MANUAL NO. 54

Model ETR-9040
Microprocessor Based
Limit Control

INSTRUCTION MANUAL

WARNING SYMBOL! 

This Symbol calls attention to an operating procedure or practice which, if not correctly performed or adhered to, could result in personal injury or damage to the product or system. Do not proceed beyond a warning symbol until the indicated conditions are fully understood and met.

INSTRUCTION MANUAL
FOR ETR-9040 LIMIT CONTROL

Section 1: INTRODUCTION

The OGDEN ETR-9040 limit control is an over temperature protection or a high limit safety device with a latching output. The limit removes power in an abnormal condition when the process temperature is higher than the high limit set point or lower than the low limit set point.

The unit is powered by an 11-26 or 90-264VDC/VAC supply, incorporating a 3 amp form C relay for limit control. The universal input is fully programmable for PT100, thermocouple types J, K, T, E, B, R, S, N, L and 0~60mV, without the need to modify the unit. The ETR-9040 has an optional port available for one of the following functions: alarm output, RS-485 communications, DC power supply output, limit annunciator output or event input. Alternative control output options also include SSR drive and triac. The input signal is digitized by using an 18-bit A to D converter. Its fast sampling rate
(5 times/second) allows the ETR-9040 to control fast processes such as pressure and flow.

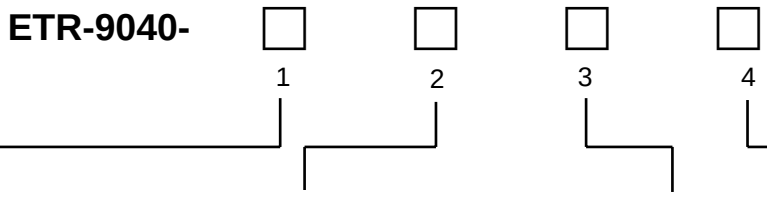
Digital communication RS-485 is available as an additional option. This option allows the ETR-9040 to be integrated with a supervisory control system. As a alternative option, alarm functions and alarm modes can also be programmed for a specific application. The DC power supply output option can be used to power an external sensor or transmitter. The event input option can be programmed to reset or lock the controller from a remote switch. The limit annunciator option can be used to control an alarm buzzer

Three methods can be used to program the ETR-9040

1. Use keys on front panel to program the unit manually.
2. Use a PC and setup software to program the unit via RS-485 port.
3. Use the P11A, a hand-held programmer to program the unit via the programming port.

High accuracy, maximum flexibility, fast response and user friendly are the main features of the ETR-9040

Section 2: CATALOG NUMBERING SYSTEM



Power Input
- **4** 90-264VAC, 50/60Hz
- **5** 11-26VAC or VDC

Example:
Standard Model:
ETR-9040-4110
- 90-264VAC operating voltage
- Input: Standard Input
- Output 1: Relay
- Option: None

Signal Input
- **1** Standard Input Thermocouple J, K, T, E, B, R, S, N, L RTD: PT100 DIN, PT100 JIS mV: 0~60MV
- **2** Voltage: 0-1V
- **3** Voltage: 0-10V
- **4** Current: 0-20mA

Output 1
- **1** Form C Relay Rated 2A/240VAC
- **2** Pulsed Voltage to Drive SSR, 5V/30mA
- **6** Triac Output 1A/240VAC, SSR

Option
- **0** None
- **1** Form A Relay 2A/240VAC
- **2** Pulsed voltage to drive SSR, 5V/30mA
- **6** Triac Output, 1A/240VAC, SSR
- **7** Isolated 20V/25mA DC Output Power Supply
- **8** Isolated 12V/40mA DC Output Power Supply
- **9** Isolated 5V/80mA DC Output Power Supply
- **A** RS-485
- **B** Event Input

Section 3: SPECIFICATIONS

Line Voltage: 90-264 VAC, 50-60 Hz, 11-26VDC available.

Input: Type: J, K, R, T, B, E, S, N,L thermocouple, PT100 ohm RTD (DIN) 43760/BS1904 (or JIS) and –10 to 60mV (given span).

Power consumption: 10VA, 5W maximum

Accuracy: ±.1%, ± least significant digit.

Input
Resolution: 18 bits
Sampling: 5 times/second
Maximum Rating: -2VDC minimum, 12VDC maximum (1 minute for mA input)
Burn-out Current: 200mA

Maximum Temperature Ranges:

Sensor	Input Type	Max. Range F°	Accuracy F°	Max. Range C°	Accuracy C°
J	Iron/Constantan	–58 to 1832°F	±3.6°F	–50 to 1000°C	±2°C
K	Chromel/Alumel	–58 to 2500°F	±3.6°F	–50 to 1370°C	±2°C
T	Copper/Constantan	–454 to 752°F	±3.6°F	–270 to 400°C	±2°C
E	Chromel/Constantan	–58 to 1382°F	±3.6°F	–50 to 750°C	±2°C
B	Pt-30%RH/Pt-6% RH	32 to 3272°F	±5.4°F	0 to 1800°C	±3°C
R	Pt-13%RH/Pt	32 to 3182°F	±3.6°F	0 to 1750°C	±2°C
S	Pt-10%RH/Pt	32 to 3182°F	±3.6°F	0 to 1750°C	±2°C
N	Nicrosil/Nisil	–58 to 2372°F	±3.6°F	–50 to 1300°C	±2°C
L	Iron/Nickel-Copper	–328 to 1652°F	±3.6°F	–200 to 900°C	±2°C
RTD	PT 100 ohms (DIN)	–328 to 752°F	±0.72°F	–200 to 400°C	±0.4°C
RTD	PT 100 ohms (JIS)	–328 to 752°F	±0.72°F	–200 to 400°C	±0.4°C
Linear	Voltage or Current	–1999 to 9999	±0.05%	–1999 to 9999	±0.05%

Common Mode Rejection Ratio (CMRR): 120db

Sensor Break
Detection: Sensor open for TC, RTD and mV inputs, below 1mA for 4-10 mA input, below 0.25V for 1-5V input, unavailable for other inputs

Sensor Break
Responding Time: Within 4 seconds for TC, RTD and mA inputs, 0.1 second for 4-20 mA and 1-5V inputs

Event Input
Logic Low -10V minimum, 0.8V maximum
Logic High: 2V minimum, 0.8V maximum
Functions: Remote reset, remote lockout

Output 1/ Output 2
Relay Rating: 2A/240VAC, life cycles 200,000 for resistive load
Pulsed Voltage: Source Voltage 5V, current limiting resistance 66 ohms

Triac (SSR) Output
Rating: 1A/240VAC
Inrush Current: 20A for 1 cycle
Min. Load Current: 50mA rms
Max.Off-state Leakage: 3mA rms
Max. On-state Voltage: 1.5V rms
Insulation Resistance: 1000 Mohms min. at 500VDC
Dielectric Strength: 2500VAC for 1 minute

DC Voltage Supply Characteristics (Installed at Output 2)

Type	Tolerance	Max. Output Current	Ripple Voltage	Isolation Barrier
20V	± 0.5V	25mA	0.2Vp-p	500VAC
12V	± 0.3V	40mA	0.1Vp-p	500VAC
5V	± 0.15V	80mA	0.05Vp-p	500VAC

Data Communications
Interface: RS-485 (up to 247 units)
Protocol: Modbus protocol RTU mode
Address: 1 - 247
Baud Rate: 0.3 ~ 38.4 Kbits/sec
Data Bits: 8 bits
Parity Bit: None, Even or Odd
Stop Bit: 1 or 2 bits
Communication Buffer: 50 bytes

Environmental& Physical
Operating Temperature: -10°C to 50°C
Storage Temperature: -40°C to 60°C
Humidity: 0 to 90% RH (non-condensing)
Insulation Resistance: 20 Mohms min. (at 500VDC)
Dielectric Strength: 2000VAC, 50/60Hz for 1minute
Vibration Resistance: 10 - 55Hz, 10m/s^2 for 2 hours
Shock Resistance: 200m/s^2 (20g)
Moldings: Flame retardant Polycarbonate
Dimensions: 48mm(W) x 48mm(H) x 94mm(D), 86mm depth behind panel
Weight: 150 grams

Approval Standards
Safety: UL873 (11th edition, 1994)
CSA C22.2 No. 24-93
EN61010-1 (IEC1010-1)
Protective Class: IP30 front panel, indoor use
IP20 housing and terminals (with protective cover)
EMC: EN61326

Related Products:
SNA10A—Smart Network Adapter for Third Party Software. Converts 255 channels of RS-485 or RS-422 to RS-232 Network
SNA10B—Smart Network Adapter for ETR-Net Software. Converts 255 channels of RS-485 or RS-422 to RS-232 Network

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NON-VOLATILE MEMORY
• Retains process parameters when power is off

STATUS INDICATORS
• OUTPUT 1
• OUTPUT 2
• °C
• °F

FM APPROVED LIMIT CONTROL
• EASY OPERATION
• QUICK SET-UP

CONTROL LOCK STATUS INDICATOR

DISPLAY MODE
Indicates value being displayed:
• PV PROCESS VALUE
• HSP1 OUTPUT 1 HIGH LIMIT SET POINT
• LSP1 OUTPUT 1 LOW LIMIT SET POINT
• SP2 OUTPUT 2

TOUCH KEY, Sealed mylar front panel
• Splash and chemical resistant
• Tactile feedback, pressure sensitive buttons

WARNING!

RISK OF ELECTRIC SHOCK - Dangerous and potentially fatal voltages are present when working on this equipment. Before installation or beginning any troubleshooting procedures, the electric power to this equipment must be disconnected and locked out as described by OSHA Standards. Units suspected of being faulty must be removed and returned to Ogden for inspection and/or repair. They contain no user serviceable components.

WARNING!

To help minimize the possibility of fire or shock hazards, do not expose this instrument to rain or excessive moisture. This control is not to be used in hazardous locations as defined in Articles 500 and 505 of the National Electric Code.

CAUTION!

Do not use this instrument in areas subject to hazardous conditions such as excessive shock, vibration, dirt, moisture, corrosive gases or oil. The ambient temperature of the areas should not exceed the maximum rating specified in Section 3, on previous page.

Unpacking:

Upon receipt of the shipment remove the instrument from the carton and inspect the unit for shipping damage. If any damage due to transit is noticed, report and file a claim with the carrier. Write down the model number, serial number, and date code for future reference when corresponding with our service center. The serial number (S/N) and date code (D/C) are located inside the control.

Mounting:

Make panel cutout to dimensions shown below. Insert the controller into the panel cutout. The maximum panel thickness is ⅛" (3mm).

Wiring Precautions:

- Before wiring, verify the label for correct model number and options. Switch off the power when checking.
- Care must be taken to ensure that maximum voltage ratings specified in Section 3 on previous page are not exceeded.
- It is recommended that power to these instruments be protected by fuses and circuit breakers rated at the minimum value possible.
- All units should be installed inside a suitably grounded metal enclosure to prevent live parts being accessible to human hands and metal tools.
- All wiring must conform to appropriate standards of good practice, national and local codes and regulations. Wiring must be suitable for the maximum voltage, current, and temperature ratings expected in the system.
- Both solderless terminals or “stripped” leads as specified in Figure 4.2 below can be used for power leads. Only “stripped” leads should be used for thermocouple connections to prevent compensation and resistance errors.
- Take care not to over-tighten the terminal screws.
- Unused control terminals should not be used as jumper points as they may be internally connected, causing damage to the unit.
- Verify that the ratings of the output devices and the inputs as specified in Table 4.2 on Page 8 are not exceeded.
- Electric power in industrial environments contains a certain amount of noise in the form of transient voltages and spikes. This electrical noise can enter and adversely affect the operation of microprocessor-based controls. For this reason we strongly recommend the use of shielded thermocouple extension wire which connects from the sensor to the controller. This wire is a twisted-pair construction with foil wrap and drain wire. The drain wire is to be attached to earth ground at the control end only. We carry both type J and type K in our stock.

NOTE: The use of motor starters in place of magnetic contactors should be avoided. They have very large inductive loads that can damage the controller’s relay.

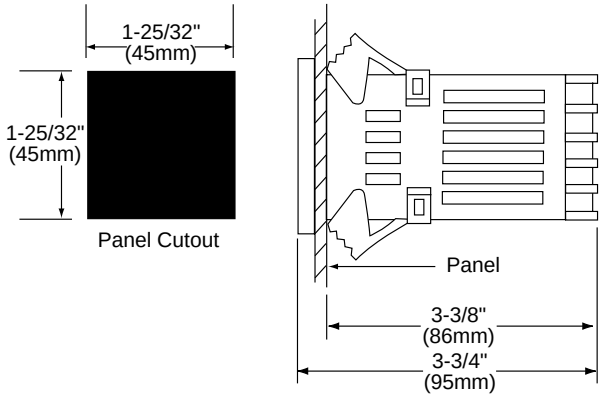

Figure 4.1 Mounting Dimensions

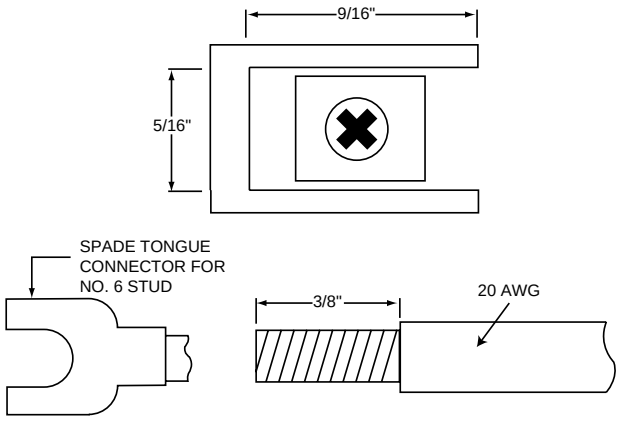

Figure 4.2 Lead Termination

Power Wiring:
Connect terminals as shown below in Fig. 4.3. The ETR-9040 is equipped to operate at either 11-26VAC/VDC or 90-264VAC. Check that the installation voltage corresponds with the power rating indicated on the product label before connecting power to the unit. All wiring must conform to national and local electric codes.

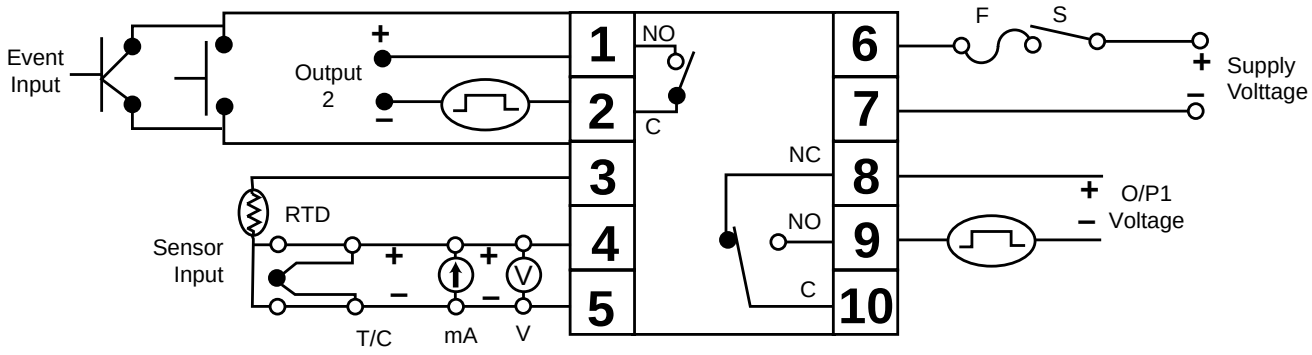

Figure 4.3 Rear Terminal Connections

Input Wiring:
Connect appropriate sensors to terminals 3, 4, or 5 as illustrated in Figure 4.3 above. Verify that the instrument is selected for the correct sensor and the correct polarity is observed at both the sensor-end and instrument-end of the cable. Do not run sensor cables in the same conduit or wiring trough as power lines because the low level signal is noise sensitive.

When wiring the thermocouple, check the thermocouple and extension wire (compensating cable) to make sure they conform to the appropriate thermocouple type specified by the instrument. Extension wires must be the same alloy and polarity as the thermocouple. The total lead resistance should not exceed 100 ohms for accurate measurements. One hundred ohms of lead resistance will introduce a 1°F (0.5°C) error.

For wiring 3 wire RTD (Resistance Temperature Detector) all leads connecting the RTD to the controller must be the same gauge and material. If the RTD is a 3 wire device, install the two common wires of the RTD to terminals 4 and 5. If a 2 wire RTD is to be used, install a jumper between terminals 4 and 5.

Table 4.1 Thermocouple Cable Color Codes

Thermocouple Type	Cable Material	American ANSI	British BS 1843	German DIN 43710	French NFE 18001
J	Iron/Constantan	+ white - red * black	+ yellow - blue * black	+ red - blue * blue	+ yellow - black * black
K	Chromel/Alumel	+ yellow - red * yellow	+ brown - black * red	+ red - green * green	+ yellow - purple * yellow
T	Copper Constantan	+ blue - red * blue	+ white - blue * blue	+ red - brown * brown	+ yellow - blue * blue
R S	Platinum/Rhodium	+ black - red * green	+ white - blue * green	+ red - white * white	+ yellow - green * green
B	Platinum/Rhodium	+ grey - red * grey		+ red - grey * grey	

* Color of overall sheath

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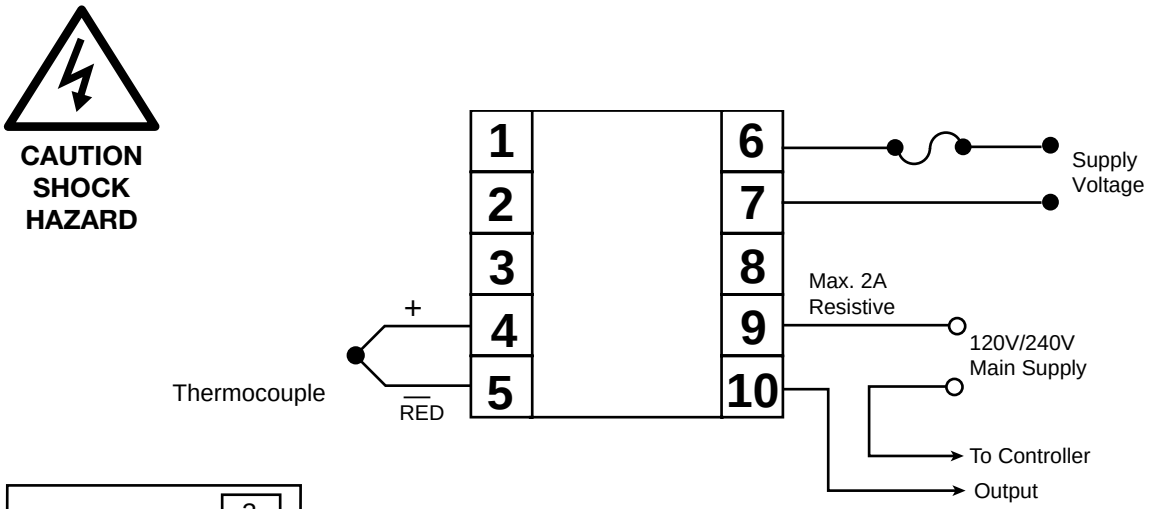
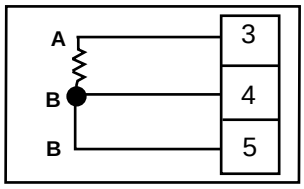




RTD Sensor Connections

Figure 4.4
Example of Wiring Connections for
ETR-9040-4110 with Relay Output
(ETR-9040-4160 with Triac Output)

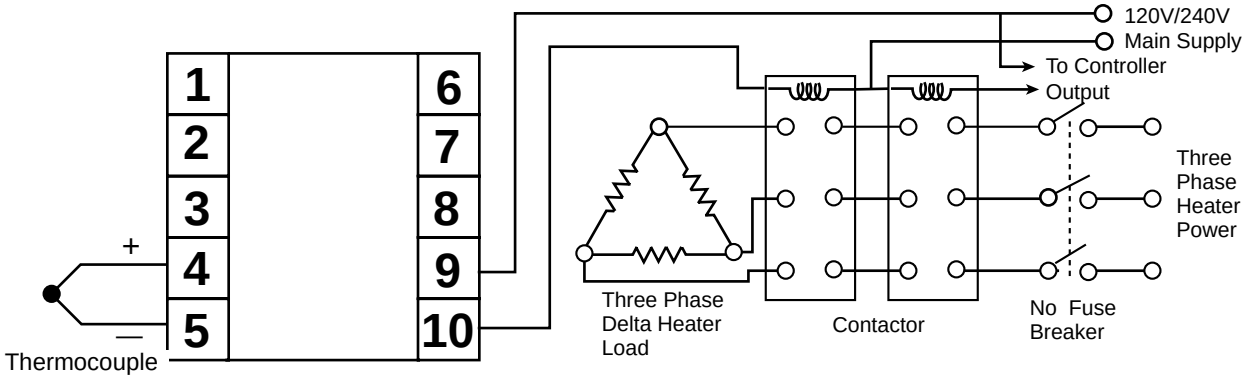


Figure 4.5
Example of Wiring Connections for
ETR-9040-4110 with Relay Output
(ETR-9040-4160 with Triac Output)

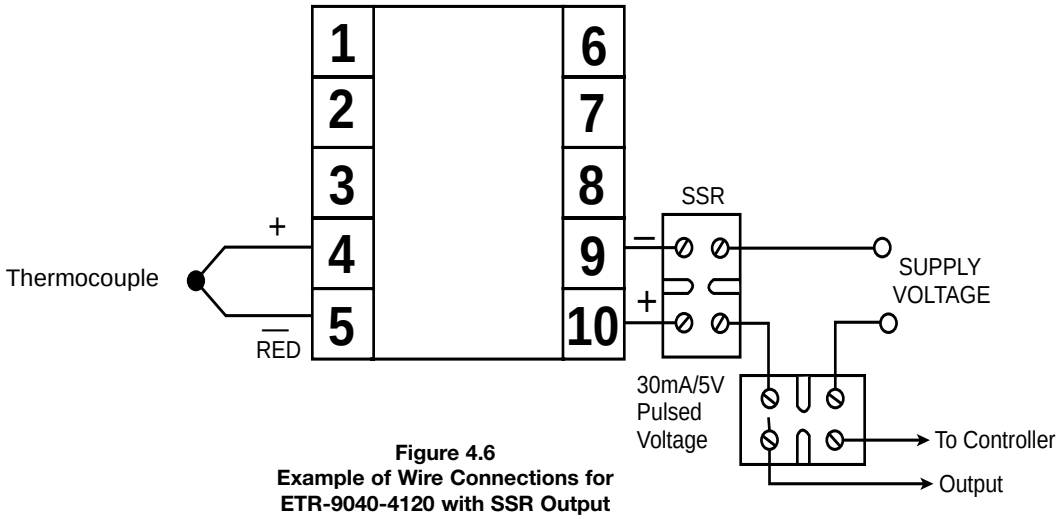


Figure 4.6
Example of Wire Connections for ETR-9040-4120 with SSR Output

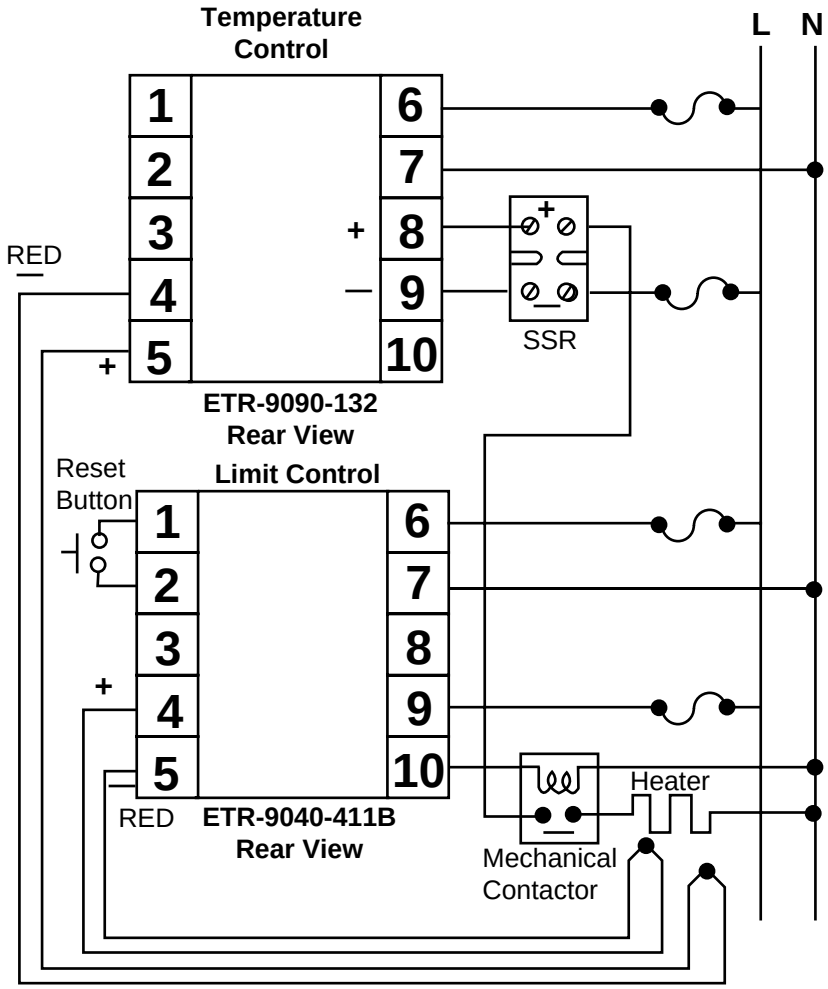
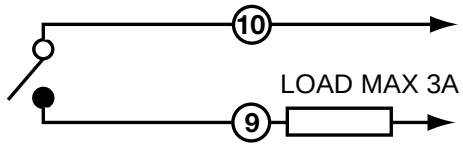
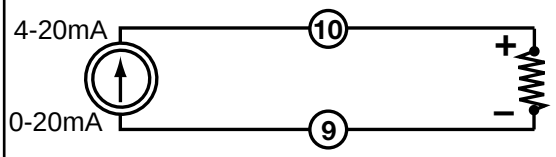
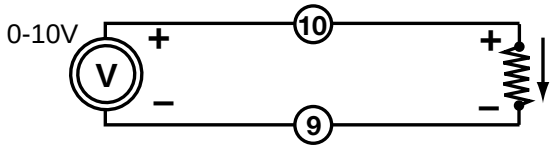
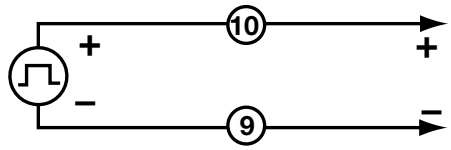


Figure 4.7
Example of Wiring Limit Control ETR-9040 with a Manual Reset to Protect the Process Being Controlled by an ETR-9090

Table 4.2 Heating Output Wiring

Function	Internal Device: Terminals:	External Connection:
1. Relay (Isolated). Relay contact is closed during ON phase of output cycle. (CTRL lamp ON)		To line 240VAC max.
2. Current (Isolated. Reverse acting current (The function of CTRL lamp ON lasts longer during decreasing process value).		Input impedance of control device, MAX. 500 ohms.
3. Voltage (Isolated). Reverse acting voltage (The Flashing of CTRL lamp ON lasts longer during decreasing process value).		Input impedance of control device, MIN. 500K ohms.
4. Pulsed Voltage. The non-isolated logic signal goes high during ON phase of output cycle. (CTRL lamp ON).		To drive solid state relay or other isolated control device 24 VDC/20mA MAX.

Output Wiring:
Four different types of output devices can be used from output one. Relay, current, voltage and pulsed voltage provide a variety of control applications, Verify that the output device is correctly selected to meet your application requirements and make certain the ratings of the output devices are not exceeded before wiring the system.

The external connections depend on what type of output is installed. Pulsed voltage output is not isolated from the internal circuits of the instrument.

Alarm
This instrument offers 14 different alarm modes. Each one can be selected by pressing the keypads on the front panel. The detailed descriptions are shown on Table 5.1, Page 13 and on Tables 5.6 and 5.7, Page 17.

Sensor Placement
Proper sensor placement can eliminate many problems in a control system. The probe should be placed so that it can detect any temperature change with minimal thermal lag. In a process that requires fairly constant heat output, the probe should be placed close to the heater. In processes where the heat demand is variable, the probe should be closer to the work area. Some experimenting with probe location is often required to find this optimum position.

In a liquid process, addition of a stirrer will help to eliminate thermal lag. Since the thermocouple is basically a point measuring device, placing more than one thermocouple in parallel will provide an average temperature reading and produce better results in most air heated processes.

Proper sensor type is also a very important factor in obtaining precise measurements. The sensor must have the correct temperature range to meet the process requirements. In special processes the sensor might have to have different requirements such as leak-proof, anti-vibration, antiseptic, etc.

Standard sensor limits of error are ± 4 degrees F (±2 degrees C) or 0.75% of sensed temperature (half that for special) plus drift caused by improper protection or over-temperature occurance. This error is far greater than controller error and cannot be corrected at the sensor except by proper selection and replacement.

Output 2 Wiring

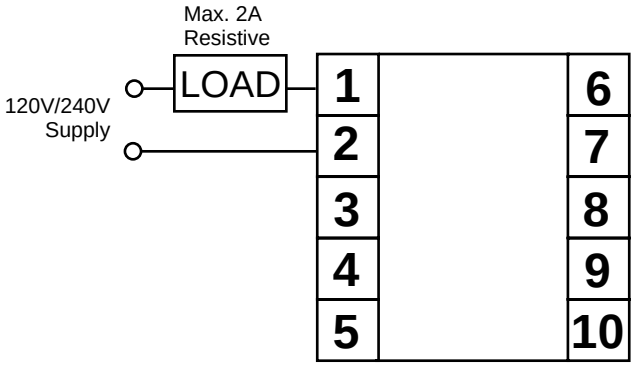


Figure 4.8 Relay or Triac Output

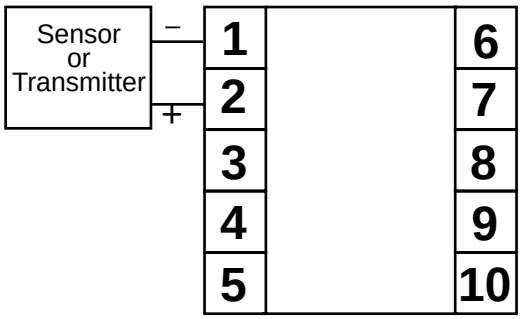


Figure 4.9 DC Power Supply Output

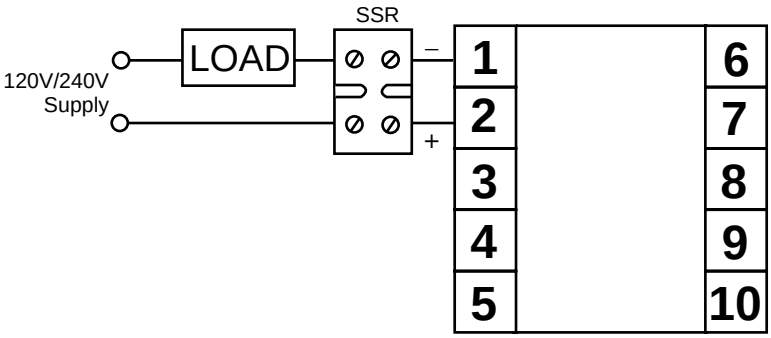
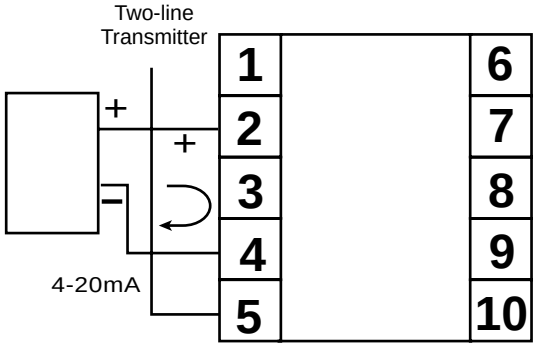


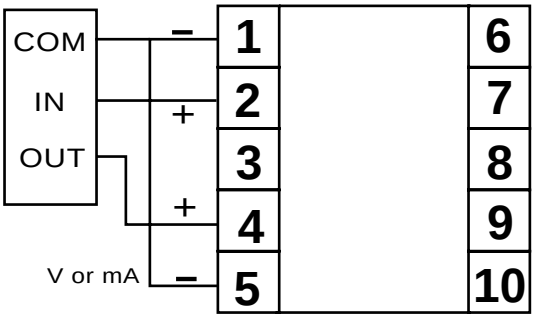
Figure 4.10 Pulsed Voltage to Drive SSR



Set
OUT2 = dCPS
DC Power Supply

Caution:
To avoid damage do not use the DC Power Supply beyond its rating current .
Purchase the correct voltage to suit your external devices. See ordering code in Section 2

Three-line
Transmitter or Sensor



Bridge Type Sensor

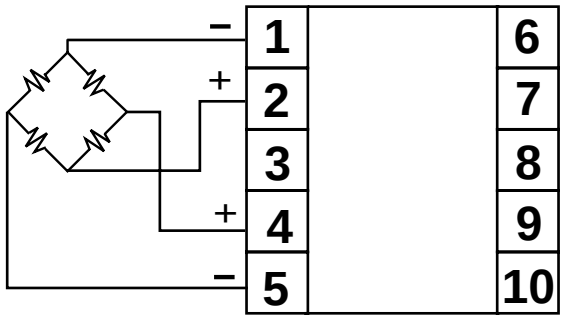
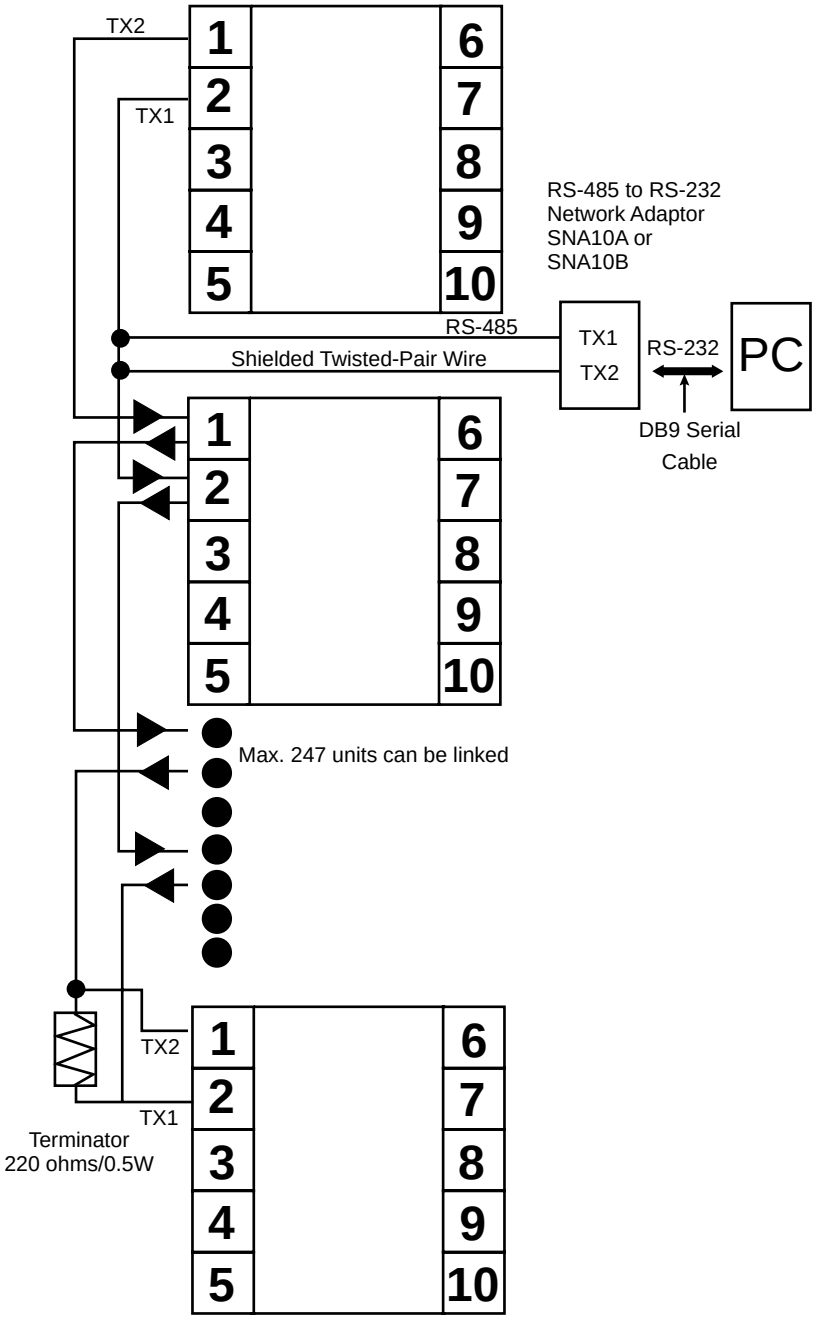


Figure 4.11
DC Power Supply Application

Figure 4.12
RS-485 Wiring



Section 5: OPERATION

Keys and Display

TOUCHKEYS	DESCRIPTION	FUNCTION
	Scroll Key	1. Select a point to be displayed 2. Select a parameter to be viewed or adjusted 3. Advance display from a parameter code to the next parameter code
Press  for 4 seconds	Enter Key	Press the scroll key for 4 seconds, the display will then enter the setup menu. Press the key for 8 seconds to enter the calibration mode.
	Up Key	This key is used to increase the selected parameter value providing the lock indicator is off.
	Down Key	To decrease the selected parameter providing the lock indicator is off.
	Reset Key*	1. Reset the limit condition after the process is within the limit. 2. Revert the display to the normal display. 3. Reset the latching alarm once the alarm condition is removed. 4. Rest the limit annunciator.
Press  for 4 seconds	Unlock Key	Press the RESET key for 4 seconds to enable up/down key function, also to reset the reference data (Section 3) and the lock indicator will be extinguished. However, this function is disabled when the remote lock is selected for EIFN (Event Input Function). See Section 3.

** NOTE: If the RESET key is left pressed, only ONE reset operation will occur. If the unit subsequently goes into a state where reset is required again, the REST key (or remote reset contacts) must be released (opened) and pressed (closed) again.*

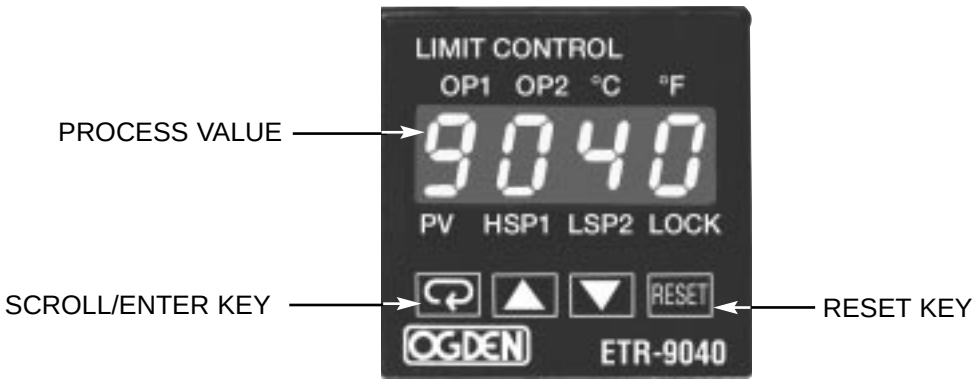
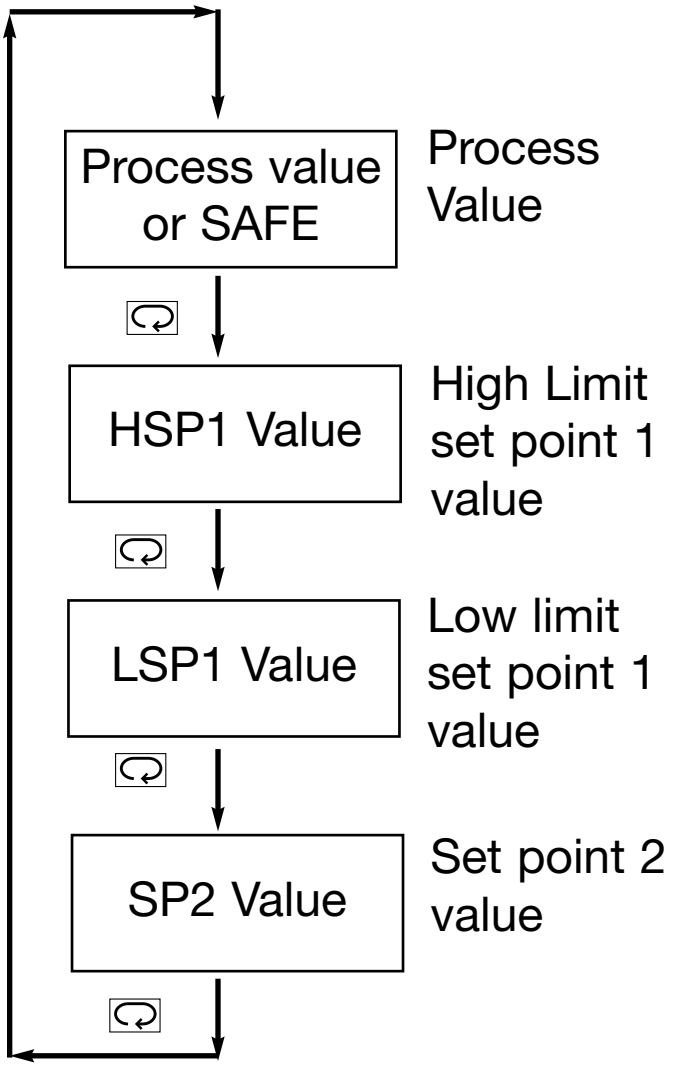


Figure 5.1 Front Panel Display

Menu Overview



NOTE 1: The flow charts show a complete listing of parameters. For actual applications, the number of available parameters is dependent on the set up conditions, and should be less than that shown in the flow charts.

NOTE 2: Press key for 4 seconds to enable up/down key function and the LOCK indicator will be extinguished.

Display Form

A	A	E	E	I	I	N	n	S	5	X	
B	b	F	F	J	J	O	o	T	t	Y	Y
C	C	G	G	K	K	P	P	U	u	Z	
c	c	H	H	L	L	Q		V	v	?	?
D	d	h	h	M	n	R	r	W		=	=

: These characters are displayed differently

Setup Mode

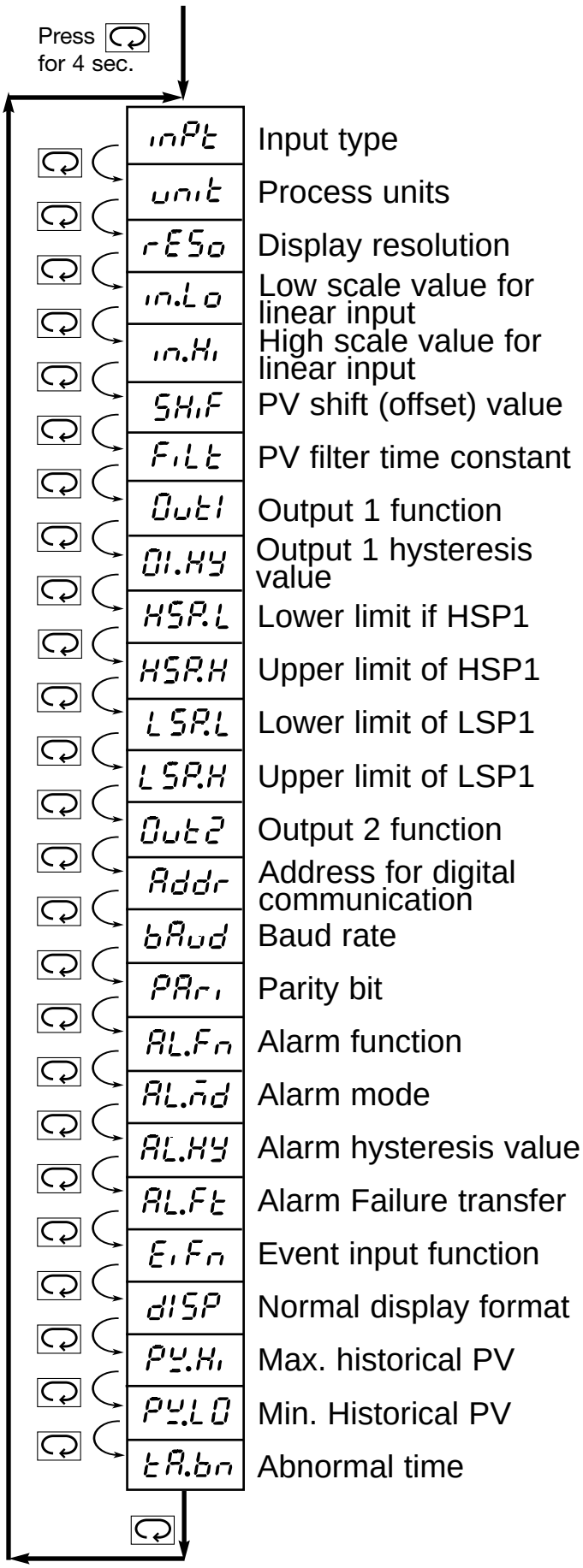


Table 5.1 Index Code (Menu) Descriptions:
(Do not disconnect power for at least 12 seconds after changing any control values. This allows the parameters to be entered into memory.)

NOTE: Further parameter definitions on pages 14 and 15

Index Code	Description —Adjusting Range	Default Setting
HSP1	High Limit Set Point 1 — Low: HSP.L; High: HSP.H	100.0°C (212.0°F)
LSP1	Low Limit Set Point 1 —Low: LSP.L; High: LSP.H	0°C (32°F)
SP2	Set Point 2 Value for Output 1	190.0°C (194.0°F)
INPT	Input Type Selection —0 J.tC J Type T/C —1 K.tC K Type T/C —2 t.tC T Type T/C —3 E.tC E Type T/C —4 b.tC B Type T/C —5 r.tC R Type T/C —6 S.tC S Type T/C —7 n.tC N Type T/C —8 L.tC L Type T/C —9 Pt.dn PT100 ohms DIN curve —10 Pt.JS PT100ohms JIS curve —11 4-20 4-20 mA linear current —12 0-20 0~20 mA linear current —13 0-60 0~60 mV linear current —14 0-1V 0~1V linear voltage —15 0-5V 0~5V linear voltage —16 1-5V 1~5V linear voltage —17 0-10 0~10V linear voltage	1 (0)
UNIT	Process Unit —0 °C Degree C unit —1 °F Degree F unit —2 Pu Process Unit	1 (0)
RESO	Display Resolution —0 no.dP No decimal point —1 1-dP 1 decimal point —2 2-dP 2 decimal points —3 3-dP 3 decimal points	1
IN.LO	Low Scale Value for Linear Input —Low: -19999; High: IN.HI	0
IN.HI	High Scale Value for Linear Input —Low: IN.LO; High: 45536	100.0
SHIF	PV Shift (offset) Value —Low: -200.0°C (360.0°F); — High: 200.0°C (350.0°F)	0.0
FILT	PV Filter Time Constant —0 0 0 second —5 5 5 second —1 0.2 0.2 second —6 10 10 second —2 0.5 0.5 second —7 20 20 second —3 1 1 second —8 30 30 second —4 2 2 second —9 60 60 second	2
OUT1	Output 1 Function —2 Hi High limit control —3 Lo Low limit control —4 Hi.Lo High/Low limit control	2
O1.HY	Output 1 Hysteresis Value —Low: 0.1; High: 10.0°C (18.0°F)	0.1
HPS.L	Lower Limit of HSP1 —Low: -19999; High: HSP.H	—
HSP.H	Upper limit of HSP1 —Low: HSP.L; High: 45536	1000.0°C (1832.0°F)

Index Code	Description —Adjusting Range	Default Setting
LSP.H	Upper Limit of LSP1 —Low: LSP.L	0°C (32°F)
OUT2	Output 2 Function —0 nonE No function —1 dCPS DC power supply output —2 Comm RS-485 Communication —3 ALn Alarm output —4 L.An Limit annunciator —5 Ei.Fn Event Input	—
ADDR	Address Assignment of Digital COMM —Low: 1; High: 255	—
BAUD	Band Rate of Digital COMM —0 0.3 0.3 Kbits/s —1 0.6 0.6 Kbits/s —2 1.2 1.2 Kbits/s —3 2.4 2.4 Kbits/s —4 4.8 4.8 Kbits/s —5 9.6 9.6 Kbits/s —6 14.4 14.4 Kbits/s —7 19.2 19.2 Kbits/s —8 28.8 28.8 Kbits/s —9 38.4 38.4 Kbits/s	5
PARI	Parity Bit of Digital COMM —0 EvEn 8 bit even parity —1 odd 8 bit odd parity —2 nonE 8 bit none parity	0
AL.FN	Alarm Function —6 Pv.HA Process value high alarm —7 Pv.LA Process value low alarm	5
AL.MD	Alarm Mode —0 norn Normal alarm action —1 Ltch Latching alarm action	0
AL.HY	Alarm Hysteresis Value —Low: 0.1; High: 10°C (18°F)	0.1
AL.FT	Alarm Failure Transfer —0 oFF Alarm output goes off as unit fails —1 on Alarm output goes on as unit fails	1
EIFN	Event Input Function —0 nonE No event function —1 rESt Remote reset for output 1 and output 2, output 1 on, output 2 off —2 LocK Remote lock for unit	0
DISP	Normal Display Function —0 Pv Display process value —1 SP Display HSP1 or LSP1 value —2 SAFE Display the word SAFE	0
PV.HI	Historical Maximum Value of PV —Low: -19999; High: 45536	—
PV.LO	Historical Minimum Value of PV —Low: -19999; High: 45536	—
T.ABN	Accumulated Time During Abnormal Condition —Low: 0; High: 6553.5 minutes	—

Table 5.4 Parameter Chart

CONTROL NO.			
DATE			
PARAMETER			
HSP1 HIGH LIMIT SET POINT 1			
LSP1 LOW LIMIT SET POINT 1			
SP2 SET POINT VALUE FOR OUTPUT 1			
inPt INPUT			
unit PROCESS UNITS			
rESo DISPLAY RESOLUTION			
in.Lo LINEAR INPUT LOW SCALE			
in.Hi LINEAR INPUT HIGH SCALE			
SHiF PV SHIFT VALUE			
FiLt PV FILTER TIME CONSTANT			
Out1 OUTPUT 1 FUNCTION			
O1.HY OUTPUT 2 HYSTERESIS			
HSP.L LOWER LIMIT OF HSP1			
HSP.H UPPER LIMIT OF HSP1			
LSP.L LOWER LIMIT OF LSP1			
LSP.H UPPER LIMIT OF LSP1			
Out2 OUTPUT2 FUNCTION			
Addr ADDRESS FOR DIG.COM.			
bAud BAUD RATE			
PAri PARITY BIT			
AL.Fn ALARM FUNCTION			
AL.Md ALARM MODE			
AL.HY ALARM HYSTERESIS			
AL.Ft ALARM FAILURE TRANSFER			
EiFn EVENT INPUT FUNCTION			
diSP NORMAL DISPLAY FORMAT			
PV.Hi MAX. HISTORICAL PV			
PV.LO MIN. HISTORICAL PV			
tA.bn ABNORMAL TIME			

Limit Control

OUT1: Selects the output 1 function. The available output 1 functions are: High Limit Control, Low Limit Control and High/Low Limit Control. Refer to page 16 for the limit control operation.

O1HY: Output 1 hysteresis value. The hysteresis value is adjusted to a proper value to eliminate the relay jitter in a noisy environment.

Set Point Range

HSP.L: Lower limit of HSP1.
Hidden if LO is selected for OUT1

HSP.H: Upper limit of HSP1
Hidden if LO is selected for OUT1

LSP.L: Lower limit of LSP1
Hidden if HI is selected for OUT1

LSP.H: Upper limit of LSP1
Hidden if HI is selected for OUT1

HSP.L and HSP.H in set up menu are used to confine the adjustment range of HSP1. LSP.L and LSP.H are used to confine the adjustment range of LSP1.

PV Shift

In certain applications it is desirable to shift the indicated value from its actual value. This can be easily accomplished by using the PV shift function.

Cycle the unit to the SHIF parameter by using the scroll key. The number you adjust here, either positive or negative, will be added to the actual value. The SHIF function will **alter PV**.

SHIF: PV shift (offset) value

Digital Filter

In certain applications the process value is too unstable to be read. To improve this, a programmable low pass filter incorporated in the ETR-9040 can be used. This is a first order filter with a time constant specified by the FILT parameter which is contained in the set up menu. The FILT is defaulted to 0.5 seconds before shipping. Adjust FILT to change the time constant from 0 to 60 seconds. 0 second represents no filter is applied to the input signal. The filter is characterized by the following diagram.

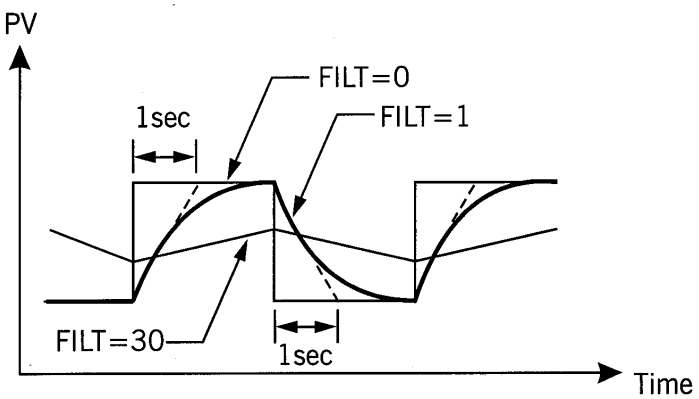


Figure 5.1
Filter Characteristics

Display Mode

The DISP in the set up menu is used to select the display format under normal conditions. If PV is selected, the display will indicate the process value. If SP1 is selected, the display will indicate HSP1 value for high limit control (OUT1 = HI) and high/low limit control (OUT = HI.LO) or indicate LSP1 value for low limit control (OUT1 - LO). If SAFE is selected, the display will indicate the word SAFE for he normal condition.

However, the display will indicate the process value if the process value goes beyond high limit or low limit. If an error condition occurs, the display will indicate the error symbol.

Normal Display

During normal operation, the unit can be configured to display the process value, high limit or low limit set point (HSP1 or LSP1 dependent on OUT1 selection) or the word SAFE.

Abnormal Display

Whenever the process is outside the normal range, the process value will be displayed.

Reference Data

The are three different types of reference data contained in the set up menu. The reference data is read-only data. The maximum historical PV, displayed by PVHI , which shows the maximum process value since the last UNLOCK operation. The minimum historical PV, displayed by PVLO , which shows the minimum process value since the last UNLOCK operation. The abnormal time, displayed by tABn , which shows the total accumulated time (in minutes) that a process has been in an abnormal condition since the last UNLOCK operation.

The reference data values will be initiated as soon as the RESET key is pressed for 4 seconds (UNLOCK operation). After the UNLOCK operation, the PV.HI and PV.LO values will start from the current process value and the T.ABN value will start from zero.

Process Input

INPT: Selects the sensor type and signal type for the process input.

UNIT: Selects the process unit.

RESO: Selects the location of the decimal point (Resolution) for most (not all) process related parameters.

IN.LO: Selects the low scale value for the linear type input

Hidden If: T/C or RTD type is selected for INPT.

IN.HI: Selects the high scale value for the linear type input.

Hidden If: T/C or RTD type is selected.

How to use IN.LO and IN.HI:

If 4-20mA is selected for INPT, let SL specify the input signal low (i.e., 20mA), S specifies the current input signal value, the conversion curve of the process value is shown as follows:

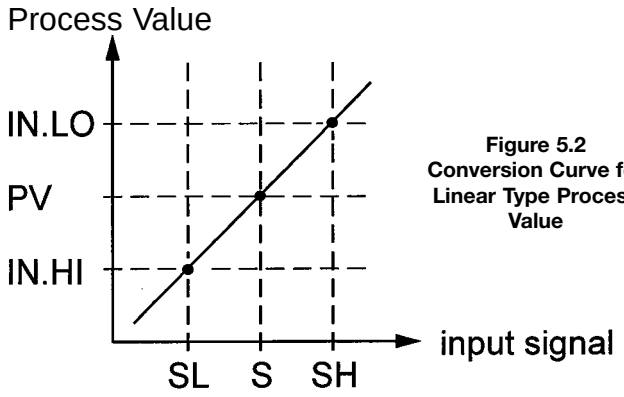


Figure 5.2 Conversion Curve for Linear Type Process Value

Formula: $PV = IN.LO + (IN.HI - IN.LO) \frac{S-SL}{SH-SL}$

EXAMPLE: A4-20mA current loop pressure transducer with range 0 - 15kg/c²m is connected to input, then perform the following set up:

INPT + 4-20MA	IN.LO = 0.0
UNIT = PU	IN.LO = 15.0
RESO - 1-DP	

Of course, you may select another value for RESO to alter the resolution.

Limit Control Operation

High Limit Operation

If Hi. is selected for OUT1, the unit will perform high limit control. When power is applied, the OUT1 relay is de-energized. After the 6.5 second self-test period if the process is below the high limit set point (HSP1), the output 1 relay will be energized and the OP1 indicator will go off. If the process goes above the high limit set point, the relay will be de-energized, the OP1 indicator will go on and the display will show the process value. After the process falls below the high limit set point and the RESET key is pressed or the remote reset input is applied, the relay will be energized and the OP1 indicator will go off.

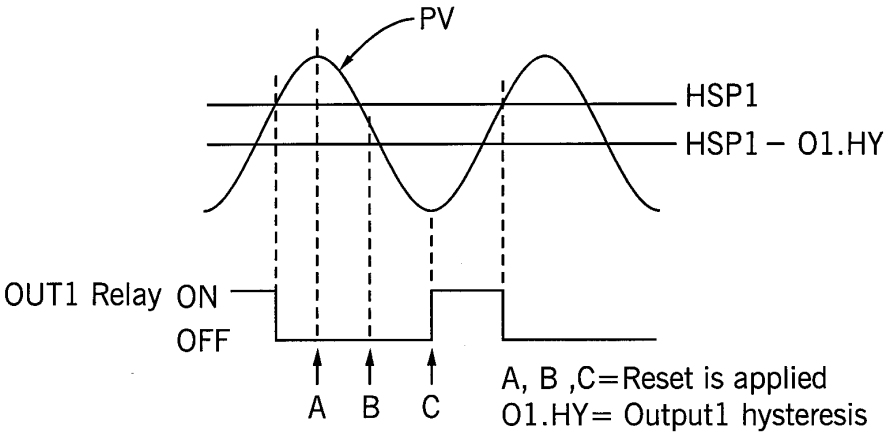


Figure 5.3 High Limit Operation

Low Limit Operation

If Lo is selected for OUT1, the unit will perform low limit control. When power is applied, the OUT1 relay is de-energized. After the 6.5 second self-test period, if the process is above the low limit set point (LSP1), the output 1 relay will be energized and OP1 indicator will go off. If the process goes below the low limit set point, the relay will be de-energized, the OP1 indicator will go on and the display will show the process value. After the process rises above the low limit set point and the RESET key is pressed or the remote reset input is applied, the relay will be energized and the OP1 indicator will go off.

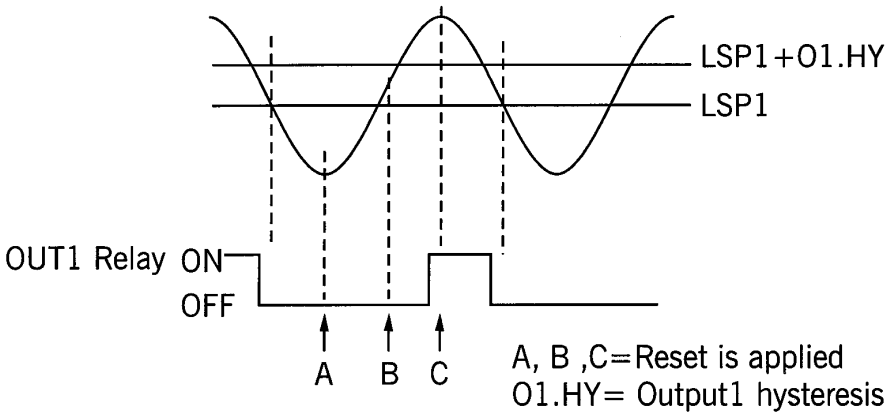


Figure 5.4 Low Limit Operation

High/Low Limit Operation

If Hi.Lo is selected for OUT1, the unit will perform high/low limit control. When power is applied, the OUT1 relay is de-energized. After the 6.5 second self-test period, if the process is below the high limit set point (HSP1), and above the low limit set point (LSP1), the output 1 relay will be energized and OP1 indicator will go off. If the process goes above the high limit set point or below the low limit set point, the relay will be de-energized, the OP1 indicator will go on and the display will show the process value. After the process is within the normal operation range, and the RESET key is pressed or the remote reset input is applied, the relay will be energized and the OP1 indicator will go off.

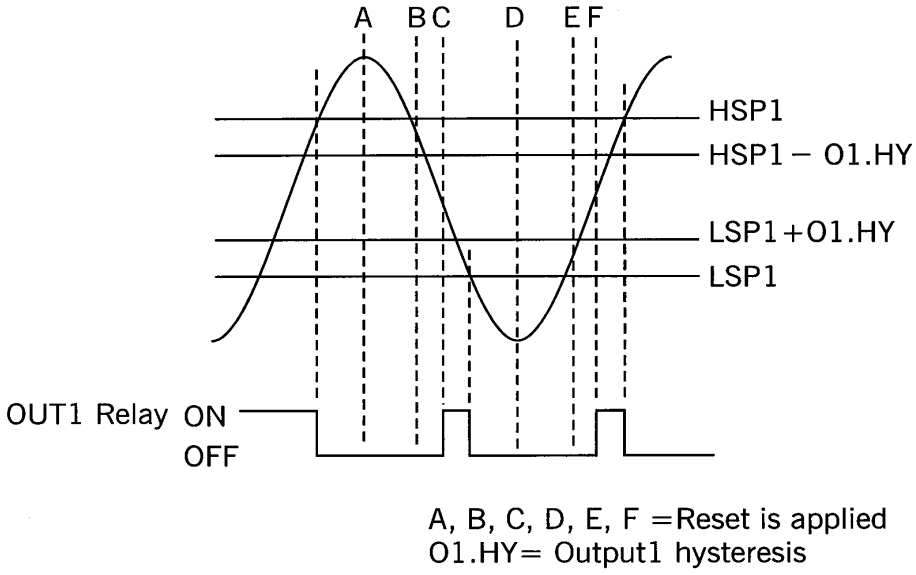


Figure 5.5 High/Low Limit Operation

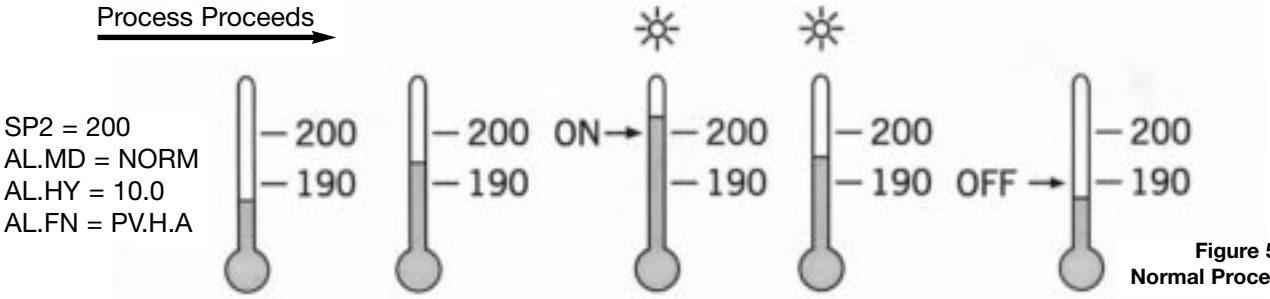


Figure 5.6
Normal Process Alarm

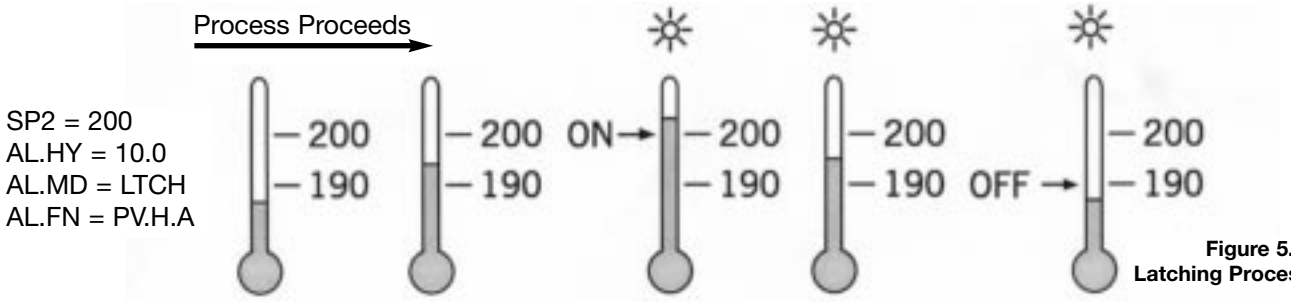


Figure 5.7
Latching Process Alarm

Process Alarms

The output 2 will perform process alarm functions by selecting ALM for OUT2 and PV.H.A or PV.L.A for AL.FN. If PV.H.A is selected, the alarm will perform process high alarm. If PV.L.A is selected, the alarm will perform process low alarm. The process alarm sets an absolute trigger level. When the process exceeds that absolute trigger level, an alarm occurs. The taller level is determined by SP2 (Set point 1 value) and AL.HY (Alarm hysteresis value). The hysteresis value is introduced to avoid interference action of alarm in a noisy environment. Normally AL.HY can be set with a minimum value (0.1).

Trigger levels for process high alarm are SP2 and SP-AL.HY. Trigger level for process low alarm are SP2+AL.HY and SP2.

There are two types of alarm modes that can be selected, these are: normal alarm and latching alarm.

Normal Alarm: AL.MD = NORM

When a normal alarm is selected, the alarm output is de-energized in the non-alarm condition and energized in an alarm condition.

Latching Alarm: AL.MD = LTCH

If a latching alarm is selected, once the alarm output is energized, it will remain unchanged even if the alarm condition has been cleared, unless the power is shut off or the RESET key (or remote reset button) is pressed.

Failure Transfer: AL.FT - OFF or ON

In a case of Sensor Break or A-D Failure, the alarm output will be on or off according to the selection of AL.FT.

Signal Conditioner DC Power Supply

Three types of isolated DC power supplies are available to power an external transmitter or sensor. These are 20V rated at 25mA, 12V rated at 40mA and 5V rated ar 80mA. The DC voltage is delivered to the output 2 terminals by selecting DCPS for OUT2 in set-up menu.

Limit Annunciator

If L.AN (Limit Annunciator) is selected for OUT2, output 2 will act as a Limit Annunciator. If the limit is or has been reached and he REST key (or remote reset contacts) has not been preset, then the limit annunciator output will be energized and the OP2 indicator will be lit and remain unchanged until the REST key or remote reset input is applied.

RS-485 Communication

Using a PC for data communication is the most economic way. The signal is transmitted and received through the PC serial communication port (generally RS-232). Since a standard PC does not support and RS-485 port, a network adapter (such as SNA10A, SNA10B) has to be used to convert RS-485 to RS-232 when RS-485 is required for data communication. Many RS-485 units (up to 247 units) can be connected to one RS-232 port. In other words, a PC with 4 comm ports can communicate with 988 units. Ogden uses a **Universal MODBUS RTU MODE** protocol to communicate via RS-485.

Set up

1. Select COMM for OUT2
2. Select an unequal address (AR) for those units which are connected to the same port.
3. Set the Baud Rate (BAUD) and Parity Bit (PARI) so that these values are accordant with PC set up conditions.

Display Shift

In certain applications it is desirable to shift the controllers indicated value from its actual value. This can be easily accomplished with this control by using the display shift function. Cycle the control to the SHiF parameter by using the “Scroll” pushbutton. The number you adjust here, either positive or negative, will be the amount that the process value (PV) will be shifted from the actual value. This amount will be the same across the entire range of the control. Note the example stated below.

The desired temperature at the part to be heated is 330 degrees F. In order to achieve that temperature, the controlling value or the temperature at the sensor must be 375 degrees F. Due to the design and position of the components of the system, the sensor could not be placed any closer to the work.

Thermal gradients (different temperatures) are common and necessary to an extent in any thermal system for heat to be transferred from one point to another.

The difference between the two temperatures is 45 degrees F. You should input –45 as to subtract 45 degrees from the actual process value (PV). Cycle the control back to the process value after making this adjustment.

The display shift will alter the process value (PV) only.

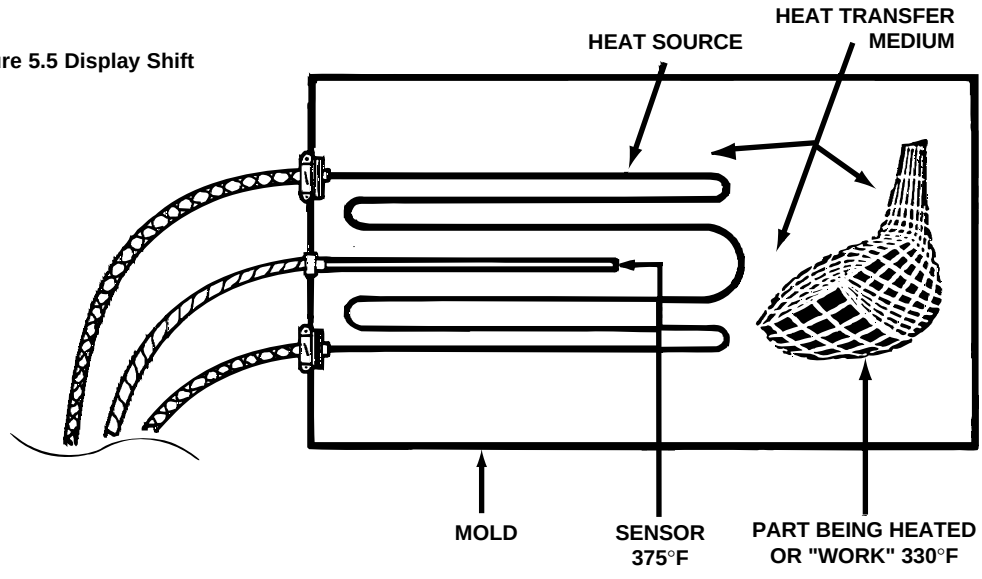
The set point must be manually adjusted to 330.

DISPLAY BEFORE INPUT SHIFT.
(PROCESS VALUE DISPLAYED)

DISPLAY AFTER INPUT SHIFT. ADJUST SV TO 330.*(PROCESS VALUE DISPLAYED)*

DISPLAY AFTER SHIFT AND SV ADJUSTMENT.
(PROCESS VALUE DISPLAYED)

Figure 5.5 Display Shift



Section 6: CALIBRATION

⚠ Do not proceed through this section unless there is a definite need to re-calibrate the controller. Otherwise, all previous calibration data will be lost. Do not attempt re-calibration unless you have appropriate calibration equipment. If calibration data is lost, you will need to return the unit to your supplier who may charge you a service fee to re-calibrate.

⚠ Entering calibration mode will break the control loop. Make sure that the system will tolerate the application of calibration mode.

Equipment needed for calibration:

1. A high accuracy calibrator (Fluke 5520A Calibrator recommended) with the following functions:
   - 0-100mA millivolt source with ± 0.005% accuracy
   - 0-10V voltage source with ± 0.005% accuracy
   - 0-20mA current source with ±0.005% accuracy
   - 0-300 ohm resistant source with ±0.005% accuracy
2. A test chamber providing 25°C - 0°C temperature range

Equipment needed for automatic calibration:

1. A switching network (SCANER 80, optional for automatic calibration)
2. A calibration fixture equipped with programming units (optional for automatic calibration)
3. A PC with calibration software ETR-Net and Smart Network Adapter SNA10B (optional for automatic calibration)

Since each unit needs 30 minutes to warm up before calibration, calibrating units individually is not efficient. An automatic calibration system for small quantities as well as for unlimited quantities is available upon request.

The calibration procedures described in th following are step by step manual procedures. Apply Enter Key ↻ (press for 8 seconds) to enter the calibration mode. See Figure 6.1 below.

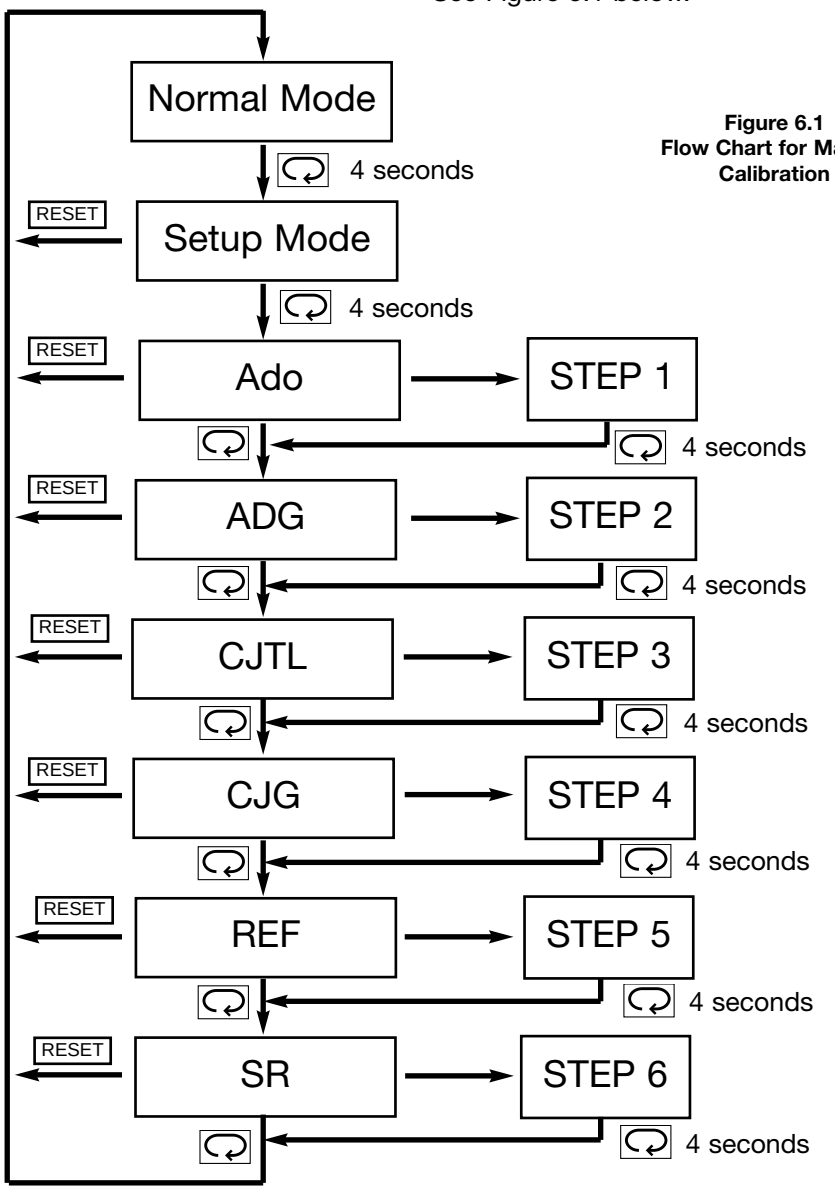


Figure 6.1
Flow Chart for Manual Calibration

Section 7: TROUBLESHOOTING

WARNING! THIS PROCEDURE REQUIRES ACCESS TO THE CIRCUITRY OF A LIVE POWER UNIT. DANGEROUS ACCIDENTAL CONTACT WITH LINE VOLTAGE IS POSSIBLE. ONLY QUALIFIED PERSONNEL ARE TO PERFORM THESE PROCEDURES. POTENTIALLY LETHAL VOLTAGES ARE PRESENT.

Experience has proven that many control problems are not caused by a defective instrument. See chart below and Table 7.1 on the next page for some of the other common causes of failures:

- Incorrect parameters entered in menu.
- Excessive electrical interference.
- Line wires are improperly connected.
- No voltage between line terminals.
- Incorrect voltage between line terminals.
- Connections to terminals are open, missing or loose.
- Thermocouple (or RTD) is open at tip.
- Thermocouple (or RTD) lead is broken.
- Shorted thermocouple (or RTD) leads.
- Short across terminals.
- Open or shorted heater circuit.
- Open coil in external contactor.
- Burned out line fuses.
- Burned out relay inside control.
- Defective solid-state relays.
- Defective line switches.
- Burned out contactor.
- Defective circuit breakers.

If the points listed above have been checked and the controller does not function, it is suggested that the instrument be returned for inspection.

MRA numbers are required for all returns. Call our office.

Table 7.1 Troubleshooting

Symptom	Probable Cause(s)	Solution(s)
1.) LED's will not light.	—No power to instrument.	—Check power line connections.
	—Power supply defective.	—Replace power supply board.
2.) Some segments of the display or LED lamps not lit or lit erroneously.	—LED display or LED Lamp defective.	—Replace LED display or LED lamp.
	—Related LED driver defective.	—Replace the related transistor or IC chip.
3.) Process Display shows: SbEr	—Sensor break error.	—Replace RTD or sensor. —Use manual mode operation.
4.) Process Display shows: LLEr	—Process value beyond the low range setpoint.	—Re-adjust LLiL value.
5.) Process Display shows: HLEr	—Process value beyond the high range setpoint.	—Re-adjust HLiL value.
6.) Process Display shows: AHEr	—Analog hybrid module damage.	—Replace module. Check for outside source of damage such as transient voltage spikes.
7.) Process Display shows: CSEr	—Check sum error, values in memory may have changed accidentally.	—Check and reconfigure the control parameters.
8.) Display Unstable	—Analog portion or A-D converter defective.	—Replace related components or board.
	—Thermocouple, RTD or sensor defective.	—Check thermocouple, RTD or sensor.
	—Intermittent connection of sensor wiring	—Check sensor wiring connections.
9.) Considerable error in temperature indication.	—Wrong sensor or thermocouple type. Wrong input mode selected.	—Check sensor or thermocouple type and if proper input mode was selected.
	—Analog portion A-D converter defective.	—Replace related components or board.
10.) Display goes in reverse direction (counts down scale as process warms).	—Reversed input wiring of sensor.	—Check and correct.
11.) No heat or output	—No heater power (output), incorrect output device used.	—Check output wiring and output device.
	—Output device defective.	—Replace output device.
	—Open fuse outside of the instrument.	—Replace output fuse.
12.) Heat or output stays on but indicator reads normal.	—Output device shorted, or power service shorted.	—Check and replace.
13.) Control abnormal or operation incorrect.	—CPU or EEPROM (non-volative memory) defective. Key switch defective.	—Check and replace.
	—Operation of control incorrect.	—Read the operation procedure carefully.
14.) Display blinks, entered values change by themselves.	—Electromagnetic interference (EMI), or Radio Frequency Interface (RFI).	—Suppress arcing contacts in system to eliminate high voltage spike sources. Separate sensor and controller wiring from "dirty" power lines, ground heaters.
	—EEPROM defective.	—Replace EEPROM.

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