HOW TO ORDER PARTS

To assure prompt delivery when ordering parts, please furnish the following information: 1) Complete name and address of consignee. 2) Method of shipment preferred. 3) Is shipment to be prepaid or collect? 4) Serial numbers of units to which parts apply. 5) Complete part numbers and descriptions. 6) Any special instructions.

**Specify unit serial number when ordering parts!**

WARRANTY

E. D. Etnyre & Co. warrants to the original Purchaser, it’s replacement parts to be free from defects in material and workmanship for a period of twelve (12) months after date of delivery to original Purchaser.

The following are exceptions to this policy:

1. All new electronic components are warranted for a period of 60 days. This is subject to vendor approval.
2. Remanufactured electronic components are warranted for a period of 30 days.
3. Remanufactured hydraulic components are warranted for a period of 60 days.
4. All non-Etnyre manufactured components are subject to the original warranty of the manufacturer.
5. New hydraulic components are warranted for the period of time set forth by the vendor of the individual item.

The obligation of the Company is limited to repairing or replacing any defective part returned to the Company and will not be responsible for consequential damages or any further loss by reason of such defect. Furthermore, the Etnyre Co. will not be responsible for any labor charges, freight charges, or transportation costs incurred by the purchaser if said part were to fail.

This warranty does not apply to:

1. Normal start-up services, normal maintenance services or adjustments usually performed by the selling dealer, factory service representative or customer personnel.
2. Any product manufactured by E. D. Etnyre & Co. purchased or subjected to rental use.
3. Any product or part thereof which shows improper operation, improper maintenance, abuse, neglect, damage or modification after shipment from factory.
4. Any product or part thereof damaged or lost in shipment. Inspection for damage should be made before acceptance or signing any delivery documents releasing responsibility of the delivering carrier.

This warranty and foregoing obligations are in lieu of all other obligations and liabilities including negligence and all warranties of merchantability or otherwise, express or implied in fact or by law.

The company excludes all implied warranties of merchantability and fitness for a particular purpose. There are no warranties, express or implied, which extend beyond the description of the goods contained in this contract.

E. D. ETNYRE & CO., Oregon, Illinois 61061-9778
1333 South Daysville Road  Phone: 800-995-2116  Fax: 800-521-1107
www.etnyre.com   sales@etnyre.com
Safety Precautions, Hazard Seriousness Level

You will find safety information boxes throughout this manual. These boxes contain information alerting you to situations or actions to avoid.

Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Their selection is based on the likely consequence of human interaction with a hazard. Definitions of hazard levels are as follows.

⚠️ **DANGER** - Immediate hazards which **will** result in severe personal injury or death.

⚠️ **WARNING** - Hazards or unsafe practices which **could** result in severe personal injury or death.

⚠️ **CAUTION** - Hazards or unsafe practices which **could** result in minor personal injury or product or property damage.

**HOT SURFACES** - Since this tank is intended to store hot liquid asphalt, the surfaces of the tank and equipment may be hot. All surfaces and equipment should be considered to be hot. Wear insulated gloves and protective clothing to prevent burns. The piping is heated with electric heat tape, it will be hot even though it has not been used recently.

**HOT LIQUIDS** - The liquids stored in this tank are hot. The piping and hoses used to transfer the liquids are hot. Wear insulated gloves, protective clothing and a face shield when transferring hot liquids or handling hot liquid hoses to avoid burns. Stay clear of piping that may contain hot liquids. Leave all valves closed unless you are performing an operation which requires a valve to be opened. Do not open valves unless you are prepared for asphalt to flow.

**ELECTRICAL SHOCK** - This equipment is powered by high voltage electricity. To avoid electrical shock causing personal injury or death do not attempt to make repairs or adjustments without turning off the main power at the control panel. Do not attempt to operate this equipment with the control panel door open.

⚠️ **MOVING PARTS** - This equipment contains moving parts, turning shafts, pulleys and belts. Keep all guards in place when operating. The agitator is controlled by a timer and may start unexpectedly. To avoid entanglement, do not attempt to make repairs or adjustments without turning off the main power at the control panel.

⚠️ **FALLS** - To avoid falls that could result in death or serious injury, do not climb over guard rails on the top of the tank for any reason. Be careful when working on top of the tank to avoid dropping tools or parts that could strike someone on the ground.

**WARNING**

Do not use this machine for any operation which is not described in this manual.
If you have any questions about operation of this machine, contact the Etnyre Service Department at 1-800-995-2116 or 1-815-732-2116.
Operations that are not approved could cause serious injury or death.
Reporting Safety Defects

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying E. D. Etnyre & Co.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, and E. D. Etnyre & Co.

To contact NHTSA, you may call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in the Washington, D.C. area). Or, you may write to: U.S. Department of Transportation, Washington, D.C. 20696. You may also obtain other information about motor vehicle safety from the Auto Safety Hotline.

This manual covers standard features and options. If your unit incorporates custom features, some of the information contained in this manual may not apply. If you have any questions regarding this manual or your unit, contact your dealer or the E. D. Etnyre Service Department at 1-800-995-2116

PROPOSITION 65 WARNING
Diesel Engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Please note this warning and remember -
Always start and operate the engine in a well-ventilated area;
If in an enclosed area, vent the exhaust to the outside;
Do not modify or tamper with the exhaust system.

---

**WARNING**

Fluoroelastomer handling
Some “O” rings and seals used in this vehicle are made from fluoroelastomers. When used under design conditions, fluoroelastomers do not require special handling. However, when fluoroelastomers are heated to temperatures beyond their design temperature (around 600 degrees Fahrenheit), decomposition may occur with the formation of hydrofluoric acid. Hydrofluoric acid can be extremely corrosive to human tissue if not handled properly.

A degraded seal may appear as a charred or black sticky mass. Do not touch either the seal or the surrounding equipment without wearing neoprene or PVC gloves if degradation is suspected. Wash parts and equipment with 10% lime water (calcium hydroxide solution) to neutralize any hydrofluoric acid.

If contact with the skin occurs, wash the affected areas immediately with water. Then rub a 2.5 calcium gluconate gel into the skin until there is no further irritation, while seeking prompt medical attention.

Note to physicians: For advice or treatment of HF Burns, call the DuPont Medical Emergency Number 1-800-441-3637.
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Insulation
The tank is covered with fiberglass insulation, four inches thick. The insulation is intended to maintain the temperature of the heated asphalt. The insulation is covered with aluminum sheeting of .040” min thickness for weather protection.

Electric Heater
The tank is heated with a 28KW Unitized Heater. The heater is located inside the bottom of the tank. It is controlled by a thermostat located in the control box. A light in the control box door indicates when the heater is on.

Float Gage
The tank is equipped with a float type level gage. The white line on the indicator weight aligns the tank.

Electric Power
Tanks with pumps require 240/480 volt three phase power, with a four wire (neutral wire) system. Conversion to other voltages is done with wiring inside the control box.

| WARNING |
| This equipment is powered by high voltage electricity. Turn off main power at control panel before making repairs or adjustments |

Thermometer
A dial thermometer is located in a dry well on the side of the tank. The thermometer indicates the temperature of the asphalt inside the tank. The thermometer may be removed from the well with asphalt in the tank.

| WARNING |
| All surfaces and equipment should be considered to be hot. Wear insulated gloves and protective clothing to prevent burns. |

Plumbing
Three inch diameter lines run from the bottom of the tank to the pump. The pump is belt driven by a five horsepower 240/480 volt three phase electric motor. It may be used to pump out of the storage tank into other small tanks, or used to pump into the storage tank from transport tanks. The system may also be used to recirculate the product in the storage tank. All lines are insulated and heated with 115 volt heat tape.

Control Box
The control box is located on the side of the tank opposite the ladder. In the door of the control box is a master disconnect switch which controls the power for all electrical functions. A heater indicator light is also located in the door, indicating when the heaters are on. A pump switch which selects forward, off, and reverse, is located in the door as well. There is also a low level light and a high limit reset switch located in the door. Inside the box there are various electrical components that operate the electrical equipment. A timer for the agitator and the thermostat for the heater is located in the box. Also located inside the box is a 115 volt receptacle (GFI), that may be used to power a trouble light or power tools up to 15 amp capacity.
1. Control Power Transformer
2. Control Fuses
3. Control Fuses
4. GFI 110 Volt Receptacle
5. Reversing Motor Starter
6.
7. Heat Trace Temperature Control
8. Heat Trace Fuse Block
9. Motor Protection Fuses
10. Motor Protection Fuses
11. Motor Protection Fuses
12. Tank High Limit Temperature Control
13.
14. Tank Temperature Control
15.
16.
Preparation For Use
Inspection

Unpack the ladder, ladder cage, and handrail. Check for damage that may have occurred during shipment. Visually inspect the tank, particularly the tank jacketing and insulation for damage that may have occurred during shipment. Report any damage to the driver delivering the tank.

Setting The Tank in Place

1. The tank level gage float has been secured to the roof of the tank for shipment.

2. Install the ladder, ladder cage, handrails and platform. Securely tighten all fasteners.

<table>
<thead>
<tr>
<th>WARNING</th>
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<tr>
<td>To avoid falls that could result in death or serious injury, do not climb over the handrails on top of the tank for any reason.</td>
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<table>
<thead>
<tr>
<th>WARNING</th>
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<tr>
<td>Keep all guards in place when operating.</td>
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</table>

Connecting Power

480 volt three phase power with a neutral wire is required for power. Power connection and wiring should be done by a qualified electrician to conform to local and national electric codes.
General Operating Instructions

Heater Operation

**WARNING**
This equipment is powered by high voltage electricity. Turn off main power at control panel before making repairs or adjustments.

**WARNING**
All surfaces and equipment should be considered to be hot. Wear insulated gloves and protective clothing to prevent burns.

**WARNING**
Keep all guards in place when operating.

1. Do not operate the heaters unless there is a minimum of 700 gallons of asphalt in the tank.
2. Turn the master power switch off and open the control box door.
3. Set the desired temperature on the thermostat knob.
4. Close the control box door and turn the master power switch on.
5. The heaters will turn on and off automatically to maintain the set temperature.
6. The indicator light on the control box door will be lit whenever the heaters are actually on.
7. Clean the pump after any operation has been completed.

---

### OPERATING INSTRUCTIONS

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![Diagram of the equipment setup](attachment:5200784.png)
Filling From Transport Using Storage Tank Pump

1. Be sure the discharge valve on the transport is closed.

2. Connect the transport’s hose to the discharge valve on the transport.
3. Close valves 1, 2, 3 and 4.
4. Remove the fill line cap and connect the hose from the transport to the 3” fill line on the storage tank.
5. Open valve #2 on the storage tank and open the discharge valve on the transport.
6. Start the storage tank pump.
7. Watch the tank level gage on the storage tank to prevent over filling the storage tank.
8. When the storage tank is full close the discharge valve on the transport.
9. Suck the hose clean as described in the transport operating instructions.
10. Close valve #2 on the storage tank.
11. Shut off the pump.
12. Disconnect the hose from the storage tank and install the cap on the fill line.
13. Clean the pump.
Unloading From Above the Heaters
Using Storage Tank Pump

**WARNING**
Do not open valves unless you are prepared for asphalt to flow. The liquids stored in this tank are hot.

**WARNING**
All surfaces and equipment should be considered to be hot. Wear insulated gloves and protective clothing to prevent burns.

**WARNING**
The liquids stored in this tank are hot. Wear insulated gloves, protective clothing when handling hoses.

1. Close valves 1, 2, 3 and 4.

2. Remove the discharge line cap and connect the hose to the discharge on the pump.

3. Connect the other end of the hose to the distributor or kettle’s fill line.

4. Open valve #3.

5. Open the distributor’s fill line valve if there is one.

6. Open valve #1 on the storage tank.

7. Turn the pump switch to forward.

8. Watch the tank level gage on the distributor to prevent over filling the distributor.

9. When the distributor tank is full close valve #1.

10. Shut off the pump.

11. If there is a valve at the distributor, close it.

12. If you are loading the distributor or kettle through a top opening, raise the hose above the level of the liquid in the distributor or kettle.

13. Open valve #1.

14. Turn the pump switch to reverse and suck the material from the hose and pump it back into the storage tank to clean the hose.

15. If the hose is connected to piping on the distributor or kettle, crack open the connection to allow air into the hose.

16. Disconnect the hose from the distributor or kettle and raise the end so that any remaining asphalt in the hose can drain back to the pump.

17. Once the hose is clean, close valve #1.

18. Disconnect the hose from the discharge line.

19. Shut off the pump.

20. Close valve #3 and install the discharge line cap.

21. Clean the pump.
Recirculating Using Storage Tank Pump

**WARNING**
Do not open valves unless you are prepared for asphalt to flow. The liquids stored in this tank are hot.

**WARNING**
All surfaces and equipment should be considered to be hot. Wear insulated gloves and protective clothing to prevent burns.

**WARNING**
The liquids stored in this tank are hot. Wear insulated gloves, protective clothing when handling hoses.

1. Close valves 1, 2, 3 and 4.
2. Check that the caps are on and locked on both the fill and discharge lines.
3. Open valve #2 and valve #4.
4. Start the pump in the forward direction
5. Clean the pump.

---

**CIRCULATING IN THE TANK**

- Valve #1: Close
- Valve #2: Close
- Valve #3: Close
- Valve #4: Close

Fill

Washout / Vent Valve

Motor

Pump

Discharge

---

General
Pump Off Using Storage Tank Pump

**WARNING**
Do not open valves unless you are prepared for asphalt to flow. The liquids stored in this tank are hot.

**WARNING**
All surfaces and equipment should be considered to be hot. Wear insulated gloves and protective clothing to prevent burns.

**WARNING**
The liquids stored in this tank are hot. Wear insulated gloves, protective clothing when handling hoses.

1. Close valves 1, 2, 3 and 4.
2. Remove the discharge line cap and connect the hose to the discharge on the pump.
3. Connect the other end of the hose to the distributor or kettle’s fill line.
4. Open valve #3.
5. Open the distributor’s fill line valve if there is one.
6. Open valve #4 on the storage tank.
7. Turn the pump switch to forward.
8. Watch the tank level gage on the distributor to prevent over filling the distributor.
9. When the storage tank is empty close valve #4.
10. Shut off the pump.
11. Close valve #3.
12. Disconnect the hose from the distributor or transport and place the end in a suitable container.
13. Disconnect the hose from the discharge line and raise the end so that any remaining asphalt in the hose can drain into the container.
14. Install the discharge line cap.
15. Clean the pump.
Cleaning The Asphalt Pump

| WARNING | Do not open valves unless you are prepared for asphalt to flow. The liquids stored in this tank are hot |
| WARNING | All surfaces and equipment should be considered to be hot. Wear insulated gloves and protective clothing to prevent burns. |
| WARNING | The liquids stored in this tank are hot. Wear insulated gloves, protective clothing when handling hoses |
| WARNING | Extinguish all sources of flame, lit cigarettes, torches or lighters |

1. Close valves 1, 2, 3 and 4.
2. Remove the discharge line cap and connect the 3” hose to the discharge on the pump.
3. Put the other end of the 3” hose in a bucket
4. Check the area for sources of flame, lit cigarettes, torches or lighters. Extinguish all sources of flame.
5. Open valve #3.
6. Put the end of the small 3/8” hose which is attached to the breather vent into a bucket of diesel fuel.
7. Open the breather vent valve between the pump and the hose.
8. Hold both hoses to avoid being splashed.
9. While holding both hoses securely, momentarily turn the pump switch to forward. This will draw the solvent from the diesel fuel bucket, pump it through the pump, and out into the catch bucket.
10. Shut off the pump.
11. Drain the remaining solvent from the 3” hose into the catch bucket.
12. Close the breather vent valve between the pump and the 3/8” hose.
13. Close valve #3.
14. Remove the 3” hose and replace the discharge line cap.
## Wiring - Storage Tank

**5200299**

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#### 5200696

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Pump Unit
5200651
### Pump Unit

#### 5200651

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Insulation And Heat Shield
5200748

EQUALLY SPACED APART-TYP
INSTALL SCREWS (ITEM #23)
### Insulation And Heat Shield

**5200748**

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Heater
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Heater
5200759

List of part #s used on the 34Kw 240V 3ph heat kit:

Our Model # for this heater kit is U-34422124-3

Description
1 - Temperature Control
1 - Hi Limit Control-Tank heat
1 - Heat Trace Temp Control
1 - Heat Trace Thermocouple
1 - Heat Trace/GFCI Transformer
1 - Transformer Primary Fuse Block
2 - Primary Fuses
1 - Transformer Secondary Fuse Block
1 - Secondary Fuse
1 - Contactor-Heat trace
1 - Heat Trace Fuse Block
2 - Heat Trace Fuse
1 - GFCI Receptacle
1 - Control Relay
1 - Disconnect
3 - Contactor-Tank heat
1 - High/Low Heat Selector Switch
1 - Control Transformer
2 - Transformer Primary Fuse
1 - Transformer Secondary Fuse
1 - Reset Light
4 - Lights (High, Low Level, Stage 1 & Stage 2)
1 - Pendant Station
4 - Tank Heat Fuse Blocks
12 - Tank Heat Load Fuse
4 - Heating Elements
1 - NEMA Size 2 Reversing Motor Starter
1 - Motor Starter Fuse Block
3 - Motor Fuse
1 - Pump Low Level Override Switch
1 - Overload Heaters
1 - 3 Pole Level Control Terminal Block
1 - Enclosure

Part#  
Partlow LF15-79 100"-450"
UE E55S-E23BC
Zytron - 120-7-Z152-056
Type J - 10' TFE
Acme TA253529
Bussman BC6032BQ
Bussman FNQR-12
Bussman BM6031PQ
Bussman FNIM-15
Square "D" 8910 DPA13
Bussman H250-30
Bussman NON-12A
Leviton - 125V,60HZ,20A
Idec - RH28-120VAC
Bussman BDNF175
Square "D" 8910 DPA53
Telemecanique ZB4-BZ102
Square "D" - TF150D1
Bussman ATQR-2
Bussman FNIM, 1 1/2A
Telemecanique ZB4-BW34, W/ZB4-BWO62
Telemecanique ZB4-BV6*, W/ZB4-BV6
Telemecanique XAC-A04 w/Rev For, PB Rev. Mush Stop
Bussman H25030-3P
Bussman NON-25
PHCo E-8.5112124-3
Allen Bradley 505COD
Bussman R25030-3P
Bussman FNQR-20
Telemecanique ZB4-BZ102 w/BE101
Allen Bradley W55 - 13 Amp
Marathon 6H55-T5K
Hoffman C-SD482412
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**Manhole Assembly**

5200683
Level Indicator
5200646

LIQUID LEVEL BIN-INDICATOR COMES W/ HEATER KIT
SEE DWG. 6500418

SEE DETAIL A

SEE 5200725 FOR FINISH RING

STANDING AT REAR LOOKING FORWARD

HEATER PIPES REF

TOP VIEW REAR

RIGHT SIDE

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Asphalt Pump
3340593
### Ladder
#### 5200779

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**SEE DETAIL A**

---

**TANK**

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Specify Unit Serial No., Part No., & Part Description
Ladder Cage
5200776

Section B-B

Section A-A

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Specify Unit Serial No., Part No., & Part Description
Handrails, Platform And Catwalk

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Wiring Diagram
Instructions for Reset Operator Kit RSK-12,
for A/200 Motor Starters
Used in Control Panels

Fig. 1 Component Parts of Reset Operator Kit S#176C585G02

The Westinghouse reset operator kit is designed for use with A/200 Motor Starters used in control panels. For illustration of component parts refer to Figure 1.

Utilize the same drilling plan for NEMA 12 and NFMA 1 kits. Follow the same installation procedure and adjustment sequence for both types except for NEMA 12 kits, the O-ring (3) supplied with the kit must be positioned between the operator and the cover before securing the operator to the cover. For NEMA 1 kits, the O-ring (3) is discarded.

Installation of Cover Mounted Reset Button

1. For applications where the cover thickness is less than .187 the top of the starter reset rod must be at least 1” below the underside of the cover. (See Figure 4)

Note

If the starter reset rod is less than 1” from the underside of the cover, use the RSK-B12 reset kit (LL-14503).


2. For application where the cover thickness is greater than .187 the operator must be mounted in a 3/16 tapped hole with a .094 front counterbore (See Figure 3).

3. Determine the type of starter which you are using and refer to Figure 2 for the cover drilling plan. Note that the single pole overload relays require two holes in the cover and two reset kits. The block type overload relay mounted below the starter requires one hole and one reset kit. Drill or tap for proper cover thickness and starter type.

4. Take operator-plunger rod assembly (1) insert through cover hole and position so that the lettering on operator is horizontal and the key on the operator lines up with the offset in the cover hole. Place housing (2) on the rear of the operator and tighten securely. This method is utilized where the cover thickness is .187 maximum. See Figure 4. For covers greater than .187, thread the operator-plunger assembly through the cover hole and tighten down securely. (See Figure 3.) The housing (2) is discarded for this application.

5. After the operator is mounted in the cover, determine the desired plunger rod (4) length by measurement or trial. Then cut plunger rod to suit the application.
HEATING SYSTEM

Specify Unit Serial No., Part No., & Part Description

Fig. 2 Drilling Plan and Tabulation

Fig. 3 Operator Mounting for Covers Over .187 In. Thick

Fig. 4 Operator Mounting for Covers Up To .187 In. Thick

Westinghouse Electric Corporation
Control Division, Asheville, NC 28813
Control Transformer

Industrial Control Transformer
Transformateur de control industrial
Transfomer de commande industrielle

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

PRECAUTIONS

DANGER
HAZARDOUS VOLTAGE can cause serious personal injury or death.
This transformer must be installed and serviced only by qualified electrical personnel in accordance with The National Electric Code (NEC) and any other applicable codes and standards.

- On the nameplate, verify that the transformer kVA and voltage are correct for the line and load.
- Install the transformer only in a well-ventilated area that is free from explosive or corrosive gases, vapor, or excessive dust, dirt, and moisture.
- Install a fresh air flow of air around the transformer. Do not exceed surrounding air temperature of 40°C (104°F).
- Use sufficient mounting hardware to support the weight of the transformer.

PROTECTION
- Use fuses or circuit breakers in accordance with Article 450 of the NEC and any other applicable codes and standards.
- For fuse recommendations, use the Square D tax on demand system. Dial 1-800-557-4556. Follow the prompts and request document number 56-130.
- For Type TF fusing, use only Class CC non-rejection fuses on the primary.
- If high voltage transients are possible, use appropriate surge suppressors.

ACCESSORIES
- To meet European Normalized (EN) Standards, use terminal covers (not included). Contact Square D at 414-426-8040 for accessory information.

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Solemnamente se destaca que no se hacen responsables por daños que puedan causar inconsistencias que sean el resultado de la utilización de este material.

Specify Unit Serial No., Part No., & Part Description 35
Industrial Control Transformers
Transformador de control industrial
Transformateur de commande industrielle

CONNECTION AND INSTALLATION

DANGER
HAZARDOUS VOLTAGE can cause serious personal injury or death.
TURN OFF POWER before servicing.

1. If necessary, install jumpers to obtain input and/or output voltages. If terminals are tapped, do not use jumpers.
   - Figure 1 shows typical parallel connection to obtain the lower of the two possible voltages. On primary side, connect one jumper to H1 and H3 and one to H2 and H4. On secondary side, connect one jumper to X2 and X4 and one to X1 and X3.
   - Figure 2 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 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 remaining screws as follows:
   - 6-32 screw 7–9 lb-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 covers.

7. Energize the transformer.

MAINTENANCE

1. De-energize the transformer.

2. Check for loose connections and wiring, or lead deterioration. Tighten, insulate, or replace where necessary.

CONEXION E INSTALACION

PELIGRO
VOLTAJE PELIGRÓSO puede causar lesiones personales serias o la muerte.
DESCONECTA LA ALIMENTACION antes de darle servicio.

1. Si fuese necesario, instale puentes de conexión para obtener tensiones de entrada y/o salida. Si las terminales han sido derivadas, no utilice puentes de conexión.
   - La figura 1 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 muestra una conexión en serie típica para obtener la tensión más alta posible de las dos. En el lado del primario, conecte ambos puente a H2 y H3. En el lado del secundario, conecte ambos puentes a X2 y X3. Consulte el diagrama de cableado en la placa de identificación para las conexiones.

2. Conecte solamente el primario según el diagrama de cableado en la placa de identificación (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. En el transformador No.2, desconecte todos los terminales. Consulte el diagrama de cableado en la placa de identificación.

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.

MAINTENANCE

1. Desenergize el transformador.

2. Realice una inspección para ver si encuentra conexiones y cables sueltos, o conductores en mal estado. Apriete los tornillos, aísle o reemplace los cables que sean necesarios.

CONEXION ET INSTALLATION

DANGER
TENSION DANGEREUSE pouvant causer des blessures graves ou la mort.
COUPEZ LE COURANT avant l'entretien.

1. Si nécessaire, installer des cavaliers pour obtenir les tensions d'entrée ou de sortie. Si des déviations sont effectuées sur les bornes, ne pas utiliser de cavalier.
   - La figure 1 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 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 du câblage de la plaque signalétique pour obtenir les connexions.

2. Connectez 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.


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 lbs-po)
   - Vis 8–32 1.6 à 1.8 N-m (14 à 16 lbs-po)
   - Vis 10–24 1.9 à 2.2 N-m (17 à 19 lbs-po)

6. Le cas échéant, installer les couvercles.

7. Mettre le transformateur sous tension.

ENTRETIEN

1. Mettre le transformateur hors tension.

2. Recherchez les connexions et les câbles desserrés, ou les conducteurs endommagés. Serrer, isoler ou remplacer lorsqu'il le nécessaire.
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 workman-
ship 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.
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HEATING SYSTEM

Unless otherwise agreed in writing by Process Heating Company ("PHCo"), all of the following terms and 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 limited 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 the 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 items if and for any reason the repair of 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 the foregoing 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 further 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 SALE OF THE GOODS BE LIABLE 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 POSSIBILITY OF SUCH DAMAGES, OR FOR ANY DAMAGES OR SUMS PAID BY BUYER OR OTHER TO 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 ANY 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 a 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 action has accrued, and any action commenced by a party thereafter shall be dismissed at the instance of the other party.
Remote Bulb Temperature Controller

55 Series
Remote Bulb Temperature Controllers

Installation and Maintenance Instructions

Please read all instructional literature carefully and thoroughly before starting. Refer to the final page for the listing of Recommended Practices, Liabilities and Warranties.

GENERAL
Temperature variations sensed by the liquid-filled bulb are hydraulically transmitted through the capillary to a stainless steel diaphragm capsule. The capsule operates a lever to actuate one or two snap-action switches.

Part I - Installation

Tools Needed
Drill, with #25 (.1495") and 5/16" drill bits
Screwdriver

MOUNTING
LOCATE THE CONTROL WHERE SHOCK, VIBRATION AND AMBIENT TEMPERATURE FLUCTUATIONS ARE MINIMAL.

The control can be mounted in any position.

Panel Mounting (Types E55 and E55AS)
Drill panel to accommodate #6-32 screws (2 each). Hole locations should align with tapped holes in mounting bracket (see Dimensions). Also, drill 5/16" diameter hole to accommodate control adjustment shaft. Note: maximum panel thickness is 1/2 inch.

Surface Mounting (Types E55 and E55A)
Mount using two enclosure mounting holes as shown.

INSTALLING BULB AND CAPILLARY
Fully immerse the bulb and 6" capillary in the control zone. For best results it is generally desirable to place the bulb close to (but not touching) the heating or cooling source in order to sense temperature fluctuations quickly. Place the remaining capillary adjacent to the control head so that it will sense the same ambient temperatures. Factory calibration, unless specified otherwise, allows for 6" capillary tube in the sensed medium. If more than 6" will be immersed in the media, recalibration may be necessary, in which case follow procedures outlined in Part II.

"C" style bulbs (1/8" OD) can be coiled or shaped to fit the installation. Avoid sharp bends and coils smaller than 2" radius. Do not bend "B" style bulbs (3/8" OD). Avoid bending or coiling the capillary tube smaller than 1/2" radius. Exercise caution when making bends near the capillary ends. If a separable well or union connector is used follow the individual instructions included.

WIRING
Making Wiring Connections
Wire directly to switch terminals according to particular requirements of the application. For dual switch Types E55A and E55AS, if switches are to be set apart, connect wiring so that switch No. 2 will function at the higher temperature. See Dimensions.

Part II - Adjustments

Tools Needed
1/16" Allen wrench
Small screwdriver

IF THE UNIT IS BEING USED TO CONTROL A PROCESS, PERFORM CALIBRATION TEST BEFORE ADJUSTMENT. UNIT MUST REPEAT ON SUCCESSIVE ON-OFF CYCLES.

Calibration Bath
Place the sensing bulb and the amount of capillary to be exposed to process temperature into the bath, preferably circulating liquid. Bath temperature should be where the greatest setting accuracy is desired or approximately mid-range.

Test Thermometer
Use an accurate test thermometer (such as a thermocouple) with its sensing area located next to the sensing bulb.

Stabilization
Before making adjustments allow 5 minutes for the thermal system to adjust to the bath temperature.

Set Point Reference
Connect test lights to the terminals to indicate switch operation.

Adjusting Single Switch
Types E55 and E55S
Set point adjustment is made by rotating the knob and dial to the desired temperature setting. Controls are factory calibrated, and do not normally require recalibration in the field. However, should this become necessary, follow the recalibration procedure.
Adjusting Dual Switch
Types ESSA and ESSAS

55 Series controllers are standardly supplied with the No. 2 (higher temperature) switch set to the dial. To adjust switch settings for these controllers, follow the recalibration procedure.

RECALIBRATION PROCEDURE

Set the dial to the same temperature as the test bath. Using 1/16" allen head wrench, loosen knob set screw and remove dial, taking care not to rotate the shaft.

Shunt has calibrated flat for easy dial replacement. Using 1/16" allen wrench, turn zero adjustment, located inside adjustment shaft, until switch No. 2 actuates. Turn counter clockwise for higher setting, clockwise for lower setting. Replace dial on shaft and secure.

To Separate Switches

Replace dial on shaft. Do not secure. Turn dial to a higher setting equal to temperature differential (F or C) desired between switches No. 1 and No. 2. Remove dial for access to the No. 1 switch adjustment screw. Using a small screwdriver turn in or out the No. 1 switch adjustment screw (accessible through opening behind dial). Replace dial, tighten dial set screw to calibrated flat. Controller is ready for operation.

For single switch units the only adjustment needed is the set screw adjustment in the middle of the shaft.

Dimensions

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RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the installation and Maintenance instructions provided with unit must be read and understood:

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (e.g., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.

- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.

- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.

- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. Orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.

- Unit must not be altered, modified after shipment. Consult UE if modification is necessary.

- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point or faulty display. Check unit immediately.

- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.

- For all applications, a factory set unit should be tested before use.

- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.

- Do not install unit in ambient temp. exceeding published limits.

LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachussets, INCOTERMS, provided). However, that this warranty applies only to equipment found to be defective within a period of 24 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF SELLER'S LIABILITY

Seller's liability to Buyer for any loss or claim, including liability incurred in connection with (i) breach of any warranty whatsoever, expressed or implied, (ii) a breach of contract, (iii) a negligent act or acts (or negligent failure to act) committed by Seller, or (iv) an act for which strict liability will be imposed on seller, is limited to the "limited warranty" of repair and/or replacement as so stated in our warranty of product. In no event shall the Seller be liable for any special, indirect, consequential or other damages of a like general nature, including, without limitation, loss of profits or production, or loss or expenses of any nature incurred by the buyer or any third party.

UE specifications subject to change without notice.

UNITED ELECTRIC CONTROLS

180 Deere Ave. P.O. Box 9143, Watertown, MA 02472-9143 USA
617-926-1003 Fax 617-926-2568
Mercury Bulb Element

INSTRUCTIONS

Piston-Pak* Mercury Bulb Elements

The Partlow thermal element is the temperature sensing portion of all Partlow temperature controls. It is a hermetically-sealed, mercury-filled assembly consisting of bulb (temperature sensing portion), capillary tube and head assembly (Fig. 1).

When assembled to the Partlow instrument, the element provides mechanism actuation through the expansion and contraction of mercury in the bulb due to temperature change.

PISTON-PAK ELEMENT

As of March, 1972, the Piston Pak thermal element has been supplied with a new one-piece housing-flange assembly. This replaces the two-part housing and flange combination previously in use.

The new assembly attaches to the instrument case with two hex-head ¼" screws in the same manner as the old style combination unit, but the size of the screw head has been reduced from ⅜" to ⅝" to accommodate the use of a socket wrench. Either size head, however, will work satisfactorily.

When elements-only are shipped as replacement units, a yellow plastic cap is supplied over instrument-end of housing to keep out foreign material.

When installing replacement element, remove and discard yellow cap and tighten hex-head screws to approximately 75 inch-pounds torque.

Thermally-Operated Gas Controls—Elements for use on gas controls incorporate a pin-type, spring-loaded plunger type M (see Fig. 2). Gas should be turned off when changing element. Be sure O-ring has been transferred from old element and is in proper position before fastening new element. After gas has been turned on, check element fit with soapy water to be certain no leakage exists (also see Partlow Instructions for the particular gas control being used).

ELEMENT INSTALLATION

1. Be sure that entire bulb is in area to be sensed or, if in liquid, that it is completely immersed.
2. Locate bulb where air or liquid is circulating as freely as possible.
3. Capillary may be bent to a radius of ½" but not sharper as it might constrict the tubing. Never bend pencil (or "P-type") bulb.
4. Do not overheat the bulb beyond its range limits.

5. The element head assembly is subject to ambient temperature limitations of -30°F to 125°F for 112 and 217 range elements, and +32°F to 150°F for all other ranges. These temperature limitations must be considered when locating instruments.
6. In mounting bulb, avoid the use of tape or other insulating materials on the bulb itself.
7. Bulbs may be elevated 40 feet above the control without affecting calibration.
8. This assembly is hermetically sealed. If any part of the tubing or bulb is cut or ruptured, the seal is broken and the element will no longer function.
9. If you are installing a "Y" or "U" type bulb in its coiled form, the coil should be opened up to provide at least ½" between coils to permit circulation. If the "Y" or "U" type bulb is to be used in its elongated form thru the chamber being sensed, it may be bent to follow a prescribed path, but never sharper than a 2" radius.
10. Steel bulbs should not be used where subjected to temperatures expected to continuously exceed 750°F.
11. Nickel bulbs should not be used in temperatures exceeding 665°.

Type M
Type L
Type B

Fig. 2

Element plunger types: Type M is used on all thermal gas valves, type B on non-indicating controls, series O and N and Indicator 194, type L on all other non-indicating, indicating and recording models.

*U.S. Patent No. 3,103,818

[1]
STUFFING BOX INSTALLATION—Overtightening of 21-T-105 steel or stainless steel stuffing boxes can damage the thermal element by restricting the capillary bore. To prevent damage, the stuffing box gland nut should be turned 1/2 to 3/4 of a revolution from a finger-tight position. This is equivalent to a torque of 65 to 100 inch-pounds for steel and 130 to 180 inch-pounds for stainless steel.

RE-ZEROING PROCEDURE — At the time of installation, the instrument and replaced element should be checked for accuracy.
Use reliable check instrument you know is accurate.
Attach sensing bulb of check instrument directly to Partlow instrument bulb.

On All Indicating or Recording Instruments — If Partlow indicating pointer or recording pen agrees with checking instrument, no adjustment is necessary.
1. If the Partlow instrument does not agree with checking instrument, hex shaft J extending into thermal element must be shortened or lengthened to accomplish the re-zeroing.
2. Loosen set screw S at threaded end of hex shaft J.
3. Using 3/16" wrench, turn shaft J so that indicating pointer or pen agrees with check instrument.
4. Tighten set screw S.

On Non-indicating Electrical Instruments with External Calibrated Dial: (Series ZC, C, GW)—If setting pointer agrees with checking instrument, no adjustment is necessary.
1. If adjustment is necessary, hex shaft J extending into thermal element must be shortened or lengthened so that both readings agree.
2. Loosen set screw S at threaded end of hex shaft J.
3. Using 5/32" wrench, turn shaft J so that the temperature being sensed settles out to agree with the setting of the control dial.
4. Retighten set screw S.

On Non-indicating Electrical Instruments with External Calibrated Dial: (Series ZF)—If setting pointer agrees with checking instrument, no adjustment is necessary.
1. If adjustment is necessary, adjust dial setting to agree with temperature indicated by test instrument.
2. Without disturbing dial setting, remove dial knob.
3. Remove cover-dial assembly.
4. Loosen set screw S and make adjustments by turning pinion gear J with a screwdriver. Screw is shortened to raise temperature, lengthened to lower temperature. Turn pinion gear J until switch actuates. Be certain check thermometer and control setting still agree. If they do not, make further adjustment.

5. Tighten set screw S, replace cover and setting knob.

On Non-indicating Electrical Instruments (Without Setting Dial): (Series O, N, GI and GWB; and Electrical Non-indicating Instruments with Uncalibrated Dials (0-50) — Elements for the above instruments are not calibrated. Actuation point of control is adjusted by adjusting switch actuation screws using checking thermometer to indicate when the desired actuation point is reached.

On Mechanical Non-indicating Gas Controls (Series 10, 20, 28, 40, 48, 60, 68, 70, 713) —
1. Set control at desired normal operating temperature.
2. Using a check thermometer as above, determine if the setting of the control agrees with the reading of the check thermometer.
3. If they disagree, loosen the set screws C on the setting knob and reposition the knob and pointer to agree with the check instrument. When repositioning knob, use screwdriver in slot of stem E to prevent its turning. Reset control to the desired operating temperature and consult check instrument again. (Several checks and readjustments may be necessary since they are throttling type controls.)

ELEMENT MAINTENANCE —
1. Do not lubricate thermal element or instrument.
2. Moisture should never be permitted to enter element.
3. If an attempt is made to unthread element housing from head, OBSERVE CAUTION—the element housing contains a heavy return spring.

ELEMENT INTERCHANGEABILITY—Elements of the same temperature range and the same plunger type are interchangeable.

ELEMENT IDENTIFICATION—The specification of the element is marked in coded symbols on the bottom of the element head. This should be used in ordering a replacement. The number appearing on the side of the element head is a coded age number which may be required in establishing warranty.

Fig. 3

Explanation of Marking Symbols
Number stamped on side of element head is the age number code. Code stamped on the bottom is the element description.
These products are sold by The Partlow Corporation ("Partlow") under the warranties set forth in the following paragraph. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Partlow or from a Partlow distributor, representative or reseller, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

These products are warranted to be free from defects in materials and workmanship at the time the products leave the Partlow factory, and to conform at that same time to the specifications set forth in the relevant Partlow instruction sheet (or sheets) for such products.

Partlow's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, at Partlow's option, free of charge, the products which are reported in writing to Partlow at its main office - The Partlow Corporation, Cumber Road, New Hartford, New York 13413 - and which, if so advised by Partlow, are returned with a statement of the observed deficiency to the designated facility during normal business hours, transportation charges prepaid, and which upon examination by Partlow are found not to comply with the above warranties. PARTLOW SHALL NOT BE LIABLE FOR ANY INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, SPECIAL DAMAGES, OR ANY OTHER DAMAGES, COSTS OR EXPENSES, EXCEPTING ONLY THE COST OR EXPENSE OF REPAIR OR REPLACEMENT AS ABOVE DESCRIBED.

THERE ARE NO EXPRESSED OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREINABOVE SET FORTH. PARTLOW MAKES NO WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.
Mechanical Heater Temperature Controller

DUAL SWITCH
INDICATING MECHANICAL TEMPERATURE CONTROLLER

The LF15-79 is a dual switch indicating controller which operates in a fixed relationship to the temperature setting. Differential between switches can be adjusted up to 5% of element range. It derives its simplicity and efficiency from the Piston-Pak filled system sensing element.
**LF15-79 PRODUCT SPECIFICATIONS**

Dimensions 8 5/8" x 8" x 4 9/32" D

Panel Mount Cutout 7 inches wide by 7 3/4 inches high

Surface Mounting Mounting brackets included

Switch Type Two 3- wire single pole double throw.

Switch Sensitivities Normal 1% of range (#79 Switch)
Super Sensitive 1/2% of element range (#73 Switch - Optional)

Switch Differential (Between each Switch) 0 to 5% of element range

Electrical Connection Terminal block accessible through top cover hatch

Conduit Openings 1/2 inch NPS holes on each side of the case for 1/2 inch conduit fitting; drill guide hole spotted in the rear of the case showing optional rear opening location.

Electrical Rating 50VA, inductive; 500VA, non inductive; 250V maximum AC only.

Agency Approvals UL and CSA Approved

Warranty One year, details on the last page

Approx. Net Weight* 5 lbs
Approx. Ship. Weight* 8 lbs

* Weight may vary depending on element length.

**LF15-79 ORDER MATRIX**

| LF | 01 |

**ACCESSORIES**

0 None
1 201 Weather Resistant **

* The first switch is always a #15. The standard second switch on the LF15-79 is a #79 which offers an accuracy of 1% of span. Accuracy of 0.5% of span may be achieved by specifying a #73 switch. However, a #73 switch must be ordered separately and will be shipped separately. User must remove the factory standard #79 switch and install the #73 switch. (See SWITCHi REPLACEMENT section in this document). To order the #73 switch specify part #64403018.

** Requires an inverted dial scale. Check factory on availability.

**PISTON-PAK THERMAL SENSING ELEMENT**

A Piston-Pak Thermal Sensing Element must be specified for each LF15-79. Use Partlow Form Number 3028 "Mechanical Products Cross Reference and Pricing Guide" to configure the matrix number for the sensing element.
INSTALLATION AND WIRING

LOCATION
The element head assembly is subject to ambient temperature limitations of -30°F to 125°F (-30°C to 52°C) for low temperature head assemblies, and 32°F to 150°F (0°C to 66°C) for high temperature head assemblies. These temperature limitations must be considered when determining the instrument location. It should be located in an area as free from vibration as possible.

MOUNTING
The instrument(s) are shipped to be surface mounted. Figure 1 illustrates hole placement for surface mount combinations. Note: Holes in brackets supplied are 9/32 clearance holes for 1/4" bolts. The three holes called out in the drawing may be any size that will accommodate the fastening required, (ie 9/32 for 1/4" thru-bolt with nut fastener) or #7 drill for 1/4" x 20 NC tapped hole fastening or #3 drill for 1/4" x 28 NF tapped hole fastening.

The instrument may also be flush mounted. This is accomplished by removing the three surface mounting angle brackets from the instrument. Figure 1A illustrates panel cutout dimensions. Cut the panel opening to 7" wide by 7 3/4" high. Drill 9/32 clearance holes in four locations if 1/4" thru-bolt with nut installation is desired. Should a tapped hole be preferred, drill a #7 hole in four locations for a 1/4" x 20 NC or a #3 drill hole in four locations for a 1/4" x 28 NF.

Note: All configurations require a flat head screw for proper cover installation. With the instrument in the upright position, insert it and the element into the panel opening and tilt it into place. Depending upon your panel size it may be easier to make electrical connections before finally connecting the instrument into the panel.

WIRING
Check applicable electrical codes, ordinances and regulations regarding use of conduit, etc. If acceptable, make connections using short sections of flexible cable or conduit. It is recommended that the rear conduit hole be used for panel mount installations. A drill guide hole is spotted in the back of the case to accommodate field drilling. Refer to the wiring diagram in Figure 2, page 4 and proceed. Withdraw screws H (Figure 3, page 4) and remove the cover hatch. This will allow access to the wiring connection terminal block. The terminal block is labeled H1, C1, L1, H2, C2, and L2. The letters H, C and L represent the normally open, common and normally closed sides, respectively, of the switches. Note that when temperature is below switch setpoint a circuit is made between L and C terminals. Make wiring connection according to Figure 2 (page 4) and replace the top cover hatch.
PLACING THE THERMAL SENSING ELEMENT
Locate the thermal sensing bulb in the most agitated part of the medium to be measured and completely immerse it. (When U and Y type bulbs are used, note separation coupling between bulb and capillary, be certain that the entire element is immersed in process). Do not bend capillary to less than 1/2 inch radius and never bend it too close to the element bulb or element head. Pencil type bulbs must never be bent as this will affect instrument accuracy. U and Y-type bulbs may be bent, but never to less than a two inch radius. Anchor the excess capillary securely to prevent vibration damage. If the bulb is to be subjected to corrosive or scouring conditions, it should be protected by a thermal well, separable socket or other protected material. These bulbs may be elevated up to 40 feet above the instrument without affecting calibration.

STUFFING BOX INSTALLATION (IF APPLICABLE)
Overtightening of 21-T-105 stuffing boxes can damage the thermal element by restricting the capillary bore. To prevent damage, the stuffing box gland nut should be turned 1/2 to 3/4 of a revolution from a finger-tight position. This is equivalent to a torque of 130 to 180 inch-pounds for stainless steel.

INSTRUMENT OPERATION
Prior to putting the instrument into service, check it against an accurate test thermometer. As with any precision instrument minor adjustments may be necessary after shipment and installation. If you are unfamiliar with how to perform this check refer to the CHECKING TEMPERATURE and RE-ZEROING of this document.

Control temperature is established by turning the knob on the front of the instrument and moving the set pointer along the scale to the desired temperature. This positions the instrument's two snap-acting switches. Both switches are spring loaded to the set pointer and are set in a fixed relationship to the set point.

Switches are actuated by the same temperature responsive mechanism that moves the indicating pointer. The first switch to be actuated on a rise must always be Switch 1 (front leaf type). Second is Switch 2 (rear, pin-type), actuated only when the temperature exceeds the operation point of the first switch.

Switches are mounted one behind the other, each having its own circuit. Differential between the two switches may be adjusted from 0 to 5% of sensing element range by turning the set screws inside the instrument case (see Differential Adjustment).

MAINTAINING YOUR LF15-79
CHECKING TEMPERATURE
When checking and verifying your temperature be sure to use a test thermometer of known accuracy. Position the test thermometer sensing bulb or probe adjacent to the thermal sensing bulb from the LF15-79. Turn the knob on the LF15-79 to the desired process temperature. Wait for the temperature to stabilize, then compare the test thermometer reading with that of the LF15-79. If the two readings do not agree, the LF15-79 should be re-zeroed.

RE-ZEROING YOUR LF15-79
Be sure that the process temperature is stable. Note the amount of temperature difference between the test thermometer reading and the black indicating pointer reading. Remove the instrument knob and cover. Note hex shaft J and set screws (Figure 4, page 5). Zeroing is accomplished by turning shaft J with the wrench provided. Lengthening shaft J (counterclockwise) raises the black indicating pointer reading; shortening shaft J (clockwise) lowers the reading. Shut off the power to the instrument and turn set pointer (reinstall knob on setting
Specify Unit Serial No., Part No., & Part Description

HEATING SYSTEM

SWITCH REPLACEMENT

#15 Micro Switch (Leaf Switch) Replacement (see Figure 10 for more details)

Turn the power to the LF15-79 off. Remove the cover and dial scale (see Exploded View Illustration on Page 8). Remove the two switch mounting screws from the front switch. (Note: the #15 switch has a spring leg actuator attached to it). Transfer the switch wires from the existing switch to the replacement switch one wire change at a time to avoid wiring confusion. Reattach the replacement switch to the switch bracket with the two mounting screws. Note the routing of the switch wires, be sure they do not interfere with proper switch actuation. Be sure to check switch actuation and adjust screw E2 (see Figure 5) as needed for proper control switch actuation.

#73 or #79 Micro Switch (Pin Type) Replacement

Turn the power off to the instrument. Remove the cover and dial scale (see Exploded view on page 8). Remove the two switch mounting screws from mechanism (page 7, see figure 10 for more details). One switch mounting screw will be part of the lower mounting screw from the front #15 switch. The second switch mounting screw will be below the first and it will be set back on the mechanism. Remove the switch from the bracket. Remove the wires from the original switch and transfer them one at a time to the replacement switch. Re-install the new switch and the mounting screws. Note the routing of the switch wires, be sure that they do not interfere with proper switch actuation. Be sure to check switch actuation and adjust screw E1 (see Figure 5) as needed for proper control switch actuation.

Note: After replacing either switch it may be necessary to make an adjustment to the switch actuation screws E (Figure 5). If, during normal process temperature cycling, the indicating pen registers a constant differential over or under the red set point adjust the appropriate actuation screw E 1 or 2 to correct. Lengthening the screw lowers the temperature while shortening it raises the temperature. Note: there are two adjusting screws, the one closest to the cover is #15 adjustment and the one behind it is the #73 or #79 adjustment screw.

SWITCH DIFFERENTIAL ADJUSTMENT

Screw Switch actuation E1 and E2 are adjusted at the factory such that the #15 switch (Front switch with switch leaf) actuates before setpoint (approximately 1% of span temperature). As the temperature continues to rise, the second switch #73 or #79 will actuate at setpoint. The actuation of the first switch and/or the actuation of the second may be adjusted either upscale or downscale with the E1 and E2 switch actuators. Note that whatever switch adjustments are desired, the front #15 switch should always actuate first before the rear #73 or #79 does. The maximum second switch actuation point should not be more than 5% of scale. Adjusting the E2 screw will cause the #15 switch to be moved either further below, or closer to setpoint. Rotating the screw CW will cause the switch to actuate closer to setpoint. Rotating the screw CCW will cause the switch to actuate further below setpoint. Adjusting E1 CW will cause the rear switch, either #73 or #79, to be moved further above setpoint. Adjusting E1 CCW will cause the rear switch to be moved below setpoint. Note, wherever switch actuators are eventually positioned, the differential between each switch should not exceed 5% of span, nor should the rear switch actuate before the front switch.
BRAKE TIGHTENING
With use, the setting shaft brake may require tightening. If the brake is too loose, over travel movement of the black indicating pointer will tend to drag the red set pointer upscale from its set position. To tighten the brake, turn the adjusting screw U (Figure 6) clockwise. Check screw U adjustment by positioning the red set pointer to a low scale setting; then, with thumb placed at the base of the black indicating pointer arm, simulate over-travel by moving the black pointer upscale through and beyond the red pointer setting and repeat several times. If the set pointer moves noticeably from its set position screw U is not tight enough. If overtightened, the set pointer will stay in position, but the setting knob will be very difficult to turn. Brake adjustment screw U should be tightened so that the red pointer retains its set position when over-traveled by indicating pointer, and setting knob turns with relative ease.

PISTON-PAK THERMAL SENSING ELEMENT IDENTIFICATION
An element designation number is stamped on the bottom of the element head. This is a coded description of the element specifications and should be used whenever a replacement element is ordered. The number appearing on the side of the element head (Figure 7) is the element age code, which may be required in establishing warranty.

ORDERING/SPECIFYING THE PISTON-PAK SENSING ELEMENT
The sensing element is ordered separately from the LF15-79 and requires its own matrix number. To determine the correct sensing element configuration for your instruments and application see Partlow Form 9028 "Mechanical Products Cross Reference and Pricing Guide."

ELEMENT REPLACEMENT
To change a thermal sensing element start by removing screws D (Figure 8) and withdrawing the element from the instrument body. Then remove the element bulb from the medium. Install the new element and tighten screws D. Insert the new element bulb into the medium being measured. Note: After the element has been replaced check the temperature setting as re-zeroing may be necessary. See the CHECKING TEMPERATURE section.

Caution: The inside mechanism(s), particularly the inside of the element housing, should never be oiled. However, if the instrument is subject to corrosion or gunking conditions, the mechanical linkage should be sprayed periodically with corrosion inhibiting CRC 2-26, 3-36, or 5-56. Use only CRC 2-26, 3-36, or 5-56 as other lubricants may cause build up and sticking of internal parts. CRC 2-26 may be purchased from Partlow in a 15 oz. container (part #636000401). CRC 5-56 may be purchased locally from any hardware or automotive store.
Specify Unit Serial No., Part No., & Part Description
### Exploded Illustration and Parts List

1. Mechanism Assembly
   - Includes: Switches #15 and #75, Wiring & Terminal Block With Mounting Screws, Push Rod.

2. Main Lever Assembly
   - Includes: Main Lever with Push Rod Cap, Push Rod, Set Screw.

3. Micro Switches
   - #15 Micro Switch
   - #75 Micro Switch
   - Both include terminal screws
   - Note: #75 replaces #4 switch

4. Case Assembly
   - Includes: Top Plate With Screws, Terminal Block Garter, Mounting Bracket With Screws

5. Cover Assembly
   - Cover, Glass & Cover Screws

6. Knob Assembly
   - Knob With Set Screw

7. Mounting Brackets (2 required)
   - Brackets As Illustrated, sold separately

8. Standard Hardware Kit (not shown)
   - Includes: Cover Screws, Switch Screws, Dial Screws, Terminal Block Mounting Screws, Mechanism Holding Screws, Mounting Bracket Screws, Push Rod Set Screw, Top Plate Screw, Ground Screw

### Warranty

These products are sold by The Partlow Corporation ("Partlow") under the warranties set forth in the following paragraph. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Partlow or from a Partlow distributor, representative or retailer, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

These products are warranted to be free from functional defects in materials and workmanship at the time the products leave the Partlow factory, and to perform at that time to the specifications set forth in the relevant Partlow instrumentation charts, sheets, manuals or manuals for such products.

Partlow's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranties is limited to repair or replacing, at Partlow's option, free of charge, the products which are reported in writing to Partlow at its main office - The Partlow Corporation, 2 Camplain Road, New Hartford, New York 13413 or by FAX. MAIL. 1-315-787-8403 and which if so advised by Partlow, are returned with a statement of the observed deficiency to the designated facility during normal business hours, transportation charges prepaid and which upon examination by Partlow are found not to comply with the above warranties. PARTLOW SHALL NOT BE LIABLE FOR ANY INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, SPECIAL DAMAGES, OR ANY OTHER DAMAGES WHICH MAY OCCUR IN THE REPLACEMENT AS ABOVE DESCRIBED.

THERE ARE NO EXPRESS OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN ABOVE SET FORTH. PARTLOW MAKES NO WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.

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Specify Unit Serial No., Part No., & Part Description
Unitized Heater Kit
Installation and Operation

Every Process Heating Company (PHCo) product is efficient, safe and reliable. If properly installed and maintained PHCo products will give you many years of dependable service. Should your heater be damaged when received, file a claim with the carrier immediately.

WARNING!!!!!!!  DANGER!!!!!!!

1. Read and understand all tags and installation and operating instructions before commencing.

2. Welding area on tank should be thoroughly cleaned.

3. Work area should be well ventilated.

4. Check that the electrical service will handle the load
Unit must be adequately grounded.

5. All wiring should conform to requirements of national and local electrical codes and or standards.
   Only a licensed electrician should connect power to panel and system.

6. Never expose heater tubes to air with power on. DANGER OF EXPLOSION MAY EXIST.

7. Care should be used when working around tubes when cleaning or installing. Walls are only 1/4" thick.

8. If there are any questions concerning the ratings or instructions please contact your distributor or the factory. Phone (206) 682-3414  Fax (206) 682-1582
ADDITIONAL IMPORTANT WARNINGS AND 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 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.

UNITIZED HEATER KIT-INSTALLATION & OPERATION

Preparation

1. Remove jacketing and insulation from section of tank heater is to be installed through.

2. Mark location of opening of tank. Heater 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 in tank slightly larger than heater terminal box (snug fit). Remove slag and grind opening smooth.

2. Remove blocking and slide heater through opening in tank. Stop at marked “weld line” on heater terminal box.

3. Heater tube support plates should be attached to tank bottom. Level heater tubes and weld supports to tank. DO NOT weld heater tubes to support plates.

4. Weld heater terminal box to tank. Terminal box is 1/4" thick steel plate. Weld must be liquid tight.

5. Tank discharge should be kept 2" to 3" above heater tubes. Never expose heater tubes to air with power on. DANGER OF EXPLOSION MAY EXIST.

6. Re-install insulation and jacketing around heater terminal box.

7. Have licensed electrician connect proper voltage and phase with properly sized conductors to main power switch. Unit must be adequately grounded. Check all electrical connection for tightness.
Operation

1. Fill tank with desired material. Turn on power at main switch.

2. Set main indicating temperature control to proper tank holding temperature.

3. Set Hi-Limit control 20 to 30 degrees above main control set point. Hi-Limit will act only in event of main control failure. Heater will continue to cycle at Hi-Limit set point and red light on panel door will indicate "Hi-Limit" condition. Press light to reset when condition is remedied.

4. If unit is equipped with a time clock, see instruction sheet for proper clock setting.

5. Heater operation is now completely automatic. Check electrical connections periodically for tightness. Keep panel door closed tightly at all times.

6. Clean tank at regular intervals. Heater tubes are 1/4" thick steel pipe. Use care with jack hammers and chisels so as not to rupture tube wall.

...Note...

Terminal block if provided is to inter-lock heat "off" while other loads are running.

(Remove jumper and connect to terminals #1 & #2.)

CONTROL PANEL

ALL WIRING SHOULD CONFORM TO REQUIREMENTS OF APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES AND OR STANDARDS.

Rating and voltage of the unit will be found on the name plate located on the inside of door in the control panel, and conduit enclosed insulated conductors of the proper gauge should be brought from the main circuit breaker or fused disconnect switch.

The controlling thermostat can be pre-set to any desired temperature within the thermostat dial range.

If the control panel has been equipped with a time clock please refer to the separate instructions enclosed for proper clock setting.

Your unit has also been equipped with an over-temperature thermostat that should be set 20 - 30 degrees above main temperature control. Its primary function is to protect against overheating in the event of main temperature control malfunction. The unit will cycle at this new temperature and a red Hi-Limit warning light, on the outside of the control panel will light. This light will remain on until the limit circuit is reset to alert personnel that there is a malfunction.

The cause of the malfunction should be investigated at once. Possible reasons are:

1. Capillary rupture on the main temperature controller (indicated by temperature indicating pointer at far left hand position).

2. "Over Ranging" of the main temperature controller (indicated by incorrect temperature reading on the scale).

3. Thermostat temperature setting is too high.

4. Main temperature controller out of calibration.

5. Over-Temperature thermostat out of calibration.
Unitized Heaters

Maintenance checklist:

1. Check electrical connections for tightness.

2. Tank should be cleaned at regular intervals.

3. Check to be sure the control panel door is tightly closed at all times.

4. Be sure to see that tank has adequate insulation. Insulation tends to break down in time thus costing dollars in lost efficiency.
**Something Wrong with this manual?**

If you find inaccurate or confusing information in this manual, or just have a suggestion for improvement, please let us know.

Mail or FAX this form to us at: E. D. ETNYRE & CO. 1333 S. Daysville Rd. Oregon, Illinois 61061 • Fax: 800-521-1107 • www.etnyre.com
Attn: Service Manager

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