November 20, 2019

Eastern Mechanical Services, Inc.
3 Starr Street
Danbury, CT 06810

Attn: Ted

Ref: 20 Horseneck Lane Filter Feeder Submittals

Hello Ted,

The following are the specifications for the Filter Feeder for 20 Horseneck Lane. Let me know if there is something else you need from Azure.

EAST COAST FILTER FEEDER SPECIFICATIONS:

FILTER VESSEL-

8-30-2P_*_150-CS-BS-PB-DP-CARBON STEEL BAG FILTER VESSEL, SIZE #2 (7-1/4"X32" BAG FILTER WITH 2" NPT CONNECTIONS, SIDE IN/UNIVERSAL DESIGN OUTLET OPPOSITE SIDE OR BOTTOM WITH 2" PLUG, 150 PSI RATING, SWING EYE BOLT CLOSURE WITH BUNA-N COVER 0-RING, STANDARD BASKET WITH 9/64" PERF, (1) 2/4"VENT, (2) ¼" NPT GAUGE PORTS, EPOXY COATED PAINTED ADJUSTABLE STEEL LEGS.

INSTALLATION ACCESSORY KIT-

>2 PRESSURE GAUGES, 0-100 PSI RANGE
>VENT ASSEMBLY INCLUDING ¼" BRASS BALL VALVE AND TWO FEET OF POLY DRAIN TUBING
>3/4" BRASS DRAIN VALVE
>SPARE BUNA-N O-RING COVER SEAL

Again, I thank you very much for considering Azure Water Services.

AZURE
WATER SERVICES

Azure Water Services supplies industrial bag filter vessels for Cooling Tower, Process Water Treatment, and a variety of other Industrial Applications. Our standard vessels are available in Carbon Steel and 304 Stainless Steel construction, and are designed to handle 150 PSID at 250°F. **Azure Water Services'** industrial bag filter vessels provide an economical filtration solution for critical applications where *high purity* and *reliability* are a must.

Features and Benefits

- Filter vessels are available in Carbon Steel or 304 Stainless Steel
- 150 PSID Rating at 250°F
- Swing Bolt Closure with Positive O-Ring Seal
- Adjustable-Height Tripod Legs come standard
- Universal Design: Side-In/Opposite Side or Bottom Outlet, supplied with 2" plug
- Vessels take a standard trade size #2 Bag Filter (7-1/4"D x 32"L), many bag filter options to choose from

Optional Accessory Kit
(illustrated above)

- 2 Pressure Gauges, 0-100 PSI Range
- Vent Assembly, including 1/4" Brass Ball Valve and 2 ft of Poly Drain Tubing
- 3/4" Drain Brass Ball Valve
- Spare BUNA-N Cover O-Ring Seal
  Note: SS Vessels supplied with SS Ball Valves

Specifications

- Design Pressure - 150 PSID
- Maximum Flow Rate: 125 GPM
- Cover Gasket: BUNA-N
- Adjustable Tripod Legs-Painted Carbon Steel (Stainless Steel vessels supplied with SS legs)
- Strainer Basket-9/64 inch diameter perforations
- Vent: 1/4" NPT
- Gauge Port: Quantity (2) 1/4" NPT Taps
- Drain: 3/4" NPT
- Inlet/Outlet Connections: 2" FNPT

Jamestown Technologies/Azure Water Services, LLC • 280 Callegari Drive
West Haven, CT 06516 • 203-932-3655 • info@azurewaterservices.com

JAMESTOWN TECHNOLOGIES
Water Resource Specialists

AZURE CARBON STEEL FILTER FEEDER OPERATION AND MAINTENANCE GUIDE

Setup of the Filter Feeder -

- The filter feeder should be placed on a solid flat surface in the proximity of the system piping to be connected to for filtration.

- The filter feeder should be anchored securely to the mounting surface. The adjustable legs should be set in the desired position and tightened securely so the weight of the water filled filter doesn't permit the unit to slip downward.

- The inlet to the filter feeder should be connected to a higher-pressure point on the circulating water system and the outlet should be connected to a lower pressure point in the circulating water system. **Note:** If a circulating pump is installed to move water through the filter feeder the connections do not have to be made to differential pressure points in the system.

- The system piping should have isolation valves at the inlet and outlet side of the filter feeder. This can be at the piping or at the filter feeder. Valves at both locations is recommended for safety and easy access to a shutoff point.

- The drain opening at the bottom of the filter feeder should be valved and plumbed to a suitable waste line or reduced to a hose bib connection for draining to a bucket.

- The pressure gauges should be screwed into place in the ports available on the side of the vessel. They should be protected with isolating ball valves and temporarily closed.

- The stainless-steel basket can be removed from the filter vessel with the plastic shipping “ring” discarded. The appropriate size filter bag should be inserted into the basket pushing the bottom of the bag all the way to the bottom of the basket. The basket should be re-inserted into the filter vessel and the top ring of the filter bag should be pushed down and “snapped” into the recessed top portion of the vessel.

- Once the filter bag is in place fresh water can be added to the filter vessel and filled to the top. The “O” ring seal should be placed into the groove at the top portion of the vessel.

- The hinged top of the vessel can then be closed, and the eye bolts tightened securely by hand with a final slight tightening with a screwdriver placed through the eye bolts. Do not tighten up the eye bolts excessively or the “o” ring can be crushed not providing the proper watertight seal.

- If furnished, the brass ball valve and drain tube can be screwed into the ¼” threaded hole at the top of the filter vessel with the valve closed. If no valve is supplied, a ¼” plug can be installed.

- At this point the inlet valve to the vessel can be slowly opened. When the pressure has equalized the outlet valve can then be slowly opened until pressure and flow has been established throughout the piping and vessel. The air purge valve at the top of the filter feeder should be opened slowly to remove air trapped at the top of the filter until only water is discharged.

- The pressure gauges can then be slowly opened and will be reading the same PSI as the filter bag is clean. As the bag becomes coated with debris the gauges will begin to show a pressure drop on one of them. Initially, this differential should be monitored daily. When the gauge pressures become equal the

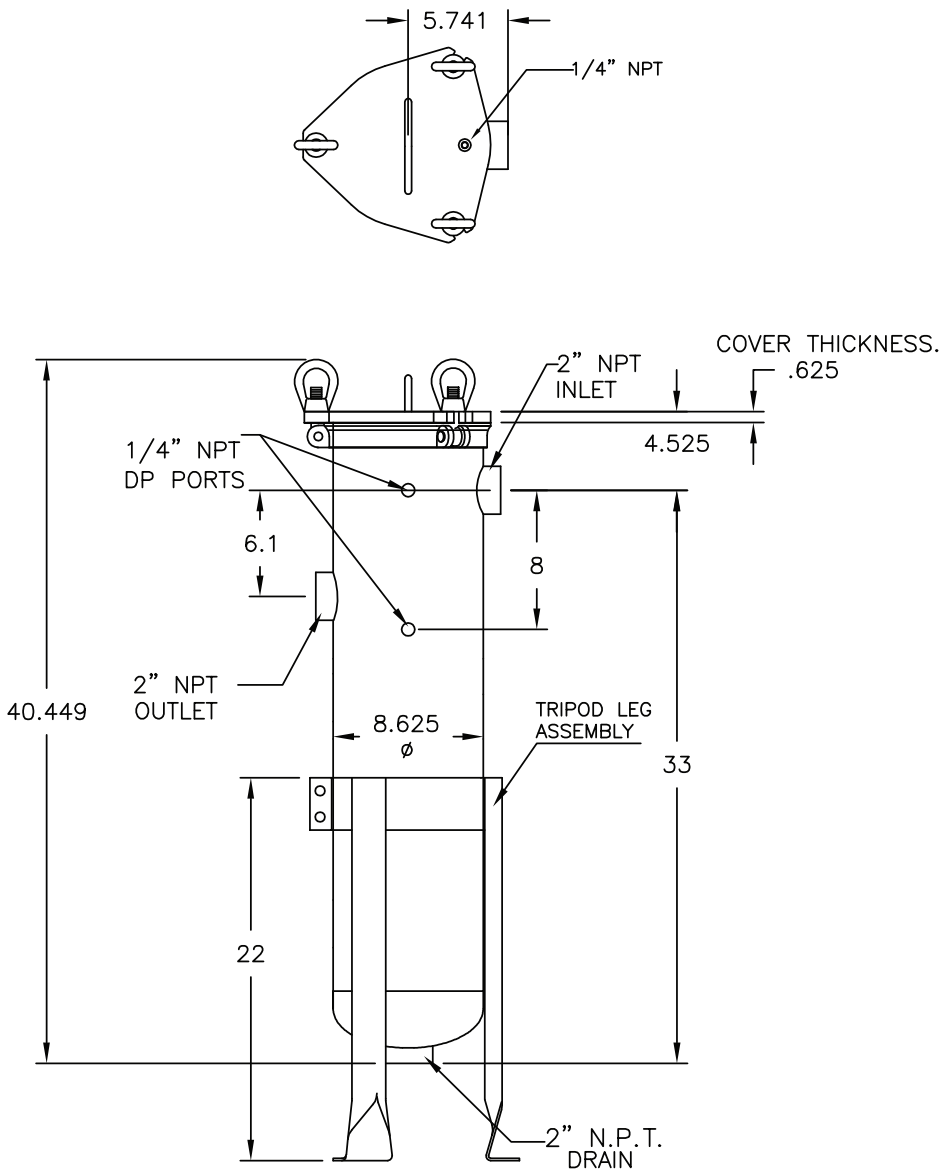
bag should be changed. This would indicate no flow through the bag.

Maintenance of the Filter Feeder –

- The Filter Feeder requires little maintenance. After bag changeouts the external surface of the filter housing can be wiped clean with a commercial cleaner and paper towel or rag. The “O” ring seal should be wiped clean after replacing the filter bag and a thin coating of Vaseline applied to it. The top of the filter feeder as well as the surface around the “O” ring can be cleaned with a scraper if buildup is visible to insure a good tight seal. With very dirty and slimy water a black or brown sludge may coat the top of the filter bag and the retaining surface of the vessel. This should be wiped clean with a rag or paper tower before inserting the filter bag into the vessel.

- The common filter bag size is 25 microns, but there are coarser and less coarse micron size bags available.

- Periodically, WD-40 spray lube can be applied to the eye bolt threads so they spin right on and off quickly and easily.



NOTES:

1. DESIGN PRESSURE - 150 PSI
2. DESIGN TEMPERATURE AT OR BELOW 150 PSI
   - STAINLESS STEEL - 250° F
   - CARBON STEEL - 500° F

OPTIONS

A. MATERIALS OF CONSTRUCTION
- CARBON STEEL
- 304 STAINLESS STEEL
- 316 STAINLESS STAINLESS

B. COVER GASKET MATERIAL
- BUNA N*
- EPR
- VITON
- TEFLON ENCAPSULATED VITON

C. ADJUSTABLE TRIPOD LEGS
- CARBON STEEL*
- 304 STAINLESS STEEL
- 316 STAINLESS STEEL

D. BASKET TYPE: (STAINLESS STEEL
- FILTER BAG - 9/64 Ø PERFORATIONS - PB*
  REFER TO **"How to Order a Filter Bag Housing"** FOR DETAILS

4. DIFFERENTIAL PRESSURE PORTS
   - ¼" NPT - 2 PLACES
5. SIZE #2 FILTER BAGS ARE ORDERED SEPARATELY

* OPTIONS THAT ARE STANDARD WITH UNIT.

** THIS DIMENSION MAY VARY SLIGHTLY ACCORDING TO O.D. OF CONNECTION COUPLINGS.

East Coast Filter, Inc.
INDUSTRIAL FILTRATION & WASTEWATER TREATMENT
WRENTHAM, MA • 1-877-ANY-FILTER

TITLE: 8-30-2P-*-150-__-__-PB-DP

FILE NAME:

DRAWN BY: | DATE:

QUOTE #: 223807

Today's date: 05 Feb 2020 ***Expires:*** *06 Mar 2020*

East Coast Filter, Inc.
560 Washington Street Suite 3
Wrentham, MA 02093
1-877-ANY-FILTER

Quoted to: Starrett Ash
Phone: 203-932-3655
Email: slash@azurewaterservices.com
Payment Terms: Net 30
Ship via: Best Way Prepay & Add

Sold to:

LISA SCHICKLER
JAMESTOWN TECHNOLOGIES, AZURE WATER SERVICES
A DIV OF AZURE WATER SERVICES, LLC 280 CALLEGARI DRIVE
WEST HAVEN CT 06516-
UNITED STATES

Ship to:

STARRETT ASH
JAMESTOWN TECHNOLOGIES, AZURE WATER SERVICES
A DIV OF AZURE WATER SERVICES, LLC 280 CALLEGARI DRIVE
WEST HAVEN CT 06516-
UNITED STATES

Qty	SKU	Item name	Specs/ Drawings	Item net	Total net
1	8-30-2P-*-150-4S-BS-PB-DP-SS Leg	8-30-2P-*-150-4S-BS-PB-DP-SS Legs - 304 Stainless Steel Bag Filter Vessel, Size #2, 2" NPT Inlet/Outlet Connections, Side In, Universal Design Opposite Side or Bottom Outlet - Supplied with 2" Plug to Close Other Outlet, Swing Eye Bolt Closure with Buna-N Cover O-Ring, Standard Stainless Steel Basket with 9/64" Perf, 150 PSI, (1) 1/2" NPT Vent, (2) 1/4" NPT Gauge Port Taps, 304 Stainless Steel Adjustable Tripod Legs. Lead Time: 1 Week + Transit Time		$0.0000	$0.00
1	Optional Install SS Kit - UNIV	Optional Install SS Kit - UNIV - Optional Installation Kit for Stainless Steel Vessel Includes (2) Pressure Gauges - 0-100 PSI Range, Vent Assembly - Including 1/4" Stainless Ball Valve and 2 ft. of Poly Drain Tubing, 3/4" Stainless Ball Valve Drain, 2" x 3/4" NPT Bushing, Spare Buna-N Cover O-Ring Seal. Lead Time: 1 Week + Transit Time » 46495K18 - 316 Stainless Steel Full-Port On/Off Vent Valve with Lockable Lever Handle, 1/4" NPT Female. x 1 » 4830K133 - Standard-Wall 304/304L Stainless Steel Pipe Nipple, Threaded on Both Ends, 1/4" NPT Pipe Size, 2" Long. x 1 » 4464K172 - 304 Stainless Steel Threaded Pipe Fitting, Low-Pressure, Reducing Bushing, 2 Male x 3/4 Female NPT. x 1 » 52245K533 - 316 Stainless Steel Compression Fitting for Poly Tubing, Straight Adapter for 1/4" Tube OD x 1/4" NPT Male. x 1 » 4464K15 - 304 Stainless Steel Threaded Pipe Fitting, Low-Pressure, 90 Degree Elbow Connector, 3/4" NPT Female. x 1 » 4830K192 - Standard-Wall 304/304L Stainless Steel Pipe Nipple, Threaded on Both Ends, 3/4" NPT Pipe Size, 1-1/2" Long. x 2 » 4452K165 - 316 Stainless Steel Threaded Pipe Fitting, Low-Pressure, Bushing Adapter, 1/2" Male x 1/4" Female. x 1 » 46325K29 - Ultra-Corrosion Resistant 316 Stainless Steel Standard-Port On/Off Drain Valve with Lockable Lever Handle, 3/4" FNPT x 1 » 8-30-BS - Replacement Buna-N O-Ring for an 8-30 Vessel. x 1 » 5384K536 - Polyethylene Tubing for Food and Beverage, High-Pressure, 0.17" ID, 1/4" OD. Sold Per Foot x 2 » PFQ169 - 316 Stainless Steel Liquid Filled Gauge, 2.5" Face, 1/4" NPT Back Mount Connection, Range 0-100 PSI, 304 SS Casing. x 2		$0.0000	$0.00

Subtotal	**$0.00**
Connecticut Non-Taxable @ 0%	$0.00
Total	**$0.00**
Paid to date	$0.00

For technical questions on this quote, please contact your salesperson: **Kevin Zagrodny** phone: (774) 847-9540 email: orders@eastcoastfilter.com *Please note that unless previously agreed upon with your Salesperson, All Items Quoted do not include freight and East Coast Filter, Inc. Reserves the Right at any time to Correct Clerical Errors.*	***To place order, send an email to:*** orders@eastcoastfilter.com **Orders will be Acknowledged within 24 hours after Receipt of Order. If you do not get an Acknowledgement within 24 hours, Please Contact our Office Directly at 774-847-9540 as your Order may not have been Received.**

CFM **TEST & BALANCE CORPORATION**

14 DEPOT SQUARE
BETHEL, CONNECTICUT 06801

(203) 778-1900

TESTING AND BALANCING SUBMITTAL
FOR

ASHFORTH

HEAT EXCHANGER REPLACEMENT

20 HORSENECK ROAD

GREENWICH, CT

FEBRUARY 24, 2020

CFM # 6483

CFM TEST & BALANCE CORPORATION	ASHFORTH HEAT EXCHANGER REPLACEMENT 20 HORSENECK ROAD GREENWICH, CT	DATA SHEET # 1
14 DEPOT SQUARE, BETHEL, CT 06801 TEL (203) 778-1900 CFM@SNET.NET	DATE: 2/24/20 BY: AA	CFM 6483

PUMP NO.	P-3
MANUFACTURER	ARMSTRONG
MODEL	4X4X6 4380
IMPELLER SIZE	N.A.
SYSTEM SERVED	TOWER WATER

TEST DATA	GPM	FT. HD.	BHP
DESIGN	400	110	N.A.
ACTUAL	404	N.A.	14.6
DESIGN GPM SYST.	400		
DISCH. VALVE S.P.	N.A.		
DIFF. PRESS. S.P.	N.A.		
DISCHARGE	N.A.		
SUCTION	N.A.		
∆P	N.A.		

BLOCK OFF	
DISCHARGE	N.A.
SUCTION	N.A.
∆P	N.A.

MOTOR MFG.	WEG		
MOTOR HP	20		
RPM	3525		
SERVICE FACTOR	1.15		
VFD HZ SETTING	60 HZ		
AMPS	23.8	ACT:	18.3
VOLTS	460	ACT:	437

PUMP NO.	P-4
MANUFACTURER	ARMSTRONG
MODEL	4X4X6 4380
IMPELLER SIZE	N.A.
SYSTEM SERVED	TOWER WATER

TEST DATA	GPM	FT. HD.	BHP
DESIGN	400	110	N.A.
ACTUAL	407	N.A.	14.9
DESIGN GPM SYST.	400		
DISCH. VALVE S.P.	N.A.		
DIFF. PRESS. S.P.	N.A.		
DISCHARGE	N.A.		
SUCTION	N.A.		
∆P	N.A.		

BLOCK OFF	
DISCHARGE	N.A.
SUCTION	N.A.
∆P	N.A.

MOTOR MFG.	WEG		
MOTOR HP	20		
RPM	3525		
SERVICE FACTOR	1.15		
VFD HZ SETTING	60 HZ		
AMPS	23.8	ACT:	18.6
VOLTS	460	ACT:	437

CFM TEST & BALANCE CORPORATION

14 DEPOT SQUARE, BETHEL, CT 06801
TEL (203) 778-1900 CFM@SNET.NET

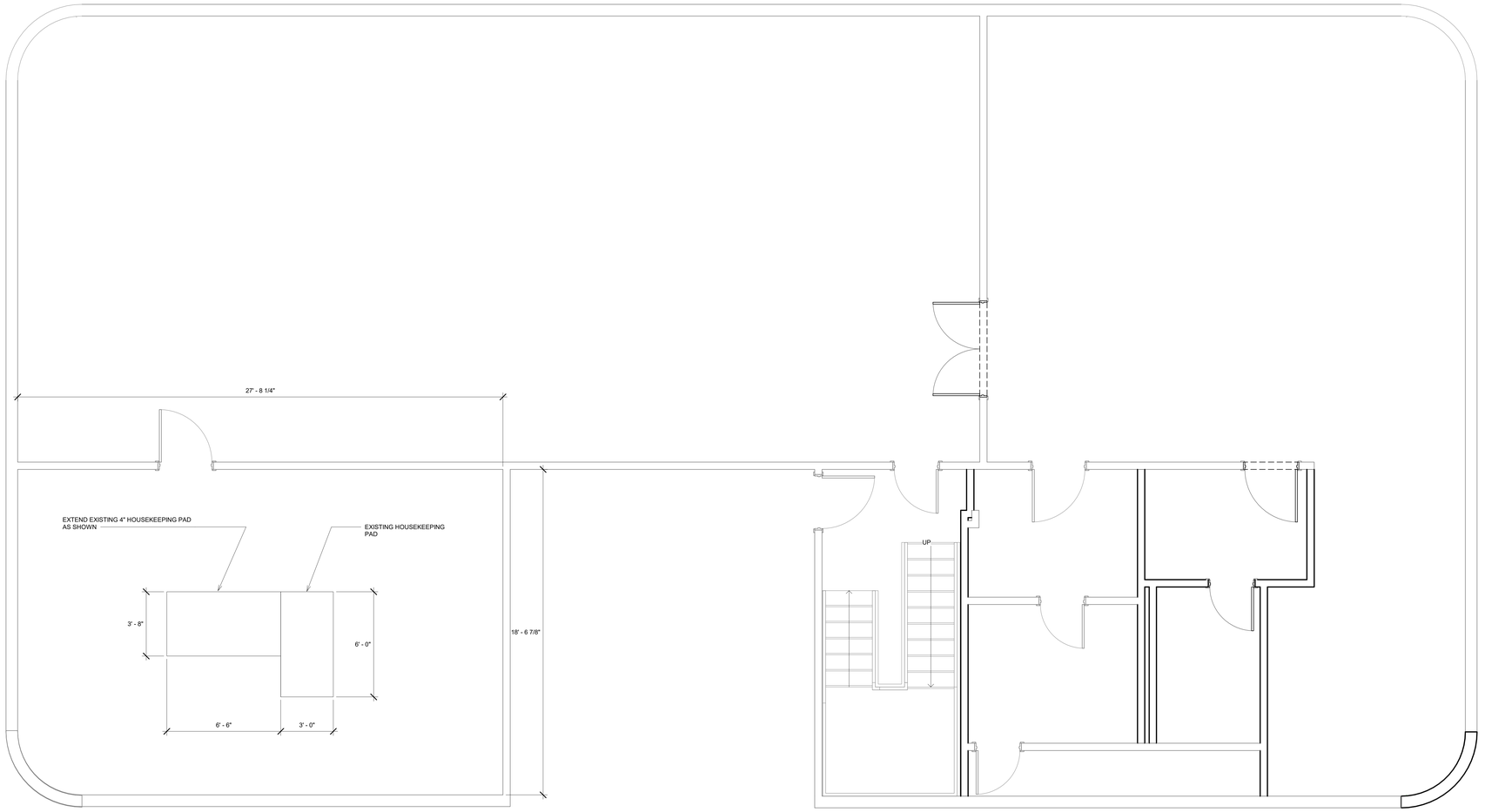
ASHFORTH
HEAT EXCHANGER REPLACEMENT
20 HORSENECK ROAD
GREENWICH, CT

DATE: 2/24/20 BY: AA

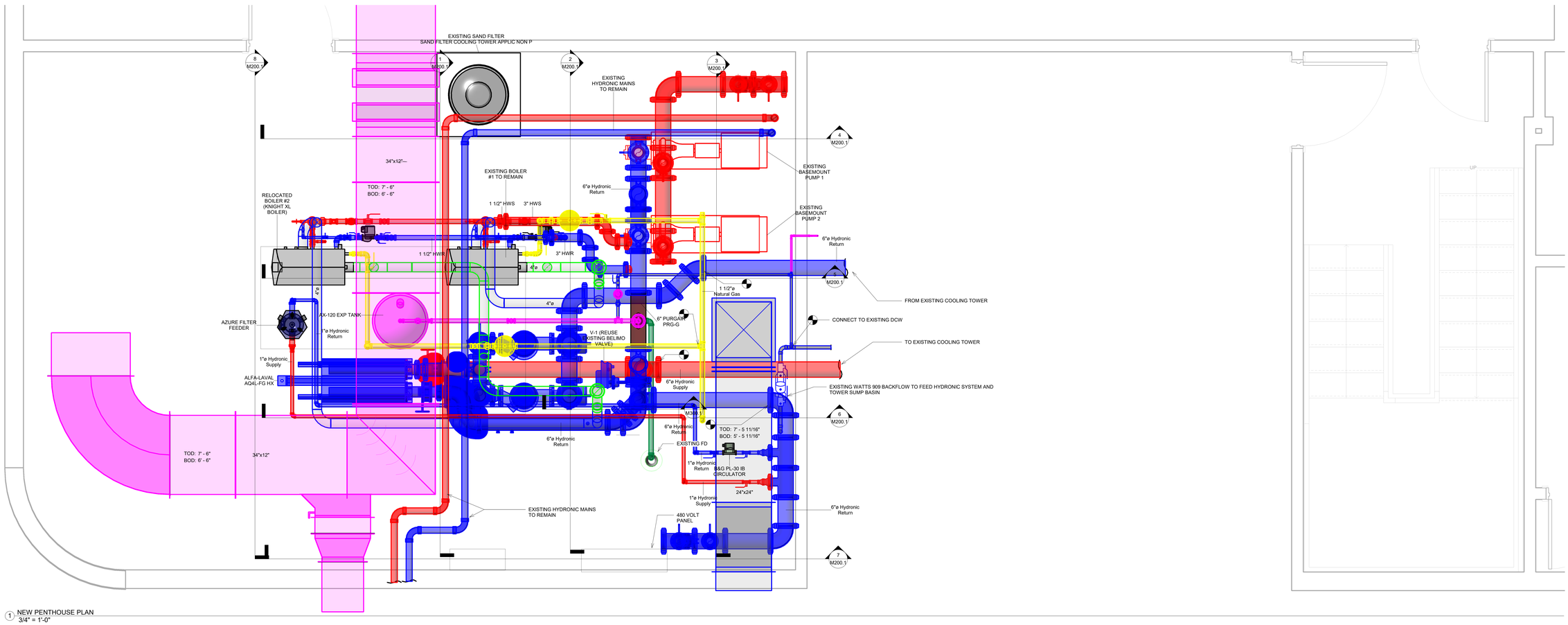
DATA SHEET # 2

CFM 6483

LOCATION	#	MODEL	SIZE	DESIGN		FINAL	
				GPM	PD	PD	GPM
P-3							
HX-COLD SIDE	1	ALFALAVAL	AQ4L-FG	400	5.5	5.6	404
P-4							
HX-COLD SIDE	2	ALFALAVAL	AQ4L-FG	400	5.5	5.7	407



2 PENTHOUSE ARCHITECTURAL
3/8" = 1'-0"



1 NEW PENTHOUSE PLAN
3/4" = 1'-0"

EASTERN MECHANICAL SERVICES
3 Starr Street, Danbury, CT 06810
Ph. 203.792.7668 www.emsinc.us

No.	Description	Date

20 HORSENECK LANE LLC

20 HORSENECK LANE HX PROJECT

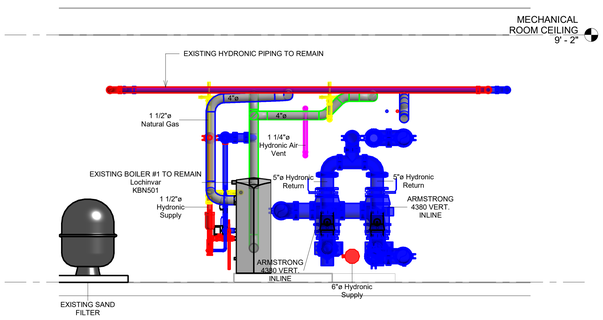
20 HORSENECK LANE GREENWICH, CT

AS-BUILT BOILER ROOM PLAN

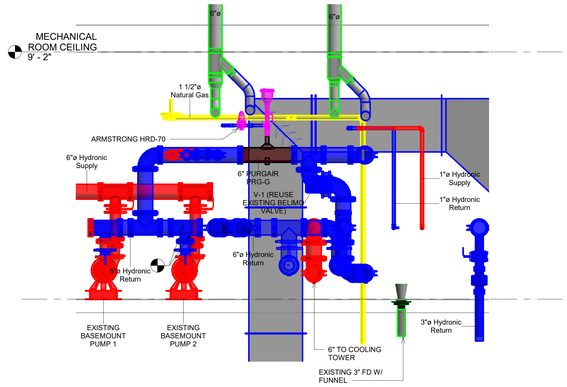
Project Number	4938
Date	2/14/2020
Drawn By	T.H.
Checked By	T.H.

M200.0

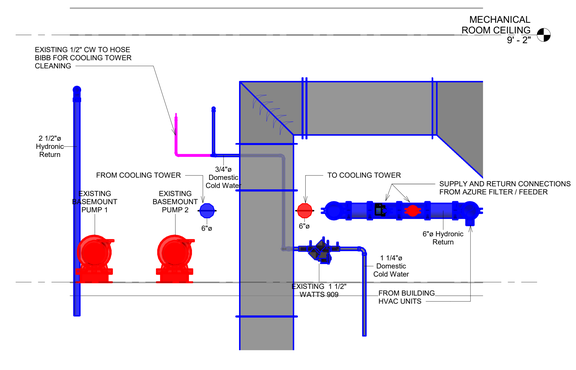
2/15/2020 7:12:29 PM



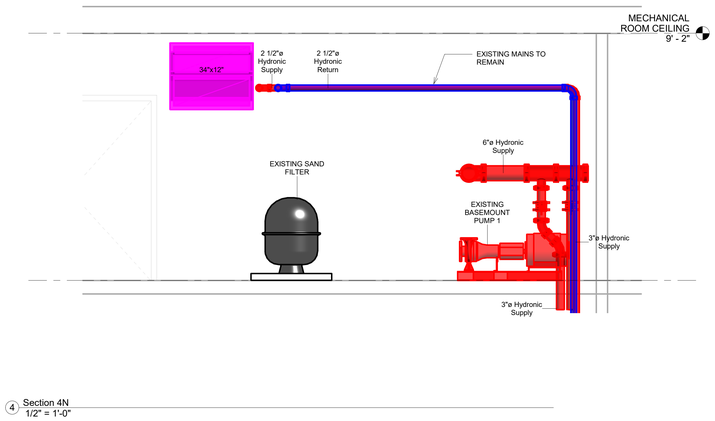
1 Section 1N
1/2" = 1'-0"



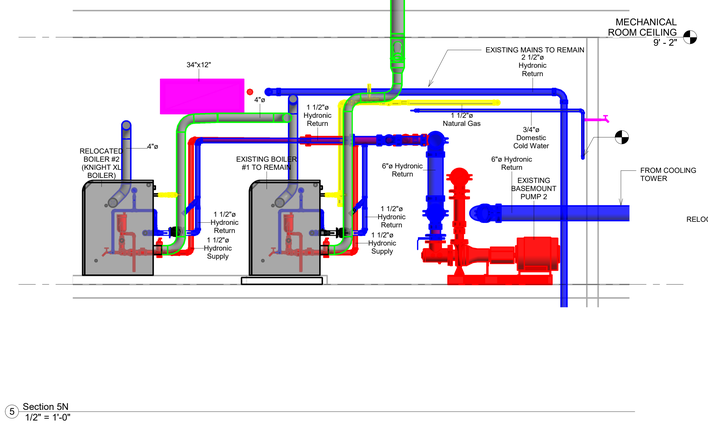
2 Section 2N
1/2" = 1'-0"



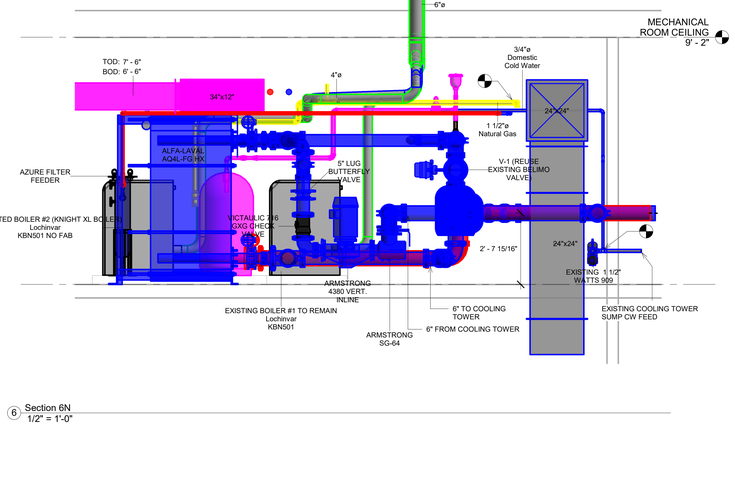
3 Section 3N
1/2" = 1'-0"



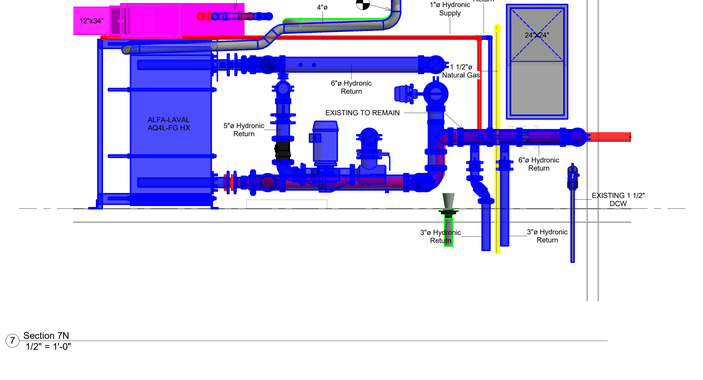
4 Section 4N
1/2" = 1'-0"



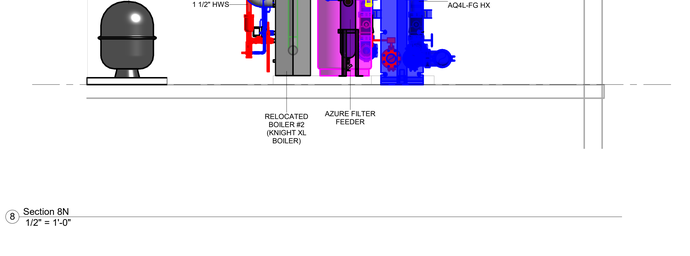
5 Section 5N
1/2" = 1'-0"



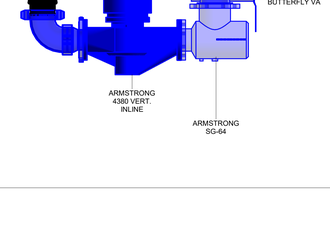
6 Section 6N
1/2" = 1'-0"



7 Section 7N
1/2" = 1'-0"



8 Section 8N
1/2" = 1'-0"



9 PUMP DETAIL
1" = 1'-0"

EASTERN MECHANICAL SERVICES
3 Starr Street, Danbury, CT 06810
Ph. 203.792.7668 www.emsinc.us

No.	Description	Date

20 HORSENECK LANE LLC

20 HORSENECK LANE HX PROJECT

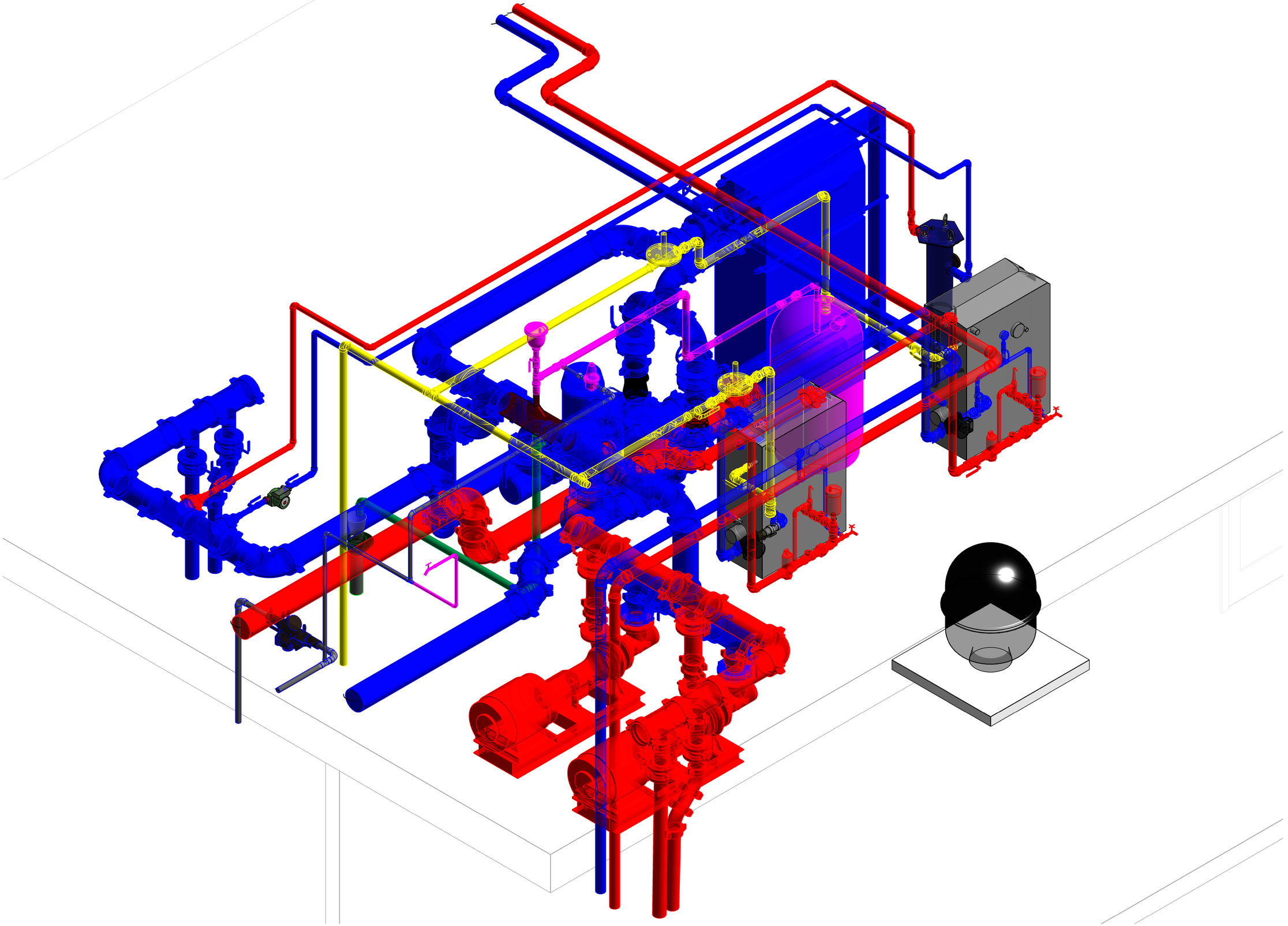
20 HORSENECK LANE GREENWICH, CT

AS-BUILT LAYOUT SECTIONS AND PUMP DETAILS

Project Number	4938
Date	2/14/2020
Drawn By	T.H.
Checked By	T.H.

M200.1

2/15/2020 7:27:37 PM



1 NE ISO VIEW N

EASTERN MECHANICAL SERVICES
3 Starr Street, Danbury, CT 06810
Ph. 203.792.7668 www.emsinc.us

No.	Description	Date

20 HORSENECK LANE LLC

20 HORSENECK LANE HX PROJECT

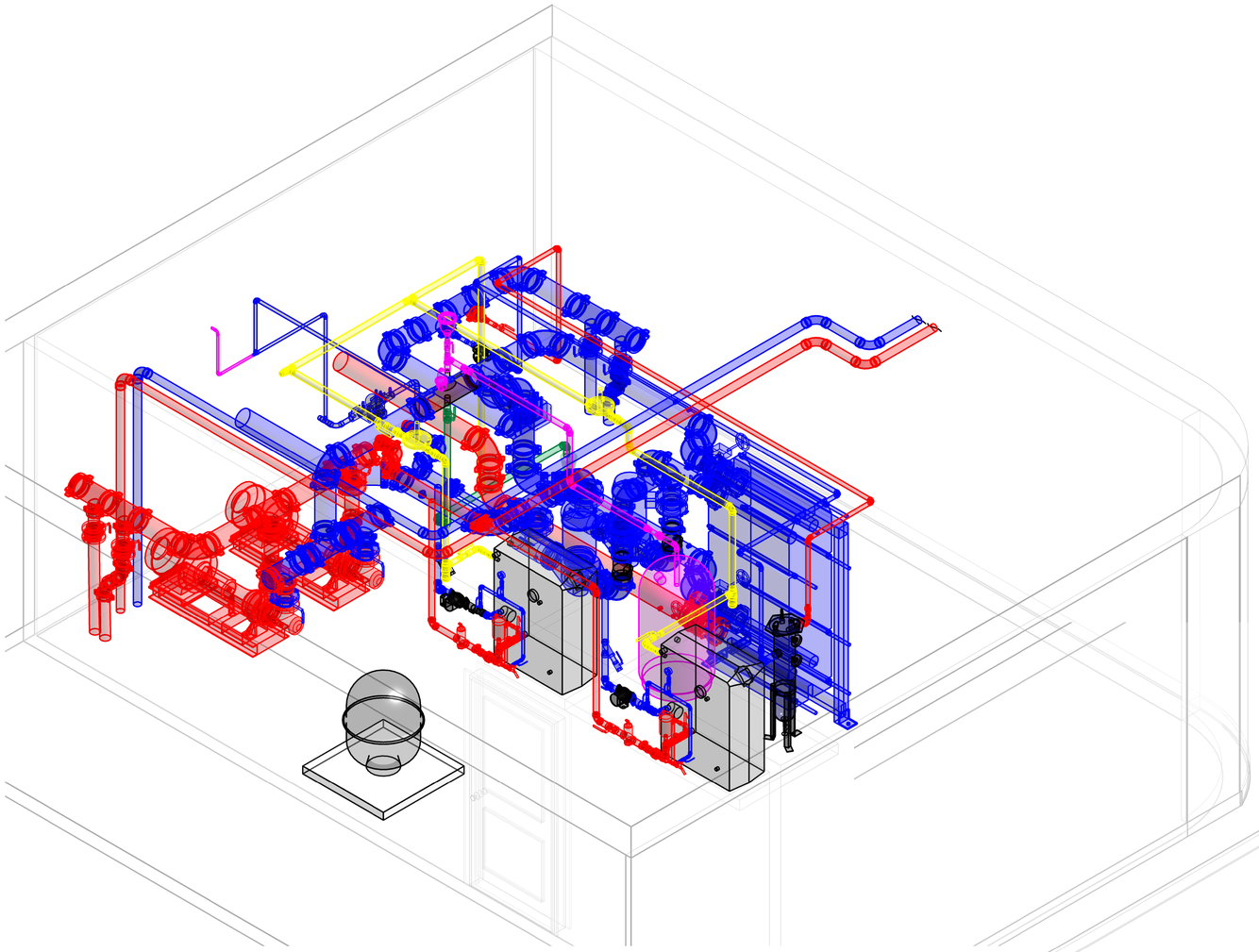
20 HORSENECK LANE GREENWICH, CT

AS-BUILT NE ISO VIEW N

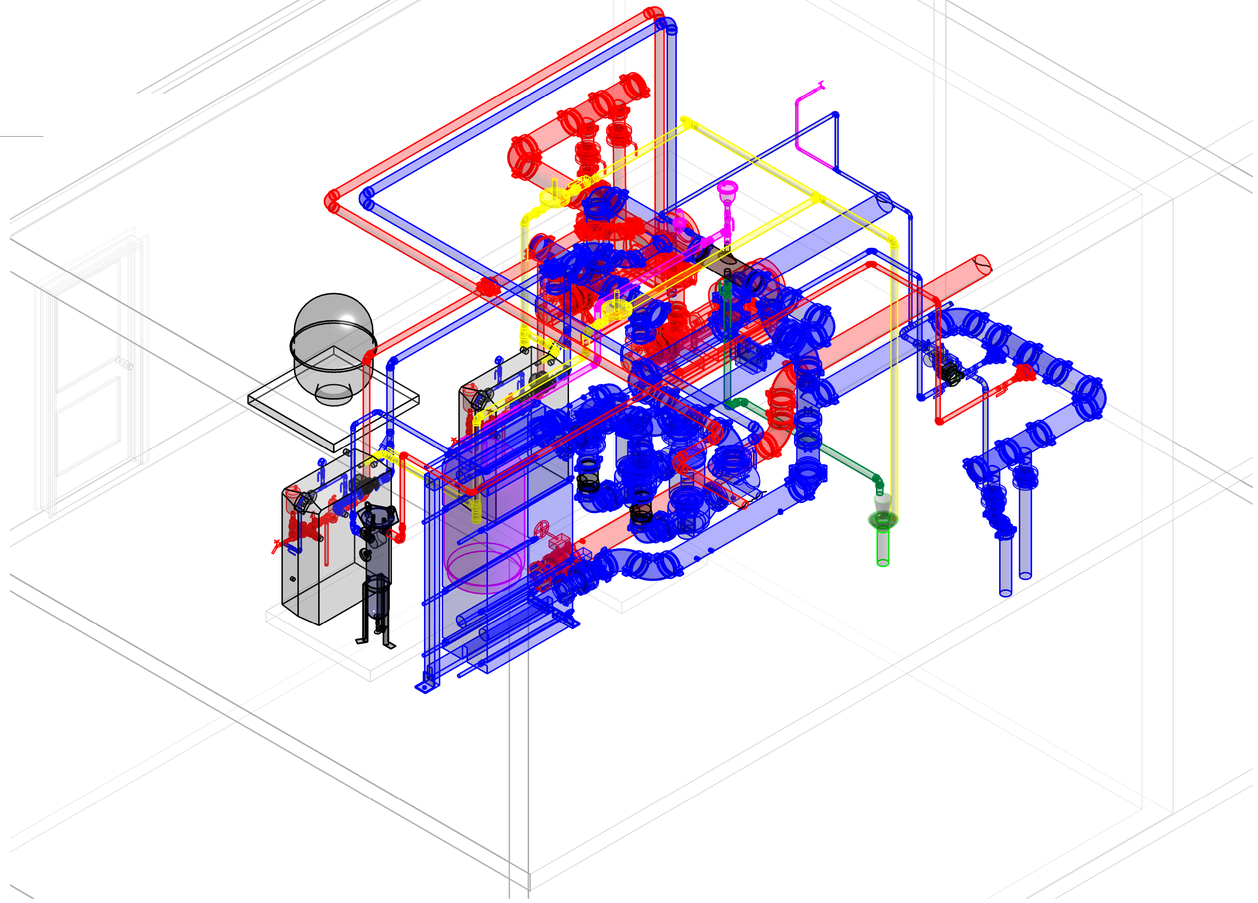
Project Number	4938
Date	2/14/2020
Drawn By	T.H.
Checked By	J.H.

M200.2

2/15/2020 7:14:01 PM



1 NW ISO VIEW N



2 SW ISO VIEW N

EASTERN MECHANICAL SERVICES

3 Starr Street, Danbury, CT 06810
Ph. 203.792.7668 www.emsinc.us

No.	Description	Date

20 HORSENECK LANE LLC

20 HORSENECK LANE HX PROJECT

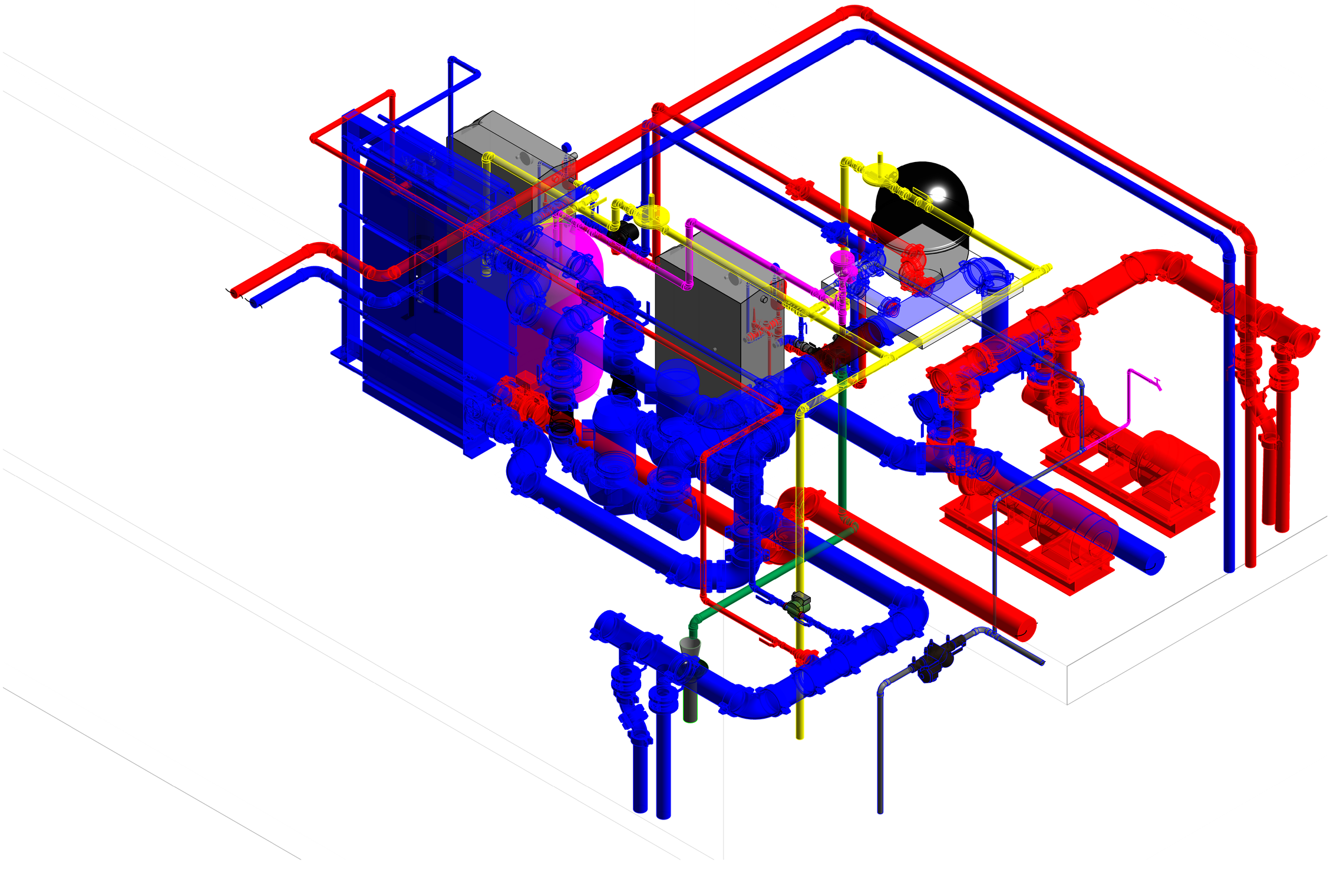
20 HORSENECK LANE GREENWICH, CT

NW / SW AS-BUILT ISO VIEWS

Project Number	4938
Date	2/14/2020
Drawn By	T.H.
Checked By	T.H.

M200.3

2/15/2020 7:16:55 PM



1 SE ISO VIEW N

EASTERN MECHANICAL SERVICES
3 Starr Street, Danbury, CT 06810
Ph. 203.792.7668 www.emsinc.us

No.	Description	Date

20 HORSENECK LANE LLC

20 HORSENECK LANE HX PROJECT

20 HORSENECK LANE GREENWICH, CT

SE AS-BUILT ISO VIEW

Project Number	4938
Date	2/14/2020
Drawn By	T.H.
Checked By	T.H.

M200.4

2/15/2020 7:17:42 PM

Eastern Mechanical Services, Inc.
3 Starr Street
Danbury, CT 06810
Phone: 203.792.7668 Fax: 203.748.0385

February 15, 2020

WARRANTY

We hereby warrant that the **HVAC IMPROVEMENTS TO HYDRONIC SYSTEM (ADDED HX TO SYSTEM)**

Which we have performed at the 20 Horseneck Lane, Greenwich, CT

Has been done in strict accordance with International Mechanical 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 February 1, 2020 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 / President

Date: February 15, 2020