ADVANCED AND EVER ADVANCING **MITSUBISHI ELECTRIC**

MITSUBISHI

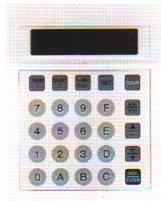
PROGRAMMABLE CONTROLLERS

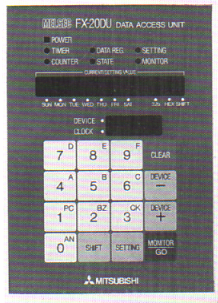
MELSEC-F

FX

FX-10DU-E/FX-20DU-E DU UNITS

USER'S MANUAL





Foreword

- This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the FX-10DU-E and FX-20DU-E MMI units and should be read and understood before attempting to install or use these units.
- If in doubt at any stage during the installation of the FX-10DU-E and FX-20DU-E MMI units 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 these MMI units please consult the nearest Mitsubishi Electric distributor.
- This manual is subject to change without notice.

Guidelines for the safety of the user and protection of the FX-10DU-E and FX-20DU-E MMI units

This manual has been written to be used by trained and competent personnel. This is defined by the European directives for machinery, low voltage and EMC.

FX-10DU-E/FX-20DU-E DU units

User's Manual

Manual number: JY992D54801A
Date: September 1995
Manual revision: A

Notes on this manual's symbology

Throughout this manual, symbols are used to highlight information relating to the user's personal safety and protection of the equipment's integrity. When any of these symbols are encountered, its associated note must be read and understood.

Hardware warnings

1) The identified danger WILL cause physical and property damage

2) The identified danger could POSSIBLY cause physical and property damage

3) 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 which the user of the associate software element should be aware of

6) Indicates a point of interest or further explanation

1. Introduction

1.1 Overview

Scope of this manual:

This manual gives details on all aspects of installation and operation of the FX-10DU-E and FX-20DU-E MMI units.

List of features:

Availability of features:

- The list of features shown here applies to the FX-10DU-E. Not all these features are available on the FX-20DU-E.

Monitor mode:

All PC word devices (timers (T), counters, (C) and data registers (D)) can be monitored and their values changed. allowed device ranges for changing values may be set, and 8 preset devices may be monitored.

User Screen mode:

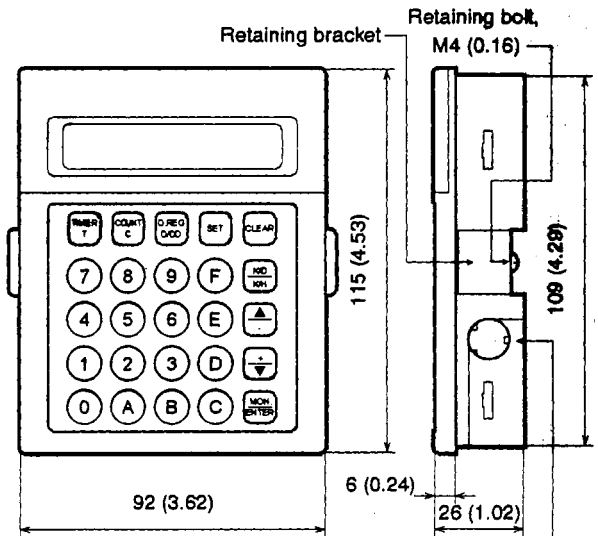
Displays user defined screen designs. These are taken from the list of 25 user defined screens (0-24). The programmable controller (PC) controls which screen is displayed.

Other mode:

Used to create user defined screens and set unit parameters.

1.2 Unit dimensions

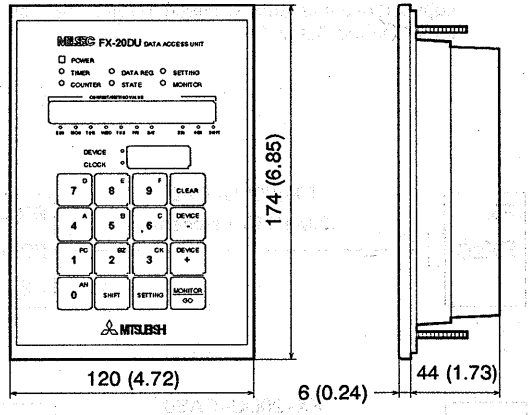
1.2.1 FX-10DU-E



mm (inches)

Weight: approx. 0.20kg (0.44 lbs)

1.2.2 FX-20DU-E



mm (inches)

Weight: approx. 0.30kg (0.66 lbs)

1.3 Supplied accessories

The FX-10DU-E is supplied with a retaining bracket and retaining bolt for mounting the unit.

The FX-20DU-E is supplied with the following items for installation purposes:

Item	Quantity	Purpose
Cable grip	1	Strain relief on FX-20DU-CAB cable on FX-20DU-E end.
Cable grip retaining screw	2	M3 (0.12) for fixing cable grip.
Cable holder	5	For routing cable between FX-20DU-E and the PC.
Hexagon nut	4	For mounting FX-20DU-E
Washer	4	
Spring washer	4	
Bush	5	
FX-20DU-CAB connecting cable (3m/118.1 inches)	1	Connect between FX-20DU-E and PC.

1.4 Optional accessories

FX-10DU-E: Cable to connect the DU unit to the PC.

FX-20DU-E: Cable to connect the unit to a FX0/FX0N PC.

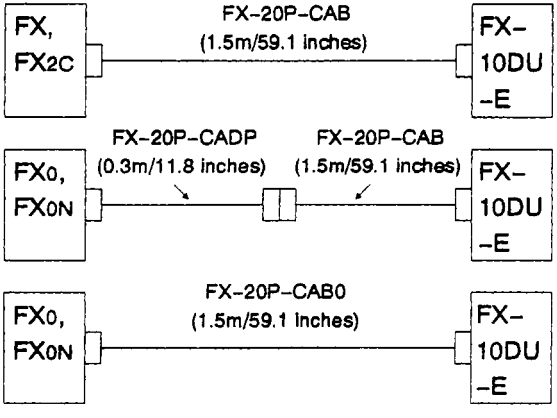
Cable connections:

- Please refer to the next section for the correct cables to use.

1.5 System configuration

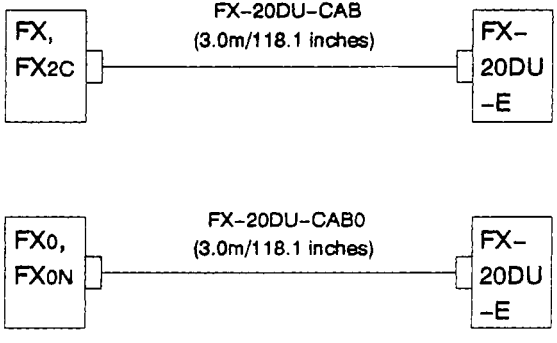
1.5.1 Connecting the FX-10DU-E

The appropriate cable should be connected between the socket on the rear of the FX-10DU-E and the programming port of the PC. Ensure the cable has adequate strain relief.



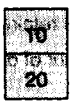
1.5.2 Connecting the FX-20DU-E

The cable connecting the FX-20DU-E is inserted into the connector under the cover on the rear of the unit. Use the supplied cable grip to provide strain relief. The supplied cable holders are used to route the cable from the PC to the DU unit.



1.6 How to use this manual

To help identify which parts of this manual apply to which DU units, the following indicator is included with relevant section titles:



← Shaded boxes indicate the applicable DU types

"10": FX-10DU-E
"20": FX-20DU-E

Throughout this manual, CAPITAL LETTERS are used to refer to items which are displayed on the screen of the DU unit. These items are sometimes abbreviated on the DU screen.

1.6.1 Symbols used to indicate operation keys

A word enclosed in square brackets [] indicates the DU key of the same name.

1.7 Note on the FX-10DU-E's memory

This unit uses EEPROM memory. This memory may have data rewritten to it up to about 100,000 times.
The EEPROM allows the unit to resume operation from the last screen displayed before a power down. This is the resume function.

2. Installation

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Both DU units are only intended to be used when installed in a panel and connected to a Mitsubishi FX family PC inside the panel.

2.1 General specification

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Parameter	Specification	
	FX-10DU-E	FX-20DU-E
Power supply (supplied from PC)	5 V DC, +5%,-5% 220 mA	5 V DC, +5%, -5% 180 mA
Operating temperature	0 to 50 deg. C	0 to 55 deg. C
Humidity (no condensation)	35 to 85% RH	45 to 85% RH
Vibration resistance	JIS C0911 (10 to 55 Hz, 0.075 mm (0.003 inch) max. 1G. 2 hours in each of X, Y and Z directions.)	JIS C0911 (10 to 55 Hz, 0.5 mm (0.02 inch) max. 2 G. 2 hours in each of X, Y and Z directions.)
Shock resistance	JIS C0912 (10 G, 3 times in each of X, Y and Z directions.)	
Operating ambience	Free of corrosive gases, minimal dust.	
Display	16 character x 2 lines, backlit LCD	11 +4 digits 7 segment LED
Keyboard	25 tactile keys	16 tactile keys
Applicable PCs	FX, FXac, FX0 and FX0N	

2.2 DU unit mounting

2.2.1 Mounting the FX-10DU-E

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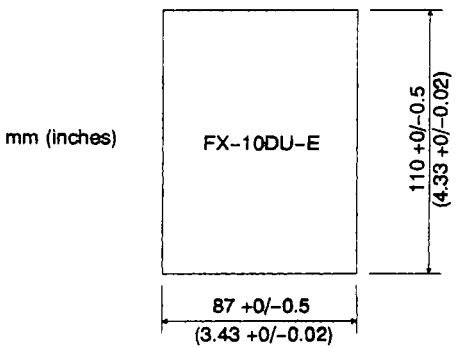
1) Remove the metal retaining bracket from the rear of the unit by removing its retaining bolt.
2) Mount the unit in a panel cutout of dimensions as shown below.
3) Replace the retaining bracket and tighten its retaining bolt with a torque of 3-5 kg.cm.

Maximum panel thickness:

- The panel should be no more than 4 mm (0.16 inch) thick.



2.2.2 Mounting the FX-20DU-E

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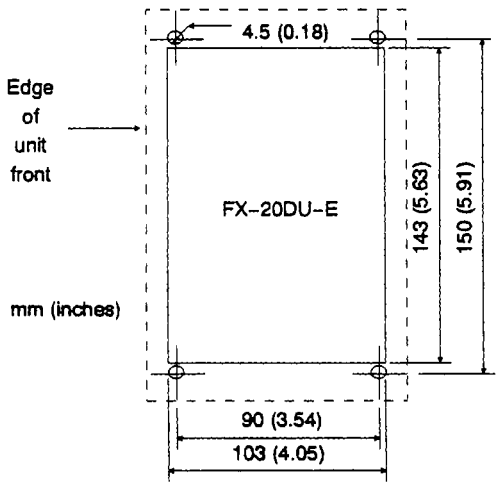
1) Make the panel cutout to the dimensions shown below, and drill the four mounting holes.

2) Insert the unit into the cutout. A washer, spring washer and nut should be fitted on each of the four retaining bolts. If the panel is thin, a bush should also be used.



2.3 FX-20DU-E data write PERMIT/FORBID switch

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This switch is located next to the connecting cable socket on the rear of the unit. To gain access to it, the cover on the lower rear part of the unit should be removed first.

The switch has two positions:

- PERMIT: PC data may be monitored and changed.
- FORBID: Access to PC data is restricted. This has the same effect as using a B or C entry code in the PC.

STOP

Effect of PC entry codes:

- When the unit is switched to PERMIT, the ability to monitor and change PC data is restricted by any entry code already in the PC.

PC entry codes:

- For further information, please see Chapter 3, section 3.3

3. Overview of Monitor mode

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Monitor mode allows PC data to be monitored and changed. Devices which can be monitored/changed are:

PC device	Item to be monitored/changed	Monitor	Change
Timer (T)	Current value	✔	✔ (10DU only)
	Set value (K)	✔	✔
	Set value stored in data register (indirect setting)	✔	✔
16 bit Counter (C)	Current value	✔	✔ (10DU only)
	Set value (K)	✔	✔
	Set value stored in data register (indirect setting)	✔	✔
32 bit Counter (C)	Current value	✔	✔ (10DU only)
	Set value (K)	✔	✔
	Set value stored in data register (indirect setting)	✔	✔
Data register (D) (16 bit)	Current value	✔	✔
	Device number when used for indirect T or C set value	✔	✔
Data register (D+1, D) (32 bit)	Current value	✔	✔
	Device number when used for indirect T or C set value	✔	✔

3.1 Special data registers

The following special data registers can also be monitored:

PC device to be monitored	Item to be monitored/changed	Monitor	Change
D8013 Real time clock	Current date/time	✔	✔
D8040 STL active state monitor	Lowest active STL step	✔	✗
D8049 Annunciator monitor (Not available on FX_0/FX_{0N})	Lowest active annunciator	✔	✗

STOP

Use of the real time clock:

- The real time clock facility is provided by installing a real time clock cassette, or a memory cassette with this feature in the PC.

Using D8040 and D8049:

- Before these devices can be used, the following special auxiliary relays must be set ON:
  D8040: M8047
  D8049: M8049

3.2 Effect of PC RUN/STOP mode and memory types on changing data

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The tables shown here summarise the effects of:

1) Whether the PC is in RUN or STOP mode

2) The type of memory being used by the PC

Key to symbols:	
Symbol	Meaning
✔	Allowed
✘	Not allowed
●	Allowed when memory protect switch is OFF

PC STOP					
PC Device	Item to be changed	FX_0	FX_{0N}, FX, FX_{2C}		
		RAM	RAM	EEPROM	EPROM
Timer (T)/ Counter (C)	Set value (K)	✔	✔	●	✘
	Set value stored in data register (indirect setting)	✔	✔	✔	✔
	Device number of indirect setting data register	✔	✔	●	✘
Data register (D)	Current value	✔	✔	✔	✔
File registers (D) (Not available on all PC types)	Current value	N/A	✔	●	✘

PC RUN					
Device	Item to be changed	FX_0	FX_{0N}, FX, FX_{2C}		
		RAM	RAM	EEPROM	EPROM
Timer (T)/ Counter (C)	Set value (K)	✔	✔	✘	✘
	Set value stored in data register (indirect setting)	✔	✔	✔	✔
	Device number of indirect setting data register	✔	✔	✘	✘
Data register (D)	Current value	✔	✔	✔	✔
File registers (D) (Not available on all PC types)	Current value	N/A	✔	✘	✘

3.3 Effect of PC entry codes on monitoring/changing data

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If the PC already has an entry code set, this will also affect what data can be monitored and changed. The table below summarises the conditions.

Entry code level	Unit	Allowed monitoring without entry code	Allowed changes without entry code
A (All operation prohibit)	FX-10DU-E	All devices and data	None
	FX-20DU-E	None	None
B (Copy protect)	FX-10DU-E	All devices and data	All except: set values, data register device numbers (indirect setting), file registers
	FX-20DU-E	All except: set values, data register device numbers (indirect setting), file registers	Data register current values
C (Write protect)	FX-10DU-E	All devices and data	All except: set values, data register device numbers (indirect setting), file registers
	FX-20DU-E	Current values (not file registers)	Data register current values

Entering entry codes:

- See section 3.10.7. Note that the FX-10DU-E cannot change or delete entry codes.

3.4 Initial display sequence

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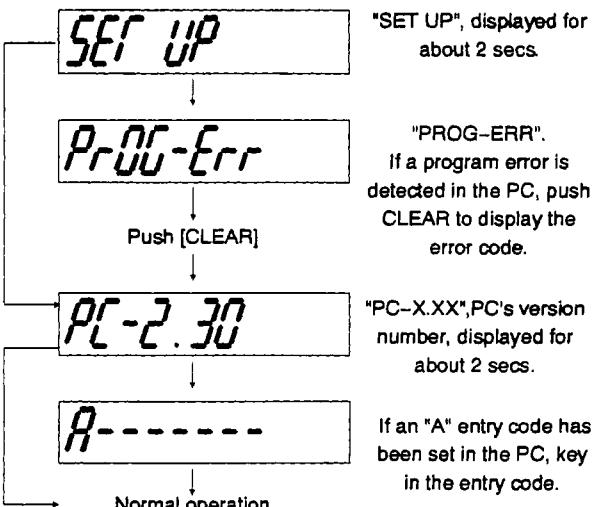
After connecting the cable and turning on the PC, the following displays are seen.

Resume function:

- The display before power off is resumed when normal operation is reached. This can be held for 3 days without power.



3.5 Monitor mode keys

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The following keys are used for monitoring and changing device values.

3.5.1 FX-10DU-E

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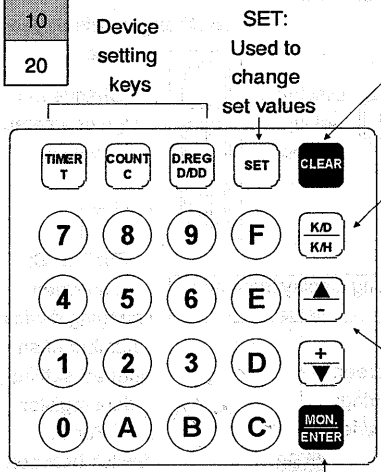

3.5.2 FX-20DU-E

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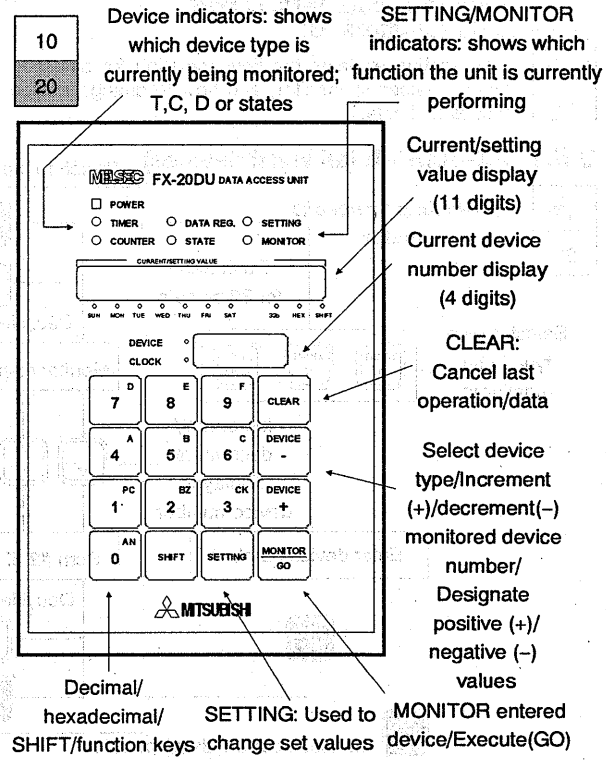

3.6 Monitor mode operation: word devices (timers,T, counters, C and data registers, D)

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This section explains the key operation for selecting which devices to monitor, and how to change device values and data.

3.6.1 FX-10DU-E (all word devices)

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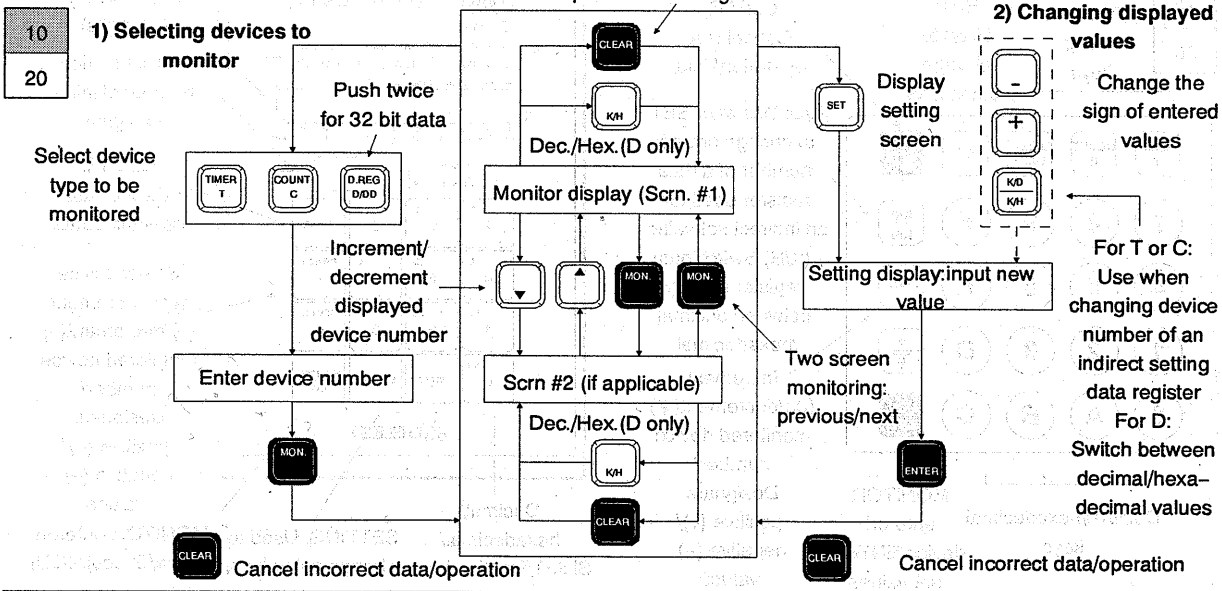
1) Selecting devices to monitor



3.6.2 Changing current values of monitored timers or counters

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1) Push SET, then MON(ITOR).

2) Current value displays a cursor. Type the new value.

3) Push ENTER.

3.6.3 FX-20DU-E (timers, T and counters, C, only)

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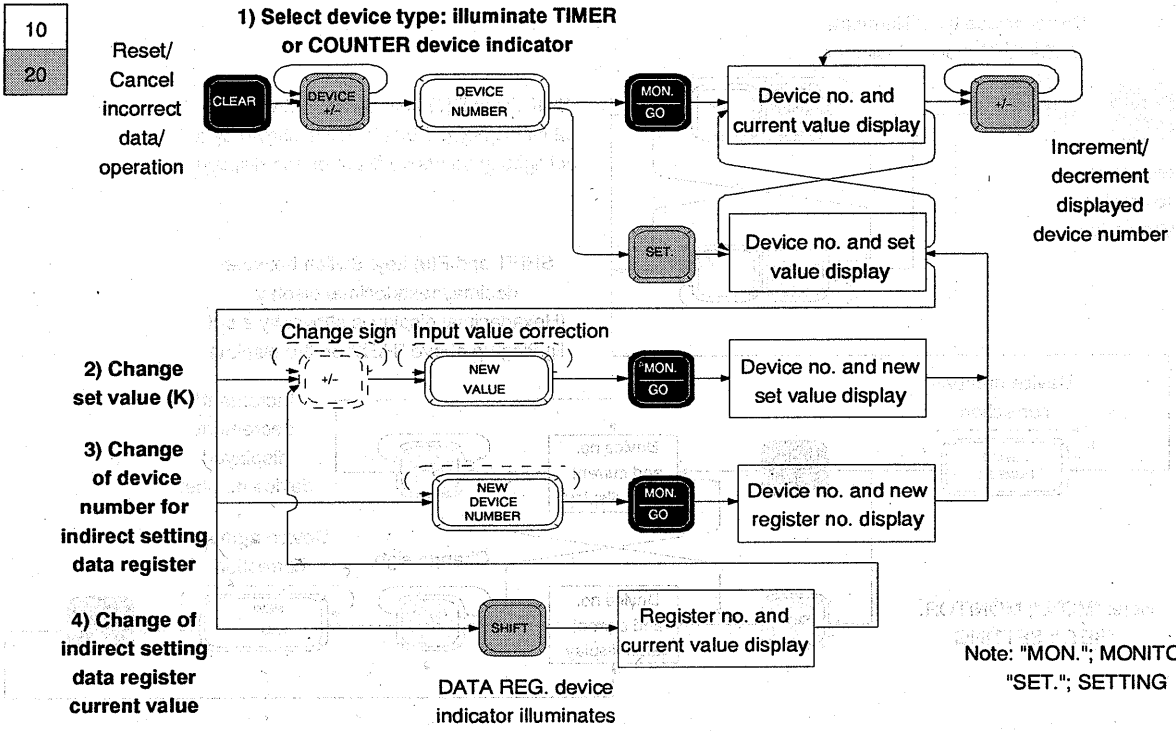
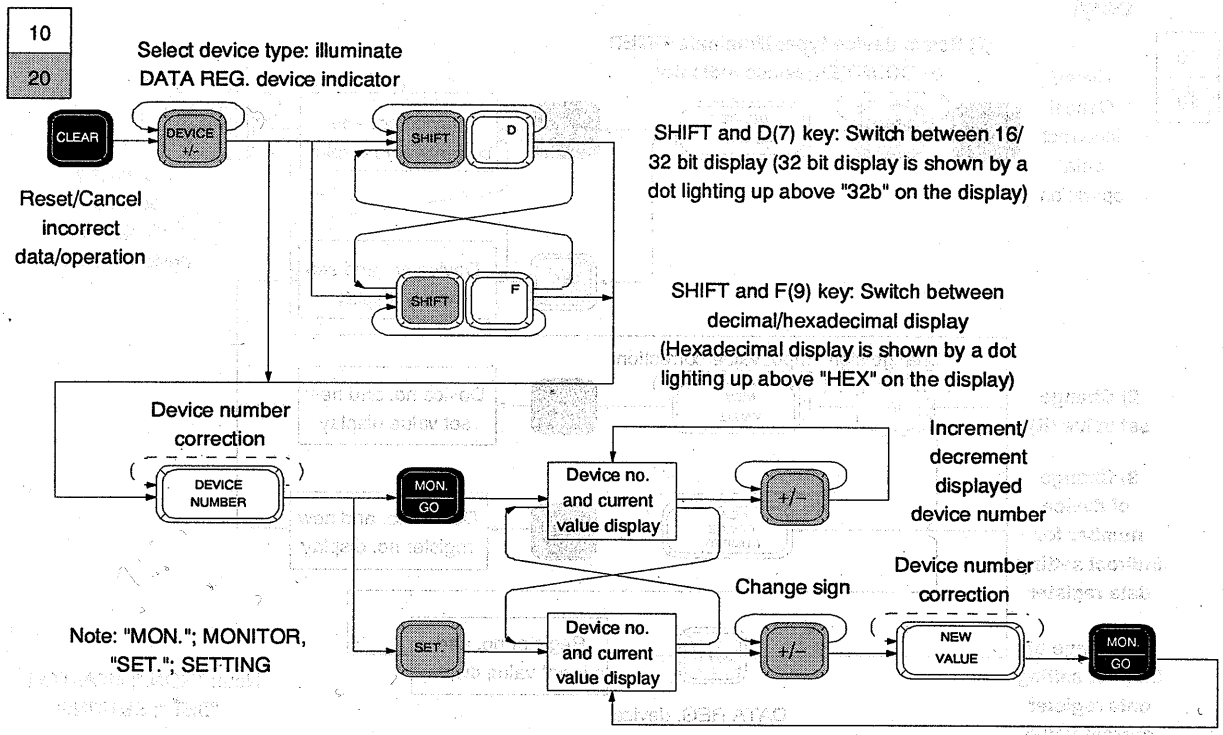


3.6.4 FX-20DU-E (data registers, D, only)



3.7 Example Monitor mode screen displays

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This section shows what displays will be seen on the units during use in Monitor mode.

3.7.1 FX-10DU-E screen displays

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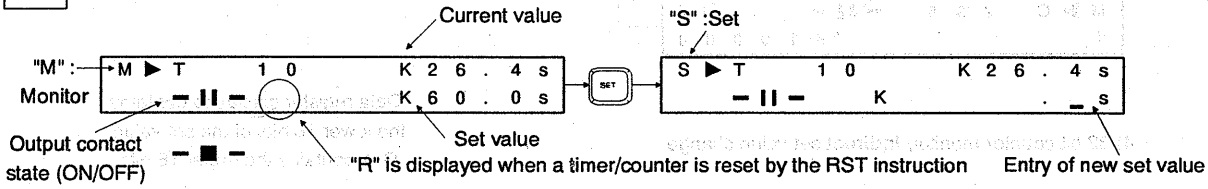
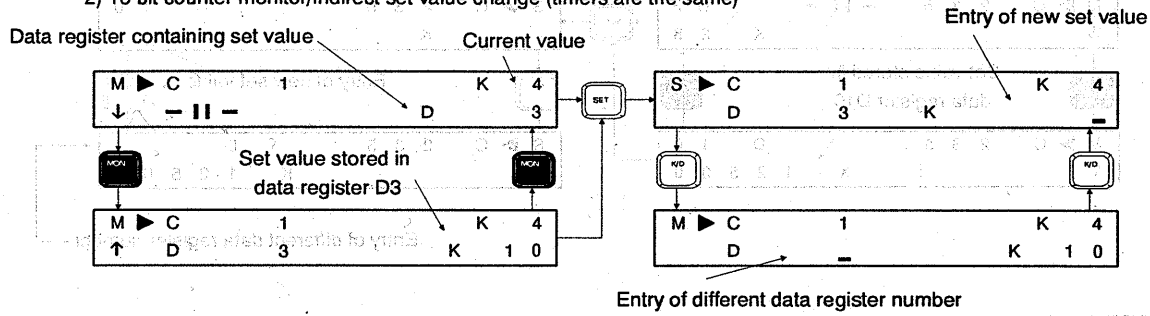
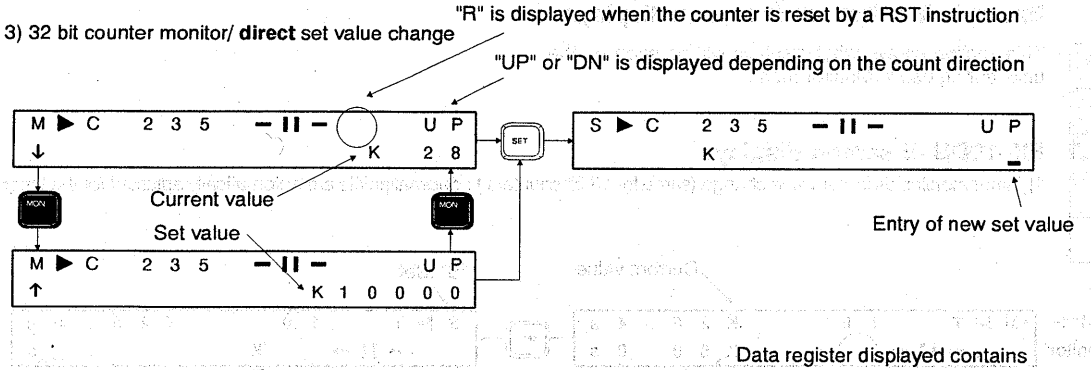
1) Timer monitor/direct set value change (same for 16 bit counters) ; decimal points are automatically adjusted for the timer being set



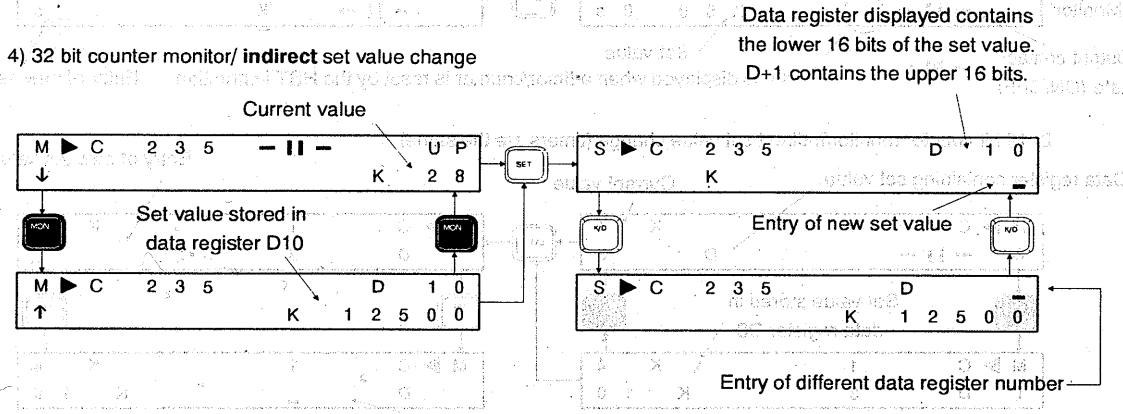
2) 16 bit counter monitor/indirect set value change (timers are the same)



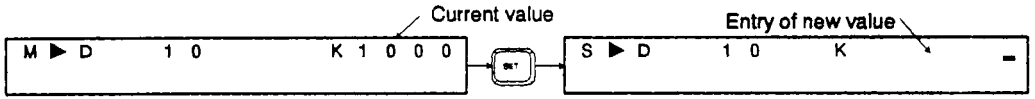
3) 32 bit counter monitor/ **direct** set value change



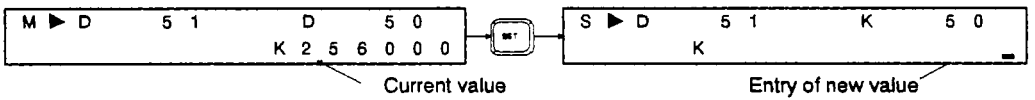
4) 32 bit counter monitor/ **indirect** set value change



5) 16 bit data register monitor/current value change (up to two can be displayed on one screen)



6) 32 bit data register (D+1 and D) monitor/current value change



3.7.2 FX-20DU-E screen displays

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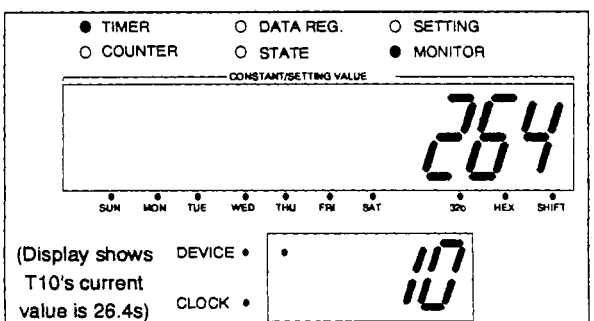
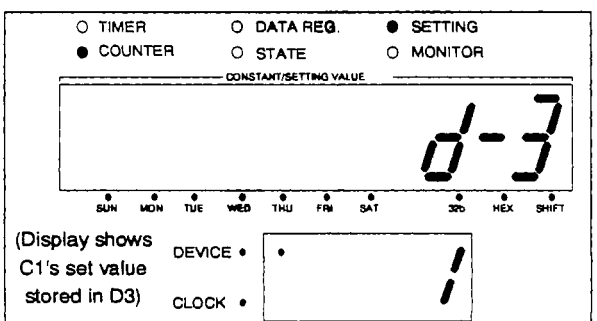
1) Timer current value display (16/32 bit counters and data registers are the **same**). **Push** [SETTING] to see the set value.



2) 16/32 bit counter indirect setting display (timers are the same). Push [MONITOR] to see the current value.



3.8 Example Monitor mode word device monitoring operation

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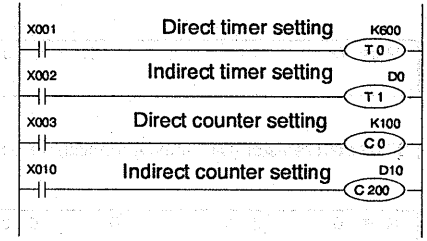
These two examples are intended to show typical monitoring operation for these devices. For these examples to work correctly, it is assumed that the PC is running the program segment shown.



3.8.1 FX-10DU-E example

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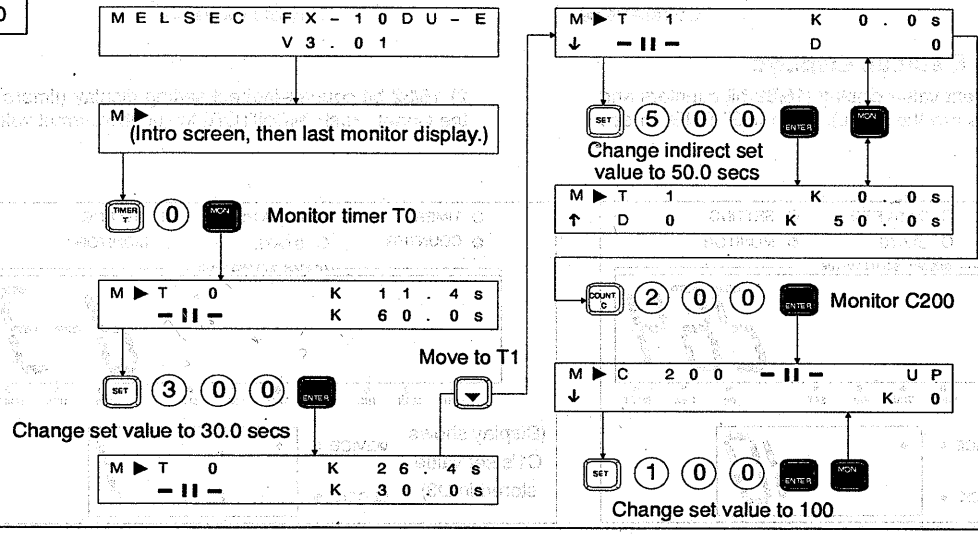

3.8.2 FX-20DU-E example

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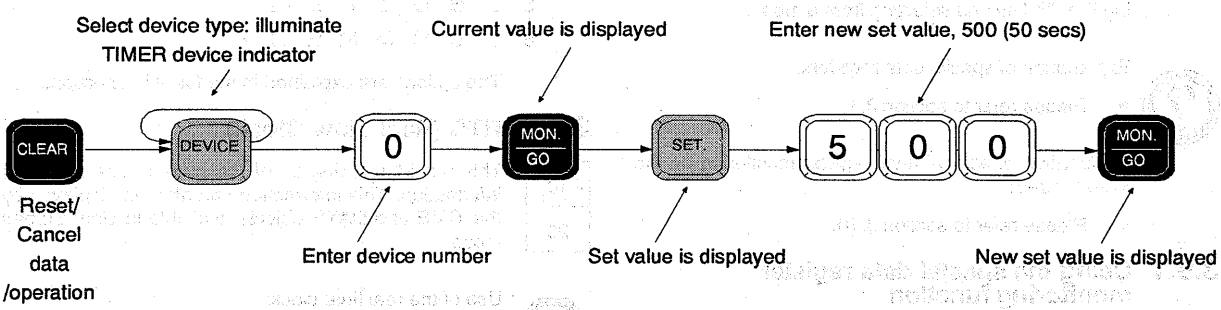
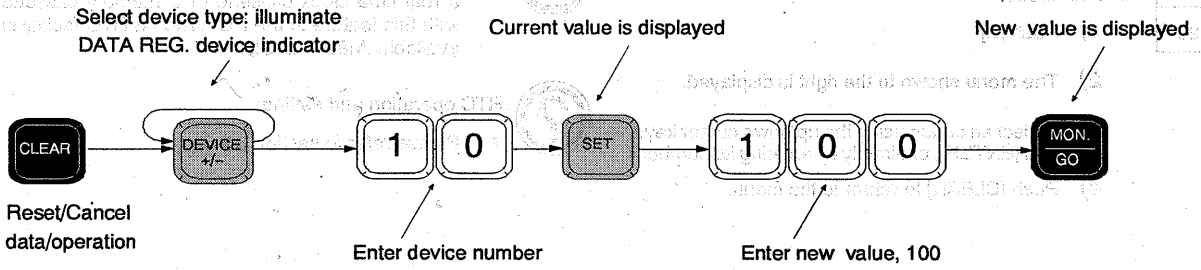
This example is also based on the program shown on the previous page.

1) Monitor the current value of Timer T0 and change its set value from 600 (60 secs) to 500 (50 secs)



2) Monitor the current value of data register D10 and change its current value to 100



3.9 Special data register monitoring on the FX-10DU-E

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This feature allows special data register information to be accessed. This allows the display of such information as real time clock data and active states.

These data registers can be monitored directly by pushing the "E" key and selecting from a menu.

Explanation of special data registers:

- Please refer to section 3.1

Explanation of special data register monitoring on the FX-20DU-E:

- Please refer to section 3.10

3.9.1 Using the special data register monitoring function

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To access this function, the DU unit must first be in Monitor mode.

1) Push [E]

2) The menu shown to the right is displayed.

3) Select an option using the up/down cursor keys and [ENTER], or directly by entering its number.

4) Push [CLEAR] to return to the menu.

```
▶ 1 . RTC
  2 . ACTIVE STATES
  3 . ANNUNCIATOR
  4 . PC DIAGNOST.
  5 . BUZZER
  6 . COMMENT
```

The options are explained in the following sections.

3.9.2 RTC (Real Time Clock)

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This provides a display of the current time **and date** information. This information can also be displayed by the TIME and DATE objects available in User Screen mode

STOP

Use of the real time clock:

- The real time clock facility is provided by installing a real time clock cassette or a memory cassette with this feature in the PC. When a RTC facility is available, M8018 is ON.

RTC operation and setting:

- Please refer to section 3.9.3

The RTC time display looks like this:

```
'95/07/07 FRI
13:46:46
```

While the clock display is present, pushing [SET] then [ENTER] rounds the display to the nearest 30 seconds. If no RTC cassette or memory cassette containing this feature is fitted, then this error message is displayed:

```
NO CLOCK CASSETTE
ON FX PC
```

3.9.3 Adjusting the Real Time Clock

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Follow this procedure while the clock display is present:

1) Push [SET] twice.
2) Type in the current time and date using the number keys. The cursor automatically moves along as each part of the new setting is entered. Single figures (e.g. "07" in the example above) should be prefixed with a zero.
3) Use the up/down cursor keys to skip items which do not need changing.
4) Push [ENTER] to finish. The clock will then start from whatever seconds value was entered.

Example operation:

To enter the date and time Tuesday, July 25th 1995 17:00:00, key in this sequence:

[9] [5] [0] [7] [2] [5] [2]

[1] [7] [0] [0] [0] [0]

Entering days of the week:

Days of the week are identified by numbers:

0	1	2	3	4	5	6
SUN	MON	TUE	WED	THU	FRI	SAT

Date format:

- Note that this display has a fixed date format. However, the format of the DATE object in User Screen mode can be set by the user.

Incorrect clock setting:

- An incorrect clock setting will not be accepted by the unit (e.g. setting a month > 12 etc.).

3.9.4 ACTIVE STATES

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This display shows the lowest currently active states when the PC is running a SFC step ladder (STL) program. This function is equivalent to monitoring the special data registers D8040 to D8047.

Before this function can be used, special auxiliary relay M8047 must be on. If not, this error is displayed:

```
M8047 NOT ON
```

If no states are active, this message is displayed:

```
NO ACTIVE STATES
```

When the STL program is executing, a display similar to this example will be seen:

```
  S100   S101
↓ S102   S103
```

MON. Use the [MONITOR] key to move back and forth between successive screens of active states.

```
  S104   S105
↑ S106   S107
```

3.9.5 ANNUNCIATOR

10 / 20

This displays the lowest currently active annunciator (states S900 to S999). Before this display can be used, the special auxiliary relay M8049 must be ON. If this is OFF, the following message is displayed.

```
M8049 NOT ON
```

Once M8049 is turned ON, a display similar to this appears:

```
ANNUNCIATOR
          S902
```

3.9.6 PC DIAGNOSTICS

10 / 20

This function allows initial diagnostic work to be carried out using the FX-10DU-E. The following sub menu is displayed when this option is selected:

```
▶1. PC VERSION
 2. PC ERROR
 3. SCAN TIME
```

Select the required option by entering its number or by using the up/down cursor keys and [ENTER].

[CLEAR] returns to the sub-menu.

1. PC VERSION

Displays the system version number of the PC, e.g.:

```
PC VER. : V2.30
```

2. PC ERROR

Displays the nature of an error and its code, e.g.:

```
P R O G R A M   E R R O R
E R R O R   C O D E : 6 6 0 2
```

The following error messages may be displayed:

Error code	Meaning
I/O CONFIG. ERROR	The PC program does not match the available hardware configuration
PC HARDWARE ERROR	A problem has occurred with the PC hardware
PC/HPP COMMS ERROR	A communication fault exists between the PC and the programming unit
PARA. LINK ERROR	A fault exists in the link between paired PCs
PARAMETER ERROR	Parameters are incorrectly set
SYNTAX ERROR	Program instructions have been used in an incorrect manner
PROGRAM ERROR	The program structure is incorrect
OPERATION ERROR	The program has attempted to carry out an operation which is not allowed

3. SCAN TIME

Displays the current average, maximum and minimum scan times for the PC program. Use the up/down cursor keys or [ENTER] to display MAX and MIN scan times.

```
S C A N   T I M E   1 . 8 m s
M A X     ↓         1 . 9 m s
M I N     ↑         1 . 7 m s
```

3.9.7 BUZZER

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Turn the audible key feedback ON/OFF. Use the up/down cursor keys to select, then [CLEAR] to return to the menu.

```
B U Z Z E R   S E T T I N G
      ▶ O N          O F F
```

3.9.8 COMMENT

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This is used to read device comments stored in the PC so they can be viewed when monitoring.

Use the up/down cursor keys to select YES or NO. If YES is selected, the messages "EXECUTING" then "COMPLETED" are displayed. The unit returns to the menu automatically.

```
R E A D   C O M M E N T S ?
      Y E S       ▶ N O
```

Effect of changing number of comment blocks:

- If the number of comment blocks stored in the PC is changed, then to update the comments read by the DU unit, turn the DU unit off then on and re-read the comments.

3.10 Special data register monitoring on the FX-20DU-E

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The FX-20DU-E allows special data registers containing such information as real time clock data and active states to be directly accessed.

3.10.1 Real time clock display

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This feature allows the FX-20DU-E to display time and date information. If an FX PC is used, it must be V2.0 or later.

STOP

Use of the real time clock:

- The real time clock facility is provided by installing a real time clock cassette or a memory cassette with this feature in the PC. When a RTC facility is available, M8018 is ON.

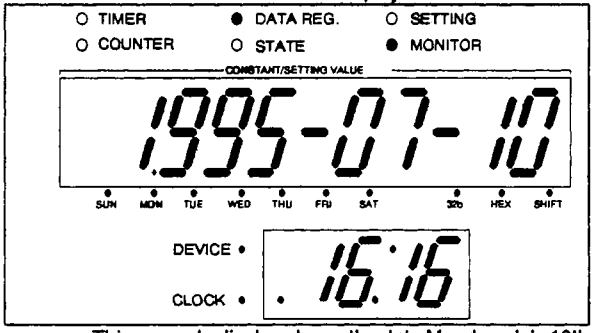
Use the following procedure to show the real time clock display;

1) Push [CLEAR]

2) Push [SHIFT]

3) Push key [3], which has "CK" (CLOCK) marked in its top right hand corner. The following display appears to show the RTC function has been selected:

4) Push [MONITOR]. A clock display similar to the one shown here is displayed.



This example display shows the date Monday, July 10th 1995, 4:16 p.m. Note that the day is shown by a flashing dot above the relevant day marker beneath the upper display. On the lower display, the colon flashes to indicate seconds.

Seconds display

Push [+] or [-] to toggle the lower display between HH:MM and MM:SS.

RTC display messages

The following messages may appear:

- If invalid values were entered for RTC data, (e.g. a month number >12), M8019 turns ON, and this message appears:

- M8018 being ON indicates the presence of a RTC. If it goes OFF, this message appears:

- If M8016 turns on, the clock display is frozen, but the clock itself continues running. This is the LAP display:

+/- 30 second rounding operation

Follow this procedure to round the display to the nearest minute:

1) Push [+] to change the lower display to MM:SS
2) Push [SETTING]. The seconds display flashes.
3) Push [MONITOR] to round the display to the nearest minute.

This operation works by pulsing M8017 (Minute rounding) in the PC.

3.10.2 Adjusting the Real Time Clock

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After calling up the real time clock display, follow this procedure to correct the current date and time setting:

1) Push [SETTING]; the year flashes. Key in the new year.
2) Push [+] to move to the month. Key in the new month.
3) Push [+] to move to the date. Key in the new date.
4) Continue this process for each part of the data. Skip items which do not need changing by using the [+] key.
5) End the process by pushing [MONITOR]

The clock starts at the set seconds figure when [MONITOR] is pushed at the end of the process. Special auxiliary relay M8015 (Time setting) is activated momentarily by this process.

Example operation:

To enter the date and time Tuesday, July 25th 1995 17:00:00, key in this sequence:

[1] [9] [9] [5] [0] [7] [2] [5] [2]

[1] [7] [0] [0] [0] [0]

Entering days of the week:

Days of the week are identified by numbers:

0	1	2	3	4	5	6
SUN	MON	TUE	WED	THU	FRI	SAT

The correct day can also be selected with the [–] key.

Date format:

- Note that this display has a fixed date format.

Incorrect clock setting:

- An incorrect clock setting will not be accepted by the unit (e.g. setting a month > 12 etc.). After pushing [MONITOR], the incorrect value will flash. Correct the value and complete with [MONITOR].

3.10.3 Monitoring active state numbers

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This display shows the lowest currently active states when the PC is running a SFC step ladder (STL) program. This function is equivalent to monitoring the special data registers D8040 to D8047.

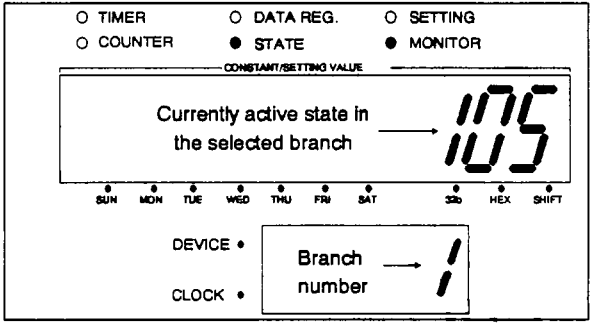
Effect of entry codes on state monitoring:

- Note that an "A" entry code prevents state monitoring.

Procedure for monitoring **state numbers**

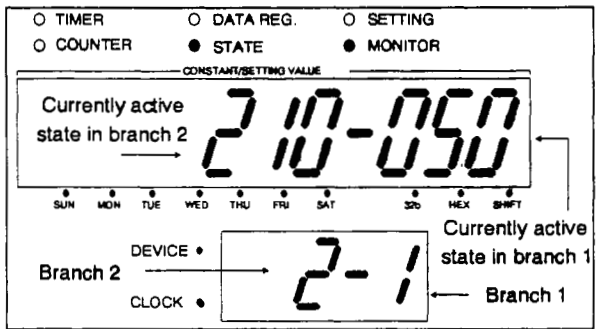
1) Push [CLEAR]
2) Push [DEVICE +] or [DEVICE–] until the STATE LED indicator comes on.
3) Enter the STL branch number, [1] to [8].
4) Push [MONITOR].

A display similar to the one below will be seen. In this example, branch 1 was selected, and state S105 is currently active within this branch. Use the [DEVICE +]/[DEVICE –] keys to access other branches. If no active states are present in a branch, "OFF" is displayed.



Monitoring two branches simultaneously

While monitoring one branch, push [MONITOR] again. The next branch number and its active state is added to the display:

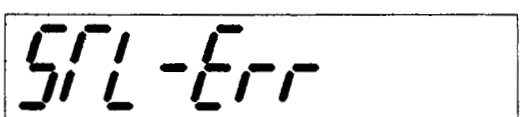


To return to single state monitoring, push [MONITOR] again.

State monitor display messages:

The following messages may appear:

- Before this function can be used, special auxiliary relay M8047 must be on. If not, this error is displayed:



- If no states are active, this message is displayed:

Conditions on the use of the state monitor:

- 1. The minimum state number in the flow of branch n+1 should be larger than the maximum state number in the flow of branch n. For example, if the highest state number in branch 3 is S30, then branch 4's lowest state number should be >30.
  2. There should be no more than 8 branches and each branch should only have one active state at any given time.

3.10.4 Monitoring annunciators

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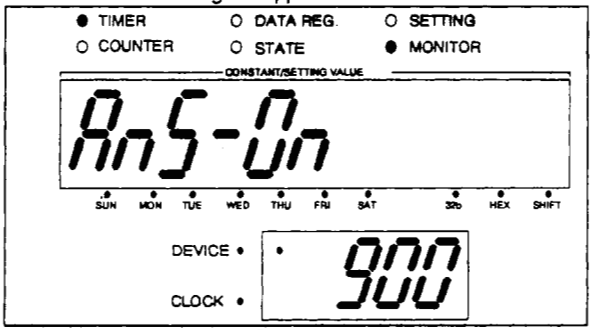
This displays the lowest currently active annunciator (states S900 to S999). Follow this procedure to use this feature:

1) Push [CLEAR]

2) Push [SHIFT]

3) Push key [0], which has "AN" (ANNUNCIATOR) marked in its top right hand corner. The following display appears to show the annunciator function has been selected:

4) Push [MONITOR] . A display similar to the following will appear:



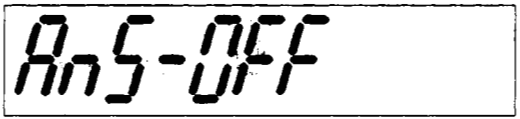
In this example, S900 is the lowest currently active annunciator.

Annunciator monitor display messages:

The following messages may appear:

- If special auxiliary relay M8049 is OFF, the annunciator monitor will not function and the following message is displayed:

- If M8049 is ON, but all annunciators are OFF, then this message is displayed:



3.10.5 Display of programmable controller status

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This feature allows some preliminary diagnostic work to be carried out in both normal and PC fault conditions.

When the PC is running normally:

Follow this procedure:

1) Push [CLEAR]

2) Push [SHIFT]

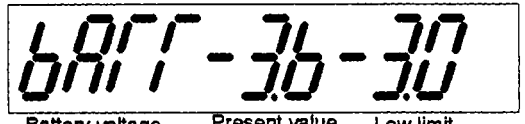
3) Push [1], which has "PC" (Programmable Controller) marked in the top right hand corner. The following display appears to show the diagnostic function has been selected:

4) Push [MONITOR]. If there are no PC errors, one of the following displays will appear:

- PC in RUN mode:

- PC in STOP mode:

Push [DEVICE +] or [DEVICE –] when the RUN/STOP display is present to toggle the battery voltage display:



Battery voltage Present value Low limit

Low battery signal:

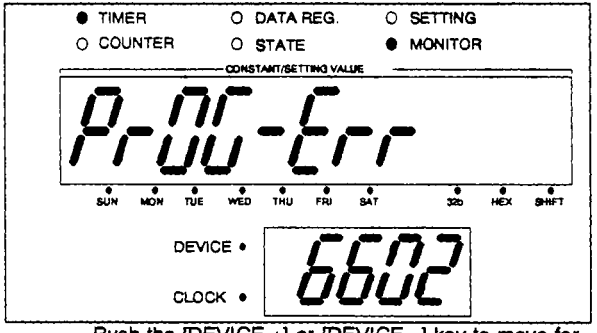
- When the battery voltage falls below the low limit, special auxiliary relay M8005 turns ON.

When an error has occurred in the PC:

The FX-20DU-E can produce error messages for errors signalled by the following special auxiliary relays:

- M8005, M8009, M8061
- M8063 to M8066

To see the error messages, follow the same procedure as before. If an error exists, a display like the example below will be seen. Note that the lower display gives the associated error code, where appropriate.



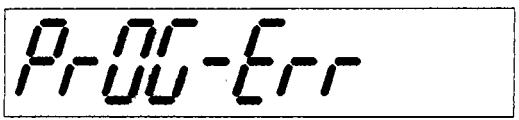
Push the [DEVICE +] or [DEVICE –] key to move forwards and backwards through the list of error messages if more than one exists.

Error display messages:
The following messages may appear:

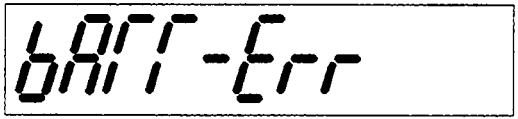
- Communication error between the 20DU and the PC

- PC hardware error: M8061 ON, error code 6101 to 6103

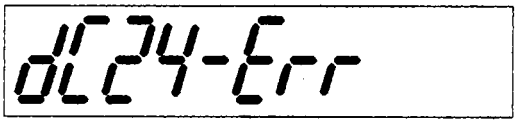
- Program error: one of M8064 to M8066 ON, error code 6401 to 6608



- Low battery voltage: M8005 ON.



- 24V DC power to extension units down: M8009 ON.



3.10.6 Key buzzer ON/OFF

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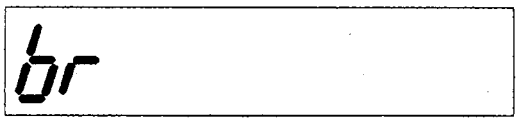
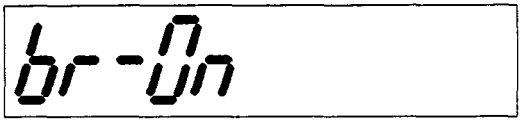
Follow this procedure to turn the key buzzer ON or OFF:

1) Push [CLEAR]
2) Push [SHIFT]
3) Push [2], which has "BZ" (BUZZER) marked in the upper right hand corner. The following display appears to show the buzzer has been selected:



4) Push [MONITOR] to display the current status of the buzzer:

- Buzzer ON:



- Buzzer OFF:

5) Push [DEVICE +] to turn the buzzer ON, [DEVICE -] to turn it OFF. Finish by pushing [MONITOR].

Buzzer operation:

- When ON, the buzzer sounds each time a key is pushed, and three times when an erroneous operation is attempted.

3.10.7 Handling of entry codes

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The 8 character entry code is used to restrict access to data in the PC when using the FX-20DU-E. Three different levels of protection exist. The first character of the entry code determines what level is selected.

Entry codes:

- Please refer to section 3.3 for an explanation of entry codes and their effects.

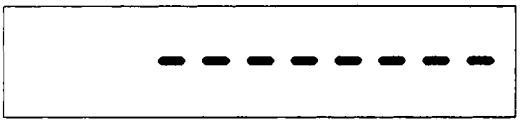
1) Releasing an entry code

If an "A" type entry code has been programmed in the PC, a display similar to the following will be seen at power up, after the "SET UP" and PC version number displays:

Follow this procedure to release the restrictions imposed by an entry code:

1) Push [CLEAR]

2) Push [SETTING]. The following display appears:



3) Type in the 8 characters of the current entry code. Note that "A", "B" and "C" are [SHIFT] and [4],[5] or [6].

4) Push [MONITOR]. The following display will be seen to indicate the entry code is released.

Notes on entry codes and memory types:

- Entering, deleting or changing an entry code is only possible when RAM memory is used on the PC. If the PC is using an EEPROM cassette, switch the PC to STOP and turn the memory protect switch to OFF before using the procedure described above.

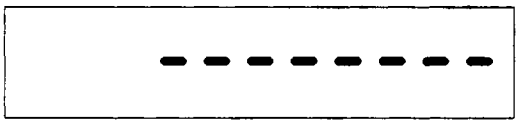
2) Deleting an entry code:

This function allows the current code to be deleted. This is necessary before a new code can be entered. Before the code can be deleted, the existing one must be released. Follow the procedure in 1) above to do this.

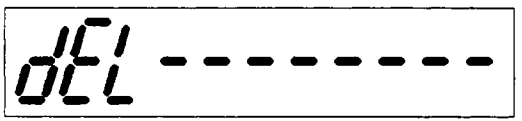
Deleting the existing code:

1) Push [CLEAR]

2) Push [SETTING]. The display below appears. Note that if no entry code exists already, the hyphens will be replaced with zeros. In this case, this procedure does not apply.

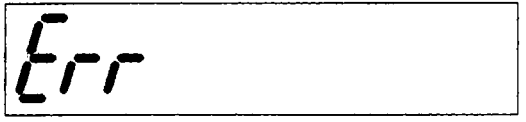


3) Push [DEVICE -]. "DEL" appears to the left. Type in the code.



4) Push [MONITOR]. The display changes to that shown below to indicate the code has been deleted.

If an incorrect code is entered, "Err" is displayed:



3) Entering a new entry code

This function allows a new code to be entered. Before the code can be changed, the existing one must be released, then deleted. Follow the procedures in 1) and 2) to do this.

To enter the new code:

1) Push [CLEAR]

2) Push [SETTING]. The display shown below appears. Note that if hyphens appear instead of zeros, an entry code already exists and this procedure cannot be used.

3) Push [DEVICE +]. "SET" appears to the left. Type in the new code.

4) Push [MONITOR] to register the new code.

3.11 Preset monitoring function

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The preset monitoring function provides two methods for limiting the number of devices which an operator can change the set values of. The amount of access is set at the design stage using one or both of the following functions:

- **Preset range monitoring:** Up to 8 preset access ranges for Timers, Counters and Data Registers (T,C,D).
- **Preset device monitoring**: Up to 8 nominated devices selected from T,C, and D.

Operation of the preset monitoring functions:

- Note that these functions only restrict the devices for which set values can be changed. It is still possible to monitor other devices not affected by these presets.

Conflicts between preset monitoring functions:

- If one of the devices set using the preset device monitor falls outside the range of the preset range monitor (when both are being used), then it will not be possible to change its set value.

Attempting to change the set value of a device not included in preset monitor functions (when used):

- This is not possible. The error "DEV OUT OF RANGE" is displayed.

3.11.1 Setting the preset range monitor function:

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Begin by holding down the [CLEAR] key while turning on the power. A display similar to that below will be seen:

"A": All devices accessible, factory setting (ENABLE SETTING)

"E": Set preset device range (RANGE SETTING)

"F": All preset device ranges disabled (FORBID SETTING)

```
A  ENABLE SETTING
(E:RANGE F:NONE)
```

Entering "A" or "F" returns to the normal Monitor mode screen. Entering "E" allows the device ranges to be preset:

1) Input the range number, 1 to 8. The up/down cursor keys can also be used to move between the ranges.
2) Type [TIMER T], [COUNT. C] or [D.REG D/DD] to enter the device type for the range. Note that 32 bit (DD) word devices cannot be selected.
3) Enter the lower limit and push [ENTER]
4) Enter the upper limit and push [ENTER]
5) Repeat for each range
6) Finish by pushing [B]

The [D] and [ENTER] may be used to delete a range, and data entry can be cancelled by pushing [CLEAR].

3.11.2 Setting the preset device monitor function:

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Begin by holding down the [SET] key while turning on the power. A display similar to that below will be seen:

"C": Preset device monitor OFF, factory setting (PRESET DISABLE)

```
C  PRESET  DISABLE
( E  MONITOR )
```

"E": Preset device monitor ON (PRESET MONITOR)

Entering "C" returns to the normal Monitor mode screen. Entering "E" allows the required devices to be preset:

1) Input the preset device number,1 to 8. The up/down cursor keys can also be used to move between the preset devices.
2) Type [TIMER T], [COUNT. C] or [D.REG D/DD] to enter the device type to be preset.
3) Enter the device number and push [ENTER]
4) Repeat for each device to be preset
5) Finish by pushing [B]

The [D] key followed by [ENTER] may be used to delete a range, and data entry can be cancelled by pushing [CLEAR]

3.11.3 Example operation of the preset range monitor function

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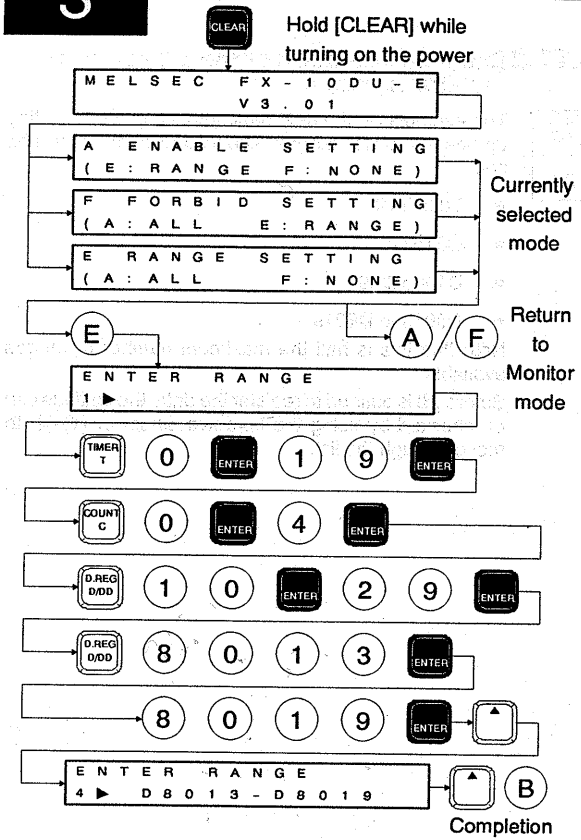
The example on the next page gives a guide to setting up preset monitor ranges. The following ranges will be set:

- T0 to T19
- C0 to C4
- D10 to D29
- D8013 to D8019

Note that this is half the maximum number of ranges available.

Before [B] is pushed to register the data, the settings can be checked by using the up/down cursor or [1]-[8] to move through the list.



3.11.4 Example operation of the preset device monitor function

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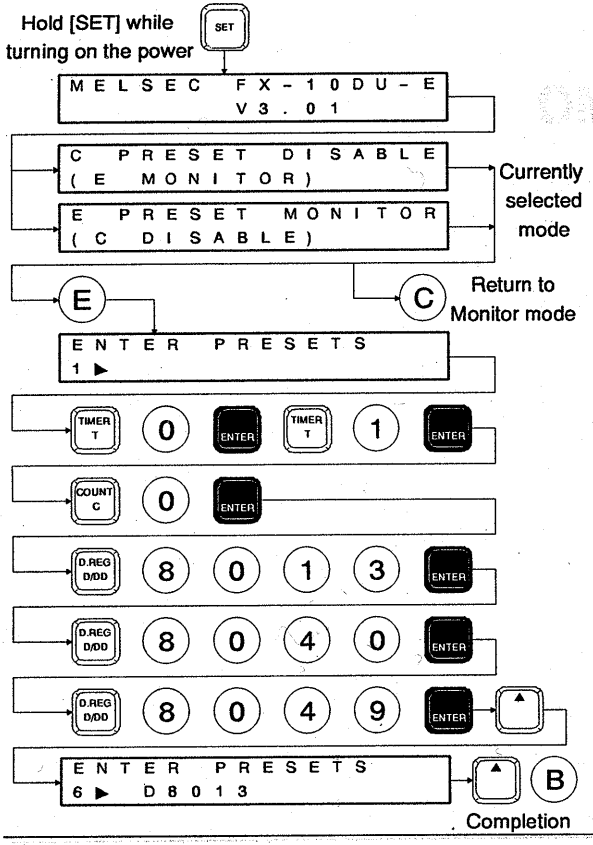
The example opposite gives a guide to setting up the preset device monitor. The following devices will be preset:

- T0
- T1
- C0
- D8013
- D8040
- D8049

Note that this is less than the available maximum of 8 devices.



3.11.5 Normal monitoring/preset range monitoring and preset device monitor screen display

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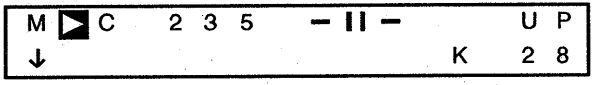
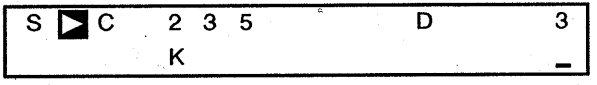
The preset range monitoring display is the same as that for normal device monitoring.

The preset device monitor display is the same as normal/preset range monitoring, except the arrow cursor appears as white on black, as shown in the examples below.

Move between different preset devices by using the up/down cursor keys.





Switching between normal/preset range monitoring (if used) and preset device monitoring:

- Switch between the two modes by pushing [CLEAR].

MEMO

4. Overview of User Screen mode

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User Screen mode allows the display of up to 25 (0–24) user defined screens. These are defined using the FX-10DU-E itself in Other mode. The size of these screens are:

- Screen #0 (default screen):16 characters x 16 lines
- Screens #1–24: 16 characters x 4 lines each

The physical display size is 16 characters x 2 lines.
Each screen may contain text and a number of other objects, listed below.

4.1 Objects available in User Screen mode

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The following objects are available:

1. Text:

Object name	Description	Maximum number on one screen	
		Screen #0	Other screens
Text	Displays text Includes: Upper case alphabet Lower case alphabet Numbers Symbols	16 characters x 16 lines	16 characters x 4 lines

2. Screen objects:

Object name	Description	Maximum number on one screen	
		Screen #0	Other screens
NUMBER	Displays PC word device (Timers, Counters and Data registers) data. Includes file registers . Set or current value may be displayed and changed.	Maximum combined object total =16	Maximum combined object total =4
INDICATOR	Causes a one character space to appear as a black square depending on the state of a PC bit device (X,Y,M,S,T,C)		
TEXT INDICATOR	Displays text for each state of a bit device		
TIME	Display current time		
DATE	Display current date in user defined format		
SWITCH	Allows the keys [A], [B] and [C] to be defined as inputs to switch the state of a PC bit device (X,Y,M,S,T,C)	3 (one for each key)	
NAME	Assign a name to a screen	1	
SCROLLING	Defines how the screen can be scrolled. SPLIT: Bottom line only scrolls LINE: Scroll line by line SCREEN: Scroll two lines.	1	

Limit on number of objects per screen:

- For screen #0, a limit of 4 display objects per two lines applies.

4.2 Example screen display (screen #0)

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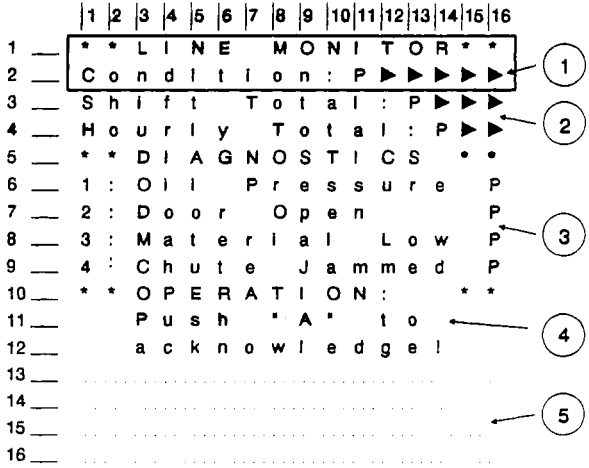
As only two lines are visible at one time, the screen must be scrolled to see all of the 12 lines of the display.

Display of objects during screen creation/editing:

- During this process, the objects are displayed as a "P" followed by one arrow for each further character space the object occupies.

Key to objects used:

1) TEXT INDICATOR: In this case, shows "NORMAL" when its bit device is OFF, "FAULT" when its bit device is ON.
2) NUMBER: Displays the data register value representing the total produced this shift. A second NUMBER object reads another data register for the "Hourly Total".
3) INDICATOR: A black square is displayed when a bit device corresponding to the fault changes state.
4) SWITCH: Pushing key [A] controls a PC bit device.
5) The dotted lines indicate unused lines (for clarity only; not displayed by the unit).



4.3 Screen change method

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The screen displayed by the DU unit is determined by the value in a PC data register (default; D0). This is the SCREEN REGISTER.

Devices used:

- D0: Data register containing the screen number to display (K0–24).
- D1: Reserved. Do not use.

Changing the default SCREEN REGISTER:

- Please see Chapter 5, section 5.4.4

4.3.1 Program example

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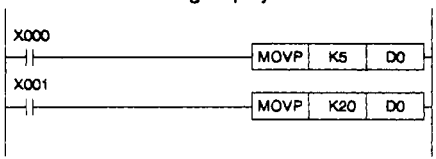
The following example demonstrates how to change which screen is being displayed.



When X000 turns ON, the value 5 is moved into D0. Hence the DU unit will display screen number 5.

When X001 turns ON, the value 20 is moved into D0. Hence the DU unit will display screen number 20.

Selecting screen numbers:

- Only defined screens can be selected. Writing the number of an undefined screen to the SCREEN REGISTER will cause the DU unit to display the message "NO SUCH SCREEN".

Programming information:

- Please see the programming manual for the PC you are using.

4.4 Screen scrolling method

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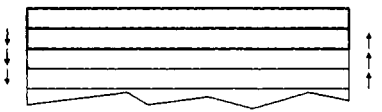
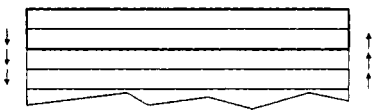
This is controlled by the SCROLLING object on each screen. Scrolling is activated from the DU's keypad by using the up/down cursor keys. The options are:

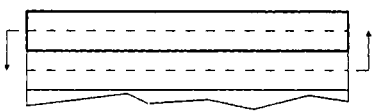
1) SPLIT: top line fixed, bottom line scrolls line by line through rest of screen



2) LINE: Each press of the cursor keys scrolls the whole screen one line up or down.



3) SCREEN: Scroll the screen two lines up or down, one physical screen.



Limits on scrolling:

- The screen can scrolled to the last line which has defined objects. For SCREEN, this may leave a blank line at the bottom of the screen as it is scrolled in line pairs.

4.5 Key functions in User Screen mode

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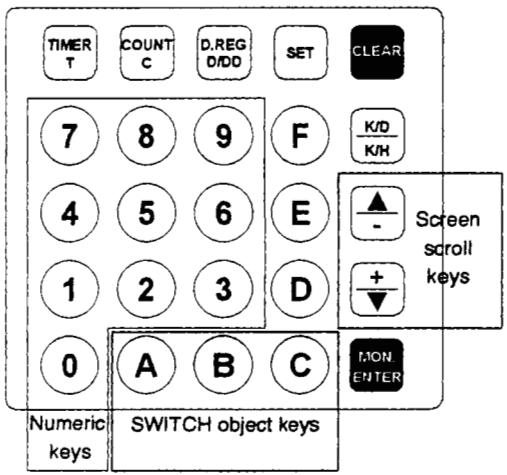
The FX-10DU-E's keypad has the following functions in User Screen mode:

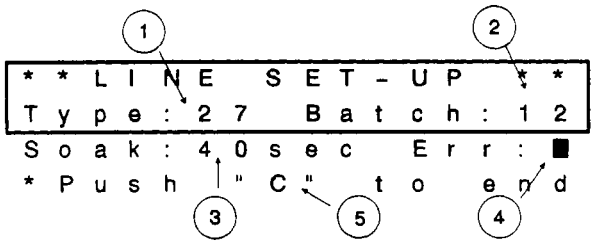


Key	Function
TIMER T	Not used
COUNT C	
D.REG D/DD	
SET	Change displayed values
CLEAR	Cancel entered data when changing values
0-9	Numeric entry
A-C	Operate SWITCH objects
D	Not used
E	
F	Switch between Monitor mode and User Screen mode
K/D K/H	Not used
Up/down cursor	Scroll screen display, change sign
MON. ENTER	Enter new values

4.6 Example use of User Screen mode

tip 20

The following example shows a sample screen which requires the operator to enter a set of values in order to configure a process. The example screen is screen number 1 and so has four lines. SCROLLING has been set to LINE.



Key to objects used:

1) "Type"; a NUMBER object used to display the value in a data register. This displays the product type being processed.

2) "Batch"; another NUMBER object. This displays a counter's set value to indicate the required batch size.

3) "Soak"; the third NUMBER object which displays a timer's set value. This is the length of time for which a batch is soaked.

4) "Err"; an INDICATOR object which is triggered by an auxiliary relay (M coil) to indicate an invalid soak time has been entered.

5) Pushing [C] activates another auxiliary relay via a SWITCH object to indicate the setting process is complete.

Displaying timer and counter values:

- If SETTING value is chosen for a timer or counter which does not exist in the PC program, question marks will be displayed instead of a value.

Use of objects:

- Note that this example is only representative of what can be achieved with these objects and their use is not limited to that shown here.

After connecting the FX-10DU-E to a PC and turning on the power, the copyright screen then version number screen is shown.

Depending on the unit's previous powered on state, the initial display will either be Monitor or User Screen mode. The Monitor mode display is shown immediately below. Push [F] for the User Screen mode display.

M ▶

If preset monitoring is being used, the M will appear as white on black.

User screen mode display:

```
* * L I N E   S E T - U P   * *
T y p e :   0   B a t c h :   0
```

4.6.1 Key operation

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The following section will explain the key operations for entering data on this user defined screen. Note that these operations are common to all user defined screens.

The general procedure is:

1) Push [SET] to display a cursor beneath the displayed value
2) Type the new value using the numeric keys
3) Push [ENTER]

When [SET] is pushed, the cursor will appear under the first value displayed which can be changed. If this is not the one required, push [SET] again to move to the next.

If the required value is not currently visible, scroll the screen to display it.

Push [CLEAR] to cancel an incorrect value/operation.

Changing displayed values:

- If a NUMBER object has been set to WRITE IN: FORBID, then its value cannot be altered. In this case, pushing [SET] will not select this object.

Acceptable ranges for displayed values:

- NUMBER objects can be configured to have MIN and MAX ranges. If a value outside this range is entered, the message "OUT OF RANGE" is displayed. Push [CLEAR] and try again.

NUMBER object display capacity:

- If the value being displayed goes outside the NUMBER object's display capacity (e.g.. becomes a three digit value when the NUMBER object only has two), asterisks will be displayed.

Setting NUMBER objects:

- Please refer to Chapter 5, section 5.7.4 for further information.

5.1 Overview of Other mode

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Other mode has two functions:

- Allows the DU unit's User Screen mode displays to be created and edited.
- Allows the FX-10DU-E to be configured for the application.

5.2 Other mode menu options

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To display the Other mode menu, turn on the power to the PC while holding down the [ENTER] key on the DU unit. After copyright and version number screens, the following screen is displayed:

```
I N P U T   P A S S W O R D
      - - >   _
```

Enter the password (a two digit number) to gain access to the menu options.

Setting the password:

- Please refer to section 5.6

The Other mode menu is then displayed as shown at the top of the next column.

Select an option using the up/down cursor keys and [ENTER], or by directly entering its number.

Push [CLEAR] to return to the menu.

```
▶ 1 . M O D E   S E T T I N G
  2 . E D I T   S C R E E N
  3 . D A T A   T R A N S F E R
  4 . P A S S W O R D
  5 . F I N I S H
```

The options are explained in the following sections:

5.3 MODE SETTING

This option allows the level of access to the functions of the DU unit to be set. On selecting MODE SETTING, this screen is displayed:

```
C   A L L   M O D E S
  ( A : S C R .   B : M O N . )
```

Push [A], [B] or [C] to select the required access level. These are:

Code	Effect
A	Access to User Screen mode only
B	Access to Monitor mode only
C	Access to both modes

5.4 EDIT SCREEN

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This option allows User Screen mode displays to be created and edited. It has its own sub-menu as shown below. Select a sub-option as shown earlier. These are explained in the rest of this section.

```
▶1. EDIT SCREEN
 2. ERASE SCREEN
 3. COPY SCREEN
 4. INTERFACE DEV
```

5.4.1 EDIT SCREEN

The EDIT SCREEN sub-option is for screen display creation and editing. When selected, a screen similar to this one is displayed:

```
▶<<INPUT SCR.#>>
 00-LINE MONITOR
```

Two options for selecting a screen to create/edit exist:

1) Use the up/down cursor keys to scroll to the required screen. Note that the list of screen names includes all screens which have been defined so far, even if they do not contain any text or objects yet. Push [ENTER] to select it.

2) Push [ENTER] with the arrow cursor on the top line to enter a screen's number directly. The following prompt will be displayed:

```
INPUT SCREEN
NUMBER -->
```

- Type the number and push [ENTER].If the screen does not exist, this will define it. If the screen already exists, a warning message is then shown:

```
ALREADY EXISTS
EDIT: PUSH [ENT]
```

- Push the [ENTER] key to select this screen. [CLEAR] cancels the selection.

When a screen is displayed for editing, the display will be similar to that shown below:

```
**LINE SET UP **
(01-01)       [A]
```

Creating/editing objects to display:

- Please refer to section 5.7 for full details of the relevant procedures.

5.4.2 ERASE SCREEN

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This option allows unwanted screens to be erased from the DU unit's memory.

Select the required screen from the list using the up/down cursor keys and [ENTER]. A confirmation message will be displayed to prevent accidental erasure. To erase the screen, push [B]. [CLEAR] cancels the operation.

5.4.3 COPY SCREEN

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Use COPY SCREEN to make a duplicate of an existing screen on another (undefined) screen number.

Select the screen to be copied from the list in the usual way. When the SOURCE SCR. is selected, enter the DESTIN.SCR. at the prompt.

To complete the copy operation, push [C] when the confirmation message is displayed.[CLEAR] cancels the operation.

Copying to existing screens/copying screen #0:

- This is not possible. The message "ALREADY EXISTS PUSH [CLR] KEY" will be displayed. Select the number of a screen which has yet to be defined (i.e. is not in the current list of screens). Additionally, screen #0 cannot be copied. This will give the error "CAN'T COPY SCR#0".

5.4.4 INTERFACE DEV(ICE)

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Use this option to set which data register (SCREEN REGISTER) in the PC will control which screen the DU unit is currently displaying. By writing different screen numbers to this register, the DU unit's screen display can be changed.

Push [SET] to enter the new number, followed by [ENTER].

Screen change programs:

- Please see Chapter 4, section 4.3.1 for an example program.

5.5 DATA TRANSFER

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DATA TRANSFER allows screen data to be transferred to/from the MPU's (Main Processing Unit/base unit) memory or standard FX memory cassettes.

WARNING:

- When screen data is written to the base unit/memory cassette, existing program data is overwritten.The memory cannot be used for programs until it is erased and reprogrammed. While the memory contains screen data, the PROG.ERR LED will flash on the PC; this is normal.

The amount of screen data that can be stored depends on the size of the memory being used. This is shown in the table on the following page.

PC	Memory capacity			
	MPU/base unit memory	Memory cassette		
		RAM	EEPROM	EPROM
FX0N	Screens 0–17	Cannot be used with FX0N	Screens 0–17	Cannot be written to
FX		All screens	All screens	
FXoc				

Using DATA TRANSFER with a FX0 series PC:

- This is not possible.

When DATA TRANSFER is selected, the following sub-menu is displayed:

```
▶ 1 . DU  < - -  PC
  2 . DU  - - >  PC
  3 . DU    :    PC
```

Select the required option using the up/down cursor keys and [ENTER], or by entering its number directly. These options are explained in the following sections:

5.5.1 DU <-- PC

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Use this option to read existing data from the memory being used by the PC.

Push the [ENTER] key to EXECUTE reading. When the process is complete, the message "COMPLETED" is displayed.

```
EXECUTE?
  OK:[ENT] KEY
```

Attempting to read non-screen data:

- If the memory being used does not contain screen data, the message "NO SCREEN DATA IN CASSETTE" is displayed.

5.5.2 DU --> PC

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Use this option to write the DU unit's screen data to the MPU's memory/memory cassette. When selected, this message is displayed.

```
CHECK INSTALLED
CASS. FOR SCREEN
```

Ensure that the memory to be written to does not contain valuable data. Push [ENTER] to continue.

Push [ENTER] to EXECUTE writing to the memory. If the DU unit detects the memory already contains screen data, the message "CASS. HAS DATA! EXECUTE? OK: [ENT]" is displayed. Push [ENTER] to overwrite, [CLEAR] to cancel.

5.5.3 DU : PC

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To verify the transferred data, use this option. If the two sets of data are different, the message "VERIFY ERROR" will be displayed. Push [CLEAR] to return to the sub-menu.

Terminology used:

- Note that the DU's messages also refer to a memory cassette when the MPU memory is being used.

5.6 PASSWORD

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This allows a two digit password to be assigned to the DU unit to prevent unauthorised access to Other mode. The following display appears when this option is selected:

```
PASSWORD
▶ON      OFF      CHANGE
```

These options are as follows:

5.6.1 ON

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If a password has been turned OFF, this option will restore it.

WARNING:

- Do not forget the password! If this happens, the DU unit's Other mode cannot be accessed until the right password is found.

5.6.2 OFF

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Select OFF to disable the current password. Note that the current password will still be stored even after being turned OFF.

5.6.3 CHANGE

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Choose an alternative password. Enter the new password at the prompt:

```
CHANGE PASSWORD
NEW PASSWORD -> _
```

5.6.4 FINISH

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Selecting FINISH leaves Other mode and returns to Monitor mode or User Screen mode. To return to Other mode, the unit must be powered off, then on while [ENTER] is held down.

5.7 Creating and editing screen displays

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This section explains the procedures involved in creating and editing screen displays for User Screen mode. First, select the screen to be created/edited.
A screen edit display similar to the one below should be seen:

```
* * L I N E   S E T   U P   * *
( 0 1 - 0 1 )                 [ A ]
```

Selecting screens to edit:

- Please see section 5.4.1

5.7.1 Explanation of screen edit display

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In general, the display is organised as follows:

Top line of display; text/objects being edited.

Text input mode indicator (example shows upper case text)

```
* * L I N E   S E T   U P   * *
( 0 1 - 0 1 )                 [ A ]
```

Screen/line number display (example shows scrn. 1, line 1)

Bottom line of display; displays options and editing information

5.7.2 Key operation for editing screen displays

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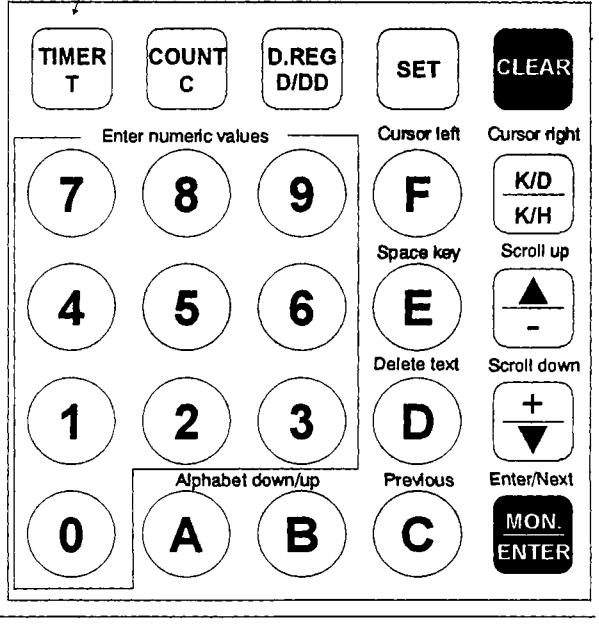
The DU's keypad has the following functions when editing:



Key	Function	Notes
TIMER T	Selects upper/lower case text or symbols/Selects Timers	Text input mode indicator changes to show currently selected mode: [A]: Upper case [a]: Lower case [#]: Symbols
COUNTER C	Select Counter	
D.REG D/DD	Select which object to add to display/Select Data register/double data register	Pushing this key repeatedly when bit devices may be entered cycles through M,S,Y,X.
SET	Display object list	Selection menu displayed
CLEAR	Cancel operation/ data entry	
0–9	Enter numeric values	
A	Select letters of the alphabet/symbols	Each push moves one letter DOWN the alphabet: (A,B,C,D, etc.)/symbol set
B	Select letters of the alphabet/symbols	Each push moves one letter UP the alphabet: (Z,Y,X,W, etc.)/symbol set
C	Previous object parameter	
D	Delete next character	
E	Space key	
F	Move edit cursor left	
K/D K/H	Move edit cursor right	
Up/down cursor	Scroll up/down one line/ select object/parameter	
MON. ENTER	Enter/Next object parameter	

5.7.3 General display creation/editing procedures

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This section gives the general procedure for selecting User Screen mode text/objects to add/edit.

Entering/editing text:

When the screen edit display is shown, text can be entered directly. Use the [A] and [B] keys to move down/up the alphabet/symbol set. Use the [TIMER T] key to switch between the upper lower case alphabet and symbols. Numbers can be entered directly. When the correct character is displayed, move the cursor along to the position of the next one using the [F] or [K/D K/H] keys. [D] deletes unwanted characters. Enter spaces with [E].

Entering/editing objects:

Explanation of User Screen mode objects:

- Please refer to Chapter 4, section 4.1

To add a new object:

1) Select the required screen as explained earlier and move the cursor to the required object position.
2) Push the [SET] key to display the OBJECT selection menu on the bottom half of the display.

3) Use the up/down cursor keys and [ENTER] to select the required object.

4) Set the object parameters as required.

Choosing an object location:

- Ensure that the chosen position will allow the object to fit on the screen. If not, the message "POSITION ERROR" will be displayed during setting object parameters if they cause it to go off the screen.

Adding an object where one exists already:

- Doing this will insert the new object in front of the old one if there is enough space.

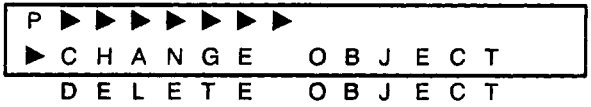
Cursor operation during object selection:

- The OBJECT selection menu has a wraparound facility. Pushing the up cursor when on NUMBER moves to BACKLIGHT and vice versa.

To edit an existing object:

1) Select the required screen and move the cursor to the object to be edited. This is indicated by a bold "P" which may be followed by arrow heads as shown in the diagram.

2) Push the [ENTER] key to show a display similar to the following:



3) Use the up/down cursor keys and [ENTER] to select an option.

CHANGE OBJECT:

This allows the object's parameters to be changed after being defined. Follow the same procedures as described in the next section.

DELETE OBJECT:

Select YES to remove the object from the display.

5.7.4 Explanation of object parameters

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This section gives details on setting each object's parameters. The objects and parameters are listed in the order in which they appear.

Moving back and forth between object parameters:

- Use the [ENTER] key to move to the next parameter, and [C] to return to the previous one. A wraparound facility exists to move from the first to the last and vice versa.

Selecting options for each parameter:

- Use the up/down cursor keys to select the required option, followed by [ENTER].

Finishing selecting/editing an object's parameters:

- The last part of the setting procedure displays the message SETTING OK? Select YES to register the object and leave the setting operation.
  NO: Returns to beginning of setting procedure for the object. To leave the setting operation at any time, push [CLEAR].

1) NUMBER

The NUMBER object parameters are:

a) DEV(ICE): Select which word device the NUMBER object will display the value of. Push [TIMER T], [COUNTER C] or [D.REG D/DD], followed by the device number, then [ENTER]. Push [D.REG D/DD] twice for 32 bit data. A bold "D" is displayed to show this. D0 is the default DEVICE.

b) DIGITS: Set the number of digits to display. The maximum number is 12, default is 4.

c) DECIMAL POS(ITION): Decide where a decimal point will be located, if needed. This will occupy the space of one character at the specified number of digits from the right. Default is 0, none. The display suppresses leading zeros.

d) VALUE: If a timer or counter device has been selected, this parameter is used to select the display of CURRENT (default) or SETTING values. This parameter will not be included if a data register was chosen.

e) WRITE IN: Choose whether or not an operator will be able to WRITE IN a new value for the NUMBER object; PERMIT or FORBID (default).

f) MIN/MAX: Push [SET] followed by the required value. Finish with [ENTER]. Default values are -2,147,483,648 and 2,147,483,647. Ensure that the chosen MIN/MAX values correspond with the word device(s) being used.

2) INDICATOR

The INDIC(ATOR) parameters are:

a) DEV(ICE): Select the bit device which will control the INDICATOR. Chose from X,Y,M,S,T,C devices. Default is M0.

Entering bit devices:

- To enter T or C devices, use the [TIMER T] or [COUNTER C] keys followed by the device number, then [ENTER]
  To enter X,Y,M,S devices, push the [D.REG D/DD] key to cycle through M,S,Y,X in turn. On selecting the required device type, enter its number, followed by [ENTER].

b) ACTIVE: Choose when the INDICATOR will show; WHEN the bit device is ON or OFF.

3)TEXT INDICATOR

The TEXT IND(ICATOR) parameters are:

a) DEV(ICE): Select the bit device which will control the TEXT INDICATOR. Chose from X,Y,M,S,T,C devices. Default is M0. See "Entering bit devices" above for more details.
b) CHARACTERS: Set the length of the text displayed. Default is 7, the maximum.
c) TEXT(OFF): Text for the OFF state, if any. Push [SET] then use the [A] , [B] and [TIMER T] keys to enter the required text. Finish with [ENTER].
d) TEXT(ON): Text for the ON state, if any. Follow the same procedure as above.

4) TIME

Using the TIME object:

- For this object to function, the PC must have a real time clock cassette, or a memory cassette with a RTC facility fitted.

a) PATTERN: Use the up/down cursor keys to select the required pattern:

01: HH:MM:SS (8 characters)

02: HH:MM (5 characters).

Each PATTERN is shown on the top line of the display as it is selected. Register the selection with [ENTER].

5) DATE

Using the DATE object:

- For this object to function, the PC must have a real time clock cassette, or a memory cassette with a RTC facility fitted.

a) PATTERN: Select as with DATE. The following formats are available:

PATTERN number	Style	Appearance	Number of characters
01	Japanese	1994/12/31	10
02		94/12/31	8
03		12/31	5
04	European	31/DEC/1994	11
05		31/DEC/94	9
06		31/DEC	6
07	US	DEC/31/1994	11
08		DEC/31/94	9
09		DEC/31	6

6) SWITCH A/B/C

These objects allow the keys [A], [B] and [C] to control PC bit devices (X,Y,M,S,T,C). Default is NONE.

Entering bit devices:

- To enter T or C devices, use the [TIMER T] or [COUNTER C] keys followed by the device number, then [ENTER]
  To enter X,Y,M,S devices, push the [D.REG D/DD] key to cycle through M,S,Y,X in turn. On selecting the required device type, enter its number, followed by [ENTER].

After entering the bit device, select ALT. (ALTernate) or MOM. (MOMentary) switch operation using the up/down cursor keys. [ENTER] moves to the next SWITCH.

7) NAME

Assign a NAME to each screen for easier identification. Enter text as usual, using the [A], [B], [TIMER T] and cursor keys.

8) SCROLLING

Select how the screen selected will be scrolled. Choose LINE (in one line increments), SCREEN (two line increments) or SPLIT (top line fixed, bottom line scrolls). Default is LINE.

9) BACKLIGHT

Select STEADY (on continuously) or FLASH(ING) backlight operation for the current screen. Default is STEADY.

6.1 Overview of diagnostics

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This chapter is intended to explain what error messages may be seen when using the DU units.

6.2 FX-10DU-E error messages

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The table below lists all errors and their meanings:

Conditions under which the error occurs	Error message	Meaning and corrective action
When the power supply is turned on	PC COMMS ERROR	The unit cannot communicate with the PC. Make sure the connecting cable is properly connected and the power to the PC is turned ON. Do not connect the cable after turning ON the power supply.
	ENTER KEYWORD	The PC is using an "Axxxxxxx" keyword. Enter the required keyword to gain access to the monitoring functions.
When setting a device number	DEV NUM ERROR	A non-existent device number was entered. Push [CLEAR] and enter the correct number.
	NO CORRESPONDING PROGRAM	The device selected is not used in the PC program. Choose one of the devices which are being used by the program.
When [SET] is pressed	ENTER KEYWORD	The PC is using a "Cxxxxxxx" keyword. Enter the required keyword to gain access to the monitoring functions.
	DEV OUT OF RANGE	The device selected is outside the range specified using the preset range monitor function. Choose a device from within the set range.
	NONE	The device selected is not used in the PC program. Choose one of the devices which are being used by the program.
	MEMORY PROTECT-DISABLE TO SET	An EPROM, or EEPROM memory cassette with write protect ON is being used in the PC. Turn OFF the memory protectionor change to RAM memory .
	PC RUNNING UNABLE TO SET	Occurs when trying to change a device value while the PC is in RUN mode. Switch the PC to STOP.

6.3 FX-20DU-E error messages

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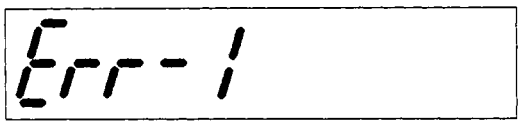
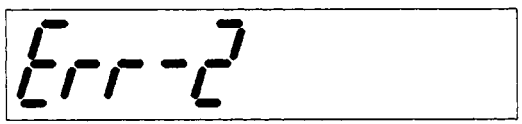
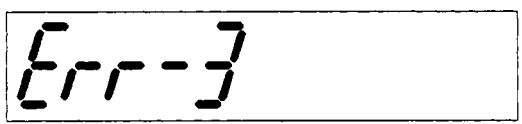
The errors are as follows:



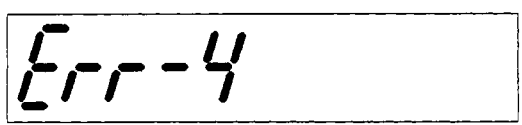
Occurs when trying to set a value for a device which is not used in the PC program.



The switch under the rear cover is set to FORBID.



The set value for a timer or counter has not been programmed.



A entry code has been set in the PC. Enter the required code to gain access to the monitoring function.

6.4 Troubleshooting guide

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The following table may help to correct any problems found during operation.

Fault	Items to check
Power LED not lit DU unit keys do not work	Is the connecting cable to the PC properly connected?
	Is the PC turned on?
Devices can be monitored, but no changes can be seen	Is the PC in RUN mode?
	Are the selected devices used in the PC program?
	For state monitoring, is M8047 ON?
	For annunciator monitoring, is M8049 ON?
	For real time clock monitoring, is a real time clock fitted in the PC? Is the PC V2.0 or later? Is there an RTC error or LAP message?
Set and current values cannot be changed	Does the PC have an entry code set? Enter the required code.
	Is the switch under the rear cover set to FORBID? Set it to PERMIT
	Is the PC equipped with an EPROM cassette? EPROM memory cannot be changed
	Is the PC equipped with an EEPROM cassette? EEPROM memory cannot be written to while the memory protect switch is ON or the PC is in RUN mode
	Are the set values of the timer or counter (K or D) programmed?
Key buzzer does not sound	Is it turned ON? See Chapter 3, Section 3.10.6

Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.

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Specifications are subject to change without notice.