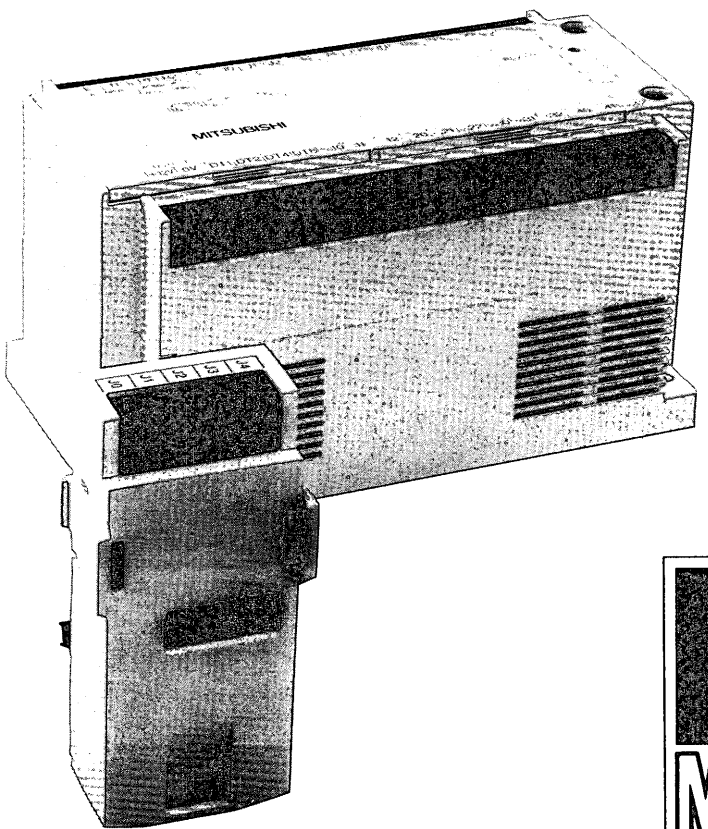
MITSUBISHI
Programmable Controller

USERS MANUAL

DATA I/O UNIT F_2-40DT-E-SET



F
MELSEC

- This manual provides technical information and guidance on the use of the Data I/O unit type F_2-40DT-E-SET.
- Users should ensure that the detail of this manual is studied and understood before attempting to install or use the unit.
- Information concerning the programming of the system, using the programmer unit, is covered in a separate manual.

MITSUBISHI ELECTRIC CORPORATION

PREFACE

The model types F_2-40DT & F_2-40DT-E, differ only in power supply specification. Part names with the letter E uses 110~120/220~240V supply while without, it uses 100~110/200~220V supply.
Information in this manual applies to both types even though sometimes only F_2-40DT is specified. However, there will be exceptions when power supply is related.

CONTENTS

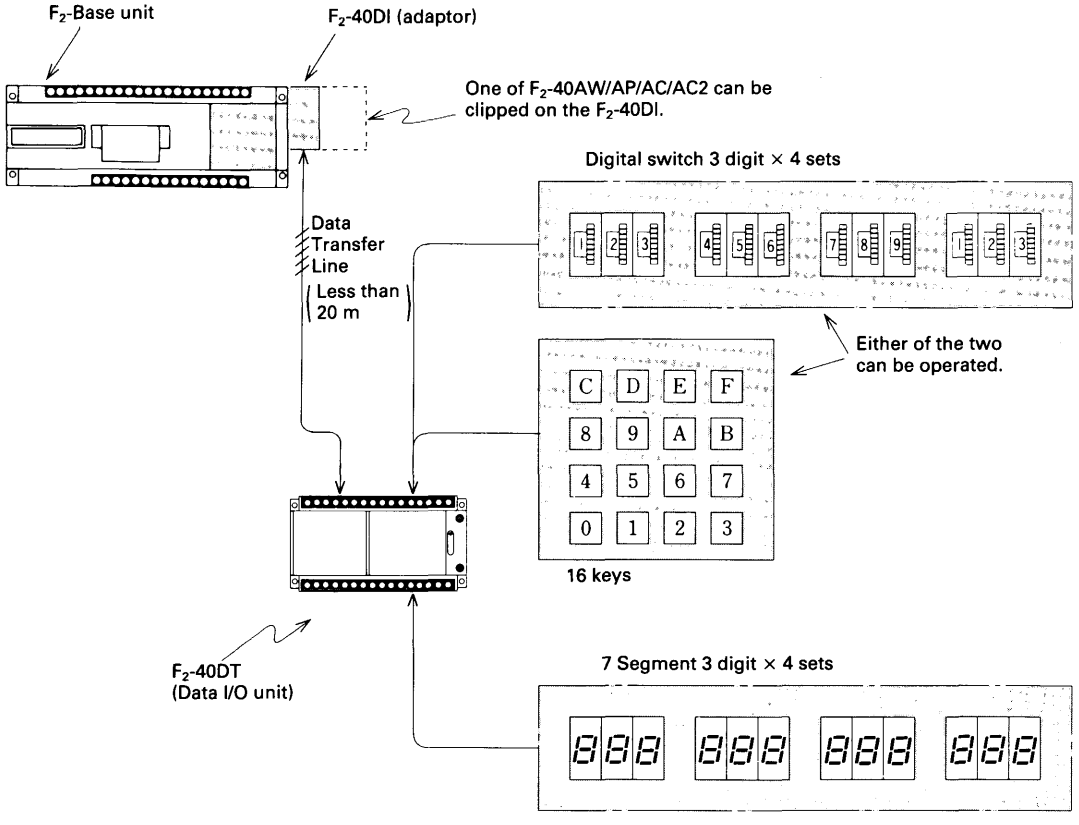
1 INTRODUCTION

1-1. Type F_2-40DT data I/O unit enables data between enhanced F_2 PC and input devices/ indicators to be transfered through the adaptor F_2-40DI which is clipped onto the PC. This unit cannot be used with base unit other than the enhanced F_2.

With the F_2-40DT, 4 sets of BCD 3 digit switch or 16 keys-switches can be connected as input devices and also 4 sets of BCD 3 digit 7 segment indicators can be controlled as output indicators.

These I/O data are treated as additional I/O to the I/Os of the PC itself.
You can handle 48 inputs and 48 outputs in addition to 120 I/Os (240 points when parallel-linked) of F_2-PC.

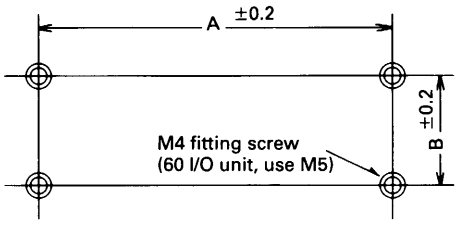
1-2. **F_2-40DT-SET includes F_2-40DT and F_2-40DI.**



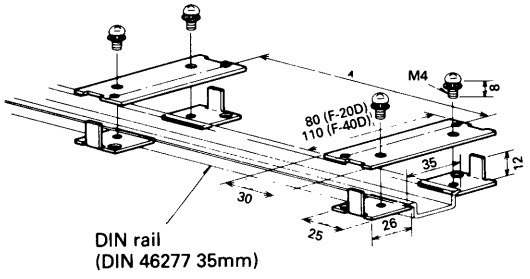
2 INSTALLATION & ENVIRONMENT

2-1. Mounting Dimensions

1 Direct Mounting



2 DIN Rail Mounting



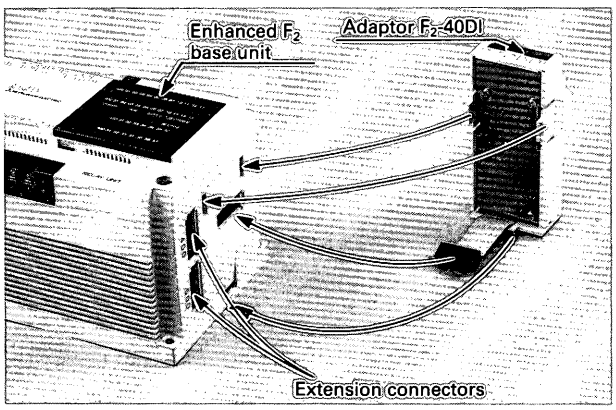
The dimensions of the fixing holes are as shown on the left and their drilling position is referenced in the table below in mm.

	A	B	DIN rail kit
F-4T	140	35	—
F_2-40DT	155	70	F-20D
F_2-8EYR	155	70	
F_2-20M, 20E	240	70	
F_2-40M, 40E	290	100	F-40D
F_2-60M, 60E	335	125	—

DIN rail installation kits are available as a pair with one at each end. Set these temporarily and position the unit before tightening.

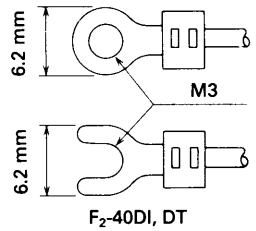
- **Caution**
  Do not attempt to install the equipment on the floor surface or the ceiling as it may defeat the heat ventilation system.
  Always install the equipment on the wall position.

2-2. Interface Attachment



First, connect the ribbon cable to the base unit as shown in the left diagram. Mount the adaptor by inserting the bottom hook first and then clip onto the base unit.

Wire Terminals



The size of the spade terminals should be as shown in the diagram (or smaller).
Recommended tightening torque: 5~6 Kg.cm

General Precautions.

Working Environment

(1) The unit should not be installed in excessive, hostile conditions where it may associate a high degree of damp, dust, temperature, humidity, corrosive gases, vibration or mechanical impact.

(2) It should not be installed near any heat-generating source. A space of more than 50mm around the unit should be allowed for heat dissipation.

Installing

(3) When mounting the unit, always check that there are no metal chips or excessive dust in the unit.

(4) For packaging purposes, there may be a thin protective film around the unit. Remove this away from the louvers to allow ventilation.

Noise

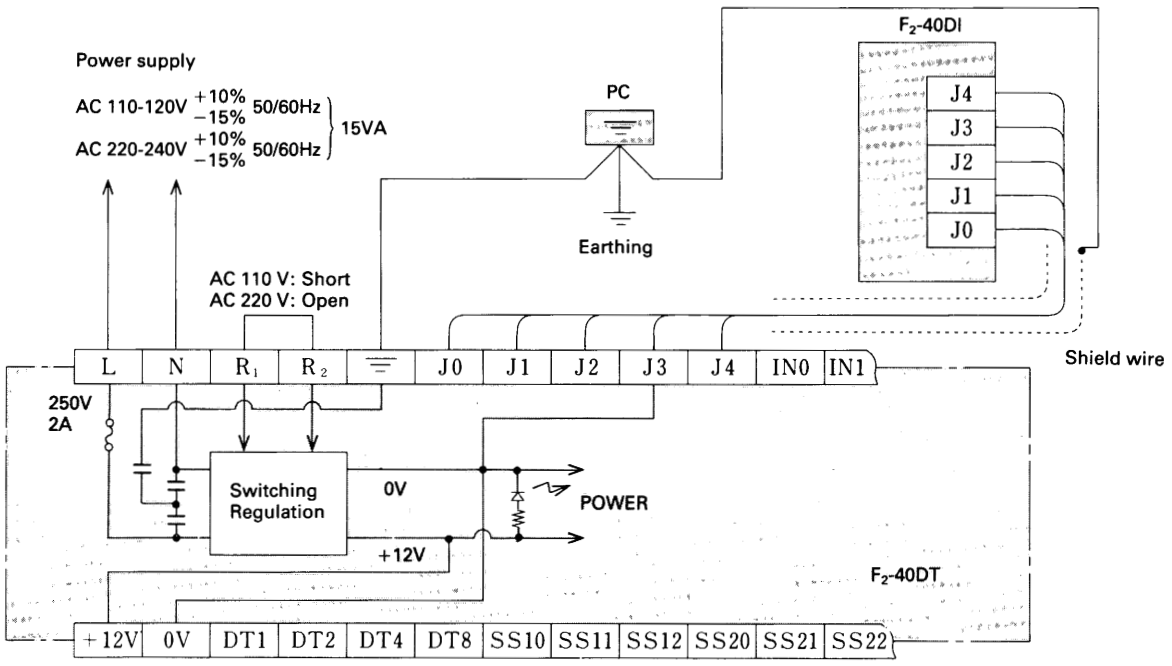
(5) To avoid electrical noise interference, the unit should not be installed near high voltage machines, cables or such appliances.

(6) Input and output wires must be kept separate and away from any power supply or high voltage cables. DC cables and AC cables should not be bound together.

(7) The signal wires from the adaptor/interface unit to the F_2-40DT unit should be of shielded type to keep good noise immunity. These must be kept away from any high power cables or appliances.

3 PRELIMINARY WIRINGS

3-1. Connection example

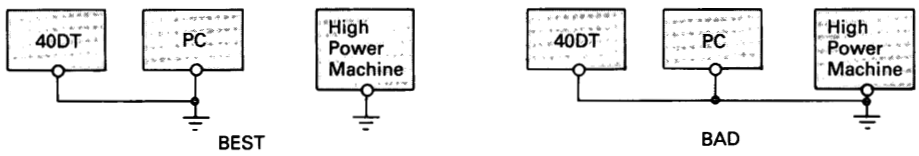


3-2. Power supply

- Supply voltage
  Optional use of
  AC 110-120V $^{+10\%}_{-15\%}$ (50/60Hz): Short between R_1 and R_2 terminals.
  AC 220-240V $^{+10\%}_{-15\%}$ (50/60Hz): Open between R_1 and R_2 terminals.
  The power to F_2-40DT and PC must be turned ON/OFF at the same time.

3-3. Earthing

- The earth terminals of PC and F_2-40DT should be connected together and execute the earthing at the PC side.
- Execute the earthing with less than 100ohms for the earth terminals by use of 2mm^2 wire or thicker.
- Earthing must not be shared with any high power equipment such as a motor system.

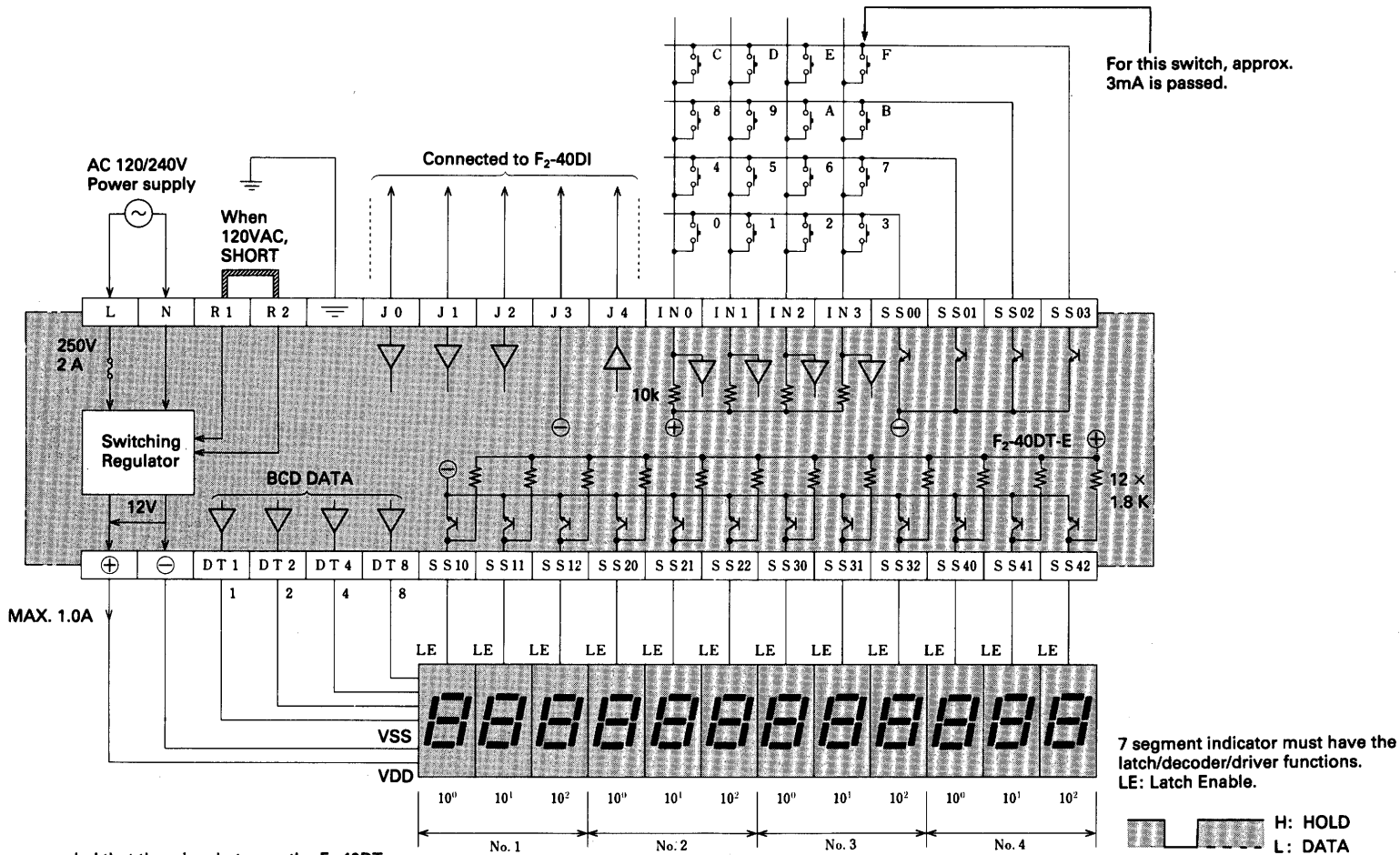


- Where the execution of correct earthing is difficult, the unit may be used without earthing.

3-4. Fuse:

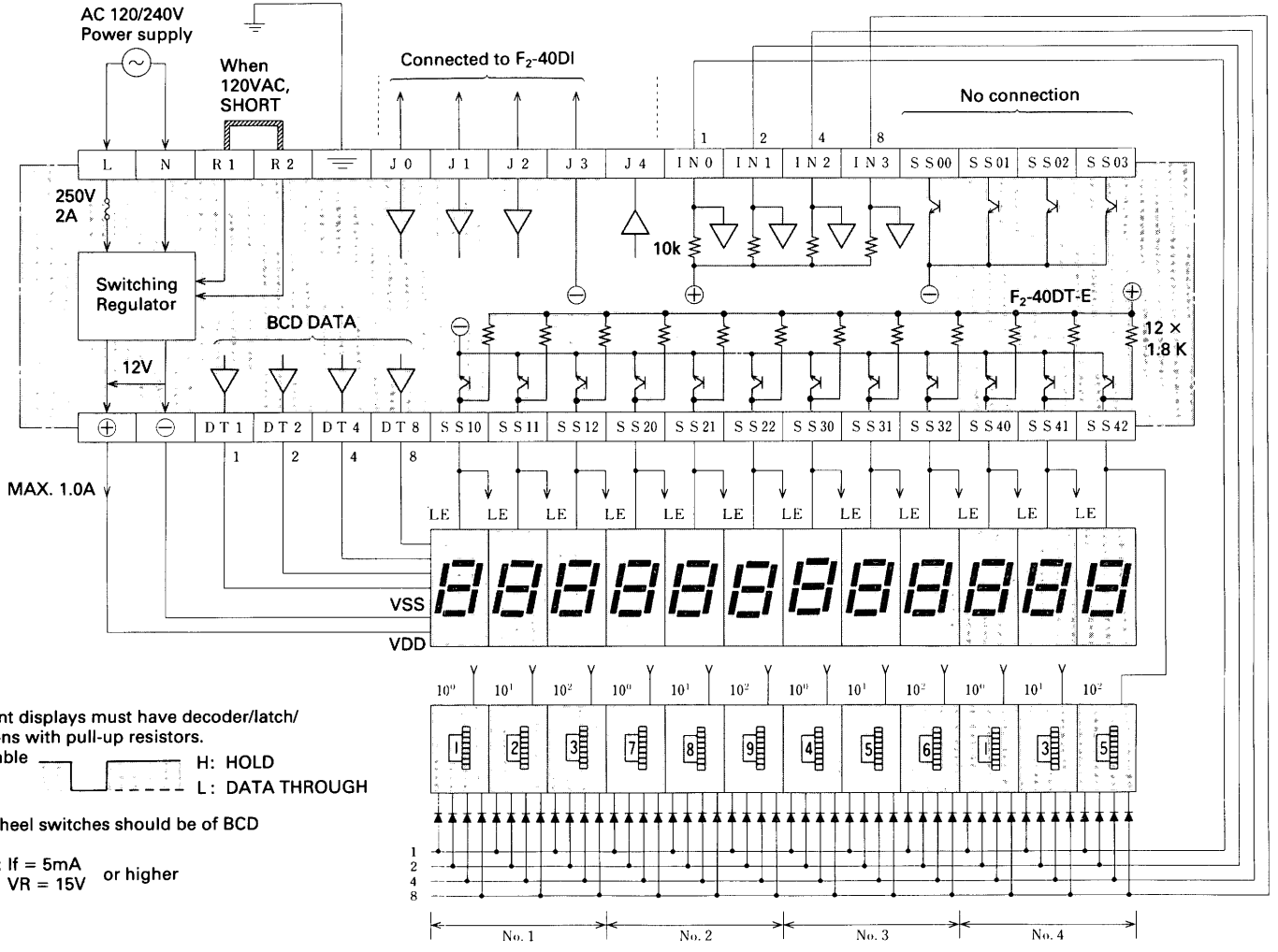
250V 2A 5.3ϕ×20
If access to the fuse is required then it is necessary to remove the unit's left top cover.

4-1. ≤In the case of 16 key input≥



It is recommended that the wires between the F_2-40DT and input units/indicators must be kept separate from any power supply cables or high voltage cables and that the wires are no longer than 5 meters for the general use.

4-2. ≤In the case of digital switch≥



The 7-segment displays must have decoder/latch/ driver functions with pull-up resistors.

LE: Latch Enable — H: HOLD, L: DATA THROUGH

The thumbwheel switches should be of BCD coded type

Diode rating: If = 5mA, VR = 15V or higher

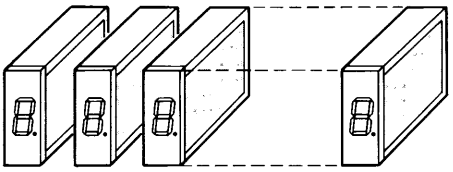
4-3 Example Display Configuration

4-3-1 Display Modules

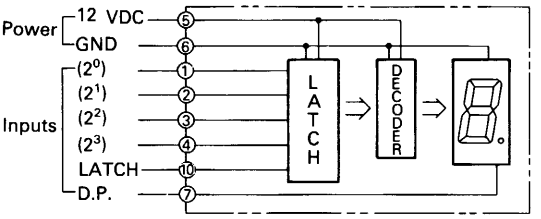
Both the BCD input switches and the 7-segment displays may be available together as one single module in the market.
However, we have chosen to use separate modules as an example for the sake of simplicity.
We recommend to use display modules with the following specification:

Self contained latch, decoder/driver, display.
Working supply voltage 12V d.c, (current draw < 1A)
LATCH ENABLE (LE) is positive logic i.e. H: HOLD, L: DATA THROUGH
Input circuit has pull-up resistor. If pull-down exists, ensure it is of high resistance (≥20kΩ)
BCD data logic positive or negative. (max current < 50mA)

Example: HENGSTLER C34L15-10B12P



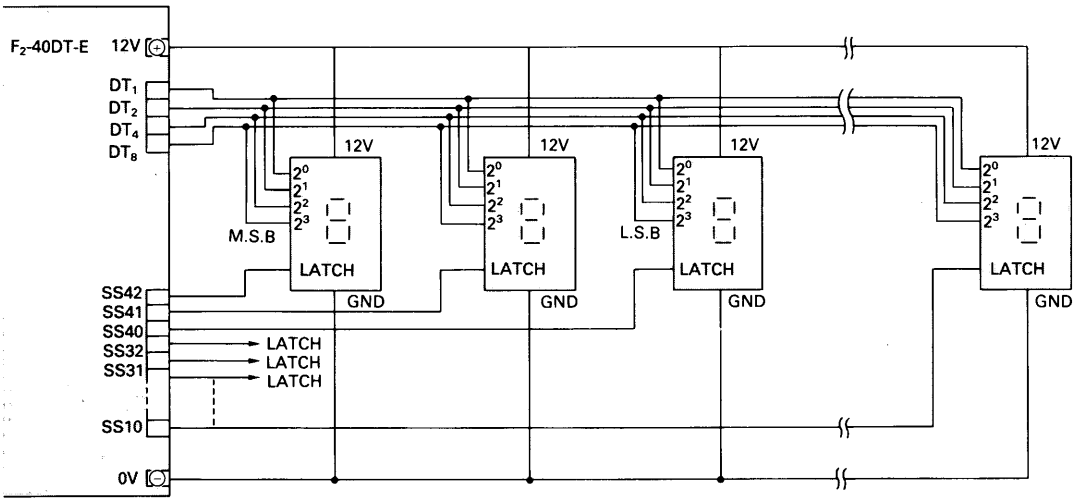
Stacked modules



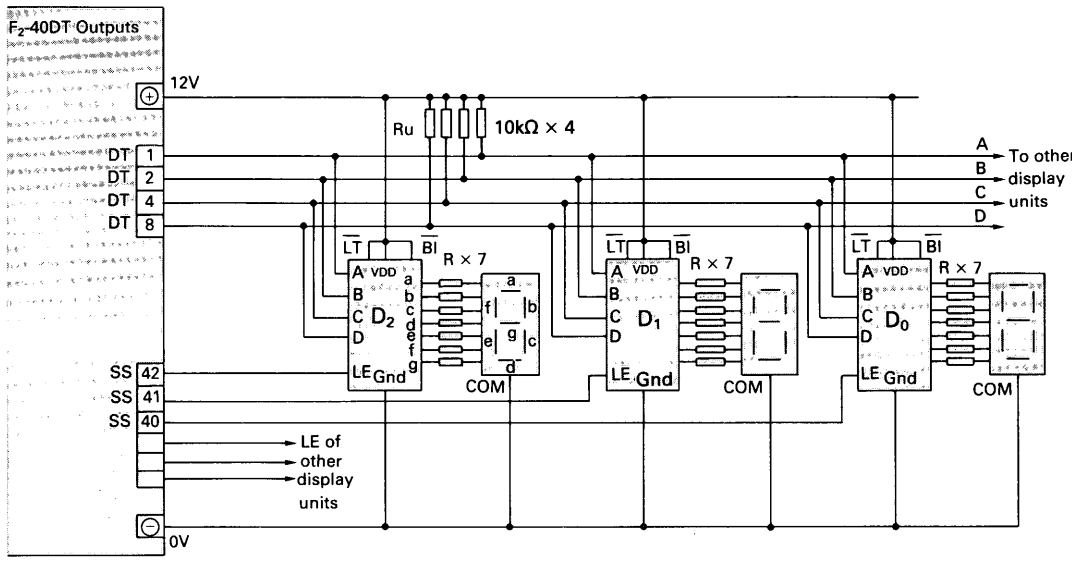
Pin-out of each module
D.P.=decimal point may be driven by an output point of the programmable controller

Connection Diagram

Outputs are in blocks of 3-digits.
M.S.B: Most significant
L.S.B: Least significant



4-3-2 Display Formed from Components



Pull-up resistors Ru should be about 10 kΩ to ensure good logic voltages. R = 1kΩ (VDD = 12V, red LED). $D_2 = D_1 = D_0$ = 5411 BCD to 7 seg. decoder/driver/latch.
Common Cathode 7-segment Red LED display is used.
LE: Latch Eable.

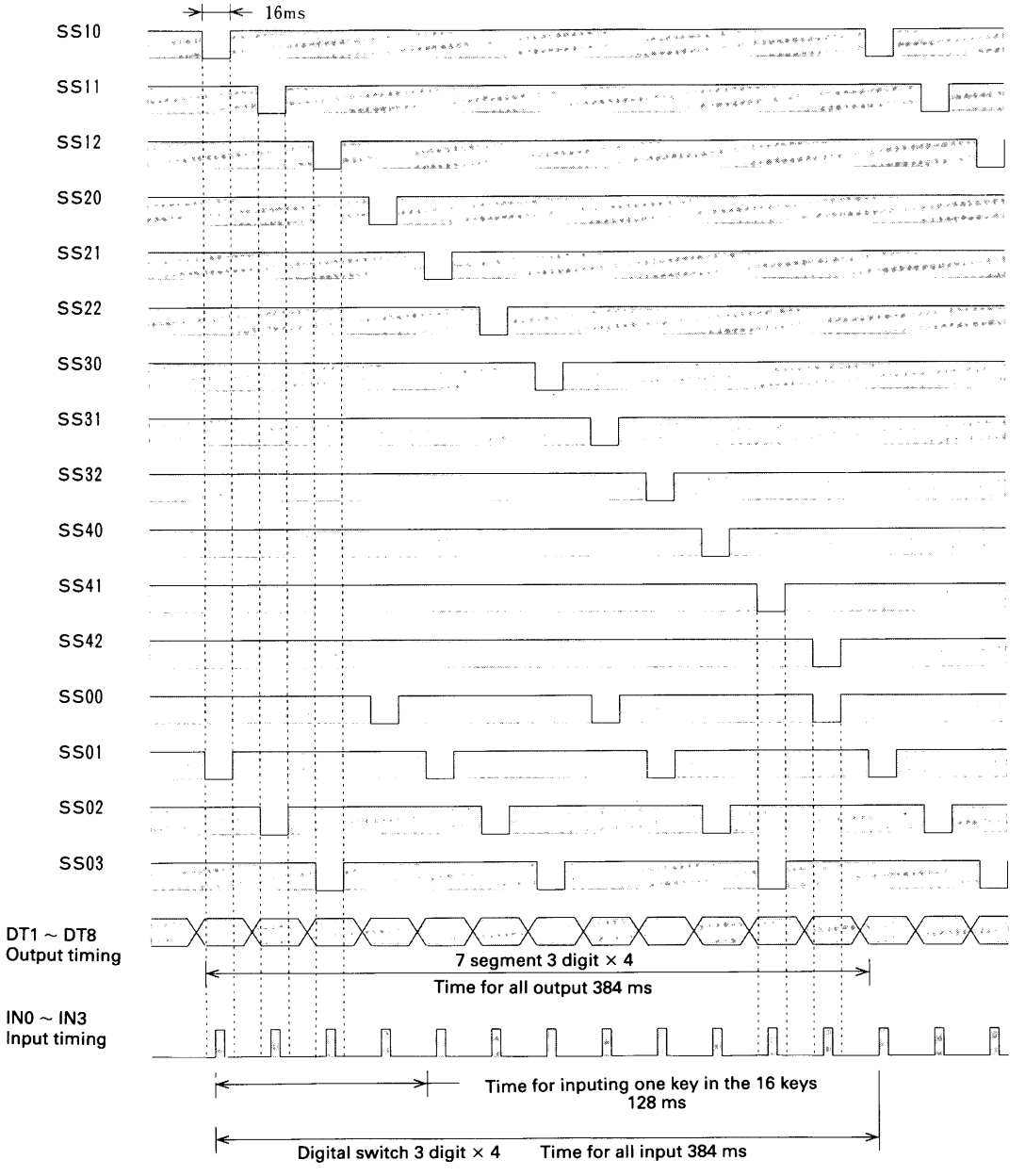
Note:
4511 BCD to 7-segment decoders have been chosen as an example because it has decoder, driver and latch functions.
Other arrangements are possible but all of these three functions are necessary. For the display, 7-segment LED's have been chosen but other types are possible. Some may require extra circuitry.
The 4511 has source outputs, thus, the 7-segment L.E.D's should be of common cathode type. With sink output decoders, LED should be common Anode type. Other combinations will require extra inverting circuitry.

Extras:
The 5411 decoder has $\overline{LT}$ lamp test and input blanking $\overline{BI}$ facilities. These are not used in the example but they must be tied to their appropriate logic level i.e. high.

CAUTION: Information given in this section are example guidelines only. Users MUST refer to component manufacturers datasheets before attempting any wiring.

5 TIMING OF DATA INPUT/OUTPUT

SS00 ~ SS42 terminals are repeating ON (L) OFF (H) condition as illustrated in the following time-chart, and on the bases of this time-chart the timing of input/output is controlled.

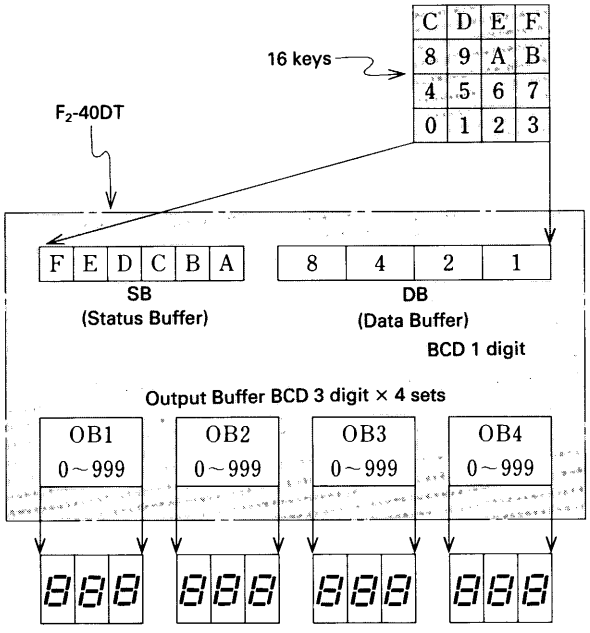


DT_1, DT_2, DT_4, DT_8 can operate both in positive logic and negative logic.
However latch-timing for 7 segment is always made when SS00 ~ SS42 change from L (ON) to H (OFF). i.e. output transistor ON to OFF.

6 DATA TRANSFER WITH PC

6-1. 16 key keypad

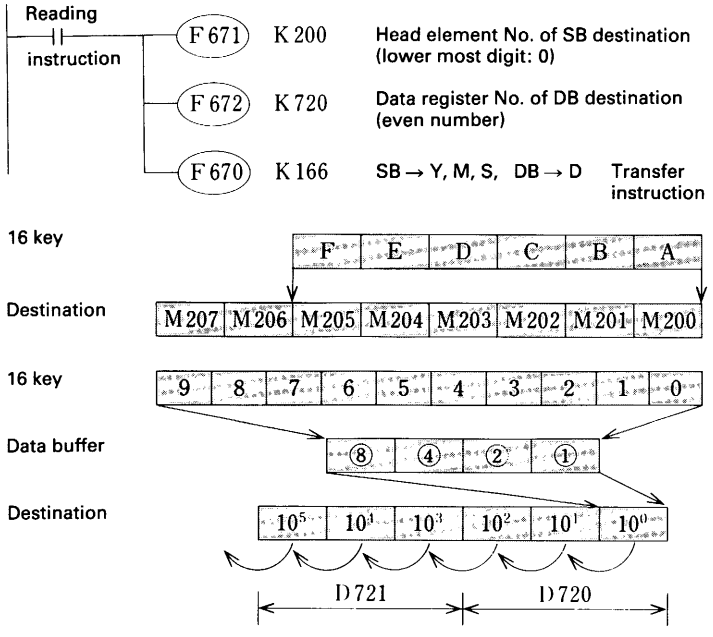
F_2-40DT can handle 16 key input of values 0~9, A, B, C, D, E, F.
A~F keys can be treated as various function keys such as writing, reading, setting etc.



- When 0~9 key is depressed, the value is input into the Data Buffer DB as BCD data.
- When A~F key is depressed, on-signal is input into the Status Buffer SB.
- The data output from the PC is transferred to the Output Buffer OB1~OB4 and through these buffers, 4 sets of BCD 3 digit data are generated.

INSTRUCTIONS

1 SB → Y, M, S DB → D



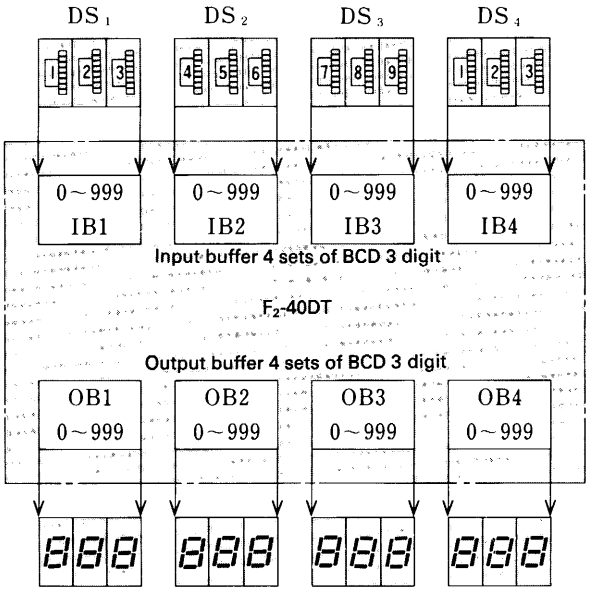
SB: Status Buffer

DB: Data Buffer

- When A~F key is depressed, M200~M205 is turned on appropriately.
- When any of A~F key is depressed, M206 will be turned on.
- When any of 0~9 key is depressed, M207 will be turned on.
- Everytime when 0~9 key is depressed, the BCD data will be transfered to D 720~D 721, and when it exceed 6 digits, the data will overflow.

6-2.Digital switch

F_2-40DT can handle 4 sets of BCD 3 digit digital switches as inputs.
However the digital switch and 16 keys cannot be handled together.



- The value of digital switch DS_1~DS_4 is input into the input buffer IB_1~IB_4 as BCD data.
- The data output from the PC is transferred to the Output Buffer OB_1~OB_4 and through these buffers, 4 sets of BCD 3 digit display data are generated.

INSTRUCTIONS

[2] IB → D, Dt, Dc

Reading instruction

F671	K001	IB No. and logic
F672	K10	Transfer form
F673	K450	D, Dt, Dc, No. of destination
F670	K128	Transfer instruction

- Transfer form
K9 : 10^0, 10^{-1}, 10^{-2} 0.01 sec timer
K10 : 10^1, 10^0, 10^{-1} 0.1 sec, 0.01 sec timer
K11 : 10^2, 10^1, 10^0 0.1 sec timer
Data registers and counters are always treated as K11, so no setting is required

[3] D, Rt, Rc → OB

Writing instruction

F671	K460	D, Rt, Rc source register
F672	K11	Transfer form
F673	K002	OB No. and logic
F670	K129	Transfer instruction

- Setting of IB · OB No. and logic

No. of IB · OB	Positive	Negative
IB_1, OB_1	001	101
IB_2, OB_2	002	102
IB_3, OB_3	003	103
IB_4, OB_4	004	104

Positive logic: Input ON (L) and Output (H) is logic "1"
Negative logic: Input OFF (H) and Output (L) is logic "1"

7 SPECIFICATIONS

General specifications

Power Supply	AC 100~120V/220~240V $^{+10\%}_{-15\%}$ 50/60Hz
Consumption	Less than 15VA
Ambient temperature	0~55°C
Ambient humidity	45~85% RH (No condensation)
Vibration resistance	10~55Hz 0.5mm (max 2G)
Impact resistance	10G 3 times to each XYZ directions
Noise immunity	1000V 1 μ sec
Insulation withstand voltage	1500VAC 1 minute
Insulation resistance	More than 5MΩ (500VDC)
Grounding	Less than 100Ω (Not required if it is impossible)
Environment	No corrosive gas, no conductive debris

Signal Transfer specifications

Applicable wire	5 pole-shield wire less than 20m
Isolation	Photo-coupler isolated between F_2-40DI/40DT.

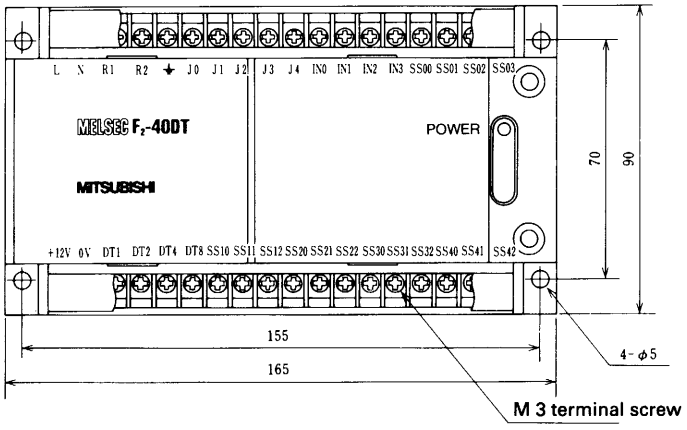
Input specifications

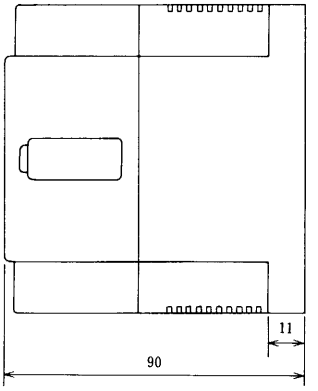
Input current	2.4mA/12 VDC when IN0~IN3 are turned on. (Current which run through input switches)
Operation Voltage	ON less than 2V OFF more than 9V
Response time	ON → OFF OFF → ON approximately 5msec
Isolation	none

Output specifications

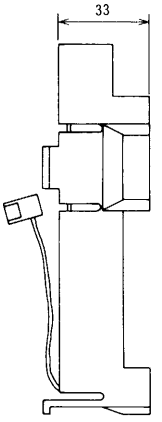
Output current	SS00~SS42; NPN open collector with pull-up resistor (1.8 K), MAX 20mA/12VDC DT_1~DT_8; PNP, NPN totem-pole transistor MAX 50mA/12VDC
Isolation	none
12VDC power supply	MAX. output current 1.0A

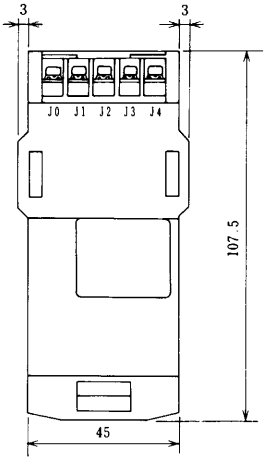
8 OUTLINE AND DIMENSIONS





Attachment: F_2-40DI adaptor
Weight : approx. 1.0kg (F_2-40DT)





F_2-40DI

Dimension in mm

MEMO

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: MITSUBISHI DENKI BLDG., MARUNOUCHI, TOKYO 100. TELEX: J24532 CABLE: MELCO TOKYO

JY992D 14501A Printed in Japan (ROD)