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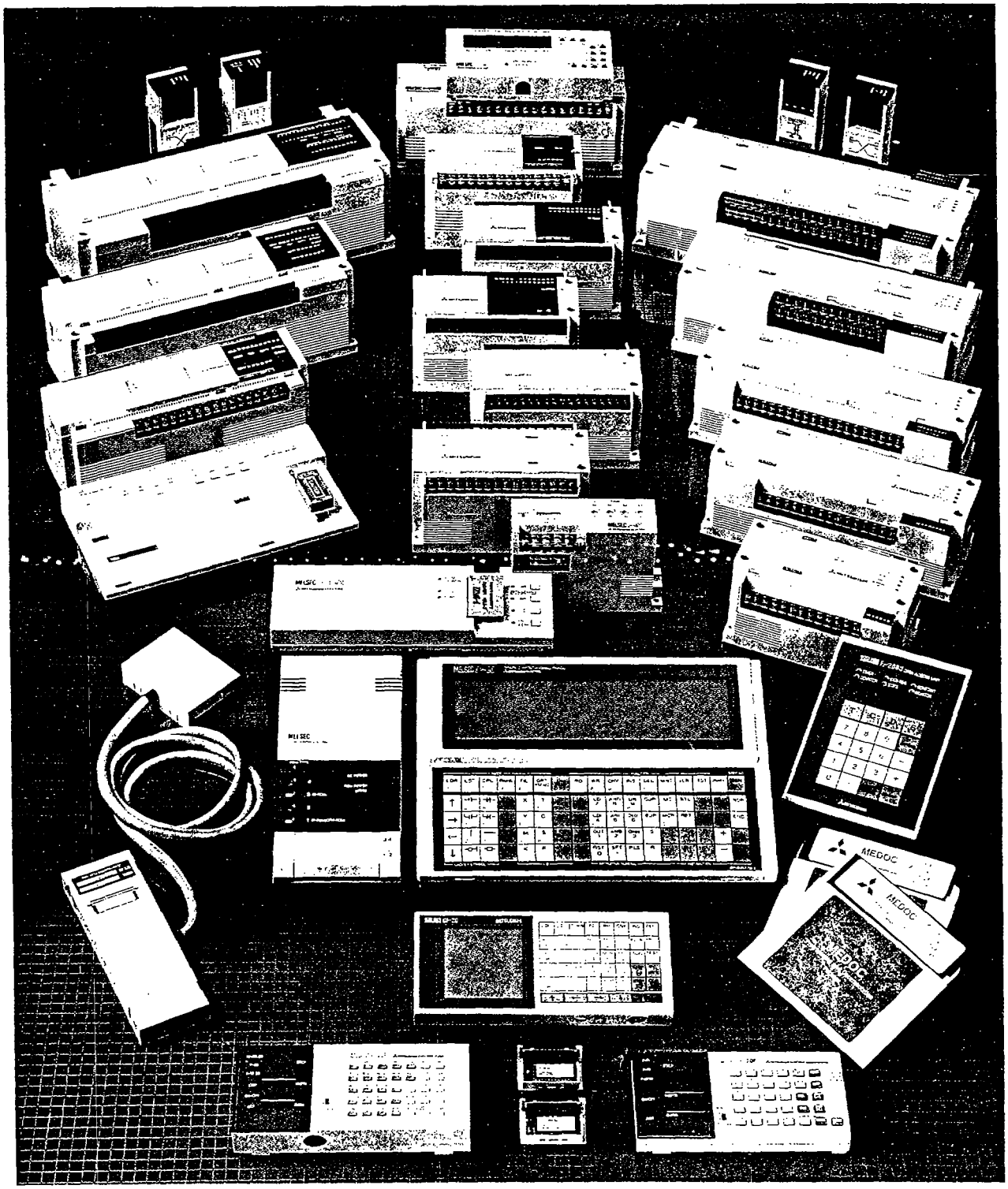
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Find the *Mitsubishi Melsec F2-20P-E* at our website: *Click HERE*

MITSUBISHI

F SERIES
PROGRAMMABLE CONTROLLERS

A family of intelligent micro PC's.



MITSUBISHI ELECTRIC SALES AMERICA, INC.
INDUSTRIAL AUTOMATION DIVISION

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F1 SERIES

Low cost micro PC for small to medium applications

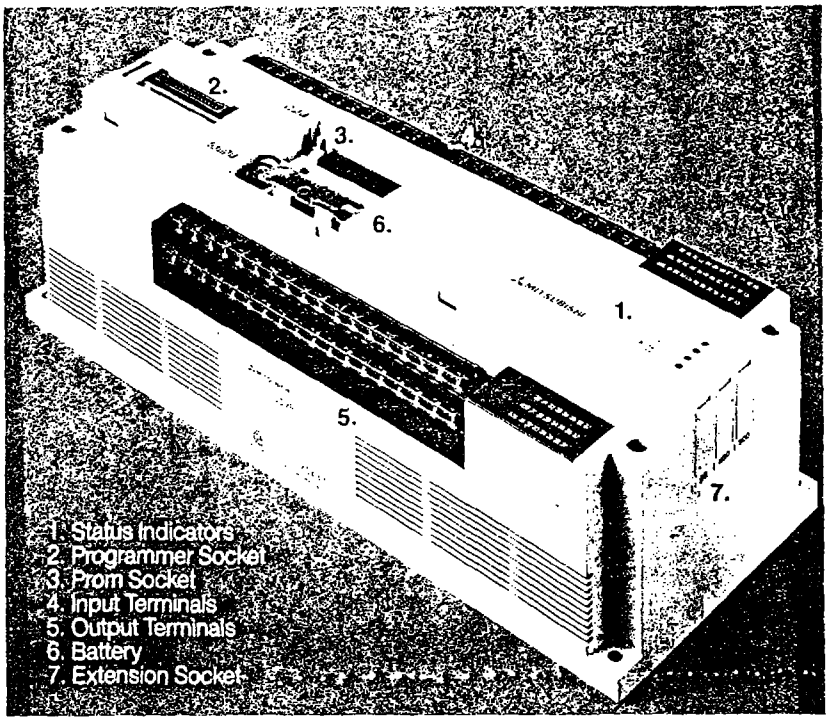
Description

The F1 Series is a low-cost yet very powerful PC for small to medium sized applications. The instructions include single and double precision math, data comparisons, BCD read/write, pulse width measurement and many more (over 100 in all). Designed for high speed applications, functions such as latch inputs, adjustable input filter time, immediate input/output updates are standard with the F1.

All units can be programmed with a variety of online/offline devices as well as IBM* compatible MEDOC software. F1 PC's have 24VDC sink-type transistor inputs and relay contact outputs, and can accommodate from 12 I/O (6 in, 6 out) to 120 I/O (72 in, 48 out).

Typical inputs and outputs include:

Inputs	Outputs
Limit Switches	Relays
Proximity Switches	Contactors
Selector Switches	Pilot Lights
Push Buttons	Solenoid Valves



FEATURES:

- Total I/O
  120 Points
- I/O Type
  Transistor Inputs (DC)
  Relay Contact Outputs (AC or DC)
- Memory Capacity
  1000 Steps
- Memory Type
  CMOS RAM, EPROM, EEPROM
- Average Scan Time
  12ms per 1K Steps
- 232 Internal Relays
- Timers
  24 .1 Sec
  8 .01 Sec
- Counters
  30 0 to 999
  1 0 to 999999
- Step Ladder
  State Transition
  Simplifies Programming
  Shortens Scan Time
- Instructions
  20 Basic Sequence
  2 Step Ladder
  96 Special Functions
  – Math
  – Data Comparison
  – Moves (Direct & Indirect)
- Extension Units

Standard I/O	8, 10, 20, 40, 60
External Timer	F-4T-E
Analog I/O Unit	F2-6A-E
Positioning Unit	F-20CM

- Operator Interface

Data Access Unit	F-20DU-E-SET (TCAM)

- Power
  120/240 VAC +10%/–15% 50/60 Hz
- Vibration Resistance
  10-55 Hz (2G Max)
- Relative Humidity
  10~85% Non-Condensing
- Temperature

Operating	0°~55°C
Storage	–15°~55°C

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Efficient and Powerful Processors

The F1 processor performs logic control functions (relay adder logic, counting, timing, sequencing and many function blocks) from information stored in the program and input/output status. Internally, the processor is virtually the same in all base units from F1-12MR to F1-60MR, giving complete program compatibility. This provides extensive control capability in a small physical package.

1K Memory Size
1000 steps (Each programmed ordinary contact or coil requires one step of memory).

High Execution Speed
12 μs/instruction, average. Additional use of master control, conditional jump and interrupting function blocks can make reaction time considerably shorter.

Input/Output Capacity
A total mix of 120 inputs and outputs can be accommodated. Analog and other special inputs can also be utilized. Note: the F1-12MR can not be used with the F2-6A Analog extension unit.

232 Internal Relays (Auxiliary Relays)
[illegible]nternal relays may be programmed as standard auxil-[illegible]elays and another 64 relays as latch relays (power loss retentive). In addition, 40 internal relays are used for STATE relays; these can be utilized for STEPLADDER (STATE-TRANSITION) programming or again as ordinary latch relays.

On-line Changing of PC Program
Timer or counter setting values may be changed while the PC is operating. Data register values may also be changed. This is useful for applications where the PC can not always be stopped during a control process.

I/O Forcing
By using a programmer, the logic status of any input, output, internal memory or STATE relay can be forced ON or OFF. Timers can be forced in the Run mode. Counters can be set to 0 or reset to their original values in either the Run or Stop mode. Hence it is easy to debug the program and minimize installation time.

32 Digital Timers
There are 24 on-delay timers with timing ranges of 0.1 seconds to 999 seconds, and eight timers with timing ranges of 0.01 to 99.9 seconds.

32 Digital Counters
There are 30 pre-settable down-counters with reset inputs; count values are retained on power failure. They have a range [illegible]0 to 999 and may be cascaded to extend the count value. There are 2 counters which can be used as above or can be used as one high-speed counter pair, count range is 0 to 999999. This counter pair can accept an internal or external pulse signal.

Arithmetic Capability
(All arithmetic operations execute with BCD data)

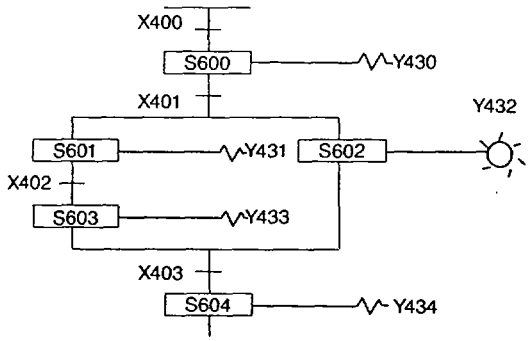
Addition	Compare for Equality
Subtraction	Compare for Greater than
Multiplication	Compare for Less than
Division	

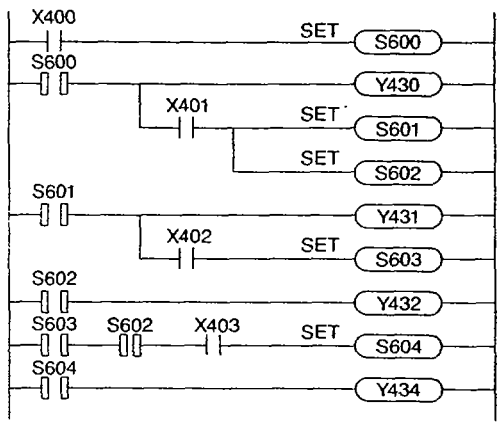
Data Transfer
This allows the storage and transfer of BCD data from one storage register to another. This is useful for applications where the PC must select stored data for processing controls or where data must be stored for use on displays.

Simplified Programming
Programming uses the universally recognized ladder diagram format making it easy for maintenance personnel to feel confident using the programming system after only a few hours.

Program Design Time Reduced with STEPLADDER
Stepladder instructions make program designing easy, and resemble Grafcet or Funktionplan, which utilize the flow chart concept drafted by IEC.

The principal advantage of the STATE-TRANSITION diagram is that the PC program can be made to closely resemble actual machine operation. This simplifies programming and shortens scan time. In addition, STEPLADDER can be used in conjunction with standard ladder diagrams.





CORRESPONDING LADDER DIAGRAM

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F1 SERIES

High-Speed Counter
A built-in-digital counter with a range from 0 to 999999 can count (either up or down) a single phase signal of up to 2kHz. The counter can be programmed to count pulses or pulse width. Counting starts from either zero or another preset value. The counter is preset by an external input signal or special internal preset function (auto-reload function). The counting value is compared with programmed values, causing program execution to be interrupted at preset points. External output is considerably faster than program scanning (direct output function). This counter may also be used as a standard six-digit counter.

Auto-Reload Function
Immediately after a data comparison is executed, it is possible to internally preset the counter. (Note: Comparison interrupts program scan.) This is very useful when it is not possible to externally preset the counter, for example, when producing coil or film windings.

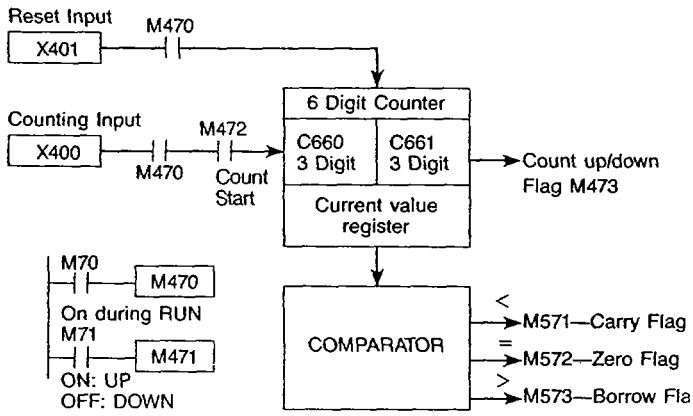
Direct Output Function
Immediately after a data comparison is executed (interrupting program scan), the comparison result can be directed to an external output. This eliminates delays caused by program scan, hence, improving control.

Changing the Input Filter Constant Value
To solve the problem of time delay with input filter response time (approx 10m sec in general), filter constant values of eight inputs may be changed from 0 to 60m sec within the program. I/O refresh functions also serve to greatly improve the response time of input signals.

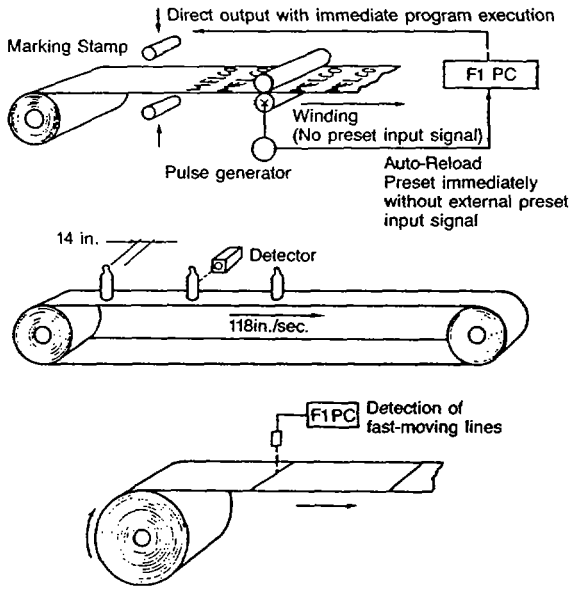
Momentary Input Signal Detection
Two input points can recognize input pulse signals shorter than the PC's program scan time (approximately 200 μsec. pulse width). The momentary signals are trapped by hardware circuits and utilized in the program.

96 Function Blocks (Functional Instructions)
- Input/Output Refresh
  The I/O image memory data can be updated by interrupting program scan.
- Data Transfers
  Data can be transferred between any of the X, Y, M, S, data registers and timer/counter current value registers.
- Arithmetic (+, −, ×, ÷, >, =, <)
- High Speed Counter Data Handling
- Momentary Pulse Handling
- Analog Input/Output Data Handling
- Data Set/Reset

High Speed Counter Operation



Application Example



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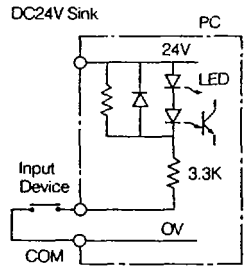
GENERAL SPECIFICATIONS

Power Supply	AC110-120V/220-240V single phase 50/60 Hz
Power fluctuation	AC99-132V/198-264V, power failure 10m sec.
Ambient temperature	0-55°C.
Ambient humidity	10~85% Non condensing
Vibration resistance	10~55Hz 0.5mm (maximum 2G)
Impact resistance	10G, 3 times to XYZ
Noise immunity	1000VP-P, 1μsec. 30-100Hz (noise simulator)
Insulation withstand voltage	AC1500V, 1 minute (between ground terminal and all other terminals)
Insulation resistance	5MΩ, 500VDC (between ground terminal and all other terminals)
Grounding	Less than 100Ω (grounding is not required)
Environment	No corrosive gas, no conductive debris

FUNCTIONAL SPECIFICATIONS (BASE UNIT)

Execution method		Stored programmed cycle execution, BATCH input/output
Execution speed		Average 12 μseconds/step
Program-language		List and ladder diagram
Program-capacity		1000 steps
Instructions	Basic sequence	20 instructions (including MC/MCR, CJP/EJP, S/R)
	Stepladder	2 instructions (STL, RET.)
	Function block	96 instructions (including +, −, ×, ÷, <, =, >)
Program memory		RAM built in, EPROM/EEPROM cassette (optional)
Auxiliary Relays	Non-retentive	128 points
	Retentive	64 points
	State (retentive)	40 points (can be used as normal relays)
	Special relays	16 points
Data Registers		64 points
Timers	0.1 sec timers	24 points, on-delay timers (0.1-999 seconds)
	0.01 sec timers	8 points, on-delay timers (0.01-99.9 seconds)
Counters (retentive)		32 points (including HSC), down counting (0-999)
High Speed Counter (retentive)		1 pair, up/down counter (0~999999), maximum 2kHz
Battery back-up		Lithium battery approximately five year shelf life
Diagnostics		Program check (checksum, syntax, circuit), watch-dog timer, battery voltage, power supply voltage

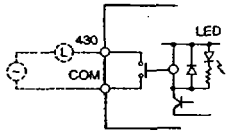
INPUT CIRCUIT



INPUT SPECIFICATIONS

Input device		No-voltage contacts on NPN open collector transistor
Isolation		Photo-coupler isolated
Input voltage		Built-in 24VDC ± 4V or External 24VDC ±8V
Input impedance		Approximately 3.3kΩ
Operation current	OFF→ON	DC 4mA minimum
	ON→OFF	DC 1.5mA maximum
Response time	OFF→ON	Approximately 10ms. (8 points can be changed from 0 to 60ms.)
	ON→OFF	Approximately 10ms. (8 points can be changed from 0 to 60ms.)

OUTPUT CIRCUIT



OUTPUT SPECIFICATIONS

Output type		Relay contact
Isolation		Relay isolated
Output load	Resistance load Inductive load Lamp load	2A/point 500,000 operations at 35VA 100W
Leakage current		0mA
Response time	OFF-ON ON-OFF	Approximately 10m sec Approximately 10m sec
Inrush current		10A For 2 cycles

BASE UNIT BUILT-IN 24VDC POWER

MODEL	FOR INPUTS	FOR SENSORS
F1-12MR-U	7mA × 6	100mA
F1-20MR-U	7mA × 12	100mA
F1-30MR-U	7mA × 16	100mA
F1-40MR-U	7mA × 24	100mA
F1-60MR-U	7mA × 36	200mA

EXTENSION UNIT BUILT-IN 24VDC POWER

MODEL	FOR INPUTS	FOR SENSORS
F1-10ER-U	7mA × 4	100mA
F1-20ER-U	7mA × 12	100mA
F1-40ER-U	7mA × 24	100mA
F1-60ER-U	7mA × 36	200mA

Note: All F_2 Extension Units will work with F_1 Base Units.

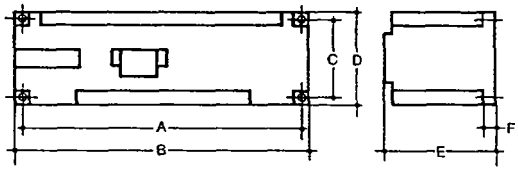
INDIVIDUAL SPECIFICATIONS

Models	F1-12MR-UL F1-10ER-UL	F1-20MR-UL F1-20ER-UL	F1-30MR-UL	F1-40MR-UL F1-40ER-UL	F1-60MR-UL F1-60ER-UL	F2-8EYR
Number of inputs	6 points (F1-12) 4 points (F1-10)	12 points	16 points	24 points	36 points	—
Number of outputs	6 points	8 points	14 points	16 points	24 points	8 points
Terminal block	Fixed terminals			Removable terminals		Fixed
Power consumption	18 VA	20 VA	22 VA	25 VA	40 VA	15 VA
Input sensor power	0.1A	0.1A	0.1A	0.1A	0.2A	—

DIMENSIONS (INCHES)

WEIGHT (POUNDS)

Model	A	B	C	D	E	F	LBS
F1-12MR/F1-10ER	6.12	6.50	2.76	3.55	3.55	.43	2.65
F1-20M/F1-20E	9.45	9.84	2.76	3.55	3.55	.43	3.31
F1-30M	10.44	10.84	2.76	3.55	3.55	.43	4.19
F1-40M/F1-40E	11.42	11.81	3.94	4.33	3.94	.43	5.07
F1-60M/F1-60E	13.19	13.78	4.92	5.51	3.94	.43	7.72



CATALOG NUMBER AND DESCRIPTION

F_1-20 M R-UL

- Number of I/O (12, 20, 30, 40, 60)
- M: Base Unit
- E: Extension Unit
- L: UL Approved
- U: 120/240VAC Power Supply
- R: Relay Output

Where the future is in progress

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F2 SERIES

Powerful micro PC for sophisticated applications

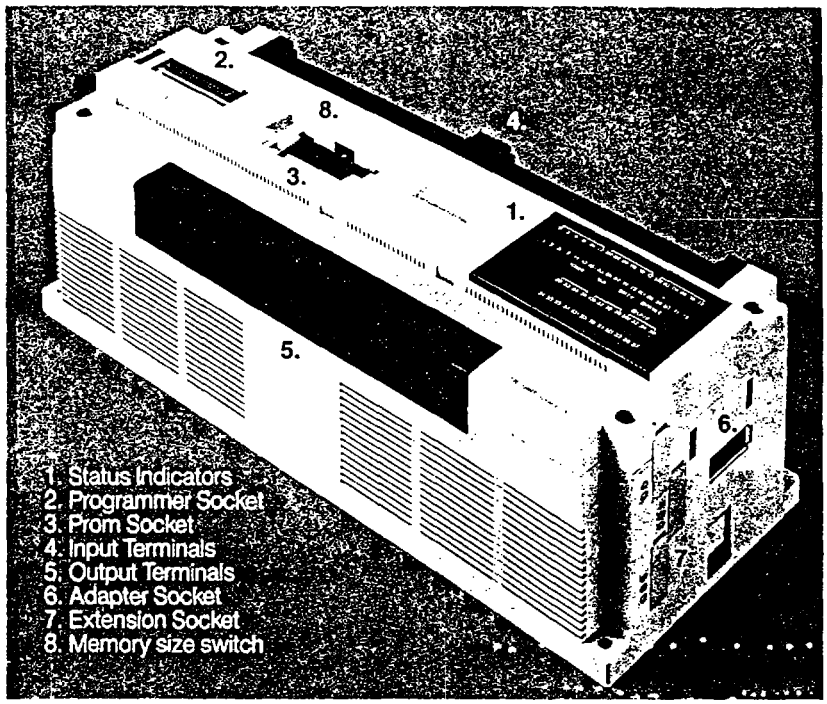
Description

The F2 Series is a highly efficient, extremely powerful micro PC with the functionality of many larger and more expensive controllers. The F2 contains a larger memory to handle an instruction set which includes single and double precision math, data comparisons, BCD read/write, pulse width measurement and more (over 190 in all). The F2 Series is designed for high speed applications by incorporating functions such as latch inputs, and immediate I/O updates. In addition, compatibility with bi-directional encoders is provided, along with the ability to communicate with the new Data I/O Unit.

All F2 units can be programmed with a number of online/offline devices as well as IBM* compatible MEDOC software. Base and extension I/O units can be configured with AC or DC inputs; relay, triac or transistor outputs, and can accommodate from 20 I/O (12 in, 8 out) to 120 I/O (72 in, 48 out).

Typical inputs and outputs include:

Inputs	Outputs
Limit Switches	Relays
Proximity Switches	Contactors
Selector Switches	Pilot Lights
Push Buttons	Solenoid Valves



FEATURES

- **Total I/O**
  - 120 Points (Single System)
  - 240 Points (Linked System)
- **I/O Type**
  - AC or DC Inputs
  - Relay, Triac, or Transistor Outputs
- **Memory Capacity**
  - 2000 Steps
- **Memory Type**
  - CMOS RAM, EPROM, EEPROM
- **Avg. Scan Time**
  - 7ms per 1k Steps
- **360 Internal Relays**
- **Timers**
  - 24 .1 Sec
  - 8 .01 Sec
- **Counters**
  - 30 0 to 999
  - 1 0 to 999999
- **Stepladder**
  - State-Transition
  - Simplifies Programming
  - Shortens Scan Time
- **Instructions**
  - 20 Basic Sequence
  - 2 Step Ladder
  - 170 Special Functions
    - Math
    - Data Comparisons
    - Boolean Operations
    - Moves (Direct & Indirect)
    - High Speed Counter
- **Power**
  - 120/240 VAC
  - +10%/−15% 50/60 Hz
- **Vibration Resistance**
  - 10-55 Hz (Max 2G)
- **Relative Humidity**
  - 10～85% Non-Condensing
- **Temperature**

Operating	0°～55°C
Storage	−15°～55°C

- **Extension Units**

Standard I/O	8, 10, 20, 40, 60
Analog I/O	F2-6A-E
External Timer	F-4T-E
Positioning Unit	F-20CM (Fwd/Rev/Slow/Fast)
Positioning Unit	F2-30GM (Pulse Generation)

- **Adaptor Units**

High Speed Counter	F2-40AC (1 Phase)
	F2-40AC2 (2 Phase)
I/O Multiplexor	F2-40DT-E-SET
Peer Link	F2-40AP (Fiber Optic)
	F2-40AN (Twisted Pair)

- **Operator Interface**

Data Access Unit	F-20DU-E-SET (TCAM)

*Registered trademark of International Business Machines Corporation

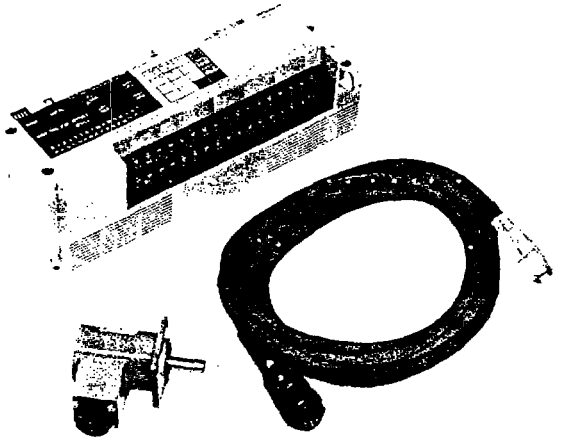
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F_2 SERIES SPECIAL FUNCTION UNIT

F_2-32RM Cam Module Unit

The F_2-32RM Programmable Cam Module allows you to program 32 transistorized outputs on and off at specific angular positions.

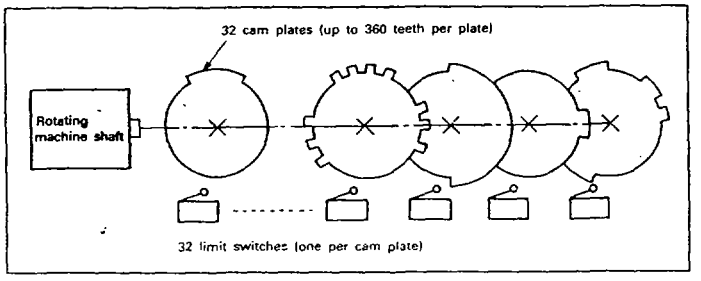
Its basic function is equivalent to a mechanical cam (see illustration at right). However, the F_2-32RM unit eliminates the fine angular adjustments required for the large number of cam plates incorporated in a machine, eliminating the need for mechanical cam switches.



Features:

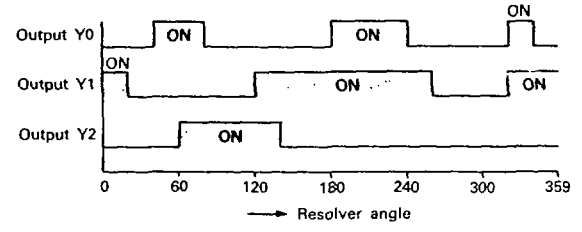
- Unit accurately detects angular positions during high-speed rotation
- 32 non-contact output points
- Individual output point can switch on or off a maximum 360 times per revolution
- Maximum permitted speed is 830 RPM for setting units of 1°, and 415 RPM for a 0.5° setting
- Angular positions are set by numerical key input, or teach pad
- Programs are stored in EEPROM memory cassettes (two programs per cassette)
- F_2-32RM can be used independently of F_2-PLC
- Brushless resolver (maintenance-free)

APPLICATION EXAMPLE (MECHANICAL)

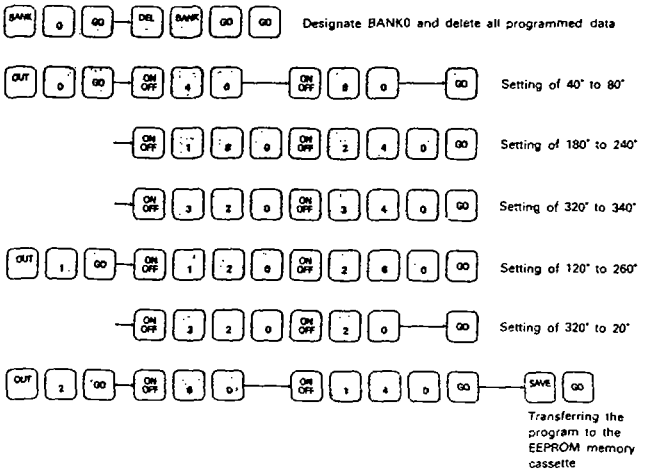


PROGRAM CREATION EXAMPLE

Control timing example



Example program for the timing indicated above

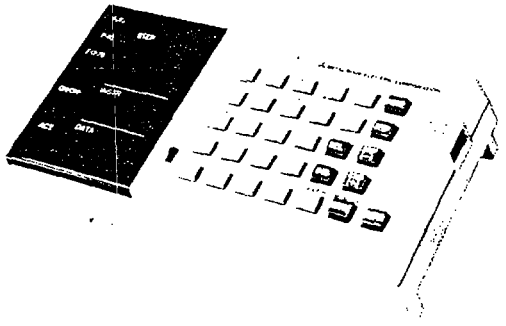


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F SERIES PROGRAMMING PANELS

Programming devices for the F Series PC

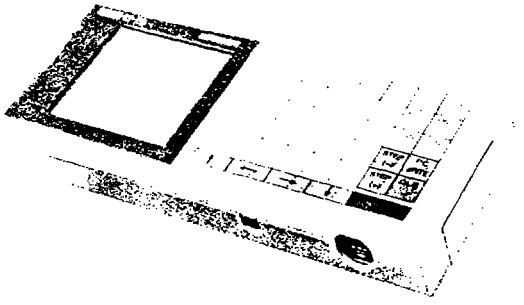
F1-20P-E Programming Panel



The F1-20P-E is an economical hand-held programming unit which is used to enter, change, or monitor programs. It offers a large number of functions particularly useful when installing new systems, including signal status display and I/O forcing. The programming panel simply clips on to the base unit or connects via a remote cable. The LED display is clearly visible even under poor light conditions.

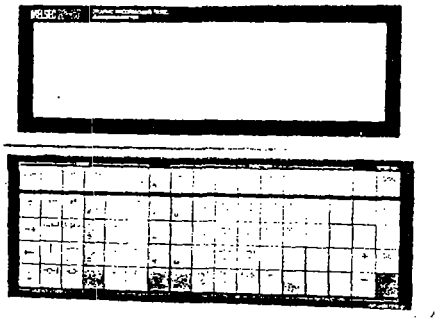
The F2-20P-E is the same in function and includes an interface for uploading and downloading programs with an audio cassette recorder.

GP-20F-E LCD Graphic Programming Panel



The GP-20F is a hand-held LCD programmer capable of displaying a ladder diagram of 11 lines by 11 contacts plus 1 coil, or 11 lines of boolean list. It clips on to the base unit or connects via a remote cable and is compatible with any F_1/F_2 Series PC. Monitoring functions include ladder monitor, batch monitor and designated monitoring of all elements and data registers. The ladder diagram display has a zoom function which displays individual element addresses. The built-in memory can store programs for up to 12 hours without being connected to a PC. The GP-20F includes an audio cassette interface for backing up and storing programs.

GP-80F2A-U Graphic Programming Panel



The GP-80F2A-U unit is a multi-function graphic programmer providing a number of facilities in one portable unit. It incorporates a large dot matrix LCD screen which displays ladder diagram or boolean list. The screen display makes programming; editing, machine diagnostics and trouble-shooting a simple task.

In addition, by using the interface functions available, it is possible to store programs onto EPROMS, audio cassette tapes or floppy disks. A printer port is provided for easy program documentation.

Functions

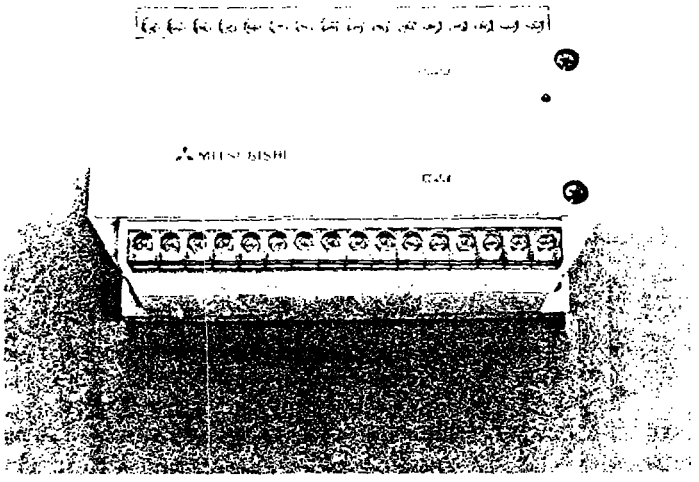
- Off-line programming and editing
- Program transfer to or from the PC (Includes cable and interface)
- On-line monitoring, forcing, and changing timer/counter constants while in the RUN mode
- Audio cassette recorder interface (Includes cable)
- EPROM writer interface
- Printer interface (Includes cable)
- Floppy disk drive unit interface
- Device name notation

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F SERIES SPECIAL FUNCTION UNITS

Functional units for the F Series PC

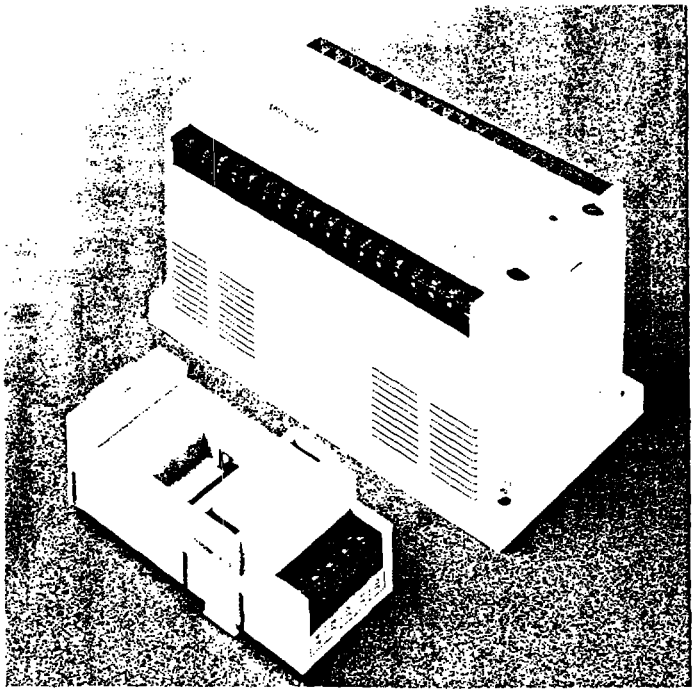
F2-6A-E Analog I/O Unit



The F2-6A Analog Module allows you to continue to use a micro PC with analog input and output devices. The unit contains 4 input and 2 output channels with 8-bit resolution. Four analog signal configurations are available: 0-5V, 0-10V, 0-20mA, and 4-20mA. The number of analog units that can be connected to a base unit is determined by the number of unused extension ports. The F1/F2-60MR has 3 extension ports. The F1/F2-40MR has 2 extension ports. The F1-30MR and F1/F2-20MR have 1 extension port. The F2-6A is not usable with the F1-12R.

Number of inputs/outputs		4 inputs/2 outputs single-ended
Input range	VOLTAGE	0–5VDC (input impedance 200kΩ)
		0–10VDC (input impedance 85kΩ)
	CURRENT	0–20mA DC (input impedance 250Ω)
		4–20mA DC (input impedance 250Ω)
Output range	VOLTAGE	0–5/10VDC (load 500–1MΩ)
	CURRENT	0–4/20mA DC (load 0–550Ω)
Digital input to CPU		8 bit binary, 0–255 3-digit BCD value
Digital output from CPU		8 bit binary, 0–255 3-digit BCD value
Conversion speed	A/D	Approximately 500μsec./CH
	D/A	Approximately 300μsec./CH
Isolation between A and D signals		Photo-coupler isolation

F2-40DT-E-SET Multiplexed BCD I/O Unit



The F2-40DT-E-SET Multiplexing BCD I/O Unit, consisting of a F2-40DT extension unit and a F2-40DI adaptor, allows you to utilize more discrete devices on an F2 PC by freeing terminals previously needed for thumbwheels, keypads, and LEDs. Up to 4-3 digit BCD inputs and 4-3 digit BCD outputs can be controlled by one F2-40DT. The F2-40DI utilizes a unique design that allows other adaptors to be attached to it, such as an F2-40AC or AC2, or F2-40AP or AW.

INPUT SPECIFICATIONS

Input Current	2.4 mA/12 VDC (When IN0-IN4 are on)
Operation Voltage	On—Less than 2V Off—More than 9V
Response Time	Approximately 5 msec.
Isolation	None

OUTPUT SPECIFICATIONS

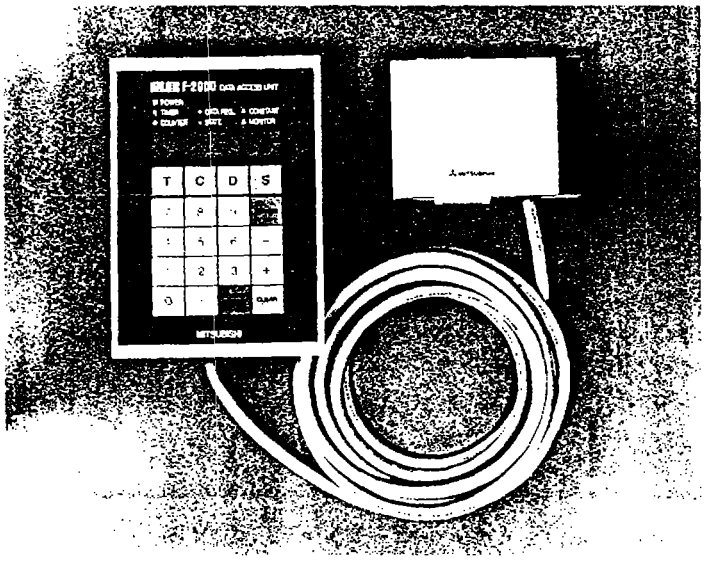
Output Current	SS00-SS42: NPN open collector Max 20mA/12VDC DT1-DT8, PNP, NPN totem-pole transistor Max. 50mA/12VDC
Isolation	None
12 VDC Power Supply	Max. output current 1.0A

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F SERIES PERIPHERALS

Get the most from a micro

F-20DU-E-SET Data Access Unit



The F-20DU-E-SET functions as a TCAM. The unit allows on-line changes of timer (T) and counter (C) setting values, as well as entering or changing data register (D) values. T,C, and D current values can be monitored as well as the status of state elements used in STEPLADDER. The TCAM provides write protection through the use of user-defined entry-code. The unit is compatible with all F1 and F2 PCs. The F-20DU access unit is designed for panel mounting.

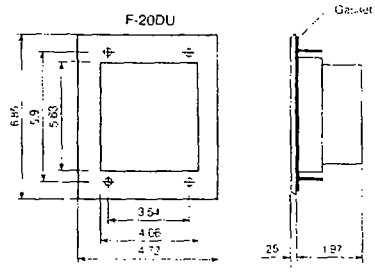
Specifications

Power supply	5 VDC ± 5% (Supplied by PC)
Ambient temperature	0°C-55°C
Ambient humidity	85% Non condensing
Vibration resistance	10-55Hz. 0.5mm (maximum 2G)
Impact resistance	10G, 3 times to XYZ
Environment	No corrosive gas, no conductive debris

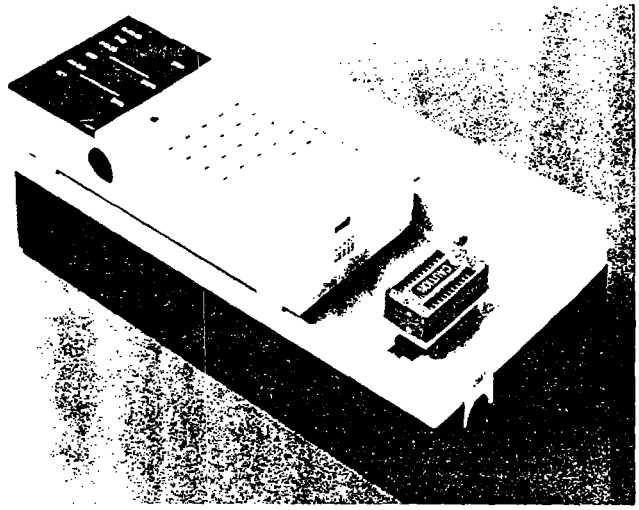
Attachments

- PC Interface F-20DF
- Cable F-20DU-CAB
- Data Access Unit F-20DU

OUTLINE AND DIMENSIONS (INCHES)



F2-20H-U Program Loader



The F2-20H-U program loader is a desktop programming console which is used with either the F1-20P-E or F2-20P-E programming panel attached. It has its own 1K RAM for off-line programming and editing. Programs may be transferred to/from a base. These functions are also helpful for maintenance and troubleshooting within the factory.

The principal advantage of this unit is that it will interface with a printer and produce ladder diagrams, program lists and component lists quickly and neatly. Additionally, EPROMs may be used, or programs may be stored on audio cassette tapes.

Functions

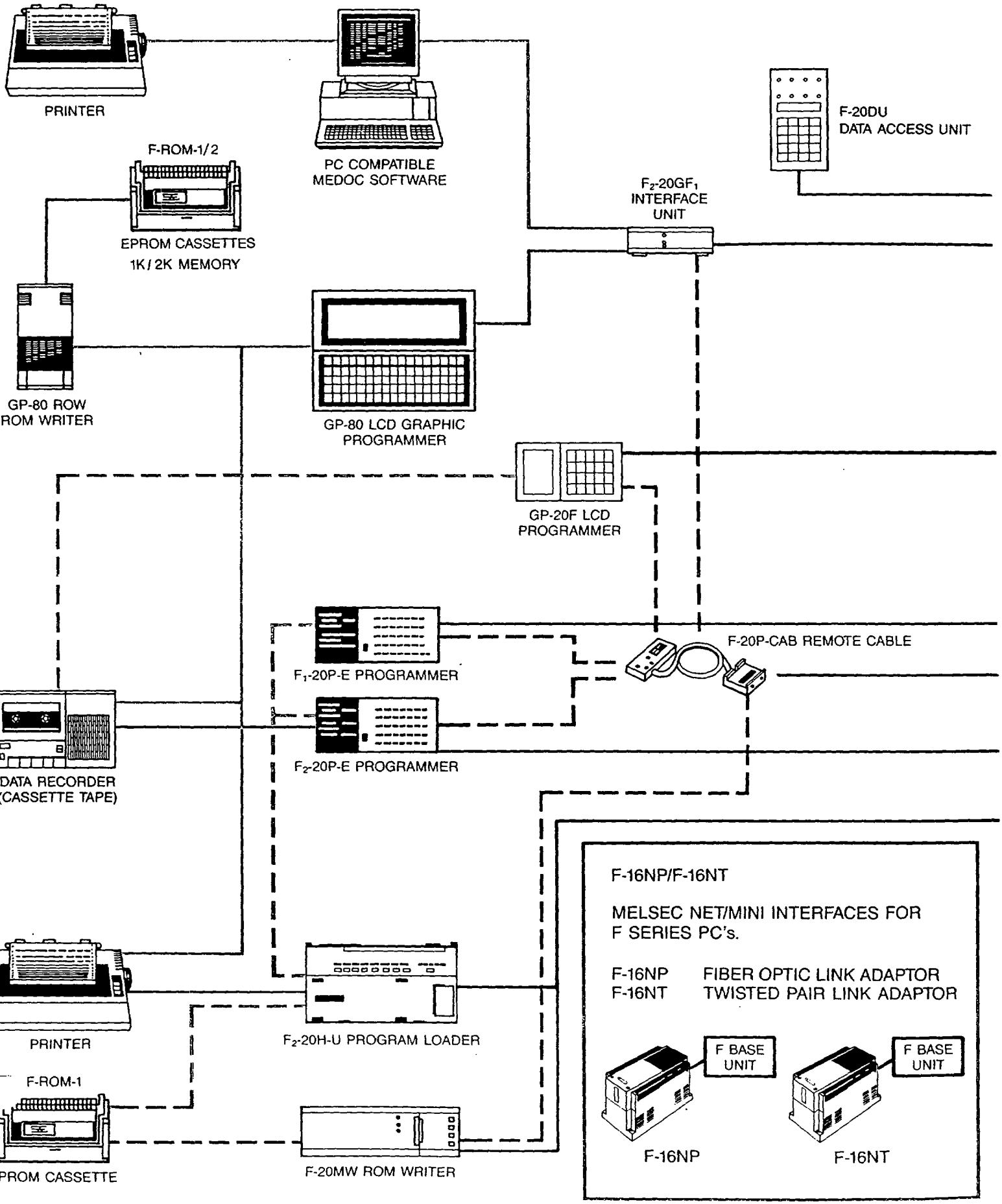
- Off-line programming and editing
- Program transfer to or from the PC
- Audio cassette recorder interface
- EPROM writing, reading and verifying
- Printer interface

Attachments

- Loader cable F-20H-CAB
- CMT cable GP-80CCB
- ROM socket GP-80RMS
- Power cable GP-80PCB
- Memory cassette F2-20H-MB

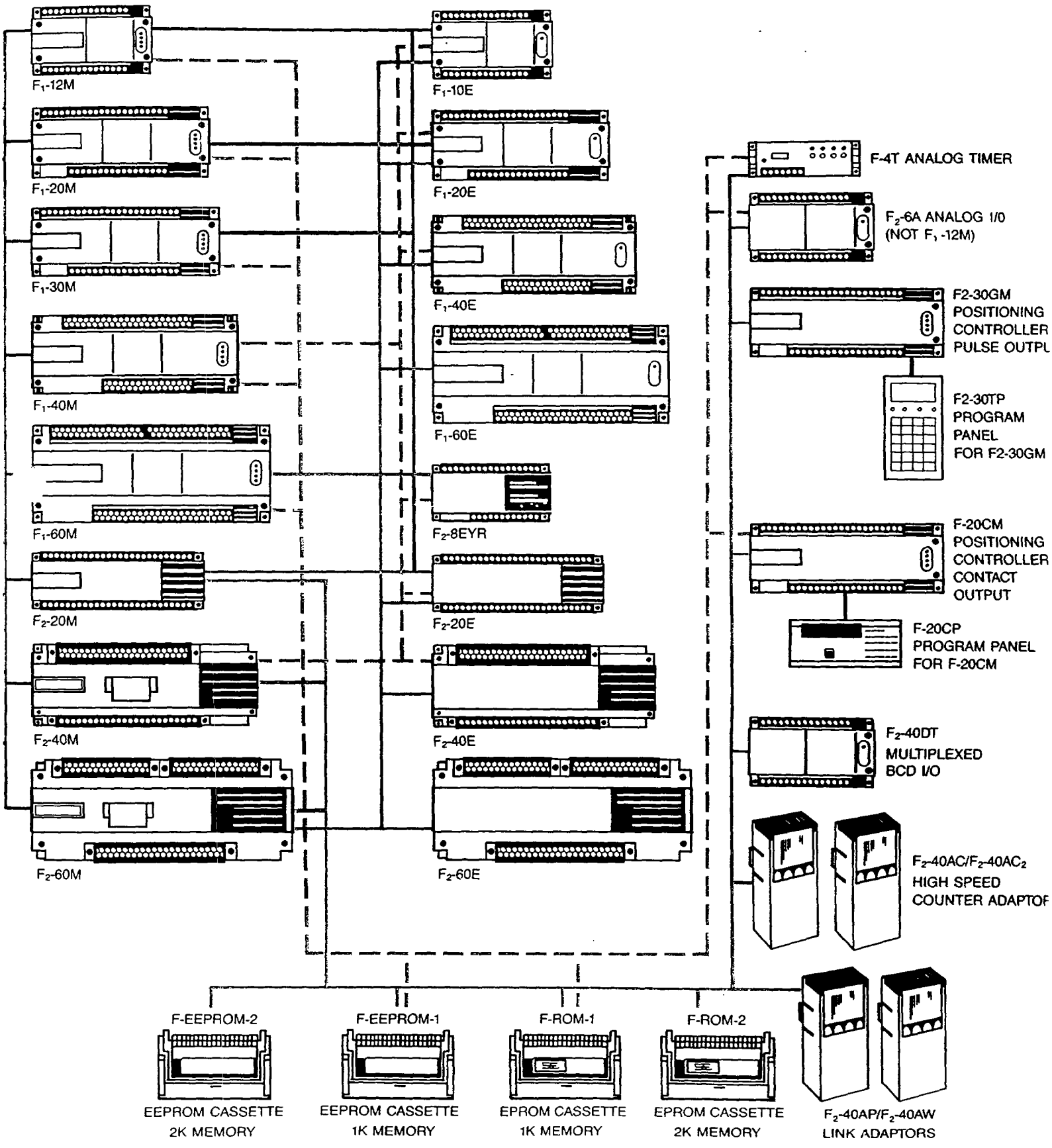
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F SERIES PRODUCT CONFIGURATION GUID



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F SERIES
I/O CONFIGURATION CHART

Total I/O	12	20	20	22	28	30	30	32	38	40	40	40	48	50	50	56	58	60	60	60	68	68	70	70
Base Units	12	20	12	12	20	30	20	12	30	40	30	20	40	40	30	40	40	60	40	40	60	40	60	40
Extension Units	—	—	8	10	8	—	10	20	8	—	10	20	8	10	20	8	10	—	20	10	8	20	10	20
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	8	—	—	10	—	8	—	10
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Inputs	6	12	6	10	12	16	16	18	16	24	20	24	24	28	28	24	28	36	36	32	36	36	40	40
Outputs	6	8	14	12	16	14	14	14	22	16	20	16	24	22	22	32	30	24	24	28	32	32	30	30

Total I/O	76	78	80	80	80	80	84	86	88	88	90	90	96	98	100	100	100	108	108	110	110	120	120	120
Base Units	60	60	60	40	60	40	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Extension Units	8	10	20	20	10	40	8	10	20	10	20	10	20	20	40	20	20	40	20	40	20	60	40	20
	8	8	—	20	10	—	8	8	8	10	10	10	8	10	—	20	10	8	20	10	20	—	20	20
	—	—	—	—	—	—	8	8	—	8	—	10	8	8	—	—	10	—	8	—	10	—	—	20
Inputs	36	40	48	48	44	48	36	40	48	44	52	48	48	52	60	60	56	60	60	64	64	72	72	72
Outputs	40	38	32	32	36	32	48	46	40	44	38	42	48	46	40	40	44	48	48	46	46	48	48	48

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