C1900 Series
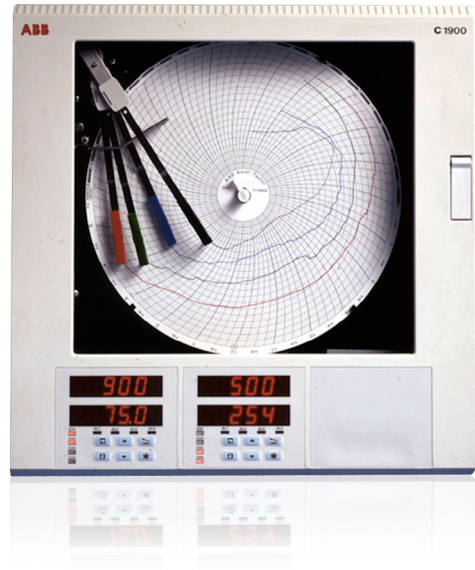# Circular Chart Recorders

Power and productivity
for a better world™

ABB

The Company

We are an established world force in the design and manufacture of measurement products for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

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	⎓	Direct current supply only
⚡	**Caution** – Risk of electric shock	∼	Alternating current supply only
⏚	Protective earth (ground) terminal	⎓∼	Both direct and alternating current supply
⏚	Earth (ground) terminal	▣	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:

1. The relevant sections of these instructions must be read carefully before proceeding.

2. Warning labels on containers and packages must be observed.

3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.

4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.

5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.

6. 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.

CONTENTS

1   INTRODUCTION

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.

A – Standard Manuals

B – Supplementary Manuals

Fig. 1.1 C1900 Documentation
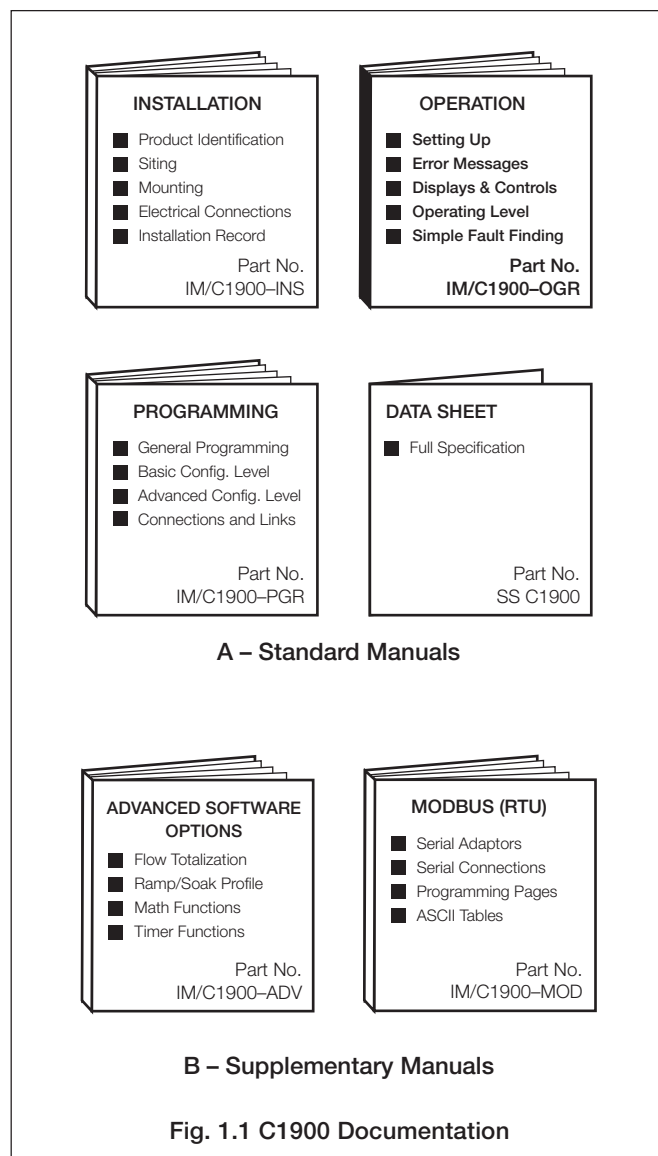
2 SETTING UP

2.1 Instrument Power-up – Fig. 2.1 and 2.2

> **Caution.** Ensure that all connections, especially to the earth stud, are made correctly.

a) Check that the input sensors are installed correctly.

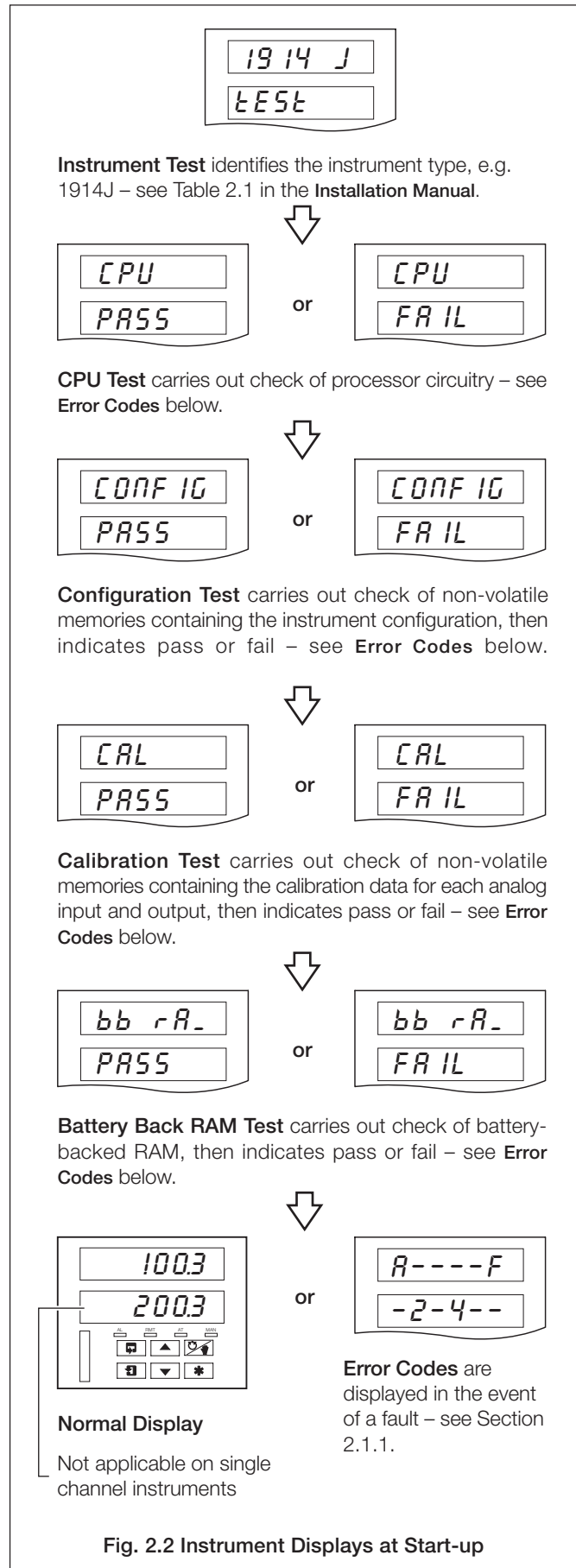b) Check that the pen(s) are installed correctly – see Fig. 2.1.

c) Switch on the supply to the instrument, any power-operated control circuits and the input signals. Wait for the pens to settle.

> **Note.** On power-up, the pens are moved to an off-chart position for automatic referencing. Pen chatter may occur on those pens nearest the reference position. **This is a normal function of the instrument.**

d) The start-up sequence shown in Fig. 2.2 is displayed on faceplate 1 when the supply is first switched on.

> **Note.** If the true time line event option is fitted, the violet event pen records on the same time line as the red pen, but on the outer edge of the chart.

Fig. 2.1 Checking the Pen(s) Installation

Instrument Test identifies the instrument type, e.g. 1914J – see Table 2.1 in the **Installation Manual**.

CPU Test carries out check of processor circuitry – see **Error Codes** below.

Configuration Test carries out check of non-volatile memories containing the instrument configuration, then indicates pass or fail – see **Error Codes** below.

Calibration Test carries out check of non-volatile memories containing the calibration data for each analog input and output, then indicates pass or fail – see **Error Codes** below.

Battery Back RAM Test carries out check of battery-backed RAM, then indicates pass or fail – see **Error Codes** below.

Normal Display

Not applicable on single channel instruments

Error Codes are displayed in the event of a fault – see Section 2.1.1.

Fig. 2.2 Instrument Displays at Start-up

2.1.1   Power-up Error Codes

If any of the power-up tests fail (see Fig. 2.2), error codes are displayed to identify the fault. Refer to Fig. 2.3 for error code interpretations.

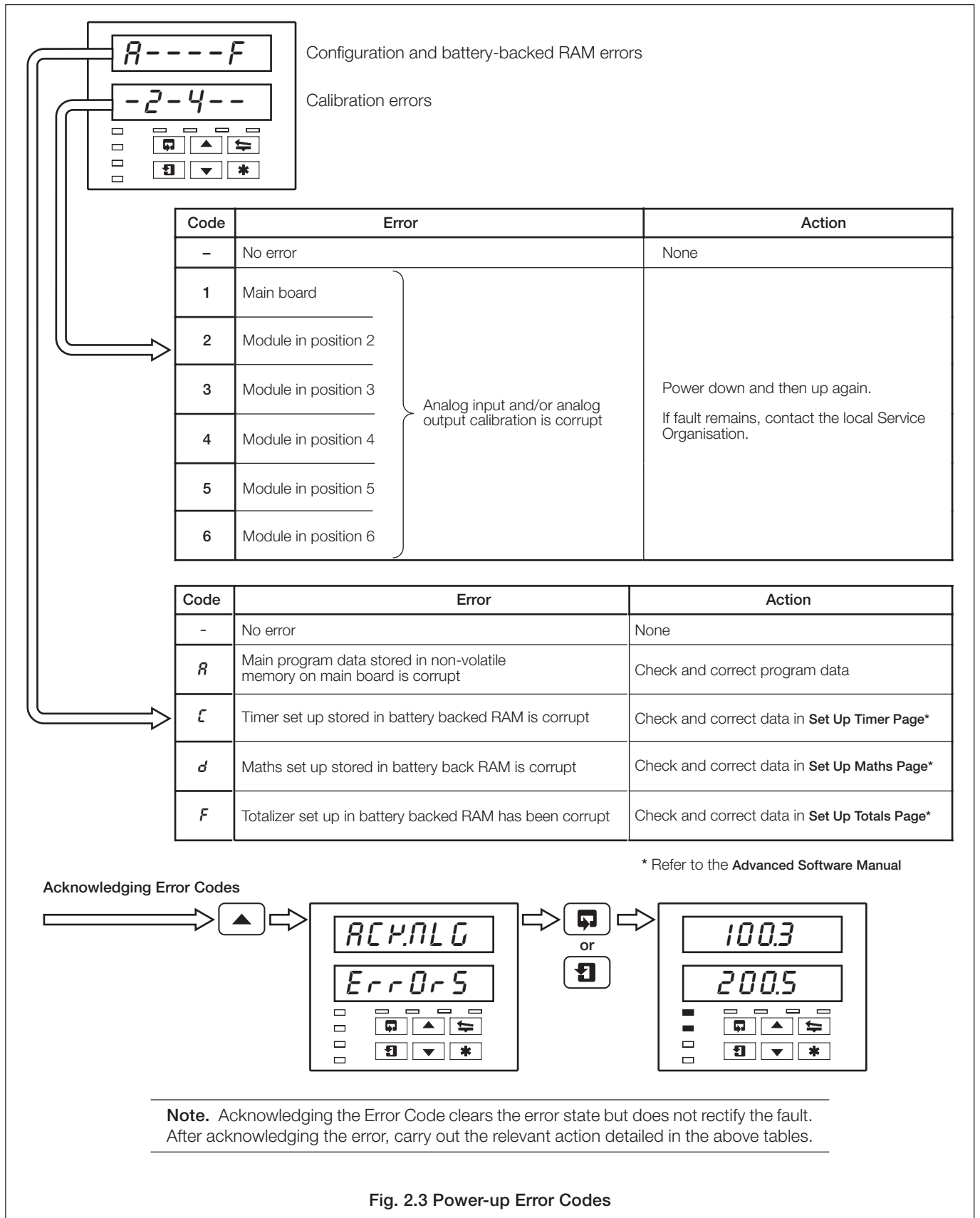|	
`A----F`	Configuration and battery-backed RAM errors
`-2-4--`	Calibration errors

Code	Error		Action
–	No error		None
1	Main board		
2	Module in position 2		
3	Module in position 3	Analog input and/or analog output calibration is corrupt	Power down and then up again.
4	Module in position 4		If fault remains, contact the local Service Organisation.
5	Module in position 5		
6	Module in position 6		

Code	Error	Action
–	No error	None
`A`	Main program data stored in non-volatile memory on main board is corrupt	Check and correct program data
`C`	Timer set up stored in battery backed RAM is corrupt	Check and correct data in **Set Up Timer Page***
`d`	Maths set up stored in battery back RAM is corrupt	Check and correct data in **Set Up Maths Page***
`F`	Totalizer set up in battery backed RAM has been corrupt	Check and correct data in **Set Up Totals Page***

*** Refer to the Advanced Software Manual**

Acknowledging Error Codes

▲	`ACK.NLG` `ErrOrS`	or	`100.3` `200.5`

Note. Acknowledging the Error Code clears the error state but does not rectify the fault. After acknowledging the error, carry out the relevant action detailed in the above tables.

Fig. 2.3 Power-up Error Codes

2.2 Fitting the Chart – Fig. 2.4

1. Raise pens
2. Lift the chart clamp and remove the chart
3. Fit new chart ensuring that it is beneath the pen lifter bars
4. Locate chart under guides
5. Rotate chart to align the time line with the red pen (see also Fig. 2.1)
6. Lower the chart clamp

Fig. 2.4 Fitting the Chart

2.3 Fitting the Pen Capsule(s) – Fig. 2.5

1. Raise pens
2. Gently pull the arm off the bracket – see **Note**

Note. Take care not to bend the arms during removal and refitting, as pen clashing may result.

3. Remove spent capsule
4. Fit new pen capsule ensuring that the arm locates in the pen capsule slot
5. Remove cap

Lifter bars

6. Ensure that the arm is positioned above its lifter bar

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

Fig. 2.5 Fitting the Pen Capsules

3 DISPLAYS & CONTROLS

The displays, LED indicators and operation/programming controls are located on the faceplate on the front panel of the instrument – see Fig 3.1.
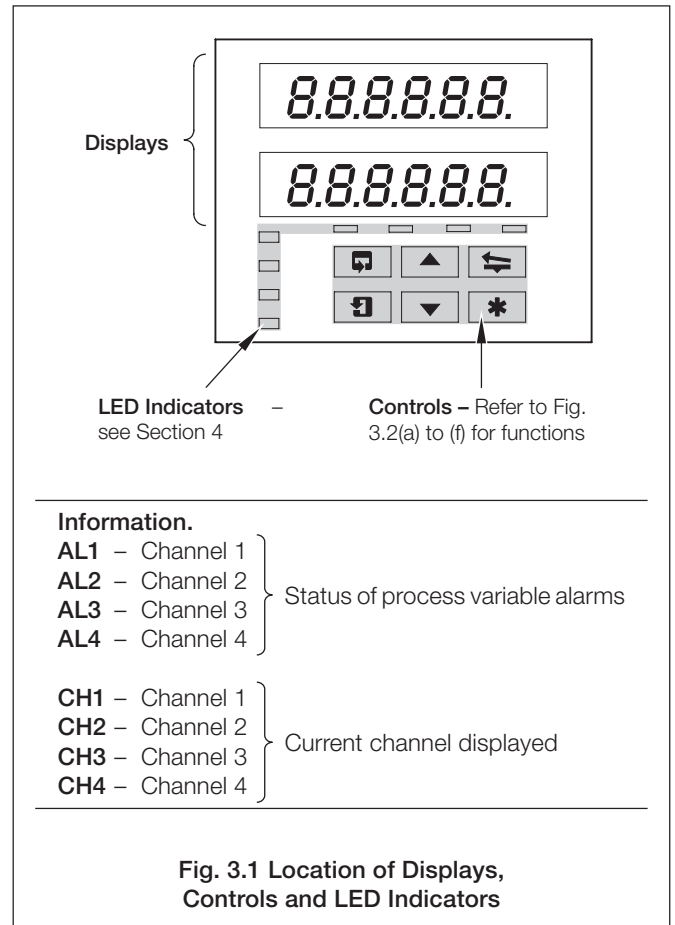
3.1 Displays and LED Indicators – Fig. 3.1

The displays comprise 2 rows of 6 characters.

At the top of each programming page (the page header) both displays are used to describe the particular page selected.

When parameters within the selected page are viewed the upper display shows the parameter and the lower display shows the value or setting for that parameter.

Alarm and Channel states are indicated by separate LEDs on the faceplate of the front panel of the instrument – see Sections 4.1, 4.2 and 4.3.

Displays

LED Indicators – see Section 4

Controls – Refer to Fig. 3.2(a) to (f) for functions

Information.
AL1 – Channel 1
AL2 – Channel 2
AL3 – Channel 3
AL4 – Channel 4
Status of process variable alarms

CH1 – Channel 1
CH2 – Channel 2
CH3 – Channel 3
CH4 – Channel 4
Current channel displayed

Fig. 3.1 Location of Displays, Controls and LED Indicators

A	𝑅		L	𝐿
B	𝑏		M	–
C	𝐶 or 𝑐		N	𝑛 or 𝑛
D	𝑑		O	𝑂 or 𝑜
E	𝐸		P	𝑃
F	𝐹		Q	𝐶.
G	𝐺		R	𝑟
H	𝐻 or ℎ		S	𝑆
I	𝐼		T	𝑡
J	𝐽		U	𝑈
K	𝐾.		V	𝑈.
			Y	𝑦

Table 3.1 Character Set

3.2   Use of Controls – Fig. 3.2(a) to (f)

Page 1 | | Page 2
Frame 1 | | Frame 1
Frame 2 | | Frame 2
Frame 3 | | Frame 3
Frame 4 | |

Return from any frame
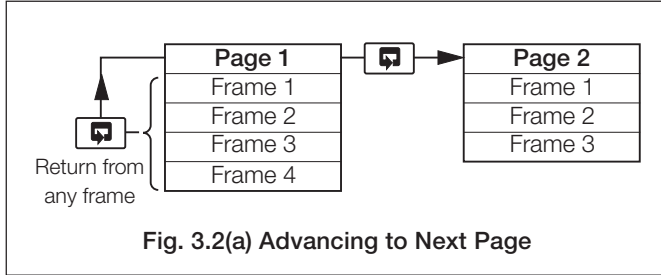
Fig. 3.2(a) Advancing to Next Page

Page X
Frame 1

Advance to next Frame

Frame 2
Frame 3
Frame 4

Fig. 3.2(b) Moving Between Parameters

Parameter Value   ▲ ▼ } Adjust
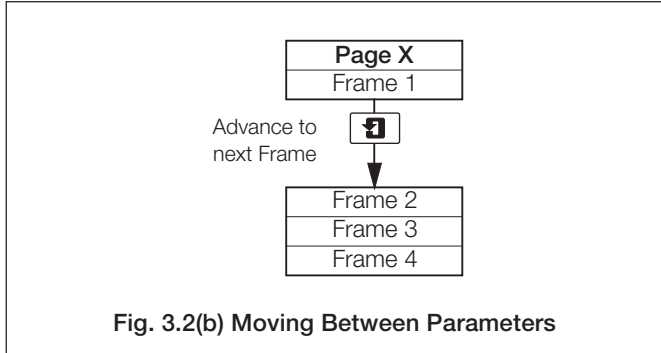
Note. Continued pressure on the ▲ and ▼ keys causes the rate of change of the displayed value to increase. To make small adjustments operate the keys momentarily.

Fig. 3.2(c) Adjusting a Parameter Value

Parameter X
Y
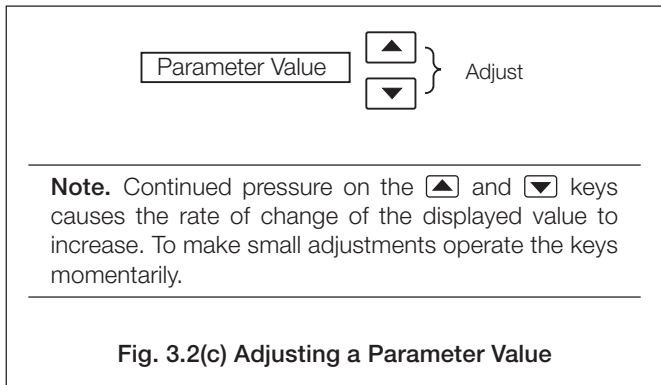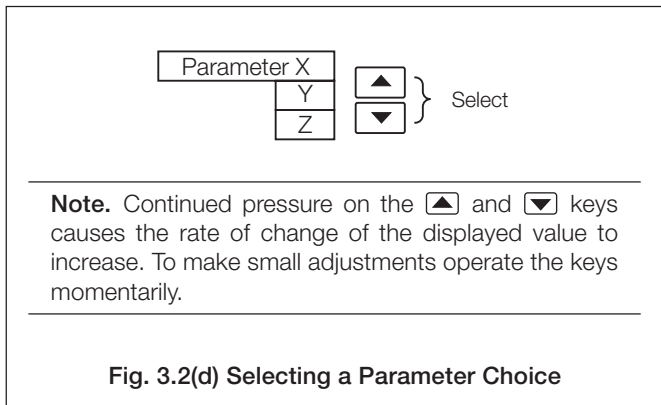Z   ▲ ▼ } Select

Note. Continued pressure on the ▲ and ▼ keys causes the rate of change of the displayed value to increase. To make small adjustments operate the keys momentarily.
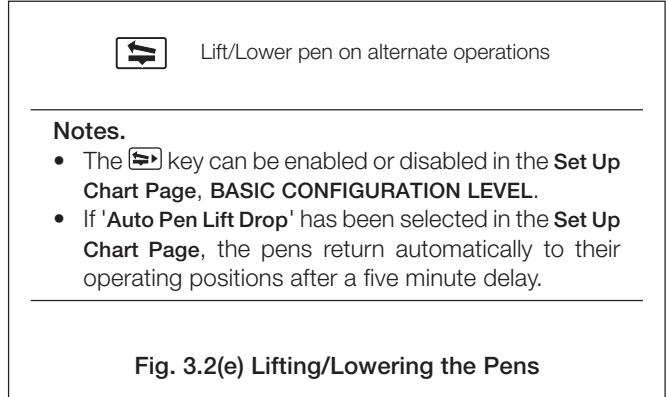
Fig. 3.2(d) Selecting a Parameter Choice

⇆   Lift/Lower pen on alternate operations

Notes.
- The ⇆ key can be enabled or disabled in the **Set Up Chart Page**, **BASIC CONFIGURATION LEVEL**.
- If '**Auto Pen Lift Drop**' has been selected in the **Set Up Chart Page**, the pens return automatically to their operating positions after a five minute delay.

Fig. 3.2(e) Lifting/Lowering the Pens

Information. The ✳ key is programmed in the **Set Up Function Keys Page**, **ADVANCED CONFIGURATION LEVEL**.

✳   Acknowledge all alarms

or

Return operator to top of **Operating Page**.

✳ | ✳

Op. Page | Page X | Page X
Parameter 1 | Parameter 1 | Parameter 1
Parameter 2 | Parameter 2 | Parameter 2
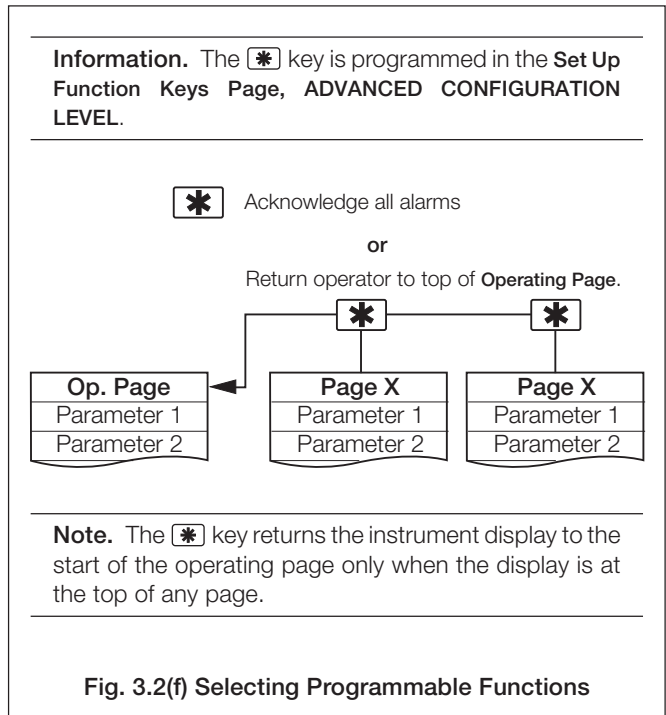
Note. The ✳ key returns the instrument display to the start of the operating page only when the display is at the top of any page.

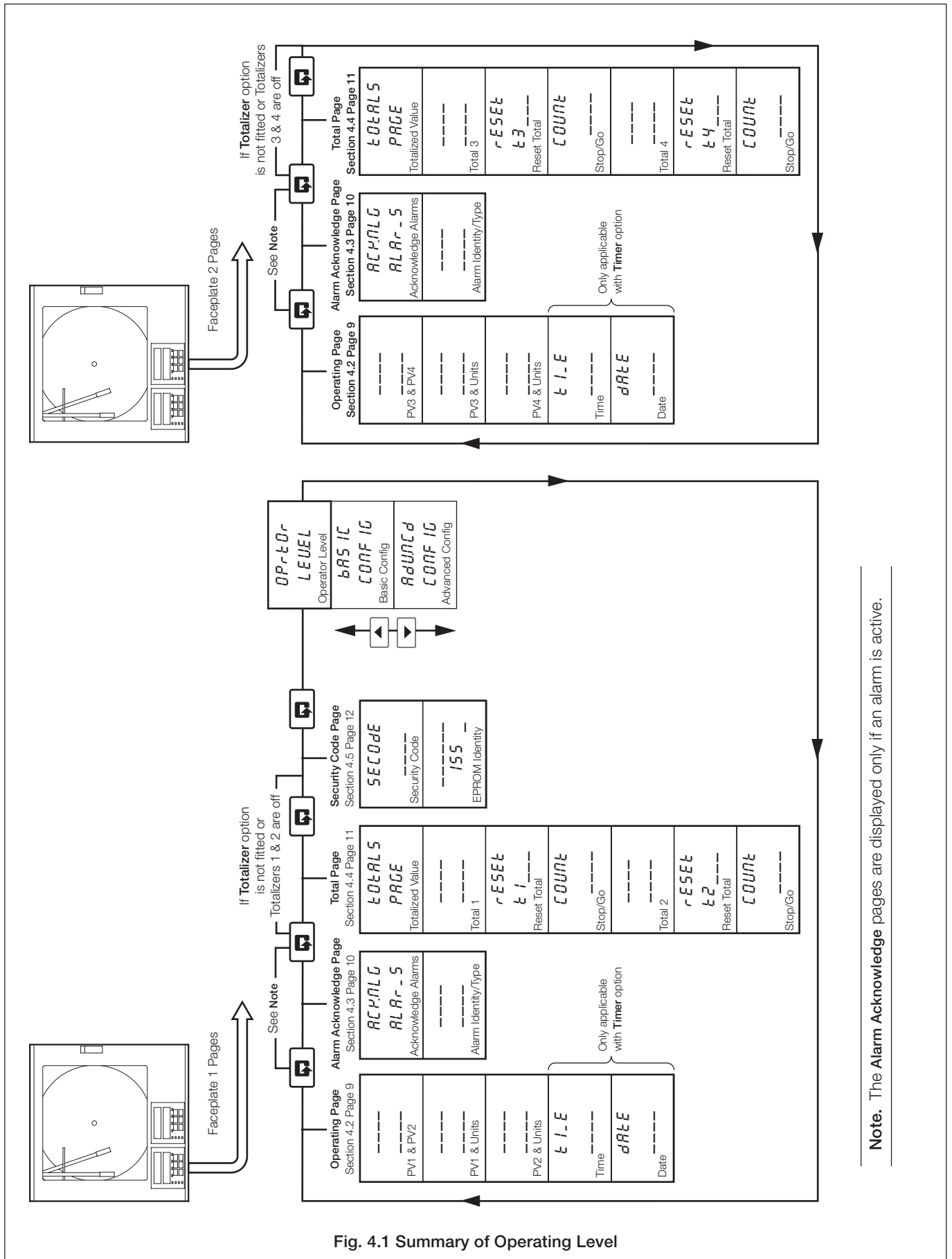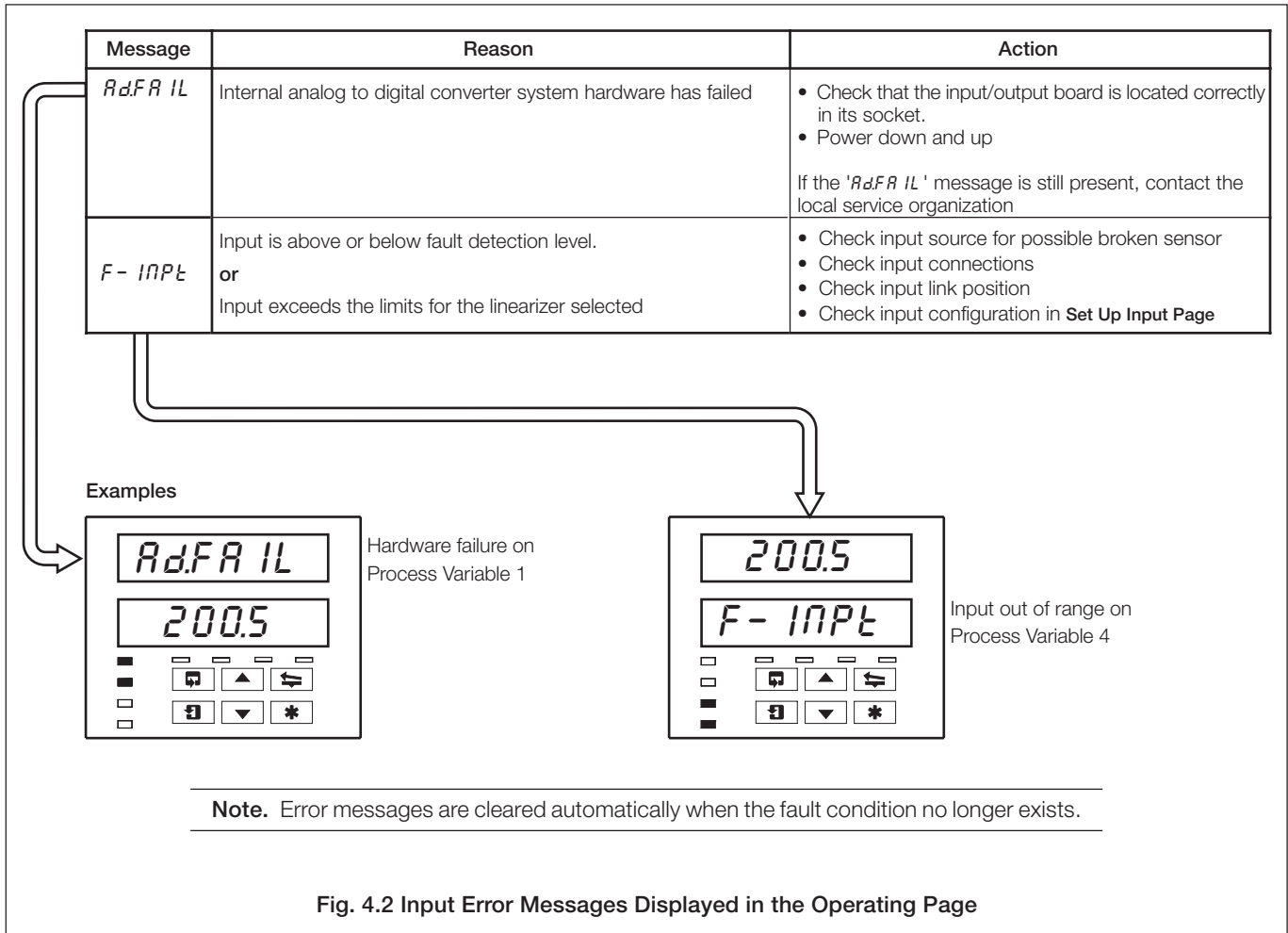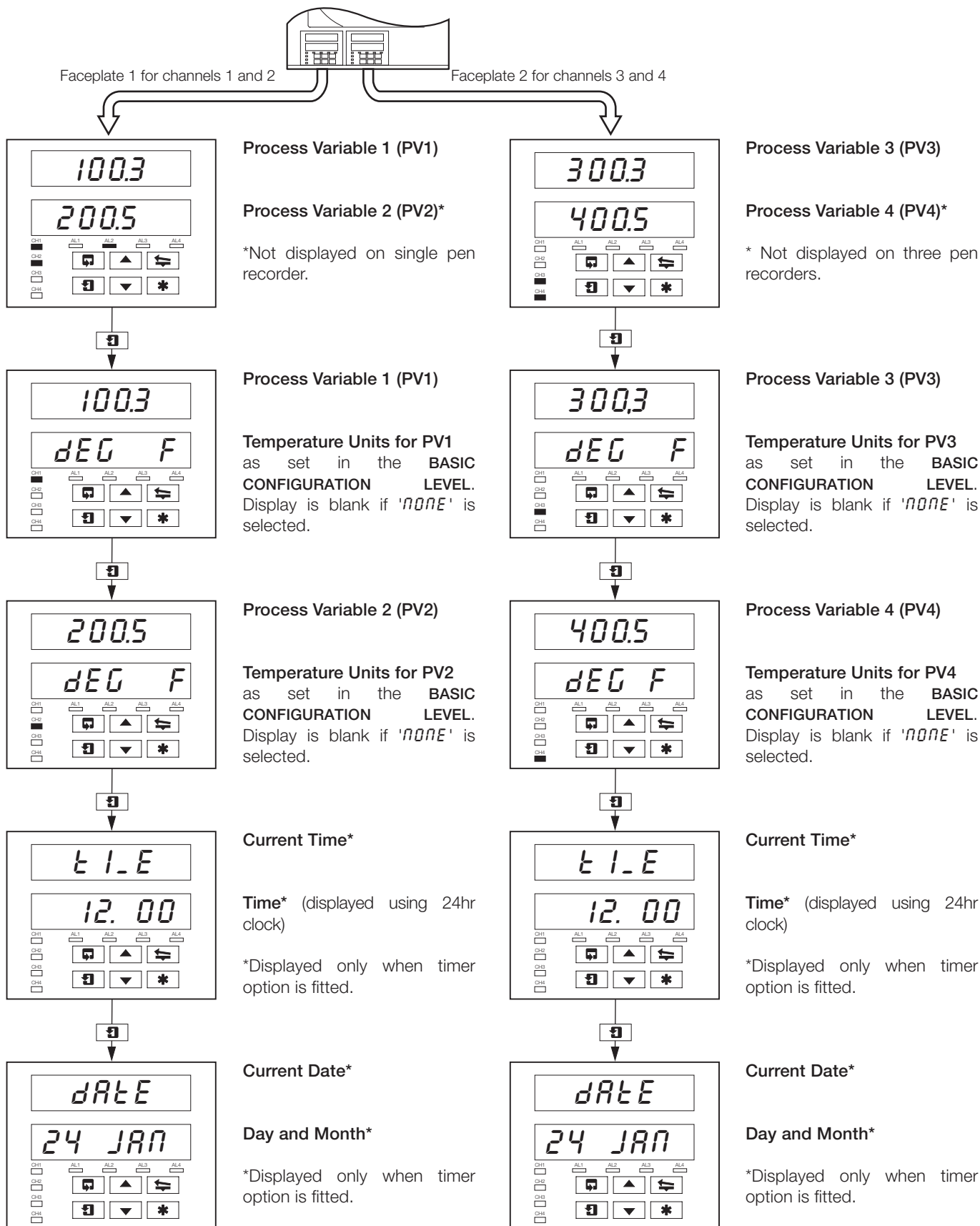**Fig. 3.2(f) Selecting Programmable Functions**

4 OPERATION

Fig. 4.1 Summary of Operating Level

The instrument has dedicated **Operating Pages** in the **OPERATOR LEVEL** – see Sections. 4.1 to 4.4. These pages are used for general monitoring of the process measurements and are not affected by the security system which inhibits access to the **PROGRAMMING LEVELS** only – see Section 4.5 on page 12.

4.1 Input Error Messages – Fig. 4.2

Message	Reason	Action
Ad.FA IL	Internal analog to digital converter system hardware has failed	• Check that the input/output board is located correctly in its socket. • Power down and up If the '*Ad.FA IL*' message is still present, contact the local service organization
F - INPt	Input is above or below fault detection level. **or** Input exceeds the limits for the linearizer selected	• Check input source for possible broken sensor • Check input connections • Check input link position • Check input configuration in **Set Up Input Page**

Examples

Ad.FA IL

200.5

Hardware failure on
Process Variable 1

200.5

F - INPt

Input out of range on
Process Variable 4

Note. Error messages are cleared automatically when the fault condition no longer exists.

Fig. 4.2 Input Error Messages Displayed in the Operating Page

4.2   Operating Page Displays

Faceplate 1 for channels 1 and 2   **Faceplate 2 for channels 3 and 4**

100.3	**Process Variable 1 (PV1)**
200.5	**Process Variable 2 (PV2)*** *Not displayed on single pen recorder.

300.3	**Process Variable 3 (PV3)**
400.5	**Process Variable 4 (PV4)*** * Not displayed on three pen recorders.

100.3	**Process Variable 1 (PV1)**
dEG F	**Temperature Units for PV1** as set in the **BASIC CONFIGURATION LEVEL**. Display is blank if '*NONE*' is selected.

300.3	**Process Variable 3 (PV3)**
dEG F	**Temperature Units for PV3** as set in the **BASIC CONFIGURATION LEVEL**. Display is blank if '*NONE*' is selected.

200.5	**Process Variable 2 (PV2)**
dEG F	**Temperature Units for PV2** as set in the **BASIC CONFIGURATION LEVEL**. Display is blank if '*NONE*' is selected.

400.5	**Process Variable 4 (PV4)**
dEG F	**Temperature Units for PV4** as set in the **BASIC CONFIGURATION LEVEL**. Display is blank if '*NONE*' is selected.

tI_E	**Current Time***
12. 00	**Time*** (displayed using 24hr clock) *Displayed only when timer option is fitted.

tI_E	**Current Time***
12. 00	**Time*** (displayed using 24hr clock) *Displayed only when timer option is fitted.

dAtE	**Current Date***
24 JAN	**Day and Month*** *Displayed only when timer option is fitted.

dAtE	**Current Date***
24 JAN	**Day and Month*** *Displayed only when timer option is fitted.

4.3   Alarm Acknowledge Page

4.3.1   Alarm Indications – Fig. 4.3
The definitions for alarm states (on, off or flashing) are detailed in Fig. 4.3.
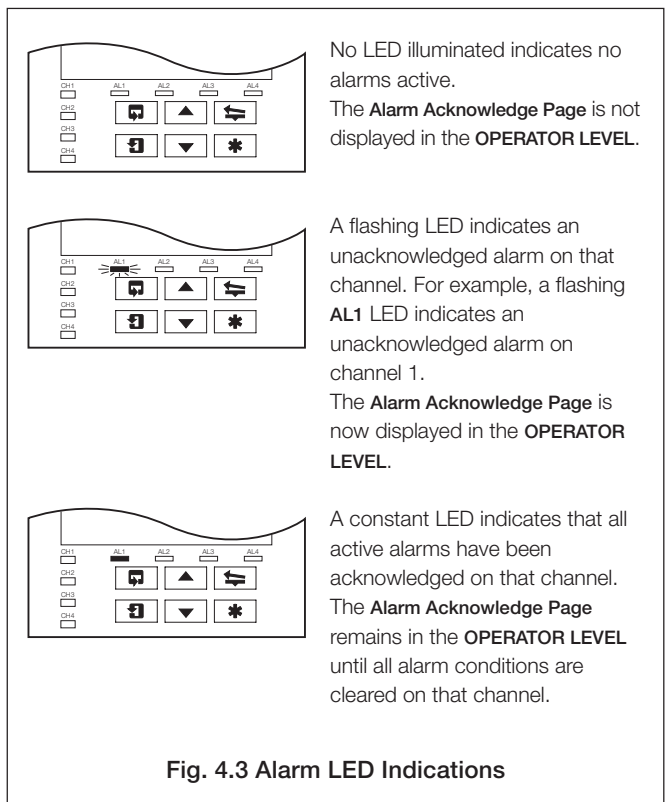
4.3.2   Acknowledging Alarms

> **Note.** Channel 1 and 2 alarms can be acknowledged only from faceplate 1. Channel 3 and 4 alarms (if applicable) can be acknowledged only from faceplate 2.
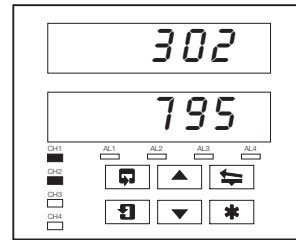
Unacknowledged alarms can be acknowledged from the faceplate controls on the front panel in two ways:

In the **OPERATING LEVEL** – by pressing the ✳ key at any frame (providing the key is programmed for this function – see Section 4.1 in the **Programming Manual**).

In the **Alarm Acknowledge Page** – by pressing the ▲ key – see Section 4.3.3 following.

No LED illuminated indicates no alarms active.
The **Alarm Acknowledge Page** is not displayed in the **OPERATOR LEVEL**.

A flashing LED indicates an unacknowledged alarm on that channel. For example, a flashing **AL1** LED indicates an unacknowledged alarm on channel 1.
The **Alarm Acknowledge Page** is now displayed in the **OPERATOR LEVEL**.

A constant LED indicates that all active alarms have been acknowledged on that channel.
The **Alarm Acknowledge Page** remains in the **OPERATOR LEVEL** until all alarm conditions are cleared on that channel.

Fig. 4.3 Alarm LED Indications

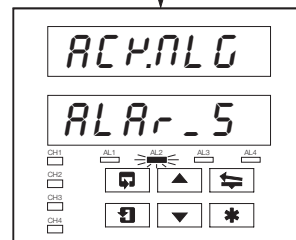### 4.3.3   Using the Alarm Acknowledge Page

No Alarm Active
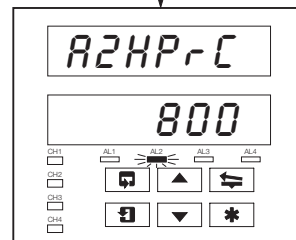No LED indicators illuminated.

Alarm Activated
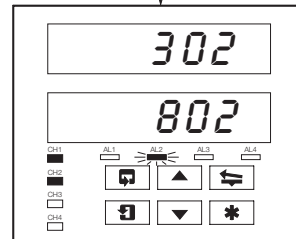
Alarm Active
AL2 LED indicator flashing, indicating active alarm on channel 2.

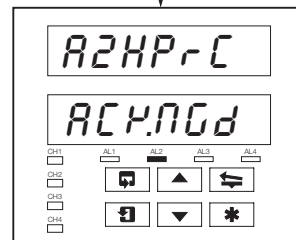Use ▢ key to go to top of **Alarm Acknowledge Page**.

Alarm Acknowledge Page
Use ▤ key to advance to next frame

Alarm Identity
Upper display: shows the alarm identity and type.

**Lower Display:** shows the trip level of the alarm identified in the upper display.

Acknowledge Alarm
Use ▲ key to acknowledge the alarm (see). When the alarm is acknowledged, '*ACK.NGd*' is displayed and a constant LED indicates the acknowledged alarm.

If there are more active alarms on channel 2 the LED continues to flash until all alarms for that channel have been acknowledged.

> **Note.** The ✳ key or a digital input can also be used to acknowledge alarm, if programmed.

4.4   Totals Page Displays

This page is omitted from both faceplates if the **Totalizer Option** is not fitted. The page is also omitted from faceplate 1 if both Totals 1 and 2 are set to *OFF* and from faceplate 2 if both Totals 3 and 4 are set to *OFF* – refer to the **Set Up Totals Page** in the **Advanced Software Options Manual**.
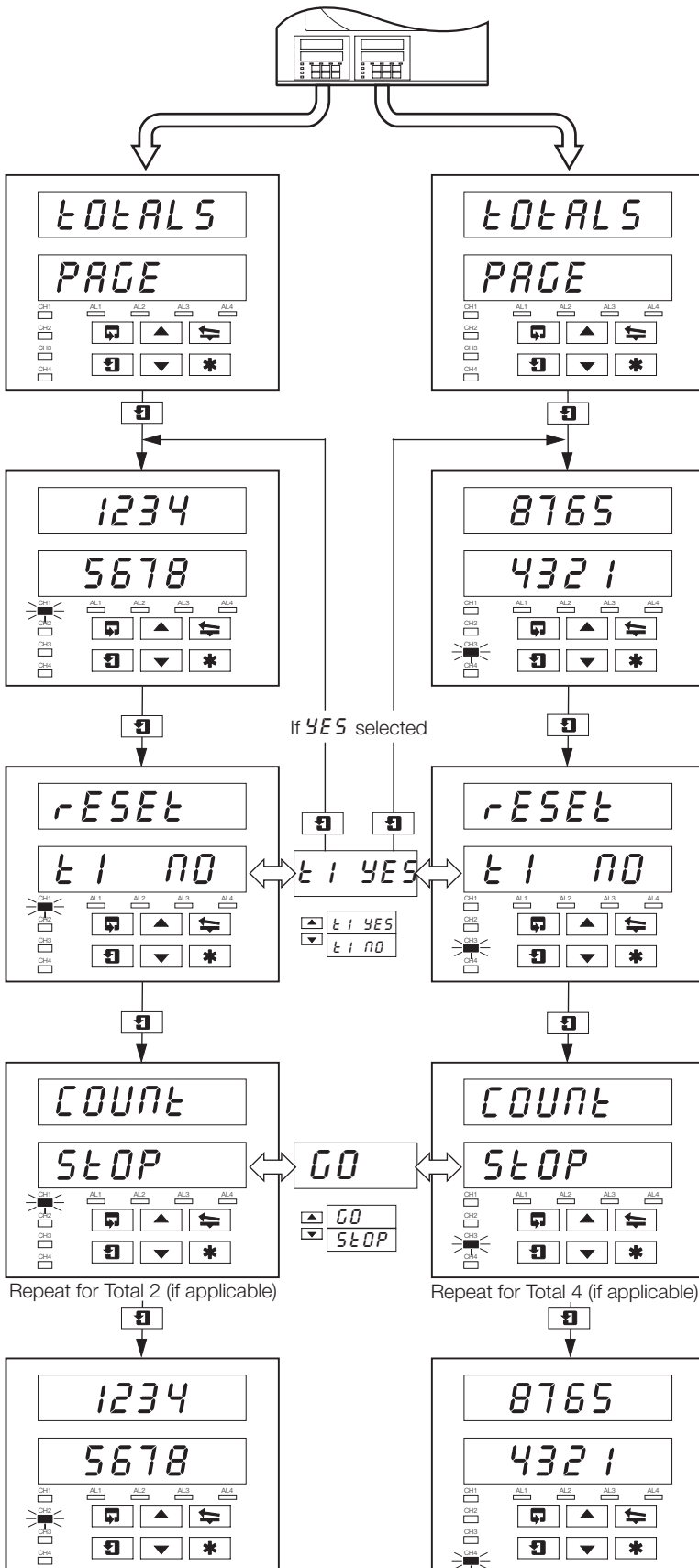
Front Panel (Batch) Flow Total 1 (3)
The batch flow total is calculated from process variable 1 (3). The flow total can be reset if **Reset Enable** in **Set Up Totals Page** is set to '*EnbL-Y*'.

The flashing channel LED indicates the flow total displayed.

For example, a flashing channel 1 LED indicates **Flow Total 1** parameters displayed.

Counter Reset
The Front (Batch) Flow Total can be reset to the **Preset Value** in **Set Up Totals Page** if required.

Select '*t1 YES*' to reset the counter ('*t1*' indicates **Flow Total 1**).

Note. If the Counter Reset is disabled in **Set Up Totals Page**, the counter reset frame is omitted.

Counter Stop/Go
Select '*GO*' to start the counter or '*StOP*' to stop it.

Note. If the Counter Stop/Go is disabled in **Set Up Totals Page**, the frame can be viewed but not altered. If a digital signal is assigned to the **Totalizer Stop/Go**, an active digital signal sets the counter to *GO* and the Counter cannot be stopped from the front panel.
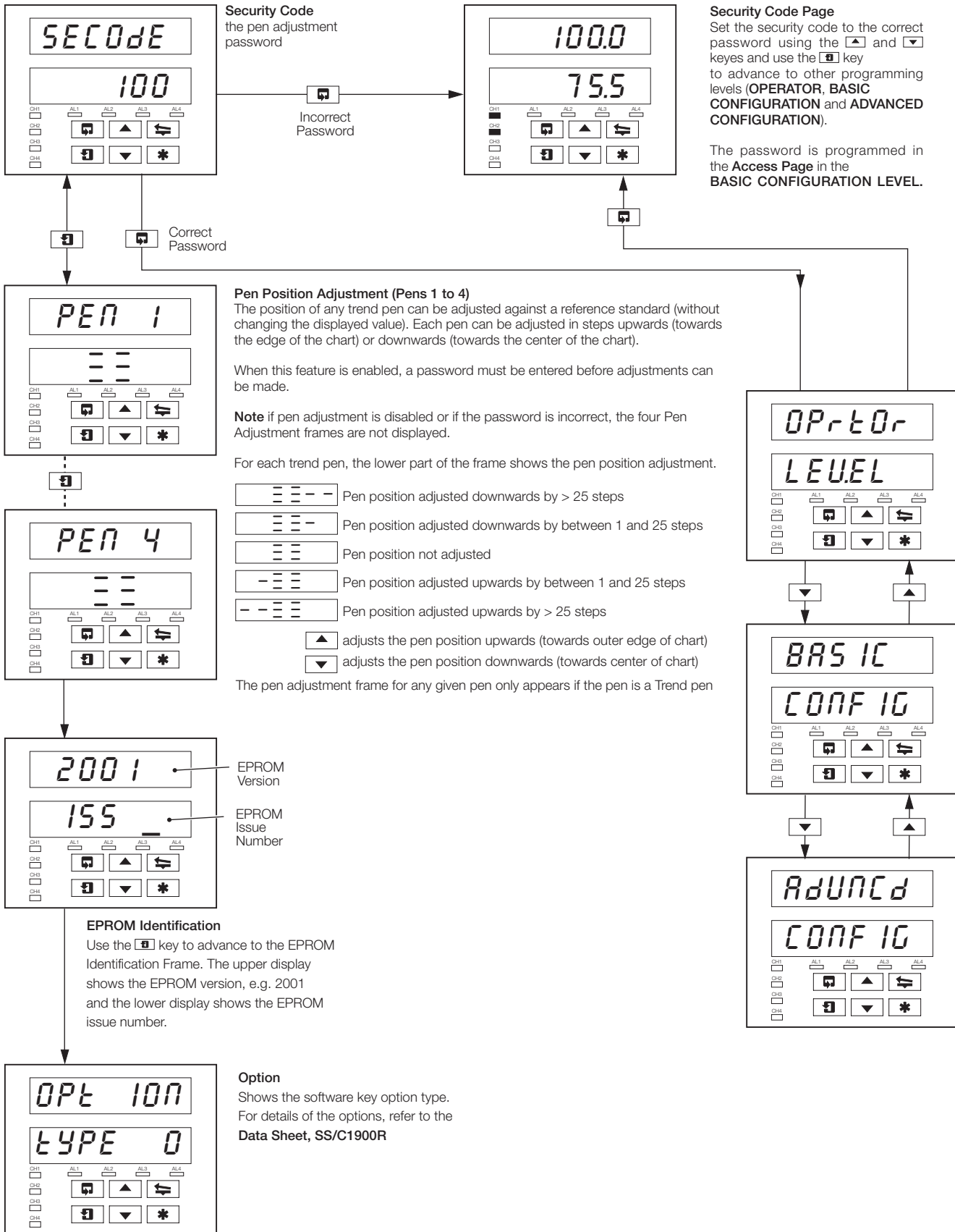
Front Panel (Batch) Flow Total 2 (4)
Repeat the above procedure for **Flow Total** 2 (4).

Note. The number of totalizers is dependent on the number of pens fitted to the instrument e.g. a 3 pen instrument has 3 totalizers.

4.5 Access to Configuration Levels

A security system is used to prevent tampering with the programmed parameters by utilizing a password giving access to all programming pages – refer to the **Programming Manual**.

Security Code
the pen adjustment password

SECOdE
100

Incorrect Password

Security Code Page
Set the security code to the correct password using the ▲ and ▼ keyes and use the key to advance to other programming levels (**OPERATOR**, **BASIC CONFIGURATION** and **ADVANCED CONFIGURATION**).

The password is programmed in the **Access Page** in the **BASIC CONFIGURATION LEVEL.**

100.0
75.5

Correct Password

Pen Position Adjustment (Pens 1 to 4)
The position of any trend pen can be adjusted against a reference standard (without changing the displayed value). Each pen can be adjusted in steps upwards (towards the edge of the chart) or downwards (towards the center of the chart).

When this feature is enabled, a password must be entered before adjustments can be made.

Note if pen adjustment is disabled or if the password is incorrect, the four Pen Adjustment frames are not displayed.

For each trend pen, the lower part of the frame shows the pen position adjustment.

PEN 1

PEN 4

Pen position adjusted downwards by > 25 steps

Pen position adjusted downwards by between 1 and 25 steps

Pen position not adjusted

Pen position adjusted upwards by between 1 and 25 steps

Pen position adjusted upwards by > 25 steps

▲ adjusts the pen position upwards (towards outer edge of chart)
▼ adjusts the pen position downwards (towards center of chart)

The pen adjustment frame for any given pen only appears if the pen is a Trend pen

OPrtOr
LEU.EL

BASIC
CONFIG

AdUNCd
CONFIG

2001
ISS

EPROM Version

EPROM Issue Number

EPROM Identification
Use the key to advance to the EPROM Identification Frame. The upper display shows the EPROM version, e.g. 2001 and the lower display shows the EPROM issue number.

OPt ION
tYPE 0

Option
Shows the software key option type.
For details of the options, refer to the
Data Sheet, SS/C1900R

5 SIMPLE FAULT FINDING

Symptom	Possible Cause	Action
Does not power up	a) Internal fuse (if fitted) is blown b) Internal power switch (if fitted) is OFF c) Power supply connections are incorrect	a) Check wiring, rectify fault and replace fuse b) Turn power switch ON c) Check connections
Chart does not appear to move	a) Very slow chart speed selected b) Chart stop function enabled	a) Select required chart speed in **Set Up Chart Page** b) De-activate source being used to stop chart – see **Set Up Chart Page**
Pens in recording position but do not drop onto paper	Chart stop function enabled	De-activate source used to stop chart – see **Set Up Chart Page**
Red pen does not move beyond 94% position on chart	When real time event pen is fitted the red pen cannot go beyond 94% to prevent pens clashing	Use chart range which prevents the need to go beyond 94% of maximum on chart
Pen lift switch on front panel does not work	Pen lift switch is disabled	Enable pen-lift switch in **Set Up Chart Page**
Pens do not remain lifted when pen lift key is used	Auto pen drop feature is enabled	Disable auto pen drop in **Set Up Chart Page** if this is not required
Analog inputs are slow to respond	A large filter time has is set	Set digital filter value to give required response in **Set Up Inputs**
Time or date incorrect	Not set for correct local time	Set correct time and date in **Set Up Clock Page** – refer to **Advanced Software Manual**
Totalizers cannot be set to STOP or GO	Operator STOP/GO selection is not enabled in the **OPERATOR LEVEL**	Enable counter STOP/GO in the **Set Up Totals Page**
Totalizer cannot be set to STOP	Digital signal assigned to the total STOP/GO function is active	De-activate digital signal assigned to total STOP/GO function
External relays connected to relays in instrument fail to de-energize	Arc suppression capacitors are provided across the relay contacts and capacitor leakage current may be sufficient to prevent an external relay from de-energizing	Remove the arc suppression components – IC4 and IC5 on mainboard IC6 and IC7 on standard I/O and analog relay IC3 to IC10 on 4 relay module

6   SPARES LIST

Item	Part No.

Pen Capsules (pack of 3)
Black C1900/0119
Blue C1900/0120
Red C1900/0121
Green C1900/0122
Violet* C1900/0123

Pen Arm Assemblies
ER/C Type Chart (J or R in Code Number) – Standard Pen C1900/0076
ER/C Type Chart (J or R in Code Number) – Event Pen C1900/0078
PX105 and PXR105 Type Chart (K or S in Code Number) – Standard Pen C1900/0075
PX105 and PXR105 Type Chart (K or S in Code Number) – Event Pen C1900/0077

Fuses
24V B11071 (4A)
115V B11070 (1A)
230V B11069 (500mA)

*True time line event option only.

NOTES

Products and customer support

Automation Systems
For the following industries:
— Chemical & Pharmaceutical
— Food & Beverage
— Manufacturing
— Metals and Minerals
— Oil, Gas & Petrochemical
— Pulp and Paper

Drives and Motors
— AC and DC Drives, AC and DC Machines, AC Motors to 1kV
— Drive Systems
— Force Measurement
— Servo Drives

Controllers & Recorders
— Single and Multi-loop Controllers
— Circular Chart and Strip Chart Recorders
— Paperless Recorders
— Process Indicators

Flexible Automation
— Industrial Robots and Robot Systems

Flow Measurement
— Electromagnetic Flowmeters
— Mass Flowmeters
— Turbine Flowmeters
— Wedge Flow Elements

Marine Systems & Turbochargers
— Electrical Systems
— Marine Equipment
— Offshore Retrofit and Refurbishment

Process Analytics
— Process Gas Analysis
— Systems Integration

Transmitters
— Pressure
— Temperature
— Level
— Interface Modules

Valves, Actuators and Positioners
— Control Valves
— Actuators
— Positioners

Water, Gas & Industrial Analytics Instrumentation
— pH, Conductivity and Dissolved Oxygen Transmitters and Sensors
— Ammonia, Nitrate, Phosphate, Silica, Sodium, Chloride, Fluoride, Dissolved Oxygen and Hydrazine Analyzers
— Zirconia Oxygen Analyzers, Katharometers, Hydrogen Purity and Purge-gas Monitors, Thermal Conductivity

Customer support
We provide a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.

UK
ABB Limited
Tel: +44 (0)1453 826661
Fax: +44 (0)1453 829671

USA
ABB Inc.
Tel: +1 215 674 6000
Fax: +1 215 674 7183

Contact us

To find your local ABB contact visit:
www.abb.com/contacts

For more product information visit:
www.abb.com

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