C1900
Circular chart recorder and recorder/controller

Pasturizer versions supplement

Measurement made easy

For more information
Further publications are available for free download from:
www.abb.com/recorders

or by scanning this code:

<table>
<thead>
<tr>
<th>Search for or click on</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Installation Guide C1900 Circular chart recorder and recorder/controller</td>
<td>IM/C1900-INS</td>
</tr>
<tr>
<td>Operating Guide C1900 Circular chart recorder</td>
<td>IM/C1900-OGR</td>
</tr>
<tr>
<td>Operating Guide C1900 Circular chart recorder/controller</td>
<td>IM/C1900-OGC</td>
</tr>
<tr>
<td>Programming Guide C1900 Circular chart recorder</td>
<td>IM/C1900-PGR</td>
</tr>
<tr>
<td>Programming Guide C1900 Circular chart recorder/controller</td>
<td>IM/C1900-PGC</td>
</tr>
<tr>
<td>Operating Instructions C1900 Circular chart recorder and recorder/controller</td>
<td>IM/C1900-MOD</td>
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<td>DS/C1900R-EN</td>
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<td>DS/C1900RC-EN</td>
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<td>Quick Reference Guide C1900 recorders</td>
<td>IM/C1900-QR</td>
</tr>
<tr>
<td>Quick Reference Guide C1900 recorder and recorder/controller</td>
<td>IM/C1900-QC</td>
</tr>
</tbody>
</table>
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.
INTRODUCTION

The C1900 Series of Documentation is shown in Fig. 1.1. This User Guide details three Dairy/Pasteurization variants within the C1900 range and must be read in conjunction with the other documentation in the C1900 series.

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Fig. 1.1 C1900 Documentation
1.1 Dairy/Pasteurization Models
The three models are: 1951 Recorder, 1952 Recorder/Controller and 1953 Recorder/Controller (enhanced). These provide the following features:

- dual RTD measurement of hot product,
- up to 8 diversion set points available,
- LED indication of forward and divert flow conditions,
- leak valve detection safety input,
- continuous hot product and divert set point display,
- forward/divert true-time event pen – can be extended to show cleaning in place (CIP),
- optional fourth analog input to record flow, pressure or other dairy related parameters on blue pen (1953 only).

![Fig. 1.2 Pasteurizer System Schematic Diagram](image-url)
2 DISPLAYS AND CONTROLS

2.1 Displays and L.E.D. Indicators – Fig. 2.1

Information.

FWD – Forward flow active:
  green LED indicator lit (standard setting) or amber LED indicator lit (optional) – see Forward/Divert Indicator Color frame \((Fd\cdot lco l)\) in Section 7.1.5

DVT – Divert flow active:
  red LED indicator lit

All LEDs off:
  – All LEDs disabled – see Forward/Divert Indicator Color frame \((Fd\cdot lco l)\) in Section 7.1.5
  or
  – a leak is detected across the divert valve – see Leak Condition Source frame \((Lk\cdot Src)\) in Section 7.1.5

Fig. 2.1 Dairy/Pasteurizer Faceplate

2.2 True Time Event Pen – Fig. 2.2

The True Time Event Pen (violet) indicates the divert status according to the divert valve position. The Event Time Line (red) is coincident with the hot product. Event traces for the different divert states are shown in Fig. 2.2.

Note. All other pens are limited to 94% of the chart to prevent collision with the True Time Event Pen.

Fig. 2.2 True Time Event Pen

<table>
<thead>
<tr>
<th>Event Pen Position</th>
<th>Required Digital Input States</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive polarity: O/C = Input active</td>
</tr>
<tr>
<td></td>
<td>1.1</td>
</tr>
<tr>
<td>Forward Flow</td>
<td>S/C</td>
</tr>
<tr>
<td>Divert</td>
<td>O/C</td>
</tr>
<tr>
<td>Clean In Place</td>
<td>S/C</td>
</tr>
<tr>
<td>Secondary Divert</td>
<td>S/C or O/C</td>
</tr>
</tbody>
</table>
2.3 Faceplate Combinations and Product Codes – Fig. 2.3

**Model 1951**

- **Red Pen (1)** – Hot Product
- **Green Pen (2)** – Select (None), Divert Set Point or Cold Product
- **Violet Pen** – 4-Position True Time Forward/Divert

**Display Options**

<table>
<thead>
<tr>
<th>Cold Product</th>
<th>2nd RTD</th>
<th>HP Units</th>
<th>Blank</th>
<th>1st-2nd RTD</th>
<th>DT Units</th>
<th>Blank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>Blank</td>
<td>HP = Hot Product</td>
<td>DT = Divert Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Model 1952**

- **Red Pen (1)** – Hot Product
- **Green Pen (2)** – Select (None), Divert Set Point or Cold Product (only if option module is selected)
- **Violet Pen** – 4-Position True Time Forward/Divert

**Model 1953**

- **Red Pen (1)** – Hot Product
- **Green Pen (2)** – Select (None), Divert Set Point or Cold Product
- **Blue Pen (3)** – No trace if auxiliary input is used for 2nd RTD option
  - Auxiliary input for pressure etc. traced but not displayed
- **Violet Pen** – 4-Position True Time Forward/Divert Event

---

Fig. 2.3 Faceplate Combinations and Product Codes
### 3.1 Checking the Instrument Code Number – Table. 3.1

#### Part 1 – General Details

<table>
<thead>
<tr>
<th>1900 Recorder, Recorder/Controller Dairy/Pasteurization Variants</th>
<th>19 XXX</th>
<th>X</th>
<th>X</th>
<th>0</th>
<th>X</th>
<th>X</th>
<th>0</th>
<th>X</th>
<th>X</th>
<th>XXX</th>
</tr>
</thead>
</table>

**Recorders and Chart Type**

- Safety Thermal Limit Recorder (STLR), Two pens (Red and Green) plus True Time Event Pen (Violet), Taylor ER/C charts: 51J
- Safety Thermal Limit Recorder (STLR), Two pens (Red and Green) plus True Time Event Pen (Violet), Kent PX105 charts: 51K

**Recorder/Controllers and Chart Type**

- High Temperature Short Time (HTST) Recording Controllers
  - (HTST) One Control Unit, Two Pens (Red and Green), Plus True Time Event (Violet), Taylor ER/C charts: 52R
  - (HTST) One Control Unit, Two Pens (Red and Green), Plus True Time Event (Violet), Kent PX105 charts: 52S
  - (HTST) Two Control Units, Three Pens (Red, Green and Blue), Plus True Time Event (Violet), Taylor ER/C charts: 53R
  - (HTST) Two Control Units, Three Pens (Red, Green and Blue), Plus True Time Event (Violet), Kent PX105 charts: 53S

**Electrical Code**

- Standard
- CSA

**Option Module**

- None
- Additional Modules – Part 2 below

**Options**

- None
- 0

**Door Lock**

- Not Fitted
- Fitted

**Power Supply**

- 115V AC
- 230V AC
- 24V AC

| 1952 Enter code 1 for optional cold product module 1951 and 1953 Enter code 0 cold product module always fitted |
| 0 1 |

| 1952 and 1953 Enter code 0, hot water module always fitted 1951 No option permitted |
| 0 |

| Enter code 1 or 2 for auxiliary input module For other options see key below |
| 0 1 2 3 4 5 |

| Enter option 9 for FDA dairy applications (115V only) For other options see key below |
| 0 – 2 3 4 – 9 |

| If option 9 is selected is selected above, no other option is permitted |
| 0 – 2 – 4 5 8 |

**Special Settings**

- Company Standard
- Customer Setting
- Special

#### Part 2 – Additional Modules

**Module Position 2**

- 1952 Enter code 1 for optional cold product module
- 1951 and 1953 Enter code 0 cold product module always fitted

**Module Position 3**

- 1952 and 1953 Enter code 0, hot water module always fitted
- 1951 No option permitted

**Module Position 4**

- Enter code 1 or 2 for auxiliary input module
- For other options see key below

**Module Position 5**

- Enter option 9 for FDA dairy applications (115V only)
- For other options see key below

**Module Position 6**

- If option 9 is selected is selected above, no other option is permitted

| 0 – 2 – 4 5 8 |

All units are provided with a True Time Event Pen as standard.

**Key to Module Types**

<table>
<thead>
<tr>
<th>0</th>
<th>No module fitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Standard Input/Output</td>
</tr>
<tr>
<td>2</td>
<td>Analog Input plus Relay</td>
</tr>
<tr>
<td>3</td>
<td>Four Relays</td>
</tr>
<tr>
<td>4</td>
<td>Eight Digital Inputs</td>
</tr>
<tr>
<td>5</td>
<td>Eight Digital Outputs</td>
</tr>
<tr>
<td>8</td>
<td>MODBUS RS485 Communications (MODBUS configurator must be set to READ only)</td>
</tr>
<tr>
<td>9</td>
<td>Dairy Relay Board (takes module positions 5 and 6), 115V only</td>
</tr>
</tbody>
</table>

Refer to Fig. 4.1 for module positions and identification.
4.1 Identifying the Input/Output Modules (and accessing the Configuration Levels) – Fig. 4.1

![Diagram of Module Positions]

To allow access to the Configuration Levels, move link 3 to the lower position.

To prevent access to the Configuration Levels, move link 3 to the upper position.

Note. When the chart plate is closed it can be sealed to prevent access to LK3.

Additional Functions:
- Input 1 – (Red Pen) Hot Product, Divert Relay, Event I/P
- Input 2 – (Green Pen) Cold Product, Control O/P (if required)
- Input 3 – Hot Water, Control O/P
- Input 4 – (Blue Pen) Pressure/Flow (2nd RTD – indicate only)

4.2 Standard Connections – Fig. 4.2

Refer to IM/C1900-INS, Section 4.2 for input connections.

1. Common
2. Logic 1* (Temp Divert)
3. Logic 2* (Sec’dy Divert [Optional])
4. Normally Open
5. Common

Additional Positions:

4.3 Dairy Relay Board Connections – Fig. 4.3

![Diagram of Dairy Relay Board Connections]

Fig. 4.2 Standard Connections

Fig. 4.3 FDA Dairy Relay Board Connections

Information:
Digital input 1.1 is permanently allocated to the low temperature divert event.
Relay 1.1 is permanently allocated to temperature divert.
When the hot product reaches the correct pasteurization temperature, divert relay RL1.1 on the C1900 main board is energized and power is applied to RL1 on the dairy relay board.

RL1 is energized: contacts are switched from pins 4 to 3 on RL1a and 5 to 6 on RL1b. Power is fed to the milk pump via TB1 pin 5 and to the flow diversion valve TB1 pin 6.

The milk pump is switched on and the flow diversion valve is switched into the forward flow position. The flow diversion valve contacts are switched from pin 4 to 7 and power is then fed to RL2 (via TB1 pin 7).

RL2 is energized. RL2a volt free contacts switch from pin 5 to 6 which moves the event marker pen to the forward flow position (see Fig. 2.2) and illuminates the forward flow LEDs – see Fig. 2.1.

Relay RL3 (Leak Divert) is de-energized.

TB3 can be used for remote indication of this event.

Fig. 5.1 Operating Sequence
6.1 Operating Level – Fig. 6.1
Two additional frames (Pen Adjust and Instrument Option) and one additional page have been added to the Operating Level as shown on Figs. 6.1 and 6.2. For all other Operating Level frames, refer to IM/C1900-OGC.

† If multiple divert option is selected, divert temperatures (2 to 8) are shown here.

Note. The Alarm Acknowledgement page is only displayed if an alarm is present.

Fig. 6.1 Operating Level (Dairy/Pasteurizer Faceplate) Model 1951
6.1.1 Pen Adjustment Frame

(example security code)

Pen Adjust

Allows micrometer adjustments of the hot product (red) pen (using the ▲ and ▼ keys) to be made when checking against an indicating thermometer.

The direction of pen movement is indicated by additional center bars on the bargraph.

▲ key adjusts pens towards 100% (left center bar)
▼ key adjusts pens towards 0% (right center bar)

6.1.2 Instrument Option Frame

Instrument Option

6.1.3 View Divert Parameters
The View Divert Parameters Page displays parameters and messages set up in the Divert Page shown in Section 7.1.5. These parameters can be monitored but not modified at this level.

**Page Header – Divert Page**

**Second RT Value**
If dual RTD values are selected, the temperature value for the second RTD is displayed.

**RT Deviation Trip Value**
Displays the deviation level \((1st - 2nd\ \text{RTD\ value})\) set for difference condition.
If \((1st - 2nd\ \text{RTD}) > r_t - dE\), then deviation trip condition is true.

**RT Divert**
Shows if diversion enabled for the above trip condition.

**Divert Mode**
Displays the divert mode configured (multi or single):
- **MULTI** – Up to eight divert set points,
- **SINGLE** – One divert set point.

**Divert Number**
Displays the number of the divert set point(s): 1, 2, 3, 4, 5, 6, 7 or 8 (used with associated Divert Set Point and Hot Water Set Temperature displays) – models 1952 and 1953 only.

**Caution.** Do not change divert numbers during a process (only before or after).

**Divert Set Point 1**
Displays the temperature set for divert set point 1.

**Divert Hysteresis Point**
Displays the hysteresis value set (in engineering units) common to all set points.

**Note.** Only activated on values above the divert set point temperature.

**Time Hysteresis**
Displays the time hysteresis value set between 0 and 9999 seconds (common to all set points).

**Note.** If product temperature reaches the set point value, forward flow is initiated \(t - \text{hyst}\) seconds after reaching this value. If the temperature drops below the setting in the Divert Set Point display, flow is diverted immediately.

**Hot Water Set Temperature 1** (Models 1952 and 1953 only)
Displays the hot water control temperature set point for divert set point 1, used in conjunction with associated divert number 1.

**Divert Set Points 2 to 8**
Displays the temperature for divert set points (from 2 to 8 as selected) used in conjunction with associated divert numbers 2 to 8.

**Hot Water Set Temperature 2** (Models 1952 and 1953 only)
Displays the hot water control temperature set point for divert set points (from 2 to 8 as selected) used in conjunction with associated divert numbers 2 to 8.
The general content of the Basic Configuration Level is detailed in IM/C1900-PGC, Section 3.
Any changes or additions to Basic Configuration Level frames are detailed in this Sections 7.1.1 to 7.1.11 of this manual.
An additional (Divert) page is also included in this level as shown in Fig. 7.1.

Note. Refer to Section 7.1.10 on page 15 for access to Pen Adjust frame in Operator Level.

† Displayed on models 1952 and 1953 only
7.1.1 Set Up Input
As detailed in IM/C1900-PGC, Section 3.1, page 4.

7.1.2 Set Up Pen Range
As detailed in IM/C1900-PGC, Section 3.2, page 8 with the following changes:

Select Pen
Blue Pen (3) is only displayed on model 1953.
True Time Event Pen is not displayed on any C1900 Dairy/Pasteurization model.

7.1.3 Set Up Chart
As detailed in IM/C1900-PGC, Section 3.3, page 9 with the following additional Lift Source frame.

Lift Source
The pen lift source can be any digital (level triggered) input source.
Press the \( \text{\text{[}} \) switch to lift the pens from the chart.
Inputs are still tracked but are not traced until the switch is pressed again to drop the pen back onto the chart.

7.1.4 Set Up Alarms
As detailed in IM/C1900-PGC, Section 3.4, page 10.

7.1.5 Divert Page
For correct fail-safe operation of the event pen, the polarity of digital input position 1 must be set to positive – see IM/C1900–INS. Switches connected to input position 1 must be short-circuited in the de-activated state.
When all inputs are de-activated, the ‘forward flow’ pen position is selected – see Table 7.1.
With the ‘temperature divert input’ (D1.1) open circuit, the event pen moves to the ‘diverted flow, low temperature position’.
The CIP position (input D2.1) is only selected if the process temperature is also above the divert temperature and the divert signal to D1.1 is inhibited at the pasteuriser control panel.
The secondary divert input (D1.2) overrides the CIP, Forward Flow or Divert Flow inputs. The secondary divert signal can also be assigned to any other digital input position. This enables an alternative polarity to be set if the input is open circuit in the non-active state.

<table>
<thead>
<tr>
<th>Event Pen Position</th>
<th>Required Digital Input States</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive polarity: O/C = Input active</td>
</tr>
<tr>
<td></td>
<td>1.1</td>
</tr>
<tr>
<td>Forward Flow</td>
<td>S/C</td>
</tr>
<tr>
<td>Divert</td>
<td>O/C</td>
</tr>
<tr>
<td>Clean In Place</td>
<td>S/C</td>
</tr>
<tr>
<td>Secondary Divert</td>
<td>S/C or O/C</td>
</tr>
</tbody>
</table>

Table 7.1 Event Pen Position
7 BASIC CONFIGURATION LEVEL...

...7.1.5 Divert Page

Note.

2nd RT and RT Deviation – the hot product temperature can be measured by a single or dual RTD. For the dual RTD, the primary input is always the one displayed as ‘Hot Product’.

The secondary RTD enables a self-check facility which can be used to maintain the integrity of primary and secondary resistance thermometer devices. Any imbalance between the first and second RTD greater than the trip level entered in the appropriate scroll automatically causes the flow to divert, regardless of the primary temperature measurement.

Page Header – Set Up Divert Page

Second RT Enable
Enables dual RTD selection (provided the auxiliary input module is fitted).

Second RT Value
If dual RTD values have been selected, the temperature value for the second RTD is displayed.

RT Deviation Trip Value
Set the deviation level (1st – 2nd RTD value) required for difference condition. If (1st – 2nd RTD) > rt–dev, the deviation trip condition is true.

RT Divert Enable
Enables diversion if the above condition is true.

Panel 2 (Record Faceplate) Set Up (displayed with model 1951 only – see fig. 2.3)

<table>
<thead>
<tr>
<th>Panel 2 Upper Display</th>
<th>Panel 2 Lower Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Blank</td>
</tr>
<tr>
<td>2nd-rt</td>
<td>Second RT value</td>
</tr>
<tr>
<td>UN ItS</td>
<td>Hot product units</td>
</tr>
<tr>
<td>COLD P</td>
<td>Divert temp. units</td>
</tr>
<tr>
<td></td>
<td>Cold product value</td>
</tr>
<tr>
<td></td>
<td>Blank</td>
</tr>
</tbody>
</table>

Divert Mode
The instrument can be configured to operate in one of two divert modes:

MULTI – Up to eight divert set points can be set.
SINGLE – One divert set point can be set.

Divert Number
Select the divert setting required:
1, 2, 3, 4, 5, 6, 7 or 8 (used with associated Divert Set Point, Hot Water Set Temperature and Set Point Source displays).

Caution. Do not change divert numbers during a process (only before or after).

Operator Level (Enable Divert Number Selection)
Allows the divert number to be selected at Operator level.

Secondary Divert Alarm Source
Diverts event pen on any assigned digital condition.

Cleaning in Place
Set digital source for CIP event.

continued on next page…
Leak Condition Source (see Section 2.1, Fig. 2.1)
If a leak detect source is used, a leak detect output from that device can be transmitted to a C1900 Dairy Pasteurization unit. This allows the unit to divert flow via a second back-up/divert valve fitted in series with the first valve. If a divert event is required, digital input 1.2 must be used and \( 2d - Src \) must also be set to digital input 1.2.

Divert Set Point 1
Set the temperature for divert set point 1.

Divert Hysteresis Point
Set the hysteresis value required in engineering units (common to all set points).

Note. Only activated on values above the divert set point temperature.

Time Hysteresis
Set the time hysteresis value required between 0 and 9999 seconds (common to all set points).

Note. If product temperature reaches the set point value, forward flow is initiated \( t-Hyst \) seconds after reaching that value. If the temperature drops below the setting in the Divert Set Point display, flow is diverted immediately.

Hot Water Set Temperature 1 (Model 1952 and 1953 only)
Set the hot water control temperature set point for divert set point 1, used in conjunction with associated divert number 1.

Set Point Source 1
Select the digital source to engage set point 1.

Divert Set Point 2
Set the temperature for the required divert set point 2, used in conjunction with associated divert number 2.

Hot Water Set Temperature 2 (Models 1952 and 1953 only)
Set the hot water control temperature set point for divert set point 2, used in conjunction with associated divert number 2.

Set Point Source 2
Select the digital source to engage set point 2.

Repeat the above procedure for additional Divert Points, Hot Water and Set Point Sources.

Up to 8 individual Divert Points can be set, each has an associated Hot Water and Set Point Source.

Note. The Hot Water Set Temperature facility is not available with model 1951.

Forward/Divert Indicator Color
Select LED indicator color to display forward and diverted flow.
- \( Or-Ed \) = Orange forward flow, red diverted flow
- \( Gn-Ed \) = Green forward flow, red diverted flow
- \( OFF \) = No forward or diverted flow indication

Note. The standard setting is green for forward flow, red for diverted flow.
7.1.6 Set Up Relay Output
As detailed in IM/C1900-PGC, Section 3.5, with the following changes:

Information. Relays can be energized by alarms, logic equation results, digital inputs, control and set point modes, totalizer wrap signal (totalizer option on model 1953 only).

Select Relay Output
No setup is allowed for relay 1.1 which is assigned to the divert alarm, with polarity set as negative. All relays remain de-energized for 10 seconds after instrument reset. This holds the instrument in failsafe divert mode.

Select Relay
Select required relay.

Relay Source
Select the source required to activate the selected relay – refer to IM/C1900, Section 3.5, Table 3.1 for source description.

7.1.7 Digital Inputs
As detailed in IM/C1900-PGC, Section 3.8.

7.1.8 Set Up Digital Output
As detailed in IM/C1900-PGC, Section 3.6.

7.1.9 Set Up Analogue Output
As detailed in IM/C1900-PGC, Section 3.7.

7.1.10 Access Page
As detailed in IM/C1900-PGC, Section 3.9 with the following additional frame which is displayed after the Tune Password 2 frame:

Pen Adjust
Password frame to allow micrometer adjustment of the red pen.

N If the password is not enabled (N selected), the micrometer adjustment value is not applied to position of the red pen.

Y If the password is enabled (Y selected), pen adjustment is included.

Select micrometer adjust code.

7.1.11 Scale Adjust
As detailed in IM/C1900-PGC, Section 3.10 with the following changes:

Select Process Variable

Note. No adjustment is available for the True Time Event Pen.
8.1 Advanced Configuration Level – Fig. 8.1

8.1.1 Set Up Pen Functions
As detailed in IM/C1900-PGC, Section 5.3 with the following additional Pen Trend source frame.

Pen 2 Trend Source
Select the analog source signal for the Green Pen (2).
Usually this is selected as divert trip temperature setting ($dVt-t$), although it can be selected as cold product ($PV-2$).