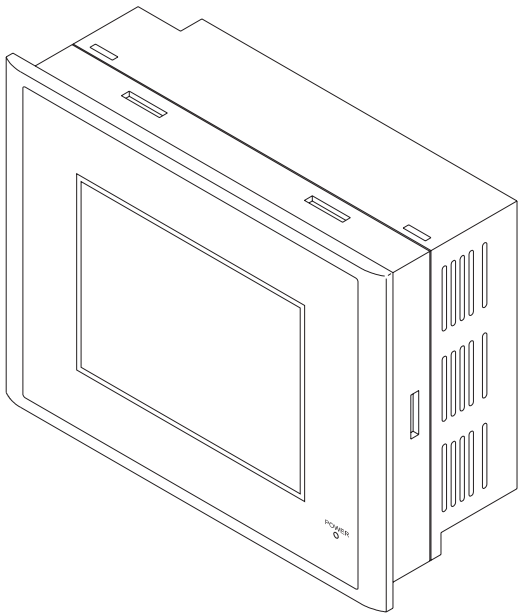**MITSUBISHI**

PROGRAMMABLE CONTROLLERS

MELSEC-F

HARDWARE MANUAL

GRAPHIC FX-50DU-TK(S)-C UNITS

FX

Foreword

- This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the FX-50DU-TK(S)-C and should be read and understood before attempting to install or use the unit.

- If in doubt at any stage during the installation of the FX-50DU-TK(S)-C always consult a professional electrical engineer who is qualified and trained to the local and national standards. If in doubt about the operation or use of the FX-50DU-TK(S)-C please consult the nearest Mitsubishi Electric distributor.

- This manual is subject to change without notice.

GRAPHIC FX-50DU-TK(S)-C UNITS

Hardware Manual

Manual number:	JY992D64301
Manual revision:	A
Date:	January 1997

Guidelines for the safety of the user and protection of the FX-50DU-TK(S)-C units

This manual provides information for the installation and use of the FX-50DU-TK(S)-C units. The manual has been written to be used by trained and competent personnel. The definition of such a person or persons is as follows;

a) Any engineer who is responsible for the planning, design and construction of automatic equipment using the product associated with this manual should be of a competent nature, (trained and qualified to the local and national standards required to fulfil that role). These engineers should be fully aware of all aspects of safety with regards to automated equipment.

b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local and national standards required to fulfil that job. These engineers should also be trained in the use and maintenance of the completed product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices.

c) All operators of the completed product should be trained to use that product in a safe and co-ordinated manner in compliance to established safety practices. The operators should also be familiar with all documentation which is connected with the actual operation of the completed equipment.

Note: the term 'completed equipment' refers to a third party constructed device which contains or uses the product associated with this manual.

Note's on the symbology used in this manual

At various times through out this manual certain symbols will be used to highlight points of information which are intended to ensure the users personal safety and protect the integrity of the equipment. Whenever any of the following symbols are encountered, its associated note must read and understood. Each of the symbols used will now be listed with a brief description of its meaning.

Hardware warnings

1) Indicates that the identified danger WILL cause physical and property damage.

2) Indicates that the identified danger could POSSIBLY cause physical and property damage.

3) Indicates a point of further interest or further explanation.

Software warnings

4) Indicates special care must be taken when using this element of software.

5) Indicates a special point of which the user of the associate software element should be aware.

6) Indicates a point of interest or further explanation.

The following variations of the FX-50DU-TK(S)-C conform to the identified standards;

ISO 9001

NATIONAL
ACCREDITATION
OF CERTIFICATION
BODIES

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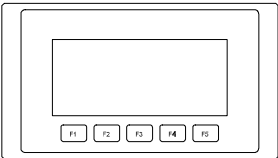| 1	Introduction
2	Terminal Layouts
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1. Introduction

This manual covers the hardware specifications and installation instructions for the following graphic data access units:

- FX-50DU-TK-C (monochrome)

- FX-50DU-TKS-C (STN; 8 colors)
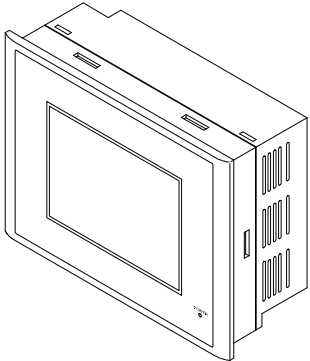
1.1 The Complete Family Of Graphic Data Access Units
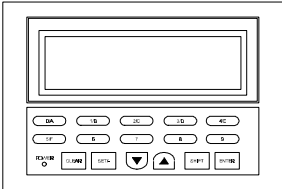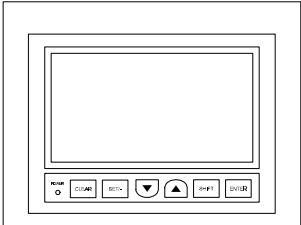
FX-25DU-E   FX-30DU-E   FX-40DU-TK-E

1.2　　Dimensions and Specifications

1.2.1　　FX-50DU-TK(S)-C Dimensions
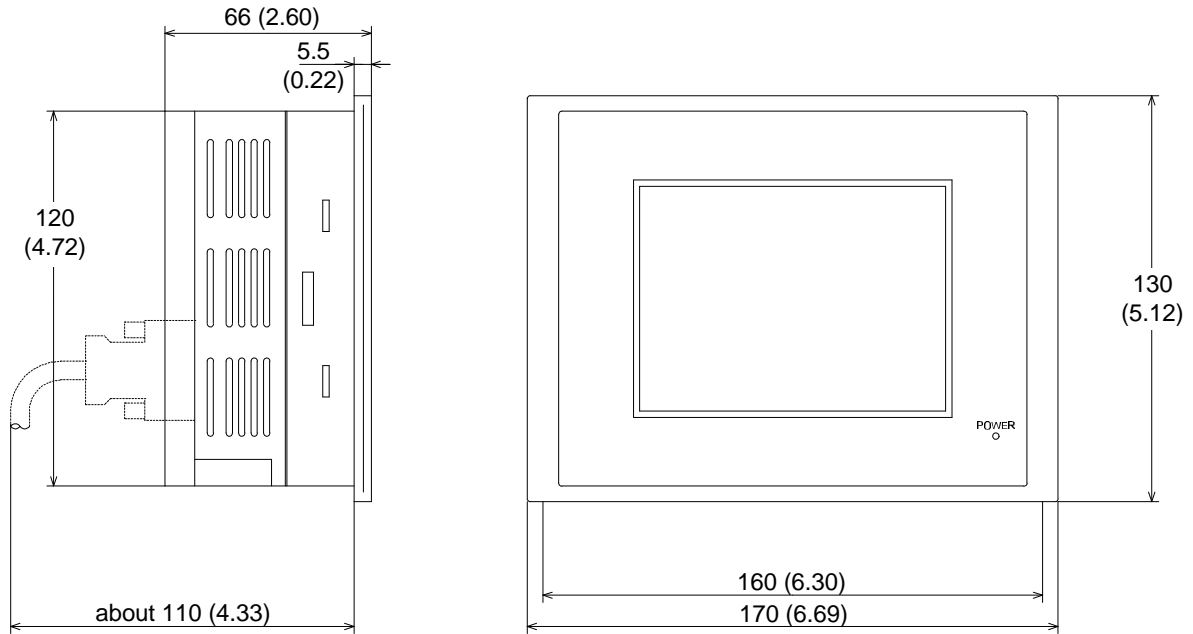
1.2.2　　Unit Characteristics

MODEL	SCREEN TYPE		KEYS	IP RATING
FX-50DU-TK-C	320 ✕ 240 dots 40 ✕ 15 chars 96 ✕ 72 mm TOUCH SCREEN	Monochrome LCD	Complete Touch Key operation 16 ✕ 8 zones (32 per screen + 32 global)	IP 65 (Based on manufacturer's own tests)
FX-50DU-TKS-C		8 color LCD		

1.2.3　　Basic Specifications

MODEL	POWER SUPPLY		DIMENSIONS (mm, inch)			WEIGHT
			W	H	D	kg (lbs)
FX-50DU-TK-C	24V DC +10% -15%	220mA	170 (6.69)	130 (5.12)	66 (2.60)	1.0 (2.2) (includes brackets: 0.1 (0.22))
FX-50DU-TKS-C		250mA				

1.3   Unit Accessories

Each of the Graphic Data Access Units comes with the following accessories.
The battery F2-40BL is inside the unit and

can be replaced by following the instructions
later in this manual (Page 5-4).
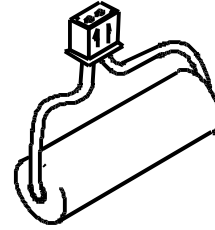
Figure 1.1   *F2-40BL*

Mounting brackets and screws (6 of each) are
included with each unit for fitting into a panel.
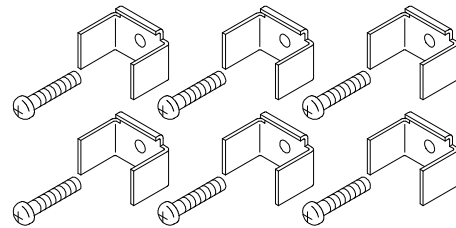
Figure: 1.2   *Mounting Brackets (6)*

A seal is also supplied and when all mounting
brackets are properly fitted IP 65 is possible.
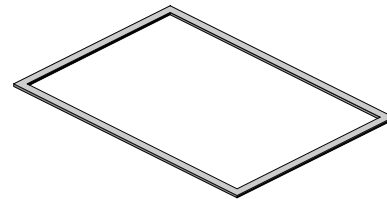
1.4   Optional Accessories

Figure: 1.3   *Seal*

For communication with an FX or A system the
FX-40DU-CAB cable is required.
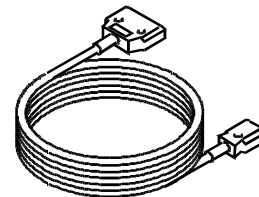
Figure: 1.4   *FX-40DU-CAB*

For programming and set-up the
FX-PCS-DU/AT-C software can be used. Please
see the appropriate manuals for more
information.
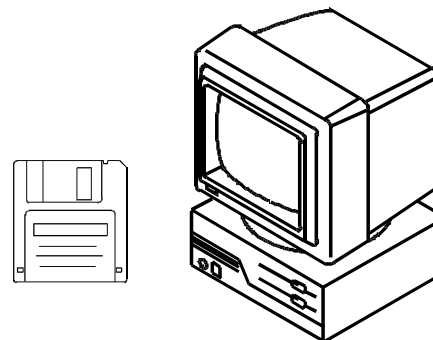
Figure: 1.5   *FX-PCS-DU/AT-C*

1.5 Configuration

Product descriptions and connection details are below.

Figure: 1.6 *Schematic System*
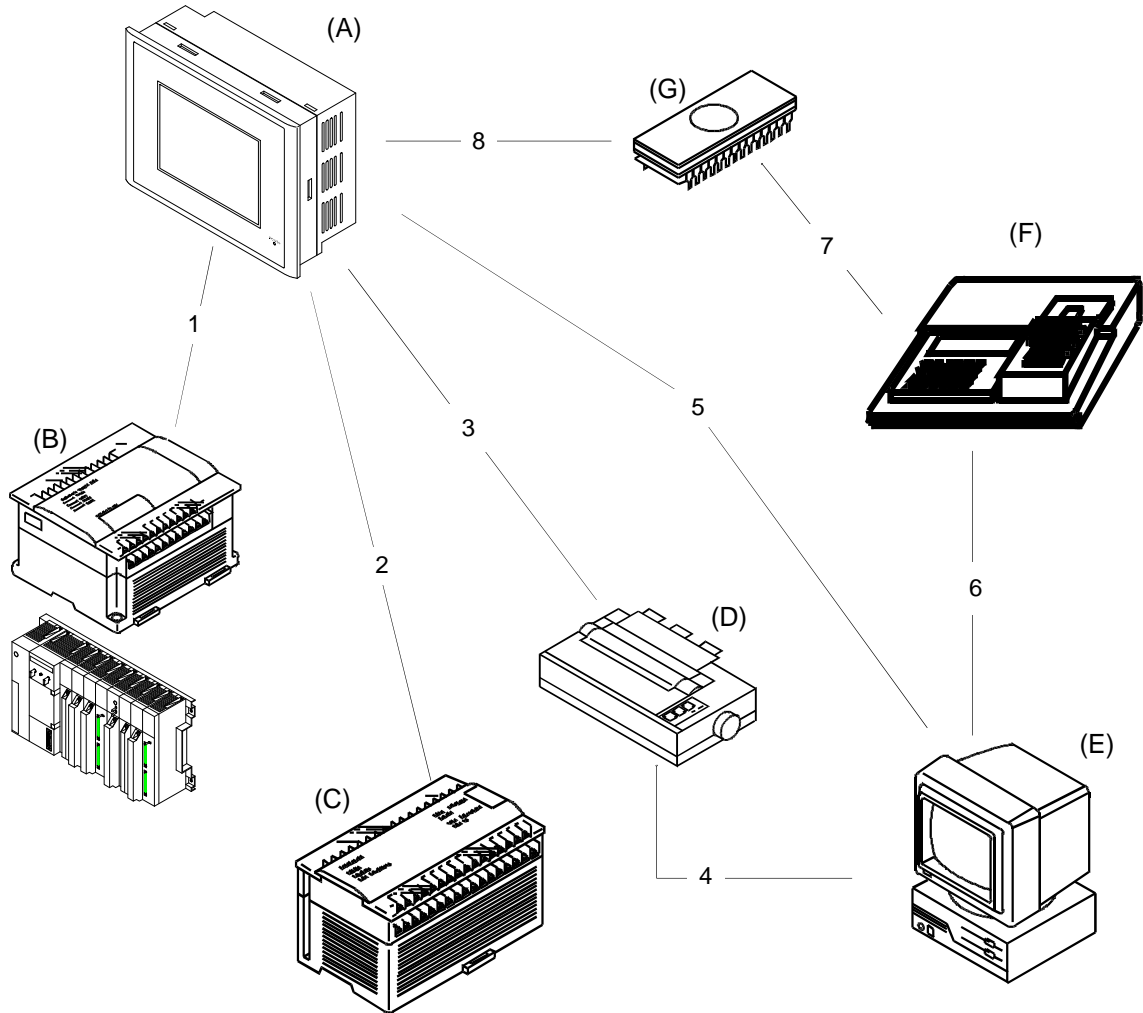
1.5.1 Product Description

REF	
A	FX-50DU-TK(S)-C Graphic Display Unit
B	FX, FX2C or A series to monitor
C	FX0, FX0S, FX0N series to monitor
D	Serial Printer to print data logging and screen data. Must be Epsom ESC/P compatible.
E	IBM PC compatible to create, read and write screen data. FX-PCS-DU/AT-C software.
F	EPROM Writer to store screen data.
G	EPROM: Type 27C1001 or equivalent

1.5.2 Connection Details

REF	
1	FX-40DU-CAB
2	FX-40DU-CAB + FX-20P-CADP
3 4 5	F2-232CAB or compatible RS232 cable
6	Connect according to the specifications of the ROM Writer
7 8	After programming the EPROM insert in the socket in the back of Data Access unit

1.6 Function List

The following table shows the various modes and the functions they support. Please refer to the DU software manual for further details.

USER SCREEN MODE	Activate the user screens	
MONITOR MODE	DEVICE MONITOR	Display/set device values
	ACTIVE STATE MONITOR	Monitor STL (States) activity
	PC DIAGNOSTICS	Display MPU status/error codes and messages.
SAMPLING MODE	SET CONDITION	SAMPLE COND. (When to sample)
		START COND. (When to start)
		END COND. (When to stop)
		SAMPLE DEV.(What to sample, D only)
	DISPLAY LIST	Show sampled data as a list
	DISPLAY GRAPH	Show sampled data as a graph
	CLEAR DATA	YES/NO
ALARM MODE	DISPLAY STATUS	Display/acknowledge active alarms
	DISPLAY HISTORY	Alarm occurrence history
	DISPLAY FREQUENCY	Alarm occurrence frequency
	CLEAR HISTORY	YES/NO
TEST MODE	USER SCREEN	Show programmed screens including common screen
	DATA BANK	View/set data bank values
OTHER MODE	SET CLOCK	TIME
		DATE
		FORMAT
	SET BACK LIGHT	OFF TIME (secs)
	DATA TRANSFER	Ready the FX-50DU to read/write data
	PRINT OUT	SAMPLING DATA (All/Range)
		ALARM HISTORY
	ENTRY CODE	ENTER
		DELETE
		UNLOCK
	BUZZER VOLUME	ON/OFF
	LCD CONTRAST	Á/Ë 10 settings

1.7   Set-up Mode

As well as the functions listed in section 1.6 the FX-50DU-TK(S)-C can also adjust the following settings direct from the unit. To reach the set-up menu power on the unit while pressing the top left corner of the screen.

SYSTEM LANGUAGE	Used for DU menus and messages	ENGLISH, JAPANESE
CHARACTER SET	Used when displaying user screens.	ENGLISH, JAPANESE, CHINESE(TRADITIONAL), CHINESE(SIMPLIFIED), ENGLISH(BOLD)
PLC TYPE	FX SERIES	FX0, FX0S, FX0N, FX, FX2C
	A SERIES	All A MPUs (except QnA and A0J2)
SERIAL PORT(RS232C)	SPEED	300 ~ 9600 baud
	DATA BIT	7 or 8
	STOP BIT	1 or 2
	PARITY	Odd, Even, None
	HANDSHAKING	DSR/DTR, XON/XOFF
	PRINTER	USE or DON'T USE
OPENING SCREEN	DISPLAY TIME	seconds
MAIN MENU CALL KEY	Screen location to return to "SELECT MODE" menu	
CLEAR USER DATA	YES/NO	

For more information see the GRAPHIC FX-50DU UNITS OPERATION MANUAL

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2.   Terminal Layouts

Following are the power terminals and the communication connectors assignments.

2.1   Power Terminals

Figure: 2.1   *FX-50DU-TK(S)-C power terminals*

The FX-50DU-TK(S)-C power terminal on the back of the unit should be connected to an external 24v DC power supply.

It is also possible to use the service supply of the MPU if sufficient power is available.
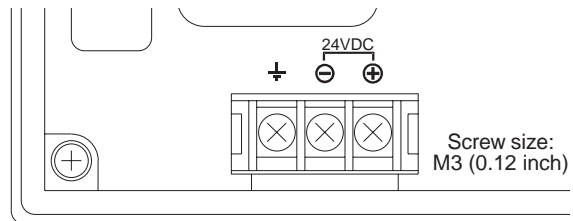
2.2   RS232C Connector

Used to connect to a printer to print alarm messages or history. Or to connect to a computer to upload/download screen data, sample data or data bank settings using the FX-PCS-DU/AT-C software. Or to directly program the MPU using standard programming software such as MEDOC.

Figure: 2.2   *25 pin D shell (female)*
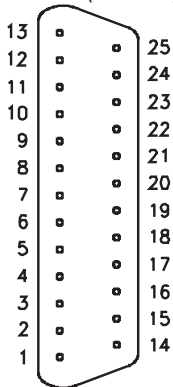
Table: 2.1   *RS232C Pin Assignments*

PIN NO.	Name	
1	FG	Frame Ground
2	SD	Send Data
3	RD	Read Data
4	RTS	Request To Send
5	CTS	Clear To Send
6	DSR	Data Set Ready
7	SG	Signal Ground
20	DTR	Data Terminal Ready

Figure 2.3

FX-50DU-TK(S)-C communication connectors
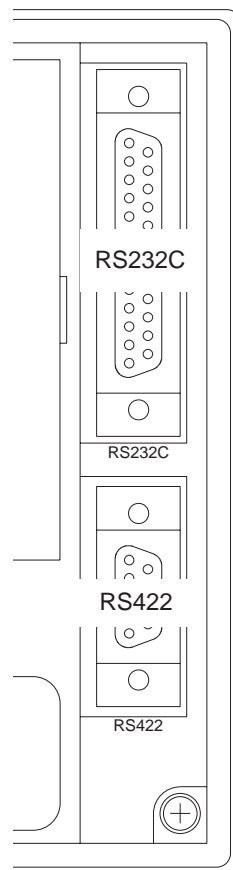
2.3   RS422 Connector

The RS422 connector is used to connect the FX-50DU-TK(S)-C to the MPU being monitored. The FX-40DU-CAB is required for this purpose.

Figure 2.4   *9 pin D shell (female)*
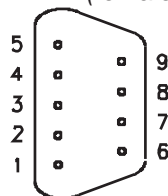
Note: The FX-40DU-CAB is provided separately.

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3.   Installation

All the graphic data access units are intended to be installed in a panel and connected to a Mitsubishi PLC mounted inside the panel.

3.1   Product Outline

The figures below show the front and rear views of the FX-50DU-TK(S)-C, indicating the hardware features of the unit.

Figure: 3.1   *Front View*
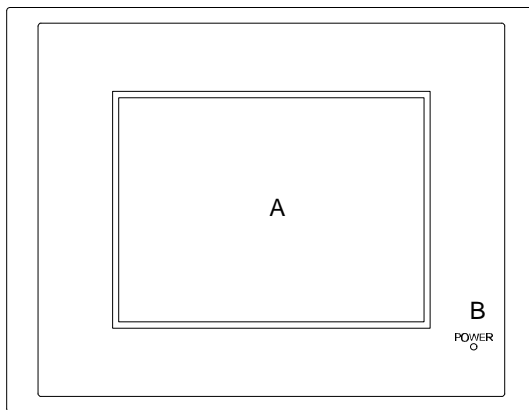
Figure: 3.2   *Rear View*
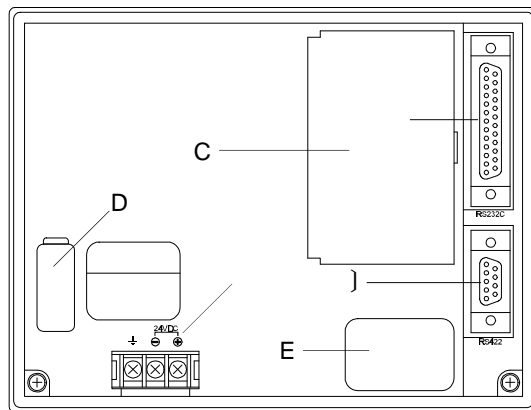
Table: 3.1   *Feature Table*

Ref.No.	

A	STN type LCD Screen - 320 × 240 dots, 96 × 72 mm, 40 chars × 15 lines,
	          8 color (FX-50DU-TKS-C) or
	          monochrome (FX-50DU-TK-C)
	Touch key pad - 16 × 8 zones (32 per screen + 32 global)

B	Power LED- ON when power is applied
	RS232C connector - Used for sending alarm or sampled data to a printer or to upload/download data to/from a computer
]	RS422 connector - Used to communicate with the monitored MPU (FX-40DU-CAB required)
	Power terminals - 24v DC +, - and earth

C	Access door to
	          EPROM socket - for user programs
	          battery - to back up alarm history and sampled data

D	Extension port - for future expansion
E	Serial number label

3.2   FX-50DU-TK(S)-C Dimensions

Dimensions: mm (inches)
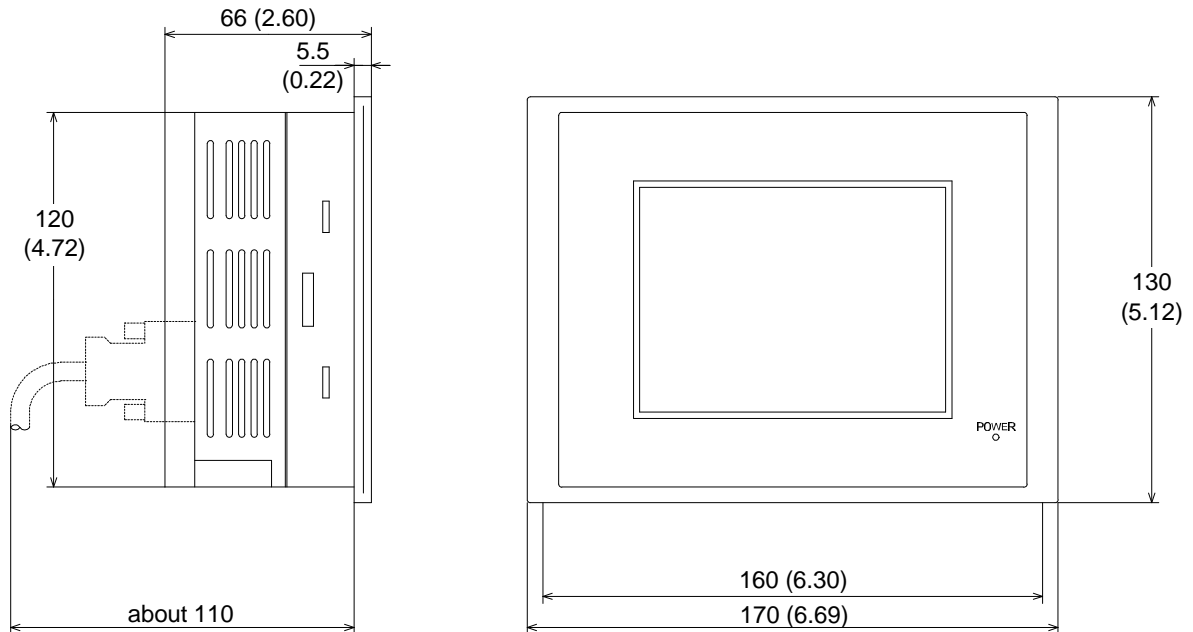
3.3   Environment Specification

Table: 3.2

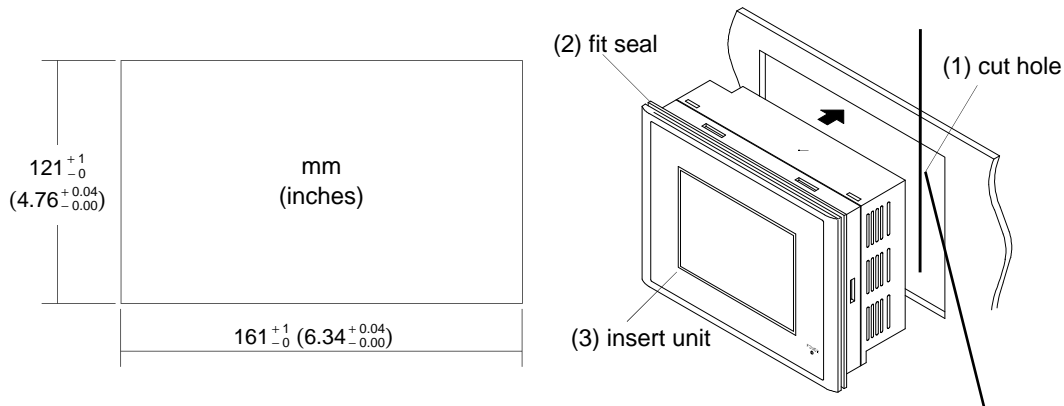|	SPECIFICATION.
Operating temperature	**0 to 40 °C 32 to 104 °F**
Storage temperature	**-20 to 60 °C -4 to 140 °F**
Humidity: *No condensation*	**35 to 85% R.H.**
Vibration resistance: *2hrs in each of 3 axis*	**JIS0911: 10 to 55Hz, 0.5G**
Shock resistance: *3 times in 3 directions*	**JIS0912: 10G**
Noise immunity: *tested by noise simulator*	**1000 Vpp, 1µs at 30 to 100Hz**
Dielectric withstand voltage *tested between External I/O pins, power terminals and ground*	**500V AC for over 1min**
Insulation resistance: *tested between External I/O pins, power terminals and ground*	**500V DC at more than 5MΩ**
Ground: *not required where impossible*	**Class 3** (100Ω)
Operating ambience: *to be free of corrosive gases., Dust should be minimal.*	/

3.4   Data Access Unit Mounting

Cut a hole in the panel (1) to the appropriate dimensions as shown below. If required fit the seal (2) before inserting the unit into the panel. Insert the unit (3) squarely into the panel.

Figure: 3.5   *Cut-out Dimensions*

121^{+1}_{-0}
$(4.76^{+0.04}_{-0.00})$

mm
(inches)

161^{+1}_{-0} $(6.34^{+0.04}_{-0.00})$

(2) fit seal

(1) cut hole

(3) insert unit

The FX-50DU-TK(S)-C must be fitted with the 6 brackets provided (4); 2 each on the top and bottom and 1 on each side. The hooks of the brackets should be fitted into the holes on the unit (5) with the lugs facing towards the back (6) of the unit. The screws can then be inserted into the brackets (7) and tightened up to the panel. Tighten to a torque of 3 to 5 kg.cm (2.6 to 4.3 inlb).
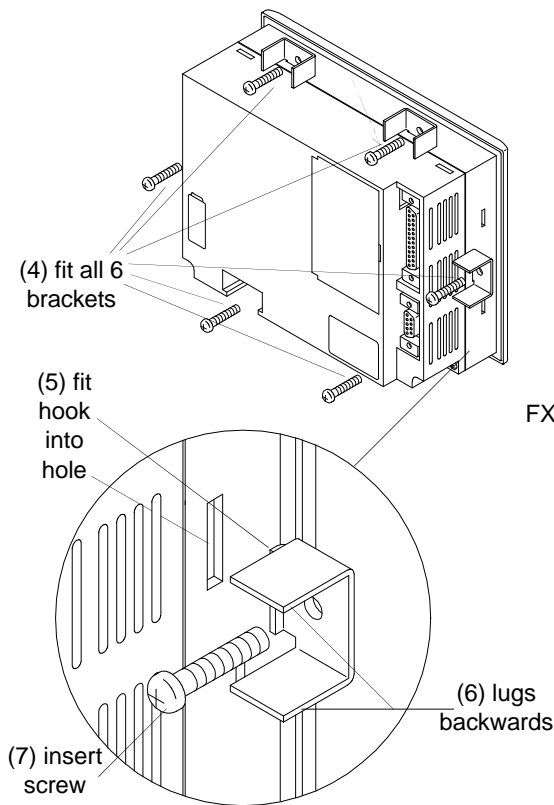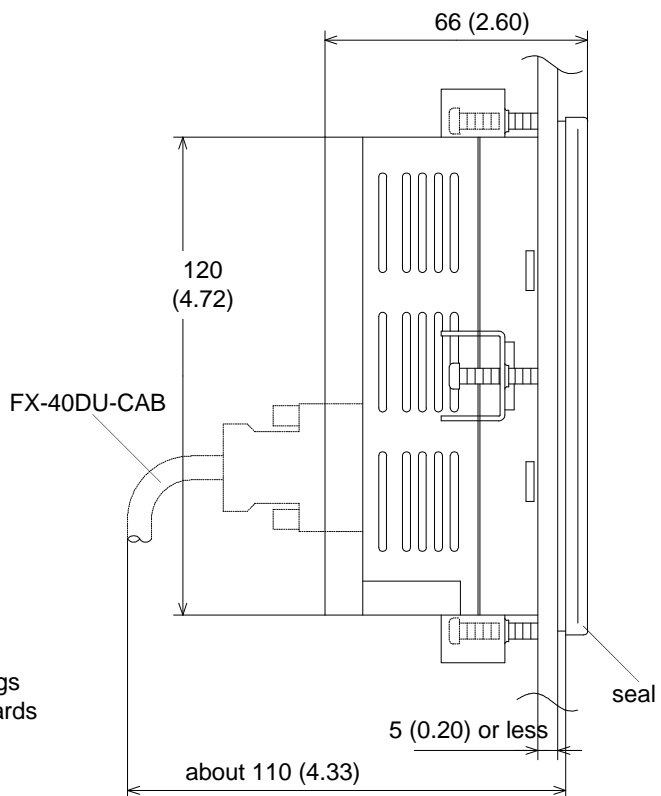
Figure: 3.3   *Securing with brackets*

Figure 3.4   *Allowed clearances*

(4) fit all 6 brackets

(5) fit hook into hole

(6) lugs backwards

(7) insert screw

66 (2.60)

120 (4.72)

FX-40DU-CAB

seal

5 (0.20) or less

about 110 (4.33)

3.5   Control Devices

The FX-50DU-TK(S)-C uses 8 bit devices and 6 data registers to enable control with the monitored MPU. The meaning of these devices is explained in the following table.

Table: 3.3   *Control Device Names*

Bit Devices	Description	Direction
Mn	Clear Alarm History	MPU ð DU
Mn+1	Alarm On	MPU ÔDU
Mn+2	Back Light Off (after set time)	MPU ð DU
Mn+3	Clear Sampling	MPU ð DU
Mn+4	Sampling Active	MPU ÔDU
Mn+5	Data Change in Progress (User Screen Mode)	MPU ÔDU
Mn+6	Battery Low	MPU ÔDU
Mn+7	Not Used	
Data Devices	Description	Direction
Dn, Dn+1, Dn+2	PLC Request Screens	MPU ð DU
Dn+3, Dn+4, Dn+5	Current Display Screens	MPU ÔDU

- The head devices, Mn and Dn have default values of M0 and D0.
- The default settings can be changed using the FX-PCS-DU/AT-C software.

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4. General Wiring

The wiring of the Data Access Units has been designed to be safe and secure by using terminals for the connection of the power supply and D-Shell connectors for all communication cabling.

4.1 Wiring Cautions

- Do not lay I/O cables next to power cables or allow them to share the same trunking duct.
- Where I/O signals are used over an extended distance consideration must be made for voltage drop and noise interference.

4.2 Termination at screw terminals

Power cables connected to the power terminals of the units should be fitted with insulated crimp terminals, see diagram opposite.

Figure: 4.1   *Crimp terminals*

< 6.2 mm
(0.24 inches)

M3
(0.12 inches)

Terminals screws should be tightened to between 5 and 8 kg.cm (4.3 and 6.9 inlbs). Screw terminals must be secure enough to prevent a loose connection from causing a malfunction.
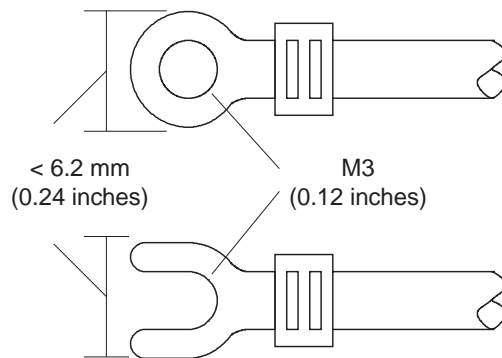
4.3 Power Supply wiring

The power supply for these units can be connected in one of two ways. First by connecting to the service supply of the FX MPU and secondly from and independent source. Both methods are shown opposite.

4.4 Power Supply Wiring Cautions

- The wires used for the power supply wiring should have a cross sectional area of at least $0.75mm^2$ ($0.001in^2$) to ensure that there is no voltage drop.
- The wire used for the earth connection should have a cross sectional area of $1.25mm^2$ ($0.002in^2$) and be of class 3 ($<100\Omega$).
- If using the service supply of an MPU or extension unit take care not to exceed the maximum current allowed for the unit (see appropriate manual).
- The FX-50DU-TK(S)-C (and all graphic DU units) must be supplied from a controlled (SELV) voltage. In all cases, the voltage supply lines from the voltage source to the DU units require *an in-line 2 amp fuse*.

Figure: 4.2   Connection to FX Service Supply

Figure: 4.3   Connection to Independent Source

Table: 4.1   Feature Table

Ref.No.	
	Programmable Controller (MPU)
]	Comms Cable FX-40DU-CAB
	FX-50DU-TK(S)-C
A	Fuse (2 Amps)
B	MPU Service Supply (24V)
C	External 24V Power Supply (SELV)
D	Earth (class 3)

Table: 4.2   Power Supply Specification

	Spec.
Power Supply Voltage	24V DC (+10%, −15%)
Power Supply Ripple	200 mV or less
Current Consumption	FX-50DU-TK-C 220 mA FX-50DU-TKS-C 250 mA
Momentary Power Down	5 ms or less
Recommended Fuse Rating	2A

4.5   Communication Cables

The Data Access Units are connected to the MPU using the FX-40DU-CAB RS422 cable and to computers and printers using the F$_2$-232CAB cable or equivalent.

- If the FX-40DU-CAB cable is not connected then a "communication error" may occur.
- For use with the FX-50DU-TK(S)-C it is necessary to earth the FX-40DU-CAB cable at the MPU.

Figure: 4.4   *FX-40DU-CAB connections*
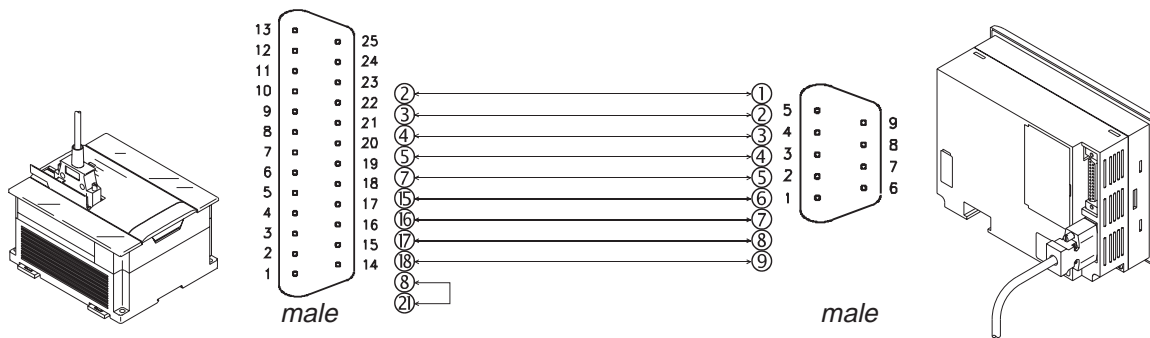
Figure: 4.5   *F2-232CAB connections*
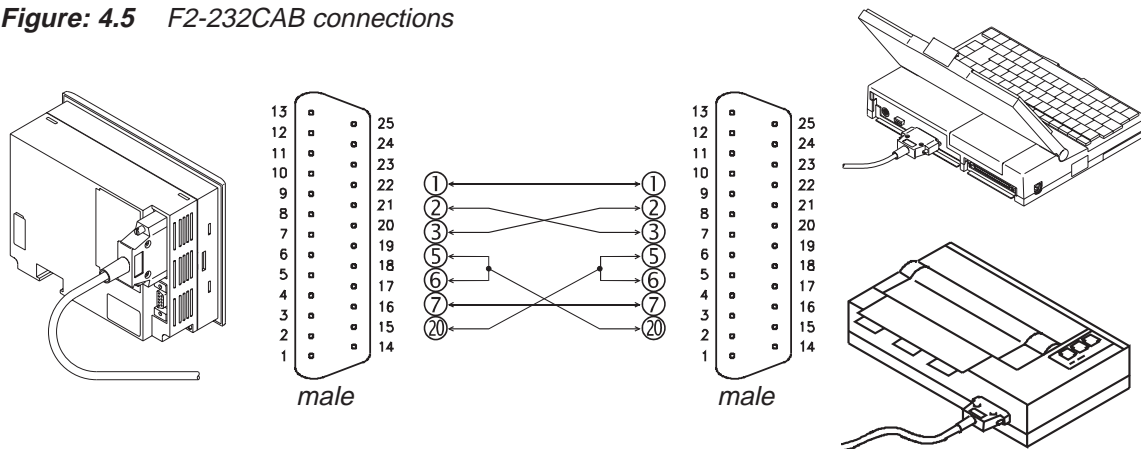
- Some printers and PCs use a 9 pin connector for RS232C. A standard conversion cable, as shown opposite, can be used.

Alternatively, the cable F2-232CAB-1 can be used. This cable already has a 9 pin connector for use with such printers and computers.

Figure: 4.6   *Convert 25 pin to 9 pin*
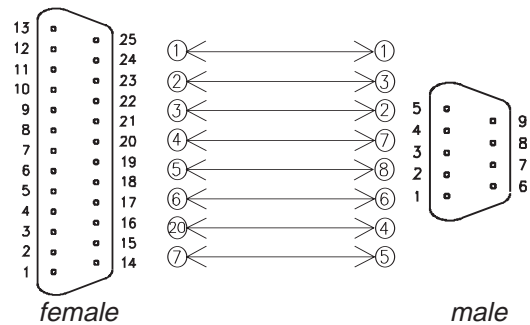
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5.   Diagnostics

This chapter is intended to aid a trained engineer in fault finding and trouble shooting.

5.1   Error Messages

Screen messages and there meanings (in alphabetical order).

BAD OBJECT EXISTS - - - XXXXXXX

An incorrectly defined object (of type XXXXXXX) has been found when viewing a screen using test mode.

● Correct the error using the FX-PCS-DU/AT-C screen creation software.

CAN NOT USE THE FUNCTION WHILE PROTECTED

Attempt to change data when the PLC has an Entry Code registered.

● Unlock or delete the entry code using the Entry Code function of Other Mode.

CAN NOT WRITE TO PLC MEMORY

Setting values of timers and counters or file registers can not be changed if the memory of the PLC is either EPROM or the write protect switch of EEPROM memory is set to ON.

● Change the memory of the PLC to RAM or turn the protect switch to OFF.

COMMUNICATION ERROR OCCURS

The programmable controller power has gone OFF.

● Switch the programmable controller power ON.

Defective cable connection or defective cable.

● Check the cable connection; connect properly. Or replace the cable.

A CPU Error has occurred at the MPU.

● Remedy the cause of the CPU Error and restart the system.

DATA IS NOT FOUND

Screen data, sampled data, alarm history or data bank data cannot be found.

● Check for references to undefined data and either create the data or remove the reference.

DISPLAYING SCREEN IS NOT FOUND

User Mode start; Screen 0 has not been defined.

● Screen 0 is required by the system as the initial screen. Create screen 0.

The screen requested by a Screen Change object does not exist.

● Check the change screen object or MPU program for an invalid screen number and either correct the number or create the screen.

PLC IS RUNNING

The entry code can not be changed while MPU is in RUN.

● Switch the MPU to STOP.

PLC PROGRAM IS DESTROYED

The program in the MPU has become corrupted.

● Re-load the program in to the MPU.

SET DEVICE IS INCORRECT

Device Number entry:
An invalid device number has been specified. Example: A word device (D) instead of a bit device (X,Y,etc.).

● Refer to the DU software manual to check the devices that can be used.

SET NUMBER IS INCORRECT

Data Entry: The data value entered is outside the range of possible values for this object.

● Check the allowed range for this object and re-enter.

5.2   Maintenance

The Data Access Units do not contain any consumable parts which are considered to have a short life.

However, the battery, LCD display and the back light do have a limited life and will need replacing.

5.2.1   General Maintenance

- Check for high temperatures.

- Check for conductive debris.

- Check for loosening of terminals or mounting brackets (due to vibration).

5.2.2   Display and Back Light

The LCD life is about 50,000 hours and the back light life is about 10,000 hours operation.

● User replacement is not possible. Please refer to your nearest Mitsubishi service centre.

● For this reason it is recommended that a back light saving technique is used to extend the operational life time of the back light.

5.2.3   Battery Replacement

The battery life is about 5 years.

- Switch OFF the power to the DU and open the User Access panel at the back of the unit.

Figure: 5.1 *Battery Socket*

- Remove the battery (A) from the holder (B) and disconnect at (C).

- Connect (C) the new battery and re-fit into the holder (B).

- Close the cover and restore the power.

● The new battery should be connected within 30 second of removing the old one to retain all the backed up data currently in memory.
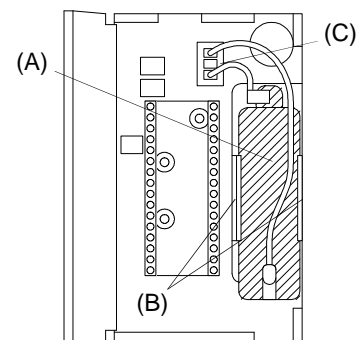
5.2.4   Installing the EPROM

- Switch OFF the power to the DU and open the User Access panel at the back of the unit.

Figure: 5.2 *EPROM Socket*

- Insert the EPROM into the socket (A) taking care that it is the correct way around and that you do not to bend the legs.

- Close the door and switch on.

● Data held on EPROM is automatically transferred to the flash memory of the FX-50DU-TK(S)-C at power on.

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MEMO

MITSUBISHI

HARDWARE MANUAL

GRAPHIC FX-50DU-TK(S)-C UNITS

MITSUBISHI ELECTRIC CORPORATION

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