C1300
Advanced circular chart recorder

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1 Health & Safety

Document symbols

Symbols that appear in this document are explained below:

⚠️ DANGER

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

⚠️ WARNING

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

⚠️ CAUTION

The signal word ‘CAUTION’ indicates an imminent danger. Failure to observe this information may result in minor or moderate 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.

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

The remainder of the recorder 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.

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.

Cleaning

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

Mechanical data
- Protection IP66/NEMA4X

Dimensions
- Height: 368.8 mm (15.23 in)
- Width: 382.0 mm (15.04 in)
- Depth behind panel: 141.5 mm (5.57 in)

Materials of construction
Case material:
- Glass fibre- filled reinforced polyester
Window material:
- Polycarbonate

Weight
- 6.6 kg (approx.) (14.55 lb)

Electrical
Power Supply range
- 100 to 240 V AC +/- 10% (90 V min to 264 V max AC)

Power consumption
- <30 VA (typical for full specification unit)

Inputs/Outputs
Universal analog inputs
- Up to 2 standard, (up to 4 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 x 4 relay module)
- Fully programmable. Contacts rated at 5A @ 240 V.

Digital Inputs
Input
- 2 standard per Input module, 8 per option module. Minimum pulse duration 250 ms
- Volt Free
- TTL

Output
- 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 % (non-condensing)
- 5 to 80 % (chart only)

Approvals, certification and general safety
- CSA general safety
- UL general safety

Emissions & Immunity
- EN 50081-2, EN 50082-2
- IEC 61326 for an industrial environment
- CE Mark

3 Installation

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

Figure 1 General requirements

NOTICE
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 2 Environmental requirements
4 Mounting

C1300 is designed for panel, wall-, pipe-, or panel-mounting. For NEMA4X hose down rating please follow the installation requirements shown:

**A – Wall-mounting**

1. **Mark fixing centers on wall (4)**
2. **Drill suitable holes (4)**
3. **Fit 'U' bolts into brackets**
4. **Secure using two nuts and washers**

**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. **Secure instrument to wall using suitable fixings**

Figure 3 Wall- and pipe-mounting
...4 Mounting

**NOTICE**

- The recorder 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 is required.

- 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.

Dimensions in inches (mm)

<table>
<thead>
<tr>
<th>Minimum cut-out dimensions</th>
<th>Maximum cut-out dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mark four mounting holes</strong></td>
<td><strong>0.15 (3.8) minimum</strong></td>
</tr>
<tr>
<td>4 holes 0.281 dia. or tap for ¼ in. thread</td>
<td><strong>14.6 (371.0) maximum</strong></td>
</tr>
<tr>
<td>0.64 (16.25)</td>
<td><strong>0.15 (3.8) minimum</strong></td>
</tr>
<tr>
<td>14.19 (360.4)</td>
<td><strong>13.7 (348.0) maximum</strong></td>
</tr>
<tr>
<td>12.72 (323.08) minimum</td>
<td><strong>14.6 (371.0) maximum</strong></td>
</tr>
<tr>
<td>11.25 (285.8)</td>
<td><strong>13.7 (348.0) maximum</strong></td>
</tr>
<tr>
<td>0.15 (3.8) minimum</td>
<td>0.15 (3.8) minimum</td>
</tr>
</tbody>
</table>

Figure 4 Panel-mounting
5 Electrical connections

**WARNING**

- The device 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.

---

**Figure 5  Accessing the terminal connections**

1. Push to release handle
2. Pull handle to release door...
3. ...and open the door
4. Loosen captive screw
5. Swing chart plate forward
6. Unplug module
...5 Electrical connections

Selecting the analog input type(s)

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

- Channel 1 PL1 & PL8 on the main PCB (Figure 6)
- Channels 2 to 4 PL1 & PL3 on the module (Figure 7).

![Figure 6](image1)

![Figure 7](image2)
Channel connections

A – Summary of connections

B – Voltage

C – Current (non 2-wire transmitters)*

D – 2-wire Transmitter

E – Thermocouple

F – Low voltage (mV)

G – 3-wire RTD

H – 2-wire RTD & Resistance

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

Four relay module connections (module type 3)

Eight digital input or output connections (module types 4 and 5)
6 Fitting the chart and pen capsule

Fitting the chart

1. Use the key to lift the pens from the chart and return them to the home position.
2. Lift the chart clamp and remove the chart:

3. Fit new chart ensuring it is beneath the pen lift bars, located under the chart guides and aligned to the timeline with the red pen:

4. Lower the chart clamp and secure in place:

Fitting the pen capsule

1. Use the key to lift the pens from the chart and return them to the home position.
2. Gently pull the pen arm from the bracket, taking care not to bend the arms during fitting or removal:

3. Remove spent capsule:

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

5. Ensure that pen arm is positioned above the correct lifter bar and slide pen arm onto the appropriate bracket until it clips into place:
7 Front panel display and key pads

Operation is performed using the keys on the front panel. There is a dedicated front panel for each control loop, but main programming of device is performed using the left hand key pad.

Key functions for the membrane switch are described below:

- **A** Side scroll key, allows operator to advance to the next menu page
- **B** Up key
- **C** Down key
- **D** Menu key
- **E** Dedicated pen lift key

Figure 8 Front panel keys

8 Operator level menus

The following information is displayed in the Operating Pages:

- Input (pen) channel readings
- Data logging status (if data logging option is enabled by installation of the appropriate hardware)
- System time/date (if any one of the Totalizer, Math or Timers software options are enabled by installation of the appropriate software key)
- Totalizer readings (if the totalizer software option is enabled by installation of the appropriate software key)
- Totalizer log (if the totalizer software option is enabled by installation of the appropriate software key)
- Totalizer control
- Alarm set points
9 Configuration level menus

Security

The security code, set to '0' when the recorder is despatched, can be set to any value from 0 to 9999. When set to anything other than '0', access to all configuration menus (i.e. all menus below Security Code) is prevented. Enter the correct code to enable access to the configuration menus.

Common

The common configuration menu is used to configure any standard features on the unit, such as chart and display options.
- Chart Duration
- Stop chart source
- Auto Pen drop
- Pen lift enable
- Configuration Password
- Line Rejection
- Pen Channel Display
- Totals display
- Other Channels display
- Alarm Adjust
- Totalizer Reset
- Contrast 1 (2)
- Brightness 1 (2)

Channels

The channels configuration menu is used to configure the inputs associated with pens 1 to 4. The following parameters are available for configuration:
- Pen 1(4) input type
- Pen 1 (4) linearizer type
- Pen 1 (4) units
- Pen 1 (4) electrical High
- Pen 1 (4) electrical low
- Pen 1 (4) decimal point
- Pen 1 (4) engineering High
- Pen 1 (4) engineering low
- Pen 1 (4) chart high
- Pen 1 (4) Chart low
- Pen 1 (4) broken sensor drive
- Pen 1 (4) fault detect level
- Pen 1 (4) filter
- Pen 1 (4) off tag
- Pen 1 (4) In Tag
- Pen 1 (4) out tag
- Pen 1 (4) In source
- Pen 1 (4) out source

Alarms

The alarms configuration menu is used to configure all 16 available process alarm settings. The following parameters are available for configuration:
- Alarm Type
- Alarm trip
- Alarm Hysteresis (Eng. units)
- Alarm Time hysteresis
Totalizers

The totalizer configuration menu is used to configure the totalizer settings for up to 4 totalizers. The following parameters are available for configuration:

- Totalizer 1 (4) source
- Totalizer 1 (4) tag
- Totalizer 1 (4) count direction
- Totalizer 1 (4) units
- Totalizer 1 (4) Count rate
- Totalizer 1 (4) cut off
- Totalizer 1 (4) preset
- Totalizer 1 (4) predetermined
- Totalizer 1 (4) wrap
- Totalizer 1 (4) reset source
- Totalizer 1 (4) run source
- Totalizer 1 (4) log enable

Relays

The relay configuration menu is used to set up and assign sources to all available relays within the product. The parameters available to configure are:

- Relay source
- Relay Polarity

Digital I/O configuration

The digital I/O menu is only displayed when a digital input or output type module is fitted. The parameters available to configure are:

- Digital Output source
- Digital Output Polarity
- Digital input polarity

Analog outputs

The analog output configuration menu is used to set up and assign sources to all available analog outputs within the product. The parameters available to configure are:

- Analog Output 1 (6) Source
- Analog output 1 (6) range high
- Analog output 1 (6) range low
- Analog output 1 (6) electrical High
- Analog output 1 (6) electrical Low

Logic equations

The logic equation configuration menu allows configuration of up to 8 individual logic equations:

- System Clock
  - Allows set up of the real time system clock
- Pen function
  - Allows selection of Pen 1 to 4 function (trend or Event marking)
- Calibration
  - Allows span and offset adjustment of all inputs and calibration of all pens.
10 Configuration level menus
### Modbus
Available only if enabled by installation of appropriate software key. Refer to Modbus supplementary manual IM/C1300–MOD

### Math blocks
Available only if enabled by installation of appropriate software key. Refer to Advanced software options supplementary manual IM/C1300–ADV

### Logic equations
- Select Equation
- Equation 1
- Equation 1.1
  - Alarm A1
  - Invert
- Equation 1.2
  - AND
- Equation 1.3
  - NOT
  - Alarm B1
  - Invert
- Equation 1.4
  - OR
- Equation 1.5
  - Alarm C1
  - Invert
- Equation 1.6
  - XOR
- Equation 1.7
  - None

### Timers
Available only if enabled by installation of appropriate software key. Refer to Advanced software options supplementary manual IM/C1300–ADV

### Data logging
- Sample Rate
  - 10 Seconds
- Filter Type
  - Instantaneous
- File Creation
  - On Pen Return
  - Instrument Tag
  - Boiler 1 Zone 3
  - Edit
- Pen 1 Short Tag
- Pen 1 Edit
- Pen 2 Short Tag
- Pen 2 Edit
- Pen 3 Short Tag
- Pen 3 Edit
- Pen 4 Short Tag
- Pen 4 Edit
- Serial Number
  - A/4590321/221
  - Edit

### Clock
- System Time
  - Wednesday
  - 26th May 2004
  - 15:28:59
- Set Clock
- Set Year
- Set Date
- Set Hour
- Set Minute
- Set Month
- Set Day
- Set Date
- Set hour
- Set minute
- Set month
- Set day
- Update – NO
  - Wednesday
  - 26th May 2004
  - 15:29:00

### Pen function
- Select Pen
- Pen 1 Function
- Pen 1 Source
- Input 1

### Calibration
- Select Cal
- Pen 1 Input Cal
- Pen 1 Source
- Pen 1 Offset
- Pen 1 Span
- 0
- -9999.9 gal/h
- 1.0000
- -9999.9 gal/h

### OR
- Select Cal
- Pen 1 Chart Cal
- Set Pen 1 High
- 0
- Set Pen 1 Low
- 0
## 11 Diagnostics and error codes

Upon power up the unit will perform a series of self checks to ensure that the unit and fitted modules are fitted and working correctly. The following figure describes what is shown on the front panel of the unit in the event any of these tests fail:

The instrument is also able to provide you with a pre-programmed error in the event of a failure relating to the input itself in normal operation:

<table>
<thead>
<tr>
<th>Message</th>
<th>Reason</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error1</td>
<td>Unspecified error from the Analog to Digital Converter</td>
<td>• Check that 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>Error2</td>
<td>Corrupt data from the Analog to Digital Converter</td>
<td>If the error message is still present, contact the ABB Ltd</td>
</tr>
<tr>
<td>Error3</td>
<td>No reply from the Analog to Digital Converter</td>
<td></td>
</tr>
<tr>
<td>F-inpt</td>
<td>Input is above or below fault detection level</td>
<td>Check input source for possible broken sensor</td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td>Check input connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check input link position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check input configuration</td>
</tr>
</tbody>
</table>

### Component Possible cause Action

| Module in position 2 | Analog input and/or analog output calibration is corrupt | Check and correct program data. If the fault persists, contact the company. |
| Module in position 3 |                                                                        |                                                                        |
| Module in position 4 |                                                                        |                                                                        |
| Module in position 5 |                                                                        |                                                                        |
| Module in position 6 |                                                                        |                                                                        |
| Main board          |                                                                        |                                                                        |
| Software key        | Configuration stored in non-volatile memory is corrupt.            | Power down and then up again. If the fault persists, contact the company. |

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