1400
SERIES
INSTALLATION
&
OPERATING
INSTRUCTIONS

WEST gulton

Dynapar, Veeder Root, and Eagle Signal Brands:

Sales, Repair, and Application Support:
1675 Delany Rd.
Gurnee, IL. 60031
847-662-4150 Sales/Order Entry Fax
847-782-5277 Applications Support Fax
800-873-8731 Sales/Order Entry
800-234-8731 Applications Support

NorthStar Brand:

Sales, Repair, and Application Support:
1675 Delany Rd.
Gurnee, IL. 60031
847-782-5288 Sales/Order Entry Fax
847-782-5277 Applications Support Fax
800-326-6216 Sales/Order Entry
800-326-6216 Applications Support

Partlow, West, Rustrak, and LFE Brands:

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800-873-8731 Sales/Order Entry
800-866-6659 Applications Support

Please disregard all phone numbers and addresses in this manual. The phone numbers and address on this page are the correct phone number and addresses to use for sales, repair, and application support.

WEST 1400 SINGLE MODE TEMPERATURE CONTROLLER

INSTALLATION & OPERATING INSTRUCTIONS

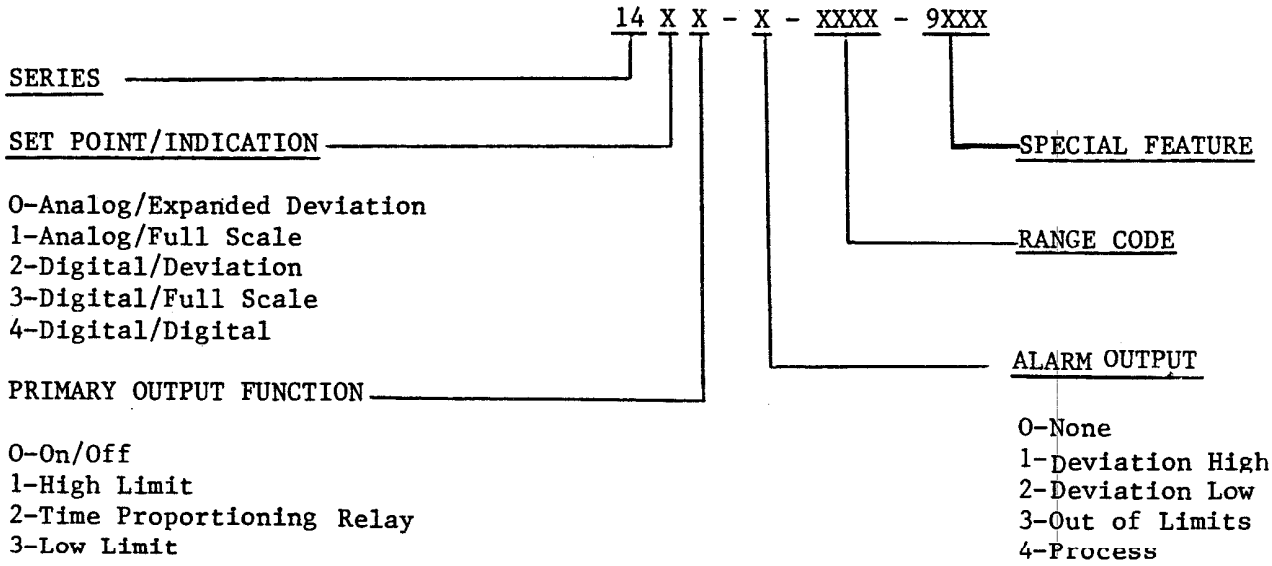
TABLE OF CONTENTS

UNPACKING THE INSTRUMENT

Carefully unpack your 1400 Series instrument from the shipping carton, and inspect it for shipping damages. Check the contents of the shipping carton against the packing slip. IMMEDIATELY REPORT ANY DAMAGES TO THE CARRIER.

IDENTIFICATION OF MODEL NUMBER

The following part number identification table explains the instrument model number on the inside of the control access door. This number can be used to determine those portions of this manual applicable to your instrument.



WARRANTY

The Company warrants all components of the 1400 Series to be free from defects in workmanship and material under normal use and service. Equipment returned transportation prepaid to the Company's originating factory within 18 months from the date code stamped on the device and found by the Company's inspection to be defective in workmanship or material will be repaired or replaced, at the Company's option, free of charge and returned prepaid. WITH EXCEPTION OF THE 18 MONTH WARRANTY, SET FORTH ABOVE, THE COMPANY MAKES NO EXPRESS WARRANTIES, NO WARRANTY OF MERCHANTIBILITY AND NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. In no event will the Company be liable for indirect, special or consequential damages of any nature whatsoever.

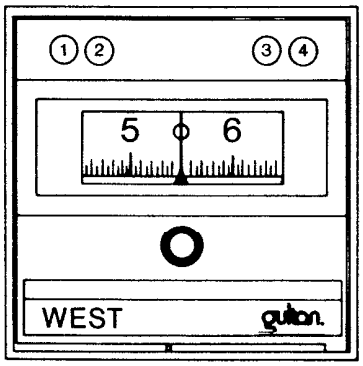
GENERAL DESCRIPTION 14 xx - x

The 1400 Series is a complete line of Proportional plus Manual Reset electronic controllers featuring the latest in solid-state design techniques. These controllers are available with five set point/indication configurations, five primary output functions and four alarm output functions to meet most control requirements. Standard input is the thermocouple input. Optional features include Rate (Derivative) and multiple instrument mounting.

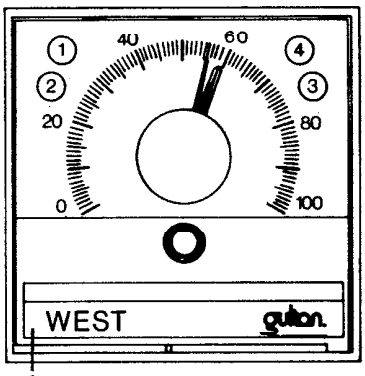
An aluminum case houses the compact plug-in chassis assembly. External wiring is connected to the screw terminals on the rear of the case, which has molded terminal barriers and terminal identification. The case is designed for panel mounting with U-shaped bracket supplied for this purpose.

INSTRUMENT DESCRIPTION

SET POINT/INDICATION IDENTIFICATION CODES

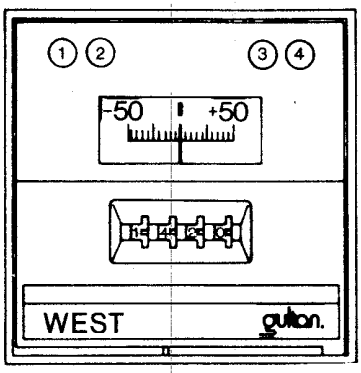


14 [0] X - X

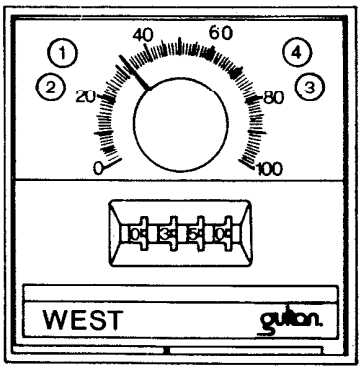


14 [1] X - X

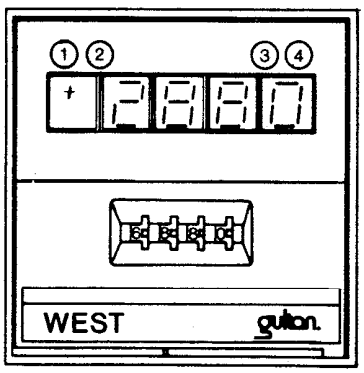
CONTROL ACCESS DOOR



14 [2] X - X



14 [3] X - X



14 [4] X - X

LIGHT SEQUENCE

Models 14 x 1 - x or 14 x 3 - x

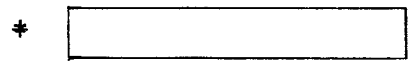
1 RED - exceeded limit
2 RED - exceeded limit
3 GRN - process within limit
4 RED - alarm output "ON"

All other Models

1 RED - primary output "ON"
2 GRN - primary output "OFF"
3 not used
4 RED - alarm output "ON"

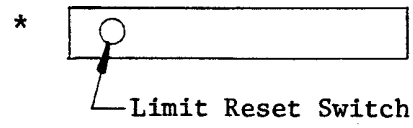
PRIMARY OUTPUT IDENTIFICATION CODES

14 x [0] - x:



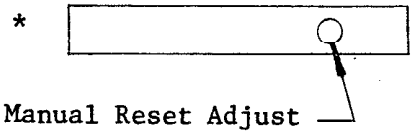
This code number identifies an instrument with a primary output that is ON/OFF. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

14 x [1] - x:



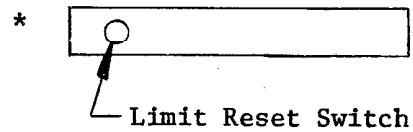
This code number identifies an instrument with a primary output that is a HIGH LIMIT. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

14 x [2] - x:



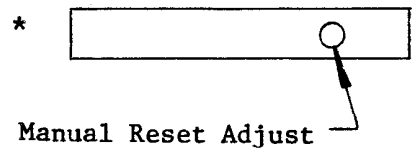
This code number identifies an instrument with a primary output that is time proportioning relay output. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

14 x [3] - x:



This code number identifies an instrument with a primary output that is a LOW LIMIT. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

14 x [7] - x:



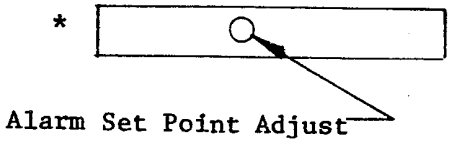
This code number identifies an instrument with a primary output that is 0-5 VDC logic level for switching solid state relays. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

ALARM OUTPUT IDENTIFICATION CODE

14 x x - [0] :

This code number identifies an instrument that has no alarm output.

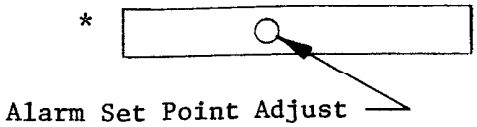
14 x x - [1] :



This code number identifies an instrument that has an ON/OFF relay deviation high alarm output. The relay will pull in when the process variable is above the alarm set point. The alarm set point will "track" the primary set point. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

* Located under control access door.

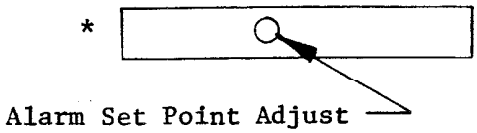
14 x x - [2] :



Alarm Set Point Adjust *

This code number identifies an instrument that has an ON/OFF relay deviation low alarm output. The relay will pull in when the process variable is below the alarm set point. The alarm set point will "track" the primary set point. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

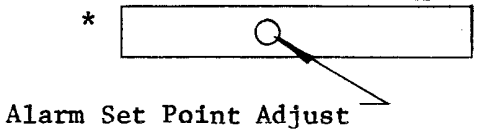
14 x x - [3] :



Alarm Set Point Adjust *

This code number identifies an instrument that has an ON/OFF relay out of limits alarm output. The relay will pull in when the process variable is either above or below (out of limits) the alarm set point. The alarm set point will track the primary set point. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

14 x x - [4] :



Alarm Set Point Adjust *

This code number identifies an instrument that has an ON/OFF relay process alarm output. The relay will pull in when the process variable is above the alarm set point which is independently adjustable from the primary set point. The adjustments associated with this feature are shown at the left. See SPECIFICATIONS and TUNING PROCEDURES for additional information.

* Located under control access door.

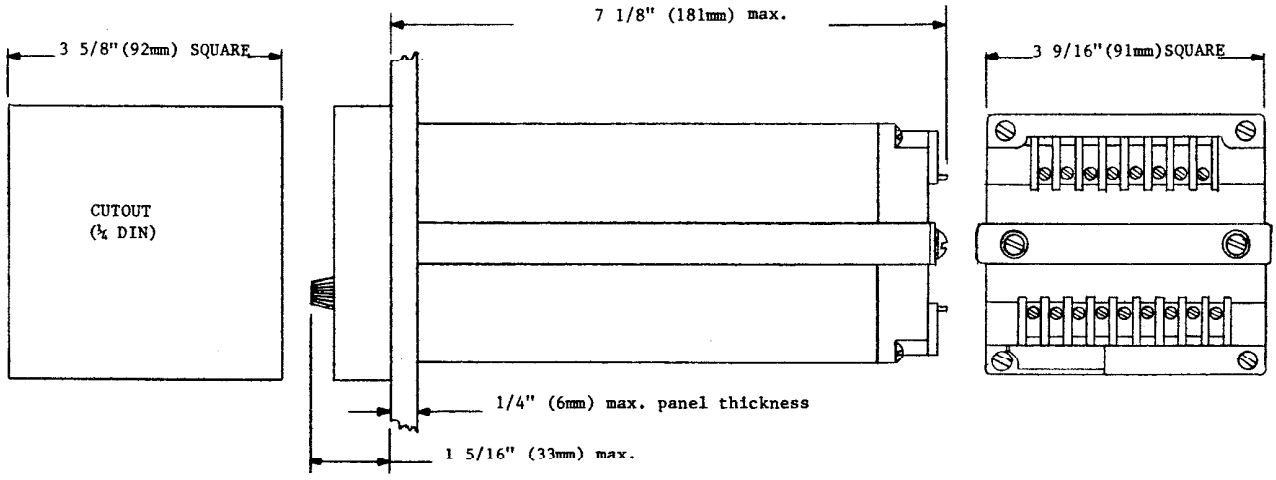
MOUNTING INSTRUCTIONS

LOCATION:

1. Select a location for the instrument where it will not be subjected to excessive shock,vibration, dirt, moisture or oil seepage.
2. The ambient temperature where the instrument is located should be between 0°C to 55°C (32°F to 131°F). 0-50°C for digital indicating controller.
3. Minimum practical center distance between instruments (without multiple mounting feature) in panel mounting is 101 MM.

INSTALLATION

1. Cut panel hole to dimensions shown below.
2. Remove U-shaped mounting bracket by removing the two screws at the back of the instrument.
3. Insert instrument housing into panel cut out and replace U-shaped bracket. Replace mounting screws at the back of the housing and tighten until the instrument is rigidly mounted. DO NOT OVERTIGHTEN.



WIRING INSTRUCTIONS

ALL WIRING MUST COMPLY WITH NATIONAL ELECTRIC CODE, REGULATIONS AND ORDINANCES. Typical wiring connections are shown starting on Page 8.

POWER WIRING

1. Input line voltage must be 120 or 240 Vac + 10% to -15% at 50/60 Hz.
2. Connect the line voltage to the terminals marked 120 and LN (120 Vac) or 240 and LN (240 Vac).
3. A good earth ground should be connected to the terminals marked ground (⏚).

INPUT WIRING:

1. DO NOT RUN SENSOR OR OTHER LOW VOLTAGE SIGNAL WIRES IN A CONDUIT WITH POWER LINE WIRING.
2. Observe correct polarity when connecting thermocouple wires. Red is ALWAYS negative.
   Use only the same type thermocouple extension wire as the type of the thermocouple.
3. With 2-wire RTD input, minimize signal wire resistance, since it adds directly to sensor resistance. With 3-wire RTD sensor, make resistance of all three signal wires equal for optimum compensation.

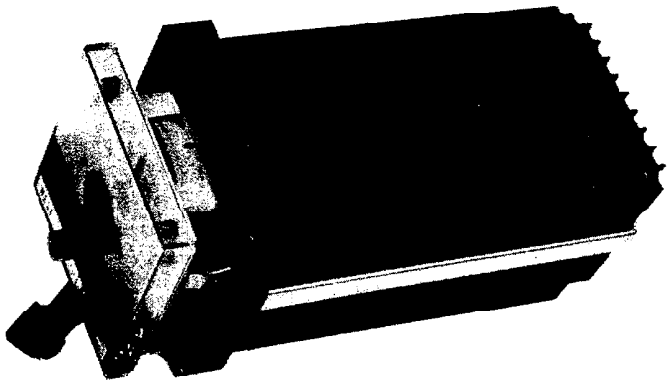
OUPUT WIRING:

1. Line voltage output options wiring may be run with the power wiring.

REMOVING INSTRUMENT FROM HOUSING

The instrument is held in its plug-in housing by a cam action lever-latch. To remove the instrument depress the lever handle in the lower right hand corner to unlatch and swing the lever outwards 90 degrees. The lever cam action will move the instrument out about 1/4 inch. Do not force lever beyond 90 degrees or cam latch may shear off.

Use lever to pull instrument out until it can be grasped by hand and completely removed.

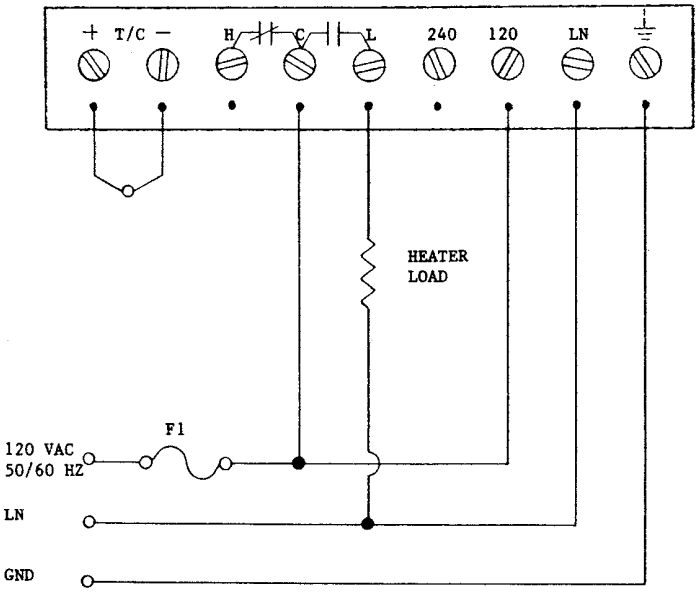


WIRING DIAGRAM IDENTIFICATION TABLE.

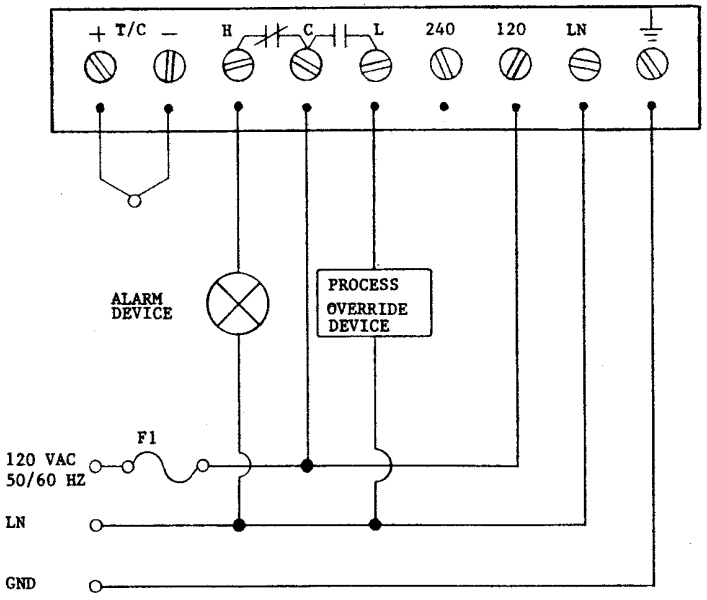
Refer to instrument model number on the inside of control access door. For example, the wiring diagram for a 1412-0 is A and the wiring diagram for 1412-1 is AA.

ALARM OUTPUT

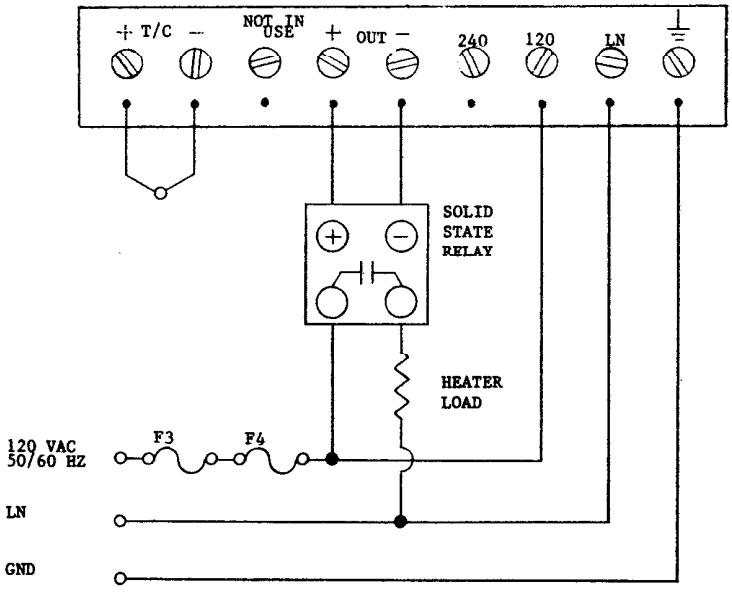
PRIMARY OUTPUT	-0	-1	-2	-3	-4
14x0	A	AA	AA	AA	AA
14x1	B	BB	BB	BB	BB
14x2	A	AA	AA	AA	AA
14x3	B	BB	BB	BB	BB
14x7	D	DD	DD	DD	DD



WIRING DIAGRAM A FOR MODELS 14x0-0 OR 14x2-0



WIRING DIAGRAM B FOR MODELS 14x1-0 OR 14x3-0

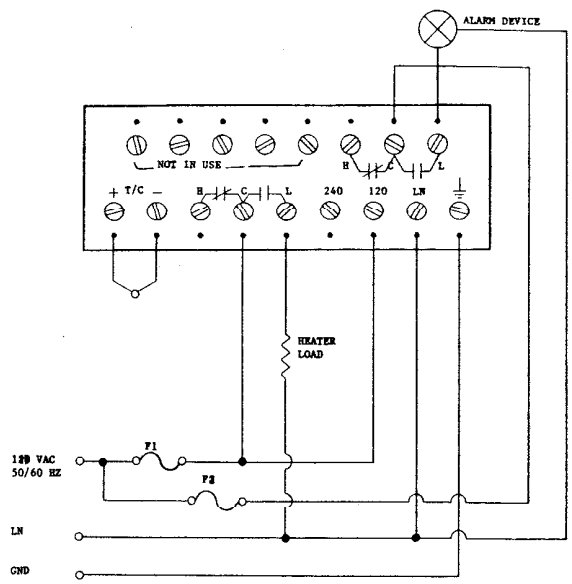


WIRING DIAGRAM D FOR MODEL 14x7-0

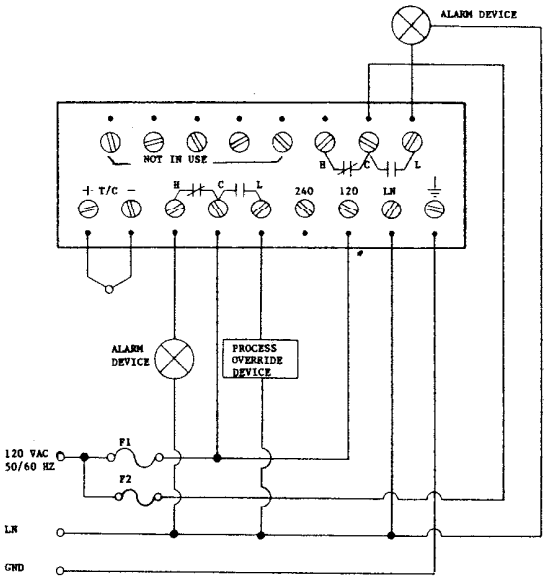
NOTES:

1. SELECT PROPER TERMINAL IF 240 VAC IS USED RATHER THAN 120 VAC.

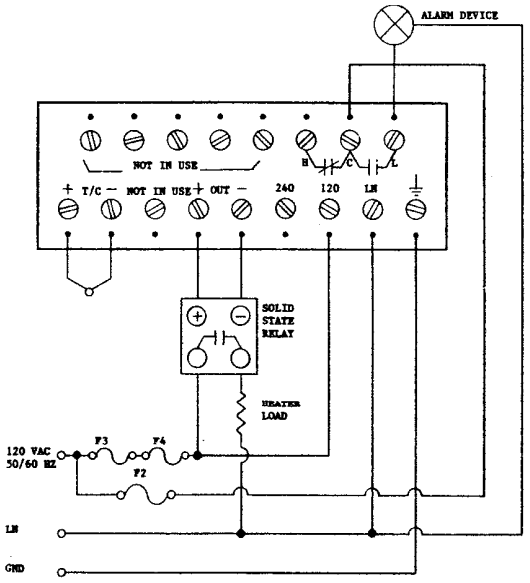
2. FUSE RATINGS
   - F1: 10A @ 120 VAC/5A @ 240 VAC (RESISTIVE LOAD)
   - F2: 5A @ 120 VAC/2.5A @ 240 VAC (RESISTIVE LOAD)
   - F3: SIZE FOR LOAD PROTECTION.
   - F4: I^2t SEMICONDUCTOR PROTECTION-SIZE FOR SOLID STATE RELAY MANUFACTURER'S SPECIFICATIONS.



WIRING DIAGRAM AA FOR MODELS 14x0 OR 14x2 WITH ALARM OUTPUTS -1, -2, -3 OR -4



WIRING DIAGRAM BB FOR MODELS 14x1 OR 14x3 WITH ALARM OUTPUTS -1, -2, -3 OR -4



WIRING DIAGRAM DD FOR MODELS 14x7 WITH ALARM OUTPUTS -1, -2, -3 OR -4

NOTES:

1. SELECT PROPER TERMINAL IF 240 VAC IS USED RATHER THAN 120-VAC.

2. FUSE RATINGS
   - F1: 10A @ 120 VAC/5A @ 240 VAC (RESISTIVE LOAD)
   - F2: 5A @ 120 VAC/2.5A @ 240 VAC (RESISTIVE LOAD)
   - F3: SIZE FOR LOAD PROTECTION.
   - F4: I^2t SEMICONDUCTOR PROTECTION-SIZE FOR SOLID STATE RELAY MANUFACTURER'S SPECIFICATIONS.

SPECIFICATIONS

INPUT SPAN

Thermocouple: 10 mV minimum, 60 mV maximum span with cold junction compensation. Total resistance of thermocouple and leadwire up to 100 ohms without affecting accuracy. Upscale thermocouple break protection (TCBP) standard, except Model 14x3-x which is downscale.

SET POINT RESOLUTION

Analog (expanded deviation): ---------- ±0.1%; 8 inches scale length
Analog (full scale): ---------- ±0.1%; 4.7 inches scale length
Digital: ---------- 1°

INDICATOR ACCURACY

Analog (expanded deviation): ---------- ±1% of span
Analog (full scale): ---------- ±2% of span
Digital (deviation meter): ---------- ±1% of span
Digital (process readout): ---------- ±1 digit

NOTE: Indication accuracy includes indicator accuracy plus set point accuracy.

OUTPUT FUNCTION

Primary
ON/OFF relay: ---------- 0.5% of span hysteresis
Time proportioning relay: ---------- cycle time fixed at 12 seconds.
Time proportioning (5Vdc logic): ---------- cycle time fixed at 2 seconds.

Alarm
Deviation High (relay) ---------- adjustable + ½ to +15% of span
Deviation Low (relay) ---------- adjustable - ½% to -15% of span
Out of Limits (relay) ---------- adjustable ±½% to ±15% of span
Process (relay) ---------- adjustable 0 - 100% of span

RATING

Relay (primary): ---------- 10A/5A @ 120/240 VAC (Resistive)
" (alarm): ---------- 5A/2.5A @ 120/240 VAC (Resistive)
5 Vdc Logic: ---------- "ON" Voltage - 5V min., 7V max.,
"OFF" Voltage - 0.3V max.
Load resistance - 500 ohm min.

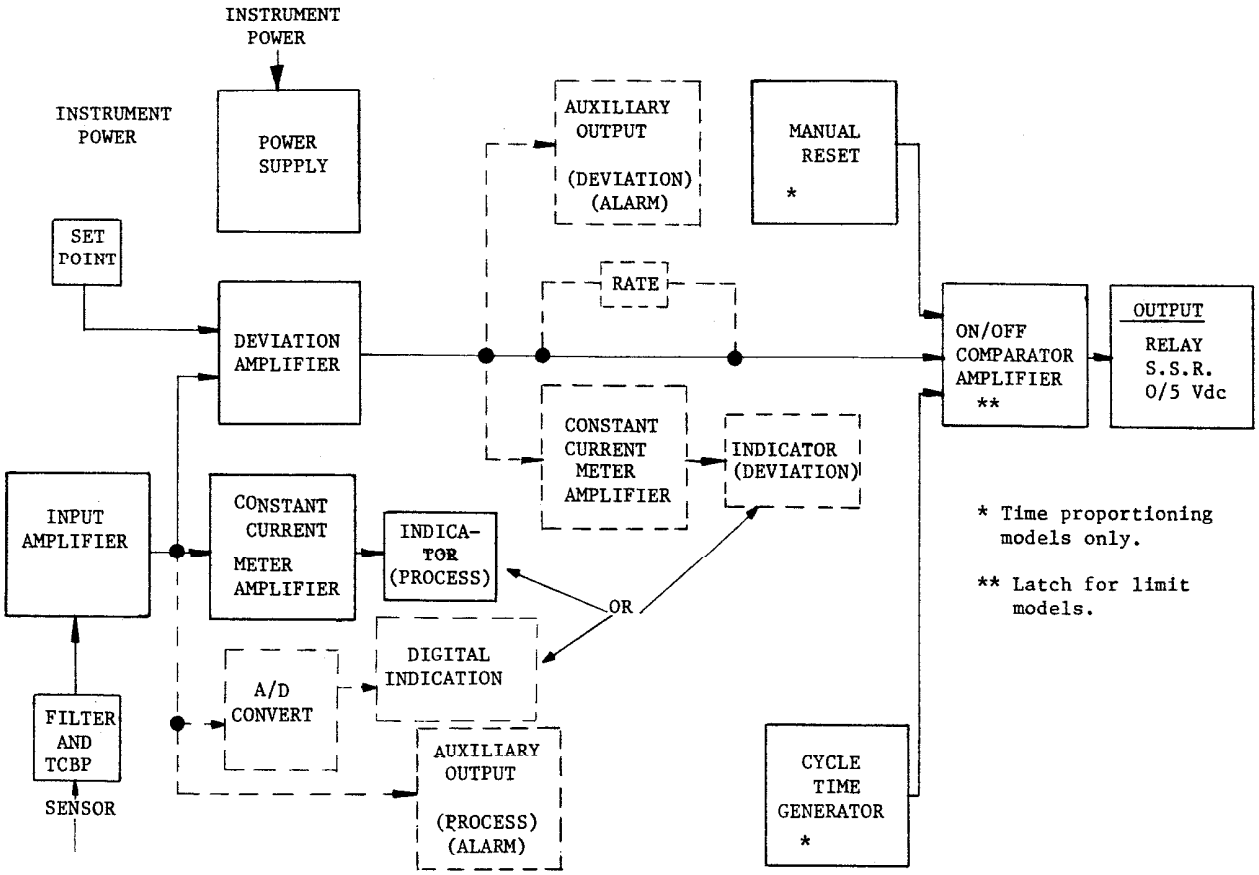
CONTROL ADJUSTMENTS

Proportional band: ---------- fixed at 3%
Manual reset: ---------- adjustable over ±4% of span
Rate: (Derivative): ---------- optional--fixed at .33 minutes

PERFORMANCE

Accuracy (Set Point)
Reference: ---------- ±1.0% of span over the central 80% of span at reference conditions.
Rated: ---------- ±1.5% typical of span over the central 80% of span at rated conditions.
Repeatability: ---------- ±0.1% of span
Conformity error: ---------- ±0.5% of span
Stability:
Temperature: ---------- ±9 microvolts/°C (maximum)
±3 microvolt/°C (typical)
(input OP amp. only)
Line Voltage: ---------- ±0.5% of span with change of +10% to -15% @ 120/240 VAC @ 50/60 Hz.
Common mode rejection: ---------- 120 db up to 240 VAC @ 50/60 Hz
Normal mode rejection: ---------- 60 db @ 50/60 Hz
Operating Conditions
Reference: ---------- 25°C± 1°C; 120/240 VAC ±1% @ 50/60 Hz; 10 ohms T/C source resistance; 15% RH
Rated: ---------- 0-55°C for all non-digital readout controller.
0-50°C for all digital readout controller.
120/240 VAC +10%, -15% @ 50/60 Hz, 100 ohms maximum T/C source resistance; 0-70% RH

THEORY OF OPERATION



The power line voltage is stepped down by the power supply transformer, rectified and filtered to approximately ±16 Vdc. This unregulated voltage energizes the power supply circuitry which develops the positive and negative regulated voltages to power the other control circuit functions.

The input amplifier converts the filtered input signal to an equivalent process variable signal which drives the meter amplifier for the process indicator and supplies the input signal to the process alarm option. This process variable signal is also one input to the deviation amplifier which compares this signal to the set point signal. When the process variable signal differs from the set point signal, the deviation amplifier generates an error signal. This error signal drives the meter amplifier for the deviation indicator, and supplies an input signal to the deviation alarm option.

The error signal is one input to the ON/OFF comparator amplifier which drives the output (relay, or 5 Vdc S.S.R. input signal). For the time proportioning models the other inputs are the manual reset and the ramp signal from the cycle time generator. The manual reset provides an adjustment to eliminate the offset between set point and control point. The cycle time generator provides a time proportioning switching action, which automatically provides the proper proportion of on time to maintain the process variable at the control point.

For the ON/OFF models, the ON/OFF comparator amplifier turns the output on when the input signal is below the set point. When the input signal is above the set point, the output is off. The HIGH LIMIT models operate the same as the ON/OFF models except that the output is latched when the output turns off. The LOW LIMIT models turn off and latch below set point.

The alarm output option will accept either the process signal or the error signal as an input. The input signal is compared to the alarm set point signal and actuates the output relay in response to these inputs. The relay will be energized when the alarm set point has been exceeded for the process alarm, deviation high alarms and out of limits alarms. The relay will be energized when the temperature is below the deviation low alarm or out of limits alarm set points.

TUNING PROCEDURES

SET POINT: Set to desired temperature.

MANUAL RESET: Initial setting on start-up should be mid-position. After the process has stabilized, turn the potentiometer clockwise (CW) to increase temperature or counterclockwise (CCW) to decrease temperature. Adjustments MUST be made in small increments with sufficient time allowed between adjustments for the process to re-stabilize at the new control point.

LIMIT RESET SWITCH: After the controller is powered, this switch MUST be pushed to override the controller automatic latch feature. In the event of an over (under) temperature condition, this switch will allow re-starting of the process after the temperature has returned to normal.

DEVIATION ALARM SET POINT: A clockwise (CW) rotation of the alarm set point potentiometer increases the separation between the primary set point and the alarm set point. This separation may be above, below or both (out of limits) depending upon the option selected. Each graduation around the alarm set point adjustment represents approximately 10% of the total adjustment e.g., for a total adjustment 15% of span, 2 graduations equals 3% of span (30° on 1000° span). The alarm set point is "blind", however, the proper switch action can be verified by moving the primary set point opposite to the direction of the alarm set point. That is, decrease the primary set point to verify a HIGH alarm output and note the difference between the set point and indicator when the alarm output LED lamp turns on.

PROCESS ALARM SET POINT: The alarm set point is continuously adjustable from 0 to 100% of the span of the controller. Clockwise (CW) rotation increases the set point. Reference marks are provided to aid in determining the proper set point. The set point is "blind" however, proper switch action can be verified by observing the point at which the alarm output LED lamp turns on as the process temperature is varied.

TROUBLESHOOTING

A temperature controller is only one part of a heating system. Its function is to sense temperature at a particular point in the system and, on the basis of what it senses, actuate some other device which changes the quantity of heat flowing into the system. A controller can respond only to what it senses at the particular sensing point. It cannot react to a temperature rise or fall somewhere else in the system until that rise or fall causes a change at the sensing point. Generally, it will have difficulty regulating the system when the heat source is improperly sized. And, most important, it has no way of recognizing whether the temperature at the sensor truly represents the temperature at the work area. Regardless of the capabilities of the controller, it can control no more closely than the design of the system permits.

The temperature controller set point, indicator and LED'S will aid you in determining whether the temperature controller is functioning properly. Generally, the RED LED is on when the output function is energized (see DESCRIPTION). In normal operation the indicator should be within the proportional band of the controller for the set point desired and relatively stable. The following table outlines some typical symptoms and probable causes.

TYPICAL SYMPTOM	PROBABLE CAUSE
LED lamps off.	No power to controller. Check all power wiring & connections.
Indicator remains at or near zero.	Open indicator circuit. Shorted T/C lead wire.
Indicator remains upscale.	Open input circuit. Check for burned out T/C, broken wires, etc.
No output, but indicator and LED lamps functioning correctly.	Open circuit in output wiring. Check for broken wires, loose connections, burned out heaters, etc.
Controller and relay/contactor are functioning properly, but process is overheating.	Sensor placement is incorrect or cooling is needed. Check sensor location, type, position in well, etc.
Primary set point LED lamp on with temperature indicator decreasing.	Reversed thermocouple polarity.
Erratic Control	Instrument not properly grounded. Sensor wiring too close to power wiring.