Commander C1900
Circular chart recorder/controller

For more information
Further publications for the C1900 recorder/controller are available for free download from:
www.abb.com/measurement
or by scanning this code:

Links and reference numbers for the recorder/controller's publications are also shown below:

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1 Health & Safety

Document symbols

Symbols that appear in this document are explained below:

⚠️ WARNING
The signal word ‘WARNING’ indicates an imminent danger. Failure to observe this information may result in death or severe injury.

NOTICE
The signal word ‘NOTICE’ indicates potential material damage.

Note
‘Note’ indicates useful or important information about the product.

Safety precautions

Be sure to read, understand and follow the instructions contained within this publication before and during use of the equipment. Failure to do so could result in bodily harm or damage to the equipment.

⚠️ WARNING
Installation and maintenance of this equipment must be performed only by personnel authorized to work on electrical installations and in accordance with relevant local regulations.

Potential safety hazards

Electrical

⚠️ WARNING
To ensure safe use when operating this equipment, the following points must be observed:
• Up to 240 V AC may be present. Be sure to isolate the supply before removing the terminal cover.
• Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.

Safety advice concerning the use of the equipment described in this publication or any relevant Material Safety Data Sheets (where applicable) can be obtained from the Company, together with servicing and spares information.

Cleaning

The recorder/controller can be hosed down if it has been installed to IP66/NEMA 4X standards. Warm water and a mild detergent can be used.

Safety standards

This product has been designed to satisfy the requirements of IEC61010-1:2010 3rd edition ‘Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use’ and complies with US NEC 500, NIST and OSHA.

EC Directive 89/336/EEC

Electrical – In order to meet the requirements of the EC Directive 89/336/EEC for EMC regulations, this product must be used in an industrial environment.

End-of-life disposal

The recorder controller contains a small lithium battery that must be removed and disposed of responsibly in accordance with local environmental regulations.

The remainder of the recorder/controller does not contain any substance that causes undue harm to the environment and must be disposed of in accordance with the Directive on Waste Electrical and Electronic Equipment (WEEE). It must not be disposed of in Municipal Waste Collection.

ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive that initially came into force on 13 August 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment.

In conformity with European local and national regulations, electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12th August 2005.

Cleaning

The recorder/controller can be hosed down if it has been installed to IP66/NEMA 4X standards. Warm water and a mild detergent can be used.
...1 Health & Safety

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

Restriction of Hazardous Substances (RoHS)

The European Union RoHS Directive and subsequent regulations introduced in member states and other countries limits the use of six hazardous substances used in the manufacturing of electrical and electronic equipment. Currently, monitoring and control instruments do not fall within the scope of the RoHS Directive, however ABB has taken the decision to adopt the recommendations in the Directive as the target for all future product design and component purchasing.

2 Specification

Mechanical data

Protection

IP66/ NEMA 4X

Dimensions

Height – 368.8 mm (15.23 in)
Width – 382 mm (15.04 in)
Depth behind panel – 141.5 mm (5.57 in)

Materials of construction

Case – Glass fiber-filled polycarbonate
Window – Polycarbonate

Weight

Approx. 6.6 kg (14.55 lb)

Electrical

Power supply range

100 to 240 V AC ±10 % (90 V min. to 264 V AC max.)
50/60 Hz

Power consumption

<30 VA (typical for full specification unit)

Inputs/outputs

Universal analog inputs

• Up to 4 standard
• Up to 2 optional

Analog outputs

• Up to 4 standard
• Range 4 to 20 mA, maximum load 750 Ω

Relay outputs

• Up to 4 standard
• Up to 8 optional (2 × 4-relay module)
• Fully programmable – contacts rated at 5A @ 240V

Digital inputs

• 2 standard per input module, 8 per option module.
• Minimum pulse duration 250 ms
• Volt-free
• TTL

Digital outputs

• 5 V TTL
• 5 mA per output

Environmental data

Ambient operating temperature

• 0 to 55 °C (32 to 130 °F)

Ambient operating humidity

5 to 95 % RH (non-condensing)
5 to 80 % (chart only)

Approvals, certification & general safety

• CSA general safety
• UL general safety
• CSA/FM Class 1 Div 2

Emissions and Immunity

• EN 50081-2
• EN 50082-2
• IEC 61326 for an industrial environment
• CE Mark
3 Installation

Location

Locate the recorder in a position where its temperature and humidity specification will not be exceeded and ensure it is suitably protected from direct sunlight, rain, snow and hail.

Select a location away from strong electrical and magnetic fields. If this is not possible, particularly in applications where mobile communications equipment is expected to be used, screened cables within flexible, earthed metal conduit must be used.

Figure 1  General installation requirements

Figure 2  Environmental installation requirements
...3 Installation

Mounting

The C1900 is designed for panel-, wall- or pipe-mounting. To achieve the NEMA4X hose-down rating, the instrument must be installed in accordance with the procedures in Figure 3, Figure 4 and Figure 5.

Dimensions in mm (in)

Figure 3  Wall-mounting (optional)

Figure 4  Pipe-mounting (optional)
Cut hole in panel
(see Note 1 below)

Mark 4 mounting holes

4 holes 0.281 dia or tap for ¼ in thread

Locate instrument in cut-out

Secure in panel using 4 bolts, washers and nuts

Optional gasket (see Note 2 below)

Notes.

1 The instrument can be inserted into a panel cut-out of any size between the minimum and maximum dimensions illustrated, provided the cut-out is positioned centrally relative to the fixing holes. If the panel cut-out is larger than the maximum, a locally manufactured adaptor plate will be required.

2 If panel-mounting to NEMA 4X hosedown standard is required, a continuous bead of suitable silicon sealant must be applied between the case flange and the panel. Do not use the optional gasket.

Figure 5 Panel-mounting
## 4 Electrical connections

### WARNING

- The recorder/controller is not fitted with a switch therefore a disconnecting device such as a switch or circuit breaker conforming to local safety standards must be fitted to the final installation. It must be fitted in close proximity to the device, within easy reach of the operator and must be marked clearly as the disconnection for the device. A fuse must be fitted in accordance with figure (*).
- Remove all power from the supply, relay and any powered control circuits and high common mode voltages before accessing or making any connections.
- Use cable appropriate for the current loads: 3-core cable rated 3A and 90°C (194°F) minimum, that conforms to either IEC 60227 or IEC 60245. The terminals accept cables from 0.8 to 2.5 mm² (18 to 14 AWG).
- The device conforms to installation category II of IEC 61010.
- All connections to secondary circuits must have basic insulation.
- After installation there must be no access to live parts, for example, terminals.
- Terminals for external circuits are for use only with equipment with no accessible live parts.
- If the indicator is used in a manner not specified by the company, the protection provided by the equipment may be impaired.
- All equipment connected to the device’s terminals must comply with local safety standards (IEC 60950, EN601010-1).

### NOTICE

- Always route signal leads and power cables separately, preferably in earthed (grounded) metal conduit.
- Use screened cable for signal inputs and relay connections.
- Replacement of the internal battery (type Varta CR2032 3V lithium cell) must only be carried out by an approved technician.

### Accessing the terminal connections

1. Push to release handle
2. Pull handle to release door...
3. …and open door
4. Loosen captive screw
5. Swing chart plate forward
6. Unplug module
7. Release clip
8. Remove terminal block assembly
Analog input type(s) selection

Plug-in links are used to select the input type:

**Channel 1**
- PL1 and PL8 on the main board – see Figure 6

**Channels 2 to 4**
- PL1 and PL3 on the module board – see Figure 7

**Figure 6**  Input type selection (main board)

**Figure 7**  Input type selection (I/O modules)
4 Electrical connections

Channel connections

- Analog output (see Note below)
- Analog input (see B to H)
- Logic inputs (see Note below)
- Relay output

Note. Not applicable to type 2 modules

Connection summary

- Voltage
- Current (non 2-wire transmitters) *

* Recommended diode:
  Diode forward voltage >0.8 V @ 20 mA or use 2 × 1N4001 general purpose diodes in series

Thermocouple

Low voltage (mV)

4-relay module connections

8-digital inputs or outputs connections
5 Fitting chart and pen capsules

1. Raise pens

2. Lift the chart clamp and remove the chart (if fitted)

3. Fit the new chart ensuring that it is beneath the pen lifter bars

4. Locate the chart under the guides

5. Rotate the chart to align the time line with the red pen

6. Lower the chart clamp

Figure 8 Fitting the chart

1. Raise pens

2. Gently pull the arm off the bracket – see Note

3. Remove spent capsule

4. Fit new capsule ensuring that the arm locates in the pen capsule slot

5. Remove cap

6. Slide pen assembly onto the appropriate bracket until it clips into place – see Note

7. Ensure that the arm is located above its lifter bar

Figure 9 Fitting the pen capsules
6 Faceplate keys and displays

Front panel keys

Operation is performed using the keypad below the display on the faceplate(s) fitted to the front panel. There is a dedicated faceplate for each control loop but main programming of recorder/controller is performed using the keypad on the left-hand faceplate.

The function of each of the keypad keys is described below:

- **A** Side scroll key
  Enables the operator to advance to the next menu page

- **B** Down scroll key
  Enables the operator to move between parameters in any page

- **C** Up/Down keys
  Enables adjustment of any parameter value

- **D** Auto/Manual key
  Enables the process to be toggled between auto mode and manual mode as required

- **E** Programmable soft key
  Can be configured to perform a number of functions (for example, alarm acknowledge, local/remote control etc.)

Displays

A display is located on the faceplate(s) fitted to the recorder/controller's front panel. The displayed character set is as follows:

```
    A   L
    b   M
   C   n
    d   o
    E   p
    F   Q
    G   r
   H   S
    I   T
    J   U
    K   V
    L   y
```
7 Operator level menus

The operator level menus are used to acknowledge alarms, start, stop and reset totalizers (if enabled), run profile programs (if enabled), set up and run an autotune and adjust PID values. The operator level also provides access to the configuration level.

To access the operator menus:

1. From the operating page, press the key to scroll through the available menu pages.
2. Use the key to scroll through each page and its available parameters.
3. Use the and keys to select the required parameters.

The following menus are available only on the C1950 pasteurizer variant:

The following menus are available only on the C1950 pasteurizer variant:

- **ACKNLG ALAr. MS** Enables the operator to acknowledge any currently active alarms
- **TOTALS PAGE** Enables the operator to display totalizer values, their current state and manually reset any totalizers
- **SECoDe** Enables the operator to enter the configuration level security password
- **PrOFILE StAtES** Enables the operator to select a program to view and control
- **AUto tUNE** Enables the operator to run autotune
- **CONtrL PAGE** Enables the operator to configure PID values and other control settings

**dIVErt PAGE** Enables the operator to view all the divert parameters without entering the configuration menu
The 3 configuration level menus (Basic, Control and Advanced) are accessed via the operator level menu.

To access the configuration level menus:
1. From the normal operator view press the key until the page is displayed.
2. Use the keys to scroll to the required menu.
3. Press the key to scroll through the available settings.

**Basic Config** Enables the operator to configure all inputs and outputs, alarms, security passwords, pens and chart settings.

**Control Config** Enables the operator to configure setpoints, motorized valve, control parameters, digital sources and operator information.

**Advanced Config** Enables the operator to configure function keys, logic equations, pen function and pen assignment.
...8 Configuration level menus

Control configuration

- Configuration level menus
- Control configuration
- Ratio
- Valve Ratio
- M. Valve Ratio
- Control configuration
- GL–t
- Bias
- Select
- Controller
- rAdJ
- Bias Adjust Enable
- Default Action PFB
- Cool High/Low Limit
- Heat Cool Control
- Heat/Cool Control
- Heat High Limit
- Operation Header
- SP KE–H
- Heat/Cool Control
- Cascade SP Tracking
- Cascade SP High
- Cascade SP Low
- Output Tracking
- OP–HI
- Output High Limit
- OP–LO
- Output Low Limit
- Default Action PV
- dFR–PU
- dFR–SP
- dUF–P
- dFR–FA
- Set point Type
- Ratio
- Bias
- Bias
- Set Point Type
- dFR–FA
- Cool High/Low Limit
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- Default Action PV
- dFR–PU
- dFR–SP
- dUF–P
- dFR–FA
- Set point Type
- Ratio
- Bias
- Bias
- Set Point Type
9 Security options

Passwords are set and changed in the Access page in the Basic Configuration level.

Passwords can be set to secure access to the configuration levels and to pen adjustment.
10 Diagnostics and error codes

Upon power up the recorder/controller performs a series of self-tests to ensure that the recorder/controller and fitted modules are working correctly. If any of the power-up tests fail, error codes are displayed to identify the fault. Refer to Figure 10 for error code interpretations.

<table>
<thead>
<tr>
<th>Code</th>
<th>Error</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>No error</td>
<td>None</td>
</tr>
<tr>
<td>R</td>
<td>Main program data stored in non-volatile memory on main board is corrupt</td>
<td>Check and correct program data</td>
</tr>
<tr>
<td>b</td>
<td>Control Date stored in non-volatile memory on main board is corrupt</td>
<td>Check and correct control program data</td>
</tr>
<tr>
<td>C</td>
<td>Timer set up stored in battery-backed RAM is corrupt</td>
<td>Check and correct data in Set Up Timer page</td>
</tr>
<tr>
<td>d</td>
<td>Maths set up stored in battery-backed RAM is corrupt</td>
<td>Check and correct data in Set Up Maths page</td>
</tr>
<tr>
<td>E</td>
<td>Ramp/soak profile set up stored in battery-backed RAM is corrupt</td>
<td>Check and correct data in Profile Control and Profile Program pages</td>
</tr>
<tr>
<td>F</td>
<td>Totalizer set up in battery-backed RAM has been corrupt</td>
<td>Check and correct data in Set Up Totals page</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Main board</td>
</tr>
<tr>
<td>2</td>
<td>Module in position 2</td>
</tr>
<tr>
<td>3</td>
<td>Module in position 3</td>
</tr>
<tr>
<td>4</td>
<td>Module in position 4</td>
</tr>
<tr>
<td>5</td>
<td>Module in position 5</td>
</tr>
<tr>
<td>6</td>
<td>Module in position 6</td>
</tr>
</tbody>
</table>

Figure 10 Power up error codes
The recorder/controller also displays preprogrammed errors in the event of an input failure during normal operation:

<table>
<thead>
<tr>
<th>Message</th>
<th>Reason</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Ad, Fr , Il$</td>
<td>Internal analog to digital converter system hardware has failed.</td>
<td>• Check the input/output board is located correctly in its socket.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Power down and up.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the $Ad, Fr , Il$ message is still present, contact the local Service Organisation</td>
</tr>
<tr>
<td>$F - , InPt$</td>
<td>Process variable input is above or below fault detection level. Process variable input exceeds the limits for the linearizer selected.</td>
<td>• Check input source for possible broken sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check input connections</td>
</tr>
<tr>
<td>$F - , r, Spb$</td>
<td>Remote set point input is above or below fault detection level. Remote set point input exceeds the limits for the linearizer selected.</td>
<td>• Check input link position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check input configuration in the Set Up Input page</td>
</tr>
<tr>
<td>$F - , Pf, b$</td>
<td>Position feedback input is above or below fault detection level.</td>
<td></td>
</tr>
</tbody>
</table>