C1900
Circular chart recorder and recorder/controller

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>Search for or click on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Sheet C1900</td>
<td>DS/C1900R-EN</td>
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<tr>
<td>Data Sheet C1900</td>
<td>DS/C1900RC-EN</td>
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<tr>
<td>Data Sheet C1900</td>
<td>DS/C1900RC-EN</td>
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<tr>
<td>Quick Reference Guide</td>
<td>IM/C1900-QR</td>
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<td>Quick Reference Guide</td>
<td>IM/C1900-QC</td>
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<tr>
<td>Operating Guide C1900</td>
<td>IM/C1900-OGR</td>
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<td>IM/C1900-PGR</td>
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<tr>
<td>Programming Guide C1900</td>
<td>IM/C1900-PGC</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

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.

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.
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The documentation for the C1900 series of circular chart recorders is shown in Fig. 1.1. The Standard Manuals, including the data sheet, are supplied with all instruments. The Supplementary Manuals supplied depend on the specification of the instrument.

This manual includes an Installation Record which should be completed as a log of the electrical installation. The record is useful when carrying out initial instrument programming and can be retained for future reference.

Fig. 1.1 C1900 Documentation
2 PREPARATION

2.1 Accessories – Fig. 2.1

Pen Capsule
1 to 4
(depending on no. of channels)

Charts
(Pack of 3)

Keys
(door lock versions only)

A – Standard Accessories

Pipe-mounting Kit
C1900/1713

Wall-mounting Kit
C1900/1712
(kit contains 4 sets of items shown)

Case-to-Panel Gasket
C1900/0149
(see Note below)

B – Optional Accessories

Note. If panel-mounting to NEMA 4X 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.

Fig. 2.1 Accessories

2.2 Checking the Code Number – Fig. 2.2

2.2.1 Non-upgradeable Version

Note. The 1901J is a basic, non-upgradeable single pen recorder. This version is not fitted with an analog output, relay, transmitter power supply unit or digital inputs and no additional modules can be fitted. The full identification code is shown below.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1901J A 0 0 1 1 00000 STD</td>
<td>single pen recorder</td>
</tr>
<tr>
<td>Electrical code</td>
<td>standard</td>
</tr>
<tr>
<td>Option module</td>
<td>none</td>
</tr>
<tr>
<td>Options</td>
<td>none</td>
</tr>
<tr>
<td>Door lock</td>
<td>not fitted</td>
</tr>
<tr>
<td>Power supply</td>
<td>115V AC</td>
</tr>
<tr>
<td>Modules fitted in module positions 2 to 6</td>
<td>none</td>
</tr>
<tr>
<td>Special Settings</td>
<td>company standard</td>
</tr>
</tbody>
</table>

Fig. 2.2 Checking the Code Number
3 MECHANICAL INSTALLATION

### 3.1 Siting – Figs 3.1 and 3.2

- **A – Close to Sensor**
- **B – At Eye-level Location**
- **C – Avoid Vibration**

![Fig. 3.1 General Requirements](image)

**Caution.** 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 earthed (grounded) metal conduit must be used.

**C – Use Screened Cables**

![Fig. 3.2 Environmental Requirements](image)

### 3.2 Mounting – Figs. 3.3 to 3.5

**Dimensions in inches (mm)**

- 15.04 (382)
- 15.23 (386.8)
- 12.63 (320.8)
- 7.22 (183.4)
- 1.44 (36.6) – Typical Space Between Adjacent Knockout Centers
- 1.30 (33)
- 1.38 (35.1)
- 0.32 (8.3)
- 12.63 (320.8)
- 2.23 (56.8)
- 1.18 (30.1)

![Fig. 3.3 Overall Dimensions](image)
3.2.1 Wall-/Pipe-Mounting – Fig. 3.4

A – Wall-mounting (Optional)

1. Mark fixing centers on wall (4)
2. Drill suitable holes (4)
3. Secure instrument to wall using suitable fixings
4. Secure mounting brackets (4) to case

B – Pipe-Mounting (Optional)

1. Position mounting brackets to suit horizontal pipe-mounting or vertical pipe-mounting as required
2. Secure mounting brackets to case using bolts and washers
3. Fit "U" bolts into brackets
4. Secure using two nuts and washers

Fig. 3.4 Wall-/Pipe Mounting
3.2.2 Panel Mounting – Fig. 3.5

Dimensions in inches (mm)

1. Cut hole in panel (see Note 1 below)

2. Mark four mounting holes

3. Drill four suitable holes

4. Locate instrument in cut-out

5. Secure in panel using four 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.
4 ELECTRICAL INSTALLATION

Warnings.
- To comply with Underwriter Laboratories (UL) and Canadian Standards Association (CSA) certification, route signal leads and power cables in earthed (grounded), flexible metal conduit. Use the Position 1 protective ground stud (NOT the terminal module ground stud) to ground the flexible metal conduit.
- Instruments not fitted with the optional internal on/off switch and fuse must have a disconnecting device such as a switch or circuit breaker conforming to local safety standards fitted to the final installation. It must be fitted in close proximity to the instrument within easy reach of the operator and must be marked clearly as the disconnection device for the instrument.
- Remove all power from supply, relay and any powered control circuits and high common mode voltages before accessing or making any connections.
- Use cable appropriate for the load currents. The terminals accept cables up to 14AWG (2.5mm²).
- The instrument and all inputs and outputs conform to Mains Power Input Insulation Category II.
- All connections to secondary circuits must have basic insulation.
- After installation, there must be no access to live parts e.g. terminals.
- Terminals for external circuits are for use only with equipment with no accessible live parts.
- If the instrument is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- All equipment connected to the instrument’s terminals must comply with local safety standards (IEC 60950, EN601010-1).

Notes.
- Always route signal leads and power cables separately.
- Use screened cable for signal inputs and relay connections. Connect the screen to the earth (ground) stud – see Fig. 4.10.
- The terminal blocks can be removed from the main PCB when making connections – see Fig. 4.1. Before removing a module, note its position.
- If wall- or pipe-mounting to NEMA 4X hosedown standard is required, suitable cable glands must be used to prevent water ingress.

Fig. 4.1 Removing Terminal Block Assembly
4.1 Identifying the Input/Output Modules – Fig. 4.2
To gain access to the modules, open the door and chassis – see Fig. 2.2. There are six module positions as shown in Fig. 4.2.

4.2 Channel Connections
Channel 1 connections are made directly to the terminal block mounted on the motherboard.

Other Channel connections are made to standard I/O modules, fitted in positions 2, 3 or 4 – see Fig. 4.2.

![Warning. The maximum channel to channel voltage (between any 2 channels) must not exceed 500V DC.]

Notes.
- Module positions can also be used for additional I/O modules (module types 1 and 2) for use with math functions.
- The module type is marked on the component side of the PCB.

Fig. 4.2 Module Positions and Functions
4.2.1 Selecting the Analog Input Type(s) – Figs. 4.3 and 4.4
Plug-in links are used to select the input type:
Channel 1: PL1 & PL8 on the main p.c.b. (Fig. 4.3)
Channels 2 to 4: PL1 & PL3 on the module (Fig. 4.4)

<table>
<thead>
<tr>
<th>Type of Thermocouple</th>
<th>BS1843 Case</th>
<th>ANSI MC 96.1 Case</th>
<th>DIN 43714 Case</th>
<th>BS4937 Part No.30 Case</th>
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</thead>
<tbody>
<tr>
<td>Ni-Cr/Ni-Al (K)</td>
<td>Brown</td>
<td>Yellow</td>
<td>Red</td>
<td>Green</td>
</tr>
<tr>
<td>Ni-Cr/Cu-Ni (E)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Violet</td>
</tr>
<tr>
<td>NicrIsi/Nisil (Ni)</td>
<td>Orange</td>
<td>Orange</td>
<td>Orange</td>
<td>Pink</td>
</tr>
<tr>
<td>Pt/Pt-Rh (R and S)</td>
<td>White</td>
<td>Black</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>Pt-Rh/Pt-Rh (B)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Grey</td>
</tr>
<tr>
<td>Cu/Cu-Ni (T)</td>
<td>White</td>
<td>Blue</td>
<td>Red</td>
<td>Brown</td>
</tr>
<tr>
<td>Fe/Con (J)</td>
<td>Yellow</td>
<td>White</td>
<td>Black</td>
<td>Blue</td>
</tr>
<tr>
<td>Fe/Con (DIN 43710)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* Case Blue for intrinsically safe circuits

Table 4.1 Thermocouple Compensating Cable
4.2.2 Voltage and Current – Fig. 4.5

Input impedances:
- Low voltage (mV) >10MΩ
- Voltage >10MΩ
- Current (mA) 100Ω

4.2.3 2-wire Transmitter Input – Fig. 4.5

Power for the transmitter is supplied by terminal 6.

Note. The voltage across terminals 4 and 6 is 20V (nominal). This is due to internal voltage drops across a shunt resistor and measurement circuitry.

4.2.4 Thermocouple – Fig. 4.5

Use correct compensating cable between the thermocouple and the terminals – see Table 4.1 (previous page).

Automatic cold junction (ACJC) is incorporated but an independent cold (reference) junction may be used.

4.2.5 Resistance Thermometer (RTD) – Fig. 4.5

If long leads are necessary it is preferable to use a 3-lead resistance thermometer.

If 2-lead resistance thermometers are used each input must be calibrated to take account of the lead resistance.

4.2.6 Logic Inputs – Fig. 4.5

The two logic inputs accept either volt-free (switch) or TTL (5V) input types and can be used for remote switching of many recorder functions, e.g. chart stop/go, alarm acknowledgment, totalizer reset etc. Refer to the Programming Guide, IM/C1900–PGR or IM/C1900–PGC.

4.2.7 Analog Output – Fig. 4.5

4.2.8 Relay Output – Fig. 4.5

Relay specification:
- Type: single pole changeover
- Voltage: 250V AC 250V DC
- Current: 5A AC 5A DC
- Loading (non inductive): 1250VA 50W
- Isolation, contacts to earth: 2kV RMS

Fig. 4.5 Channel Connections

Note. Not applicable on Type 2 Modules.

* Recommended diode:
Diode forward voltage > 0.8 V @ 20 mA or use 2 x 1N4001 general purpose diodes in series
4.2.9 Motorized Valve – Fig. 4.6
A motorized valve with or without feedback requires 2 relays (common and normally open terminals) to drive the valve in either direction. Any two relays can be allocated for this function. Fig. 4.6 A shows two possible combinations.

**Note.** For valves with position feedback using low voltage (mV), voltage (V) or current (C), refer to Fig. 4.5 B, C and F for connections.

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![Diagram of Motorized Valve Connections](image-url)

**A – Standard Feedback Slidewire Configuration**

**B – Alternative Feedback Slidewire Configuration**

**Notes.**
1. Type 1 and type 2 modules have one relay output, therefore two modules are required.
2. Link must be connected at valve drive end, not at the controller terminals.

Fig 4.6 Motorized Valve Connections (using feedback slidewire)
4.3 Module Connections

4.3.1 Standard I/O or Analog + Relay (Module Types 1, 2 and 7) – Fig. 4.5
The connections are the same as Channel connections to the main board. Refer to Section 4.2.

4.3.2 Four Relay Module (Module Type 3) – Fig. 4.7

```
  1  2  3  4  5  6  7  8  9  10  11  12
  |   |   |   |   |   |   |   |   |   |   |   |
  | N  | N  | C  | N  | N  | C  | N  | N  | C  | N  | N  | C  |
  | lately Closed | Normally Open | Common | Normally Closed | Normally Open | Common | Normally Closed | Normally Open | Common | Normally Closed | Normally Open | Common |

Fig. 4.7 Four Relay Module Connections (Module Type 3)
```

4.3.3 Eight Digital Inputs or Outputs (Module Types 4 and 5 respectively) – Figs. 4.8 and 4.9
A plug-in link is used to select the board’s function; digital inputs or digital outputs – see Fig. 4.8. The maximum current drain from each TTL output must not exceed 5mA.

```
  1  2  3  4  5  6  7  8  9  10  11  12
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |
  |   |   |   |   |   |   |   |   |   |   |   |   |

Fig. 4.9 Eight Digital Inputs or Outputs Connections (Module Types 4 and 5)

---

4 ELECTRICAL INSTALLATION…
4.4 Power Supply Connections – Fig. 4.10

Note. Recorders manufactured before June 2005 are fitted with a Mainboard that is not equipped with a universal power supply. Ensure the supply voltage selector switch is set correctly and the appropriate fuse is fitted – see Fig 4.11.

Warning. If the optional internal power switch and fuse are not fitted, an external disconnection device and fuse must be fitted – see also Warnings on page 6.

Before making any electrical connections, see Warnings on page 6.

Notes.
1. Fuse rating:
   500mA (20 X 5mm) Type T
2. Ensure that the Earth (Ground) lead is longer than the Line and Neutral leads.

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<th>Supply Type</th>
<th>Fuse Rating</th>
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<tr>
<td>115V Supply</td>
<td>1A (20 x 5mm) Type T</td>
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<tr>
<td>230V Supply</td>
<td>½A (20 x 5mm) Type T</td>
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<tr>
<td>24V Supply</td>
<td>4A (20 x 5mm) Type T</td>
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</tbody>
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Fig. 4.10 Power Supply Connections

Fig. 4.11 Power Supply Selection
(Recorders Manufactured Before June 2005 Only)
### Position 5

<table>
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<th>Analog Input</th>
<th>Link Positions (Tick Boxes)</th>
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<th>Link Positions (Tick Boxes)</th>
<th>Logic Inputs</th>
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<td>-</td>
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<td></td>
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<td>C</td>
<td>8</td>
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<td></td>
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Relay Outputs:
- Position 6

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<td>11</td>
<td>NO</td>
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<tr>
<td>12</td>
<td>C</td>
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**Notes:**
- Not available on Module Type 2

### Position 6

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<th>Link Positions (Tick Boxes)</th>
<th>Analog Input</th>
<th>Link Positions (Tick Boxes)</th>
<th>Analog Input</th>
<th>Link Positions (Tick Boxes)</th>
<th>Analog Input</th>
<th>Link Positions (Tick Boxes)</th>
<th>Logic Inputs</th>
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<tbody>
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<td>Link Positions (Tick Boxes)</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
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<td>7</td>
<td>C</td>
<td>8</td>
<td>L1</td>
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<td>L2</td>
<td>10</td>
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<td>NO</td>
<td></td>
<td></td>
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Relay Outputs:
- Position 6

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<th>Link Positions (Tick Boxes)</th>
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</thead>
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<tr>
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<tr>
<td>11</td>
<td>NO</td>
</tr>
<tr>
<td>12</td>
<td>C</td>
</tr>
</tbody>
</table>

**Notes:**
- Not available on Module Type 2