C1900
Circular chart recorder and recorder/controller

Agents manual

Measurement made easy

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Electrical safety

This equipment complies with the requirements of CEI/IEC 61010-1:2001-2 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use'. If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

Symbols

One or more of the following symbols may appear on the equipment labelling:

- **Warning** – refer to the manual for instructions
- **Caution** – risk of electric shock
- Protective earth (ground) terminal
- Earth (ground) terminal
- Direct current supply only
- Alternating current supply only
- Both direct and alternating current supply
- The equipment is protected through double insulation

Health and safety

To ensure that our products are safe and without risk to health, the following points must be noted:
- The relevant sections of these instructions must be read carefully before proceeding.
- Warning labels on containers and packages must be observed.
- Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
- Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
- When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.
1 INTRODUCTION

The COMMANDER 1900 Series of documentation is shown in Fig. 1.1.

The COMMANDER 1900 instrument can be configured for specific applications using different combinations of front panels and modules. The COMMISSIONING LEVEL is used in the setting up and calibration of the instrument.
2 PREPARATION

2.1 Agents Upgrade Kit Identification – Figs. 2.1 to 2.6

Information. Due to variations in pen geometry and position of chart fixings it is not possible to convert instruments from one chart/pen type to another, i.e. ER/C to PX105/ PXR105. The 5th code letter in the instrument code identifies the chart type (see Section 2 of the Installation Guide). For example, an ER/C type chart can only be fitted to instruments with J or R in the instrument code number.

Similarly, when fitting additional or replacement pens, ensure that the correct pen arm is used. Pen arms used with ER/C type charts are identified by a hole located near the motor end of the arm. This hole is not visible on pen arms used with PX105 and PXR105 charts.

<table>
<thead>
<tr>
<th>Kit Number</th>
<th>Purpose</th>
<th>Part Number ER/C Type Chart</th>
<th>Part Number PX105 and PXR105 Type Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kit 1</td>
<td>Two or three pen upgrade</td>
<td>C1900/0720</td>
<td>C1900/0726</td>
</tr>
<tr>
<td>Kit 1A</td>
<td>Fourth pen upgrade</td>
<td>C1900/0721</td>
<td>C1900/0727</td>
</tr>
<tr>
<td>Kit 2</td>
<td>Pen upgrade (Recorder Overlay)</td>
<td>C1900/0722</td>
<td>C1900/0728</td>
</tr>
<tr>
<td>Kit 2A</td>
<td>Fourth pen upgrade (Recorder Overlay)</td>
<td>C1900/0723</td>
<td>C1900/0729</td>
</tr>
<tr>
<td>Kit 3</td>
<td>Recorder to Controller upgrade</td>
<td>C1900/0724</td>
<td>C1900/0724</td>
</tr>
<tr>
<td>Kit 4</td>
<td>One to two pen upgrade (Controller Overlay)</td>
<td>C1900/0725</td>
<td>C1900/0730</td>
</tr>
<tr>
<td>Kit 5</td>
<td>True time event marker</td>
<td>C1900/0708</td>
<td>C1900/0731</td>
</tr>
</tbody>
</table>

Fig. 2.1 Pen Upgrade Kit 1 or 1A

Fig. 2.2 Pen Upgrade (Recorder Overlay) Kit 2 or 2A
...2.1 Upgrade Kit Identification

![Diagram](image)

**Fig. 2.3 Recorder to Controller Upgrade (Kit 3)**

![Diagram](image)

**Fig. 2.4 One to Two Pen Upgrade (Controller Overlay) Kit 4**

![Diagram](image)

**Fig. 2.5 True Time Event Marker (Kit 5)**
...2 PREPARATION

...2.1 Upgrade Kit Identification
Identify the upgrade kit required and the relevent faceplate positions as detailed in Fig 2.6

Fig. 2.6 Upgrade Kit Identification and Faceplate Combinations
3 FITTING ADDITIONAL PEN(S)

To fit additional pen(s) perform all the following procedures:

a) Fit module in required position – see Section 3.1.

b) Fit the required motor and pen assembly – see Section 3.2.

c) Fit the required display board – see Section 3.3.

d) Access the **COMMISSIONING LEVEL** to change the instrument type and re-configure instrument – see Section 3.4.

### 3.1 Fitting a Standard Input/Output Module – Fig. 3.1 and 3.2

**Warning.** Before making any connections, ensure that the power supply, any high voltage-operated control circuits and high common mode voltages are switched off.

a) Disconnect all power supplies from the instrument.

b) Identify the module position – see Fig. 3.1.

---

**Note.** Module positions 2 and 3 can also be used for additional Input and Output modules (module types 1 and 2) for use with math functions.

**Information.** The module type is marked on the component side of the p.c.b.

---

![Fig. 3.1 Module Positions and Functions](image-url)
3 FITTING ADDITIONAL PEN(S)

3.1 Fitting a Standard Input/Output Module

c) If necessary, remove and discard knockout(s) from instrument case.

d) Carefully clean out hole(s) and ensure all debris is removed from inside the instrument.

e) Route the leads and cables into the case.

f) Identify the module position.

g) Fit the required module as detailed in Fig. 3.2.

On completion proceed to Section 3.2.

Note. Connections to the terminal block can be made before or after fitting to the main p.c.b.

Caution. The terminal board is vulnerable to electrostatic damage. Handle the board by its edges only and use an anti-static bench when fitting or removing.

Fig. 3.2 Fitting a Standard Input/Output Module
3.2 Fitting a Motor and Pen Assembly – Fig. 3.3

a) Fit the required motor and pen assembly as detailed in Fig. 3.3.

On completion proceed to Section 3.3.

Fig. 3.3 Fitting a Motor and Pen Assembly
3.3 Fitting a Display Board – Fig. 3.4

a) Fit the required display board as detailed in Fig. 3.4.

On completion proceed to Section 3.4.

1. Peel off blanking plate and remove any residue adhesive using petroleum ether.

2. Fit the self-adhesive spacer.

3. Open door.

4. Loosen screw.

5. Remove screw and slide the display cover away from the door.

6. Route the flexi-circuit of the new membrane switch through the cutout in the door and fix the membrane overlay onto the door.

7. Connect the flexi-circuit carefully to the display board.

8. Link the display board to the adjacent display board using a ribbon cable (PXR105/0170).

9. Secure the display board to the door using two self-tapping screws.

10. Replace the display cover by reversing steps 3, 4 and 5.

11. Fit upgrade label inside the door gasket area.

See Note 1.
When fitting a display board in the left-most position (indicated), the door stay bracket must be removed to access the top right-hand display board securing screw.

See Note 2.
Although the adhesive on the membrane overlay must be allowed to cure for a minimum of 2 hours, it is recommended that the overlay is left for 24 hours (the full cure time of the adhesive) before the switches are used.

Fig. 3.4 Fitting a Display Board
3 FITTING ADDITIONAL PEN(S)...

3.4 Changing the Software Configuration – Fig. 3.5
To enable the use of the additional pen(s), it is necessary to change a number of parameters in the COMMISSIONING LEVEL:

a) Access the COMMISSIONING LEVEL – see Fig. 3.5.

b) Select the Instrument Type frame and set the instrument type required – see Section 8.1.

c) Assign the new inputs to a process variable, remote set point or position feedback in the Input Assignment Page – see Section 8.4.

d) Assign the new pen(s) to a process variable, remote set point or position feedback in the Pen Assignment Page – see Section 8.5.

e) Calibrate the new pen(s) in the Pen Calibration Page – see Section 8.8.

Note.
- Inputs and analog outputs are calibrated at the factory and do not require re-calibration.
- Some parameters are reset during the start-up sequence. Therefore, after the instrument has been re-configured, the instrument must be switched OFF and then switched ON.

f) If a new display is fitted, set the display brightness and test in Display Set Up Page – see Section 8.9.

Fig. 3.5 Access to Commissioning Level
To upgrade a recorder instrument to a controller instrument perform all the following procedures:

a) Replace recorder faceplate(s) with controller faceplate(s) – see Section 4.1.
b) Fit correct software key to allow access to control parameters – see Section 4.2.
c) Access the COMMISSIONING LEVEL to change the instrument type and re-configure instrument – see Section 4.3.

### 4.1 Fitting a Controller Faceplate

a) Fit a controller faceplate as shown in Fig. 4.1.

On completion proceed to Section 4.2.

**Note 1.**
When fitting a display board in the left-most position (indicated), the door stay bracket must be removed to access the display board top right-hand securing screw.

**Note 2.** Although the adhesive on the membrane overlay must be allowed to cure for a minimum of 2 hours, it is recommended that the overlay is left for 24 hours (the full cure time of the adhesive) before the switches are used.

---

**Fig. 4.1 Fitting a Controller Faceplate**
4.2 Fitting a Software Key

a) Fit the required software key as shown in Fig. 4.2.

b) Switch on and configure the instrument using the Advanced Software Options manual.

On completion proceed to Section 4.3.

**Caution.** The software key is vulnerable to electrostatic damage. Handle the board by its edges only.
4.3 Changing the Software Configuration – Fig. 4.3

To use the instrument as a controller, it is necessary to change a number of parameters in the COMMISSIONING LEVEL:

**Note.** This procedure must also be completed when a replacement processor board has been fitted to controller versions of the instrument.

a) Access the COMMISSIONING LEVEL.

b) Select the VERSION page and set the lower display to CONtrL.

c) Select the Instrument Type frame and set the instrument type required – see Section 8.1.

d) Re-assign the inputs to a process variable, remote set point and position feedback signals in the Input Assignment Page – see Section 8.3.

**Note.**
- Inputs and analog outputs are calibrated at the factory and do not require re-calibration.
- Some parameters are reset during the start-up sequence. Therefore, after the instrument has been re-configured, the instrument must be switched OFF and then switched ON.

---

**Fig. 4.3 Changing the Software Configuration**
5 FITTING A TRUE TIME EVENT MARKER

To fit a true time event marker perform all the following procedures:

a) Fit pen motor in position 4 and special pen arm assembly to pen bracket 4 – see Section 5.1.
b) Access the COMMISSIONING LEVEL to select event pen option – see Section 5.2.
c) Set up pen 4 event marker sources in Set Up Range Page, BASIC CONFIGURATION LEVEL.

5.1 Fitting a Motor and True Time Event Marker

a) Fit a new motor in position 4 on the motor plate and a true time event pen arm assembly to pen bracket 4 (black identification band) – see Fig 5.1.

On completion proceed to Section 5.2.

---

Fig. 5.1 Fitting a Pen Motor and Special Pen Arm
5.2 Changing the Software Configuration – Fig. 5.2

a) Switch on the instrument.

b) Access the COMMISSIONING LEVEL – see Fig. 5.2.

c) Set the Event Option Enable frame to Yes – see Section 8.1.

d) Set up pen 4 event marker sources in the Set Up Pen Range Page, BASIC CONFIGURATION LEVEL.

Fig. 5.2 Access to Commissioning Level
6 FITTING ADDITIONAL MODULES

Information.
- There are five module types – standard input/output, analog input relay, four relay, digital input/output and RS 485 serial communications.

6.1 Fitting an Input and Relay Module

Warning. Before making any connections, ensure that the power supply, any high voltage-operated control circuits and high common mode voltages are switched off.

a) Disconnect all power supplies from the instrument.

b) Identify the module position – see Fig. 6.1.

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Module Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Input/Output</td>
<td>C1900/0255</td>
</tr>
<tr>
<td>Analog Input Relay</td>
<td>C1900/0256</td>
</tr>
<tr>
<td>Four Relay</td>
<td>C1900/0285</td>
</tr>
<tr>
<td>Digital Input/Output</td>
<td>C1900/0325</td>
</tr>
<tr>
<td>RS 485 Serial Communications</td>
<td>C1900/0295</td>
</tr>
</tbody>
</table>

Table 6.1 Module Identification

Note. Module positions 2 and 3 can also be used for additional Input/Output modules (module types 1 and 2) for use with math functions.

Fig. 6.1 Module Positions and Functions
...6 FITTING ADDITIONAL MODULES

6.1 Fitting an Input and Relay Module

c) If necessary, remove and discard knockout(s) from instrument case.

d) Carefully clean out hole(s) and ensure all debris is removed from inside the instrument.

e) Route the leads and cables into the case.

f) Identify the module position.

g) Fit the required module as shown in Fig. 6.2.

Note. Connections to the terminal board can be made before or after fitting to the main p.c.b.

Caution. The terminal board is vulnerable to electrostatic damage. Handle the board by its edges only and use an anti-static bench when fitting or removing.

Fig. 6.2 Fitting a Module
To add additional software options perform all the following procedures:
a) Fit correct software key to allow access to control parameters.
b) Configure the instrument using the Advanced Software Options Manual, IM/C1900–ADV

### 7.1 Software Key Identification – Fig. 7.1
The software key is a p.c.b. assembly which must be fitted to the main processor board to enable access to the additional programming pages required to configure the instrument.

![Software Key Identification](image)

Table 7.1 Software Key Identification

<table>
<thead>
<tr>
<th>Software Key</th>
<th>Option Type</th>
<th>Recorder Version</th>
<th>Controller Version</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard Controllers and Recorders</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totalizer</td>
<td>E</td>
<td>C1900/0336</td>
<td>C1900/0331</td>
</tr>
<tr>
<td>Ramp/Soak</td>
<td>S</td>
<td>–</td>
<td>C1900/0332</td>
</tr>
<tr>
<td>Math &amp; Timer</td>
<td>A</td>
<td>C1900/0337</td>
<td>C1900/0333</td>
</tr>
<tr>
<td>Totalizer, Math &amp; Timer</td>
<td>B</td>
<td>C1900/0338</td>
<td>C1900/0334</td>
</tr>
<tr>
<td>Totalizer, Ramp/Soak, Maths &amp; Timer</td>
<td>C</td>
<td>–</td>
<td>C1900/0335</td>
</tr>
<tr>
<td><strong>Pasteurizer Versions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1951J Hot Product Recorder</td>
<td>E</td>
<td>C1900/0353</td>
<td></td>
</tr>
<tr>
<td>1952R Hot Product Recorder/Controller</td>
<td>H</td>
<td>–</td>
<td>C1900/0354</td>
</tr>
<tr>
<td>1953R Hot &amp; Cold Product Recorder/Controller</td>
<td>J</td>
<td>–</td>
<td>C1900/0355</td>
</tr>
<tr>
<td><strong>Retort Controllers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960K</td>
<td>K</td>
<td>–</td>
<td>C1900/0356</td>
</tr>
<tr>
<td>1960L</td>
<td>L</td>
<td>–</td>
<td>C1900/0357</td>
</tr>
</tbody>
</table>

1 Refer to IM/C1900–ADV for additional programming and operating information
2 Refer to IM/C1900–PAS for additional programming and operating information
3 Refer to IM/C1900–MPC for additional programming and operating information

*Fig. 7.1 Software Key Identification*
7.2 Fitting a Software Key – Fig. 7.2

**Warning.** Ensure all power supply, any high voltage-operated control circuits and high common voltages are switched off.

a) Fit the required software key – see Fig. 7.2.

b) Switch on and configure the instrument using *Advanced Software Options* manual.

**Caution.** The software key is vulnerable to electrostatic damage. Handle the board by its edges only.

---

**Fig. 7.2 Fitting a Software Key**

1. Identify the software key sockets on main processor board
2. Fit required software key ensuring pins are aligned correctly – see **Caution**
3. Fit upgrade label inside the door gasket area
Section 8.6, Page 26
Input Assignment

Section 8.7, Page 28
Output Calibration

Section 8.3, Page 23
Company Standard

Section 8.4, Page 24
Input Assignment

Section 8.5, Page 25
Pen Assignment

Section 8.1, Page 20
Section 8.2, Page 22
Instrument Type

Section 8.10, Page 30
Relay Test

Section 8.11, Page 31
Input Test

Section 8.12, Page 31
Output Test

Display Brightness

Display Set Up

Fig. 8.1 Commissioning Level
8.1 Set Up Instrument Type Page (All Models Except C1950 Series Pasteurizer Versions)

**Information.**
- Select instrument type – controller/recorder, chart type, number of pens and instrument version.
- Enable or disable event pen option.
- Enable or disable 3rd faceplate (recorder versions 1913 and 1914, controller version 1914 only).

**Note.**
- If fitting a replacement processor board to a controller version, the instrument version must be set before the instrument type – refer to Section 4.3.
- For access to the **COMMISSIONING LEVEL** refer to steps 1 to 3 of Fig. 4.3.

---

**Page Header – Instrument Type**

To advance to the **Company Standard Page** press the switch.

**Instrument Type**
Select the instrument type required.

19xx.x controller/recorder chart type:
- J ER/C type chart – recorder
- R ER/C type chart – controller
- K PX105 and PXR105 type chart – recorder
- S PX105 and PXR105 type chart – controller
- C Special chart – recorder
- D Special chart – controller

See Note

number of standard pens (1 to 4)

version: 0 non-upgradable version
1 recorder version
1 or 2 controller version (number of control channels)

**Note.** Due to variations in pen geometry and position of chart fixings of the instruments, the 5th code letter in the instrument code number (see Section 2 of the Installation Guide) and the chart type selected in this frame must be compatible. For example, an ER/C type chart can only be fitted to instruments with J or R in the instrument code number.

**Event Option Enable**
Enable or disable true time event option:
- YES – enable
- NO – disable

Pen 4 can only be used as a true time event marker if the Event Option is enabled and is fitted with a special event arm. The true time event marker operates on the same time line as pen 1.

**Note.** The true time event option is not available on 4 pen instruments or non-upgradable instruments.

Continued on next page.
8  COMMISSIONING LEVEL...

...8.1  Set Up Instrument Type Page  (All Models Except C1950 Series Pasteurizer Versions)

Display Option
This frame allows the second and third faceplates on specific instruments to be enabled or
disabled:

YES – enable
NO – disable

The Display frame is only displayed on the following versions:
  recorder versions – 1913 and 1914
  controller version – 1914.

Note.  The display option is set automatically according to the instrument type and must not be
adjusted.

Update Done
The Active frame is displayed momentarily as any changes are stored in the non-volatile
memory.  Done is displayed on completion.

Note.  The parameters changed in this Page are updated during the start-up sequence.
Subsequently, switch OFF the power supply to the instrument, wait 5 seconds and then switch
ON again.
8.2 Set Up Instrument Type Page (C1950 Series Pasteurizer Versions Only)

Information.
- Select controller/recorder chart type.
- Select single or dual RTD.

Note.
- For access to the COMMISSIONING LEVEL refer to steps 1 to 3 of Fig. 4.3.

Chart Type
Select the controller/recorder chart type required.

19 51.x
- controller/recorder chart type:
  J  ER/C type chart  –  recorder
  K  PX105 and PXR105 type chart  –  recorder
  C  Special chart  –  recorder

19 52.x
19 53.x
- controller/recorder chart type:
  R  ER/C type chart  –  controller
  S  PX105 and PXR105 type chart  –  controller
  D  Special chart  –  controller

Single or Dual RTD.
Select either single or dual (second divert) RTD.
See User Guide (Pasteurizer Versions) Section 7 for further information on the use of a second divert RTD.

Update Done
The ACTIVE frame is displayed momentarily as any changes are stored in the non-volatile memory. DONE is displayed on completion.

Return to Instrument Type frame.

Note. The parameters changed in this Page are updated during the start-up sequence. Subsequently, switch OFF the power supply to the instrument, wait 5 seconds and then switch ON again.
8.3 Company Standard Page

Information.
- Select Company Standard settings.
- Select Security Type – enable or disable access to control and program settings.
- Select Mains Filter – noise rejection frequency.

Page Header – Company Standard Page

To advance to the Input Assignment Page press the \[\text{\text{\&}}\] switch.

Set Company Standard
Select \text{YES} to reconfigure the instrument to the company standard settings.

The \text{ACT IUE} frame is displayed momentarily as any changes are stored in the non-volatile memory. \text{DONE} is displayed on completion.

Note. If the software in use is earlier than version 5, reconfiguring the instrument to the company standard resets the crystal frequency to 8MHz. If a 12MHz crystal is fitted, the frequency must be re-set in the Crystal Type frame below.

Note. If the software in use is version 2101 issue 1 or later, the crystal frequency is fixed at 12MHz. A frequency of 8 MHz is obtainable only on earlier software versions.

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

Security Type
Select type of security required in OPERATOR LEVEL:
- \(A\) – access to control and program settings with correct security code
- \(B\) – no access to control or program settings even with correct security code.

Note. The security system can be overridden and the COMMISSIONING LEVEL accessed, irrespective of the security type selected in this frame (refer to Section 3.4 for link positions).

Crystal Type
Select crystal type fitted on main processor board:
- \(8.\text{EG}\) – 8 Megahertz crystal
- \(12.\text{EG}\) – 12 Megahertz crystal

Note. The parameter selected in this frame is dependent on the type of crystal fitted on the main processor board. An incorrect crystal frequency results in an \text{AD-FAIL} message.

Note. If the software in use is version 2101 issue 1 or later, the crystal frequency is fixed at 12MHz and this frame does not appear.

Return to Company Standard frame.

Note. The crystal frequency is read during the start up procedure. If the frequency has been re-set:
- a) Return to the Company Standard frame.
- b) Switch the instrument OFF then ON.
8.4 Input Assignment Page

**Information.**
- Assign Inputs – Process Variables, Remote Set Points and Position Feedbacks can all be assigned to any analog input or math block result (if applicable).

**Page Header** – Input Assign

**Note.** Entry and access to and from this page can only be implemented from the page header.

To advance to the Pen Assignment Page press the switch.

---

**Process Variable 1**
Select analog input or math block result for Process Variable 1.

- \( IP - i \) to \( IP - 5 \) – analog input 1 to 6 (if available)
- \( bLk - i \) to \( bLk - 4 \) – math block 1 to 4 (if available)

**Process Variable 2**
Select analog input or math block result for Process Variable 2 – see \( PU - i \) for description of inputs and math blocks.

**Process Variable 3**
Select analog input or math block result for Process Variable 3 – see \( PU - i \) for description of inputs and math blocks.

**Process Variable 4**
Select analog input or math block result for Process Variable 4 – see \( PU - i \) for description of inputs and math blocks.

**Remote Set Point (Controller 1)**
Select analog input or math block result for Remote set point for Controller 1 – see \( PU - i \) for description of inputs and math blocks.

**Position Feedback (Controller 1)**
Select analog input or math block result for Position Feedback for Controller 1 – see \( PU - i \) for description of inputs and math blocks.

**Remote Set Point (Controller 2)**
Select analog input or math block result for Remote set point for Controller 2 – see \( PU - i \) for description of inputs and math blocks.

**Position Feedback (Controller 2)**
Select analog input or math block result for Position Feedback for Controller 2 – see \( PU - i \) for description of inputs and math blocks.

**Update Active/Done**
The \( RCE IUE \) frame is displayed momentarily as any changes are stored in the non-volatile memory. \( done \) is displayed on completion.

Return to Input Assign frame
8.5 Pen Assignment Page

Information.
- Select pen function – trend or event.
- Select source for trend pens from process variables, remote set points or position feedback signals.

Page Header – Pen Assignment

To advance to the Input Calibration Page press the switch.

Pen 1 Type
Select pen function required:
\(\text{trend} \quad \text{event}\)

Note. The event pen and the true time event marker are separate functions and only the Event Pen can be selected in this page. The True Time Line Event Pen Option allows marking on the same time line as the red pen and requires a special pen arm and motor assembly – see Section 5.

Pen 1 Source
Select the signal to be recorded on pen 1 – the selections in this frame relate to instrument type.

Pen 2 Type
Repeat as for Pen 1 Type, if applicable.

Pen 2 Source
Repeat as for Pen 1 Source, if applicable.

Pen 3 Type
Repeat as for Pen 1 Type, if applicable.

Pen 3 Source
Repeat as for Pen 1 Source, if applicable.

Pen 4 Type
Repeat as for Pen 1 Type, if applicable.

Pen 4 Source
Repeat as for Pen 1 Source, if applicable.

Return to Pen Assignment frame.
8.6 Input Calibration Page

**Information.**
- Low range calibration (100mV).
- High range calibration (1V).
- Cold junction compensation calibration.

The following equipment is required to carry out input calibration:
- DC Voltage Calibrator — accuracy of 1V and 100mV range (± 0.05% of setting).
- Thermometer — accuracy of ± 0.1°C.

**Note.**
- Do not perform the input calibration procedures if the d.c. voltage calibrator or thermometer have not been calibrated.
- Take note of the link positions before carrying out the 100mV, 1V and Cold Junction calibration procedures.

---

**Page Header – Input Calibration**

To advance to the Output Calibration Page press the switch.

**Select Input**

Select input required.

**Calibrate 100mV Enable**

If 100mV calibration is required, set the input links to mV – see Section 4 of Installation Guide.

Connect a d.c. voltage calibrator to the selected input and apply 100mV.

Select 𝐶𝐴𝐿 𝑪𝐿 – 𝑁 to enable 100mV calibration.

If 100mV calibration is not required select 𝐶𝐴𝐿 𝑪𝐿 – 𝑫.

**Calibrate 100mV**

If calibrate 100mV is enabled, (−) is displayed in the lower display during calibration. 𝑑𝑶𝑵𝑬 is displayed on completion.

**Calibration Pass**

If calibration is successful, the selected input displayed on the upper display and the input value displayed on the lower display.

**Calibration Fail**

Calibration failure may be due to the following:
- incorrect input link setting
- incorrect input signal applied
- faulty non-volatile memory.

**Re-calibration Enable**

Enable or disable 100mV re-calibration:
- 𝑌𝑬𝑺 — repeat 100mV calibration
- 𝑍𝑶,No — advance to the next frame.

Continued on next page.
8.6 Input Calibration Page

**Calibrate 1V Enable**
If 1V calibration is required, set the input links to V – see Section 4 of Installation Guide.

Connect a d.c. voltage calibrator to the selected input and apply 1V.

Select \( \text{CAL} - \text{Y} \) to enable 1V calibration.

If 1V calibration is not required select \( \text{CAL} - \text{N} \).

**Calibrate 1V**
If calibrate 1V is enabled, (-) is displayed in lower display during calibration. \( \text{DONE} \) is displayed on completion.

**Calibration Pass**
If calibration is successful, the selected input is displayed on the upper display and input value is displayed on the lower display.

**Calibration Fail**
Calibration failure may be due to the following:
- incorrect input link setting
- incorrect input signal applied
- faulty non-volatile memory.

**Re-calibration Enable**
Enable or disable 1V re-calibration:
- \( \text{YES} \) – repeat 1V calibration
- \( \text{NO} \) – advance to the next frame.

**Calibrate Cold Junction**
An automatic cold junction (ACJC) transistor (TR10) is fitted on the main p.c.b. adjacent to module position 1.

If cold junction calibration is required, set the input links to mV – see Section 4 of Installation Guide.

Select \( \text{YES} \) to enable cold junction calibration.

If cold junction calibration is not required select \( \text{NO} \).

**Set Cold Junction Temperature**
Measure the temperature adjacent to the automatic cold junction transistor (TR10). Set the measured temperature in °C.

If the input links are set incorrectly \( \text{Check Links} \) flashes until the links are reset.

**Cold Junction Temperature**
Check cold junction temperature is the same as the value set in the \( \text{SEt CJ} \) frame above.

**Note.** If the cold junction temperature is different from the value set in the \( \text{SEt CJ} \) frame above, reset the cold junction temperature.

Return to Select Input frame.

**Note.** Reset the links to their original positions before proceeding to the next Page.
8.7 Output Calibration Page

**Information.**
- 20mA Calibration.
- 4mA Calibration.

The following equipment is required to carry out input calibration:
- Digital Voltmeter – accuracy 0.02% of reading.
- 100Ω Resistance Standard – accuracy ±0.01%

**Note.** Do not perform the output calibration procedures if the digital voltmeter has not been calibrated.

**Caution.** The main input and current output calibration data (unique to each instrument) is contained in the non-volatile memory ICs 24 and 25. Do not interchange these ICs between instruments.

---

**Page Header – Output Calibration**

To advance to the Pen Calibration Page press the switch.

**Select Output**

Select output required.

Connect the 100Ω resistance standard across the output that requires calibration and connect the digital voltmeter across the resistor.

**Calibrate 20mA**

Use the and switches to set the output reading on the digital voltmeter to 2.0V.

**Calibrate 4mA**

Use the and switches to set the output reading on the digital voltmeter to 0.4V.

---

Return to Select Output frame.
8.8 Pen Calibration Page

**Information.**
- Pen Calibration – range high and range low.
- Pen Linearity Check.

---

**Page Header – Pen Calibration**

To advance to the Display Set Up Page press the switch.

---

**Pen 1 Range High Calibration**

Pen 1 moves to its 100% position on the chart. Use the and switches to position the pen on the 100% chart line.

---

**Pen 1 Range Low Calibration**

Pen 1 moves to its 0% position on the chart. Use the and switches to position the pen on the 0% chart line.

---

**Pen 2 to 4 Range High Calibration**

Repeat as for Pen 1 Range High Calibration, if applicable.

**Note.** On instruments configured for true time event marker, the true time event pen calibration uses Pen 4 High Calibration. Set the pen to the 100% position on the chart.

---

**Pen 2 to 4 Range Low Calibration**

Repeat as for Pen 1 Range Low Calibration, if applicable.

**Note.** Pen 4 Low Calibration is omitted on instruments configured for true time event marker.

---

**Pen Linearity Check**

The pens automatically draw the pen linearity check test pattern shown below.

---

Return to Pen Calibration frame.
8.9 Display Set Up Page

**Information.**
- Display Brightness – illuminates all display segments, bar graph segments (if applicable) and l.e.d.s.
- Display Brightness.

**Display Test**
To advance to the Relay Test Page press the switch.

**Display 1 Brightness**
Set brightness required for display 1 (4 to 15). The higher the value the brighter the display.

**Display 2 Brightness**
Set brightness required for display 2 (if fitted).

**Display 3 Brightness**
Set brightness required for display 3 (if fitted).

**Display Test**
The display test alternate between ‘888888’ on the upper display, ‘888888’ on the lower display, the l.e.d. indication and bar graph displays of each faceplate fitted.

Ensure all segments in the upper and lower displays, all l.e.d. indications and bar graph displays are illuminated.

Return to Display Test frame.

8.10 Relay Test Page

**Information.**
- Relay Test.

**Relay Test**
To advance to the Digital Input Test Page press the switch.

**Select Module Position**
The selections in this frame relate to modules fitted. Select module position required,

**Select Output State**
Select the relay output state for the module selected in the previous frame:

**Note.** All relays on the selected module are turned **ON** or **OFF** together.

Return to Select Module Position frame.
8.11 Digital Input Test Page

**Information.**
- Digital inputs open circuit test.
- Digital inputs closed circuit test.

**Page Header – Digital Input Test**
To advance to the Output Test Page press the switch.

**Select Module Position**
The selections in this frame relate to modules fitted with digital inputs. Select module position required.

- **Digital Input Open Circuit Test**
  Open circuit all digital inputs on the selected module.
  
  **PASS** is displayed if all digital inputs are confirmed open circuit. **FAIL** is displayed if any of the digital inputs are not open circuit.

- **Digital Input Close Circuit Test**
  Short circuit all digital inputs on the selected module.
  
  **PASS** is displayed if all digital inputs are confirmed short circuit. **FAIL** is displayed if any of the digital inputs are not short circuit.

Return to **Select Module Position** frame.

8.12 Output Test Page

**Information.**
- Output test – used to check chart and pen movement over a 24 hour cycle.

**Page Header – Output Test**
To advance to the Diagnostics Page press the switch.

**Output Test Enable**
The output test cycles each of the current outputs through a number of steps. The chart duration is automatically set to 24 hours.

Select **OP ON** to enable the output test. **OP TEST E 1 UE** is displayed until the test is complete.

To disable the output test select **OP OFF**.

**Note.** To produce the correct test pattern, the current output of each module must be linked to its analog input and the plug-in links set for mA – see Section 4 of the Installation Guide.

Return to **Output Test** frame.
8.12 Output Test Page
The output test can be used to check the chart and pen movement and detect any linearity or hysteresis errors in pen positioning.

8.13 Diagnostics Page

**Information.**
- Instrument timing.

Page Header – **Diagnostics Page**
To advance to the **COMMISSIONING LEVEL** frame press the switch.

**Error Code**
This frame is for factory use only.

**Instrument Timing**
The display indicates the number of 8ms interrupts used to process the enabled functions.

The total executive cycle time is 240ms.

**Example** – a display of 20 indicates 160ms of the executive cycle time have been used to process the enabled functions.

Return to **Diagnostics Page** frame.
9 INSTRUMENT REPAIR

9.1 Non-volatile Memory ICs

**Caution.** The main input and current output calibration data (unique to each instrument) is contained in the non-volatile memory ICs 24 and 25. Do not substitute between instruments or each other. If for any reason these ICs are replaced then both the main input and the current output will require recalibration – *see sections 8.5 and 8.6.*

9.2 Microprocessor Board Replacement

**Caution.** Replacement microprocessor boards are despatched from the manufacturing unit with Company Standard settings. Before replacing a microprocessor board, make a note of all non-standard or instrument-specific configuration data. When mechanical installation is complete and the instrument has powered up successfully, carry out the configuration procedure as detailed in Sections 8.1 to 8.12.