

PROFI
PROCESS FIELD BUS
BUS

The Company

We are an established world force in the design and manufacture of instrumentation 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.

The NAMAS Calibration Laboratory No. 0255 is just one of the ten flow calibration plants operated by the Company, and is indicative of our dedication to quality and accuracy.

EN ISO 9001:1994



Cert. No. Q05907

EN 29001 (ISO 9001)



Lenno, Italy – Cert. No. 9/90A

Stonehouse, U.K.



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.

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1 INTRODUCTION

Note. This Supplementary User Guide contains information specific to PROFIBUS®-DP-enabled AX400 Series analyzers and must be read in conjunction with the appropriate User Guide for the product.

1.1 PROFIBUS

PROFIBUS is a manufacturer-independent, open fieldbus standard for a wide range of applications in manufacturing, process and building automation. Manufacturer independence and openness are ensured by the international standard EN 50170.

Using the PROFIBUS protocol, devices from different manufacturers exchange information on the same communications bus without the need for special interface equipment.

The PROFIBUS family comprises three types of protocol, PROFIBUS-DP, PROFIBUS-FMS and PROFIBUS-PA, each of which is used for different tasks. Of these three protocols, the most important for process automation are PROFIBUS-DP and PROFIBUS-PA.

Further information on PROFIBUS can be found at www.profibus.com.

1.1.1 PROFIBUS-DP

PROFIBUS-DP is designed for high-speed data exchange and is commonly used by complex or externally powered devices. The central controller or 'master' device (e.g. PLC or PC) utilizes PROFIBUS-DP as a fast serial connection with distributed (slave) field devices such as PROFIBUS-enabled AX400 Series analyzers.

The master reads the input information cyclically in a defined, recurring order from the slave(s). When configuring the bus system, the user assigns an address in the range 0 to 125 to each slave device and also defines which of the slaves are to be included in, or excluded from, the data acquisition cycle.

1.1.2 PROFIBUS-PA

PROFIBUS-PA is designed to accommodate process automation field devices that require power via the network with the option to use intrinsic safety for hazardous areas. Typical devices using this protocol include transmitters and positioners. A DP/PA coupler or link device is used to connect the PROFIBUS PA network to the PROFIBUS DP network.

...1 INTRODUCTION

1.2 PROFIBUS and ABB Products

AX400 analyzers utilize PROFIBUS DP as this is the protocol optimized for high speed and low connection costs (see www.abb.com/fieldbus and follow the PROFIBUS link).

1.3 PROFIBUS DP Transmission Technology

The transfer method of PROFIBUS-DP is RS485 – a proven technology. A twisted, shielded, two-wire copper cable is used as the transfer medium.

The bus structure enables addition and removal of stations or step-by-step commissioning of the system without affecting other stations. Later expansion has no influence on stations already in operation.

Transmission speeds of between 9.6 kbit/sec and 12 Mbit/sec are available. One uniform transmission speed is selected for all devices on the bus when the system is commissioned.

1.4 ABB Industrial IT

Fieldbus-enabled devices provide, not only full process information, but access to device configuration and maintenance condition also. Tighter integration into a network's control and supervisory system takes full advantage of all these features, which in turn realizes additional cost savings. Such integration includes timely access to field device process and maintenance data and appropriate links to the device aspects. The PROFIBUS protocol provides the GSD file for open system integration in that it allows the set up of cyclical communications to the slave devices. ABB's Industrial IT provides all the technology to realize the benefits of fieldbus-enabled devices, whilst the Industrial IT enabled status of field devices enable savings to be made during engineering of the control system.

Industrial IT from ABB significantly improves application connectivity and the quality of the information that can be acquired and used. This enables access to real-time information on a unified application – allowing faster, more informed decisions to be made that can be effectively and successfully implemented for profitable growth.

Understanding Business Needs

Many challenges must be faced in achieving more efficient plantwide and global operations. Every business is unique and each consists of a multiplicity of processes that can span marketing, design, supply chain, manufacturing, quality, sales and distribution. These processes are dependent on trouble-free access to accurate, up-to-the-minute, reliable information. As knowledge is the most precious commodity in business today, the challenge is to have the relevant information available at the right time in the right form for the right people. The information needs of the people who manage, control, operate and administer an enterprise are all different but each has a common goal – increasing enterprise-wide productivity.

Industrial IT from ABB is a powerful portfolio that makes automation easier by integrating automation systems in real-time – right across an application. It provides business information from initial order through production to delivery and payment. ABB has aligned its products, services and people to create compatible Industrial IT building blocks that provide real-time automation and information solutions – with one common architecture. This provides a consistent infrastructure for data, operations, configuration and maintenance. The suite of integrated Industrial IT solutions address the problems faced in today's e-business environment. The unified architecture improves productivity, provides higher asset optimization and enables more informed decision-making.

2 INSTALLATION

2.1 Installation Overview – Fig. 2.1

All devices are connected in a bus structure ('line'). Up to 32 stations (master or slaves) can be linked to create one 'segment'.

Each end of a segment must be terminated by an active bus terminating resistor. Both bus terminators must always be powered to ensure fault-free operation therefore it is strongly recommended that they are connected to a back-up power supply.

Up to three line bus amplifiers (repeaters) can be used to extend the network to a total of four segments, allowing a maximum of 125 devices to be installed in the system.

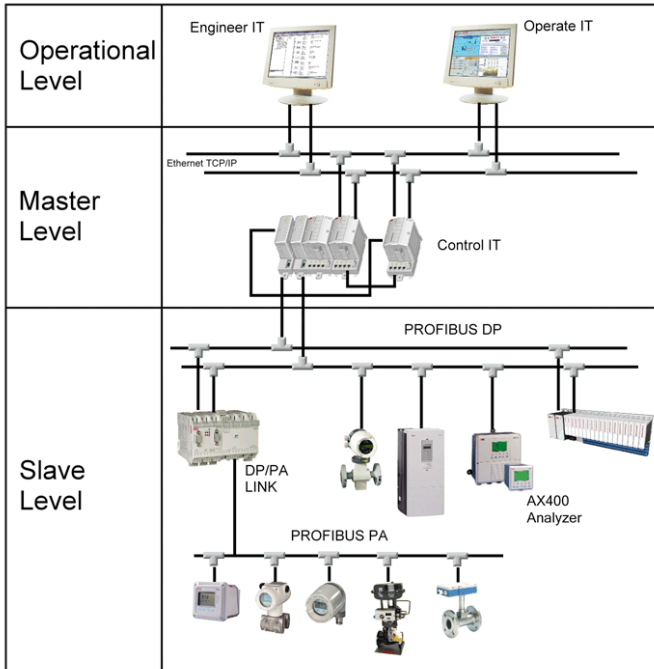


Fig. 2.1 Typical PROFIBUS Network

2.2 Cable Length

The maximum cable length of a segment is determined by the transmission speed – see Table 2.1. The cable length specified can be extended by using repeaters but it is recommended that no more than three repeaters be connected in series.

Transmission Rate (bits/sec)	Maximum Segment Length (m)	Maximum Total Network Length (m)
9.6 to 93.75K	1200	4800
187.5K	1000	4000
500K	400	1600
1.5M	200	800
3 to 12M	100	400

Table 2.1 Cable Length

2.3 Cable Specification

The cable lengths in Table 2.1 refer to the following cable type:

Characteristic impedance	135 to 165Ω
Capacitance per unit length	<30 pf/m
Loop resistance	110Ω/km
Core diameter	0.64mm
Core cross section	>0.34mm ²

Suitable PROFIBUS cable, Part Nos. PCA010, PCA 011 and PCA 012, can be obtained from ABB. Refer to Data Sheet 10/63-6.46 EN.

2.4 Device Integration – the GSD File

PROFIBUS devices differ with respect to available functionality and parameters and these vary individually for each device type and manufacturer. In order to obtain Plug-and-Play configuration for PROFIBUS, characteristic device communication features such as manufacturer name, device name, hardware/software versions, baud rate and the number and nature of inputs/outputs are defined in an electronic device data sheet known as a GSD (Gerätestammdaten) file.

A GSD file is readable ASCII text file that contains both general and device-specific specifications for communication. Each of the entries describes a feature supported by a device. By the means of keywords, a configuration tool reads the device identification, the adjustable parameters, the corresponding data type and the permitted limit values for the configuration of the device from the GSD. Some keywords are mandatory, e.g. Vendor_Name; others are optional, e.g. Sync_Mode_supported.

The GSD file for PROFIBUS-enabled AX400 Series analyzers conforms to the PROFIBUS standard and provides a clear and comprehensive description of each instrument in a precisely defined format. This enables the system configuration tool to use the information automatically when configuring a PROFIBUS bus system.

The ABB GSD file is divided into 2 sections:

- **General Specifications**
Identification of the device, together with hardware and software versions, baud rates supported and the possible time intervals for monitoring times.
- **DP Slave-Related Specifications**
Modules containing output data information for each PROFIBUS-enabled AX400 Series analyzer. The content of each module is defined by the amount of data that can be obtained from each device. Module 01 contains those analyzers from which 10 bytes of data are obtained, Module 02 contains those analyzers from which 20 bytes of data are obtained and Module 03 contains those analyzers from which 24 bytes of data are obtained.

APPENDIX A lists all PROFIBUS-enabled AX400 Series analyzers, grouped by Module.

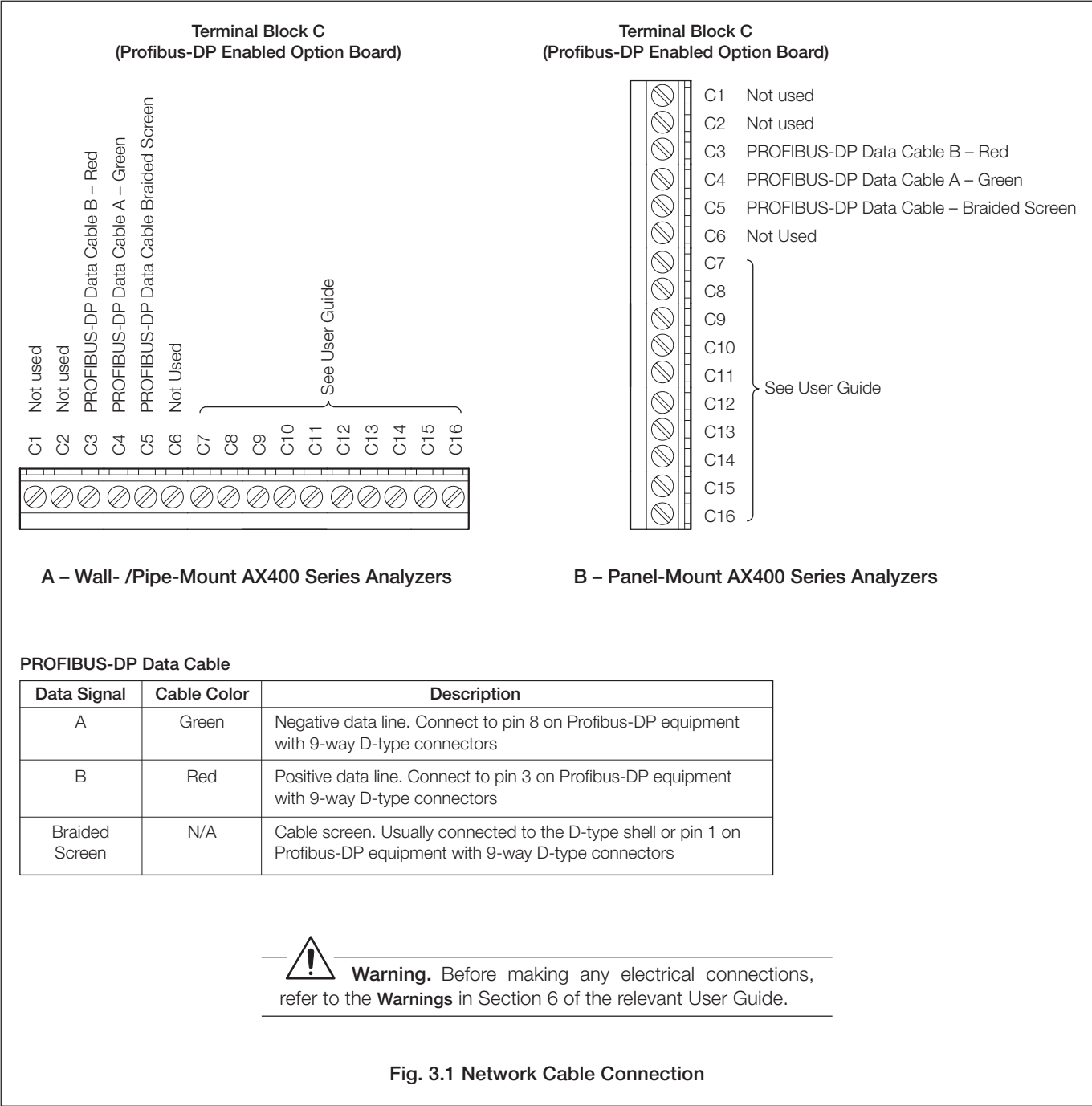
3 NETWORK CONNECTION AND CONFIGURATION



Warnings. When connecting a PROFIBUS-enabled AX400 Series analyzer to a PROFIBUS-DP network:

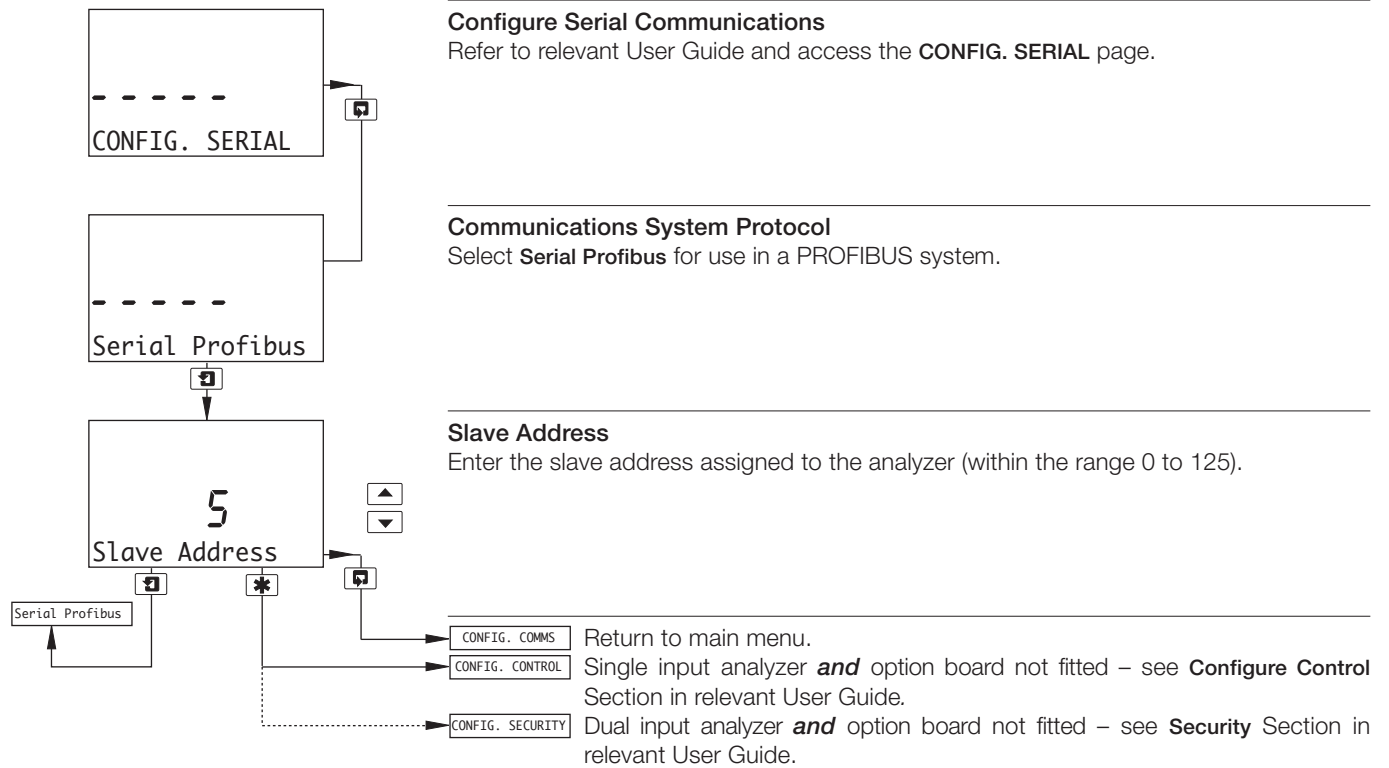
- Use shielded data lines and ensure they are not reversed.
- Ensure all data lines are routed clear of the source of any strong electrical and magnetic fields.
- Refer to the relevant User Guide for all other installation and connection details.

3.1 Network Connections – Fig. 3.1



3.2 Network Configuration

Note. An AX400 Series analyzer is not configured using PROFIBUS commands but via the analyzer's keypad and menu system. Configure the analyzer for PROFIBUS communication as shown below.



APPENDIX A – GSD FILE MODULES

Note.

- Float = Floating-point number – requires 4 bytes
- Char = Character – requires 1 byte
- Int = Integer – requires 2 bytes

A1.1 Module 01

Module 01 contains the following AX400 analyzers that output 10 bytes of data:

- **AX410**
- **AX430**
- **AX450**
- **AX460**
- **AX480**

Byte	Contents	Sensor	Description
1 to 4	Float	A	Measured Process Variable (See Section A1.4)
5 to 8	Float	A	Measured Process Temperature
9	Char	A	Sensor Status (See Section A1.5)
10	Char	N/A	Alarm Status (See Section A1.6)

Table A.1 Module 01 Data

A1.2 Module 02

Module 02 contains the following AX400 analyzers that output 20 bytes of data:

- **AX413**
- **AX416**
- **AX418**
- **AX433**
- **AX436**
- **AX438**
- **AX455**
- **AX456**
- **AX466**
- **AX468**
- **AX488**

Byte	Contents	Sensor	Description
1 to 4	Float	A	Measured Process Variable (See Section A1.4)
5 to 8	Float	A	Measured Process Temperature
9 to 12	Float	B	Measured Process Variable (See Section A1.4)
13 to 16	Float	B	Measured Process Temperature
17	Char	A	Sensor Status (See Section A1.5)
18	Char	B	Sensor Status (See Section A1.5)
19	Char	N/A	Alarm Status (See Section A1.6)
20	Char	N/A	Not Used

Table A.2 Module 02 Data

A1.3 Module 03

Module 03 contains the following AX400 analyzers that output 24 bytes of data:

- **AX411**

Byte	Contents	Sensor	Description
1 to 4	Float	A	Measured Process Variable (See Section A1.4)
5 to 8	Float	A	Measured Process Temperature
9 to 12	Float	B	Measured Process Variable (See Section A1.4)
13 to 16	Float	B	Measured Process Temperature
17 to 20	Float	N/A	Measured Calculation
21	Char	A	Sensor Status (See Section A1.5)
22	Char	B	Sensor Status (See Section A1.5)
23	Char	N/A	Alarm Status (See Section A1.6)
24	Char	N/A	Not Used

Table A.3 Module 03 Data

A1.4 Measured Process Variable

Table A.4 lists the process variable measured by each AX400 Series analyzer variant.

Model Number	Sensor A	Sensor B
AX410	Conductivity	–
AX411	Conductivity	Conductivity
AX413	Conductivity	Conductivity
AX416	Conductivity	pH or Redox(ORP)
AX418	Conductivity	Dissolved Oxygen
AX430	Conductivity	–
AX433	Conductivity	Conductivity
AX436	Conductivity	pH or Redox(ORP)
AX438	Conductivity	Dissolved Oxygen
AX450	Conductivity	–
AX455	Conductivity	Conductivity
AX456	Conductivity	pH or Redox(ORP)
AX460	pH or Redox(ORP)	–
AX466	pH or Redox(ORP)	pH or Redox(ORP)
AX468	pH or Redox(ORP)	Dissolved Oxygen
AX480	Dissolved Oxygen	–
AX488	Dissolved Oxygen	Dissolved Oxygen

Table A.4 Measured Process Variable

A1.5 Sensor Status Message

Table A.5 lists the sensor status message that is displayed when the relevant bit of the sensor status byte is active (i.e. contains 1) for each AX400 Series analyzer variant.

	Bit							
	0	1	2	3	4	5	6	7
Sensor Type	Status Message							
PH	FAULTY PT100	FAULTY PT1000	FAULTY BALCO 3K	PH CAL FAILED	CAL LOW SLOPE	CHECK REF.	LOW GLASS IMP.	OUT OF SAMPLE BROKEN CABLE
Redox	FAULTY PT100	FAULTY PT1000	FAULTY BALCO 3K	–	–	CHECK REF.	–	OUT OF SAMPLE BROKEN CABLE
Dissolved Oxygen	FAULTY PT100	–	–	CAL FAILED	LOW SENSOR OUTPUT	HIGH PROCESS TEMPERATURE	–	–
2-electrode Conductivity	FAULTY PT100	FAULTY PT1000	–	–	–	–	–	–
4-electrode Conductivity	–	FAULTY PT1000	FAULTY BALCO 3K	–	–	–	–	–

Table A.5 Sensor Status Messages

A1.6 Alarm Status

Table A.6 shows the alarm that is associated with each bit of the alarm status byte for each AX400 Series analyzer variant.

Note. Alarms 4 and 5 are available only if the option board is fitted to the instrument and analog features enabled – see Section 7.3 of the relevant User Guide.

Bit	0	1	2	3	4	5	6	7
Alarm No.	A1	A2	A3	A4 *	A5 *	–	–	–
Bit Status	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1	X	X	X

0 = Not Active

1 = Active

X = Always 0

Table A.6 Alarm Status

NOTES

PRODUCTS & CUSTOMER SUPPORT

Products

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 Flow Meters*
- *Turbine Flowmeters*
- *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.

United Kingdom

ABB Limited
Tel: +44 (0)1453 826 661
Fax: +44 (0)1453 829 671

United States of America

ABB Inc.
Tel: +1 775 850 4800
Fax: +1 775 850 4808

Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification.

Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:

1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of all storage, installation, operating and maintenance records relating to the alleged faulty unit.

ABB has Sales & Customer Support
expertise in over 100 countries worldwide

www.abb.com

The Company's policy is one of continuous product
improvement and the right is reserved to modify the
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