User's Guide

CT1900 Programming Guide

http://www.omega.com
e-mail: info@omega.com
1 INTRODUCTION

The Circular Chart Recorder documentation is shown in Fig. 1.1. The Standard Manuals are supplied with all instruments. The Supplementary Manuals supplied depend on the specification of the instrument.

Fig. 1.1 Recorder Documentation
2 GENERAL PROGRAMMING

The programming of all channels is performed using faceplate 1 – see Fig. 3.1

When changing the input type it may be necessary to reposition the input selector links accordingly – see Section 5, CONNECTIONS & LINKS.

2.1 Preparation for Changes to the Parameters

Ensure that the external alarm/control circuits are isolated if inadvertent operation during programming is undesirable.

Any change to the operating parameters are implemented using the ▲ or ▼ switches – see Section 3 of the Operating Guide.

[Note. The instrument responds instantly to parameter changes which are saved automatically when leaving the current frame.]

2.2 Security System

A security system is used to prevent tampering with the programmed parameters by restricting access to programming levels, other than the OPERATOR LEVEL; all users have access to this level.

A security password is used to give access to the programming pages. The password can be set to any value from 0 to 9999. The instrument is despatched with the password set to '0' – see Section 4.5 of Operating Guide.

3 BASIC CONFIGURATION LEVEL

3.1 Set Up Input (Process Variable) ........................................... 4
   • Input types
   • Linearization
   • Electrical ranges
   • Engineering ranges
   • Fault detection
   • Digital filtering

3.2 Set Up Pen Range ............................................................ 8
   • Chart ranges
   • Event pen sources

3.3 Set Up Chart ................................................................. 9
   • Chart duration (spaced)
   • Chart stop function
   • Auto pen drop
   • Pen lift

3.4 Set Up Alarms ............................................................... 10
   • Acknowledge type
   • Global alarm acknowledge
   • Alarm type
   • Trip/hysteresis/time hysteresis

3.5 Set Up Relay Output ....................................................... 14
   • Relay sources
   • Relay polarity

3.6 Set Up Digital Output ..................................................... 16
   • Digital output source
   • Digital output polarity

3.7 Set Up Analog Output ..................................................... 18
   • Retransmission sources
   • Retransmission ranges
   • Current output ranges

3.8 Digital Inputs ............................................................... 20
   • Input polarity

3.9 Access Page ............................................................... 21
   • Configurable password
   • Internal security link

3.10 Scale Adjust ............................................................. 22
   • Process variable offset adjustment
   • Process variable span adjustment
   • Pen calibration
   • Mains filter
   • Pen Linearity Check

Fig. 3.1 Location of Faceplate 1
Fig. 3.2 Basic Configuration Level

* These pages do not appear on the non-upgradeable version
Information:
- **Universal inputs** – mV, mA, V, THC, RTD and resistance.
- **Internal cold junction compensation.**
- **Linearization** – of temperature sensors to allow use of non-linearizing transmitters or any electrical input.
- **Programmable fault levels and actions.**
- **Digital filter** – to reduce the effect of noise on inputs.

**Example A** – setting up:
- a current input of 4 to 20 mA
- displaying a range of 0 to 200psi
- a fault detection level 10% above 200psi (engineering/display range) and 10% below 0psi (engineering/display range)
- in the event of a fault being detected and/or the fault detection level being exceeded the process variable is driven downscale.

**Example B** – setting up:
- a Type K thermocouple
- displaying temperature in °F
- displaying a range of 0 to 2000°F
- a fault detection level 10% above 2000°F (engineering/display range) and 10% below 0°F (engineering/display range)
- in the event of a fault being detected and/or the fault detection level being exceeded the process variable is driven upscale.
...3.1 Set Up Input (Process Variable)

To advance to Set Up Pen Range Page press the switch.

**Select Channel**
Select the channel to be programmed:
- PU- 1 – Channel 1
- PU- 2 – Channel 2
- PU- 3 – Channel 3
- PU- 4 – Channel 4

*Note.* In the remaining frames press the switch to view the channel selected.

**Input Type (Process Variable)**

⚠️ **Caution.** Ensure the correct input link positions are selected and the input is wired correctly – see Section 5, CONNECTIONS & LINKS.

Select the input type required:
- rd – Resistance thermometer
- TCPL – Thermocouple
- UOLT – Voltage
- LD OH – Low resistance (≤750Ω)
- HI OH – High resistance (>750Ω)
- RP – Current
- ULT – Millivolt (≤150mV)
- NONE – None

**Linearizer Type**
Select the linearizer type required:
- 5/2 – \( x^{5/2} \) Open channel flow applications
- 3/2 – \( x^{3/2} \)
- SCR – Square Root
- rd – Resistance thermometer
- TC-B – Type B thermocouple
- TC-N – Type N thermocouple
- TC-E – Type E thermocouple
- TC-J – Type J thermocouple
- TC-T – Type T thermocouple
- TC-S – Type S thermocouple
- TC-R – Type R thermocouple
- TC-K – Type K thermocouple
- NONE – No linearizer

Continued on next page.
3.1 Set Up Input (Process Variable)

**Input Range High**
Set the maximum electrical input value required (in electrical units).

*Note.* The value set must be within the limits detailed in the table below.

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Range Low Min.</th>
<th>Range High Max.</th>
<th>Min. Range (Low to High)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millivolts</td>
<td>0</td>
<td>150</td>
<td>5.0</td>
</tr>
<tr>
<td>Volts</td>
<td>0</td>
<td>5</td>
<td>0.1</td>
</tr>
<tr>
<td>Milliamps</td>
<td>0</td>
<td>50</td>
<td>1.0</td>
</tr>
<tr>
<td>Resistance Low</td>
<td>0</td>
<td>750</td>
<td>20</td>
</tr>
<tr>
<td>Resistance High</td>
<td>0</td>
<td>9999</td>
<td>400</td>
</tr>
</tbody>
</table>

**Input Range Low**
Set the minimum electrical input value required (in electrical units).

*Note.* The value set must be within the limits detailed in the above table.

**Temperature Units**
Select units required.

**Engineering Range High**
Set the maximum engineering (display) value required.

*Note.* The value set must be within the limits detailed in the tables below.

<table>
<thead>
<tr>
<th>Linearizer Type</th>
<th>Degrees Fahrenheit</th>
<th>Degrees Celsius</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>Type B</td>
<td>0</td>
<td>3272</td>
</tr>
<tr>
<td>Type E</td>
<td>-148</td>
<td>1652</td>
</tr>
<tr>
<td>Type J</td>
<td>-148</td>
<td>1652</td>
</tr>
<tr>
<td>Type K</td>
<td>-148</td>
<td>2372</td>
</tr>
<tr>
<td>Type N</td>
<td>-326</td>
<td>2372</td>
</tr>
<tr>
<td>Type R &amp; S</td>
<td>0</td>
<td>3092</td>
</tr>
<tr>
<td>Type T</td>
<td>-418</td>
<td>572</td>
</tr>
<tr>
<td>RTD</td>
<td>-328</td>
<td>1112</td>
</tr>
</tbody>
</table>

Performance accuracy is not guaranteed below 725°F/400°C for types B, R and S thermocouples.
Minimum span below zero Type T 126°F/70°C
Minimum span below zero Type N 189°F/105°C
THC standard DIN 4730 IEC 584
RTD standard DIN 43760 IEC 751

<table>
<thead>
<tr>
<th>Linearizer Type</th>
<th>Engineering Range High and Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
</tr>
<tr>
<td>5/2</td>
<td>-9999</td>
</tr>
<tr>
<td>3/2</td>
<td></td>
</tr>
<tr>
<td>Square Root</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Continued on next page.
3 BASIC CONFIGURATION LEVEL...

...3.1 Set Up Input (Process Variable)

- **Decimal Point**
  Set the decimal point position required for both the engineering range high and engineering range low values.

- **Engineer Range Low**
  Set the minimum engineering (display) value required.
  ![Note](image)
  The value set must be within the limits detailed in Engineer Range High tables opposite.

- **Broken Sensor Protection Drive**
  In the event of a fault being detected on the input and/or if the Fault Detection Level Percentage is exceeded (see next frame), the process variable is driven in the direction of the drive selected.
  
  Select the broken sensor drive required:
  - **none**  No drive
  - **up**  Upscale drive
  - **dn**  Downscale drive.

- **Fault Detection Level Percentage**
  A fault level percentage can be set to detect a deviation above or below the display limits.

  For example, if set at 10.0%, then if an input goes more than 10% above Engineer Range High or more than 10% below Engineer Range Low, a fault is detected.

  On some ranges the input circuitry may saturate before the fault level set is reached. In this case an error is detected below the level set.

  Set the level required, between 0.0 and 100.0% of engineering span (range low to high) in 0.1% increments.
  ![Note](image)
  If an input exceeds the minimum or maximum value for the linearizer selected an error is detected regardless of any fault level.

- **Programmable Filter**
  Filters the process variable input, i.e. if the input is stepped it smooths the transition between steps and may also be used for some degree of cleaning of noisy inputs. The filter time represents the time a step in the input takes to change the displayed process variable from 10 to 90% of the step.

  Set the value required, between 0 and 60 in 1 second increments.

Return to Select Channel frame.
3.2 Set Up Pen Range/Event Source

**Information.**

- **Trend pens** – have an independent chart range allowing a selected part of the engineering (display) range to be used for extra resolution on the chart.

- **Three position event pen function** – can be driven by digital inputs, alarms, logic equation results and real time events (when timer option is fitted).

---

**Select Pen Range (in engineering units)**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>(Eng. Range High)</td>
</tr>
<tr>
<td>700</td>
<td>(Pen Range High)</td>
</tr>
<tr>
<td>400</td>
<td>(Pen Range Low)</td>
</tr>
<tr>
<td>0</td>
<td>(Eng. Range Low)</td>
</tr>
</tbody>
</table>

**Select 'In' Source**

- Source on
- Source off

**Select 'Out' Source**

- Source on
- Source off

**Event Pen Chart Position**

- Pen 4 at 80%
- Pen 3 at 60%
- Pen 2 at 40%
- Pen 1 at 20%

*With Real Time Event Pen option fitted, Pen 4 is above 100%*

---

**Page Header – Set Up Pen Range**

To advance to Set Up Chart Page press the switch.

**Select Pen**
Select the pen to be programmed

**Note.**

- In the remaining frames press the switch to view the pen selected.

- Record (trend) or event pen function is set in the **ADVANCED CONFIGURATION LEVEL** (if True Time Event Pen option is selected, the fourth pen is fitted with a special pen arm and is set automatically for event pen function) – see Section 4.3, Set Up Pen Functions.

**Pen Range High**
Set the maximum value required on the chart, in engineering units (the value must be within the engineering range set in Set Up Input Page – see Section 3.1).

**Pen Range Low**
Set the minimum value required on the chart, in engineering units (the value must be within the engineering range set in Set Up Input Page).

**In Source**
Select a source to move the pen inwards on the chart.

For a description of sources – see Table 3.1 on page 15.

**Out Source**
Select a source to move the pen outwards on the chart.

For a description of sources – see Table 3.1 on page 15.

Return to Select Pen frame.
3.3 Set Up Chart

- **Information.**
  - **Programmable chart duration** – between 1 and 167 hours or 7 and 32 days.
  - **Chart stop function** – the chart can be stopped by an alarm, digital input, logic equation result or a real time event (if timer option is fitted).
  - **Auto pen drop** – automatically drops the pen(s) onto the chart after a 5 minute delay to ensure recording is not left disabled inadvertently.

---

**Page Header – Set Up Chart**

To advance to **Set Up Alarms Page** press the switch.

---

**Chart Duration**
Select the chart duration required per revolution of the chart; between 1 and 167 hours or 7 and 32 days.

---

**Stop Chart Source**
Select the source required for stopping the chart.

For a description of sources – see **Table 3.1** on page 15.

---

**Auto Pen Drop**
Select 'YES' to enable or 'NO' to disable.

If 'YES' selected, pen(s) drop automatically onto the chart 5 minutes after they are lifted.

If 'NO' selected, the pen(s) remain lifted until they are manually dropped by the operator.

---

**Pen Lift Enable/Disable**
The switch can be disabled if required. Select 'YES' to enable or 'NO' to disable.

---

**Pen Lift/Pen Status**
To raise pen(s) press switch. The following status displays are shown:

- $r\text{ECO}_{rd}$ – pen records on chart
- $L\text{IF}_{e}$ – pen lifts off chart
- $\text{PR}_{ri}$ – pen moves to park position
- $\text{RE}_{rF}$ – pen at reference position

To lower pen(s) press switch. The following status displays are shown:

- $\text{RE}_{rF}$ – pen returns to record position
- $d_{rOp}$ – drops (lowers) onto chart
- $r\text{ECO}_{rd}$ – pen records on chart

---

Return to top of Set Up Chart Page.
3.4 Set Up Alarms

- Four alarms per channel – identified A1 to D1 (for channel 1) up to A4 to D4 (for channel 4).
- Three operator acknowledge options.
- Global alarm acknowledgment – by digital input, alarm, logic equation result or real time event (if option fitted).
- High/low process alarms.
- Fast/slow rate of change – of process variable alarms.
- Adjustable hysteresis value – to prevent oscillation of alarm state.
- Time hysteresis – to allow delayed triggering of alarms.

**Fig. 3.3 High and Low Process Alarm with Hysteresis**

**Fig. 3.4 Time Hysteresis Alarm**

Example shows time hysteresis set to 70 seconds used with a high process alarm
3 BASIC CONFIGURATION LEVEL...

3.4 Set Up Alarms

The maximum time it takes to detect an alarm condition is present \( T \), in seconds, is calculated as follows:

\[
T = \left[ 10.81 + \frac{1800}{\text{Trip Value}} \right] \times 2
\]

The time it takes for the alarm state to be cleared once the alarm condition has been removed is also equal to \( T \).

![Diagram](image)

Falling Slow Rate

Rising Slow Rate

Examples shown are for a trip value of 10% per hour on a PV engineering range of 0.0 to 100.0

\[
T = \left[ 10.81 + \frac{1800}{10} \right] \times 2 \quad T = 382 \text{ seconds}
\]

Fig. 3.5 Slow Rate Alarms with Hysteresis

![Diagram](image)

Falling Fast Rate

Rising Fast Rate

Examples shown are for a trip value of 10% per hour on a PV engineering range of 0.0 to 100.0

\[
T = \left[ 10.81 + \frac{1800}{10} \right] \times 2 \quad T = 382 \text{ seconds}
\]

Fig. 3.6 Fast Rate Alarms with Hysteresis
3.4 Set Up Alarms

Page Header – Set Up Alarms

To advance to Set Up Relay Output page press the [ ] switch.

Alarm Acknowledge Type
Alarms may be acknowledged while they are displayed.
Select the alarm acknowledge type:
- **NONE** – no acknowledge facility. If the cause of the alarm no longer exists, the alarm state and display are cleared automatically.

<table>
<thead>
<tr>
<th>Alarm cause</th>
<th>L.E.D.</th>
<th>Alarm State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>Flashing</td>
<td>Active</td>
</tr>
<tr>
<td>Not Present</td>
<td>Off</td>
<td>Inactive</td>
</tr>
</tbody>
</table>

- **NDR_AL** and **LATCH** – if the cause of the alarm no longer exists, the alarm display remains until it has been acknowledged.

<table>
<thead>
<tr>
<th>Alarm cause</th>
<th>Acknowledge</th>
<th>L.E.D.</th>
<th>Alarm State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>No</td>
<td>Flashing</td>
<td>Active</td>
</tr>
<tr>
<td>Present</td>
<td>Yes</td>
<td>Steady</td>
<td>Active</td>
</tr>
<tr>
<td>Not Present</td>
<td>Previously acknowledged</td>
<td>Off</td>
<td>Inactive</td>
</tr>
<tr>
<td>Present</td>
<td>No</td>
<td>Flashing</td>
<td>Active</td>
</tr>
<tr>
<td>Not Present</td>
<td>No</td>
<td>Flashing</td>
<td>Active/inactive*</td>
</tr>
<tr>
<td>Not Present</td>
<td>Yes</td>
<td>Off</td>
<td>Inactive</td>
</tr>
</tbody>
</table>

*Alarm state is active if LATCH is selected or inactive if NDR_AL is selected

Global Alarm Acknowledge Source
Select the alarm acknowledgment source required.

For a description of sources – see Table 3.1 on page 15.

Select Alarm
Select the alarm to be programmed.

* Note. In the remaining frames press the [ ] switch to view the alarm selected.

Continued on next page.
...3.4 Set Up Alarms

**Alarm Type**
Select the alarm type required for the alarm selected.

- **HI-PrC** - high process
- **LO-PrC** - low process
- **F-rtE** - fast rate (rate of change of process variable)
- **S-rtE** - slow rate (rate of change of process variable)
- **OFF** - alarm off

**Trip Level**
Set the trip value required for the alarm selected.

The following are displayed in engineering units:

- **HPrC**, **LP rC**

The following are displayed as a percentage of the engineering span (engineering range high - engineering range low) per hour between ±0.5 and ±500%:

- **F-rtE** and **S-rtE**

**Hysteresis**
Hysteresis is operational when the alarm is active.

Set the hysteresis value required for high/low process, in engineering units (within the engineering range) or in 0.1% increments for rate alarms. The alarm is activated at the trip level but is only turned off after the alarm variable has moved into the safe region by an amount equal to the hysteresis value. For rate alarms this setting is a percentage of the trip rate – see 'F-rtE' and 'S-rtE' in previous frame.

**Time Hysteresis**
Set the time hysteresis value required between 0 and 9999 seconds.

*Note.* The alarm condition must be present continually for the time set, before the alarm becomes active. If a hysteresis level is also set, the alarm condition remains active until the process variable moves outside the hysteresis band. When the alarm condition no longer exists the alarm becomes inactive, i.e. time hysteresis does not affect turning off of alarm states.

Return to Select Alarm frame.
3.5 Set Up Relay Output

*Information.*
- **Relays** – can be energized by alarms, logic equation results, digital inputs, real time events (timer option) and totalizer wrap signal (totalizer option).
- **External Totalizer count function** – external counter can only be driven by module type 3 (4 relays module) fitted in module positions 4, 5 and 6.
- **Polarity** – to allow failsafe settings.

---

**Relay Source**
- Alarm Acknowledge
- Logic Equation 1
- Logic Equation 2
- Digital Input 1
- Digital Input 2
- Alarm A1
- Alarm D4
- None

**Polarity Selection**
<table>
<thead>
<tr>
<th>Source State</th>
<th>Polarity</th>
<th>Relay State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm A1 Active</td>
<td>Positive</td>
<td>Energized</td>
</tr>
<tr>
<td>Alarm A1 Active</td>
<td>Negative</td>
<td>De-energized</td>
</tr>
<tr>
<td>Alarm A1 Inactive</td>
<td>Positive</td>
<td>De-energized</td>
</tr>
<tr>
<td>Alarm A1 Inactive</td>
<td>Negative</td>
<td>Energized</td>
</tr>
</tbody>
</table>

**Relay Contacts**
- NC
- C
- NO
- NC
- C
- NO
- NC
- C
- NO

---

**Page Header – Set Up Relays**

To advance to Set Up Digital Output Page press the [ ] switch.

**Select Relay Output**
Select the output to be programmed. The selections in this frame relate to the number of fitted modules with relays and their relative module positions.

**Example** – for a type 3 (four relays) module fitted in position five the following selections are also programmable:
- \( \text{REL} \text{ RY 5.1} \) (position 5, relay 1)
- \( \text{REL} \text{ RY 5.2} \) (position 5, relay 2)
- \( \text{REL} \text{ RY 5.3} \) (position 5, relay 3)
- \( \text{REL} \text{ RY 5.4} \) (position 5, relay 4)

**Note.** In the remaining frames press the [ ] switch to view the relay selected.

**Relay Source**
Select the source required to activate the selected relay.

For a description of sources – see Table 3.1 on page 15.

**Note.** To drive an external counter \( \text{COUNT} \text{x} \) must be selected.

---

Continued on next page
3 BASIC CONFIGURATION LEVEL...

### 3.5 Set Up Relay Output

**Polarity**
The polarity selection is used to invert the effect of the digital source state on the relay state as shown in the following table:

<table>
<thead>
<tr>
<th>Source State</th>
<th>Polarity</th>
<th>Relay State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Positive</td>
<td>Energized</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>De-energized</td>
</tr>
<tr>
<td>Non-active</td>
<td>Positive</td>
<td>De-energized</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>Energized</td>
</tr>
</tbody>
</table>

Select the polarity required.

⚠️ **Caution.** Check connections before operating – see Section 5, CONNECTIONS & LINKS.

Return to Select Relay Output frame.

<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RL_RLY</strong></td>
<td>Alarm Acknowledge – Unacknowledged process alarm anywhere in the unit</td>
</tr>
<tr>
<td><strong>t 1 2</strong></td>
<td>Real time event 2</td>
</tr>
<tr>
<td><strong>t 1 1</strong></td>
<td>Real time event 1</td>
</tr>
<tr>
<td><strong>ENO-4</strong></td>
<td>Programmable logic equation 4</td>
</tr>
<tr>
<td><strong>ENO-3</strong></td>
<td>Programmable logic equation 3</td>
</tr>
<tr>
<td><strong>ENO-2</strong></td>
<td>Programmable logic equation 2</td>
</tr>
<tr>
<td><strong>ENO-1</strong></td>
<td>Programmable logic equation 1</td>
</tr>
<tr>
<td><strong>RP-4</strong></td>
<td>Wrap around on total 4</td>
</tr>
<tr>
<td><strong>COUNL 4</strong></td>
<td>Total 4 external counter drive</td>
</tr>
<tr>
<td><strong>RP-1</strong></td>
<td>Wrap around on total 1</td>
</tr>
<tr>
<td><strong>COUNL 1</strong></td>
<td>Total 1 external counter drive</td>
</tr>
<tr>
<td><strong>1G-6B</strong></td>
<td>Digital Input 6.8</td>
</tr>
<tr>
<td><strong>1G-11</strong></td>
<td>Digital Input 1.1</td>
</tr>
<tr>
<td><strong>RL-d4</strong></td>
<td>Alarm D</td>
</tr>
<tr>
<td><strong>RL-c4</strong></td>
<td>Alarm C</td>
</tr>
<tr>
<td><strong>RL-b4</strong></td>
<td>Alarm B</td>
</tr>
<tr>
<td><strong>RL-a4</strong></td>
<td>Alarm A</td>
</tr>
<tr>
<td><strong>RL-d3</strong></td>
<td>Alarm D</td>
</tr>
<tr>
<td><strong>RL-c3</strong></td>
<td>Alarm C</td>
</tr>
<tr>
<td><strong>RL-b3</strong></td>
<td>Alarm B</td>
</tr>
<tr>
<td><strong>RL-a3</strong></td>
<td>Alarm A</td>
</tr>
<tr>
<td><strong>RL-d2</strong></td>
<td>Alarm D</td>
</tr>
<tr>
<td><strong>RL-c2</strong></td>
<td>Alarm C</td>
</tr>
<tr>
<td><strong>RL-b2</strong></td>
<td>Alarm B</td>
</tr>
<tr>
<td><strong>RL-a2</strong></td>
<td>Alarm A</td>
</tr>
<tr>
<td><strong>RL-d1</strong></td>
<td>Alarm D</td>
</tr>
<tr>
<td><strong>RL-c1</strong></td>
<td>Alarm C</td>
</tr>
<tr>
<td><strong>RL-b1</strong></td>
<td>Alarm B</td>
</tr>
<tr>
<td><strong>RL-a1</strong></td>
<td>Alarm A</td>
</tr>
<tr>
<td><strong>NONE</strong></td>
<td>No source required</td>
</tr>
</tbody>
</table>

* Only available on 4-relay and 8-digital output modules (types 3 and 5), fitted in module positions 4,5 and 6.

**Table 3.1 Description of Sources**
3.6 Set Up Digital Output

- Information.
  - This page is not displayed if there are no digital outputs fitted.
  - Up to 24 digital outputs are available – depending on the module types fitted.
  - Digital outputs – can be energized by alarms, logic equations results, digital inputs, real time events (timer option) and totalizer wrap signal (totalizer option).
  - External Totalizer count function – external counter can only be driven by module type 5 (8 digital outputs module) fitted in module positions 4, 5 and 6.
  - Polarity – inverts the effect of the selected source on the output state.

![Diagram of digital output configuration]
3.6 Set Up Digital Output

Page Header – Set Up Digital Outputs

to advance to Set Up Analog Output page press the [ ] switch.

Select Digital Output

Select the output to be programmed – the selections in this frame relate to the number of fitted digital output modules and their relative module positions.

Example – for a type 5 (eight digital outputs) module fitted in position five the following selections are also programmable:

\[
\begin{align*}
&\text{OUT} \: 5.1 \text{ (position 5, output 1)} \\
&\text{OUT} \: 5.2 \text{ (position 5, output 2)} \\
&\text{OUT} \: 5.3 \text{ (position 5, output 3)} \\
&\text{OUT} \: 5.4 \text{ (position 5, output 4)} \\
&\text{OUT} \: 5.5 \text{ (position 5, output 5)} \\
&\text{OUT} \: 5.6 \text{ (position 5, output 6)} \\
&\text{OUT} \: 5.7 \text{ (position 5, output 7)} \\
&\text{OUT} \: 5.8 \text{ (position 5, output 8)} \\
\end{align*}
\]

Note. In the remaining frames press the [ ] switch to view the output selected.

Output Source

Select the source required to activate the selected digital output.

For a description of sources – see Table 3.1 on page 15.

Note. To drive an external counter COUT must be selected.

Polarity

The polarity selection is used to invert the effect of the source state on the output as shown in the following table:

<table>
<thead>
<tr>
<th>Source State</th>
<th>Polarity</th>
<th>Output State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>Positive</td>
<td>Energized</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>De-energized</td>
</tr>
<tr>
<td>Non-active</td>
<td>Positive</td>
<td>De-energized</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>Energized</td>
</tr>
</tbody>
</table>

Select the polarity required

Caution. Check connections before operating – see Section 5, CONNECTIONS & LINKS.

Return to Select Digital Output frame.
3.7 Set Up Analog Output

- Analog Output – omitted on the non-upgradeable version.
- Fitted analog outputs – assignable to retransmit any process variable.
- Selectable retransmission range – allows maximum resolution on range of interest.
- Adjustable output range – for non-standard and reversed outputs.

Note. The example below shows analog output 1 set to retransmit part of process variable 1’s engineering range (250 to 750°C) as a 4.0 to 20.0mA current output.
3.7 Set Up Analog Output

Page Header – Set Up Analog Output

To advance to Digital Inputs Page press the [ ] switch.

Select Analog Output
Select the analog output to be programmed. The selections in this frame relate to the number of fitted modules with analog output.

Example – Output 1 is the analog output in position 1 (fitted on the main board), output 3 is the analog output fitted in module position 3.

Note. In the remaining frames press the [ ] switch to view the analog output selected.

Output Source
Select output source required. The selections in this frame correspond to the channels on the instrument (as available) – PV1 (channel 1), PV2 (channel 2) etc.

Retransmission Range High
Set the engineering range value (in engineering units) at which maximum output is required.

Retransmission Range Low
Set the engineering range value (in engineering units) at which minimum output is required.

Output Range High
Set the maximum current output required for the Retransmission Range programmed between 2.0 and 20.0mA.

Output Range Low
Set the minimum current output required for the Retransmission Range programmed between 2.0 and 20.0mA.

Return to Select Analog Output frame.
3.8 Digital Inputs

- Up to 30 digital inputs are available – depending on the module types fitted.
- Volt-free contacts or TTL levels.
- Polarity – sets the logic state (unchanged or inverted) for the module position(s).

**Page Header – Digital Inputs**

To advance to Access Page press the switch.

**Select Digital Input**
Select digital module position to be programmed.

- Note. In the remaining frames press the switch to view the module selected.

**Polarity**
Select the polarity required for the module position selected above:
- POSITIVE – logic input state unchanged
- NEGATIVE – logic input state inverted

Return to Select Digital Input frame.
3.9 Access Page

- Configurable password protection – of PROGRAMMING LEVELS.
- Internal security link – enable/disable password protection.

Page Header – **Access Page**.

To advance to Scale Adjust Page press the \[\text{switch}\] switch.

**Configuration Password**
Prevents access to the Programming Pages.
Set the required password, between 0 and 9999.

Return to top of **Access Page**.

---

**Fig. 3.7 Use of Security Code in Operator Level**

---

**Fig. 3.8 Location of Security Link**

Enable Security position, allows access to CONFIGURATION LEVELS with correct security code.

Disable Security position, allows unprotected access to CONFIGURATION LEVELS.
3.10 Scale Adjust

- Analog Inputs – do not require re-calibrating when the input type or range is changed.
- Process variable adjust reset – removes any previously programmed offset or scale adjustment settings.
- System offsets errors – can be removed using process variable scale offset adjustment.
- System scale errors – can be removed using process variable span adjustment.
- Process variable offset/span adjustment – can be used to perform spot calibration.
- Pen(s) – can be independently calibrated and checked across the full range of the chart.
- Mains filter – selectable for maximum noise rejection.
- Pen Linearity Check – automatically draws a pen linearity test pattern.

Scale Adjustment

Offset Adjustment

Span Adjustment

\* Note. As a general rule:
- use Offset adjustment for spot calibration at <50% of engineering range span.
- use Span adjustment for spot calibration at >50% of engineering range span.
...3.10 Scale Adjust

Page Header – Scale Adjust

To advance to BASIC CONFIGURATION LEVEL frame use the [ ] switch.

Select Process Variable/Pen
Select linearity check, process variable or pen required:

- L INCH: the pens automatically draw a test pattern to check pen linearity. DONE is displayed on completion
- FIR: mains frequency filter
- PEN: pens 1 to 4
- PU: process variable on channel 4
- P: process variable on channel 3
- P: process variable on channel 2
- P: process variable on channel 1
- NONE: None

* Note. In the remaining frames press the [ ] switch to view the process variable or pen selected.

Process Variable Scale Adjustment Reset
Set YES to reset the process variable offset and span values to their nominal values (values are reset when frame is exited).

Process Variable Offset Adjustment
Electrical and resistance thermometer inputs: apply the correct input for the spot calibration required.

RTD inputs: use resistance values obtained from standard tables.

Thermocouple Inputs: measure the ambient temperature at the output terminals of the signal source (calibrator). From thermocouple tables obtain the millivolt equivalent of this temperature (a) and that for the spot calibration temperature (b). Subtract (a) from (b) and set the signal source to the resultant value. (The voltage is negative if the spot calibration temperature is below the measured ambient temperature).

* Note. The displayed units are engineering units.

Set the value required. The decimal point position is set automatically.

Example – If the display range is 50.0 to 250.0 and a spot calibration is required at 100 and 225, inject a signal equivalent to 100 and set the display to 100.0 using the [ ] and [ ] switches

Span Adjust
Proceed as for Offset Adjustment above and apply the correct input for the spot calibration required. The displayed units are engineering units. Set the value required. The decimal point is set automatically.

For the example above, inject a signal equivalent to 225 and set the display to 225.0.

Continued on next page.
3.10 Scale Adjust

**Calibrate Pen At 100%**
Drives the pen automatically to the full scale position on the chart.

Use the [▲] and [▼] switches to set pen to 100% on the chart.

**Calibrate Pen At 0%**
Drives the pen automatically to the zero position on the chart.

Use the [▲] and [▼] switches to set pen to 0% on the chart.

**Check Pen Calibration**
The pen calibration can be checked at any point on the chart.

Use the [▲] and [▼] switches to move the selected pen from the zero point up to the 100% position on the chart.

**Note.** If the true time event option is fitted the red pen does not move beyond the 94% position on the chart.

**Select Filter**
Select the mains frequency of the supply used to ensure maximum noise rejection on analog inputs.

Return to Select Process Variable/Pen frame.
4 ADVANCED CONFIGURATION LEVEL

4.1 Set Up Function Keys

Information:
- Programmable function key – on each faceplate
- Home function – returns the instrument display to the start of the operating page when at the top of any page.
- Global alarm acknowledge function – acknowledges any unacknowledged alarms on all channels.

Page Header – Set Up Function Keys

To advance to the Set Up Logic press the [ ] switch.

Function Key 1
Select function required.
- H.O.E – Home (return to Operating Page in OPERATING LEVEL)
- R.L.R.C.H. – Acknowledge alarm

Function Key 2
Select function required (if applicable).

Return to Set Up Function Keys frame.
4.2 Set Up Logic

- 4 logic equations
- 7 elements per equation
- OR/AND operators
- Can combine internal and external digital signals – i.e. alarms, digital inputs, other logic equation results and real time events (timer option).

For each equation, the logic elements 1 to 7 are arranged sequentially, as shown below. Odd numbered elements are used for logic inputs and even numbered elements for logic gates.

Logic inputs must be set to $\text{AND}$, $\text{OR}$ or $\text{End}$. Setting an element to $\text{End}$ terminates the equation.

![Logic Diagram]

**Note.** Elements on each equation are calculated sequentially, i.e. elements 1, 2 and 3 are evaluated first and this result is then combined with elements 4 and 5. Similarly, this resultant is then combined with elements 6 and 7 to give the logic equation result.

**Example – Reservoir level monitoring using:**
- process variable 1 with an engineering range 0 to 100 feet
- logic equation 1 result assigned to relay 1.1 which is used to operate the control valve.
Page Header – Set Up Logic

To advance to Set Up Pen Functions Page press the [ ] switch.

Select Equation
Select equation to be constructed.

In the remaining frames press the [ ] switch to view the equation selected.

---

**Equation n/Element 1**
Select the source required for element 1.

For a description of sources – see Table 3.1 on page 15.

---

**Equation n/Element 2**
Select the operator required to combine elements 1 and 3:

- Or
- And
- End

---

**Equation n/Element 3**
Repeat previous two steps for elements 3 to 7.

Odd numbered elements = sources
Even numbered elements = operators

---

Return to Select Equation frame.
4.3 Set Up Pen Functions

Information:
• Any fitted pen can be assigned to a trend or an event function.

Page Header – Pen Functions

To advance to Advanced Configuration frame press the switch.

Pen 1
Select pen function required:
   Trend pen
   Event pen

Note. The event pen and true time line event pen are separate functions and only the event pen can be selected in this page. The true time line event pen option allows event marking on the same time line as the red pen and requires a special pen arm and motor assembly. Refer to the order code in the Specification Sheet.

Pen 2 to 4
Repeat as for Pen 1 (if applicable).

Return to top of Set Up Pen Functions Page.
Main Input, Standard Input & Analog + Relay

4 Relays Module

8 Digital Inputs/Outputs Module

*Not fitted on Analog + Relay Module

5. CONNECTIONS & LINKS
Servicing North America:

USA: One Omega Drive, Box 4047
     Stamford, CT 06907-0047
     Tel: (203) 359-1660     FAX: (203) 359-7700
     e-mail: info@omega.com

Canada: 976 Bergar
         Laval (Quebec) H7L 5A1
         Tel: (514) 856-6928     FAX: (514) 856-6886
         e-mail: canada@omega.com

For immediate technical or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA SM
Customer Service: 1-800-622-2378 / 1-800-BEST SM
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN SM
TELEX: 996404    EASYLINK: 62968934     CABLE: OMEGA

Mexico and Latin America: Tel: (95) 800-TC-OMEGA SM     FAX: (95) 203-359-7807
En Español: (203) 359-7803     e-mail: espanol@omega.com

Servicing Europe:

Benelux: Postbus 8034, 1180 LA Amstelveen, The Netherlands
         Tel: (31) 20 6418405     FAX: (31) 20 6434643
         Toll Free in Benelux: 06 0993344
         e-mail: nl@omega.com

Czech Republic: ul. Rude armady 1868, 733 01 Karvina-Hranice, Czech Republic
                Tel: 420 (69) 6311627     FAX: 420 (69) 6311114
                e-mail: czech@omega.com

France: 9, rue Denis Papin, 78190 Trappes
        Tel: (33) 130-621-400     FAX: (33) 130-699-120
        Toll Free in France: 0800-4-06342
        e-mail: france@omega.com

Germany/Austria: Daimlerstrasse 26, D-75392, Deckenpfronn, Germany
                 Tel: 49 (07056) 3017     FAX: 49 (07056) 8540
                 Toll Free in Germany: 0130 11 21 66
                 e-mail: germany@omega.com

United Kingdom: 25 Swannington Road, Broughton Astley, Leicestershire, Irland, Manchester,
                 LE9 6TU, England
                 Tel: 44 (1455) 285520     Tel: 44 (161) 777-6611
                 FAX: 44 (1455) 283912     FAX: 44 (161) 777-6622
                 Toll Free in England: 0800-488-488
                 e-mail: uk@omega.com

It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.