INSTALLATION, OPERATION AND MAINTENANCE MANUAL

DISTRIBUTOR TRUCK HEATER KIT

PROCESS HEATING COMPANY, INC.
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WARNINGS

1) READ AND UNDERSTAND ALL TAGS AND INSTALLATION AND OPERATING INSTRUCTIONS BEFORE COMMENCING.

2) CHECK THAT THE ELECTRICAL SERVICE WILL HANDLE THE LOAD. UNIT MUST BE ADEQUATELY GROUNDED.

3) ALL WIRING SHOULD CONFORM TO REQUIREMENTS OF NATIONAL AND LOCAL ELECTRICAL CODES AND STANDARDS.

4) ONLY LICENSED ELECTRICIAN SHOULD CONNECT POWER TO PANEL AND SYSTEM.

5) NEVER EXPOSE HEATER TUBES TO AIR WITH POWER ON.

6) CARE SHOULD BE USED WHEN WORKING AROUND TUBES WHEN CLEANING OR INSTALLING. WALLS ARE LESS THEN ¼" THICK.

7) IF THERE ARE ANY QUESTIONS CONCERNING THE RATINGS OR INSTRUCTIONS PLEASE CONTACT YOUR LOCAL DISTRIBUTOR OR THE FACTORY. PHONE (206) 682-3414 FAX (206) 682-1582

ADDITIONAL IMPORTANT INFORMATION

1) THESE INSTRUCTIONS CANNOT POSSIBLY COVER EVERY SITUATION CONCERNING THE OPERATION, INSPECTION, ADJUSTMENT AND TEST OF THE EQUIPMENT FURNISHED. PROCESS HEATING COMPANY (PHCo), IN THE FURNISHING OF THIS EQUIPMENT AND THESE INSTRUCTIONS, MUST PRESUME THAT THE OPERATING AND MAINTENANCE PERSONNEL USING THIS EQUIPMENT HAVE SUFFICIENT TECHNICAL KNOWLEDGE AND EXPERIENCE TO APPLY SOUND SAFETY AND OPERATIONAL PRACTICES WHICH MAY NOT BE MENTIONED.

2) IN APPLICATIONS WHERE PHCo FURNISHED EQUIPMENT THAT IS TO BE INTEGRATED WITH A PROCESS OR OTHER EQUIPMENT, THESE INSTRUCTIONS SHOULD BE THOROUGHLY REVIEWED TO DETERMINE THE PROPER INTEGRATION OF THE EQUIPMENT INTO THE OVERALL PLANT OR SYSTEM OPERATIONAL PROCEDURES.

3) PHCo DOES NOT SUPPLY, RECOMMEND OR APPROVE THE VARIOUS SYSTEMS IN WHICH ITS PRODUCTS ARE OR MAY BE USED. UNLESS DESIGNED, MANUFACTURED AND USED PROPERLY, VARIOUS SYSTEMS MAY BE INHERENTLY UNSAFE OR DANGEROUS. THE USER SHOULD CHECK AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS AND OTHER REGULATIONS AND RECOMMENDATIONS SUCH AS: NFPA, UL, API, OSHA, ETC.

PREPARATION

1) REMOVE JACKETING AND INSULATION FROM SECTION OF TANK HEATER IS TO BE INSTALLED THROUGH.

2) MARK LOCATION OF OPENING ON TANK. HEATER(S) SHOULD BE KEPT AS LOW AS POSSIBLE IN TANK.

CAUTION

BEFORE BURNING OR WELDING ON TANK, CLEAN THOROUGHLY AND KEEP WELL VENTILATED.

INSTALLATION

1) BURN OPENING(S) IN TANK SLIGHTLY LARGER THAN HEATER TUBE(S) (SNUG FIT). REMOVE SLAG AND GRIND OPENING SMOOTH.

2) REMOVE BLOCKING AND SUPPORT PLATE(S) AND SLIDE HEATER(S) THROUGH OPENING(S) IN TANK. STOP AT MARKED “WELD LINE” ON HEATER TUBE(S).

3) HEATER TUBE SUPPORT PLATE(S) SHOULD BE ATTACHED TO TANK BOTTOM. LEVEL HEATER TUBES AND WELD SUPPORT(S) TO TANK. DO NOT WELD HEATER TUBES T SUPPORT PLATE(S).

4) WELD HEATER TUBES TO TANK. TUBES ARE ¼” THICK STEEL. WELDS MUST BE LIQUID TIGHT.

5) LOCATE THERMOWELL BETWEEN TUBES AND 1” – 2” HIGHER THAN TOPS OF HEATER TUBES. MARK AND BURN 7/8” DIAMETER HOLE IN TANK HEAD. INSTALL THERMOWELL TO PAINT LINE AND WELD IN LIQUID TIGHT.

6) TANK DISCHARGE SHOULD BE KEPT 2” TO 3” ABOVE HEATER TUBES. NEVER EXPOSE HEATER TUBES TO AIR WITH POWER ON.

7) MOUNT CONTROL PANEL TO A CONVENIENT LOCATION. PANEL MUST BE CLOSE ENOUGH TO ALLOW EASY ACCESS TO DISCONNECT SWITCH.

8) RE-INSTALL INSULATION AND JACKETING AROUND HEATER TUBES.

9) INSTALL THERMOCOUPLE SENSORS THROUGH FITTING ON END OF THERMOWELL AND TIGHTEN.

10) HAVE LICENSED ELECTRICIAN CONNECT INDIVIDUAL HEATERS TO FUSE BLOCKS IN CONTROL PANEL. USE SUPPLIED CORDS OR CONDUIT ENCLOSED CONDUCTORS.

11) HAVE A LICENSED ELECTRICIAN CONNECT PROPER VOLTAGE AND PHASE WITH PROPERLY SIZED CONDUCTORS TO MAIN POWER SWITCH. UNIT MUST BE ADEQUATELY GROUNDED. CHECK ALL ELECTRICAL CONNECTIONS FOR TIGHTNESS.

12) CHECK ALL CONNECTIONS TO INSURE THEY ARE ALL TIGHT SINCE VIBRATION IN TRAVEL CAN LOOSEN WIRE CONNECTIONS.

OPERATION

1) TURN ON THE MAIN DISCONNECT SWITCH.

2) PUSH THE RED HIGH LIMIT RESET PUSHBUTTON TO PULL IN THE CONTACTOR AND PROVIDE LOAD POWER.

3) THE INDICATING TEMPERATURE CONTROL (IN ENCLOSURE DOOR) SHOULD BE SET TO DESIRED PROCESS TEMPERATURE BY PRESSING UP/DOWN ARROWS AND THEN PRESSING ENTER (HALF CIRCLE) KEY (FACTORY SET TO 125°F).

4) THE HIGH LIMIT CONTROL (PROCESS TEMPERATURE SENSING) IN THE PANEL, MOUNTED ON THE BACK PANEL UNDER THE MAIN CONTROLLER TO THE LEFT SIDE, SENSES PROCESS TEMPERATURE AND WILL DISCONNECT POWER TO THE HEATERS IF OVER TEMPERATURE OCCURS. SETPOINT SHOULD BE APPROXIMATELY 20° TO 25°F ABOVE PROCESS TEMPERATURE. WHEN THE TEMPERATURE RETURNS TO BELOW THE HIGH LIMIT SETPOINT THE POWER WILL RETURNED TO THE HEATING CIRCUIT ALLOWING THE HEATERS TO COME ON BUT THE RED HIGH LIMIT RESET PUSHBUTTON WILL BE ILLUMINATED UNTIL MANUALLY RESET (INDICATING THAT THERE WAS A HIGH LIMIT OCCURRENCE). THE CAUSE OF THE MALFUNCTION SHOULD BE INVESTIGATED AT ONCE. POSSIBLE REASONS ARE:

- Thermocouple failure on the main temperature controller (indicated by “no” in the upper display of the controller).
- “Over Ranging” of the main temperature controller (indicated by “over” in upper display).
- Temperature controller setting higher then Hi-Limit controller setting.
- Main temperature controller out of calibration.
- Hi-Limit controller out of calibration.
- Heater magnetic contactor locked in closed position because of “welded” contacts or mechanical binding.

MAINTENANCE

1) PERIODICALLY CHECK ALL WIRING CONNECTIONS TO INSURE THEY ARE TIGHT AND FREE OF OXIDATION.

2) PERIODICALLY CHECK CONTACTS ON THE CONTACTORS FOR WEAR AND REPLACE CONTACTOR IF WORN.

3) TANK SHOULD BE CLEANED AT REGULAR INTERVALS.

4) BE SURE TO SEE THAT TANK HAS ADEQUATE INSULATION. INSULATION TENDS TO BREAK DOWN IN TIME THUS COSTING DOLLARS IN LOST EFFICIENCY.

Five Year Warranty

on

Products
Manufactured by
Process Heating Company
PHCo

and delivered to the initial user are subject to the following limited warranty: **PHCo** warrants its Patented Heating Elements to be free from defects in workmanship and materials for a period of five (5) years (one (1) year for drop-in style) after the date of delivery to the initial user when operated under normal use and service and in accordance with printed instructions provided by **PHCo**. All other parts and components provided by **PHCo** as part of the unit are warranted to be free from defects in material and workmanship for a period of one (1) year from date of delivery to the initial user.

THE ABOVE WARRANTY IS SUBJECT TO THE TERMS & CONDITIONS ON THE REVERSE SIDE OF THIS DOCUMENT

Unless otherwise agreed in writing by Process Heating Company ("PHCo"), all of the following terms & conditions shall apply to its transaction with you (the "buyer"):

1. LIMITED WARRANTY; DISCLAIMERS. PHCo warrants that the goods sold under this contract shall be free from defects in workmanship and materials at the time delivery is tendered. If there is discovered any failure of goods to conform to this warranty within one (1) year after tender of delivery (five (5) years in the case of immersion type heating elements other than drop-in style elements), and if Buyer notifies PHCo in writing of such fact within thirty (30) days following such discovery, PHCo at its own expense either will repair the defective item, or replace it, or refund to Buyer the purchase price paid for that item (with choice between repair, replacement or refund to be made solely by PHCo). The foregoing limited warranty and remedy are exclusive of all other warranties, express or implied, and constitute PHCo's exclusive liability, and Buyer's exclusive remedy, on account of any claim relating to any item sold. PHCo DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. If PHCo should elect to repair or replace a defective item and if for any reason the repair or replacement should fail in its essential purpose (which is to provide Buyer with a non-defective item), then PHCo's liability nevertheless shall be limited to the purchase price charged by PHCo for the goods. PHCo shall have no liability on account of any claim asserted under principles of negligence or other tort, breach of any statutory duty, indemnity or contribution, or on any other basis, if PHCo's liability on account of such claim would exceed or in any respect differ from its liability under forgoing limited warranty and exclusive remedy.

2. LIABILITY OF PHCo UNDER THE FOREGOING LIMITED WARRANTY SHALL EXIST ONLY IF:
a. The goods are installed, operated and tested in accordance with the PHCo approved installation and operation instruction.
b. The goods are used and maintained in conformity with installation and operation instructions approved or published by PHCo.
c. Written authorization must be given by PHCo before any warranty work is done.
The above limited warranty shall be void and no longer in effect if the goods are subject to abuse, strain, impact or loading that is greater than their normal.

3. LIMITATION OF LIABILITY. UNDER NO CIRCUMSTANCES SHALL PHCO OR ANYONE ELSE INVOLVED IN THE MANUFACTURE OR SALES OF THE GOODS BE LAIBLE TO BUYER OR OTHERS FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, EVEN IF PHCO HAS BEEN ADVISED OF THE POSSIBILTY OF SUCH DAMAGES, OR FOR ANY DAMAGES OR SUMS PAID BY BUYER OR OTHER THIRD PARTIES. THE FOREGOING LIMITATION OF LIABILITY SHALL APPLY WHETHER ANY CLAIM FOR ANY SUCH DAMAGES IS BASED UPON PRINCIPLES OF CONTRACT, WARRANTY, NEGLIGENCE OR OTHER TORT, BREACH OF STATUTORY DUTY, PRINCIPLES OF INDEMNITY OR CONTRIBUTION, THE FAILURE OF ANY LIMITED OR EXCLUSIVE REMEDY TO ACHIEVE ITS ESSENTIAL PURPOSE, OR ANY OTHER BASIS.

4. AUTHORITY OF PHCo's AGENTS. No agent, employee or representative of PHCo has any authority to bind PHCo to any other affirmation, representation, promise or warranty concerning the goods sold under this contract, unless it is in writing and included as part of the terms of this contract.

5. MODIFICATION OF WAIVER. No subsequent waiver or modification of this Limited Warranty and Liability shall be effective unless the same is in writing and signed by the party against whom such waiver or modification is asserted. No waiver in any one instance shall constitute a waiver of the same or any other term or condition on any subsequent occasion. None of the express terms of this Limited Warranty and Liability may be waived or varied by course of dealing or usage of trade.

6. DISPUTES. This agreement shall be governed by the laws of the State of Washington without reference to its choice of law rules. Any action to enforce any of the terms or conditions of this agreement may be commenced or maintained at the option of either party in any federal or state court located in King County, Washington having jurisdiction over the matter, and both parties consent in advance to the exercise by such courts of jurisdiction over them personally. No action by either party arising out of or relating to this contract (including any action based upon principles of contract, tort or otherwise) may be commenced more than one (1) year after the cause of the action has accrued, and any action commenced by a party thereafter shall be dismissed at the instance of the other party.

Bulletin E-90-C

2006-02-15

5011643800-DWC0

C Series Temperature Controller Instruction Sheet

Thank you very much for purchasing a Love Controls Series C Temperature Controller. Please read this instruction sheet before using your controller to ensure proper operation and please keep this instruction sheet handy for quick reference.

1 Precaution

⚠ DANGER! Caution! Electric Shock!

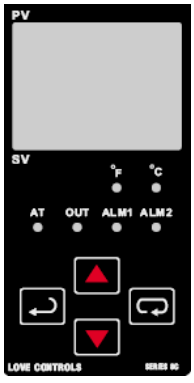
1. Do not touch the AC terminals while the power is supplied to the controller to prevent an electric shock.
2. Make sure power is disconnected while checking the unit inside.
3. The symbol ⧈ indicates this Controller is protected throughout by DOUBLE INSULATION or REINFORCED INSULATION (equivalent to Class II of IEC 536).

⚠ WARNING!

Mount the controller in a location that will not be subject to excessive temperature, shock, or vibration. All models are designed for mounting in an enclosed panel..

1. Always use recommended solder-less terminals: Fork terminal with isolation (M3 screw, width is 7.0mm, hole diameter 3.2mm). Screw size: M3 x 6.5 (With 6.8 x 6.8 square washer). Recommended tightening torque: 0.4 N.m (4kgf.cm). Applicable wire: Solid/twisted wire of 2 mm^2, 12AWG to 24AWG. Please be sure to tighten them properly.
2. Do not allow dust or foreign objects to fall inside the controller to prevent it from malfunctioning.
3. Never modify or disassemble the controller.
4. Do not connect anything to the “Not used” terminals.
5. Make sure all wires are connected to the correct polarity of terminals.
6. Do not install and/or use the controller in places subject to: Dust or corrosive gases and liquid, high humidity and high radiation, vibration and shock, high voltage and high frequency
7. Power must be off when wiring and changing a temperature sensor.
8. Be sure to use compensating wires that match the thermocouple types when extending or connecting the thermocouple wires.
9. Please use wires with resistance when extending or connecting a platinum resistance sensor (RTD).
10. Please keep the wire as short as possible when wiring a platinum resistance sensor (RTD) to the controller and please route power wires as far as possible from load wires to prevent interference and induced noise.
11. This controller is an open-type unit and must be placed in an enclosure away from high temperature, humidity, dripping water, corrosive materials, airborne dust and electric shock or vibration.
12. Please make sure power cables and signals from instruments are all installed properly before energizing the controller, otherwise serious damage may occur.
13. Please do not touch the terminals in the controller or try to repair the controller when power is applied to prevent an electric shock.
14. Wait at least one minute after power is disconnected to allow capacitors to discharge, and please do not touch any internal circuit within this period.
15. Do not use acid or alkaline liquids for cleaning. Please use a soft, dry cloth to clean the controller.
16. This instrument is not furnished with a power switch or fuse. Therefore, if a fuse or power switch is required, install the protection close to the instrument. Recommended fuse rating: Rated voltage 250 V, Rated current 1 A. Fuse type: Time-lag fuse
17. Note: This controller does not provide overcurrent protection. Use of this product requires that suitable overcurrent protection device(s) must be added to ensure compliance with all relevant electrical standards and codes. (Rated 250 V, 15 Amps max). A suitable disconnecting device should be provided near the controller in the end-use installation.

2 Display, LED, and Pushbuttons



PV displays process value
SV displays setpoint value.

INDEX: advances the display to the next menu item.

UP ARROW: Increments a value or changes a menu item.

DOWN ARROW: Increments a value or changes a menu item.

ENTER: stores the value or item change.

3 Temperature Sensor Type and Temperature Range

Input Temperature Sensor Type	Register Value	LED Display	Temperature Range
Platinum resistance (Pt100) type3	15	Pt3	0.0 to 100.0 °C
Platinum resistance (Pt100) type2	14	Pt2	-20.0 to 500.0 °C
Platinum resistance (Pt100) type1	13	Pt1	-200 to 600 °C
Platinum resistance (JPt100) type2	12	JPt2	0.0 to 100.0 °C
Platinum resistance (JPt100) type1	11	JPt1	-20.0 to 400.0 °C
Thermocouple (TC) B type	10	b	100 to 1800 °C
Thermocouple (TC) S type	9	S	0 to 1700 °C
Thermocouple (TC) R type	8	r	0 to 1700 °C
Thermocouple (TC) N type	7	n	-200 to 1300 °C
Thermocouple (TC) E type	6	E	0 to 600 °C
Thermocouple (TC) T type2	5	t2	-20.0 to 400.0 °C
Thermocouple (TC) T type1	4	t1	-200 to 400 °C
Thermocouple (TC) J type2	3	J2	-20.0 to 400.0 °C
Thermocouple (TC) J type1	2	J1	-100 to 850 °C
Thermocouple (TC) K type2	1	K2	-20.0 to 500.0 °C
Thermocouple (TC) K type1	0	K1	-200 to 1300 °C
Thermocouple (TC) L type	16	L	-200 to 850 °C
Thermocouple (TC) U type	17	U	-200 to 500 °C
Thermocouple (TC) Txk type	18	tXK	-200 to 800 °C

4 Operation

There are three modes of operation: operation, regulation and initial setting. When power is applied, the controller will default to the operation mode. Press the ↵ key to switch to regulation mode. If the ↵ key is pressed for more than 3 seconds, the controller will switch to the initial setting mode. Pressing the ↵ key while in the regulation mode or initial setting mode, forces the controller to return to the operation mode. PV/SV : Sets the temperature set point and displays the temperature process value. Use the ∧ and ∨ keys to set the temperature set point.

Setting method: While in any function mode, press the ⟲ key to select the desired function and use the ∧ and ∨ keys to change settings. Press ↵ key to save the changes. Menu items are listed below.

Regulation Mode	Operation Mode	Initial Setting Mode
AT Auto-tuning (Set in PID control and RUN mode) Press ⟲ ⇩	1234 Use ∨ ∧ key to set temperature set point Press ⟲ ⇩	InPt Set input type Press ⟲ ⇩
P Set proportional band (Kp) (in PID control) Press ⟲ ⇩	r-S Control setting RUN or STOP Press ⟲ ⇩	tPUn Set temperature unit do not display when analog input Press ⟲ ⇩
I Set integral time (Ki) (in PID control) Press ⟲ ⇩	AL1H Upper-limit alarm 1 (This parameter is available only when ALA1 function enables) Press ⟲ ⇩	tP-H Set upper-limit of temperature range Press ⟲ ⇩
d Set derivative time (Kt) (in PID control) Press ⟲ ⇩	AL1L Lower-limit alarm 1 (This parameter is available only when ALA1 function enables) Press ⟲ ⇩	tP-L Set lower-limit of temperature range Press ⟲ ⇩
PdoF or ioF P/PD control offset (when PID control is ON and Ki=0 set the value of PdoF. If Ki≠0, AT (auto-tuning, will automatically set the value of ioF. Press ⟲ ⇩	AL2H Upper-limit alarm 2 (This parameter is available only when ALA2 function enables) Press ⟲ ⇩	Ctrl Sets Control Method: on/off, PID, or manual. Press ⟲ ⇩
HES or CES Heating/Cooling hysteresis. (in ON/OFF control) Press ⟲ ⇩	AL2L Lower-limit alarm 2 (This parameter is available only when ALA2 function enables) Press ⟲ ⇩	C-HC Select heating or cooling control. Press ⟲ ⇩

HtPd or CLPd Heating/Cooling control cycle setting (Set in PID control mode) Press ↩ ⇩	LoC Setting lock mode Press ↩ ⇩	AL A1 Alarm 1 mode setting Press ↩ ⇩
tPoF Regulate temperature deviation value Press ↩ ⇩	oUt Display and adjust output value. Press ↩ ⇩	AL A2 Alarm 2 mode setting Press ↩ ⇩
CrHi Regulate upper-limit of analog output value (The setting display when analog output) Press ↩ ⇩		CoSH Communication write function enable/disable Press ↩ ⇩
CrLo Regulate lower-limit of analog output value (The setting display when analog output) Press ↩ to return to auto-tuning mode		C-no Communication address setting Press ↩ ⇩
		bPS Communication baud rate setting Press ↩ ⇩
		LEn Data length setting Press ↩ ⇩
		PrtY Parity bit setting Press ↩ ⇩
		StoP Stop bit setting Press ↩ to return input type setting

Parameters List

1. Operation Mode: The default mode after start-up

LED	Explanation	Default
r-S	RUN/STOP: Control setting. Run (rUn) or Stop (StoP) mode on the SV display.	RUN
AL 1H	ALARM 1 HIGH: Upper limit for alarm 1. (Only available when alarm is set in the initial setting mode).	4.0 °C
AL 1L	ALARM 1 LOW: Lower limit for alarm 1. (Only available when alarm is set in the initial setting mode).	4.0 °C
AL2H	ALARM 2 HIGH: Upper limit for alarm 2. (Only available when alarm is set in the initial setting mode).	4.0 °C
AL2L	ALARM 2 LOW: Lower limit for alarm 2. (Only available when alarm is set in the initial setting mode).	4.0 °C
LoC	Lock Function Setting: LoC1, LoC2, or OFF. LoC1 mode will lock all settings, LoC2 locks everything except the setpoint value, and OFF will not lock any settings. Press ↩ and ↵ keys simultaneously, to release the lock status.	OFF
oUt	OUT: The Output value adjustment and display in manual tuning control. (Not available in ON/OFF or Auto-tuning control).	0

2. Regulation Mode: Control parameters Settings

LED	Explanation	Default
At	AT (Auto-Tuning): ON or OFF, when set ON, the execution of the auto-tuning function in PID control mode is automatically started. (Only available when PID control is selected in initial settings)	OFF
P	P (Proportional Band in PID control): Sets P value.	47.6
I	I (Integral Time in PID control): Sets I value.	260
d	D (Derivative Time in PID control): Sets D value.	41
PdoF	PdoF: Offset output when P or PD control function is on. PID in initial settings is selected and the value of Ki (Integral Time in regulation mode) is equal to zero.	0
IoF	ioF: Default value of integral volume when PID control is ON and the Ki (Integral Time in regulation mode) is not equal to zero. AT function can automatically set this parameter when PID control is active and Ki≠0.	0
HtS	HtS (Heating Hysteresis): Available only in ON/OFF control. Sets the value the heating hysteresis.	0
CtS	CtS (Cooling Hysteresis): Available only in ON/OFF control. Sets the value the cooling hysteresis.	0
HtPd	HtPd: PID heating control cycle setting. Only available when a PID control is selected in the initial settings.	Output Selection: Voltage: 4 sec. Relay : 20 sec.
CLPd	ClPd: PID cooling control cycle setting. Only available when a PID control is selected in the initial settings.	
tPoF	TPoF: Regulates the temperature deviation value.	0
CrHi	CrHi: Regulates the 20 mA output deviation value.	0
CrLo	CrLo: Regulates the 4 mA output deviation value.	0
CrLo	HtS (Heating Hysteresis): Available only in ON/OFF control. Sets the value the heating hysteresis.	0

3. Initial Setting Mode: Initial settings of the controller and communication parameters

LED	Explanation	Default
InPt	INPUT: Select input temperature sensor type (Please refer to the contents of the "Temperature Sensor Type and Temperature Range" for detail)	PT2
tPUn	Engineering Unit(°F or °C): Select engineering unit F or C.	°C
tP-H	T-High: Upper limit for temperature range.	500.0
tP-L	T-Low: Lower limit for temperature range.	-20.0
CtrL	CONTROL METHOD (ON/OFF, PID, or manual tuning [mAnU]): Sets the control method for the set point value.	PID
S-HC	Control Action (Direct or Reverse Acting): Cooling [Cool] or heating [HEAT].	HEAT
AL A1	ALARM 1: Alarm 1 setting. (See Alarm Output Section for set values and descriptions).	0
AL A2	ALARM 2: Alarm 2 setting. (See Alarm Output Section for set values and descriptions).	0
CoSH	C WE: Write-in function disabled/enabled. Can be set only when unit is equipped with serial communication.	OFF
C-no	C NO: Address setting. Can be set only when unit is equipped with serial communication.	1
bPS	BPS: Baud rate setting. Can be set only when unit is equipped with serial communication.	9600
LEn	Length: Data length setting. Can be set only when unit is equipped with serial communication.	7
PrtY	Parity: Parity bit setting. Can be set only when unit is equipped with serial communication.	E
StoP	Stop Bit: Stop bit setting. Can be set only when unit is equipped with serial communication.	1

Execution :

The programming execution is initiated through r-S *in the operation mode.*

When r-S *is set to* rUn*, the program will start to execute in order from the step 0 of the start pattern.*

When r-S *is set to* StoP*, the program will stop and the control output is disabled*

5 Heating and Cooling

Temperature control can be achieved either by heating or cooling. Please refer to the following for the operation: Settings for heat or cool operation are found in the initial settings mode under S-HC.

Select HEAt, for heating (reverse) control on Output 1.

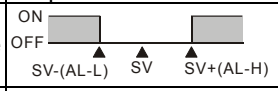
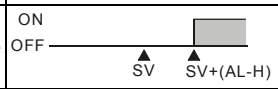
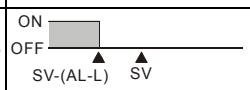
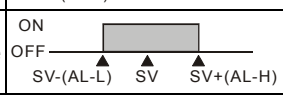
Select Cool, for cooling (forward) control on Output 1

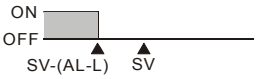
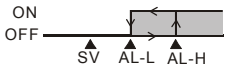
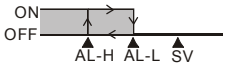
■ **Input Error Indication**

Setting value	Temperature sensor is not connected	Measured temperature value exceeds the temperature range	Unknown input
PV	no	ouEr	Err
SV	Cont		InPt

6 Alarm Outputs

Depending on the controller model, there can be up to two alarm outputs. Each alarm output can be configured for an alarm type listed below. Alarm types are set in the initial setting mode. The alarm output is activated whenever the process temperature value (PV) is getting higher or lower than the set point of alarm limit.

Set Value	Alarm Type	Alarm Output Operation
0	Alarm function disabled	Output OFF
1	Deviation upper- and lower-limit: This alarm output operates when PV value is higher than the setting value SV+(AL-H) or lower than the setting value SV-(AL-L).	
2	Deviation upper-limit: This alarm output operates when PV value is higher than the setting value SV+(AL-H).	
3	Deviation lower-limit: This alarm output operates when PV value is lower than the setting value SV-(AL-L).	
4	Reverse deviation upper- and lower-limit: This alarm output operates when PV value is in the range of the setting value SV+(AL-H) and SV-(AL-L).	

5	Absolute value upper- and lower-limit: This alarm output operates when PV value is higher than the setting value AL-H or lower than setting value AL-L.	
6	Absolute value upper-limit: This alarm output operates when PV value is higher than the setting value AL-H.	
7	Absolute value lower-limit: This alarm output operates when PV value is lower than the setting value AL-L.	
8	Deviation upper- and lower-limit with standby sequence: This alarm output operates when PV value reaches set point (SV value) and the value is higher than the setting value SV+(AL-H) or lower than the setting value SV-(AL-L).	
9	Deviation upper-limit with standby sequence: This alarm output operates when PV value reaches set point (SV value) and the reached value is higher than the setting value SV+(AL-H).	
10	Deviation lower-limit with standby sequence: This alarm output operates when PV value reaches the set point (SV value) and the reached value is lower than the setting value SV-(AL-L).	
11	**Hysteresis alarm output:** **Heating control**: This alarm output operates if PV value is higher than the setting value SV+(AL-H). This alarm output is OFF when PV value is lower than the setting value SV+(AL-L).	
12	**Hysteresis alarm output:** **Cooling control**: This alarm output operates if PV value is lower than the setting value SV-(AL-H). This alarm output is OFF when PV value is higher than the setting value SV-(AL-L).	

(Note: AL-H and AL-L include AL1H, AL2H and AL1L, AL2L)

With the standby sequence, the alarm output will be temporarily disabled until the PV value reaches the set value. Then, the alarm output will operate. Once the alarming output operation is activated, there is a 1.5 sec. delay time to avoid any malfunction.

7 Specification

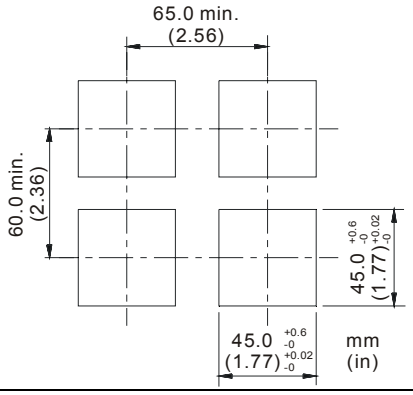
Input Voltage	100 to 240VAC 50/60Hz
Operation Voltage Range	85% to 110% of rated voltage
Power Consumption	5VA max.
Memory Protection	EEPROM 4K bit (non-volatile memory (number of writes: 100,000)
Display Method	2 line x 4 character 7-segment LED display Process value(PV): Red color, Set point(SV): Green color
Sensor Type	Thermocouple: K, J, T, E, N, R, S, B, L, U, TXK
	3-wire Platinum RTD: Pt100, JPt100
Control Mode	PID, ON/OFF, Manual or Auto-tuning.
Control Output	Relay output: SPDT (SPST on the 1/16 DIN size series16C), Max. load 250VAC, 5A resistive load
	Voltage pulse output: DC 14V, Max. output current 40mA
	Current output: DC 4 ~ 20m A output (Load resistance: Max. 600Ω)
Display Accuracy	0.1% of measuring range.
Sampling Rate	0.5 sec.
RS-485 Communication	MODBUS ASCII communication protocol (only on models designated with serial communication).
Vibration Resistance	10 to 55Hz, 10m/s^2 for 10min, each in X, Y and Z directions
Shock Resistance	Max. 300m/ s^2, 3 times in each 3 axes, 6 directions
Ambient Temperature	32 ^{o}F to 122 ^{o}F (0 ^{o}C to +50 ^{o}C)
Storage Temperature	-4 ^{o}F to 150 ^{o}F (-20 ^{o}C to +65 ^{o}C)
Altitude	2000m or less
Relative Humidity	0% to 80% (non-condensing)

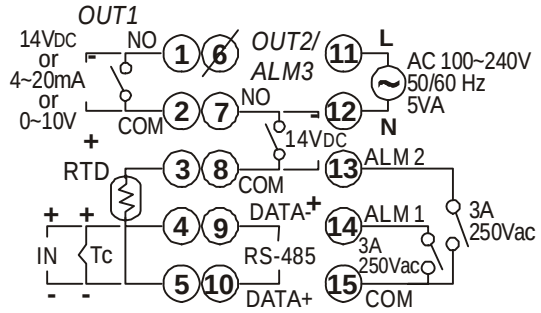
8 Plan Cutout and External Dimensions

Panel Cutout [dimensions are in mm (in.)]

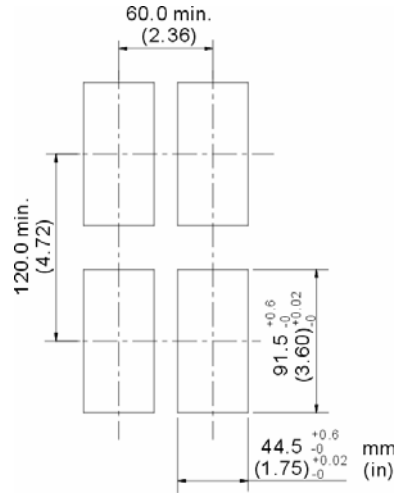
Terminals Identification

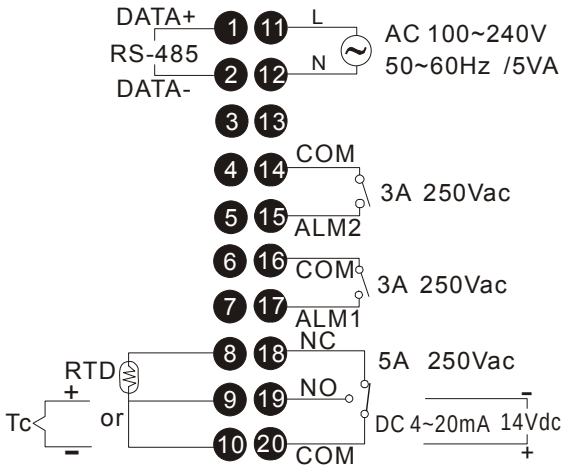
16C



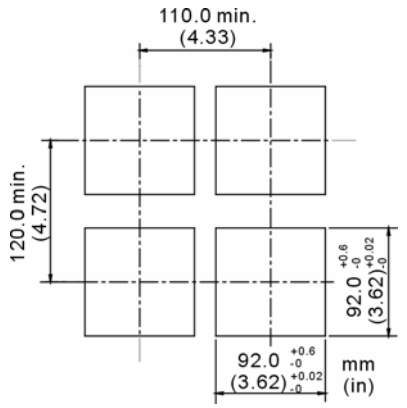


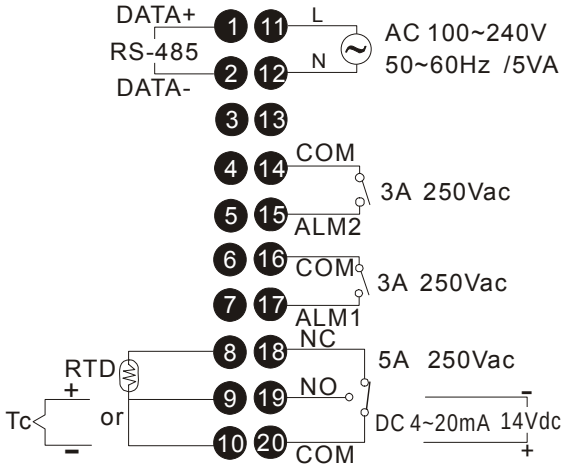
8C





4C

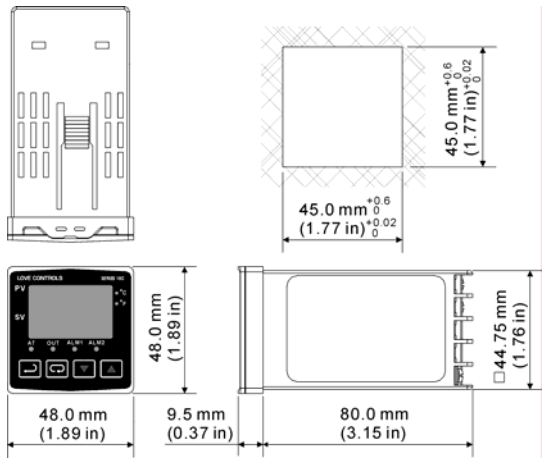




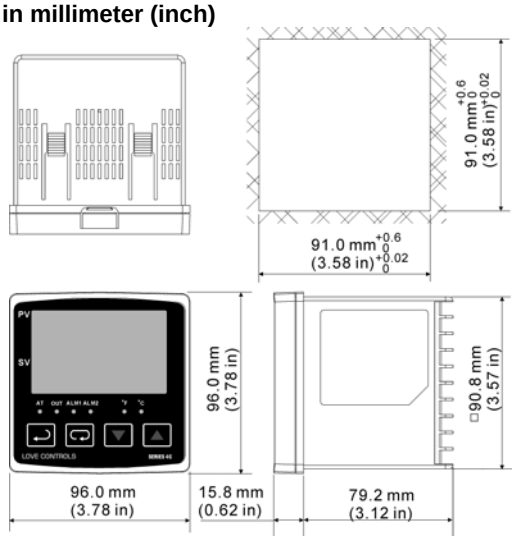
9 External Dimensions

Dimensions are in millimeter (inch)

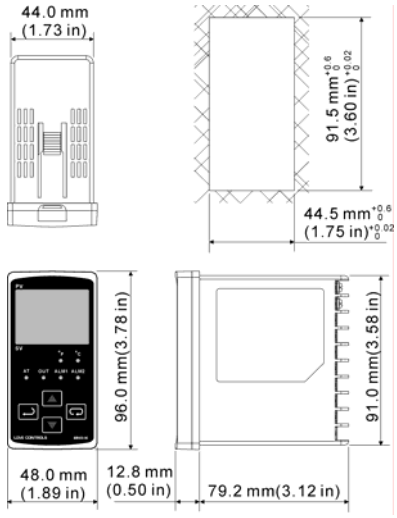
16C



4C



8C

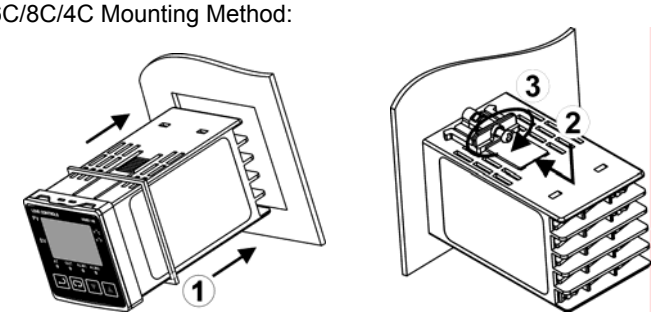


10 Mounting

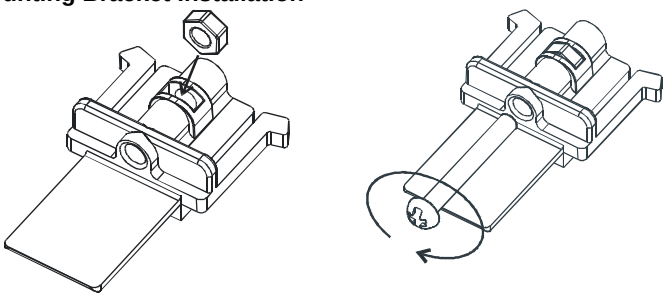
Mounting Method

Step 1: Insert the controller through the panel cutout.
Step 2: Insert the mounting bracket into the mounting groove at the top and bottom of the controller
Step 3: Push the mounting bracket forward until the bracket stops at panel wall.
Step 4: Insert and tighten screws on bracket to secure the controller in place. (The screw torque should be 0.8kgf-cm to 1.5kgf-cm)

16C/8C/4C Mounting Method:



Mounting Bracket Installation



PRODUCT SPECIFICATION SHEET

MODEL:	REV:
120L-17JZ329	-

DESCRIPTION:	CUSTOMER PN:	DATE:
DIN Rail/Surface Mtg. Temp Limit Controller	Process Heating	10/17/06

120L-17JZ329

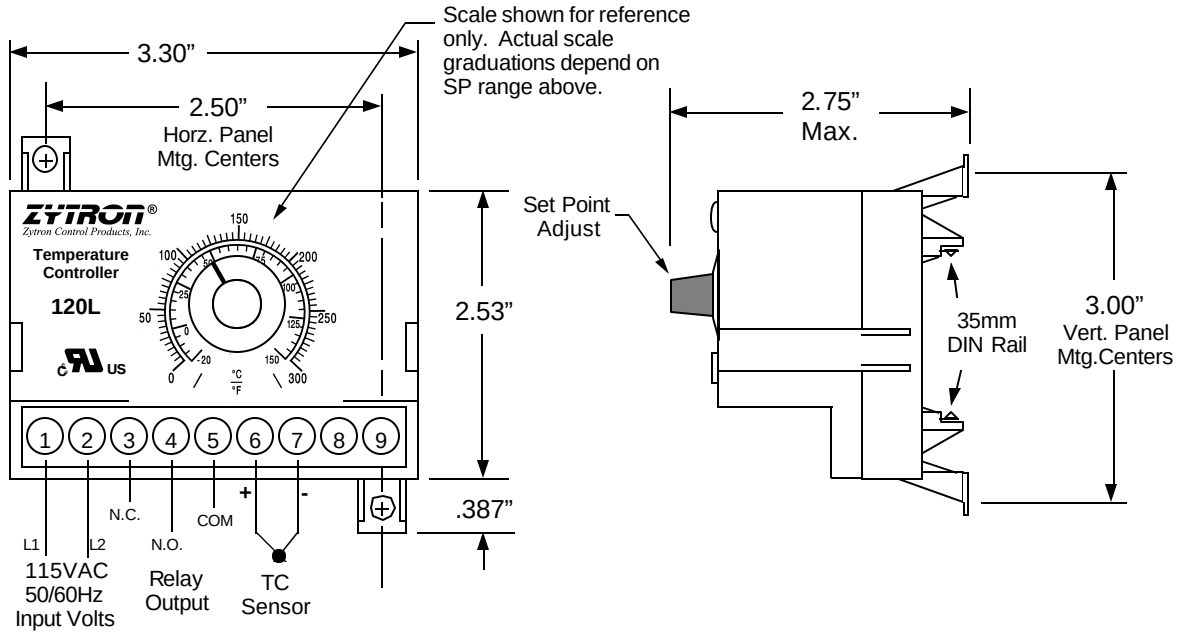
Input Voltage:	115VAC ±15%, 50/60Hz, 3VA Max.
Control Output:	SPDT Relay, N.O. contacts rated 8 Amps Res. 240VAC, 100,000 cycles
Control Mode:	Relay de-energizes on temperature rise (N.O. contacts open).
Control Action:	Latching with manual reset (Reset terminals open) or On-Off with 2°F Hyst. (Reset terminals shorted) .
Manual **Reset:**	Cycle power off & on or momentarily short Reset terminals with N.O. momentary switch (customer supplied). .
Set Point Range:	0 to 600°F
Setpoint Adj.:	Local SP pot with dual °F/°C graduated scales
Sensor Type:	"J" Thermocouple
Compensation:	Automatic cold junction compensation
Control Stability:	Typically better than ±5mV/°F ambient and .01% of span/% rated line voltage
Set Point Accuracy:	±3% of FS maximum at 25°C and rated line voltage
Sensor Failure Prot:	Contacts open for thermocouple break
Amb. Oper. Temp:	0 to 55°C (32 to 131°F)

MECHANICAL

Enclosure Material:	Noryl, Black color
Field Terminations:	Screw termininals with wire clamping plat es and touch safe shield.
Mounting:	35mm DIN rail and surface mounting base

AGENCY APPROVALS UL 873 & CUL per CSA C22.2 No. 24 File #E105669

DIMENSIONS:



LTR	DESCRIPTION	DATE

Replaces / Reemplaza / Remplace 39000-285-01C 02/1997

Industrial Control Transformer
Transformador de control industrial
Transformateur de contrôle industriel

Class Clase Classe	Type Tipo Type
9070	T, TF

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

RECEIVING

Inspect the transformer for damage. If damaged, notify and file a claim with the carrier. Contact the supplier for repair or replacement.

RECIBO

Realice una inspección visual del transformador para ver si encuentra daños. Si ha encontrado daños, notifique a la compañía de transportes y presente una reclamación. Comuníquese con el proveedor para obtener detalles sobre la reparación o sustitución del equipo.

RÉCEPTION

Inspecter le transformateur pour rechercher les dommages. En cas de dommage, prière d'aviser l'entreprise de transport et de faire une déclaration auprès de celle-ci. Contacter le fournisseur pour les réparations ou le remplacement.

PRECAUTIONS

PRECAUCIONES

PRÉCAUTIONS

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel in accordance with the National Electrical Code® (NEC®) and any other applicable codes or standards.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo de acuerdo con las normas del Código nacional eléctrico de los EUA (NEC®) o NOM-001-SEDE así como con cualquier otra norma y código local correspondiente.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil conformément au Code National de l'Électricité (NEC®; É.-U.) et tout autre code et norme applicables.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

1. On the nameplate, verify that the transformer kVA and voltage are correct for the line and load.

Continued on next page

1. Consulte la placa de datos y verifique que los kVA y tensión del transformador sean los correctos para la línea y carga.

Continúa en la siguiente página

1. Sur la plaque signalétique, vérifier si les kVA et la tension du transformateur sont corrects pour la ligne et la charge.

Page suivante

2. Install the transformer only in a well-ventilated area that is free from explosive or corrosive gases, vapor, or excessive dust, dirt, and moisture.
3. Ensure a free flow of air around the transformer. Do not exceed surrounding air temperature of 40° C (104° F).
4. Use sufficient mounting hardware to support the weight of the transformer.

PROTECTION

Use fuses or circuit breakers in accordance with Article 450 of the National Electrical Code® (NEC®) and any other applicable codes and standards.

— For Type TF fusing, use only Class CC rejection fuses on the primary.
— If high voltage transients are possible, use appropriate surge suppression.

ACCESSORIES

To meet European Normalized (EN) Standards, use terminal covers (not included). Refer to the transformer section in the Schneider Electric *Digest*, and call 1-888-778-2733 for accessory information.

CONNECTION AND INSTALLATION

2. Instale el transformador sólo en un área bien ventilada libre de gases explosivos y corrosivos, vapor o demasiado polvo, suciedad y humedad.
3. Asegúrese de que circule el aire alrededor del transformador y de que no exceda la temperatura ambiente de 40° C (104° F).
4. Utilice suficiente herrajes de montaje para soportar el peso del transformador.

PROTECCIÓN

Utilice los fusibles o interruptores automáticos necesarios para cumplir con los requisitos del artículo 450 del Código nacional eléctrico de EUA (NEC®) o NOM-001-SEDE así como con otras normas y códigos locales correspondientes.

— Para la unidades tipo TF, utilice sólo fusibles de rechazo clase CC en el primario.
— Utilice supresores de transitorios apropiados si existe la posibilidad de sobretensiones transitorias.

ACCESORIOS

Para cumplir con las normas europeas (EN), utilice las cubiertas de terminales (no provistas). Consulte la sección de transformadores en el *Compendiado* de Schneider Electric y llame al 1-888-778-2733 (en los EUA) para obtener información sobre los accesorios.

CONEXIÓN E INSTALACIÓN

2. Installer le transformateur seulement dans une zone bien ventilée, dépourvue de gaz ou de vapeur explosif ou corrodant, ou de poussière, de saletés et d'humidité excessives.
3. Assurer une circulation libre de l'air autour du transformateur. Ne pas dépasser une température ambiante de 40° C (104° F).
4. Utiliser la quincaillerie de montage suffisante pour supporter le poids du transformateur.

PROTECTION

Utiliser les fusibles ou les disjoncteurs conformément à l'article 450 du Code national de l'électricité (NEC®; É.-U.) et à tout autre code ou norme applicable.

— Pour les unités type TF, utiliser uniquement des fusibles class CC avec dispositif de rejet sur le primaire.
— Si des tensions transitoires élevées sont possibles, utiliser une suppression de surtension appropriée.

ACCESSOIRES

Pour satisfaire aux normes européennes (NE), utiliser des couvercles de bornes (non fournis). Se reporter à la section des transformateurs dans le *Digest* Schneider Electric, et appeler le 1-888-778-2733 (É.-U.) pour obtenir des informations concernant les accessoires.

CONNEXION ET INSTALLATION

⚠ DANGER / PELIGRO / DANGER

HAZARDOUS VOLTAGE

Turn off power before installing or servicing.

Failure to follow this instruction will result in death or serious injury.

TENSIÓN PELIGROSA

Desconecte la alimentación antes de instalar o prestarle servicio.

El incumplimiento de esta instrucción podrá causar la muerte o lesiones serias.

TENSION DANGEREUSE

Coupez l'alimentation avant d'installer ou de procéder à l'entretien.

Si cette directive n'est pas respectée, cela entraînera la mort ou des blessures graves.

1. If necessary, install jumpers to obtain input and/or output voltages. If windings are tapped, do not use jumpers.
   - — Figure 1 on page 4 shows a *typical parallel* connection to obtain the lower of the two possible voltages. On the primary side, connect one jumper to H1 and H3 and one to H2 and H4. On the secondary side, connect one jumper to X2 and X4 and one to X1 and X3.
   - — Figure 2 on page 4 shows *typical series* connection to obtain the higher of the two possible voltages. On primary side, connect both jumpers to H2 and H3. On secondary side, connect both jumpers to X2 and X3. See the nameplate wiring diagram for connections.
2. Connect only the primary according to the nameplate wiring diagram (A).
3. Energize the transformer. Measure the secondary voltage to ensure transformer voltages are correct for the load.
4. Turn off the primary supply, and connect the load to the secondary terminals (B). All terminals are not always used. See the nameplate wiring diagram.
5. Tighten all unused screws. Torque the remaining screws as follows:
   - — 6–32 screw
     7–9 lbs-in (0.8–1.0 N•m)
   - — 8–32 screw
     14–16 lb-in (1.6–1.8 N•m)
   - — 10–24 screw
     17–19 lb-in (1.9–2.2 N•m)
6. If applicable, install the covers.
7. Energize the transformer.

1. Si es necesario, instale puentes de conexión para obtener tensiones de entrada y/o salida. Si los devanados tienen derivaciones, no utilice puentes de conexión.
   - — La figura 1 en la página 4 muestra una conexión *paralela típica* para obtener la tensión más baja posible de las dos. En el lado del primario, conecte un puente a H1 y H3 y el otro puente a H2 y H4. En el lado del secundario, conecte un puente a X2 y X4 y el otro puente a X1 y X3.
   - — La figura 2 en la página 4 muestra una conexión en *serie típica* para obtener la tensión más alta posible de las dos. En el lado del primario, conecte ambos puentes a H2 y H3. En el lado del secundario, conecte ambos puentes a X2 y X3. Consulte el diagrama de alambrado en la placa de datos para realizar las conexiones.
2. Conecte solamente el primario según el diagrama de alambrado en la placa de datos (A).
3. Energice el transformador. Mida la tensión secundaria y asegúrese de que las tensiones del transformador sean las correctas para la carga.
4. Desconecte la fuente de alimentación del primario y conecte la carga a las terminales del secundario (B). No siempre se usan todas las terminales. Consulte el diagrama de alambrado en la placa de datos.
5. Apriete todos los tornillos sin usar. Apriete el resto de los tornillos de la siguiente manera:
   - — Tornillo 6–32
     0,8–1,0 N•m (7–9 lbs-pulg)
   - — Tornillo 8–32
     1,6–1,8 N•m (14–16 lbs-pulg)
   - — Tornillo 10–24
     1,9–2,2 N•m (17–19 lbs-pulg)
6. Si fuese aplicable, instale las cubiertas.
7. Energice el transformador.

1. Si nécessaire, installer des cavaliers pour obtenir les tensions d'entrée ou de sortie. Si les enroulements sont munis de prises, ne pas utiliser de cavaliers.
   - — La figure 1 à la page 4 indique la connexion *parallèle typique* pour obtenir la tension la plus faible des deux tensions possibles. Sur le côté primaire, connecter un cavalier entre H1 et H3 et un autre entre H2 et H4. Sur le côté secondaire, connecter un cavalier entre X2 et X4 et un autre entre X1 et X3.
   - — La figure 2 à la page 4 indique la connexion *en série typique* pour obtenir la tension la plus élevée des deux tensions possibles. Sur le côté primaire, connecter les deux cavaliers entre H2 et H3. Sur le côté secondaire, connecter les deux cavaliers entre X2 et X3. Voir le schéma de câblage de la plaque signalétique pour obtenir les connexions.
2. Connecter seulement le primaire conformément au schéma de câblage de la plaque signalétique (A).
3. Mettre le transformateur sous tension. Mesurer la tension secondaire pour s'assurer que les tensions du transformateur correspondent à la charge.
4. Couper l'alimentation primaire et connecter la charge aux bornes secondaires (B). Les bornes ne sont pas toujours toutes utilisées. Voir le schéma de câblage de la plaque signalétique.
5. Serrer toutes les vis non utilisées. Serrer les autres vis aux couples suivants :
   - — Vis 6–32
     0,8 à 1,0 N•m (7 à 9 lb-po)
   - — Vis 8–32
     1,6 à 1,8 N•m (14 à 16 lb-po)
   - — Vis 10–24
     1,9 à 2,2 N•m (17 à 19 lb-po)
6. Le cas échéant, installer les couvercles.
7. Mettre le transformateur sous tension.

MAINTENANCE

1. De-energize the transformer.
2. Check for loose connections and wiring, or lead deterioration. Tighten, insulate, or replace where necessary.

SERVICIO DE MANTENIMIENTO

1. Desenergice el transformador.
2. Realice una inspección para ver si encuentra conexiones y cables sueltos, o conductores dañados. Apriete las conexiones, aísle o reemplace los cables o conductores que sean necesarios.

ENTRETIEN

1. Mettre le transformateur hors tension.
2. Rechercher les connexions et les câbles desserrés, ou les conducteurs endommagés. Serrer les connexions, isoler ou remplacer les câbles ou conducteurs lorsque nécessaire.

Figure / Figura / Figure 1 : Typical parallel connection / Conexión paralela típica / Connexion parallèle typique

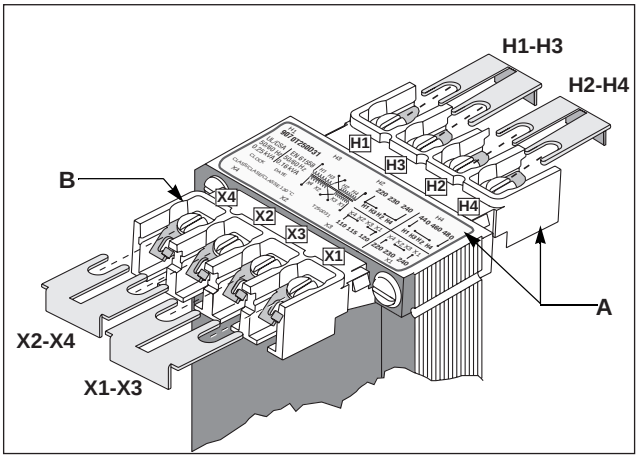
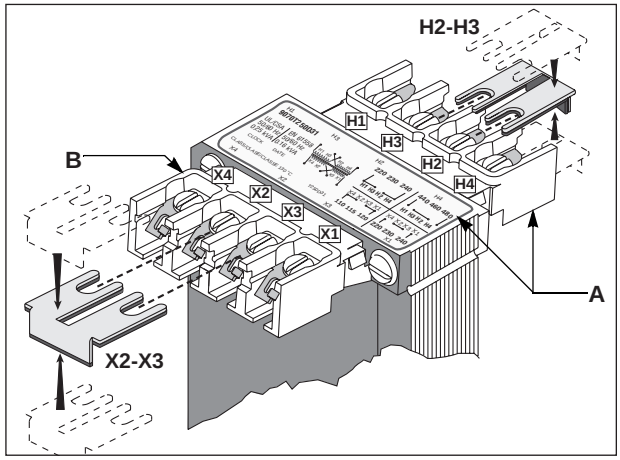


Figure / Figura / Figure 2 : Typical series connection / Conexión en serie típica / Connexion en série typique



Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Schneider Electric USA
6 Commercial Road
Huntington, IN 46750 USA
1-888-SquareD (1-888-778-2733)
www.us.SquareD.com

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

Importado en México por:
Schneider Electric México, S.A. de C.V.
Calz. J. Rojo Gómez 1121-A
Col. Gpe. del Moral 09300 México, D.F.
Tel. 55-5804-5000
www.schneider-electric.com.mx

Seul un personnel qualifié doit effectuer l'installation, l'utilisation, l'entretien et la maintenance du matériel électrique. Schneider Electric n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation de cette documentation.

Schneider Electric Canada
19 Waterman Avenue, M4B 1 Y2
Toronto, Ontario
1-800-565-6699
www.schneider-electric.ca

EGS Electrical Group

Appleton®

330086-000
INSTRUCTION SHEET

Instruction for Installation and Maintenance of Powertite® Series: Pin and Sleeve Receptacles, Plugs and Cable Connectors (30, 60 and 100 Ampere) For Use With Copper Conductors Only

Electrical Rating
Maximum Voltage: 600 VAC at 50-400Hz, 250V DC; Maximum.
Continuous Current: 30, 60, or 100 Amperes.

Applications

- Designed to supply power to portable or fixed electrical equipment such as motor generator units, welders, pumps, compressors and similar apparatus.
- Ideal for use on shipping docks, ports and other "ship to shore" applications.
- Suitable for use in locations where a watertight enclosure is required.
- Rough usage construction.

Features

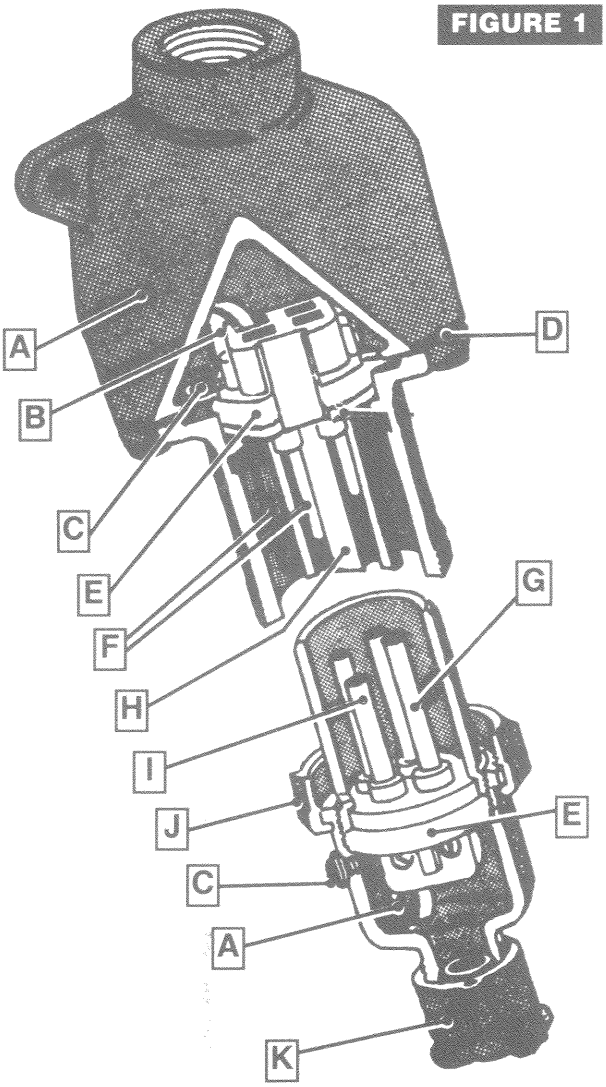
A. **Rugged.** All components have copper-free aluminum housings.
B. **Two Grounding Styles.** Copper grounding straps in Style 2 receptacles and plugs (shown) ground thru shell and extra pole. Style 1 thru shell only.
C. **Convertible.** Two screws secure receptacle insulator block; one screw secures plug insulator block. Permits easy conversion to reverse service (30, 60, 100A).
D. **Watertight.** Mounting box sealed with gasket. Receptacle and connector seals with screw cap or plug. Plug sealed when in receptacle or connector
E. **Insulator Blocks.** Provide high mechanical and dielectric strength, very low "arc tracking".
F. **Positive Ground.** Grounding detent springs assure maintained ground contact.
G. **Self-Aligning.** "Floating" plug and receptacle contacts automatically align.
H. **Arcing Confined.** Contacts made and broken in snuffing chamber. In emergency, plugs can be withdrawn under full rated loads (30A thru 100A). Positive polarization helps prevent mismatching plugs.
I. **Positive Contacts.** Brass contacts have integral springs for positive maintained electrical contact.
J. **Clamping Ring, Plug.** Neoprene gasketed, 30A, 60A, 100A plugs thread onto receptacle for watertight union.
K. **Positive Cable Clamp.** Plugs supplied with neoprene bushing and a reversible cable clamp for firm, watertight fit over a wide range of cable diameters. Locking screw prevents Gland Nut from turning.

Retain this instruction sheet for future reference.

Read instructions carefully and with full understanding for safe installation and operation.

Compliances:
UL Standards 1682, 1686 (all) and 1010 (plugs only);
CSA Specification C22.2 No. 182.1
Enclosure Type 3, 4, 4X

FIGURE 1



Style 2 Powertite Plugs, Receptacles and Cable Connectors are equipped (since mid-1990) with contacts designed to provide a safety polarization means called **"Controlled Length"** contacts, as indicated on product nameplate. This feature will not allow the plug grounding contact (Style 2) to touch an energized receptacle "line" contact in the event the plug becomes damaged and/or loses its primary polarization means and/or is rotated into the incorrect position.

Except as expressly provided by Appleton Electric (Appleton) in writing, Appleton products are intended for ultimate purchase by industrial users and for operation by persons trained and experienced in the use and maintenance of this equipment and not for consumers or consumer use. Appleton warranties do not extend to and no reseller is authorized to extend Appleton's warranties to any consumer.

CAUTION

To prevent ignition of hazardous atmospheres do not use in Class 1, Group F locations that contain electrically conductive dusts.

WARNING

Use cable with diameters within the specified range given in TABLE B for any given grommet size and clamp orientation. Failure to do so may result in over stressed wire terminations which could cause the conductors to pull out of the contacts and cause serious/fatal injuries due to electrocution or fire.

WARNING

Do not modify these devices in any way.

Replace any missing or broken parts with proper replacements parts from Appleton Electric. Modification of these devices or substitution of parts with non-standard parts may result in serious/fatal personal injury from electrocution.

CAUTION

ACP series plugs may be mated with Powertite Series Receptacles in ordinary locations and with the DBR, MD2SR, JBR, EBR and EBRH Series Receptacles for use in hazardous (classified) locations as defined in the National Electrical Code and the Canadian Electric Code. Portable utilization equipment connected to the ACP Series plug must be approved for use in the intended location. Equipment **NOT** approved for use in hazardous location as defined by the N.E.C. and C.E.C., connected to an ACP plug must be used in non-hazardous locations. If used in a hazardous area, the equipment must be approved for that location, or the area must be purged of the hazard and declared non-hazardous.

WARNING

If any parts of the plug, receptacle or cable connector appear to be missing, broken or show signs of damage;

DISCONTINUE USE IMMEDIATELY!

This condition could cause serious/fatal personal injury due to electrocution and/or equipment damage. Repair with proper replacement part(s) before continuing service.

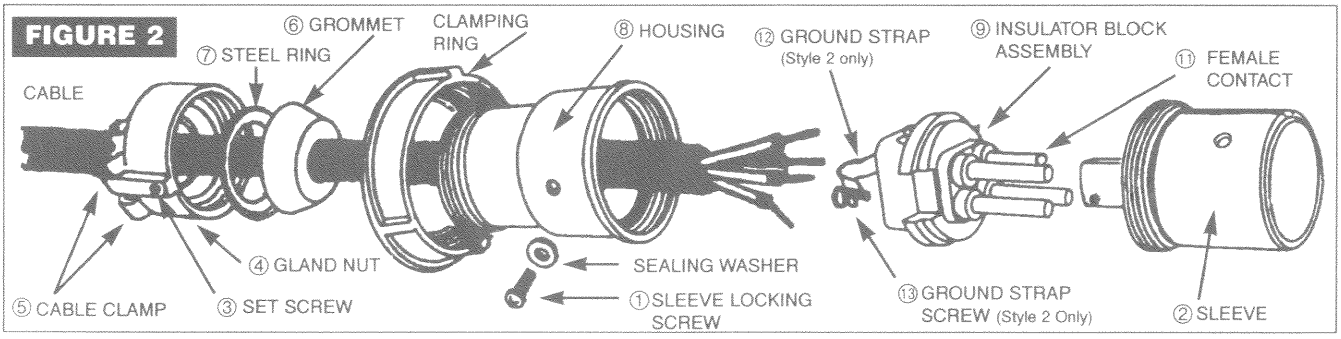
WARNING

Electrical power must be turned **"OFF"** before and during installation and maintenance. Failure to do so may result in serious/fatal injuries due to electrocution.

Plug is watertight when inserted in proper receptacle or cable connector and the clamping ring is fully tightened.

INSTALLATION INSTRUCTIONS FOR POWERTITE "ACP" PLUGS: 30A, 60A, 100A:

FIGURE 2



1. Disassemble plug as shown in Figure 2 by removing sleeve locking screw ①, loosening set screw ③ and unscrewing gland nut ④. It is not necessary to remove female contacts ⑪ from insulator block ⑨. In case of STYLE 2 insulator block, make sure grounding contact with strap ⑫ is in the proper location. See Figure 4.
2. Strip the cable jacket and individual conductors per Table "A".
3. Select proper grommet ⑥ and cable clamp ⑤ orientation per Table "B". Reversible cable clamps (just remove screws, flip over and replace screws) permit wide cable range. Convenient in installations having different cable sizes. See Figure 8.

4. Slide gland nut ④, steel ring ⑦, proper grommet ⑥ and housing ⑧ in that order back over cable.
5. Connect wires to proper terminals in insulator block by loosening (but not removing) terminal pressure screws on contacts. Then insert conductors including all strands into contact terminals according to your established wiring scheme. Tighten terminal pressure screws to a torque value between 30-35 inch lbs. (Conductors must bottom in contact terminal well and insulation must extend below surface of insulator block.) See Figure 3.

Continued on next page...

6. Position insulator block assembly ⑨ in sleeve ②. For STYLE 2, attach ground strap ⑫ to sleeve ② with ground strap screw ⑬ and torque in 25 in. lb. min. / 30 in. lb max. Screw the combination of sleeve and contact block assembly into housing ⑧ until the threaded hole in sleeve ② is aligned with the hole in housing ⑧. Thread in sleeve locking screw ① including sealing washer and torque to 30 in. lb. min. / 35 in. lb. max.
7. Slide grommet ⑥ and steel ring ⑦ up and as close to housing as possible. Force cable into wiring chamber to induce a minimum of 1/8 in. slack in the wire between clamp and terminal. Screw gland nut ④ onto housing ⑧ and torque per Table "C". Finally torque the set screw ③ in place at 10 in. lb. min. / 15 in. lb. max.
8. Refer to Table "B" and Figure 8 for correct cable clamp orientation. Tighten cable clamp screws to 30 in. lb. min. / 35 in. lb. max. Screws were lubricated at the factory but if needed, relubricate with a good grade of grease.

WARNING

A wire scheme must be followed so that the same color wire is always put into the same numbered contact opening in all plugs, connectors and receptacles in the system. This will help insure correct polarity for the system and helps to eliminate possibilities for equipment damage and/or personal injuries due to electrocution or fire.

ELECTRICAL TESTING

Do not connect to power until conducting the following electrical tests.

- Test continuity of wiring to verify correct phasing and grounding connections.
- Measure insulation resistance to be sure system does not have any short circuits or unwanted grounds.

FIGURE 3

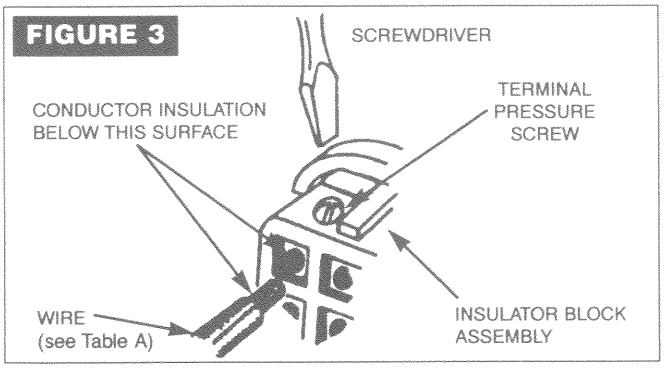
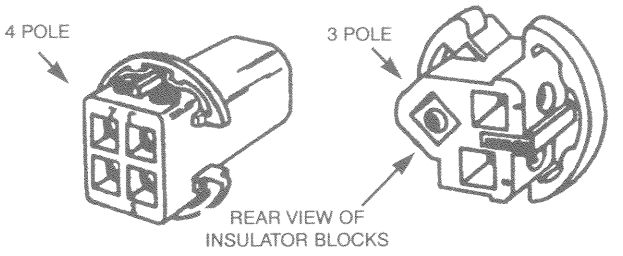


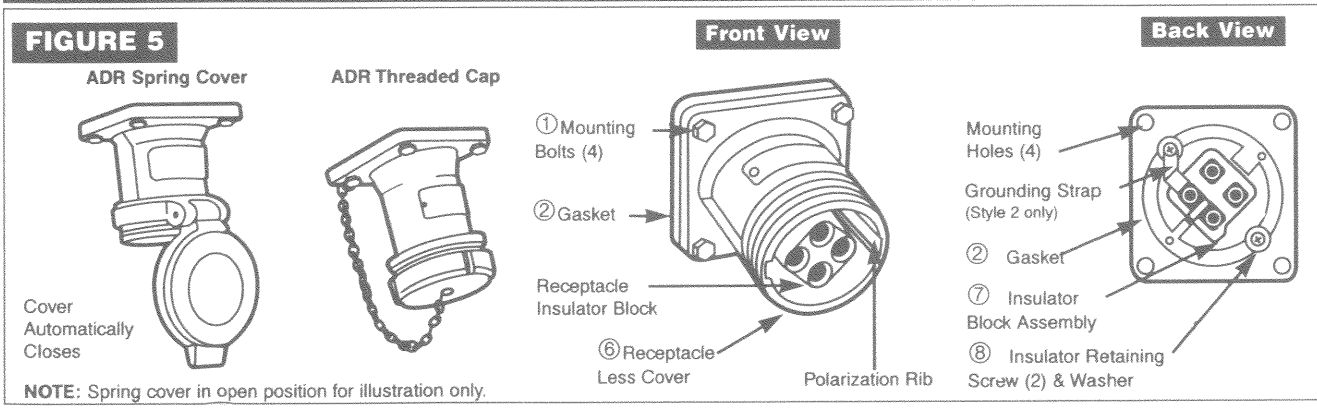
FIGURE 4

NOTE:
In STYLE 2, unmarked terminal cavities are for grounding contacts.



INSTALLATION INSTRUCTIONS FOR POWERTITE "ADR" RECEPTACLES: 30A, 60A, 100A

FIGURE 5



NOTE: Spring cover in open position for illustration only.

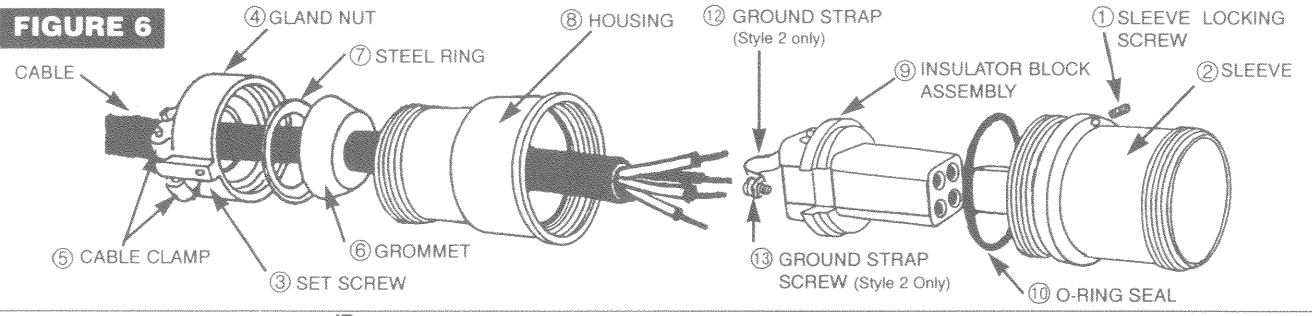
Spring Cover and Screw Cover receptacles are threaded to accept the clamping ring of the ACP plug. The ring threads onto the receptacle to form a watertight assembly with plug in use and also to prevent plug fallout. When the plug is withdrawn, the gasketed Spring Cover automatically closes tightly against receptacle opening providing weather-proof protection.

1. Follow instruction given in paragraphs 2 and 5 for "ACP" plugs.
2. Insert insulator block assembly ⑦ into receptacle housing ⑥ and install two retaining screws with washers ⑧. Torque to 30 in. lbs. min. / 35 in. lbs. max.
3. Mount receptacle to previously installed back box using mounting bolts ① supplied with receptacle and torque to 30 in. lb. min. / 40 in. lb. max. Mounting screws provide electrical continuity between receptacle housing ⑥ and back box. Make sure gasket ② is positioned correctly to make a watertight seal.
4. The spring cover can be positioned to open in any direction by loosening the set screws ⑤, repositioning the spring cover ④, and retightening the set screws ⑤. Torque set screws ⑤ to 7 in. lb. min. / 12 in. lb. max.

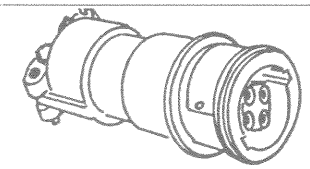
Installation Instructions for Powertite "ARC" Cable Connectors: 30A, 60A, 100A

30A Cable Connector

FIGURE 6



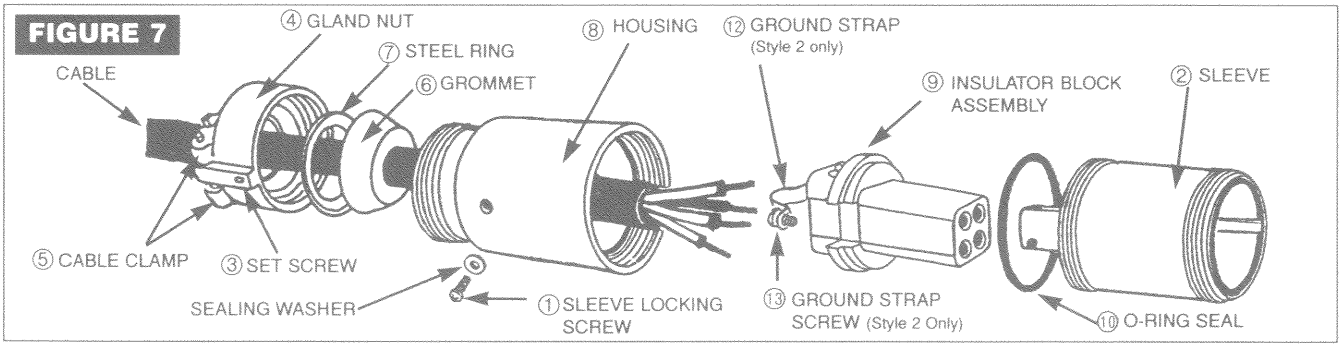
These Cable Connectors are for use with "ACP Powertite Plugs and others. See Intermateability Chart



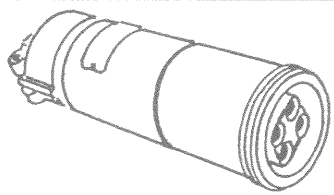
1. Disassemble connector as shown in Figure 6 by loosening sleeve locking set screw ① and gland nut set screw ③, then unscrew sleeve ③ and gland nut ④.
2. Follow instructions given in paragraphs 2, 3, 4, 5 and 6 for the "ACP" plugs.
3. Screw the combination of sleeve and insulator block assembly into the housing ⑧ until the gasket ⑩ is tightened between the sleeve ② and the housing ⑧.
4. Tighten sleeve locking set screw ① and torque to 30 in. lb. min. / 35 in. lb. max.
5. Follow instruction given in paragraphs 7and 8 for "ACP" plugs.

60A/100A Cable Connector

FIGURE 7



These Cable Connectors are for use with "ACP Powertite Plugs and others. See Intermateability Chart

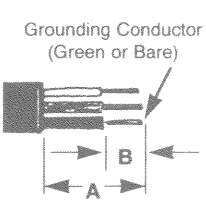


1. Disassemble connector as shown in Figure 7 by loosening sleeve locking set screw ① and gland nut set screw ③, then unscrew sleeve ② and gland nut④.
2. Follow instructions given in paragraphs 2, 3, 4, 5 and 6 for the "ACP" plugs.
3. Screw the combination of sleeve ② and insulator block assembly ⑨ into the housing ⑧ until the "O"-ring ⑩ seats against the sleeve ② and housing ⑧. At this point continue to screw the two components together until the hole in the housing is aligned with the threaded hole of the sleeve ②. Replace sleeve locking screw ① and torque to 30 in. lb. min. / 35 in. lb. max.
4. Follow instruction given in paragraphs 7 and 8 for "ACP" plugs.

TABLE A Dimensions in Inches

Terminal Wire Range and Stripping Guide, Copper Conductors Only

Amperes Rating	Strip Length (inches) Jacket A	Strip Length (inches) Conductor B	Terminal Wire Range (AWG) Building	Terminal Wire Range (AWG) Extra Flex
30	1 1/2	1/2	#10 - #6	#10 - #8
60	1 7/8	5/8	#6 - #2	#6 - #4
100	2 1/2	7/8	#4 - #1	#4 - #2



Terminal Wire Size and Electrical Ratings
Plug and Cord Connector Ratings

AMPERES	MAX. VOLTAGE	WIRE RANGE EXTRA FLEX
30	600 VAC @ 50-400 Hz, 250 VDC	#10 - #8
60	600 VAC @ 50-400 Hz, 250 VDC	#6 - #4
100	600 VAC @ 50-400 Hz, 250 VDC	#4 - #2

CAUTION

Plug and cord connectors are rated for use with Type SO or equivalent portable cord with copper conductors ONLY.

CAUTION

Care must be taken not to cut into the individual conductor insulation when removing the outer cable jacket and to not damage the conductors when removing individual wire insulation. Failure to do so will seriously degrade the electrical properties of the cable and may produce overheating/electrical hazard due to electrocution.

WARNING

Use cable with diameters within the specified range given in TABLE "B" for any given grommet size and clamp orientation. Failure to do so may result in over stressed wire terminations which could cause the conductors to pull out of the contacts and cause serious/fatal injuries due to electrocution.

TABLE B

DIMENSIONS IN INCHES

Grommet Selection and Cable Clamp Orientation Guide (figure 8)

AMP SIZE & CAT. NO.	CABLE DIA. RANGE (In.)	GROMMET I.D. (in.)	REVERSIBLE CLAMP POSITION
30 AMP ACP30xxBC ARC30xxBC	.390-.625 .625-.812 .812-1.125	.625 .812 1.125	1 1 1
30 AMP ACP30xxB ARC30xxB	.500-.625 .625-.750 .750-.875	.625 .750 .875	1* 1* 1*
30 AMP ACP30xxC ARC30xxC	.875-1.000 1.000-1.188 1.188-1.375	1.000 1.188 1.375	1* 2* 2*
60 AMP ACP60xxBC ARC60xxBC	.625-.812 .812-1.125 1.125-1.375	.812 1.125 1.375	1 1 2*
60 AMP ACP60xxB ARC60xxB	.500-.625 .625-.750 .750-.875	.625 .750 .875	1* 1* 1*
60 AMP ACP60xxC ARC60xxC	.875-1.000 1.000-1.188 1.188-1.375	1.000 1.188 1.375	1* 2* 2*
100 AMP ACP10xxCD ARC10xxCD	.875-1.062 1.062-1.281 1.281-1.562 1.562-1.906	1.062 1.281 1.562 1.906	1 1 2 2
100 AMP ACP10xxC ARC10xxC	.875-1.000 1.000-1.188 1.188-1.375	1.000 1.188 1.375	1* 2* 2*
100 AMP ACP10xxD ARC10xxD	1.375-1.625 1.625-1.188	1.625 1.188	2* 2*

*Clamps B & C were replaced by clamp BC; also C & D replaced by CD. Some products with a B or C catalog number suffix were shipped with a BC clamp installed. Same for C or D but with a CD clamp.

Figure 8

To reverse cable clamp, just remove screws, flip over and replace screws. Permits a wider cable range. Convenient in installations having different cable sizes.

1st POSITION 2nd POSITION Clamp position for B, C and D clamps.

ACP plugs are supplied with four bushings to accommodate a wide variety of cable diameters.

For minimum torque tightening, see Table C.

Table C Gland Nut Tightening Torque Guide

DEVICE AMP RATING	MINIMUM TIGHTENING TORQUE (in. lb.)
30A	60.0
60A	60.0
100A	72.0

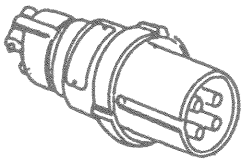
INTERMATEABILITY CHART FOR ORDINARY LOCATION PLUGS & RECEPTACLES

		30A				60A				100A			
		2W, 2P	3W, 3P	4W, 4P	3W, 4P	2W, 2P	3W, 3P	4W, 4P	3W, 4P	2W, 2P	3W, 3P	4W, 4P	2W, 2P	3W, 4P
APPLETON														
Plugs		ACP3022BC	ACP3033BC	ACP3044BC	ACP3034BC	ACP6022BC	ACP6033BC	ACP6044BC	ACP6034BC	ACP1022CD	ACP1033CD	ACP1044CD	ACP1023CD	ACP1034CD
Cable Connectors		ARC3022BC	ARC3033BC	ARC3044BC	ARC3034BC	ARC6022BC	ARC6033BC	ARC6044BC	ARC6034BC	ARC1022CD	ARC1033CD	ARC1044CD	ARC1023CD	ARC1034CD
Receptacles		ADR3022 ACR3022	ADR3033 ACR3033	ADR3044 ACR3044	ADR3034 ACR3034 WRDK3034 WRDK30SQ 312737	ADR6022 ACR6022	ADR6033 ACR6033	ADR6044 ACR6044	ADR6034 ACR6034 WRDK6034 WRDK60SQ 312726	ADR1022 ACR1022	ADR1033 ACR1033	ADR1044 ACR1044	ADR1023 ACR1023	ADR1034 ACR1034 WRDK1034 WRDK10SQ 312738
CROUSE-HINDS														
Plugs		APJ3275	APJ3375	APJ3475	APJ3485 NPJ3483 NPJ3484	APJ6275	APJ6375	APJ6475	APJ6385 NPJ6384 NPJ6385	APJ10277	APJ10377	APJ10477	APJ10387 NPJ10386 NPJ10387	APJ10487 NPJ10486 NPJ10487
Cable Connectors		APR3253 APR3255	APR3353 APR3355	APR3453 APR3455	APR3463 APR3465 NPR3463 NPR3464	APR6253 APR6255	APR6353 APR6355	APR6453 APR6455	APR6463 APR6465 NPR6464 NPR6465	APR10255 APR10257	APR10355 APR10357	APR10455 APR10457	APR10365 APR10367 NPR10366 NPR10367	APR10465 APR10467 NPR10466 NPR10467
Receptacles		AR321 AR323 AR327	AR331 AR333 AR337	AR341 AR343 AR347	AR342 AR344 AR348 NR342	AR621 AR623 AR627	AR631 AR633 AR637	AR641 AR643 AR647	AR642 AR644 AR648 NR642	AR1021 AR1023 AR1027	AR1031 AR1033 AR1037	AR1041 AR1043 AR1047	AR1032 AR1034 AR1038 NR1032	AR1042 AR1044 AR1048 NR1042

ANY PLUG WILL FIT AND OPERATE IN ANY RECEPTACLE OR CORD CONNECTOR IN THAT SAME COLUMN.

ACP Plugs for EBR, EBRH, JBR, MD2SR and DBR Receptacles

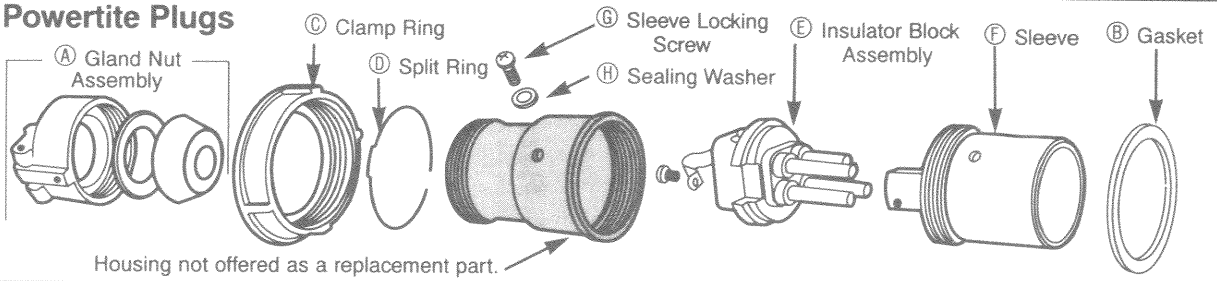
ACP Plugs can be used with ACR and ADR series receptacles and ARC cord connectors. ACP Plugs can also be used with the following receptacles in hazardous locations.



PLUG	RECEPTACLE
ACP3023BC	DBR, EBR, EBRH, JBR, MD2SR-3023
ACP3034BC	DBR, EBR, EBRH, JBR, MD2SR-3034
ACP6023BC	DBR, EBR, EBRH, JBR, MD2SR-6023
ACP6034BC	DBR, EBR, EBRH, JBR, MD2SR-6034
ACP1023CD	DBR, EBR, EBRH, JBR, MD2SR-1023
ACP1034CD	DBR, EBR, EBRH, JBR, MD2SR-1034

Replacement Parts Lists for Powertite "ACP" plugs

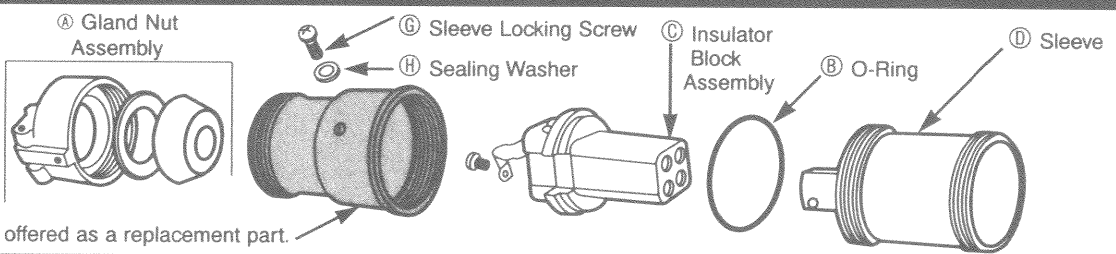
"ACP" Powertite Plugs



Ampacity	Style	Description	Item A Gland Nut Assembly	Item B Gasket	Item C Clamp Ring	Item D Split Ring	Item E insulator Block Assembly	Item F Sleeve STD Position	Item F Sleeve P4 Position	Item G Sleeve Locking Screw	Item H Sealing Washer
30	1	2W, 2P	350482-2	304023-004	304073	____	API-3022	304368-001	304368-003	P06174	W05146-3
30	1	3W, 3P	350482-2	304023-004	304073	____	API-3033	304368-001	304368-003	P06174	W05146-3
30	1	4W, 4P	350482-2	304023-004	304073	____	API-3044	304368-001	304368-003	P06174	W05146-3
30	2	2W, 3P	350482-2	304023-004	304073	____	API-3023	304368-002	304368-005	P06174	W05146-3
30	2	3W, 4P	350482-2	304023-004	304073	____	API-3034	304368-002	304368-005	P06174	W05146-3
60	1	2W, 2P	350482	304023-004	304351	____	API-6022	304339-001	304339-003	P06175	W05146-1
60	1	3W, 3P	350482	304023-004	304351	____	API-6033	304339-001	304339-003	P06175	W05146-1
60	1	4W, 4P	350482	304023-005	304351	____	API-6044	304339-001	304339-003	P06175	W05146-1
60	2	2W, 3P	350482	304023-004	304351	____	API-6023	304340-002	304340-005	P06175	W05146-1
60	2	3W, 4P	350482	304023-005	304351	____	API-6034	304340-002	304340-005	P06175	W05146-1
100	1	2W, 2P	350495	304023-006	304353	____	API-1022	304341-001	304341-003	P06175	W05146-1
100	1	3W, 3P	350495	304023-006	304353	____	API-1033	304341-001	304341-003	P06175	W05146-1
100	1	4W, 4P	350495	304023-007	304353	____	API-1044	304342-001	304342-003	P06175	W05146-1
100	2	2W, 3P	350495	304023-006	304353	____	API-1023	304341-002	304341-005	P06175	W05146-1
100	2	3W, 4P	350495	304023-007	304353	____	API-1034	304342-002	304342-005	P06175	W05146-1

Replacement Parts Lists for Powertite "ARC" Cable Connectors

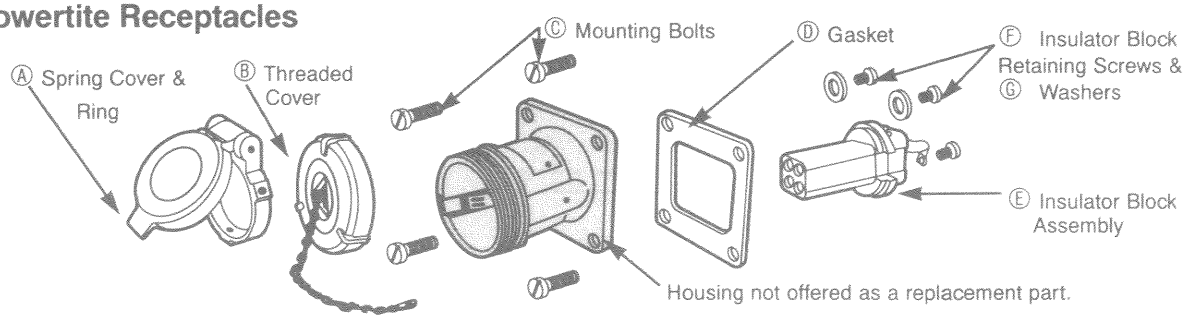
"ARC" Powertite Cable Connector



Ampacity	Style	Description	Item A Gland Nut Assembly	Item B O-Ring	Item C Contact Block Assembly	Item D Sleeve STD Position	Item D Sleeve P4 Position	Item E Sleeve Locking Screw	Item F Nylon Washer
30	1	2W, 2P	350482-2	304117-001	API-3022	351037-001	351037-003	----	----
30	1	3W, 3P	350482-2	304117-001	API-3033	351037-001	351037-003	----	----
30	1	4W, 4P	350482-2	304117-001	API-3044	351037-001	351037-003	----	----
30	2	2W, 3P	350482-2	304117-001	API-3023	351037-002	351037-004	----	----
30	2	3W, 4P	350482-2	304117-001	API-3034	351037-002	351037-004	----	----
60	1	2W, 2P	350482	304374-001	API-6022	351038-001	351038-005	P06175	W05146-1
60	1	3W, 3P	350482	304374-001	API-6033	351038-001	351038-005	P06175	W05146-1
60	1	4W, 4P	350482	304374-002	API-6044	351038-002	351038-006	P06175	W05146-1
60	2	2W, 3P	350482	304374-001	API-6023	351038-003	351038-007	P06175	W05146-1
60	2	3W, 4P	350482	304374-002	API-6034	351038-004	351038-008	P06175	W05146-1
100	1	2W, 2P	350495	304374-003	API-1022	351039-005	351039-005	P06175	W05146-1
100	1	3W, 3P	350495	304374-003	API-1033	351039-005	351039-005	P06175	W05146-1
100	1	4W, 4P	350495	304374-004	API-1044	351039-006	351039-006	P06175	W05146-1
100	2	2W, 3P	350495	304374-003	API-1023	351039-007	351039-007	P06175	W05146-1
100	2	3W, 4P	350495	304374-004	API-1034	351039-008	351039-008	P06175	W05146-1

Replacement Parts Lists for Powertite "ACR" and "ADR" Receptacles

"ADR" Powertite Receptacles



Ampacity	Style	Description	Item A Spring Cover & Ring	Item B Threaded Cover	Item C Mounting Bolts	Item D Gasket	Item E Contact Block Assembly	Item F Insulator Block Retaining Screws	Item G Washers
30	1	2W, 2P	350565	350251	P-5340	60871	API-3022	P05738	W05127
30	1	3W, 3P	350565	350251	P-5340	60871	API-3033	P05738	W05127
30	1	4W, 4P	350565	350251	P-5340	60871	API-3044	P05738	W05127
30	2	2W, 3P	350565	350251	P-5340	60871	API-3023	P05738	W05127
30	2	3W, 4P	350565	350251	P-5340	60871	API-3034	P05738	W05127
60	1	2W, 2P	350424	350417	P-7311	60567	API-6022	P05738	W05127
60	1	3W, 3P	350424	350417	P-7311	60567	API-6033	P05738	W05127
60	1	4W, 4P	350425	350420	P-7311	60567	API-6044	P05738	W05127
60	2	2W, 3P	350424	350417	P-7311	60567	API-6023	P05738	W05127
60	2	3W, 4P	350425	350420	P-7311	60567	API-6034	P05738	W05127
100	1	2W, 2P	350425	350447	P-7311	60567	API-1022	P05738	W05127
100	1	3W, 3P	350425	350447	P-7311	60567	API-1033	P05738	W05127
100	1	4W, 4P	350453	350449	P-7311	60567	API-1044	P05738	W05127
100	2	2W, 3P	350425	350447	P-7311	60567	API-1023	P05738	W05127
100	2	3W, 4P	350453	350449	P-7311	60567	API-1034	P05738	W05127

Maintenance

Electrical and mechanical inspection of all components must be performed regularly. It is recommended that inspection be performed a minimum of once a year.

WARNING

If any parts of the plug, receptacle or cable connector appear to be missing, broken or show signs of damage;

DISCONTINUE USE IMMEDIATELY!

This condition could cause serious/fatal personal injury due to electrocution and/or equipment damage. Repair with proper replacement part(s) before continuing service.

1. Inspect all contact wire terminals for tightness. (Retorque). Discoloration due to excessive heat is an indicator of possible problems and should be thoroughly investigated and repaired as necessary.
2. Check grounding and bonding for correct installation and secure connection. (**Re-torque**)
3. Check gaskets for deterioration and replace if necessary.
4. Clean exterior surfaces making sure nameplates remain legible.
5. Inspect gland nut and cable grip tightness to ensure proper cord/cable gripping.
6. Torque all screws as described in instructions before re-using device.
7. Inspect housing parts and replace those which are broken or excessively worn.
8. Check contacts for signs of excessive arcing or burning and replace if necessary.

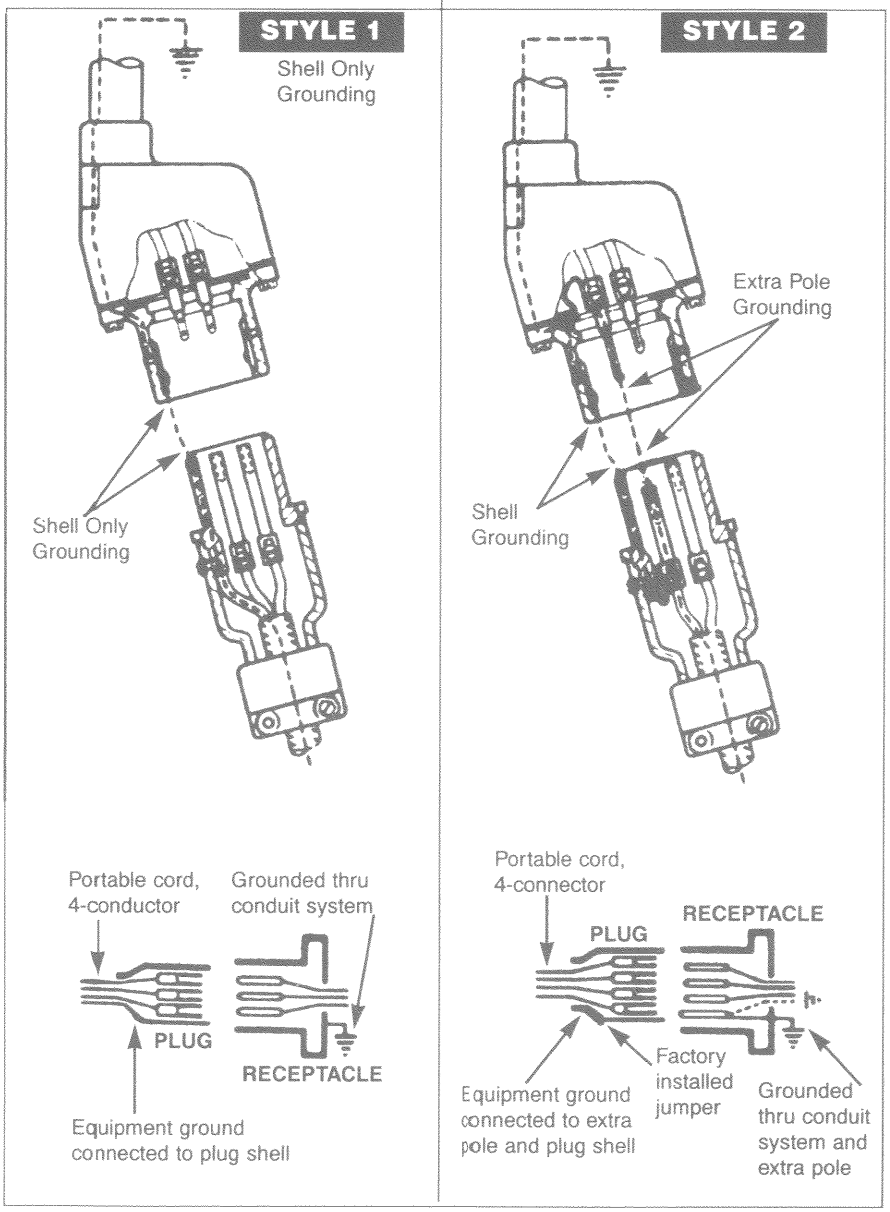
In addition to these required maintenance procedures, we recommend an Electrical Preventive Maintenance program as described in the National Fire Protection Association Bulletin NFPA No. 70B.

ELECTRICAL RATING

Maximum Voltages: 600 VAC @ 50-400Hz, 250V DC;
Maximum continuous current: 30, 60 or 100 Amperes.

Retain this Instruction Sheet for Future Reference

Powertite Plugs and Receptacles available in two grounding styles:



PLUG - Equipment grounding conductor is wired directly to a solderless lug which is connected to the plug housing with pressure connector. All contacts are "current carrying".

RECEPTACLE - Two detent spring clips engage the grounded plug housing on plug insertion - grounded plug shell makes contact with receptacle ground spring before line and load poles are engaged. Grounding path is maintained until after current-carrying contacts disengage. All contacts are "current carrying".

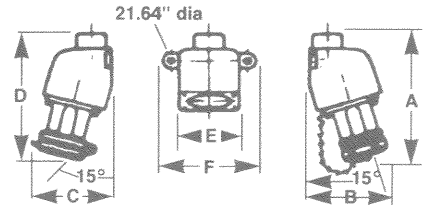
PLUG - Equipment grounding conductor is not only connected to the solderless lug in the plug housing, but also to an extra grounding pole. Grounding pole has copper alloy grounding jumper strap that connects to plug housing.

RECEPTACLE - Two detent spring clips engage the grounded plug housing on plug insertion. Jumper from extra grounding pole is electrically connected to a screw on receptacle housing. Longer grounding pole "makes first and breaks last".

Powertite 30, 60, 100 Amp Pin and Sleeve Receptacles, Plugs and Connectors

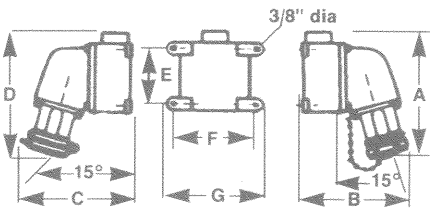
Dimensions in Inches

Receptacle Mounted on AEE Box



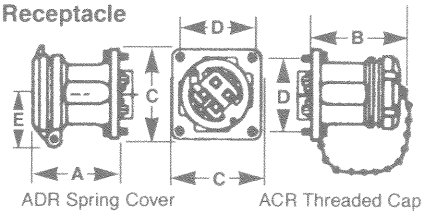
	A	B	C	D	E	F
30 Amp	6.88	3.75	4.25	7.13	3.88	5.00
60 Amp	9.75	5.25	5.50	10.00	4.25	6.38

Receptacle Mounted on AJA-AJAC Box



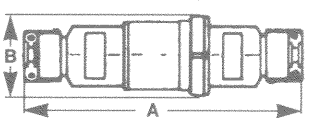
	A	B	C	D	E	F	G
30 Amp	9.63	8.00	8.81	10.69	4.88	6.88	7.88
60 Amp	11.44	9.00	9.19	11.82	4.88	6.88	7.88

Receptacle



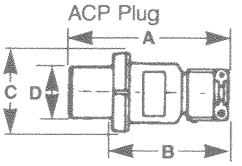
	No. Poles	A	B	C	D	E
30 Amp	2,3,4	3.31	3.19	3.38	2.72	2.06
60 Amp	2,3	4.88	4.63	4.50	3.50	2.31
60 Amp	4	4.88	4.63	4.50	3.50	2.44
100 Amp	2,3	5.81	5.50	4.50	3.50	2.44
100 Amp	4	5.81	5.50	4.25	3.50	2.56

Connector ACP Plug



	A	B
30 Amp	10.50	3.13
60 Amp	13.25	3.81
100Amp	16.00	4.25

Plug ACP Plug



	No. Poles	A	B	C	D
30 Amp	2,3,4	6.00	4.75	3.13	1.86
60 Amp	2,3	7.81	4.94	3.50	2.23
60 Amp	4	7.81	4.94	3.81	2.55
100 Amp	2,3	10.50	6.63	4.00	2.47
100 Amp	4	10.50	6.63	4.25	2.72

Notes

Process Heating Company, Inc.

With Over Fifty Years of Designing & Manufacturing Lo-Density Automatic Electric Heating Systems