Continental Electronics

816HD Series FM-IBOC TRANSMITTERS

PRE-INSTALLATION GUIDE

This manual is intended to be a guide to help you prepare your transmitter facility for the installation of your new Continental FM Transmitter. This manual contains mechanical, electrical, and cooling information for the transmitter. It also contains shipping information and telephone numbers for Continental support personnel who will be working with your order. Please don’t hesitate to call on us if you have any questions.

Please make this manual available to your installation engineer.

Continental Electronics Corporation

Factory Contacts

24 Hour Emergency Phone Numbers
Technical Service: (214) 388-5800
Parts Service: (214) 388-3737

*** Main Switchboard: (214) 381-7161**
Fax: (214) 381-3250
*8:00 AM - 5:00 PM Central Time, Monday - Friday
(Except Holidays)

Sales Department
Michael Troje, Broadcast Sales Manager (214) 275-2319

Contract Administration - Order Processing
Dona Watson, Contract Administrator (214) 275-2303

Shipping Department
Ext. 2379: Timmy James

4212 South Buckner Blvd
Dallas, Texas 75227

http://www.contelec.com

816HD SERIES FM TRANSMITTER PRE-INSTALLATION INFORMATION

GENERAL INFORMATION

Output Power

The 816HD series transmitters cover the power range of 11kW to 28kW. Table 1 lists the power rating for each transmitter model in this series:

Table 1. Transmitter Rated Power

816HD-20	11kW - 20kW
816HD-25	20kW - 25kW
816HD-28L	25kW - 28kW

816HD-20 and 816HD-25 Transmitters

All the 816HD-20 and 816HD-25 transmitters are completely self-contained, including the harmonic or low pass filter. The primary power is connected to the main transmitter cabinet.

816HD-28L Transmitter

The 816HD-28L transmitter requires a separate plate transformer and rectifier cabinet. The plate transformer and rectifier cabinet has no controls, fans or blowers, interlocks, or circuit breakers and may be placed at any convenient location within 100 feet of the main transmitter cabinet.

The ends of the plate transformer cabinet may be placed against other equipment or wall and the back may be placed as close as six inches from a wall or other equipment.

It is only necessary to have access to the top and front side of the plate transformer cabinet. It will be necessary have one 2-inch and one 1-inch conduit between the main transmitter cabinet and the plate transformer cabinet. Primary power is connected to the main transmitter cabinet.

The 816HD-28L liquid-cooled transmitter includes a cooling system, consisting of a heat exchanger with dual fans and a redundant pump system, to provide cooling as needed to adequately cool the PA tube. The cooling system also includes a filtration system and manifold assembly with replaceable filter elements.

Table 2. Transmitter Weights (approx)

816HD-20	2100 lbs
816HD-25	2260 lbs
816HD-28L	
Main transmitter cabinet	1657 lbs
Plate Transformer Cabinet	900 lbs
Heat Exchanger	490 lbs

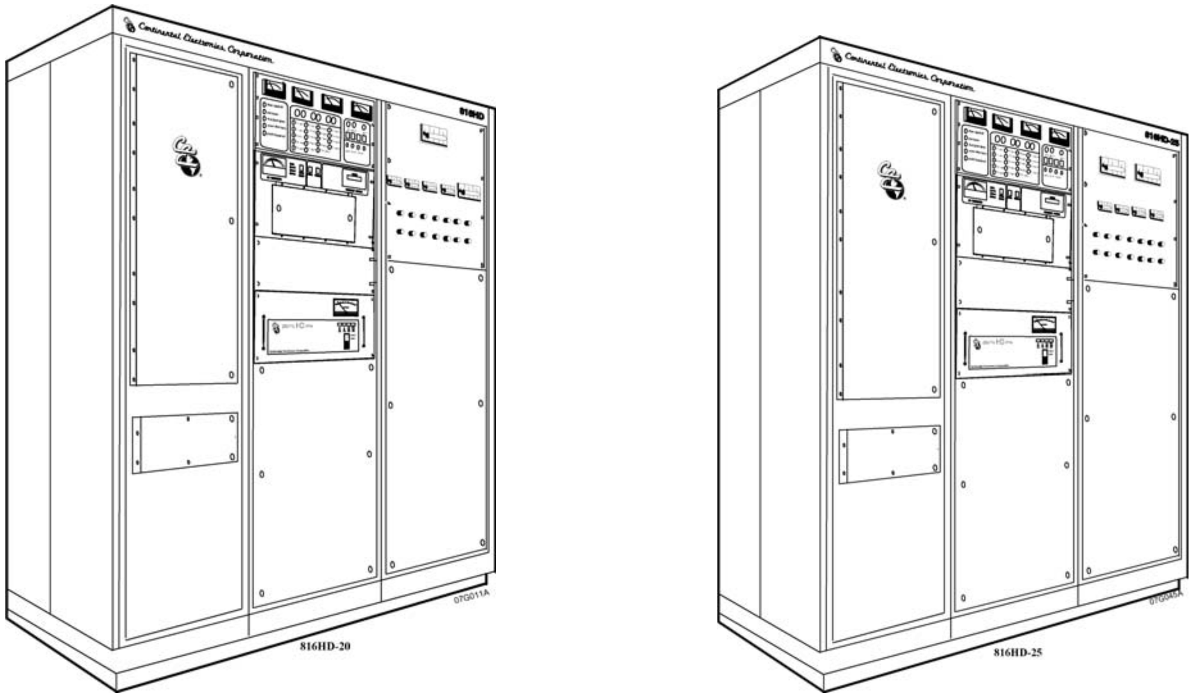


Figure 1. 816HD-20 and 816HD-25.

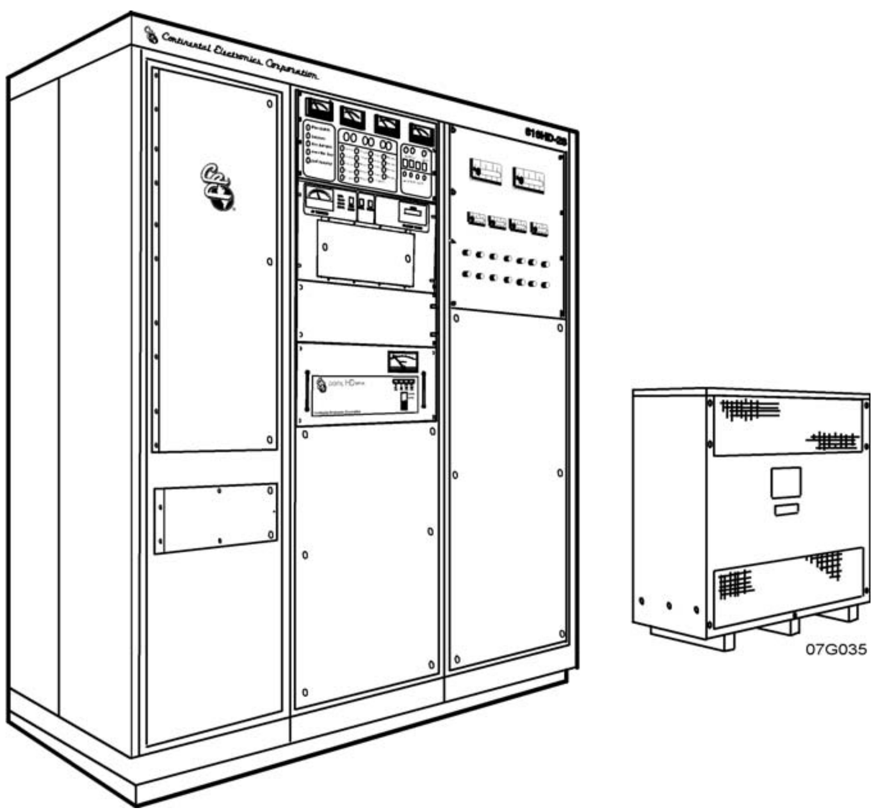


Figure 2. 816HD-28L (28L Heat Exchanger not shown).

TRANSMITTER ROOM

Figure 3 shows a sample floor layout for the 816HD series FM Transmitters. There should be a minimum of 36 inches clearance at the front and rear of the transmitter. There is no requirement for maintenance access to the ends of the transmitter and the ends of the transmitter can be placed against other cabinets or a wall.

There should be adequate electrical outlets in the room so that extension cords are not necessary. The transmitter room should be planned so that the area around the transmitter is clear at all times for safety reasons. A workbench and storage space should be included in the transmitter room plans.

Arrange for all cable entrances to be on the same wall close to each other for proper grounding. Grounding will be discussed in another area of this manual.

In order to minimize the effects of wind on transmitter and building cooling, arrange for all air openings to be on the same wall.

Refer to Figures 4 and 5 for location of transmitter air intake and exhaust, wire entrances, and cabinet dimensions.

Concrete walls and floors must be sealed to eliminate the very fine concrete dust.

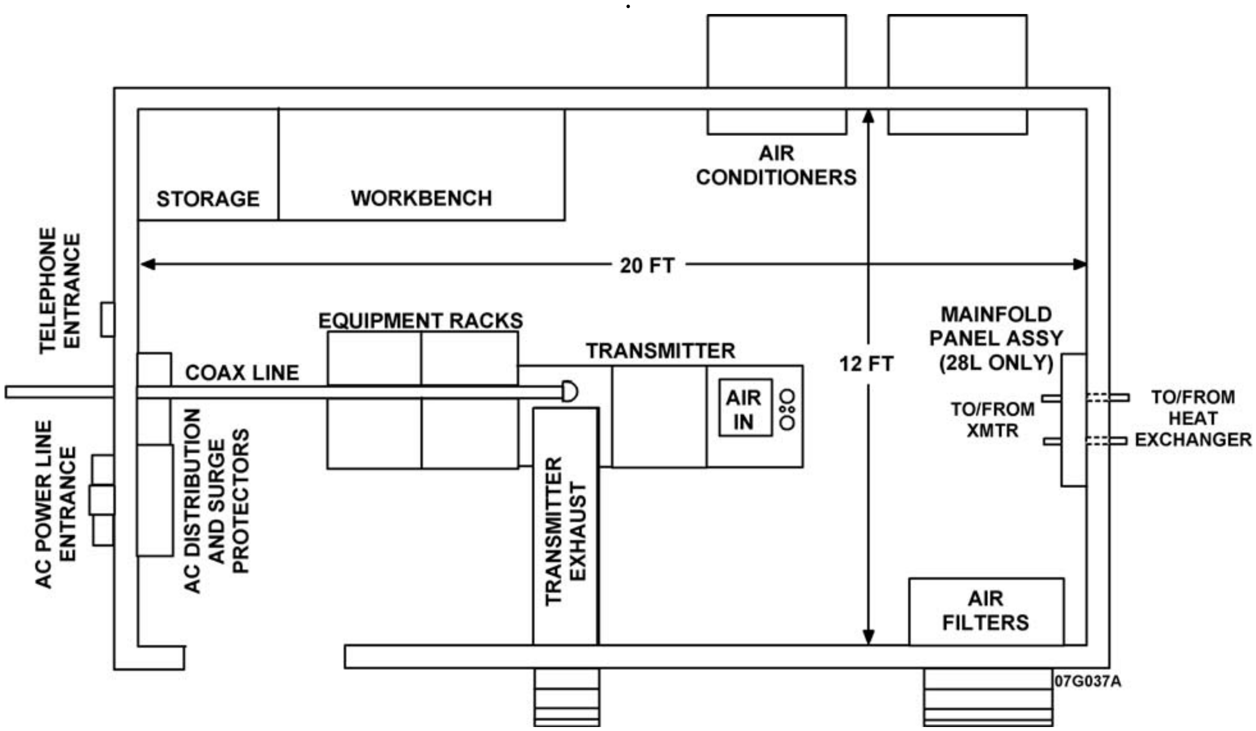


Figure 3. Sample Floor Layout.

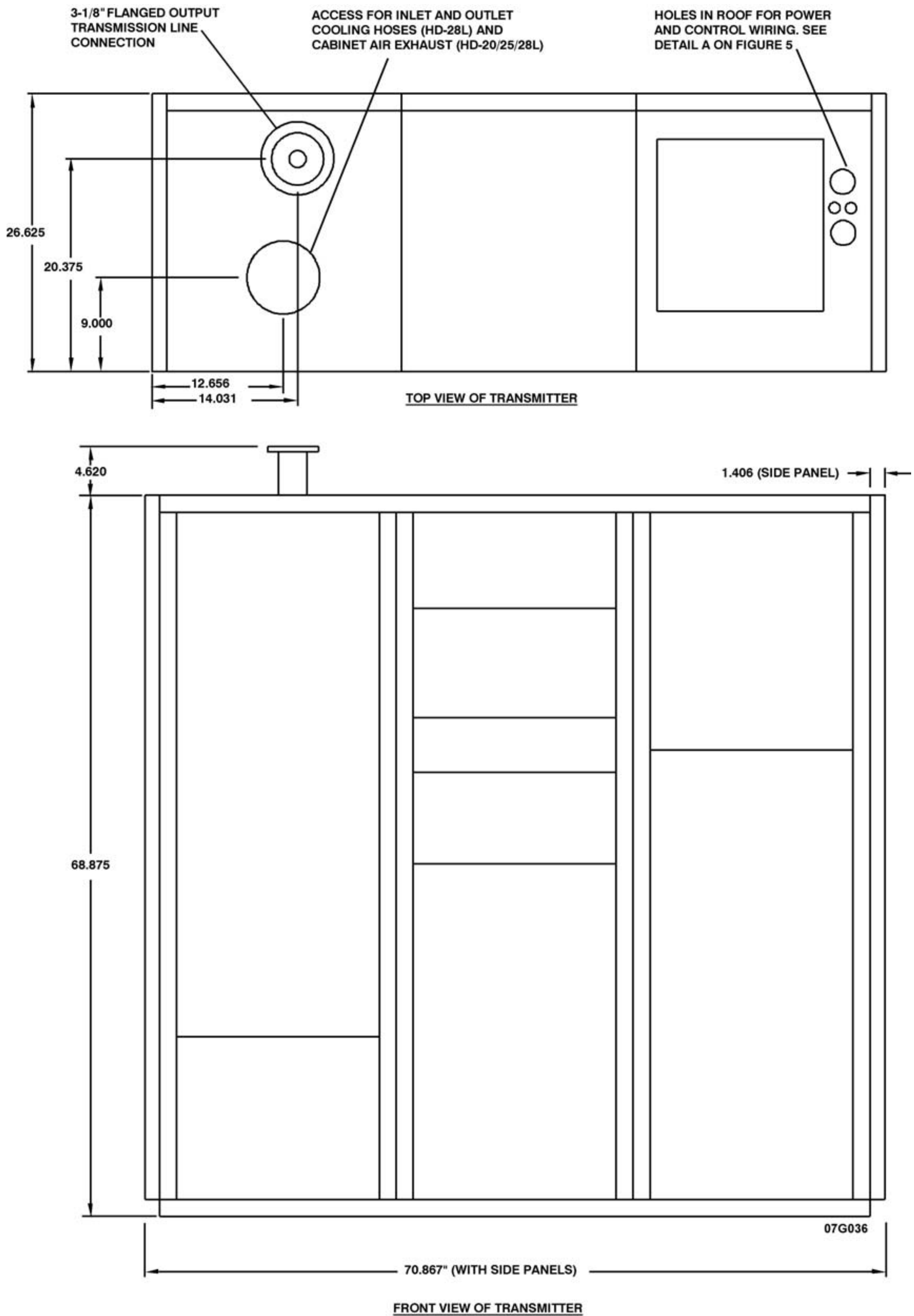


Figure 4. 816HD Transmitter Cabinet Dimensions.

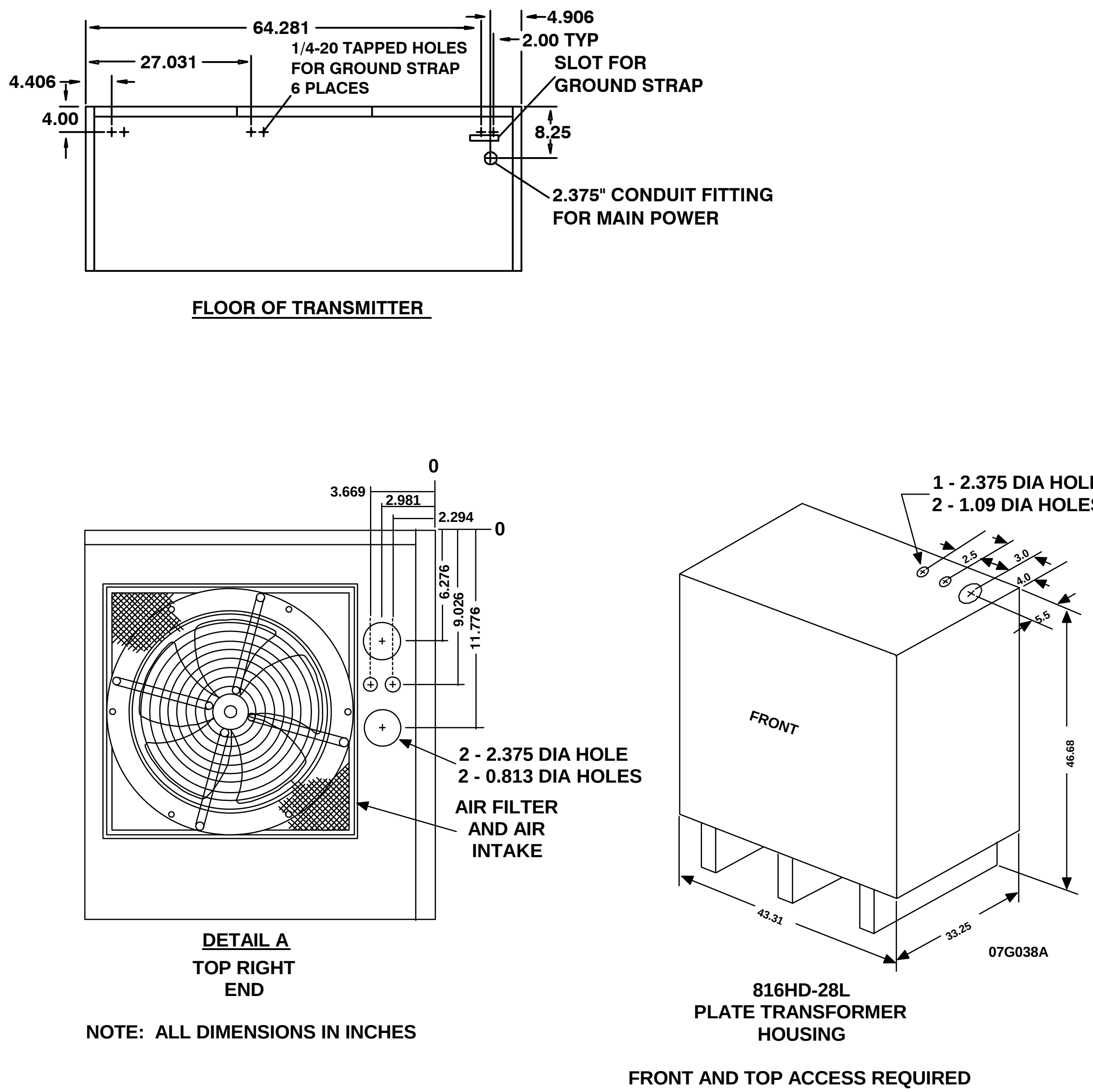


Figure 5. 816HD Series Transmitter Dimensions.

ELECTRICAL REQUIREMENTS

AC Voltage Requirements.

All 816HD transmitters require 3-phase, 200 to 250 volts, 50 or 60 Hz, AC primary power of either Wye or closed Delta configuration (**DO NOT use open delta)**. The 816HD-20 transmitter requires 200 Amp service while the 816HD-25 and 816HD-28L require 400 Amp service. Line-to-line balance must be within five percent both for voltage and phase when the transmitter is operating at desired power. Rotary phase converters are acceptable where commercial three-phase power is not available for the 816HD-20 and 816HD-25, but is not acceptable for the 816HD-28L. There are special considerations when rotary phase converters are used. The filament circuit must not be connected to the "manufactured" phase. Please call Continental Technical Service if considering this option.

Figures 4 and 5 show the location of the openings in the top and floor of the transmitter that can be used to bring the power cables into the transmitter. Power cables may be brought in through either a two-inch knockout in the top of the cabinet or through a two-inch round opening in the floor of the transmitter. If the floor opening is chosen, make certain that the AC wires do not come closer than two inches to the windings of the high voltage transformer.

In order to prevent heating of the fuse or breaker box contacts, the fuse disconnect box or the circuit breaker box should have a 200-amp rating for the 816HD-20. The 816HD-25 and 816HD-28L should have a fuse disconnect box or a circuit breaker box with a 400-amp rating. (Lower rated breakers or fuses may be used in the 400-amp box). Fuses should be the slow blow type if used. The size of the power wiring is determined by local electrical code and good engineering practice, considering breaker or fuse rating. For safety reasons the breaker or fuse box must be located close to Transmitter.

Transient Protection

AC line transient suppressors are suggested for the primary lines. It is important to select the appropriate line-to-ground voltage rating for your transient protectors. The line-to-line voltage for a wye configuration is 208 volts and the voltage from each line or leg to ground of a wye power source is 120 volts AC. Refer to Figure 6.

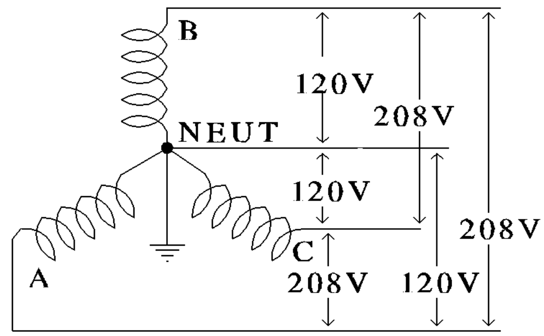


Figure 6. Wye Configuration.

Two of the three legs, phase A and C, of a conventional delta configuration are 120 volts AC with respect to ground and the third leg, Phase B, is 208 volts with respect to ground and should be positively identified before voltage is applied to transient suppressors. Refer to Figure 7.

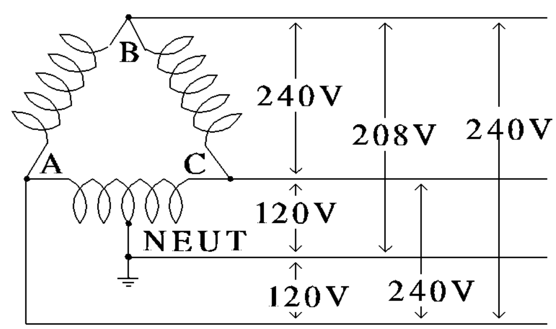


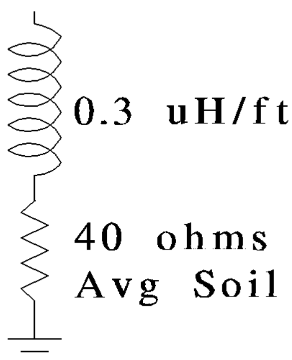
Figure7. Delta Configuration.

This "high leg" is the B phase and should be marked with an orange color identifier. Before AC power is applied to the transient suppressors, verify the voltage rating of the suppressors and the "high leg" connection to the suppressors where delta configuration is used. For recommendation, call your Sales Representative or Continental Technical Service.

ELECTRICAL GROUNDING

Grounding and equipment bonding is essential for personnel safety and reliable operation of your transmitter. An FM transmitter can operate without proper grounding but is almost certain to sustain extensive damage from power line and lightning transients. Without proper grounding and bonding, all equipment in a transmitter building will be extremely dangerous to personnel in that building during an electrical storm.

Figure 8. Ground Path.



There is no perfect ground. A path to ground consists of inductive reactance and resistance. A 10-foot ground rod in average soil will have about 40 ohms resistance and a round conductor connecting to the ground rod will have about 0.3 microhenries of inductance per foot.

It is not uncommon for a lightning strike to have 200,000 amperes current. A typical lightning strike will have 20,000 to 30,000 amperes and a rise time of approximately one microsecond. If you consider a lightning strike of just 1,000 amperes, the voltage at the ground rod can be about 40,000 volts peak due to resistance alone. This is the reason for installing several ground rods at the tower and at your common earth ground point.

To be effective, multiple ground rods should not be closer than ten feet.

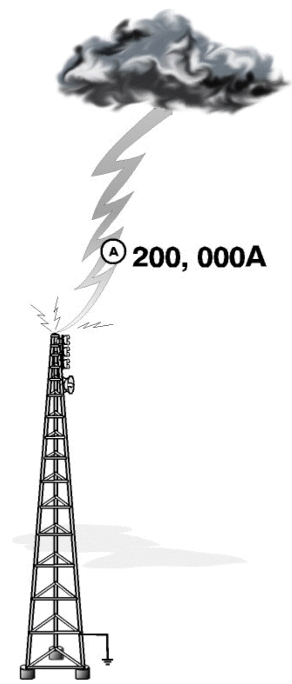


Figure 9. Direct Lightning Strike.

Usually four rods, connected with four inch copper strap, spaced around the tower will be required. Round conductors have approximately the same inductance regardless of size. Wide flat copper strap should be used to reduce the ground conductor inductance. If the soil conductivity is poor, it may be necessary to install a counterpose system much like that used for ground systems at AM towers.

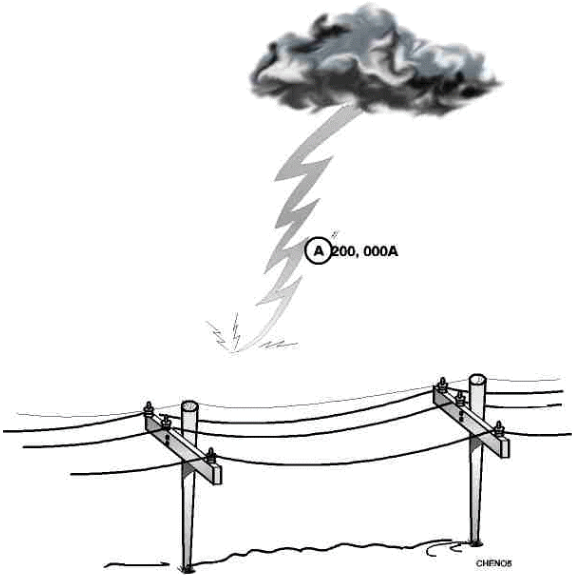


Figure 10. Indirect Lightning Strike.

Lightning does not have to make a direct strike on the power line to generate damaging currents and voltages. A strike close to the power lines will induce a current in all the lines including the ground conductor. Since there is no perfect ground, a lightning strike on or near the power company lines will cause fault currents to take a path to ground through your transmitter site ground system as well as the power company ground system. When your tower takes a lightning strike, fault currents will take a path to ground through the power company ground system as well as your ground system. **Install your ground system so that fault currents do not take a path through your equipment.**

Each coaxial cable and all protection devices for electrical and telephone lines that enter your transmitter building must be grounded outside the building. The ideal situation would be where all cables and electrical service cables enter the building at one small area which is close to the station "earth ground" point. Individual ground straps from each coaxial line, a ground strap from the telephone protection block, a ground strap from the AC power transient protection suppressors, a ground strap from the transmitter, and a ground strap from each equipment rack in the building would come together at this common ground point.

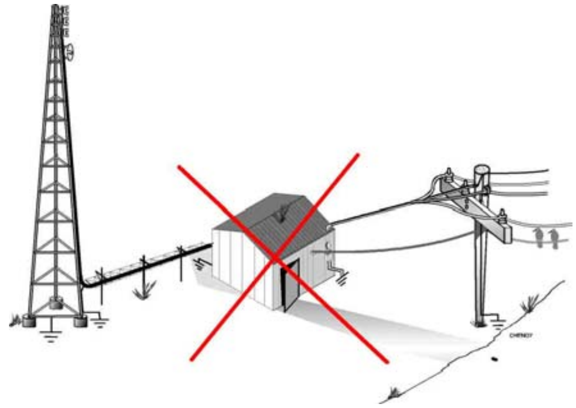


Figure 11. Serial Ground System.

Do not install the ground system in a serial manner. Let there be just one ground connection point and all ground connection are made at that point. This type of grounding system minimizes the possibility of fault currents taking a path through equipment to get to the "earth ground."

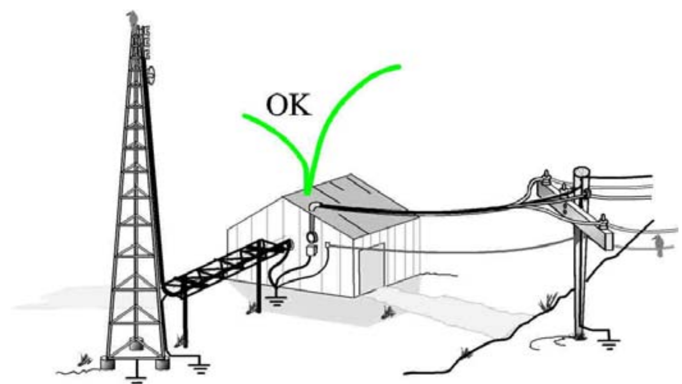


Figure 12. Single-Point Ground System.

For personnel safety, all equipment inside the building must be bonded together. This includes any metal equipment or objects such as transmitters, cable trays, racks, transformers, conduits, etc. Ground straps should be four-inch wide copper to provide a low inductance path to ground. All strap connections must be secured between bolted plates or brazed because of the very high currents that are present during a lightning strike. Soft solder connections can melt and your ground path will open.

TRANSMITTER ROOM COOLING

Exhaust Ducted to the Outside

The transmitter exhaust may be ducted to the outside when air conditioning or ventilating the transmitter space. Careful consideration must be given to location of transmitter, air intake, and air outlet vents. First, consider where to place the transmitter. The transmitter exhaust will be vented to the outside and transmitter will take air from the room. Since the transmitter will exhaust to the outside, the exhaust vent on the transmitter should be placed as close as possible to an outside wall. The exhaust ductwork must be insulated to reduce heating to the room

.

Do not duct the transmitter exhaust through the building roof. It is extremely difficult to leak proof ductwork through the roof. When the seal at the roof fails, water will come directly into the transmitter.

The ducts must be kept as short as possible to minimize backpressure at the transmitter outlet. Remember that elbows, vent caps, and hoods all add extra resistance to air flow through the transmitter. In most installations, the transmitter can be placed so that no more than eight feet of exhaust duct is needed. If this is possible, 16 inch round duct or the equivalent rectangular duct will be acceptable. Do not use more than two elbows. Use elbows that have long radius and are smooth inside. Refer to Figure 13. **Do not use flexible duct or adjustable elbows that can be adjusted for any angle between straight and 90 degrees**. These types have very rough interior surfaces with high turbulence and air resistance.

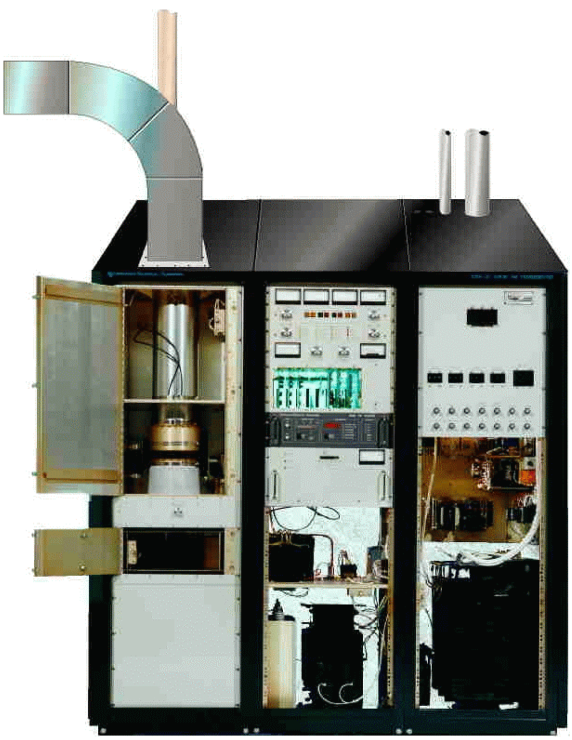


Figure 13. Acceptable Ductwork.

Figure 14. Unacceptable Ductwork.

NOTE: Backpressure

The maximum backpressure at the transmitter exhaust must not exceed 0.1 inch H_2O.

There must be approximately 1000 CFM of filtered replenishment air coming into the room from the outside if you duct the tube exhaust to the outside. The transmitter will “starve” for air if you fail to provide for this “make up” air. **A restriction of the air into the building has the same detrimental effect on transmitter cooling as a restriction at the transmitter tube exhaust**. It is not a good practice to connect more than one transmitter to the same exhaust duct. Let each transmitter have its own individual exhaust duct. Connect the ductwork directly to top of the transmitter using sheet metal screws. The transmitter cover is approximately two inches above the RF cavity and no harm will be done by attaching the duct to the transmitter cover.

Where possible, use large ductwork instead of duct fans. Duct fans may be required if the duct run is long or you have several elbows, but duct fans increase air resistance if they fail; therefore, some method of monitoring air flow and interlocking the transmitter must be used if there is no alternative to the use of duct fans.

It is a good practice to place the transmitter exhaust and the building air intake on the same building wall. This arrangement allows pressure from the wind to be applied equally to both inlet and exhaust, thus neutralizing the effects of wind on the air system. The exhaust air will be hot, and if returned to the room, will place an additional load on the air cooling system. Make sure that there is no possibility that the exhaust air can be returned to the building air intake. This is usually accomplished by placing the air intake high on the wall and directing the exhaust air downward and away from the intake opening. Always place the intake opening as high as possible to provide the cleanest air to the air intake.

COOLING BY AIR CONDITIONING

Air conditioning a transmitter space results in a clean environment for the transmitter and in some geographical areas, is essential because of high ambient temperatures, high humidity or very dirty conditions. You may duct the tube exhaust to the outside or re-circulate the tube exhaust back into the room. There is seldom a valid reason to duct the transmitter air intake to the outside. The transmitter cabinet fan is designed to move a large volume of air but not against air resistance. Where intake ducting is used, the intake duct must be very large in order to prevent air starvation. If the outside air is hot enough to require air conditioning, the transmitter should have the advantage of the cooler, cleaner air from the room.

Air Conditioning units are mechanical and may fail. It is ideal to have two identical units that are set to slightly (5 degrees) different temperature settings. Because air conditioners operate most efficiently when running continuously, select units that are marginal in their capacity when operating alone. Arrange a selector switch to swap the thermostats from one air conditioner to the other. This will allow both units to accumulate equal running time without changing the thermostat settings.

The following paragraphs will help you determine the heat load that the transmitter generates but does not include other equipment or the building heat load from the outside environment. Your HVAC contractor should be able to calculate the building cooling requirements.

CAUTION:

When you are totally dependant upon air conditioning equipment for cooling, the transmitter will overheat if the air conditioning equipment fails. Temperature monitoring, temperature interlocks, and remote alarms are essential where air conditioning is used.

Tables 3 through 5 show the approximate amount of heat that can be exhausted and heat that is vented to the room where the transmitter is ducted to the outside.

Table 3. Heat Load, 816HD-20

TPO	Heat Ducted outside	Heat To Room
20kW	72,090 BTU	7,800 BTU
17.5kW	65,370 BTU	7,700 BTU
15kW	57,820 BTU	7,530 BTU
12.5kW	49,760 BTU	6,560 BTU

Table 4. Heat Load, 816HD-25

TPO	Heat Ducted Outside	Heat To Room
22.5kW	82,906 BTU	7,880 BTU
25kW	77,936 BTU	7,980 BTU

Table 5. Heat Load, 816HD-28L

TPO	Heat Ducted Outside	Heat To Room
28kW	78,500 BTU	17,065 BTU

When the transmitter is ducted to the outside, you must account for cooling the replenishment air. If the outside air temperature is 100 degrees and you maintain 80 degrees in the transmitter room, you will require almost 11,000 BTU of air conditioning just to cool the 1000 CFM of outside air.

Closed Air Conditioning System

If the transmitter cannot be placed near an outside wall or the outside air is very dirty and cannot be effectively filtered, you may want to vent the transmitter to the room and close off all outside opening to the room. This will provide the cleanest possible environment for the transmitter but with added air conditioning costs.

The transmitter heat load is very simple to calculate in this instance. The AC input power will be converted to RF and heat. The RF goes to the antenna and the heat will be vented to the room and must be cooled. Subtract the transmitter power output from the AC input power and the result is the power in watts that is converted to heat. The factor for converting watts to BTU is 3413 BTU/kWatt. If you have a TPO of 25kW, the transmitter AC power input will be about 40kW and there will be 15kW of heat. Multiply 15 by 3413 and you have 51,195BTU of heat delivered to the room from the transmitter or approximately four tons of air conditioning requirement for just the transmitter. Avoid the possibility of exhaust air returning to the transmitter air intake. If the ceiling is high, 10 feet or more, it is not likely that exhaust air will get back into the air intake.

The following table shows the approximate total transmitter heat load at different transmitter power output levels.

Table 6. 816HD Series Total Heat Load
(See Table 1 for transmitter rated power)

TPO	Total Heat Load
28kW (28L)	95,565BTU
25kW	90,886 BTU
22.5kW	85,816 BTU
20kW	78,890 BTU
17.5kW	73,070 BTU
15kW	65,346 BTU
12.5kW	56,320 BTU

Air Cooled Test/Reject Loads

Air-cooled test and reject loads should be placed in an area that is ventilated rather than air conditioned, where possible. An air-cooled test load operating at 25kW will place a heat load of more than 85,000 BTU on the cooling system.

If one transmitter fails in a 40kW-combined system, the air-cooled reject load will place a heat load of more than 34,000 BTU on the cooling system while on one transmitter.

COOLING BY VENTILATION

The 816HD series transmitters can operate in a room environment where temperatures can be as low as -4 °F to as high as 122 °F. However, it is generally accepted that reliability can be greatly improved with building temperatures that are lower than 80 °F.

Exhaust Fans.

There are times when exhaust fans may be used to cool a transmitter space. It is better in this situation to vent the transmitter directly to the room or through a short duct to the attic and use exhaust fans in the room or the attic. It is important to arrange the transmitter exhaust so that there is no chance of re-circulation of exhaust air back into the transmitter.

If the room has a high ceiling (more than 10 feet), install a drop ceiling about eight feet from the floor. Vent the transmitter exhaust directly into the space above the drop ceiling. Let the transmitter take air from the room. Install air registers at the four corners of the drop ceiling that will allow air from the room to escape into the area above the drop ceiling. Install an exhaust fan that will evacuate the area above the drop ceiling. This method will not have the exhaust fan competing with the transmitter fan and blower, will prevent re-circulation (providing exhaust fan does not fail), and will provide ventilation for the transmitter space. There are variations of this scheme that will allow re-circulation (controlled by a thermostat) in the winter to heat the transmitter space.

Although exhaust fans and blowers are the most common method of ventilating transmitter spaces, they are not the best in some cases. Three reasons are listed below for choosing another method when there is a choice.

1. An exhaust fan allows unfiltered air into the transmitter room by expelling air from the room or building and pulling air into the room through any and all openings in the room. The transmitter space should be as clean and dust free as possible. It is not likely that the transmitter space can be air tight except for the filtered air intake. The unfiltered openings will allow dust and dirt into the transmitter space.

2. An exhaust fan may allow dead air spaces since it does not "stir" the air in a room. There is usually only one intended air inlet to a transmitter space and the air movement is from that inlet directly to the exhaust fan.

3. In installations where the transmitter is ducted to the outside and takes air from the room, the exhaust fan is competing with the transmitter cabinet fan and cavity blower for air through the same room air inlet. In this situation, the greater capacity of the exhaust fan will reduce the transmitter cooling if the room air inlet is not large in size. Where exhaust fans or blowers are used, the room air intake must be large enough so that the room in not under negative pressure. Negative pressure at the transmitter air inlet has the same detrimental effect as back pressure of the same amount at the transmitter air exhaust.

Positive Pressure.

Positive pressure ventilation forces air into the room and the air escapes through openings in the room and through the transmitter exhaust if ducted to the outside. The air may be forced into the room with propeller type fans or with centrifugal blowers. Propeller type fans move more air with smaller motors than will centrifugal blowers. A 30- or 36-inch fan is quiet and can move more than 3000 CFM of air into a room and use only a 1/4HP motor. Some of the advantages of positive pressure ventilation are:

1. All the air entering the room comes through one opening which can be easily filtered. When doors or windows are opened, air moves out through these opening.

2. A fan blowing air into a room will "stir" the room air, reducing the risk of dead air space. Deflectors at the fan can be used to direct air into areas that might not otherwise have moving air.

3. All fans aid each other. The fan that is forcing air into a room is aiding the transmitter fans in cooling the transmitter. All the fans, the room fan, the transmitter cabinet fan, and the power amplifier cavity blower are moving air in the same direction through the transmitter.

4. Like the exhaust system, the pressure system will also ventilate the room. The transmitter will exhaust about 500 cu-ft/min. of air to the outside. If the room fan is capable of moving three or four thousand cu-ft/min. of air into the room, another opening in the room must be provided for room ventilation.

An example of positive room ventilation will be described here. This is intended as an example and can be modified to meet your particular requirements.

Position the left end or the rear of the transmitter near an outside wall in order to keep the exhaust ductwork as short as possible. Position the transmitter so that the exhaust duct will not interfere with the coaxial RF output line. If the total duct run is eight feet or less and there are no more than two elbows, 16 inch round or the equivalent rectangular duct can be connected directly over the transmitter exhaust output using sheet metal screws. (Use care when drilling holes for sheet metal screws so as to avoid metal shavings falling into the transmitter.) The duct will have to be turned down at the outside to prevent rain and snow from getting into it. A bell type transition should be used at the end of the duct to reduce turbulence.

The duct at the transmitter exhaust will have a damper that will direct the exhaust to the outside or re-circulate the exhaust air back into the room. The damper will be motor controlled so that the opening to the room will be closed off at the same time that the air from the transmitter will be directed to the outside. With the damper in the second position, the air from the transmitter will be directed to the room instead of outside. This arrangement will allow the transmitter to exhaust to the outside in the summer and re-circulate to the inside in the winter.

A fan that has enough capacity to change the room air at least once each minute is installed in the wall. This fan pulls filtered air into the room through motor controlled louvers. A 3000 CFM fan will change the air once a minute in a 15X20 foot room having a 10-foot ceiling.

An opening with motor controlled louvers is provided in the same wall where the fan is mounted. The reason for intake fan and room air outlet being on the same wall is to minimize the effects of wind on the ventilation system. If both inlet and outlet are on the same wall, the effects of wind, regardless of direction, is neutralized since the wind pressure is the same on both. The transmitter air exhaust should be on this wall also. The transmitter exhaust should be positioned so that there is no risk of re-circulation.

With motor control on inlet and outlet louvers and transmitter duct damper, it is possible to control the operation of louvers, dampers, and the ventilation fan with thermostats. Set the thermostats to maintain the required equipment operating temperature at all times. Three conditions are described below:

1. At temperatures above 85 °F, a condition of maximum ventilation and cooling will result. The transmitter will be ducted to the outside and the intake fan will be running. The outlet wall louvers will also be opened to permit room ventilation.

2. For temperatures between 65 °F and 85 °F, a condition of minimum ventilation will exist at times when it is not necessary to run the room intake fan, but the transmitter should be vented to the outside. Under these conditions the transmitter exhaust dampers will direct the transmitter exhaust to the outside, the outlet wall louvers will be closed, the fan will be off, and the inlet fan louvers will be open to allow fresh filtered air into the room and transmitter.

3. For temperatures below 65 °F, a condition of re-circulation for heating will exist. The transmitter exhaust damper will be positioned to allow transmitter exhaust air into the room and all outside outlets and inlets will be closed.

The system described will require two heating type thermostats and control relays. One will be set to approximately 65 °F and the second will be set to approximately 85 °F.

The thermostats should be mounted approximately six feet off the floor and in an area of the room where the temperature is not influenced by heat radiated by the transmitter or by direct airflow from the room intake fan.

The transmitter space should also be provided with a thermostatically controlled heater that can be set to approximately 50 °F. This will provide heat during maintenance periods or during times that the transmitter is off the air, if not a 24-hour operation.

816HD-28L COOLING SYSTEM

Unit 3, Cooling System, consists of Liebert Model 197 liquid-to-air Heat Exchanger HE1, an expansion tank, a dual pump assembly, Manifold Panel Assembly A1, filters, copper tubing and various other components. Figure 15 and assembly drawing 202552 provide a typical installation configuration showing plumbing runs, nominal pipe sizes and dimensions. Parts list PL202552 provides parts data on the callouts located on drawing 202552.

NOTE

All items (ball, check, drain and gate valves, pipe adapters and elbows, etc.) shown in Figure 15 and assembly drawing 202552 may not be necessary at every installation site.

The Manifold Panel Assembly and some components come partially assembled. The manifold assembly is typically mounted on an outside wall near the transmitter. The heat exchanger legs are shipped loose and are to be field mounted as shown in Figure 16 with the hardware provided.

The heat exchanger and pump assembly are typically mounted outside on the ground or on the roof. The heat exchanger may be mounted over the pump assembly to reduce the installation footprint. To ensure an adequate air supply, locate the heat exchanger in a clean air area, away from loose dirt and foreign matter that may clog the coil. In addition, the heat exchanger must not be placed near steam, hot air, or fume exhausts.

Also, the heat exchanger should be no closer than three feet from a wall, obstruction or adjacent unit with no obstructions over the unit. Install the heat exchanger in a level position to assure proper vent and drain. The heat exchanger should be located for maximum security and maintenance accessibility. Avoid ground level sites with public access or areas which contribute to heavy snow or ice accumulations.

All heat exchanger legs have mounting holes for securing the unit to steel supports or concrete pads. For roof installation, mount the heat exchanger on steel supports in accordance with local codes. To minimize sound and vibration transmission, mount steel supports across load-bearing walls. For ground installations, a concrete pad will support the load. Liebert drawing 3G-1212 shows the ground mounting hole template for the heat exchanger legs.

After the heat exchanger and pump assembly are installed, install plumbing, desired valves, flow switches 3S1 and 3S2, and terminal board TB1 as shown in Figure 15 and drawing 202552.

The heat exchanger requires 208 volts, 60 Hz, 3–phase input power. The pump assembly receives its power from the heat exchanger. Connect the HE1 input power wiring from a fuse or circuit breaker panel with a 60-ampere rating. Use of a fused disconnect is preferred. Fuse the disconnect to 60 amperes.

Liebert schematic 3G-1207 and Figures 16 and 17 show heat exchanger and pump assembly wiring connections and switch adjustment settings. Using the appropriate wire size, (follow local "Electrical Code" to determine wire size for a 208 ampere fused service) connect 3-phase power to the heat exchanger disconnect switch. Also, connect 3-phase power wiring between HE1 and the pump assembly. Connect chassis ground between the HE1 and pump assembly ground terminals, and earth ground.

Set the heat exchanger's internal thermostatic switches, AQ1 and AQ2, per schematic 3G-1207 (see Notes 7 and 8). Use the standard glycol system temperature settings.

Connect flow switches 3S1 and 3S2, remote start wiring, remote interlock wiring and liquid level indicator to the heat exchanger and manifold assembly per Figure 17. Connect the resistivity monitor, 3A1M1, to a 115/230V, 60 Hz, 1-phase power source.

The cooling system typically uses either pure distilled water or a mixture of distilled water (60%) and ethylene glycol (40%) which protects down to -10 ºF (-23 ºC). If a water/glycol mixture is used, ethylene glycol (Univar P/N 263411 or equiv.) must be used. **DO NOT** use automotive antifreeze. It contains additives that can damage the cooling system. Also, the percentage of water to glycol may be adjusted to suit the environment of the installation site.

If, when turning on the transmitter, the main cooling pump stops and the secondary cooling pump starts, the time delay relay, TD, inside the heat exchanger needs to be adjusted to delay longer. This allows the main pump's flow rate to achieve 8-9 GPM and prevents flow switch 3S2 from turning off the main pump and turning on the secondary pump upon startup.

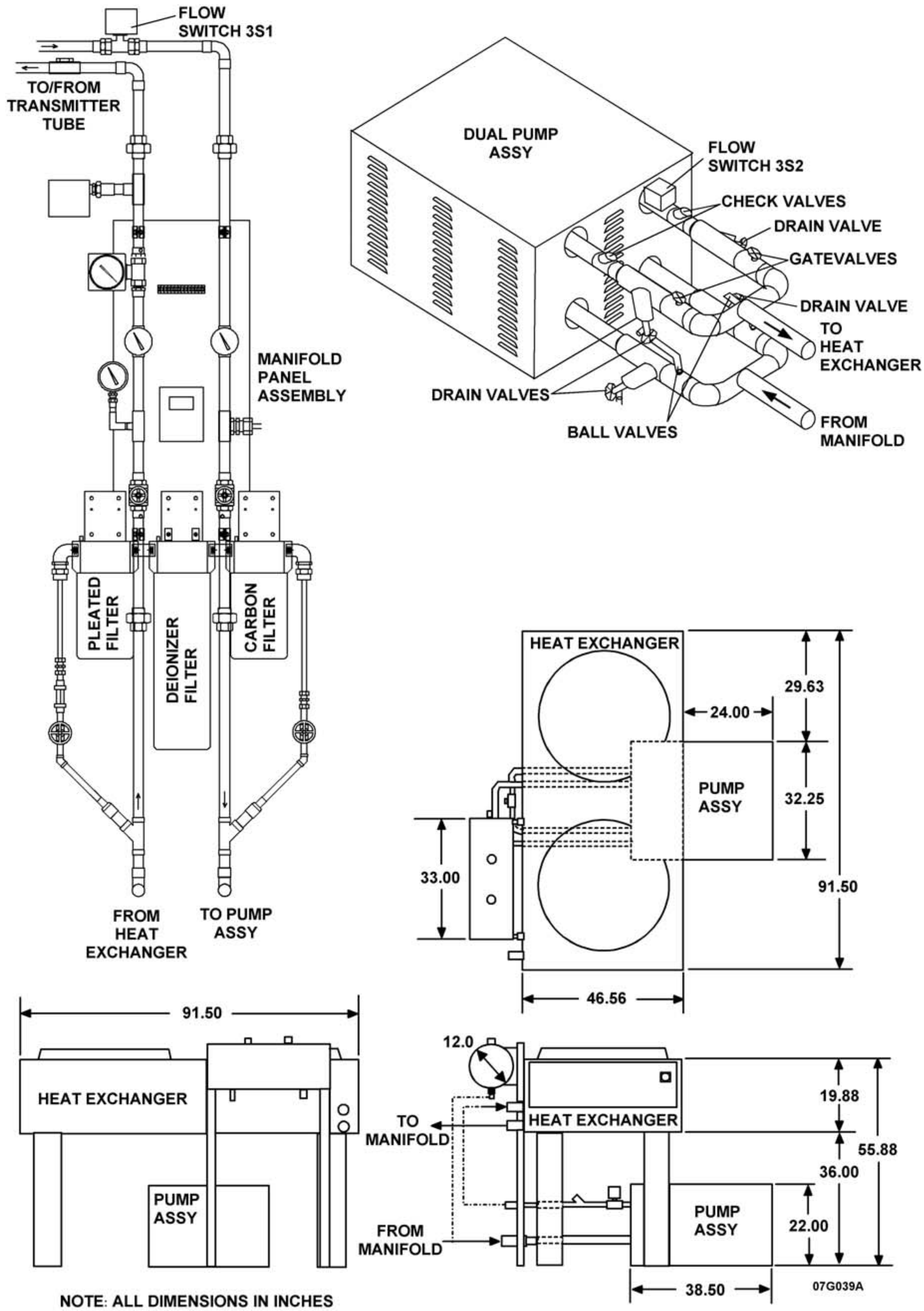
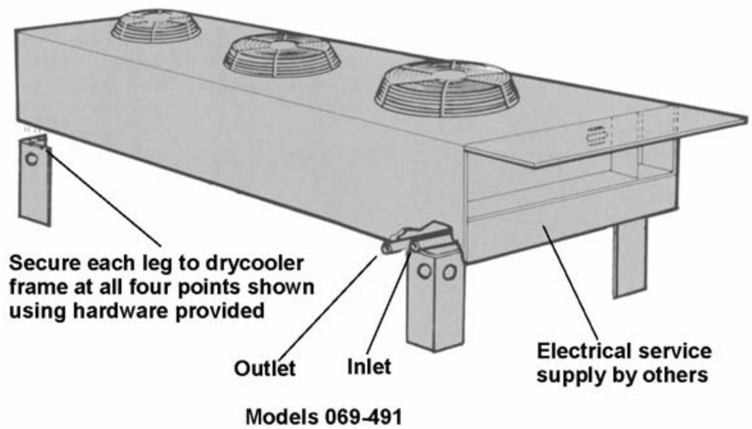


Figure 15. Typical 816HD-28L Cooling System Installation Configuration.

Leg Assembly

The legs are shipped loose and are to be field mounted as shown with the hardware provided.

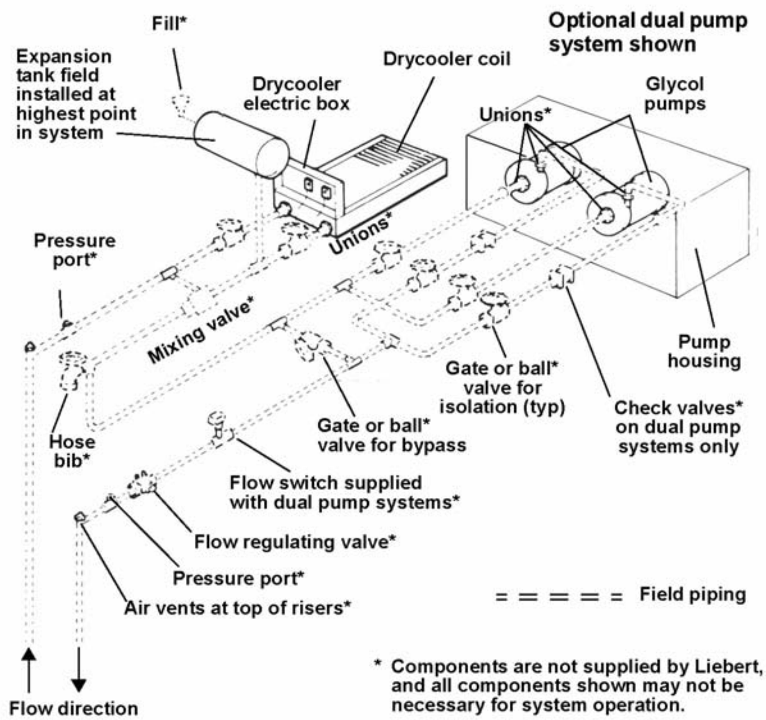


Models 620 through 940 have 2 sets of connections on end of unit

Rigging

Holes in the drycooler legs permit lifting the unit. Spreader bars are required. Four, 6 and 8 fan models have additional lifting eyes.

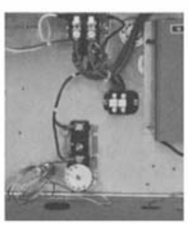
Figure 7 General arrangement diagram



High Voltage Electrical Connections

Line Voltage is connected to the terminal strip or directly to the factory supplied locking disconnect (optional). Check voltage and compare to nameplate.

Low Voltage Electrical Connections



A control interlock between the indoor and outdoor equipment must be minimum 16 ga. for up to 75 ft. or not to exceed 1 volt drop in control line.

Figure 16. Heat Exchanger/Pump Assembly Component Installation.

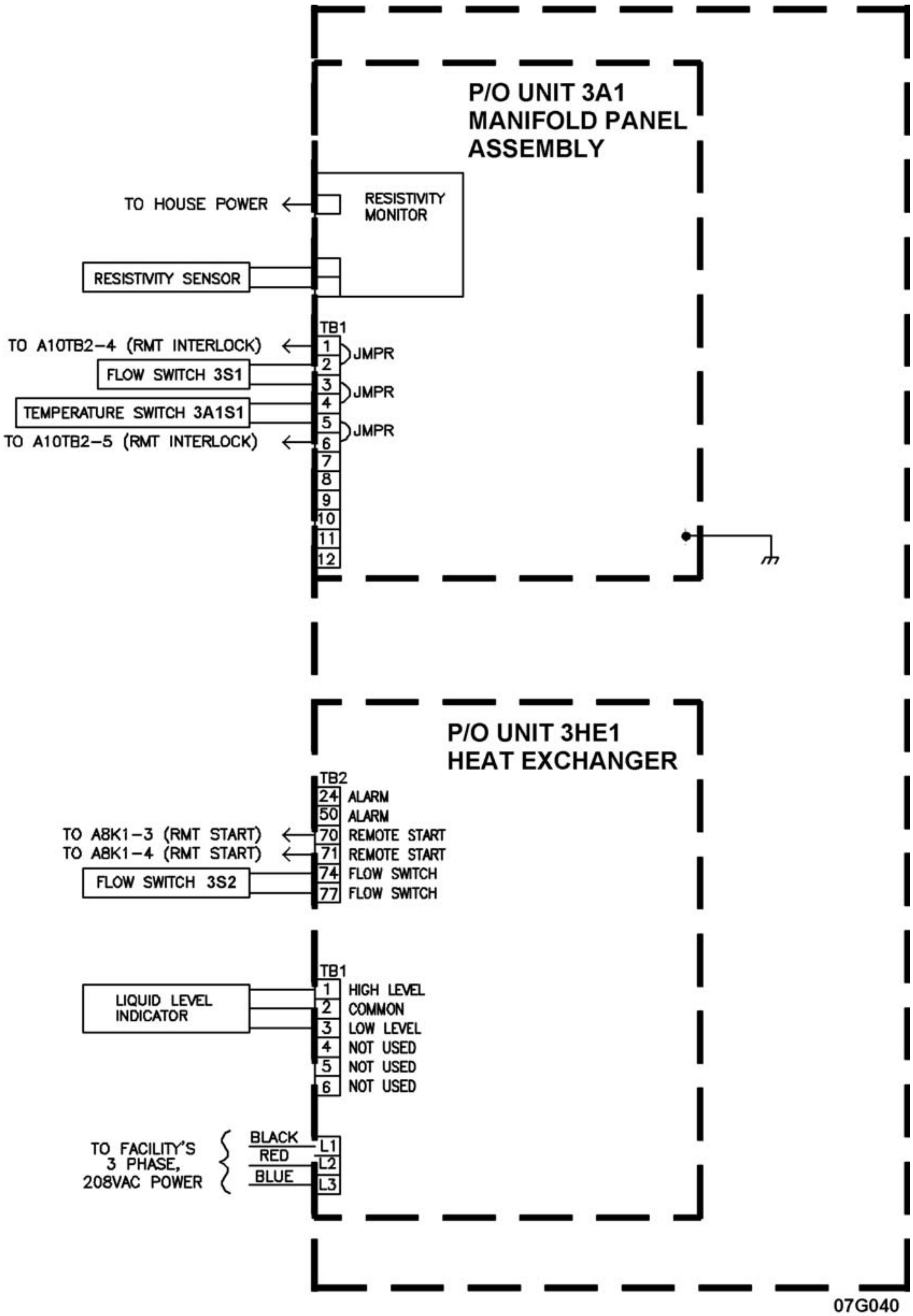


Figure 17. Heat Exchanger Wiring.

PL202552-1 COOLING SYSTEM Rev. -				
Ref.Des.	**Qty.**	**Cage**	**Part No.**	**Description**
2	4	52151	332-5029-160	ADAPTER,STRAIGHT,PIPE TO TUBE:1" TUBE,1" NPT WROT COPPER,COPPER TO MALE PIPE THREAD
3	0	52151	015-9984-040	COUPLING ASSY,QUICK DISCONNECT1 IN.NPTF EACH END,BRASS CONSISTS OF SOCKET AND PLUG
4	2	52151	332-5392-030	ADAPTER,STRAIGHT,PIPE-TO-HOSE:1" MALE PIPE THREAD 1" ID HOSE,BRASS
5	32	52151	030-0038-030	HOSE,NON-METALLIC:HEATER,SIZE 16,1.00' ID,1.39" OD SILICONE RUBBER
6	10	52151	013-6067-020	CLAMP,HOSE:W/LINER,13/16" TO 1-3/4" EFF RANGE WORM DRIVE,HEX/SLOT,ST STL UNIT,FOR SILICONE TBG
7	2		*181569-1	BUS,GROUND STRAP
8	2		*152599-1	TARGET
9	2	52151	332-5638-070	REDUCER,COUPLING:3/4" FNPT X 1/2" FNPT STAINLESS STEEL
10	2	52151	015-9984-010	COUPLING ASSY,QUICK DISCONNECT1/2 IN. NPTF, EACH END, BRASS CONSISTS OF SOCKET AND PLUG
11	2	52151	332-5665-010	CONNECTOR,MALE,BRASS 5/8 OD TUBE 37 DEG F LAIR (MALE) X 1/2 NPT (MALE)
13	2	52151	332-5264-120	UNION,REDUCER:5/8 TO 1/2" TUBE OD,BRASS
14	4	52151	820-4011-010	TUBE,METALLIC:COPPER,1/2" NOM,TYPE L,CLASS 1,HARD
15	2	52151	332-5252-010	VALVE,GATE:1/2" NOM,BRONZE BODY,SOLDER CONN COPPER TO COPPER,125PSI TO 406 DEGF,SCREW-IN BNT
16	1	52151	010-0011-020	METER,FLUID FLOW,1/2 G PM1/2 NPT FEMALE,BOTH ENDS
17	2	52151	332-5029-070	ADAPTER,STRAIGHT,PIPE TO TUBE:1/2" TUBE,1/2" NPT WROT COPPER,COPPER TO MALE PIPE THREAD
18	55	52151	800-0010-010	ANTIFREEZE:ETHYLENE GLYCOL
19	2	52151	332-5644-030	TEE,Y,45 DEG,PIPE,1 IN NOMINAL
20	2	52151	332-5011-040	REDUCER,TUBE:1"X 1/2"NOM SZ,WROUGHT COPPER
21	2	52151	332-5024-070	ELBOW,TUBE:45 DEG,1/2" NOM SZ,WROUGHT COPPER
22	1	52151	332-5226-230	ADAPTER,STRAIGHT,PIPE TO TUBE:1/2" OD TUBE TO 3/4" MALE PIPE THREAD,BRASS
23	2	52151	009-5192-020	FILTER HOUSING: 1 NPTF,10" LG
24	1	52151	009-5192-060	FILTER,PLEATED CARTRIDGE 1 MICRON,9-3/4" X 4.5"
25	96	52151	152-8011-010	TUBING,NON-METALLIC:IMPOLENE,1/2" OD
26	3	52151	015-9986-010	BRACKET:FILTER HOUSING
27	6	52151	334-1393-000	NUT ASSEMBLY,SPRING RETAINED:1/4-20 UNC-2B THD SZ, 0.080 LB
28	6	96906	MS51957-81	SCREW,MACHINE:1/4-20UNC-2A X 3/4,PAN HEAD, CRES CROSS RECESSED
29	6	96906	MS35338-139	WASHER,LOCK:1/4"NOM ID,SPRING,HELICAL,300 CRES 0.487"OD,0.260"ID,0.062"TK,PASSVTD, REGULAR SERIES

PL202552-1 COOLING SYSTEM Rev. -				
Ref.Des.	**Qty.**	**Cage**	**Part No.**	**Description**
30	6	96906	MS15795-810	WASHER,FLAT:0.281 ID,0.625 OD,0.065 THK,CRES
31	0	96906	MS51958-63	SCREW,MACHINE:10-32UNF-2A X 1/2,PAN HEAD, CRES CROSS RECESSED
32	0	96906	MS35338-138	WASHER,LOCK:#10 NOM ID,SPRING,HELICAL,300 CRES 0.334"OD,0.200"ID,0.047"TK,PASSVTD, REGULAR SERIES
33	0	96906	MS15795-808	WASHER,FLAT:0.219 ID,0.438 OD,0.049 THK,CRES
34	10	52151	332-2517-040	ELBOW,TUBE:1" NOM,90 DEG,LONG TURN WROT COPPER,COPPER TO COPPER
35	1	52151	332-5006-320	COUPLING,TUBE:WROT COPPER,1-1/4 X 1 NOM SIZE
36	1	52151	332-5006-440	COUPLING,TUBE:WROT COPPER,2 X 1 NOM SIZE
37	60	52151	820-4022-160	TUBE,METALLIC:COPPER,1" NOM,TYPE K,CLASS 1,HARD PER ASTM B88
38	4	52151	139-8068-040	CLAMP,PIPE:FOR 1-1/8" OD TUBING,STAINLESS STEEL
40	12	52151	138-3007-040	CHANNEL,STRUCTURAL:1-5/8" X 1-5/8",12 GAUGE, 20 FT T SERIES
41	4	52151	312-5023-020	ROD,CONTINUOUS THREAD:3/8-16UNC X 6FT LG ZINC PLATED STEEL
42	4	52151	334-1395-000	NUT ASSEMBLY,SPRING RETAINED:3/8-16UNC-2B, THD SZ, 0.100 LB
43	8	96906	MS15795-814	WASHER,FLAT:0.406 ID,0.812 OD,0.065 THK,CRES
44	8	96906	MS35338-141	WASHER,LOCK:3/8"NOM ID,SPRING,HELICAL,300 CRES 0.680"OD,0.385"ID,0.094"TK,PASSVTD, REGULAR SERIES
45	8	96906	MS51971-3	NUT,PLAIN,HEXAGON:0.375-16UNC-2B THD SZ,CRES
46	4	96906	MS51861-65C	SCREW,TAPPING:THREAD FORMING,1/4-14,1/2"LG, TYP AB PAN HEAD,CROSS RECESSED,410 CRES, PASSIVATED
47	1	52151	332-5040-040	PLUG,PIPE:1/2 INCH NOMINAL,CAST BRONZE
48	2	52151	332-5040-060	PLUG,PIPE:1 INCH NOMINAL,CAST BRONZE
49	1	52151	009-5192-010	FILTER HOUSING: 1" NPTF,20" LG
50	1	52151	009-5192-040	FILTER:ACTIVATED CARBON 4.5" X 10.0"
51	1	52151	009-5192-070	FILTER,MIXED BED,4.5" X 20.0" WITH OXYGEN REMOVAL, DEIONIZER FILTER
52	2	52151	332-5668-010	FITTING,PIPE,STREET ELL 90 DEGF X M,1" NOM NPT
53	3	52151	332-5226-330	FITTING,1" TO 1/2" OD TUBE
54	1	52151	009-5192-030	FILTER:VENT,1"NPT
55	1	52151	332-5013-160	ADAPTER,STRAIGHT,PIPE TO TUBE:WROUGHT COPPER,1 SZ 0.24 POUND
56	1	52151	332-5143-180	TEE,PIPE:1 FX X 1 FS X 1 FPT,CAST COPPER
57	2	52151	332-5024-130	ELBOW,TUBE:45 DEG,NOMINAL SIZE,WROUGHT COPPER
58	2	52151	332-5029-280	ADAPTER,STRAIGHT,PIPE TO TUBE 1-1/4" TUBE TO 1" NP T,C X M
59	2	52151	332-5190-010	NIPPLE,PIPE:BRASS,1" NPT THREADS,2-1/2" LONG
60	1	52151	332-5662-010	VALVE,BALL:1/2" TUBE FITTING,BRASS ON-OFF TYPE
61	14	52151	138-3009-020	CHANNEL,STRUCTURAL:1-5/8"W X 1-5/8"H, ALUMINUM TYPE 6063-T6
62	1	52151	332-5009-134	TEE,TUBE:COPPER,2 X 2 X 1 NOMINAL SIZE

PL202552-1 COOLING SYSTEM Rev. -				
Ref.Des.	**Qty.**	**Cage**	**Part No.**	**Description**
64	2	52151	332-5226-220	ADAPTER,STRAIGHT,PIPE TO TUBE:1/2" OD TUBE TO 1/2" MALE PIPE THREAD,BRASS
A1	1	52151	*202556-1	MANIFOLD PANEL ASSY
HE1	1	52151	406-2049-010	HEAT EXCHANGER COOLING SYSTEM OUTDOOR
S1	1	52151	266-9924-020	SWITCH,FLOW:SPDT,7 AMP,115 VAC,CLOSE ON INC FLOW 1.5-15GPM ADJ RANGE,1" NPT CONNECTION,BRASS
S2	1	52151	266-9924-020	SWITCH,FLOW:SPDT,7 AMP,115 VAC,CLOSE ON INC FLOW 1.5-15GPM ADJ RANGE,1" NPT CONNECTION, BRASS
TB1	1	81349	37TB6	TERMINAL BOARD: 6 TERMINALS, RATED 15 AMP @ 300 VAC MOLDED, BARRIER TYPE, 5-40 SCREW TYPE

TRANSMITTER DELIVERY

The delivery time from pickup at our factory to major points within the US is approximately eight working days and approximately ten working days for outlying areas.
The transmitter will be transported by large tractor and trailer combination (18 wheel semi tractor/trailer). You should request a site survey before shipment, if the transmitter site is difficult to access. This survey will determine if the large truck can deliver directly to your site and if additional people or special equipment or handling is required. There is a small charge for this survey.

The Van Line will provide a driver and one helper to deliver, remove transmitter from shipping skid, and place the transmitter where you want it on the ***ground floor*** of your facility when accessible by 18 wheeler.

Continental will arrange insurance when booking the transporting of your transmitter if you, the consignee, request insurance. The insurance will stop at the point of delivery by the Carrier (Van Line) that picks up at the factory unless special arrangements are made before shipment.

Please contact Timmy James, our shipping coordinator, at (214) 381-7161, ext 2379, if you have any questions about shipping, delivery, site survey, or insurance.

YOUR COMMENTS PLEASE:

It is our goal to provide useful information to you. It is by our Customer's suggestions and comments that we are able to improve our service and products. Please let us know what you think of this "Pre-Installation Guide" and what are your suggestions for improvement?

Please send your comments and suggestions to:

E-Mail
rgarrett@contelec.com

or

FAX

Richard Garrett (214) 381-3250

or

Continental Electronics
Richard Garrett

4212 South Buckner Blvd
Dallas, TX 75227