User's Manual

DPharp EJX®
DPharp EJA®

DPharp BRAIN Communication Type (EJX□□□A, EJA□□□E)

IM 01C25T03-01E

vigilantplant®

DPharp FOR THE DIGITAL WORLD

YOKOGAWA
Yokogawa Electric Corporation

IM 01C25T03-01E
6th Edition

DPharp
BRAIN Communication Type

IM 01C25T03-01E 6th Edition

Contents

1. Introduction

Thank you for purchasing the DPharp EJX series pressure transmitter/EJA series pressure transmitter (“transmitter”).

The transmitters are precisely calibrated at the factory before shipment. To ensure both safety and efficiency, please read this manual carefully before operating the instrument.

This manual describes the BRAIN protocol communication functions of the transmitter and explains how to set the parameters for the transmitters using the BT200 handheld terminal. For information on the installation, wiring, and maintenance of the transmitters, please refer to the user’s manual of each model.

WARNING

When using the transmitter in a Safety Instrumented Systems (SIS) application, refer to Appendix 1 in this manual. The instructions and procedures in the appendix must be strictly followed in order to maintain the designed safety integrity of the transmitter.

■ Regarding This Manual

- This manual should be provided on to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa’s written permission.
- Yokogawa makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instruments.
- Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- The following safety symbols are used in this manual:

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

IMPORTANT

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

NOTE

Draws attention to information essential for understanding the operation and features.

1.1 Safe Use of This Product

For the safety of the operator and to protect the instrument and the system, please be sure to follow this manual’s safety instructions when handling this instrument. If these instructions are not heeded, the protection provided by this instrument may be impaired. In this case, Yokogawa cannot guarantee that the instrument can be safely operated. Please pay special attention to the following points:

(a) Installation

- This instrument may only be installed by an engineer or technician who has an expert knowledge of this device. Operators are not allowed to carry out installation unless they meet this condition.
- With high process temperatures, care must be taken not to burn yourself by touching the instrument or its casing.
- Never loosen the process connector nuts when the instrument is installed in a process. This can lead to a sudden, explosive release of process fluids.
- When draining condensate from the pressure detector section, take appropriate precautions to prevent the inhalation of harmful vapors and the contact of toxic process fluids with the skin or eyes.
- When removing the instrument from a hazardous process, avoid contact with the process fluid and the interior of the meter.
- All installation shall comply with local installation requirements and the local electrical code.

(b) Wiring

- The instrument must be installed by an engineer or technician who has an expert knowledge of this instrument. Operators are not permitted to carry out wiring unless they meet this condition.
- Before connecting the power cables, please confirm that there is no current flowing through the cables and that the power supply to the instrument is switched off.

(c) Operation

- Wait 10 min. after the power is turned off, before opening the covers.

(d) Maintenance

- Please carry out only the maintenance procedures described in this manual. If you require further assistance, please contact the nearest Yokogawa office.
- Care should be taken to prevent the build up of dust or other materials on the display glass and the name plate. To clean these surfaces, use a soft, dry cloth.

(e) Modification

- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.

1.2 Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurring during the warranty period shall basically be repaired free of charge.
- If any problems are experienced with this instrument, the customer should contact the Yokogawa representative from which this instrument was purchased or the nearest Yokogawa office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- The party responsible for the cost of fixing the problem shall be determined by Yokogawa following an investigation conducted by Yokogawa.
- The purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:

  - Improper and/or inadequate maintenance by the purchaser.
  - Malfunction or damage due to a failure to handle, use, or store the instrument in accordance with the design specifications.
  - Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
  - Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
  - Malfunction or damage from improper relocation of the product in question after delivery.
  - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/ lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

1.3 ATEX Documentation

This section is only applicable to the countries in the European Union.

GB
All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK
Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I
Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E
Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL
Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF
Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P
Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F
Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D
Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S
Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR
Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

SK
Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.

CZ
Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.

LT
Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø, vokieèiø ir prancûzø kalbomis. Norëdami gauti prietaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës "Yokogawa" biuru arba atstovu.

LV
Visas ATEX Ex kategorijas izstrâdâjumu Lietoðanas instrukcijas tiek piegâdâtas angïu, vâcu un franèu valodâs. Ja vçlaties saòemt Ex ierîèu dokumentâciju citâ valodâ, Jums ir jâsazinâs ar firmas Jokogava (Yokogawa) tuvâko ofisu vai pârstâvi.

EST
Kõik ATEX Ex toodete kasutamisjuhendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima lokagava (Yokogawa) kontori või esindaja poole.

PL
Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja. obsługi w Państwa lokalnym ję zyku, prosimy o kontakt z najbliższym biurem Yokogawy.

SLO
Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v angliščini, nemščini ter francoščini. Če so Ex sorodna navodila potrebna v vašem tukejnjem jeziku, kontaktirajte vaš najbliši Yokogawa office ili predstaunika.

H
Az ATEX Ex mûszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kérik az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviseletet.

BG
Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.

RO
Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.

M
Il-manwali kollha ta' l-istruzzjonijiet għal prodotti marbuta ma' ATEX Ex huma disponibbli bl-Ingliż, bil-Ġermaniż u bil-Franċiż. Jekk tkun teħtieġ struzzjonijiet marbuta ma' Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentan jew uffiċċju ta' Yokogawa.

2. Connection

The BRAIN communication signal is superimposed onto the 4 to 20 mA DC analog signal. Since the modulated wave is a communication signal, superimposing it on the normal signal will, from basic principles, cause no error in the DC component of the analog signal. Thus, monitoring can be performed via the BT200 while the transmitter is on-line.

2.1 Connecting the BT200

IMPORTANT

Analog output may change temporally in connecting with BRAIN terminal due to an initial current flowed to it. To prevent communication signal affecting the upper system, it is recommended to install a low-pass filter (approximately 0.1s)

Connection to the transmitter with the BT200 can be made by either connecting to the BT200 connection hooks in the transmitter terminal box or by connecting to a relaying terminal or a terminal board.

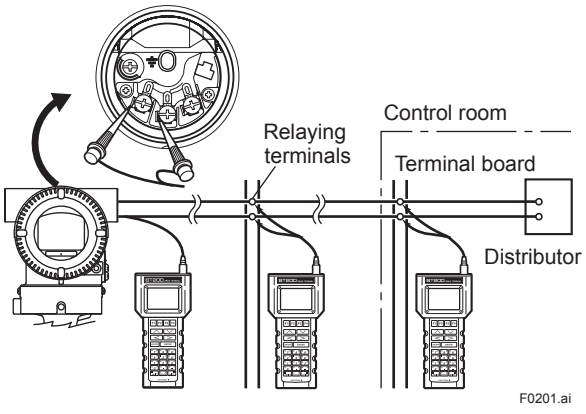


Figure 2.1 Connecting the BT200

2.2 Communication Line Requirements

[Protocol specification] Yokogawa original protocol

[Modulation] Burst modulation
0: 2400Hz
1: Signal without carrier

[Baud rate] 1200bps

[Communication signal]

host to device: +/- 0.5V (load resistance 250Ω)

device to host: +/- 2mA

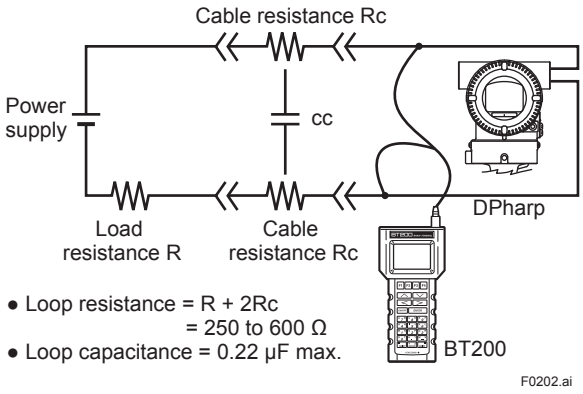


Figure 2.2 Communication Line Requirements

2.3 Power Supply Voltage and Load Resistance

When configuring the loop, make sure that the external load resistance is within the range in the figure below.

(Note) With an intrinsically safe transmitter, external load resistance includes safety barrier resistance.

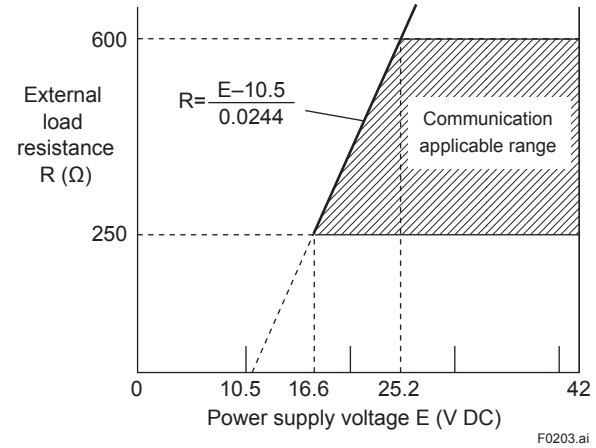
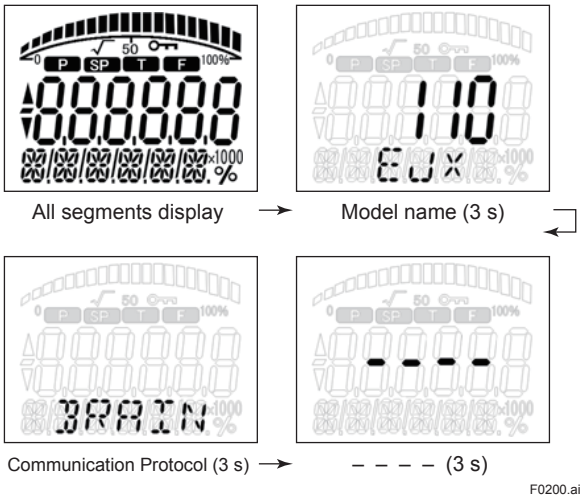


Figure 2.3 Relationship between Power Supply Voltage and External Load Resistance

2.4 Integral Indicator Display When Powering On

For models with the integral indicator code “D”, the display shows all segments in the LCD and then changes to the displays shown below sequentially.



NOTE

For output signal code “D”, this function is available for software revision 2.02 or later. Software revision can be checked by the parameter M15: SOFT REV.
Refer to section 3 “Operation” how to call up the parameter.

NOTE

LCD display can be set to all segments display only by the parameter I41: POWER ON INF.

ON	Show All segments display, Model name and Communication Protocol when powering on.
OFF	Show All segments display when powering on.

Refer to section 3 “Operation” how to call up the parameter.

3. Operation

The transmitter is equipped with BRAIN communications capabilities, so that range changes, Tag No. setup, monitoring of self-diagnostic results, and zero point adjustment can be handled remotely via the BT200 BRAIN TERMINAL, the FieldMate Versatile Device Management Wizard or the CENTUM CS console. This section describes procedures for setting parameters using the BT200. For further information on the BT200, see the BT200 User's Manual (IM 01C00A11-01E).

IMPORTANT

Communication signal is superimposed on analog output signal. It is recommended to set a low-pass filter (approximately 0.1s) to the receiver in order to reduce the output effect from communication signal. Before online-communication, confirm that communication signal does not give effect on the upper system.

3.1 BT200 Operating Procedures

3.1.1 Key Layout and Screen Display

Figure 3.1 shows the arrangement of the operating keys on the BT200 keypad, and figure 3.2 shows the BT200 screen.

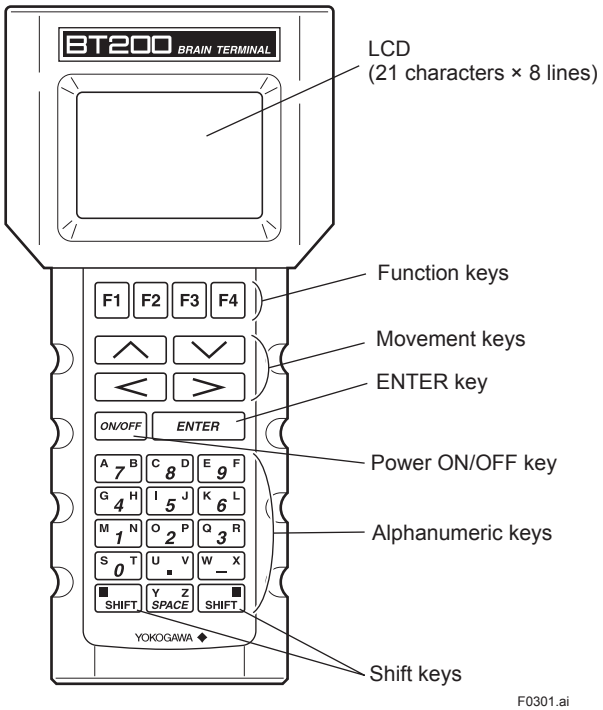


Figure 3.1 BT200 Key Layout

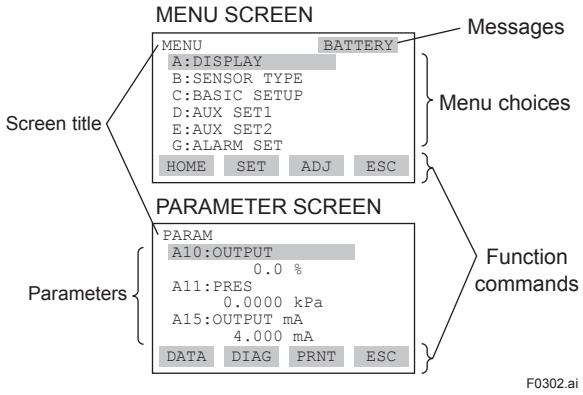
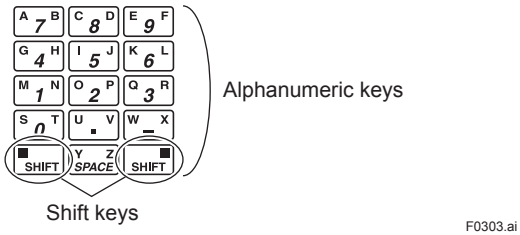


Figure 3.2 BT200 Screen

3.1.2 Operating Key Functions

(1) Alphanumeric Keys and Shift Keys

Use the alphanumeric keys in conjunction with the shift keys to enter numbers, symbols, and alphabetic characters.



a. Entering Numbers, Symbols, and Spaces

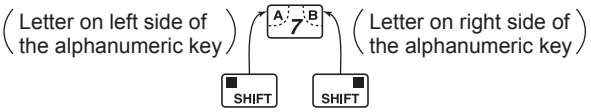
Simply press the alphanumeric keys.

Entry	Key-in sequence
–4	W _ X, G 4 H
0.3	S 0 T, U . V, Q 3 R
1 ␣ –9	M 1 N, Y Z SPACE, W _ X, E 9 F

F0304.ai

b. Entering Alphabetic Characters

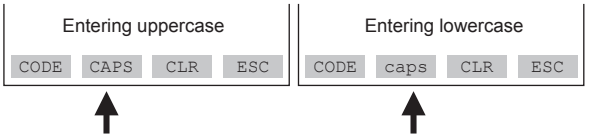
Press either the left or right shift key and then an alphanumeric key to enter the desired alphabetic character. The shift key must be pressed each time an alphabetic character is entered.



Entry	Key-in sequence
W	SHIFT W_X
IC	SHIFT I 5 J SHIFT C 8 D
J. B	SHIFT I 5 J U . V SHIFT A 7 B

F0305.ai

Use the function key [F2] CAPS to select uppercase and lowercase (for alphabetic characters only). The case toggles between uppercase and lowercase each time [F2] CAPS is pressed.



Entry	Key-in sequence
Boy	to lower case SHIFT A 7 B F2 SHIFT O 2 P SHIFT Y Z SPACE (B) (o) (y)

F0306.ai

Use the function key [F1] CODE to enter symbols. The following symbols will appear in sequence, one at a time, at the cursor each time [F1] CODE is pressed:

/ . – , + *) (’ & % $ # ” !

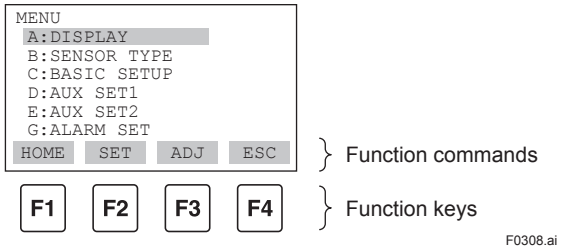
To enter characters next to these symbols, press [>] to move the cursor.

Entry	Key-in Sequence
l/m	symbol command F2 SHIFT K 6 L F1 > SHIFT M 1 N (l) (/) (m)

F0307.ai

(2) Function Keys

The function command carried out by each function key is displayed directly above the key.



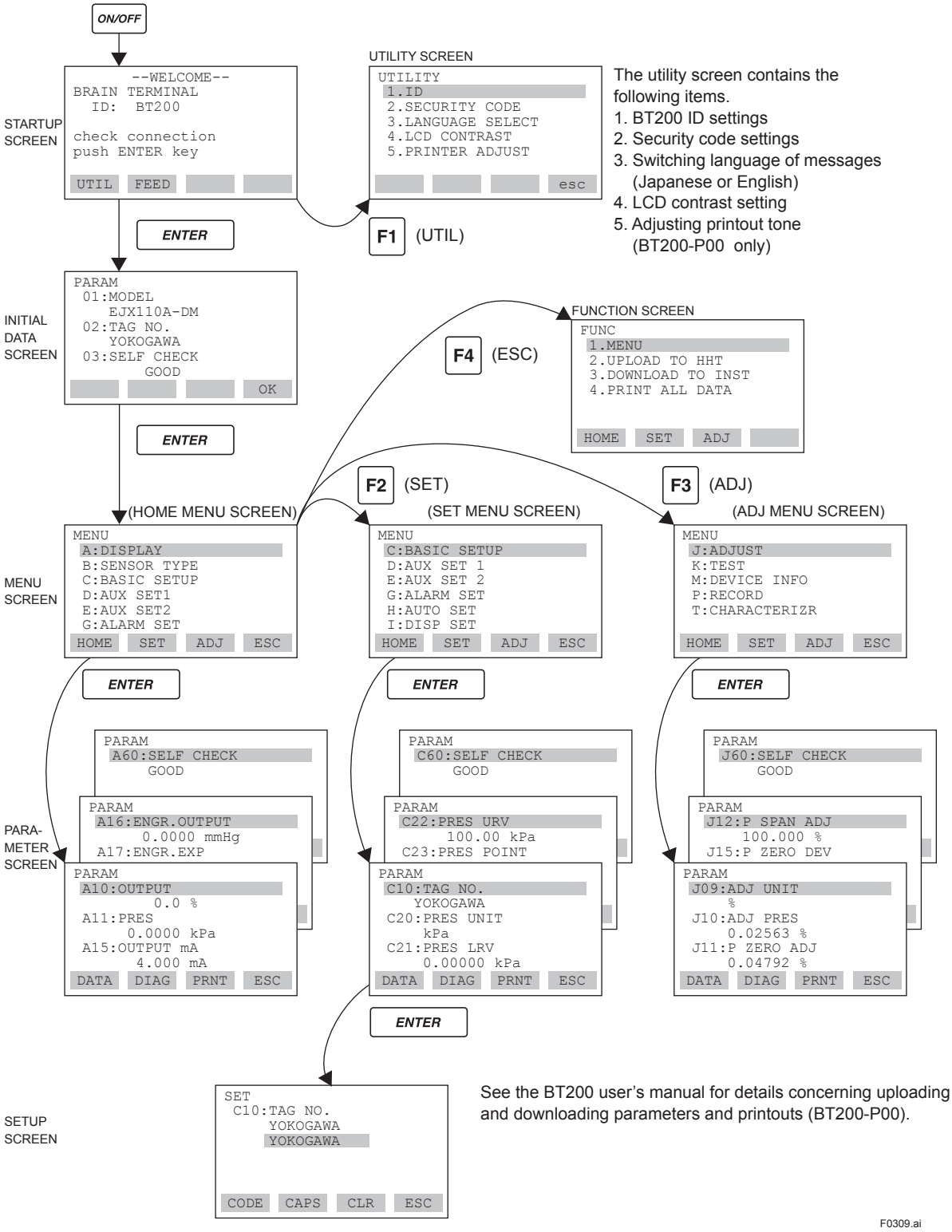
F0308.ai

Function Command List

Command	Function
ADJ	Displays the ADJ menu
CAPS/caps	Selects uppercase or lowercase
CODE	Selects symbols
CLR	Erases input data or deletes all data
DATA	Updates parameter data
DEL	Deletes one character
DIAG	Calls the self-check panel
ESC	Returns to the most recent display
HOME	Displays the menu panel
NO	Quits setup and returns to the previous display
OK	Proceeds to the next panel
PARM	Enters the parameter number setup mode
SET	Displays the SET menu
SLOT	Returns to the slot selection panel
UTIL	Calls the utility panel
*COPY	Prints out parameters on display
*FEED	Paper feed
*LIST	Lists all parameters in the menu
*PON/POFF	Automatic printout mode on or off
*PRNT	Changes to the print mode
*GO	Starts printing
*STOP	Cancels printing

* Available on BT200-P00 (with printer).

3.1.3 Calling Up Menu Addresses Using the Operating Keys



3.1.4 Printout (for BT200 printer option)

(1) Printout of All Parameters

Select *4. PRINT ALL DATA* from the function screen to output a list of all parameters. It takes about 10 minutes to complete the printout.

(2) Printout by Menu Item

To printout the parameters for a specific screen, push the function key corresponding to screen's PRNT.

3.2 Setting Parameters Using the BT200

3.2.1 Parameter Usage and Selection

Before setting a parameter, please see the following table for a summary of how and when each parameter is used.

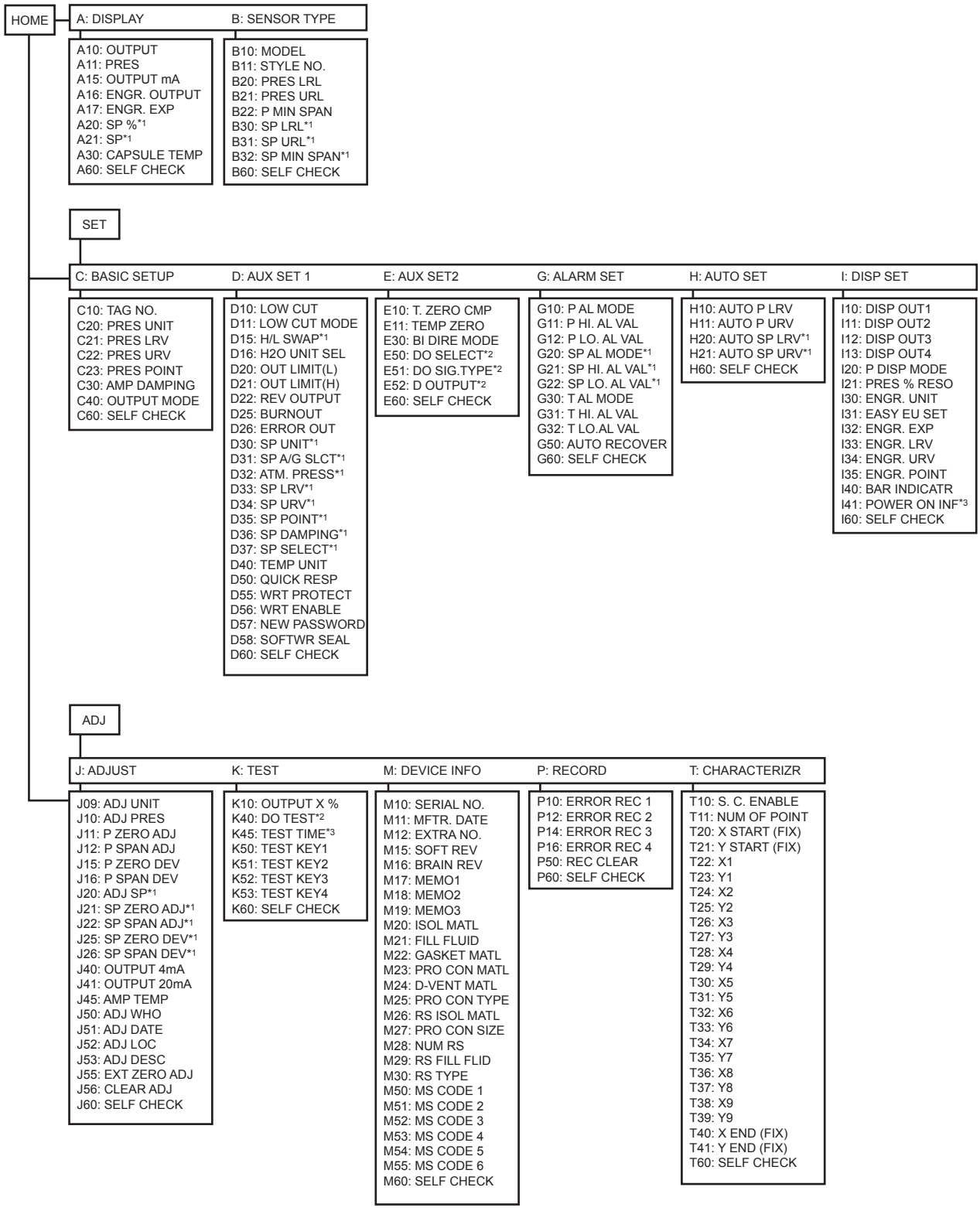
IMPORTANT

After setting and sending data with the BT200, wait 30 seconds before turning off the transmitter. If it is turned off too soon, the settings will not be stored in the transmitter.

Table 3.1 Parameter Usage and Selection

Setup item	Description
Tag No. setup ▶P.3-6	Sets the Tag No. (using 16 alphanumeric characters).
Calibration range setup ▶P.3-6	Sets the calibration range for 4 to 20 mA DC. Sets the following items: range unit, input value at 4 mA DC (LRV), input value at 20 mA DC (URV), and decimal point position. Note: LRV and URV can be specified with range value specifications up to 5 digits (excluding any decimal point) within the range of –32000 to 32000.
Damping time constant setup ▶P.3-7	Adjusts the output response speed for 4 to 20 mA DC at amplifier. Can be set from 0.50 to 100.00 s. (from 0.00 to 100.00 s with quick response mode on)
Output and integral indicator display mode setup ▶P.3-8	Sets modes for output signal and integral indicator to Linear mode (proportional to input differential pressure) or to Square root mode (proportional to flow).
Output signal low cut mode setup ▶P.3-8	Used mainly to stabilize output near 0% if the output signal is square root mode. Two modes are available: forcing output to 0% for input below a specific value, or changing to proportional output for input below a specific value.
Integral indicator display function ▶P.3-9	Available from the following 5 types of integral indicator scale ranges and units: input pressure, % of range, user set scale, input static pressure, % of static pressure range, and alternating among any four of the above. Configure the following when using the user set scale; user set scale setting, unit (BT200 only), display value at 4 mA DC (LRV), and display value at 20 mA DC (URV). Note: LRV and URV can be specified with range value specifications up to 5 digits (excluding any decimal point) within the range of –32000 to 32000.
Static pressure setup ▶P.3-11	Sets the parameters concerned with static pressure such as unit, calibration range, upper and lower range values, decimal point position, damping time constant.
Unit setup for displayed temperature ▶P.3-11	Sets the unit for temperatures displayed on the BT200.
Operation mode (normal/reverse signal) setup ▶P.3-11	Reverses the direction for 4 to 20 mA DC output relative to input. Reverse mode is used for applications in which safety requires that output be driven toward 20 mA if input is lost.
Impulse line connection orientation (higher pressure on right/left side) setup ▶P.3-11	Used where installation conditions make it imperative to connect high pressure side impulse line to low pressure side of transmitter. Reversal of orientation should be dealt with by reversing impulse line wherever possible. Use this function only where there is no alternative.
CPU Failure burnout direction and hardware write protect ▶P.3-11	Displays the status of 4 to 20 mA DC output when a CPU fails. The direction is selectable by the hardware switch on the amplifier. It also physically prevents parameter access
Software write protect ▶P.3-12	Configured data can be protected by setting a password.
Output status setup when a hardware error occurs ▶P.3-13	Sets the status of the 4 to 20 mA DC output when an abnormal status is detected with the capsule or the amplifier as the result of self-diagnosis. Either the last held, high limit, or low limit values status, can be selected.
Bi-directional flow measurement ▶P.3-13	Used to measure bi-directional flows. Output at zero flow is 12 mA DC, with output range equally divided between forward and reverse flow. Can be used with square root mode.
Range change while applying actual inputs ▶P.3-13	Range for 4 to 20 mA DC signal is set with actual input applied. Sets 20 mA DC output precisely with respect to user's reference instrument output. Note that the transmitter is calibrated with high accuracy before shipment, so span should be set using the normal range setup.
Sensor trim ▶P.3-14	Adjusts zero point and span of the sensor.
Test output (fixed current output) setup ▶P.3-17	Used for loop checks. Output can be set freely from –2.50% to 110.00% in 0.01% steps.
Signal characterizer ▶P.3-17	Used to compensate the output for the non-linear application.
Process alarm ▶P.3-18	Used for alarm generation on the integral indicator.
Status output ▶P.3-18	Outputs an on/off digital signal based on the settings of process alarm.
Capillary fill fluid density compensation ▶P.3-19	Compensates the zero shift by the ambient temperature effect on the capillary tubes.
User memo fields ▶P.3-20	Allows user to enter up to 3 items, each containing any combination of up to 16 alphanumeric characters.

3.2.2 Menu Tree



*1: Available for differential pressure transmitter.
*2: Available for EJX series only.
*3: Available for software revision 2.02 or later.
Software revision can be checked by the parameter M15: SOFT REV.

F0310.ai

3.2.3 Setting Parameters

Set or change the parameters as necessary. After completing these, do not fail to use the “DIAG” key to confirm that “GOOD” is displayed for the self-diagnostic result at **_60: SELF CHECK**.

(1) Tag No. Setup (C10: TAG NO)

Use the procedure below to change the Tag No. Up to 16 alphanumeric characters can be entered.

• Example: Set a Tag No. to FIC-1a

<When power is off>

Press the ON/OFF key to turn on the BT200.

```
      --WELCOME--
BRAIN TERMINAL
  ID:  BT200

check connection
push ENTER key
UTIL FEED
```

Connect the transmitter and BT200 using a communication cable and press the ENTER key.

```
PARAM
 01:MODEL
   EJX
 02:TAG NO.
   YOKOGAWA
 03:SELF CHECK
    GOOD
          OK
```

Displays the model name of connected transmitter, TAG NO. and diagnostics information. Press the F4 (OK) key after confirmation.

```
MENU
 A:DISPLAY
 B:SENSOR TYPE
 C:BASIC SETUP
 D:AUX SET1
 E:AUX SET2
 G:ALARM SET
HOME SET ADJ ESC
```

Press the F2 (SET) key to display the SET menu panel.

```
MENU
 C:BASIC SETUP
 D:AUX SET 1
 E:AUX SET 2
 G:ALARM SET
 H:AUTO SET
 I:DISP SET
HOME SET ADJ ESC
```

Select C: BASIC SETUP and press the ENTER key.

```
MENU
 C10:TAG NO.
    YOKOGAWA
 C20:PRES UNIT
    kPa
 C21:PRES LRV
    0.00000 kPa
DATA DIAG PRNT ESC
```

Select C10: TAG NO. and press the ENTER key.

```
SET
 C10:TAG NO.
    YOKOGAWA
    YOKOGAWA
CODE CAPS CLR ESC
```

Set the new TAG NO. (FIC-1a).

SHIFT + E 9 F	**F**OKOGAWA
SHIFT + I 5 J	FI**K**OGAWA
SHIFT + C 8 D	FI**C**OGAWA
W _ X	FIC-GAWA
M 1 N	FIC-**1**AWA
F2, SHIFT + A 7 B	FIC-1**a**WA
Y Z SPACE, Y Z SPACE	FIC-1a␣␣

```
SET
 C10:TAG NO.
    YOKOGAWA
    FIC-1a _
CODE caps CLR ESC
```

Set TAG NO. and press the ENTER key.

When you have made an entry mistake, return the cursor using the < key, then reenter.

F0311_1.ai

```
SET
 C10:TAG NO.
    YOKOGAWA
    FIC-1a
 print off
 F2:printer on
FEED POFF NO
```

This is the panel for confirming set data. The set data items flash. When all items have been confirmed, press the ENTER again. (To go back to the setting panel, press the F3 (NO) key.

```
SET
 C10:TAG NO.
    FIC-1a
FEED NO OK
```

The DPharp TAG NO. was overwritten.
Press the F4 (OK) key to return to the parameter panel.
Press the F3 (NO) key to return to the setting panel.

```
PARAM
 C10:TAG NO.
    FIC-1a
 C20:PRES UNIT
    kPa
 C21:PRES LRV
    0.00000 kPa
DATA DIAG PRNT ESC
```

F0311_2.ai

(2) Calibration Range Setup

a. Setting Calibration Range Unit (C20: PRES UNIT)

The unit parameter is set at the factory before shipment if specified at the time of order. Follow the procedure below to change the unit parameter.

• Example: Change the unit from **mmH2O** to **kPa**.

```
SET
 C20:PRES UNIT
     mmH2O
   < mmWG    >
   < mmHg    >
   < Torr    >
   < kPa     >
          ESC
```

Use the ^ or v key to select **kPa**.
Press the ENTER key twice to enter the setting.

```
SET
 C20:PRES UNIT
     kPa
FEED NO OK
```

Press the F4 (OK) key.

F0312.ai

Note that the Yokogawa default setting for the standard temperature is 4°C (39.2°F). For the units of mmH_2O, mmAq, mmWG, inH_2O, and ftH_2O, the pressure varies according to the standard temperature definition. When a standard temperature of 20°C (68°F) is required, select @20degC (68.0F) at the parameter D16:H2O UNIT SEL.

Available pressure units are shown below.

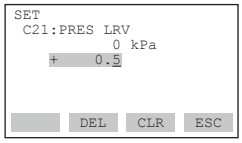
mmH2O	MPa	inHg
mmAq	mbar	ftH2O
mmWG	bar	psi
mmHg	gf/cm2	atm
Torr	kgf/cm2	Pa
kPa	inH2O	hPa

b. Setting Calibration Range Lower Range Value and Upper Range Value (C21: PRES LRV, C22: PRES URV)

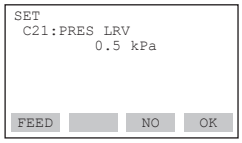
These range values are set as specified in the order before the instrument is shipped. Follow the procedure below to change the range.

- The measurement span is determined by the upper and lower range limit values. In this instrument, changing the lower range value also automatically changes the upper range value, keeping the span constant.

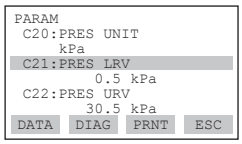
• Example 1: With present settings of 0 to 30 kPa, set the lower range value to 0.5 kPa.



Set **0.5**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.



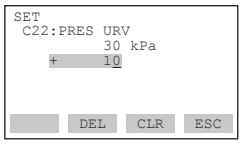
The upper range value is changed while the span remains constant.

(Span = Upper range value – Lower range value)

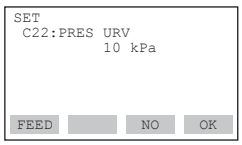
F0313.ai

- Entering the range values as LRV>URV reverses the direction of the output signal of 4-20 mA to 20-4 mA corresponding to the calibration range of 0 to 100%.
- Calibration range can be specified with range value specifications up to 5 digits (excluding any decimal point) for lower or upper range limits within the range of –32000 to 32000.
- Note, however, that changing the upper range value does not cause the lower range value to change. Thus, changing the upper range value also changes the span.

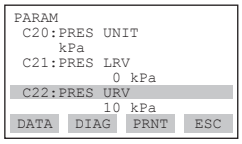
• Example 2: With present settings of 0 to 30 kPa, set the upper range value to 10 kPa.



Set **10**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.



The lower range value is not changed, so the span changes.

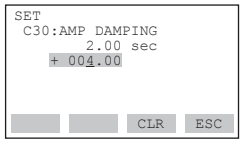
F0314.ai

(3) Damping Time Constant Setup (C30: AMP DAMPING)

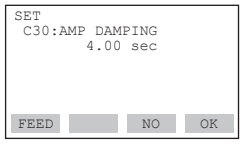
When the instrument is shipped, the damping time constant is set at 2.00 seconds unless otherwise specified in the order. Follow the procedure below to change the damping time constant.

Note that setting the quick response parameter (D50: QUICK RESP) ON enables you to set the damping time constant between 0.00 to 0.49 second.

• Example: Change from 2.00 to 4.00 seconds.



Enter **4**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.

F0315.ai

Note 1: The damping time constant set here is the time constant for the amplifier assembly. The damping time constant for the entire transmitter is the sum of the values for the amplifier assembly and for the capsule assembly.

Note 2: When the damping time constant is set to less than 0.5 second, communication may occasionally be unavailble during the operation, especially while output changes dynamically.

(4) Output Mode and Integral Indicator Display Mode Setup (C40: OUTPUT MODE, I20: P DISP MODE)

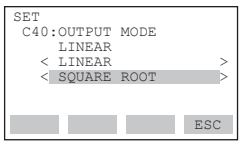
The mode setting for the output signal and the integral indicator can be performed independently.

This mode is set as specified in the order when the instrument is shipped. Follow the procedure below to change the mode.

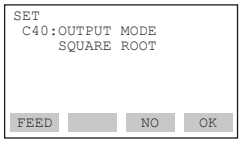
If the instrument is equipped with an integral indicator and the display mode is **SQUARE ROOT**, "$\sqrt{\ }$" is displayed on the integral indicator.

- Output mode for 4-20 mA output

• Example: Set output mode from **Linear** to **Square root**.



Use the ^ or v key to select **SQUARE ROOT**.
Press the ENTER key twice to enter the setting.

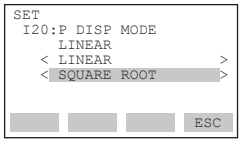


Press the F4 (OK) key.

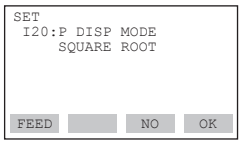
F0316.ai

- Integral indicator display mode

• Example: Set display mode from **Linear** to **Square root**.



Use the ^ or v key to select **SQUARE ROOT**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.

F0317.ai

(5) Output Signal Low Cut Mode Setup (D10: LOW CUT, D11: LOW CUT MODE)

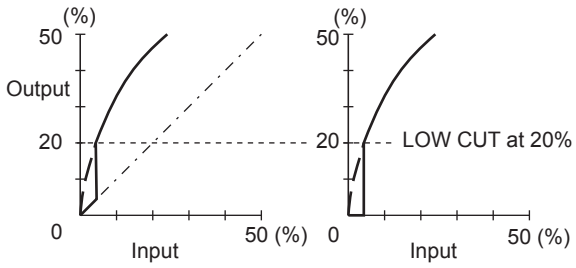
Low cut mode can be used to stabilize the output signal near the zero point. The low cut point can be set in a range from 0 to 20%, the direct ratio corresponding to the output signal of 4 to 20 mA. (Hysteresis: ±10% of the cut point)

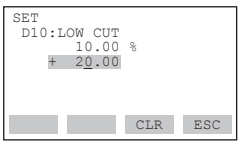
Either **LINEAR** or **ZERO** can be selected as the low cut mode. Unless otherwise specified, the cut mode is set to LINEAR at the factory.

Note that when the output modes of the output signal and the integral indicator are selected as **SQUARE ROOT** and **LINEAR** accordingly, the low cut function is not available for the integral indicator display.

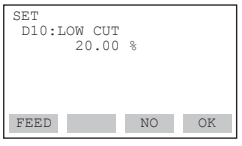
• Example: Change the low cut setting range from 10% to 20%, and the low cut mode from **LINEAR** to **ZERO** in the SQUARE ROOT output mode.

● Low cut mode "LINEAR" ● Low cut mode "ZERO"

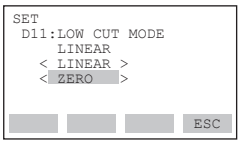




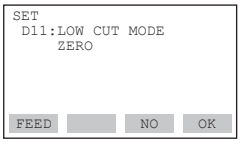
Set **20**.
Press the ENTER key twice to enter the setting.



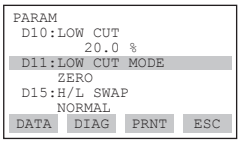
Press the F4 (OK) key.
Next, the [D11: LOW CUT MODE] setting panel is displayed.



Use the ^ or v key to select **ZERO**.
Press the ENTER key twice to enter the setting.



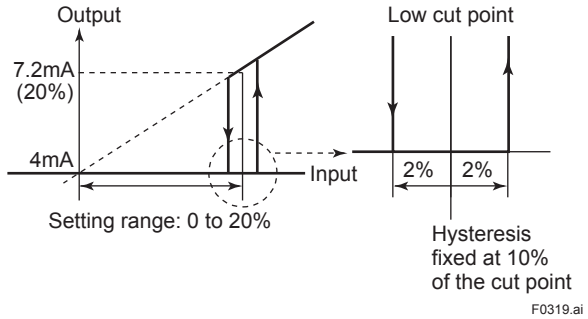
Press the F4 (OK) key.



F0318.ai

The low cut point has hysteresis so that the output around the point is behaved as below figure.

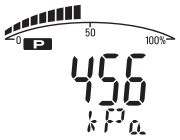
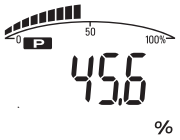
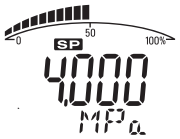
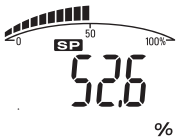
<Example>
Output mode: Linear
Low cut mode: Zero
Low cut: 20.00%



F0319.ai

(6) Integral Indicator Scale Setup

The following five displays are available for integral indicators: input pressure*1, % of range, user set scale, input static pressure, and % of static pressure range*1. A cycle of up to four displays can be shown by assigning variables to the parameters I10 to I13: DISP OUT1 to DISP OUT4.

Available displays	Description and related parameters
Input pressure (PRES)  	Indicates values of input pressure with the indication limits -32000 to 32000. A11:PRES 456 kPa
% of range (PRES %)  	Indicates input pressure in -2.5 to 110% range depending on the measuring range (C21, C22). A10:OUTPUT 45.6 %
User set scale (ENGR. PRES)  	Indicates values depending on the engineering range (I33, I34) with the unit (I30). A16:ENGR.OUTPUT 20.5 m3/min A17:ENGR.EXP ×100
Input static pressure (SP)*1  	Indicates input static pressure with the indication limits -32000 to 32000. Reference pressure is factory-set in absolute. A21:SP 4.000 MPa
% of static pressure range (SP %)*1  	Indicates input static pressure in -10 to 110% range depending on the measuring range (D33, D34). A20:SP % 52.6 %

F0320.ai

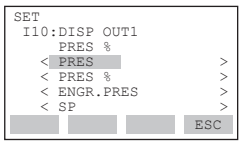
*1: Available for differential pressure transmitter.

See (a.) through (d.) for each setting procedure.

a. Display Selection (I10: DISP OUT1)

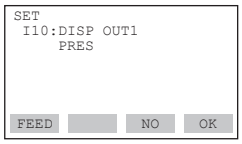
Select the variable for the parameter I10: DISP OUT1 to display on the integral indicator.

• Example: Change the integral indicator scale from % of range to input pressure display.



Use the ∧ or ∨ key to select **PRES**.

Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.

F0321.ai

b. Cyclic Display (I11: DISP OUT2, I12: DISP OUT3, and I13: DISP OUT4)

In addition to the display set at I10: DISP OUT1, displays can be set at I11: DISP OUT2, I12: DISP OUT3, and I13: DISP OUT4 for cyclic display in the order of the parameter number.

c. User Setting of Engineering Unit and Scale (I30: ENGR.UNIT, I31: EASY EU SET, I33: ENGR.LRV, and I34: ENGR.URV)

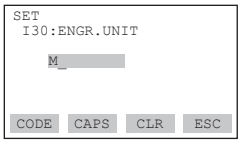
These parameters allow the entry of the engineering units and scale to be displayed. The engineering unit can be selected from the parameter I31: EASY EU SET as listed below. Alternately, up to eight alphanumerics, spaces, and a slash "/" can be input on keypad at I30: ENGR. UNIT; only first six are displayed on the integral indicator.

Select the unit from the list of I31: EASY EU SET.

kPa	ftH2O	Nl/min
MPa	gf/cm2	Nm3/h
mbar	kgf/cm2	Nm3/min
bar	kg/cm2G	ACFH
psi	kg/cm2A	ACFM
psia	atm	SCFH
mmH2O	kg/h	SCFM
mmHg	t/h	GPH
mmHgA	m3/h	GPM
mmAq	m3/min	m
mmWG	l/h	mm
Torr	l/min	in
inH2O	kl/h	ft
inHg	kl/min	kg/m3
inHgA	Nl/h	g/cm3

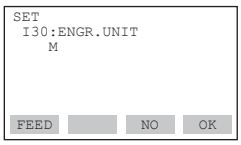
Follow the procedure below to change the settings.

• Example: Set an engineering unit **M**.



Set **M**.

Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.

F0322.ai

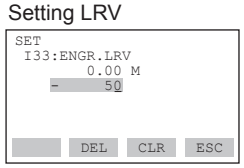
Note that following symbols are not available.

. – , + *) (' & % $ # " !

The transmitter integral indicator shows "-- -- -- -- -- --" when these are entered.

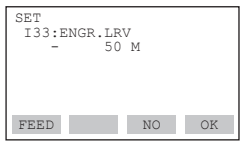
• Example: Set lower range value (LRV) to **–50** and upper range value (URV) to **50**.

Setting LRV



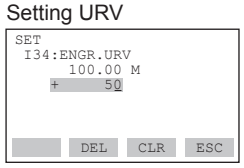
Set **–50**.

Press the ENTER key twice to enter the setting.



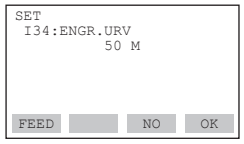
Press the F4 (OK) key.

Setting URV

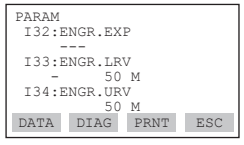


Set **50**.

Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.



F0323.ai

d. Setting Static Pressure Unit and Scale (D30: SP UNIT, D33: SP LRV, and D34: SP URV)

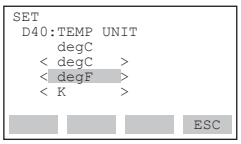
Static pressure can be displayed in measured input static pressure or in %, independent from the 4-20 mA output signal of measured pressure or differential pressure. These parameters allow the entry of the static pressure unit and scale to be displayed.

Note that the parameter D37: SP SELECT can be used to select either the high or low pressure side of the capsule to monitor the static pressure.

(7) Unit Setup for Displayed Temperature (D40: TEMP UNIT)

When the instrument is shipped, the temperature units are set to **degC**. Follow the procedure below to change this setting. Note that changing the unit here changes the unit for A30: CAPSULE TEMP (capsule temperature) and J45: AMP TEMP (amplifier temperature).

• Example: Change the unit for the temperature display **degC** to **degF**.



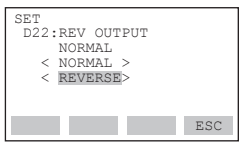
Use the ^ or v key to select **degF**.
Press the ENTER key twice to enter the setting.
Then press the F4 (OK) key.

F0324.ai

(8) Operation Mode Setup (D22: REV OUTPUT)

This parameter allows the direction of the 4-20 mA output to be reversed with respect to input. Follow the procedure below to make this change.

• Example: Change 4 to 20 mA output to 20 to 4 mA output.



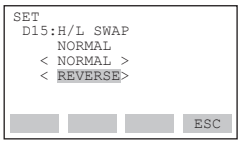
Use the ^ or v key to select **REVERSE**.
Press the ENTER key twice to enter the setting.
Then press the F4 (OK) key.

F0325.ai

(9) Impulse Line Connection Orientation Setup (D15: H/L SWAP)

This function reverses the impulse line orientation. Follow the procedure below to make this change.

• Example: Assign the high pressure impulse line connection to the L side of the transmitter.

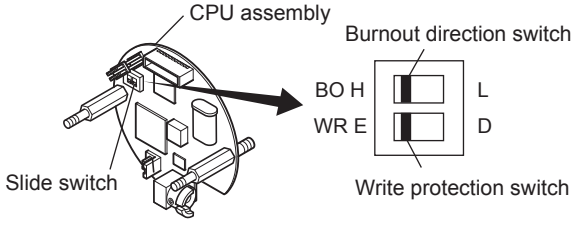


Use the ^ or v key to select **REVERSE**.
Press the ENTER key twice to enter the setting.
Then press the F4 (OK) key.

F0326.ai

(10) CPU Failure Burnout Direction and Hardware Write Protect (D25: BURNOUT)

There are two slide switches on the CPU assembly board. One sets the burnout direction at CPU failure, and the other sets a write protection function which disables parameter changes through the use of a handheld terminal or some other communication method.



Burnout direction switch (BO)		
Burnout Direction Switch Position	H L E D	H L E D
Burnout Direction	HIGH	LOW

Hardware write protection switch (WR)		
Write Protection Switch Position	H L E D	H L E D
Write Protection	NO (Write enabled)	YES (Write disabled)

F0327.ai

The parameter D25: BURNOUT displays the status of 4-20 mA DC output if a CPU failure occurs. In case of a failure, communication is disabled.

Standard specifications

The burnout direction switch is set to HIGH. If a failure occurs, the transmitter outputs a 110% or higher signal.

Option code /C1

The burnout direction switch is set to LOW. If a failure occurs, a –5% or lower output is generated.

• Example: Standard specifications

```
D25: BURNOUT
     HIGH
```

Slide switch position: H

• Example: Option code /C1

```
D25: BURNOUT
     LOW
```

Slide switch position: L

F0328.ai

(11) Software Write Protect (D55: WRT PROTECT, D56: WRT ENABLE, D57: NEW PASSWORD)

Transmitter configured data can be saved by the write protect function. Write protect status (D55: WRT PROTECT) is set from **NO** to **YES** when eight alphanumerics are entered in the parameter D57: NEW PASSWORD. Accordingly, the transmitter does not accept any parameter changes. When the eight alphanumeric password is entered in the parameter D56: WRT ENABLE, the transmitter accepts parameter changes during a 10 minute period.

To cancel the transmitter for the software write protection completely, use D56: WRT ENABLE to first release the write protect function and then enter eight spaces in the D57: NEW PASSWORD field.

The software write protection does not affect the function of external zero adjustment screw.

To disable the external zero adjustment screw, set the parameter J15: EXT ZERO ADJ to INHIBIT before activating the software write protection.

a. Setting Password (D57: NEW PASSWORD)

• Example: Set the password to 1234ABCD.

```
SET
 D57:NEW PASSWORD
    1234ABCD

CODE  CAPS  CLR  ESC
```

Enter **1234ABCD**.
Press the ENTER key twice to enter the setting.

```
SET
 D57:NEW PASSWORD
    1234ABCD

FEED        NO   OK
```

Press the F4 (OK) key.
Then status of parameter D55: WRT PROTECT becomes YES.

F0329.ai

b. Entering Password to Enable Parameter Change (D56: WRT ENABLE)

• Example: Enter the password of 1234ABCD.

```
SET
 D56:WRT ENABLE
    1234ABCD

CODE  CAPS  CLR  ESC
```

Enter the password.
Press the ENTER key twice to enter the setting.

```
SET
 D56:WRT ENABLE
      PASS

FEED        NO   OK
```

Press the F4 (OK) key.
Parameter changes are available for 10 minutes.

F0330.ai

c. Releasing Password (D57: NEW PASSWORD)

To release the password, enter eight spaces at D57: NEW PASSWORD during the period that the parameter change is possible.

d. Software Seal (D58: SOFTWR SEAL)

When you lose the password that has been registered, it is possible to release the write protect function by using general password. Contact Yokogawa about the general password. When the password is used, the status shown in the parameter D58: SOFTWR SEAL is changed from **KEEP** to **BREAK**. The status returns to **KEEP** by entering a newly set password at D56: WRT ENABLE.

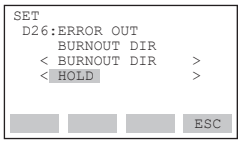
(12) Output Status Setup when a Hardware Error Occurs (D26: ERROR OUT)

This parameter allows the setting of the output status when a hardware error occurs. The following selections are available.

(a) BURNOUT DIR; Outputs the corresponding values of 110% or –5% of output signals according to the setting by burnout direction switch (BO) on the CPU board.
(b) HOLD; Outputs the last value held before the error occurred.

Note: A hardware error means CAP.ERR of AL.01 or AMP.ERR of AL.02 which are shown in table 4.1 Alarm Message Summary.

• Example: Set the output status to **HOLD** when a hardware error occurs.



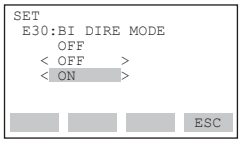
Use the ^ or v key to select **HOLD**.
Press the ENTER key twice to enter the setting.
Then press the F4 (OK) key.

F0331.ai

(13) Bi-directional Flow Measurement Setup (E30: BI DIRE MODE)

(a) This parameter enables selection of 50% output at an input of 0 kPa.
Procedure is shown in the figure below.
(b) Combining this with **C40: OUTPUT MODE** provides a square root output computed independently for 0% to 50% output and for 50% to 100% output.

• Example: If measurement range is 0 to 10 kPa (LRV=0 kPa, URV=10 kPa)

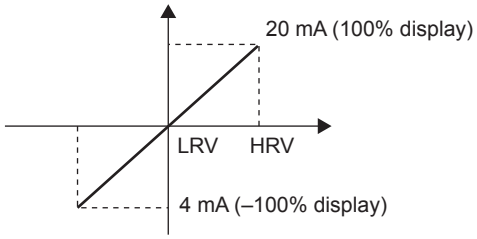


Use the ^ or v key to select **ON**.
Press the ENTER key twice to enter the setting.
Then press the F4 (OK) key.

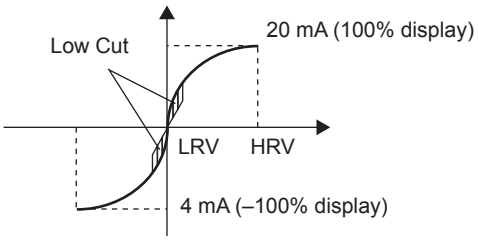
The measurement range changes to –10 to 0 to 10 kPa (output 0% to 50% to 100).
Note that **C21: PRES LRV** and **C22: PRES URV** are not changed.

F0332.ai

• Output mode “LINEAR”



• Output mode “SQUARE ROOT”



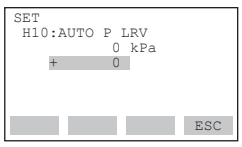
F0333.ai

(14) Range Change while Applying Actual Inputs (H10: AUTO P LRV, H11: AUTO P URV)

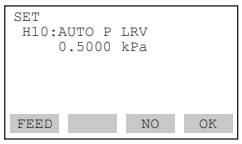
This feature allows the lower and upper range values to be set up automatically with the actual input applied. If the lower and upper range values are set, C21: PRES LRV and C22: PRES URV are changed at the same time.

Follow the procedure in the figure below.
The measurement span is determined by the upper and lower range values. Changing the lower range value results in the upper range value changing automatically, keeping the span constant.

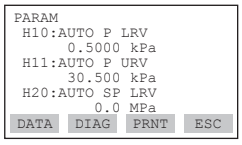
• Example 1: When changing the lower range value to 0.5 kPa for the present setting of 0 to 30 kPa, take the following action with input pressure of 0.5 kPa applied.



Press the ENTER key twice.
The lower range value is changed to 0.5 kPa.



Press the F4 (OK) key.

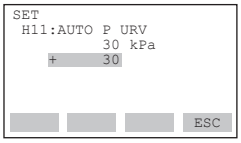


The upper range value is changed keeping the span constant.
Parameters **C21** and **C22** are changed at the same time.

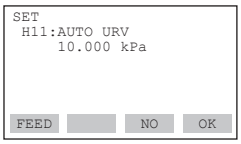
F0334.ai

Note that changing the upper range value does not cause the lower range value to change but does change the span.

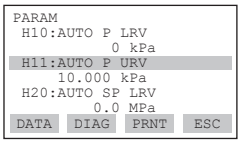
• Example 2: When the upper range value is to be changed to 10 kPa with the present setting of 0 to 30 kPa, take the following action with an input pressure of 10 kPa applied.



Press the ENTER key twice. The upper range value is changed to 10 kPa.



Press the F4 (OK) key.



The lower range value is not changed, so the span changes. Parameter **C22** is changed at the same time.

F0335.ai

(15) Sensor Trim

Each transmitter is factory characterized. Factory characterization is the process of comparing a known pressure input with the output of each transmitter sensor module over the entire pressure and temperature operating range. During the characterization process, this comparison information is stored in the transmitter EEPROM. In operation, the transmitter uses this factory-stored curve to produce a process variable output (PV), in engineering units, dependent on the pressure input.

The sensor trim procedure allows you to adjust for local conditions, changing how the transmitter calculates process variables. There are two ways to trim the sensor: a zero trim and a full sensor trim. A zero trim is a one-point adjustment typically used to compensate for mounting position effects or zero shifts caused by static pressure. A full sensor trim is a two-point process, in which two accurate end-point pressures are applied (equal to or greater than the range values), and all output is linearized between them.

a. Zero Trim (J11: P ZERO ADJ, J15: P ZERO DEV, J55: EXT ZERO ADJ)

The transmitter supports several adjustment methods. Select the method best suited for the conditions of your application.

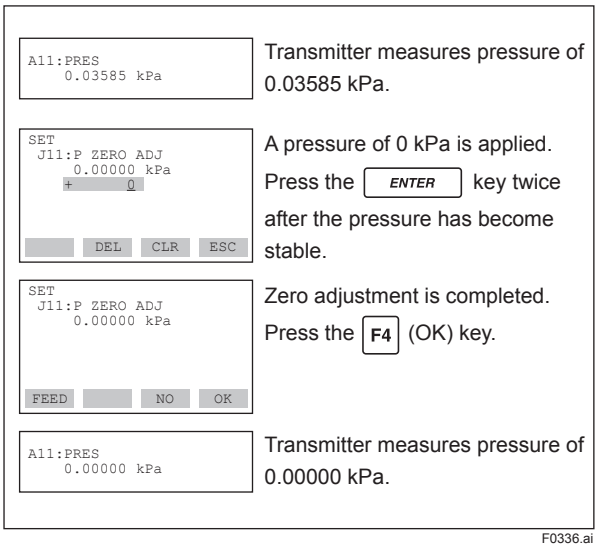
Adjustment Method	Description
Using the BT200	**Set the present input to 0%.** Adjust for 0% output at input level of 0%.
	Adjust output to the reference value obtained using other means. If the input level cannot easily be made 0% (because of tank level, etc.), adjust output to the reference value obtained using other means, such as a sight glass.
Using the external zero-adjustment screw	Adjust zero point using the zero-adjustment screw on the transmitter. This permits zero adjustment without using the BT200. Accurately adjust the output current to 4 mA DC or other target output value using an ammeter that accurately reads output currents.

When using BT200, the output signal can be adjusted either in % or pressure unit. The unit can be selected by the parameter J09: ADJ UNIT. Output signal can be changed by displaying parameter A10: OUTPUT for % or J10: OUTPUT for pressure unit.

This section discribes the zero adjustment procedure by using the pressure unit.

a-1. Zeroing

Setting the parameter J11: P ZERO ADJ carries out the zero adjustment and automatically sets the applied “0” input values to the transmitter’s output value of zero, keeping the span constant. Use this setting when the LRV is known to be 0 kPa.

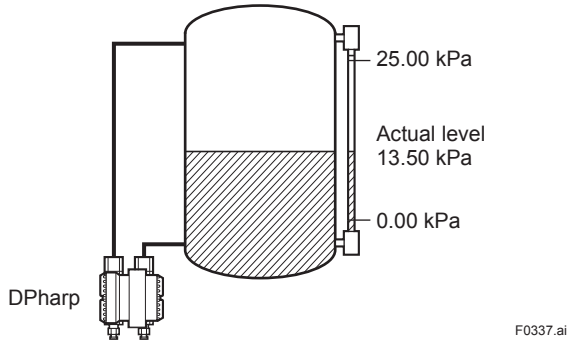


F0336.ai

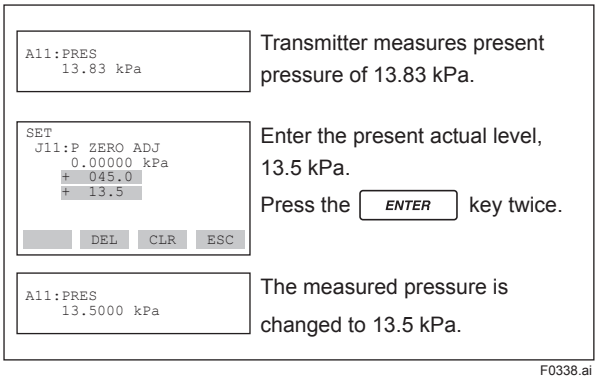
a-2. Level Adjustment

The zero adjustment by the parameter J11: P ZERO ADJ calibrates the transmitter output corresponding to the actual tank level. To perform this adjustment, first use a glass gauge or the like to determine the actual tank level, then enter the correct data as shown below.

DPharp span: 0 to 25.00 kPa
Actual level: 13.50 kPa
Transmitter output: 13.83 kPa



F0337.ai



F0338.ai

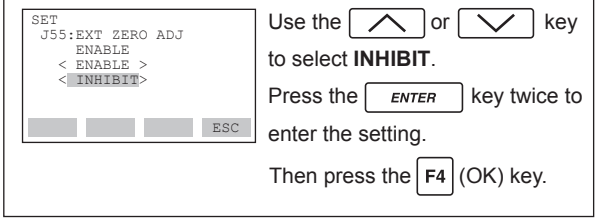
a-3. Using External Zero-adjustment Screw

This method permits zero adjustment without the BT200. Use a slotted screwdriver to turn the zero-adjustment screw. See the hardware manual for details.

Note that the parameter J55: EXT ZERO ADJ must be **ENABLE** to perform this adjustment.

Follow the procedure below to enable or inhibit zero point adjustment from the zero-adjustment screw on the transmitter.
This is set to **ENABLE** when the instrument is shipped.

• Example: Inhibiting zero adjustment by the external zero-adjustment screw.



F0339.ai

b. Full Sensor Trim (J11: P ZERO ADJ, J12: P SPAN ADJ, J15: P ZERO DEV, J16: P SPAN DEV)

Full sensor trim is carried out with a series of the procedure of J11: P ZERO ADJ and J12: P SPAN ADJ. Also, you can manually perform the trimming procedure by using J15: P ZERO DEV and J16: P SPAN DEV.

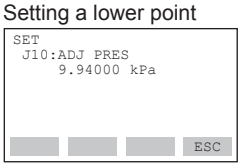
The full sensor trim is a two-point adjustment, and the lower point adjustment should always be performed before the upper point adjustment in order to maintain the pitch between the zero and 100% points within the calibration range.

In the manual method, the reference pressure should also be applied to the transmitter at both lower and upper point of trim ends. Without the reference pressure, J15: P ZERO DEV and J16: P SPAN DEV may not represent the correct value of adjustment point for each.

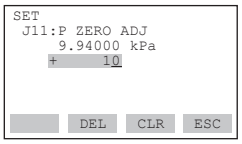
b-1. Auto Sensor Trim

• Example: For the range of 10 to 30 kPa.

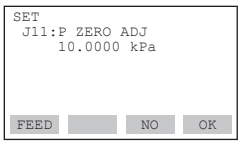
Setting a lower point



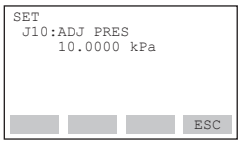
Transmitter indicates 9.94 kPa as its output when applying a standard pressure of 10 kPa.



Set **10**.
After obtaining a stable pressure of 10 kPa, press ENTER key twice.

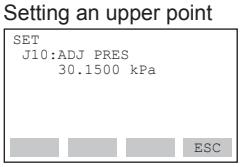


Press the F4 (OK) key.

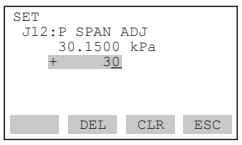


Check the output becomes 10 kPa.

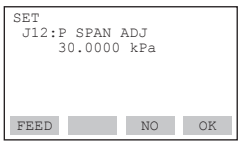
Setting an upper point



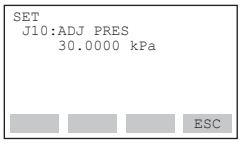
Transmitter indicates 30.15 kPa as its output when applying a standard pressure of 30 kPa.



Set **30**.
After obtaining a stable pressure of 30 kPa, press ENTER key twice.



Press the F4 (OK) key.



Check the output becomes 30 kPa.

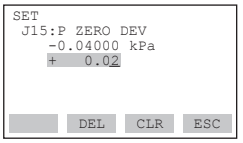
F0340.ai

b-2. Manual Sensor Trim

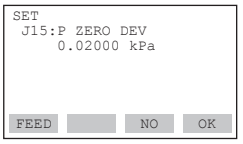
• Example: For the range of 10 to 30 kPa.
J15: P ZERO DEV = –0.04 kPa
J16: P SPAN DEV = –0.03 kPa

Suppose that a standard pressure of 10 kPa is applied and the value of the parameter J10: ADJ PRES is 9.94 kPa. Correct for this output error of 0.06 kPa by adding 0.06 to J15: P ZERO DEV.

–0.04 + 0.06 = +0.02



Set **0.02**.
Press ENTER key twice.



Press the F4 (OK) key.

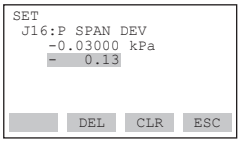
Suppose that a standard pressure of 30 kPa is applied and the value of the parameter J10: ADJ PRES is 30.15 kPa. Firstly, obtain the slope error for the span as follows;

$$\text{Slope Error} = \frac{\text{Applied Pres Value} - \text{Measured Pres Value}}{\text{Applied Pres Value}} \times (\text{URV} - \text{LRV})$$

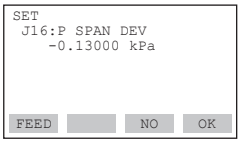
$$= \frac{30.00 - 30.15}{30.00} \times (30.00 - 10.00) = -0.1$$

Then correct for this slope error of –0.1 by adding –0.1 to J16: P SPAN DEV.

–0.03 + (–0.1) = –0.13



Set **–0.13**.
Press ENTER key twice.



Press the F4 (OK) key.

F0341.ai

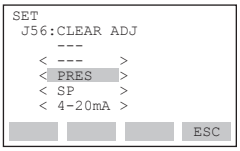
c. Sensor Trim for Static Pressure (J21: SP ZERO ADJ, J22: SP SPAN ADJ, J25: SP ZERO DEV, J26: SP SPAN DEV)

For the transmitters (Except for EJX120A/EJA120E), zeroing and full sensor trim of the static pressure is performed in the same way as with the primary process variable (PV). Note that the static pressure sensor trim should be done only after trimming the PV.

d. Reset Trim Adjustment to Factory Setting (J56: CLEAR ADJ)

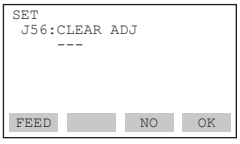
Use **PRES** or **SP** of J56: CLEAR ADJ parameter to reset the trim adjustment to the initial calibrated values that were set. When **PRES** is selected to clear the adjustment, the amount of the adjustment by the external zero-adjustment screw is returned to the initial setting as well.

• Example: Reset the trim adjustment of pressure to factory set characterization curve.



Use the ^ or v key to select **PRES**.

Press the ENTER key twice to enter the setting.



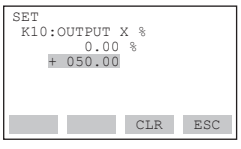
Press the F4 (OK) key.

F0342.ai

(16) Test Output Setup (K10: OUTPUT X %)

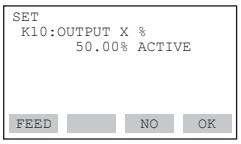
This feature can be used to output a fixed current for loop checks. The available range for test output depends on the setting at parameters D20: OUT LIMIT (L) and D21: OUT LIMIT (H), whose limit is from 3.6 mA (–2.5%) to 21.6 mA (110%).

• Example: Output 12 mA (50%) fixed current.



Set **50.00**%.

Press the ENTER key twice to output a fixed current at 50%.



ACTIVE is displayed while this is being executed.

Press the F4 (OK) key to cancel the fixed current output.

F0343.ai

NOTE

- Fixed current output and DO Test continue for a given holding time, then is released automatically. Even if the BT200 power supply is turned off or the communication cable is disconnected, the test output will continue for that time.
  The holding time can be selected from 10 min*, 30 min, 60 min, 3 hour, 6 hour or 12 hour by the parameter K45: TEST TIME.
  *: Default value.
- Press the F4 (OK) key to release test output immediately.

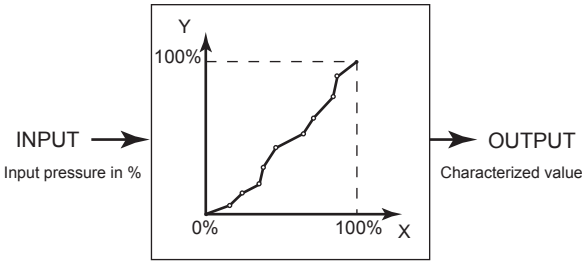
(17) Signal Characterizer

This function is used to compensate the output for non-linear applications. The characterized values are applied to the 4-20 mA output. For the measured pressure, a maximum of nine coordinates can be specified between 0-100%. Perform the coordinate settings while the T10: S. C. ENABLE parameter is **INHIBIT**.

To apply the settings to the output, set the T10: S. C. ENABLE parameter to **ENABLE**.

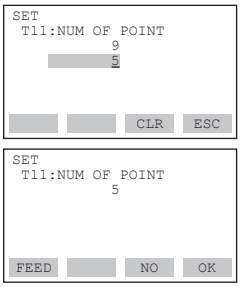
Note that the transmitter rejects the activation of the function by AL. 60 with the following transmitter's status:

- When the specified coordinates of x and y are not incremental as the input increases.
- When the output mode of the output signal is set as **SQUARE ROOT**; at the same time, the low cut mode is set to **LINEAR**.



F0344.ai

• Example: Set the number of coodinates on the line graph to 5.

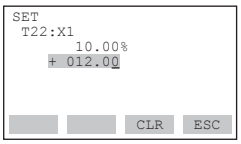


Set **5**.
Press the ENTER key twice to enter the setting.

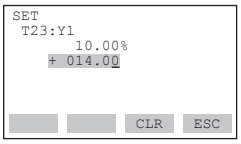
Press the F4 (OK) key.

F0345.ai

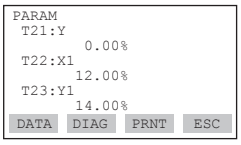
• Example: Set the first coordinates (X1, Y1) as (12, 14) in %.



Set **12** for X1.
Press the ENTER key twice to enter the setting.
Press the F4 (OK) key.

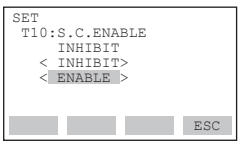


Set **14** for Y1.
Press the ENTER key twice to enter the setting.
Press the F4 (OK) key.

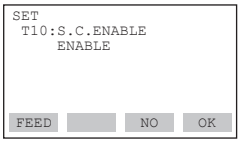


F0346.ai

• Example: Set the signal characterizer **ENABLE**.



Use the ^ or v key to select **ENABLE**.
Press the ENTER key twice to activate the function.



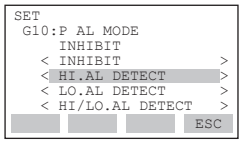
Press the F4 (OK) key.

F0347.ai

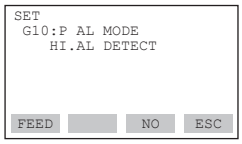
(18) Process Alarm (G10: P AL MODE, G11: P HI.AL VAL, G12: P LO.AL.VAL)

The function is used to display the alarm codes when the input pressure exceeds the specified value within the calibration range. The same is available for the input static pressure and the capsule temperature on the pressure sensor. Refer to table 4.1 Alarm Message Summary for the specific alarm code to be generated.

• Example: Set alarm mode from **OFF** to **HI.AL DETECT**.



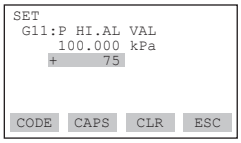
Use the ^ or v key to select **HI. AL DETECT**.
Press the ENTER key twice to enter the setting.



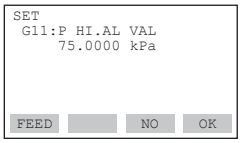
Press the F4 (OK) key.
Alarm code is generated when the output goes beyond the value set at G11: P HI. AL VAL.

F0348.ai

• Example: Set the higher alert value of 75 for alarm generation.



Set **75**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.
Then the alarm code “AL.35 P. HI” is generated when the input pressure goes beyond that value.

F0349.ai

(19) Status Output (option code AL)

This feature is used for a transistor output (open collector) of an on/off signal according to the status of high and low alarm limits, which are user-configurable values as shown in (18) Process Alarm. The status output can be assigned as any combination of the high or low limits of the input pressure, input static pressure, or capsule temperature.

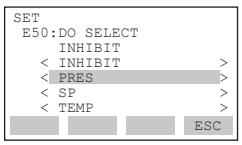
CAUTION

Execute DO testing by the parameter "K40: DO test" whenever turning on the transmitter or detecting the short interruption in order to check that the alarm contact output is correctly configured.

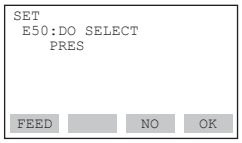
NOTE

No status output signal has been defined for a CPU failure or hardware error. Use a 4-20 mA signal to indicate a transmitter’s failure.

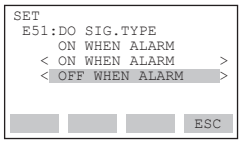
• Example: Set the status output to output an off signal when the input pressure exceeds 75 kPa with its alert mode of HI. AL DETECT.



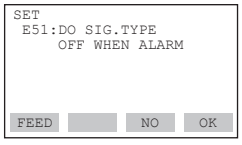
Use the ^ or v key to select **PRES**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.



Use the ^ or v key to select **OFF WHEN ALARM**.
Press the ENTER key twice to enter the setting.

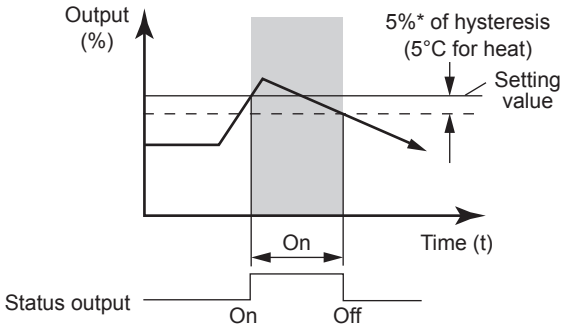


Press the F4 (OK) key.

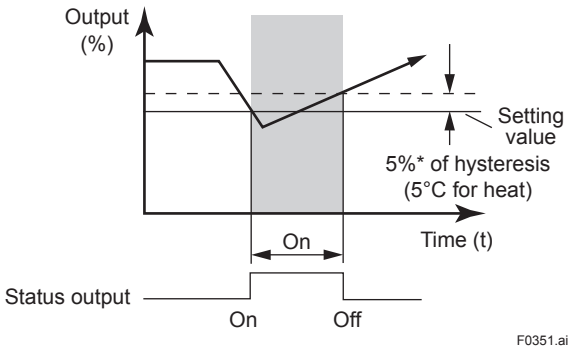
F0350.ai

Example: Status output operation of **ON WHEN AL. DETECT**

● Status output for higher alert value



● Status output for lower alert value



F0351.ai

*5% of the setting span of differential pressure / pressure.

(20) Capillary Fill Fluid Density Compensation (E10: T.ZERO CMP, E11: TEMP ZERO)

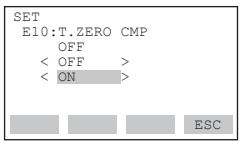
For transmitters with diaphragm seals, this function is used to compensate the zero shift caused by the ambient temperature effect on the capillary tubes.

The following equation indicates the relationship between the calculated output value and the compensating constant K (%/°C) with the measured ambient temperature at the capsule module.

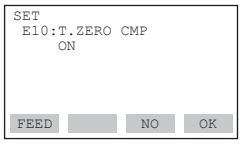
Compensated output = output + K × Tamb

(1) Temperature Compensation Mode Setup (E10: T. ZERO CMP)
When using this function, set T. ZERO CMP to *ON* to enable or *OFF* to disable. To set to *ON*, follow the procedure below.

• Example: Set the temperature compensation mode to **ON**.



Use the ^ or v key to select **ON**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.

F0352.ai

(2) Zero Shift Compensation Setup (E11: TEMP ZERO)
Obtain the K compensating value from the equation(1) below.

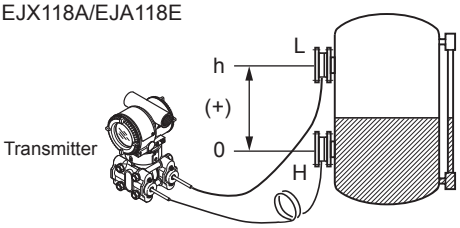
$$K = -\frac{h \times B}{span} \times 100 \quad \cdots\cdots\cdots \text{(a)}$$

where,
B: Constant value of fill fluid (See Table A.)
span: |URV–LRV|
h: Distance from high pressure side to low pressure side (m)

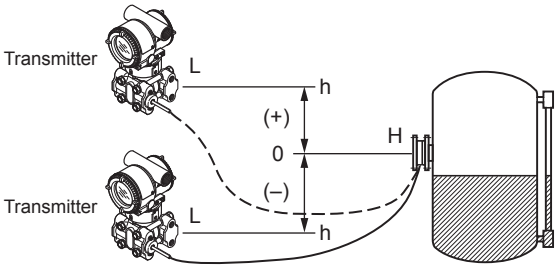
EJX118A/EJA118E: Distance from high side of diaphragm seal to low side of diaphragm seal.

EJX438A/EJA438E: Distance from diaphragm seal (high side) to position of transmitter (low side).

● EJX118A/EJA118E



● EJX438A/EJA438E



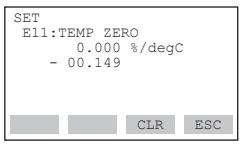
Note: When the transmitter is positioned lower than the diaphragm seal part, the value of “h” must have a negative sign (–).

F0353.ai

• Example: Enter K value obtained from the equation (a). A value having up to 3 decimal places may be specified.

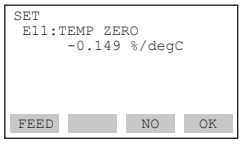
When h=+3 m, Fill fluid code A, span=15 kPa,

K=−(+3)×0.00745÷15×100=−0.149



Enter “–0.149.”

Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.

F0354.ai

Note 1: The function is performed using a built-in temperature sensor in the transmitter body. The temperature deviation between the transmitter body and capillaries should be minimized to achieve optimal performance of the function.

Note 2: When the span changes, reenter the newly obtained value of K to E11: TEMP ZERO.

Table A. Constant value [B] of fill fluid

	Fill fluid code	A, C, 1, 2, 4	B	D	E
Constant value [B]	mmH_2O	0.76	0.87	1.45	0.75
	kgf/cm^2	0.000076	0.000087	0.000145	0.000075
	kPa	0.00745	0.00853	0.01422	0.00736
	mBar	0.07453	0.08532	0.14220	0.07355
	atm	0.000074	0.000084	0.000140	0.000073
	inH_2O	0.02992	0.03425	0.05709	0.02953
	psi	0.00108	0.00124	0.00206	0.00167
	mmHg	0.05592	0.06401	0.10669	0.05518

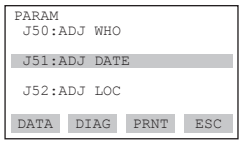
Note 3: Select the unit of constant value of [B] from the actual unit used for the transmitter in operation.

(21) Adjustment Information and User Memo Fields

(J50: ADJ WHO, J51: ADJ DATE, J52: ADJ LOC, J53: ADJ DESC, M17 to M19: MEMO1 to MEMO3)

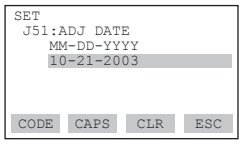
This feature provides four fields for instrument adjustment information at maintenance: inspection date, inspector, location, and description. Also three user memo fields are provided, each holding up to 16 alphanumeric characters.

• Example: Save an inspection date of October 21, 2003.



Set “10-21-2003” in the order of month, day, and year.

Press the ENTER key twice to enter the setting.



F0355.ai

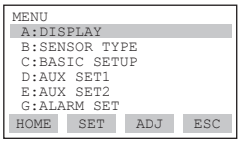
3.3 Displaying Data Using the BT200

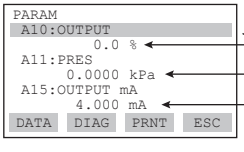
3.3.1 Displaying Measured Data

The BT200 can be used to display measured data.

The measured data is updated automatically every seven seconds. In addition, the display can be updated to the present data value at any time by pressing the F1 (DATA) key. For parameters associated with the display of measured data, see chapter 5 Parameter Summary.

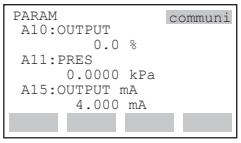
• Example: Display output.





Display “A10: OUTPUT.”

Data is updated automatically at 7-second intervals.

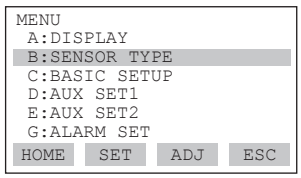


F0356.ai

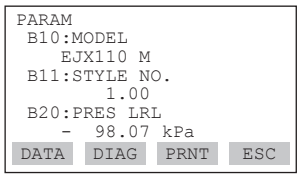
3.3.2 Display Transmitter Model and Specifications

The BT200 can be used to display the model and specifications of the transmitter.

• Example: View transmitter model name.



Press ENTER .



For the associated parameters, see Chapter 5, Parameter Summary.

F0357.ai

4. Self-diagnostics

4.1 Checking for Problems

4.1.1 Identifying Problems with BT200

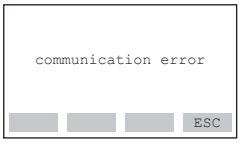
The following four areas can be checked.

(a) Whether connections are good.
(b) Whether BT200 was properly operated.
(c) Whether settings were properly entered.
(d) History of the errors.

See examples below.

• Example 1: Connection errors

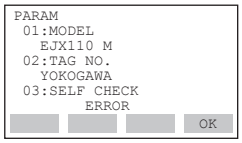
Press the ON/OFF key.
When the panel shown on the left appears, press the ENTER key.



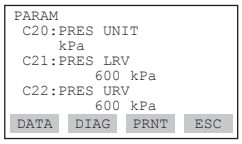
Since communications will be unsuccessful if there is a problem in the connection to the BT200, the display at the left will appear.
Recheck the connection.
Press the F4 (OK) key.

F0401.ai

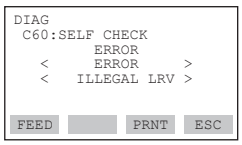
• Example 2: Setting entry errors



The initial data panel shows the result of current transmitter diagnostics.



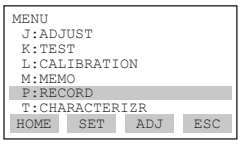
Press the F2 (DIAG) key in the parameter panel to go to the diagnostics panel (C60: SELF CHECK).



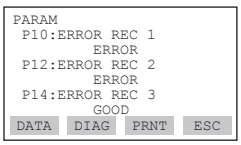
An error message is displayed when an error occurs in the diagnostics panel.

F0402.ai

• Example 3: Checking the history of the errors

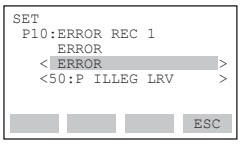


Connect the BT200 to the transmitter, and call item “P.”



P10: “ERROR REC 1” displays the last error.
P12: “ERROR REC 2” displays the error one time before the last error occurred.
P14: “ERROR REC 3” displays the error two times before the last error occurred.
P16: “ERROR REC 4” displays the error three times before the last error occurred.

The history of up to four errors can be stored. When the 5th error has occurred, it is stored in “P10.” The error stored in “P16” will be deleted, and then, the error in “P14” will be copied to “P16.” In this sequence, the history of the most previously occurred error will be removed from memory.
“GOOD” will be displayed if there was no previous error.



Select P10: ERROR REC1 and press the ENTER key to display the error message.

<(a) SETUP PANEL>

For the details of the messages, see Table 4.1 Alarm Message Summary.

Note 1: Press the ENTER key twice in the setup panel (a) to clear all error message (P10 to P16) information.
Note 2: When the error occurs, the self-diagnostic detects errors and records them in two ways depending on the types of errors. The amplifier/capsule failures are recorded immediately after the occurrence, while the minor errors such as warnings of inappropriate parameter settings are periodically recorded at an interval of minimum five minutes to twenty four hours.
Note that the interval extends as the number of access counts to EEPROM increases.

F0403.ai

4.1.2 Checking with Integral Indicator

NOTE

If an error is detected by running self-diagnostics, an error number is displayed on the integral indicator. If there is more than one error, the error number changes at three-second intervals.
See table 4.1 regarding the alarm codes.

Figure 4.1 Integral Indicator

4.2 Alarms and Countermeasures

Table 4.1 Alarm Message Summary

Indicator	BT200 display	Cause	Output operation during error	Countermeasure
None	GOOD			
AL. 01 CAP. ERR	01: P-SENSOR ERR	Sensor problem.	Outputs the signal (Hi or Low) set with parameter D26. [Status output: undefined]	Replace capsule when error keep appearing error even after restart.
	01: CT-SENSOR ERR	Capsule temperature sensor problem.		Replace capsule.
	01: C-EEPROM ERR	Capsule EEPROM problem.		
AL. 02 AMP. ERR	02: AT-SENSOR ERR	Amplifier temperature sensor problem.		Replace amplifier.
	02: A-EEPROM ERR	Amplifier EEPROM problem.		
	02: CPU BOARD ERR	Amplifier problem.		
AL. 10 PRESS	10: P OVER SPEC	Input is outside measurement range limit of capsule.	Outputs upper range limit (URL) or lower range limit (LRL).	Check input or replace capsule when necessary.
AL. 11 ST. PRSS	11: SP OVER SPEC	Static pressure exceeds limit.	Continues to operate and output.	
AL. 12 CAP. TMP	12: CT OVER SPEC	Capsule temperature is outside range (–50 to 130°C).		Use heat insulation or make lagging to keep temperature within range.
AL. 13 AMP. TMP	13: AT OVER SPEC	Amplifier temperature is outside range (–50 to 95°C).		
AL. 30 RANGE	30: P OVER RANGE	Output is outside upper or lower range limit value.	Outputs upper range value (URV) or lower range value (LRV).	Check input and range setting, and change them as needed.
AL. 31 SP. RNG	31: SP OVER RANGE	Static pressure exceeds specified range.	Continues to operate and output.	
AL. 35 P. HI	35: P HIGH ALARM	Input pressure exceeds specified threshold.		Check input.
AL. 36 P. LO	36: P LOW ALARM			
AL. 37 SP. HI	37: SP HIGH ALARM	Input static pressure exceeds specified threshold.		
AL. 38 SP. LO	38: SP LOW ALARM			
AL. 39 TMP. HI	39: CT HIGH ALARM	Detected temperature exceeds specified threshold.		Check capsule temperature.
AL. 40 TMP. LO	40: CT LOW ALARM			

Indicator	BT200 display	Cause	Output operation during error	Countermeasure
AL. 50 P. LRV	50: P ILLEG LRV	Specified value is outside of setting range.	Holds output immediately before error occurred.	Check settings and change them as needed.
AL. 51 P. URV	51: P ILLEG URV			
AL. 52 P. SPN	52: P ILLEG SPAN			
AL. 53 P. ADJ	53: P SPAN ADJ		Continues to operate and output.	Adjust settings and change them as needed.
	53: P ZERO ADJ			
AL. 54 SP. RNG	54: SP ILLEG LRV		Continues to operate and output holding static pressure in %.	Check settings and change them as needed.
	54: SP ILLEG URV			
	54: SP ILLEG SPAN			
AL. 55 SP. ADJ	55: SP SPAN ADJ		Continues to operate and output.	Adjust settings and change them as needed.
	55: SP ZERO ADJ			
AL. 60 SC. CFG	60: SC CONFIG ERR	Specified values or settings do not meet the conditions.	Continues to operate and output without signal characterizing.	Check settings and change them as needed.
AL. 79 OV. DISP	—	Displayed value exceeds limit.	Continues to operate and output.	

5. Parameter Summary

Instruments to which applicable:

F: Differential pressure transmitters

P: Absolute and gauge pressure transmitters

L: Flange mounted differential pressure transmitters

No.	Parameter name	Item	*1 R/W	Content	Default value	Applicable model			Upload data
						F	P	L	
01	MODEL	Model	R		EJX (for EJX series) EJA (for EJA series)	○	○	○	—
02	TAG No.	Tag number	R		As specified	○	○	○	—
03	SELF CHECK	Self-diagnostics	R		GOOD	○	○	○	—
A	DISPLAY	Measured data display							
A10	OUTPUT	Output (in %)	R	-2.5 to 110%		○	○	○	—
A11	PRES	Measured pressure after zero adjustment	R	Unit specified in C20		○	○	○	—
A15	OUTPUT mA	Output current	R	3.600 to 21.600 mA		○	○	○	—
A16	ENGR. OUTPUT	User scaled value	R	Unit specified in I30		○	○	○	—
A17	ENGR. EXP	Exponents	R	Unit specified in I32		○	○	○	—
A20	SP %	Static pressure (in %)	R	-10 to 110%		○	—	○	—
A21	SP	Static pressure after zero adjustment	R	Unit specified in D30		○	—	○	—
A30	CAPSULE TEMP	Capsule temperature	R	Unit specified in D40		○	○	○	—
A60	SELF CHECK	Self-diagnostics	R	Refer to Table 4.1 Alarm Message Summary		○	○	○	—
B	SENSOR TYPE	Sensor type							
B10	MODEL	Model and capsule type	R	Model and capsule type		○	○	○	—
B11	STYLE NO.	Style number	R	Style number of product		○	○	○	—
B20	PRES LRL	Lower range limit	R	Unit specified in C20		○	○	○	—
B21	PRES URL	Upper range limit	R	Unit specified in C20		○	○	○	—
B22	P MIN SPAN	Minimum span	R	Unit specified in C20		○	○	○	—
B30	SP LRL	Lower range limit for static pressure	R	Unit specified in D30		○	—	○	—
B31	SP URL	Upper range limit for static pressure	R	Unit specified in D30		○	—	○	—
B32	SP MIN SPAN	Minimum span for static pressure	R	Unit specified in D30		○	—	○	—
B60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—
C	BASIC SETUP	Setting data							
C10	TAG NO.	Tag number	W	16 alphanumeric characters	As specified	○	○	○	○
C20	PRES UNIT	Measurement range unit	W	mmH_2O, mmAq, mmWG, mmHg, Torr, kPa, MPa, mbar, bar, gf/cm^2, kgf/cm^2, inH_2O, inHg, ftH_2O, psi, atm, Pa, hPa	kPa	○	○	○	○
C21	PRES LRV	Lower range value	W	-32000 to 32000 within measurement range	As specified	○	○	○	○
C22	PRES URV	Upper range value	W	-32000 to 32000 within measurement range	As specified	○	○	○	○
C23	PRES POINT	Decimal place	W	0 to 4	2	○	○	○	○
C30	AMP DAMPING	Damping time constant at amplifier	W	0.50(0.00) to 100.00 seconds, see D50	2.00 seconds or as specified	○	○	○	○
C40	OUTPUT MODE	Output mode	W	LINEAR or SUQARE ROOT	LINEAR or as specified	○	○	○	○
C60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—

*1: R/W: R = Read only, W = Read & Write

*2: The default value shows MWP (Maximum working pressure) of the capsule.
Since the working pressure limit varies according to the Model, refer to the General Specifications section in each user's manual.

No.	Parameter name	Item	*1 R/W	Content	Default value	Applicable model			Upload data
						F	P	L	
D	AUX SET 1	Auxiliary setting data 1							
D10	LOW CUT	Low cut	W	0.00 to 20.00%	10.00%	○	○	○	○
D11	LOW CUT MODE	Low cut mode	W	LINEAR or ZERO	LINEAR	○	○	○	○
D15	H/L SWAP	Impulse piping accessing direction	W	NORMAL or REVERSE	NORMAL	○	—	○	○
D16	H2O UNIT SEL	H2O unit select	W	@4degC or @20degC (68.0F)	@4degC	○	○	○	○
D20	OUT LIMIT (L)	Low side output limiter	W	-2.50 to 110.00%	-2.50%	○	○	○	○
D21	OUT LIMIT (H)	High side output limiter	W	-2.50 to 110.00%	110%	○	○	○	○
D22	REV OUTPUT	Output reversal	W	NORMAL or REVERSE	NORMAL	○	○	○	○
D25	BURNOUT	CPU error	R	HIGH or LOW		○	○	○	—
D26	ERROR OUT	Hardware error	W	BURNOUT DIR or HOLD	BURNOUT DIR	○	○	○	○
D30	SP UNIT	Static pressure unit	W	See C20	MPa	○	—	○	○
D31	SP A/G SLCT	Gauge/Abs select for static pressure	W	GAUGE or ABSOLUTE	ABSOLUTE	○	—	○	○
D32	ATM. PRESS	Coefficient for given gauge pressure	W	Unit specified in D30	0.10133 MPa	○	—	○	○
D33	SP LRV	Lower limit of static pressure	W	-32000 to 32000 within measurement range	0.0 MPa	○	—	○	○
D34	SP URV	Upper limit of static pressure*2	W	-32000 to 32000 within measurement range		○	—	○	○
D35	SP POINT	Decimal place of static pressure	W	0 to 4	1	○	—	○	○
D36	SP DAMPING	Damping time constant of SP	W	0.00 to 100.00 seconds	2.00 seconds	○	—	○	○
D37	SP SELECT	H/L select for static pressure	W	HIGH or LOW	HIGH	○	—	○	○
D40	TEMP UNIT	Temperature setting unit	W	degC, degF, or K	degC	○	○	○	○
D50	QUICK RESP	Quick response	W	OFF or ON (enable 0.00 to 0.50 seconds at C30)	OFF	○	○	○	○
D55	WRT PROTECT	Write protect indicator	R	NO or YES	NO	○	○	○	—
D56	WRT ENABLE	Write protect release	W	8 alphanumeric characters	None	○	○	○	—
D57	NEW PASSWORD	User set password for write protect	W	8 alphanumeric characters	None	○	○	○	—
D58	SOFTWR SEAL	Software seal	R	BREAK or KEEP	KEEP	○	○	○	—
D60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—
E	AUX SET 2	Auxiliary setting data 2							
E10	T. ZERO CMP	Temperature compensation mode	W	OFF or ON	OFF	○	○	○	—
E11	TEMP ZERO	Zero shift compensation	W	-99.999 to 99.999%/degC	0.000%/degC	○	○	○	—
E30	BI DIRE MODE	Bidirectional mode	W	OFF or ON	OFF	○	○	○	—
E50	DO SELECT	Contact output select	W	INHIBIT, PRES, SP, TEMP, PRES/SP, PRES/TEMP, SP/TEMP, or PRES/SP/TEMP	INHIBIT	○	○	○	—
E51	DO SIG. TYPE	Signal type select	W	OFF WHEN ALARM or ON WHEN ALARM	ON WHEN ALARM	○	○	○	—
E52	D OUTPUT	Contact output	R	OFF or ON	OFF	○	○	○	—
E60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—

*1: R/W: R = Read only, W = Read & Write
*2: The default value shows MWP (Maximum working pressure) of the capsule.
Since the working pressure limit varies according to the Model, refer to the General Specifications section in each user's manual.

No.	Parameter name	Item	*1 R/W	Content	Default value	Applicable model			Upload data
						F	P	L	
G	ALARM SET	Alarm setting							
G10	P AL MODE	Alert mode	W	INHIBIT, HI. AL DETECT, LO. AL DETECT, or HI/LO. AL DETECT	INHIBIT	○	○	○	—
G11	P HI. AL VAL	High side alert value	W	-32000 to 32000, unit specified in C20	100.000 kPa	○	○	○	—
G12	P LO. AL VAL	Low side alert value	W	-32000 to 32000, unit specified in C20	-100.000 kPa	○	○	○	—
G20	SP AL MODE	Static pressure alert mode	W	INHIBIT, HI. AL DETECT, LO. AL DETECT, or HI/LO. AL DETECT	INHIBIT	○	—	○	—
G21	SP HI. AL VAL	High side alert value of SP*2	W	-32000 to 32000, unit specified in D30		○	—	○	—
G22	SP LO. AL VAL	Low side alert value of SP	W	-32000 to 32000, unit specified in D30	0.00000 MPa	○	—	○	—
G30	T AL MODE	Temperature alert mode	W	INHIBIT, HI. AL DETECT, LO. AL DETECT, or HI/LO. AL DETECT	INHIBIT	○	○	○	—
G31	T HI. AL VAL	High side alert value of temperature	W	-50 to 130	120 degC	○	○	○	—
G32	T LO. AL VAL	Low side alert value of temperature	W	-50 to 130	-40 degC	○	○	○	—
G50	AUTO RECOVER	Auto-recover from sensor error	W	OFF or ON	ON	○	○	○	—
G60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—
H	AUTO SET	Automatic setup							
H10	AUTO P LRV	Lower range value auto setup	W	-32000 to 32000, unit specified in C20	As specified	○	○	○	—
H11	AUTO P URV	Upper range value auto setup	W	-32000 to 32000, unit specified in C20	As specified	○	○	○	—
H20	AUTO SP LRV	SP lower range value auto setup	W	-32000 to 32000, unit specified in D30	0.00000 MPa	○	—	○	—
H21	AUTO SP URV	SP upper range value auto setup*2	W	-32000 to 32000, unit specified in D30		○	—	○	—
H60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—
I	DISP SET	Display setting							
I10	DISP OUT1	LCD output 1	W	PRES, PRES %, ENGR. PRES, SP, or SP %	PRES %	○	○	○	○
I11	DISP OUT2	LCD output 2	W	PRES, PRES %, ENGR. PRES, SP, SP %, or ---	---	○	○	○	○
I12	DISP OUT3	LCD output 3	W	See I11	---	○	○	○	○
I13	DISP OUT4	LCD output 4	W	See I11	---	○	○	○	○
I20	P DISP MODE	% display mode	W	LINEAR or SQUARE ROOT	LINEAR	○	○	○	○
I21	PRES % RESO	% display resolution	W	NORMAL or HIGH RESOLUTION	NORMAL	○	○	○	○
I30	ENGR. UNIT	User set engineering unit	W	8 alphanumeric characters		○	○	○	○
I31	EASY EU SET	Engineering unit select	W			○	○	○	—
I32	ENGR. EXP	Exponents	W	---, ×10, ×100, ×1000	---	○	○	○	○
I33	ENGR. LRV	User set lower range limit	W	-32000 to 32000, unit specified in I30	0.00	○	○	○	○
I34	ENGR. URV	User set upper range limit	W	-32000 to 32000, unit specified in I30	100.00	○	○	○	○
I35	ENGR. POINT	Decimal place of user set	W	0 to 4	1	○	○	○	○
I40	BAR INDICATR	Bar indicator	W	OFF or ON	ON	○	○	○	○
I41	POWER ON INF	Display when powering on	W	OFF or ON	ON	○	○	○	—
I60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—

*1: R/W: R = Read only, W = Read & Write
*2: The default value shows MWP (Maximum working pressure) of the capsule.
Since the working pressure limit varies according to the Model, refer to the General Specifications section in each user's manual.

No.	Parameter name	Item	*1 R/W	Content	Default value	Applicable model			Upload data
						F	P	L	
J	ADJUST	Adjusting data							
J09	ADJ UNIT	Pressure adjusting unit select	W	% or PRES UNIT	PRES UNIT	○	○	○	—
J10	ADJ PRES	Adjustment reference pressure	R	Unit specified in J09		○	○	○	—
J11	P ZERO ADJ	Automatic zero adjustment	W	-32000 to 32000, unit specified in J09	0.00000 kPa	○	○	○	—
J12	P SPAN ADJ	Automatic span adjustment	W	-32000 to 32000, unit specified in J09	100.000 kPa	○	○	○	—
J15	P ZERO DEV	Manual zero adjustment	W	-32000 to 32000, unit specified in J09	100.000 kPa	○	○	○	—
J16	P SPAN DEV	Manual span adjustment	W	-32000 to 32000, unit specified in J09	100.000 kPa	○	○	○	—
J20	ADJ SP	Adjustment reference pressure of SP	R	Unit specified in J09		○	—	○	—
J21	SP ZERO ADJ	Automatic SP zero adjustment	W	-32000 to 32000, unit specified in J09	0.00000 MPa	○	—	○	—
J22	SP SPAN ADJ	Automatic SP span adjustment*2	W	-32000 to 32000, unit specified in J09		○	—	○	—
J25	SP ZERO DEV	Manual SP zero adjustment	W	-32000 to 32000, unit specified in J09	0.00000 MPa	○	—	○	—
J26	SP SPAN DEV	Manual SP span adjustment	W	-32000 to 32000, unit specified in J09	0.00000 MPa	○	—	○	—
J40	OUTPUT 4mA	4 mA adjustment	W	-10.000 to 10.000%	0.000%	○	○	○	—
J41	OUTPUT 20mA	20 mA adjustment	W	-10.000 to 10.000%	0.000%	○	○	○	—
J45	AMP TEMP	Amplifier temperature	R	Unit specified D40	0 degC	○	○	○	—
J50	ADJ WHO	Adjustment information	W	8 alphanumeric characters		○	○	○	—
J51	ADJ DATE	Adjustment information	W	16 alphanumeric characters		○	○	○	—
J52	ADJ LOC	Adjustment information	W	8 alphanumeric characters		○	○	○	—
J53	ADJ DESC	Adjustment information	W	16 alphanumeric characters		○	○	○	—
J55	EXT ZERO ADJ	External zeroing permission	W	INHIBIT or ENABLE	ENABLE	○	○	○	—
J56	CLEAR ADJ	Clear adjustment	W	---, PRES, SP, 4-20mA, or ALL	---	○	○	○	—
J60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—
K	TEST	Test parameters							
K10	OUTPUT X %	Test output % setting	W	Within a range between D20 and D21	0.00%	○	○	○	—
K40	DO TEST	Test contact output	W	OFF or ON	OFF	○	○	○	—
K45	TEST TIME	“OUTPUT X %” and “DO TEST” duration time selection	W	10 min, 30 min, 60 min, 3 hour, 6 hour, 12 hour	10 min	○	○	○	—
K50	TEST KEY1	Special maintenance parameter	W			○	○	○	—
K51	TEST KEY2	Special maintenance parameter	W			○	○	○	—
K52	TEST KEY3	Special maintenance parameter	W			○	○	○	—
K53	TEST KEY4	Special maintenance parameter	W			○	○	○	—
K60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—
M	DEVICE INFO	Device information							
M10	SERIAL NO.	Serial number	R			○	○	○	—
M11	MFTR. DATE	Manufactured date	R			○	○	○	—
M12	EXTRA NO.	Customization number	R			○	○	○	—
M15	SOFT REV	Software revision	R			○	○	○	—
M16	BRAIN REV	BRAIN protocol revision	R			○	○	○	—
M17	MEMO1	Memo	W	16 alphanumeric characters		○	○	○	—
M18	MEMO2	Memo	W	16 alphanumeric characters		○	○	○	—
M19	MEMO3	Memo	W	16 alphanumeric characters		○	○	○	—
M20	ISOL MATL	Capsule material	W			○	○	○	—
M21	FILL FLUID	Fill fluid	W			○	○	○	—

*1: R/W: R = Read only, W = Read & Write
*2: The default value shows MWP (Maximum working pressure) of the capsule.
Since the working pressure limit varies according to the Model, refer to the General Specifications section in each user’s manual.

No.	Parameter name	Item	*1 R/W	Content	Default value	Applicable model			Upload data
						F	P	L	
M22	GASKET MATL	Gasket material	W			○	○	○	—
M23	PRO CON MATL	Flange material	W			○	○	○	—
M24	D-VENT MATL	Vent plug material	W			○	○	○	—
M25	PRO CON TYPE	Process connection type	W			○	○	○	—
M26	RS ISOL MATL	Remote seal material	W			○	○	○	—
M27	PRO CON SIZE	Flange size	W			○	○	○	—
M28	NUM RS	Number of remote seal	W			○	○	○	—
M29	RS FILL FLUID	Fill fluid of remote seal	W			○	○	○	—
M30	RS TYPE	Remote seal type	W			○	○	○	—
M50	MS CODE 1	Model and suffix code 1	W			○	○	○	—
M51	MS CODE 2	Model and suffix code 2	W			○	○	○	—
M52	MS CODE 3	Model and suffix code 3	W			○	○	○	—
M53	MS CODE 4	Model and suffix code 4	W			○	○	○	—
M54	MS CODE 5	Model and suffix code 5	W			○	○	○	—
M55	MS CODE 6	Model and suffix code 6	W			○	○	○	—
M60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—
P	Record	History of errors							
P10	ERROR REC 1	Last error	W	See A60	GOOD	○	○	○	—
P12	ERROR REC 2	Second recent error	W	See A60	GOOD	○	○	○	—
P14	ERROR REC 3	Third recent error	W	See A60	GOOD	○	○	○	—
P16	ERROR REC 4	Forth recent error	W	See A60	GOOD	○	○	○	—
P60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—
T	CHARACTERIZR	Signal characterizer setting							
T10	S. C. ENABLE	Signal characterizer permission	W	INHIBIT or ENABLE	INHIBIT	○	○	○	—
T11	NUM OF POINT	Number of coordinates	W	0 to 9	0	○	○	○	—
T20	X START (FIX)	Start point of X	R	0.00%		○	○	○	—
T21	Y START (FIX)	Start point of Y	R	0.00%		○	○	○	—
T22	X1	Coordinate 1 of X	W	0.00 to 100.00%	10.00	○	○	○	—
T23	Y1	Coordinate 1 of Y	W	0.00 to 100.00%	10.00	○	○	○	—
T24	X2	Coordinate 2 of X	W	0.00 to 100.00%	20.00	○	○	○	—
T25	Y2	Coordinate 2 of Y	W	0.00 to 100.00%	20.00	○	○	○	—
T26	X3	Coordinate 3 of X	W	0.00 to 100.00%	30.00	○	○	○	—
T27	Y3	Coordinate 3 of Y	W	0.00 to 100.00%	30.00	○	○	○	—
T28	X4	Coordinate 4 of X	W	0.00 to 100.00%	40.00	○	○	○	—
T29	Y4	Coordinate 4 of Y	W	0.00 to 100.00%	40.00	○	○	○	—
T30	X5	Coordinate 5 of X	W	0.00 to 100.00%	50.00	○	○	○	—
T31	Y5	Coordinate 5 of Y	W	0.00 to 100.00%	50.00	○	○	○	—
T32	X6	Coordinate 6 of X	W	0.00 to 100.00%	60.00	○	○	○	—
T33	Y6	Coordinate 6 of Y	W	0.00 to 100.00%	60.00	○	○	○	—
T34	X7	Coordinate 7 of X	W	0.00 to 100.00%	70.00	○	○	○	—
T35	Y7	Coordinate 7 of Y	W	0.00 to 100.00%	70.00	○	○	○	—
T36	X8	Coordinate 8 of X	W	0.00 to 100.00%	80.00	○	○	○	—
T37	Y8	Coordinate 8 of Y	W	0.00 to 100.00%	80.00	○	○	○	—
T38	X9	Coordinate 9 of X	W	0.00 to 100.00%	90.00	○	○	○	—
T39	Y9	Coordinate 9 of Y	W	0.00 to 100.00%	90.00	○	○	○	—
T40	X END (FIX)	End point of X	R	100.00%		○	○	○	—
T41	Y END (FIX)	End point of Y	R	100.00%		○	○	○	—
T60	SELF CHECK	Self-diagnostics	R	See A60		○	○	○	—

*1: R/W: R = Read only, W = Read & Write
*2: The default value shows MWP (Maximum working pressure) of the capsule.
Since the working pressure limit varies according to the Model, refer to the General Specifications section in each user's manual.

Appendix 1. Safety Instrumented Systems Installation

WARNING

The contents of this appendix are cited from exida.com safety manual on the transmitters specifically observed for the safety transmitter purpose. When using the transmitter for Safety Instrumented Systems (SIS) application, the instructions and procedures in this section must be strictly followed in order to preserve the transmitter for that safety level.

A1.1 Scope and Purpose

This section provides an overview of the user responsibilities for installation and operation of the transmitter in order to maintain the designed safety level for Safety Instrumented Systems (SIS) applications. Items that will be addressed are proof testing, repair and replacement of the transmitter, reliability data, lifetime, environmental and application limits, and parameter settings.

A1.2 Using the Transmitter for an SIS Application

A1.2.1 Safety Accuracy

The transmitter has a specified safety accuracy of 2%. This means that the internal component failures are listed in the device failure rate if they will cause an error of 2% or greater.

A1.2.2 Diagnostic Response Time

The transmitter will report an internal failure within 5 seconds of the fault occurrence.

A1.2.3 Setup

During installation the transmitter must be setup with engineering units parameters. This is typically done with a handheld terminal. These parameters must be verified during the installation to insure that the correct parameters are in the transmitter. Engineering range parameters can be verified by reading these parameters from the optional local display or by checking actual calibration of the transmitter.

The calibration of the transmitter must be performed after parameters are set.

A1.2.4 Required Parameter Settings

The following parameters need to be set in order to maintain the designed safety integrity.

Table A1.1 Required Parameter Settings

Item	Description
Burnout direction switch	To specify if the output should go 21.6 mA or higher or 3.6 mA or lower upon detection of an internal failure.
Write protection switch	The write function should be disabled.

A1.2.5 Proof Testing

The objective of proof testing is to detect failures within the transmitter that are not detected by the diagnostics of the transmitter. Of main concern are undetected failures that prevent the safety instrumented function from performing its intended function. See table A1.2 for proof testing method.

The frequency of the proof tests (or the proof test interval) is to be determined in the reliability calculations for the safety instrumented functions for which the transmitter is applied. The actual proof tests must be performed more frequently or as frequently as specified in the calculation in order to maintain required safety integrity of the safety instrumented function.

The following tests need to be specifically executed when a proof test is performed. The results of the proof test need to be documented and this documentation should be part of a plant safety management system. Failures that are detected should be reported to Yokogawa.

The personnel performing the proof test of the transmitter should be trained in SIS operations including bypass procedures, transmitter maintenance, and company management of change procedures.

Table A1.2 Proof Testing

Testing method	Tools required	Expected outcome	Remarks
Functional test: 1. Follow all Management of Change procedures to bypass logic solvers if necessary. 2. Execute HART/BRAIN command to send value to high alarm (21.5 mA) and verify that current has reached this level. 3. Execute HART/BRAIN command to send value to low alarm (3.6 mA) and verify that current has reached this level. 4. Restore logic solvers operation and verify.	• Handheld terminal	Proof Test Coverage =52%	The output needs to be monitored to assure that the transmitter communicates the correct signal.
Perform three point calibration along with the functional test listed above.	• Handheld terminal • Calibrated pressure source	Proof Test Coverage =99%	

A1.2.6 Repair and Replacement

If repair is to be performed with the process online the transmitter will need to be bypassed during the repair. The user should setup appropriate bypass procedures.

In the unlikely event that the transmitter has a failure, the failures that are detected should be reported to Yokogawa.

When replacing the transmitter, the procedure in the installation manual should be followed.

The personnel performing the repair or replacement of the transmitter should have a sufficient skill level.

A1.2.7 Startup Time

The transmitter generates a valid signal within 1 second of power-on startup.

A1.2.8 Firmware Update

In case firmware updates are required, they will be performed at factory. The replacement responsibilities are then in place. The user will not be required to perform any firmware updates.

A1.2.9 Reliability Data

A detailed Failure Mode, Effects, and Diagnostics Analysis (FMEDA) report is available from Yokogawa with all failure rates and failure modes.

The transmitter is certified up to SIL2 for use in a simplex (1oo1) configuration, depending on the PFDavg calculation of the entire Safety Instrumented Function.

The development process of the transmitter is certified up to SIL3, allowing redundant use of the transmitter up to this Safety Integrity Level, depending the PFDavg calculation of the entire Safety Instrumented Function.

When using the transmitter in a redundant configuration, the use of a common cause factor (β-factor) of 2% is suggested. (However, if the redundant transmitters share an impulse line or if clogging of the separate impulse lines is likely, a common cause factor of 10% is suggested.)

Note that the failure rates of the impulse lines need to be accounted for in the PFDavg calculation.

A1.2.10 Lifetime Limits

The expected lifetime of the transmitter is 50 years. The reliability data listed the FMEDA report is only valid for this period. The failure rates of the transmitter may increase sometime after this period. Reliability calculations based on the data listed in the FMEDA report for the transmitter lifetimes beyond 50 years may yield results that are too optimistic, i.e. the calculated Safety Integrity Level will not be achieved.

A1.2.11 Environmental Limits

The environmental limits of the transmitter are specified in the user's manual IM 01C25.

A1.2.12 Application Limits

The application limits of the transmitters are specified in the user's manual IM 01C25. If the transmitter is used outside of the application limits, the reliability data listed in A1.2.9 becomes invalid.

A1.3 Definitions and Abbreviations

A1.3.1 Definitions

Safety

Freedom from unacceptable risk of harm

Functional Safety

The ability of a system to carry out the actions necessary to achieve or to maintain a defined safe state for the equipment/machinery/plant/ apparatus under control of the system

Basic Safety

The equipment must be designed and manufactured such that it protects against risk of damage to persons by electrical shock and other hazards and against resulting fire and explosion. The protection must be effective under all conditions of the nominal operation and under single fault condition

Verification

The demonstration for each phase of the life-cycle that the (output) deliverables of the phase meet the objectives and requirements specified by the inputs to the phase. The verification is usually executed by analysis and/or testing

Validation

The demonstration that the safety-related system(s) or the combination of safety-related system(s) and external risk reduction facilities meet, in all respects, the Safety Requirements Specification. The validation is usually executed by testing

Safety Assessment

The investigation to arrive at a judgment -based on evidence- of the safety achieved by safety-related systems

Further definitions of terms used for safety techniques and measures and the description of safety related systems are given in IEC 61508-4.

A1.3.2 Abbreviations

FMEDA

Failure Mode, Effects and Diagnostic Analysis

SIF

Safety Instrumented Function

SIL

Safety Integrity Level

SIS

Safety Instrumented System

SLC

Safety Lifecycle

Revision Information

- Title : DPharp
  BRAIN Communication Type
- Manual No. : IM 01C25T03-01E

Edition	Date	Page	Revised Item	
1st	Apr. 2004	—	New publication.	
2nd	Oct. 2004	3-19	3.2.3(20)	• Add capillary fill fluid density compensation setting procedure.
3rd	Aug. 2009	3-8	3.2.3(5)	• Add example for hysteresis.
		3-14	3.2.3(15)	• Correct misprint.
		3-18	3.2.3(19)	• Add CAUTION. Add note for hysteresis.
4th	Jun. 2012	2-2	2.4	• Add integral indicator display when powering on
		3-5	3.2.2	• Add parameters in the menu tree (I41, K45)
		3-6	3.2.3(1)	• Correct errors
		3-12	3.2.3(11)d	• Change description for SOFTWARE SEAL
		3-15	3.2.3(15)a-2	• Correct the figure
		3-17	3.2.3(16)	• Correct the NOTE
		3-20	3.2.3(20)	• Add EJA model name
		5-1	5	• Add EJA to default value of parameter No. "01"
		5-3	5	• Add parameter I41
		5-4	5	• Add parameter K45
5th	Jun. 2013	3-20	3.2.3(20)	• Add constant value of fill fluid for high vacuum use diaphragm sealed differential pressure/pressure transmitters.
6th	June 2014	2-1	2.1	• Change terminal drawing.
		2-1, 3-1	Add Note for BRAIN communication.	