FMT-200J Compact programmable controller

200k bytes user RAM
Plug in Flash RAM card
High Speed Inputs
32 Digital Inputs
24 Digital Outputs
8 Analogue Inputs
4 Analogue Outputs
4 Comms Ports
2 x 16 LCD Display
4 Function Keys
Real Time Clock
CE Compliant

Introduction

The FMT-200J provides 200k bytes user RAM, 32 digital inputs and 24 solid state PNP outputs. 8 analogue inputs and 4 analogue outputs Four communication ports, a 2 line by 16 character LCD display, four function keys, and a socket for an external FLASH memory card are also provided. It is part of the FMT range and is programmed using the FLEX PC programming software. The typical connections along with the ratings and descriptions are shown in the following tables. For information relating to programming or the internal facilities available see your FLEX32 on-line help..

General Ratings

Storage temperature	-20 to +70 ˚C
Operating temperature	0 to 50 ˚C
Humidity	0-90%
Battery life	Typically 5 years un-powered 10 years powered
Weight	Typically 2200g
Dimensions	353 mm wide 166 mm high 40 mm deep
Screw terminal wire gauge	Up to 2.5 mm csa (14 AWG)
Supply currents	Typically 265 mA @ 24VDC Supply
Output type	24 opto isolated PNP outputs
Output rating	Maximum load per channel 500 mA @ 24VDC
Input type	32 opto isolated bipolar digital inputs
Input rating	Approx. 8 mA @ 24VDC
High-Speed Inputs	Inputs 0 - 7 are High-Speed Inputs, upto 10KHz
Analogue input type	8 channels, 0-10VDC, 0-4VDC, or 0-20mA. Range individually jumper selectable for each channel. **Note:** These channels are not individually isolated from each other. A separate 0V is provided for each channel to maintain the accuracy of the analogue inputs.
Analogue resolution	Range / 4096. For example: on 10V range 10/4096=2.44mV
Analogue accuracy	Better than 0.5%. Typically better than 0.1%

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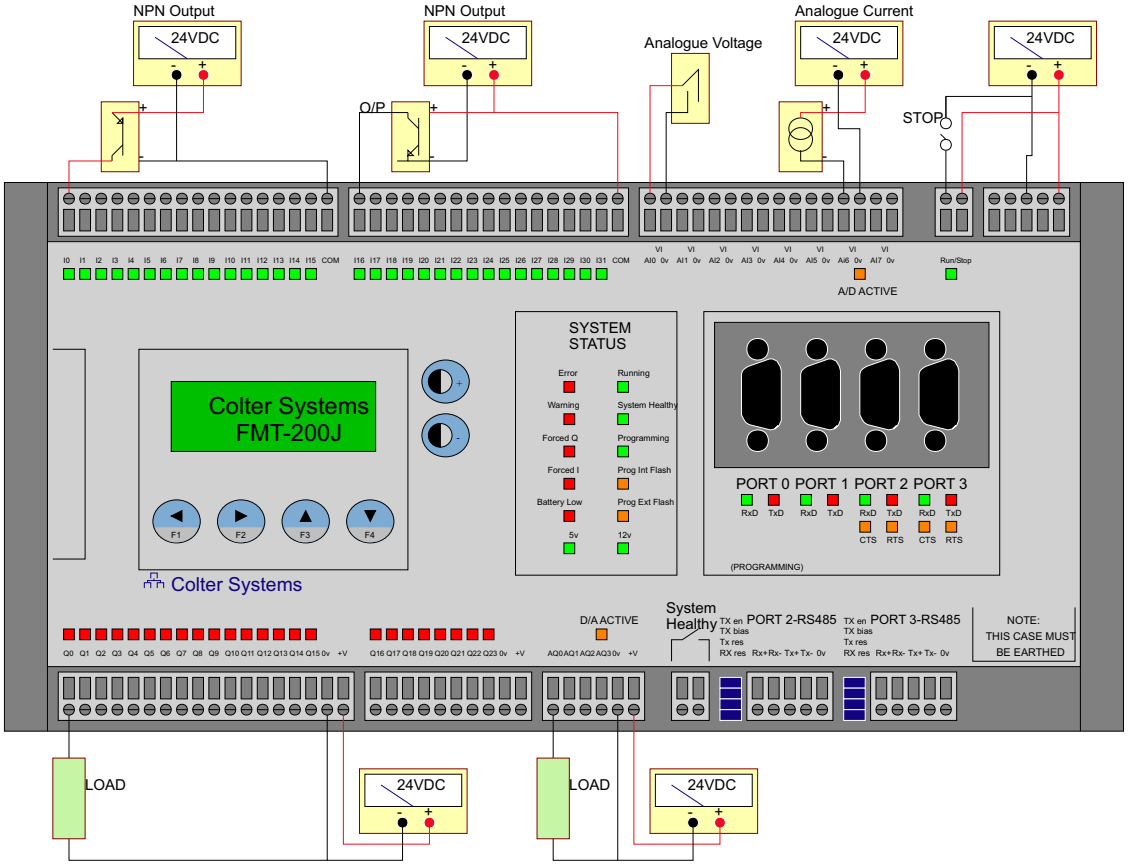
General Ratings (continued)

Analogue input impedance 0-10V	5.5KΩ. Typical noise filtering of 1mS
Analogue input impedance 0-4V	1MΩ. Typical noise filtering of 1mS
Analogue input impedance 0-20mA	200Ω. Typical noise filtering of 1mS
Analogue output	4 channels, 0-20mA, Max. loop 900R
Analogue Update Times per channel	< 1mS to 1000mS. Note: This is configured in the internal register editor (IR105) in FLEX 2 or in the project configuration screen of FLEX32.

Connection Details



LED Descriptions

Label	Colour	Description
I00- I31 & Run/Stop	Green	Indicates status of the digital input. When illuminated the external input is energised.
Q00 - Q23	Red	Indicates status of the digital output. When illuminated the output is turned on.
RxD	Green	Indicates status of the RS232 receive data line input. When flashing, data is being received by the FMT.
TxD`	Red	Indicates status of the RS232 transmit data output line. When flashing, data is being sent out from the FMT.
CTS	Yellow	Indicates status of the external 'Clear To Send' input. When illuminated the CTS line is high and the FMT will send data out of the RS232 port.
RTS	Yellow	Indicates status of the 'Request To Send' input. When illuminated the RTS output is high and the FMT is ready to receive data into the RS232 port.

LED Descriptions (continued)

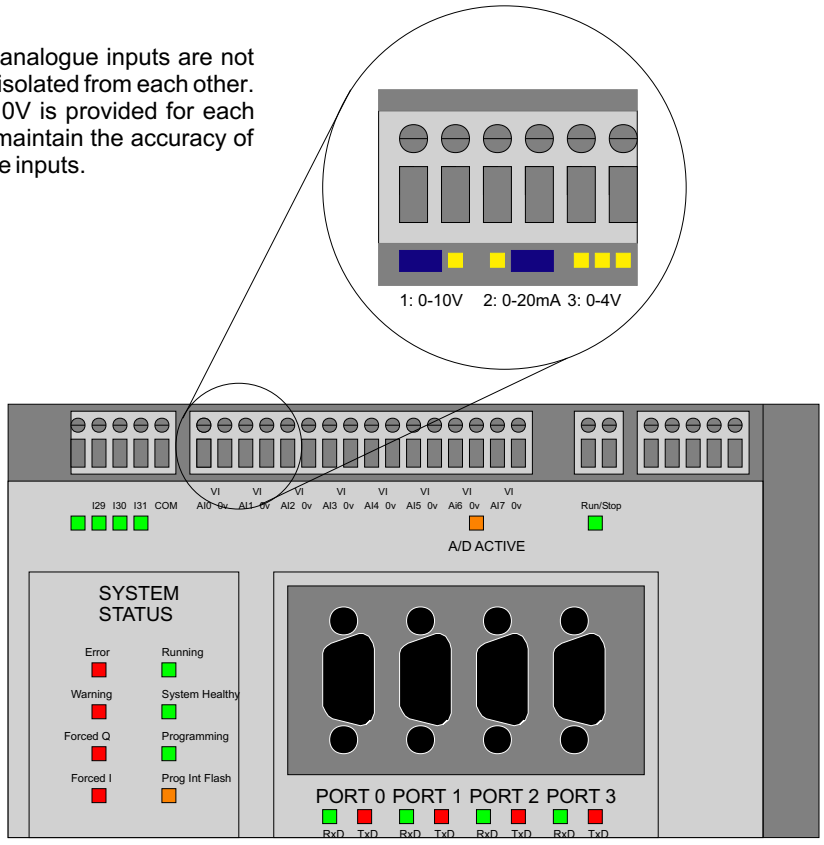
Label	Colour	Description
ERROR	Red	An error has been detected by the FMT firmware. Use the Alarm options within the FLEX debug screens to find out which error has occurred.*
WARNING	Red	A warning has been detected by the FMT firmware. Use the Alarm options within the FLEX debug screens to find out which warning has occurred.*
FORCED Q	Red	One or more outputs have been forced on or off. Use the debug facilities within FLEX to set or clear forces.*
FORCED I	Red	One or more inputs have been forced on or off. Use the debug facilities within FLEX to set or clear forces.*
A/D Active	Yellow	The Analogue to Digital circuit for the analogue inputs is active
D/A Active	Yellow	The Digital to Analogue circuit for the analogue outputs is active
Battery Low	Red	When on the battery requires replacement. Note that IF7 also reflects this state.*
5V	Green	Indicates the internal 5v power supply is healthy
12V	Green	Indicates the internal 12v power supply is healthy
Running	Green	When on the FMT is running the user program stored inside. Flashes quickly after power-up whilst checking the integrity of the application program.
System Healthy	Green	This is normally on but will go out in the event of an internal failure of the microprocessor
Programming	Green	Indicates that a programming lead is connected to Port 0.
Prog.Int.Flash	Yellow	Indicates that the system is writing the downloaded program to the internal FLASH memory. Do not turn the FMT off while this is illuminated.
Prog.Ext.Flash	Yellow	Indicates that the system is writing to the external FLASH memory. Do not turn the FMT off while this is illuminated.

* Display menu system (page 8) also allows access to situations that LEDs indicate.

Analogue Input Range Setting

To set the input range, put the jump link for the relevant channel in one of three positions (see diagram below). If the jump link is in position 1 then the channel will be set to 0-10V. If the jump link is in position 2 then the channel will be set to the range of 0-20mA. If the jump link is removed or only on one pin then the channel will be set to the range of 0-4V.

Note: The analogue inputs are not individually isolated from each other. A separate 0V is provided for each channel to maintain the accuracy of the analogue inputs.



Terminal Descriptions

Label	Description	Nominal Rating	Maximum Rating (not continuous)	Notes
I00 - I31	Inputs 0 to 31	24V (+/-20%) where <5V = OFF >18V = ON	48V < 1 Second	The input current at 24V is typically 8 mA Blocks of 16 inputs can be connected in different polarities to different power supplies.
COM	Common for block of 16 inputs			Can be connected to either 0v or 24v. See the 'connection details' diagram.
Run/Stop	Run/Stop	24V (+/-20%) where <5V = RUN >18V = STOP	48V < 1 Second	The input current at 24V is typically 8 mA If no connection, FMT will RUN
⏚	Earth			To meet the EMC regulations, this terminal must be connected to a clean earth. The Earth terminal is directly connected to the - (supply common) terminal.
-	FMT supply common	0V	0V	This supplies all the internal needs of the FMT
+	FMT supply +V	+8 to +40V	+8 to + 40V	
Q00-Q23	Outputs 0 to 23	500 mA @ 24v		Blocks of 16 outputs can be connected to different power supplies.
0v	Common for block of 16 outputs			
+V	Supply for block of 16 outputs	+24VDC		This supply feeds the block of digital outputs and is isolated from all other supplies.
AI0 - AI7	Analogue Inputs 0 to 7	0-10V, 0-4V and 0-20mA		There are three analogue input range, each channel has individual 0v connection next to the input.
AQ0 - AQ3	Analogue Outputs 0 to 3	0-20mA	20mA max	Outputs need 24v suplply connected to them using the 0v and +v connections next to them.
System Healthy	System Healthy	5A @ 24v DC/AC		System Healthy relay contact. Contact closed when the processor system is working correctly.
Rx+				Receive data +
Rx-				Receive data -
Tx+	Port 2 RS485			Transmit data +
Tx-	connections			Transmit data -
(earth)				Earth for Screen
Rx+				Receive data +
Rx-				Receive data -
Tx+	Port 3 RS485			Transmit data +
Tx-	connections			Transmit data -
(earth)				Earth for Screen

RS232 Communications Ports

The FMT-200 has four communication ports. All four ports have a 9 way D-type connector for connection to RS232 devices. Ports 2 and 3 also have RS485 connections via two part terminals. Pin assignments for the 9 way connectors are as below:

Pin No	Port 0	I/O	Port 1	II/O	Port 2	I/O	Port 3	I/O
1	Protective Earth	-	Protective Earth	-	Protective Earth	-	Protective Earth	-
2	Receive Data	I	Receive Data	I	Receive Data	I	Receive Data	I
3	Transmit Data	O	Transmit Data	O	Transmit Data	O	Transmit Data	O
4	N/C	-	N/C	-	Request to send	O	Request to send	O
5	N/C	-	N/C	-	Clear To Send	I	Clear To Send	I
6	Programming	I	N/C	-	N/C	-	N/C	-
7	Common	-	Common	-	Common	-	Common	-
8	N/C	-	N/C	-	N/C	-	N/C	-
9	N/C	-	N/C	-	N/C	-	N/C	-

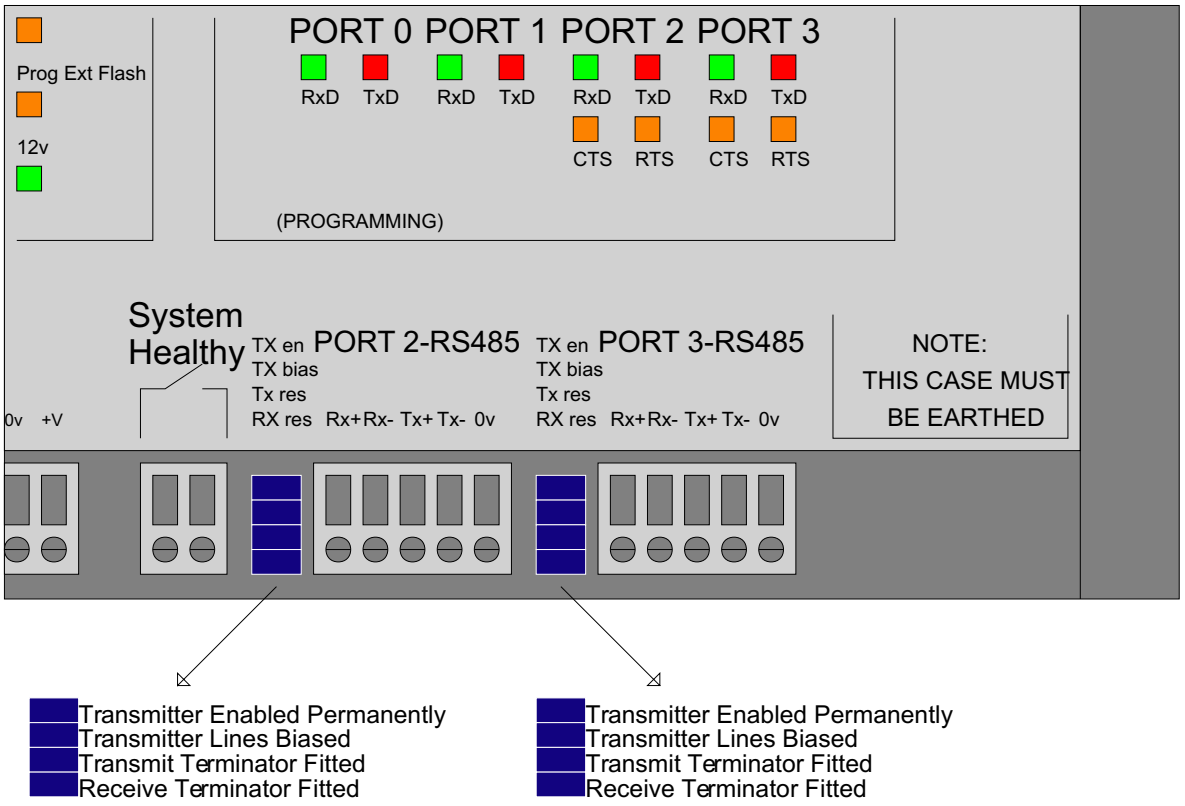
RS485 Communications Ports

RS485 is available on ports 2 and 3 of the FMT-200. The following points relating to RS485 should be noted;

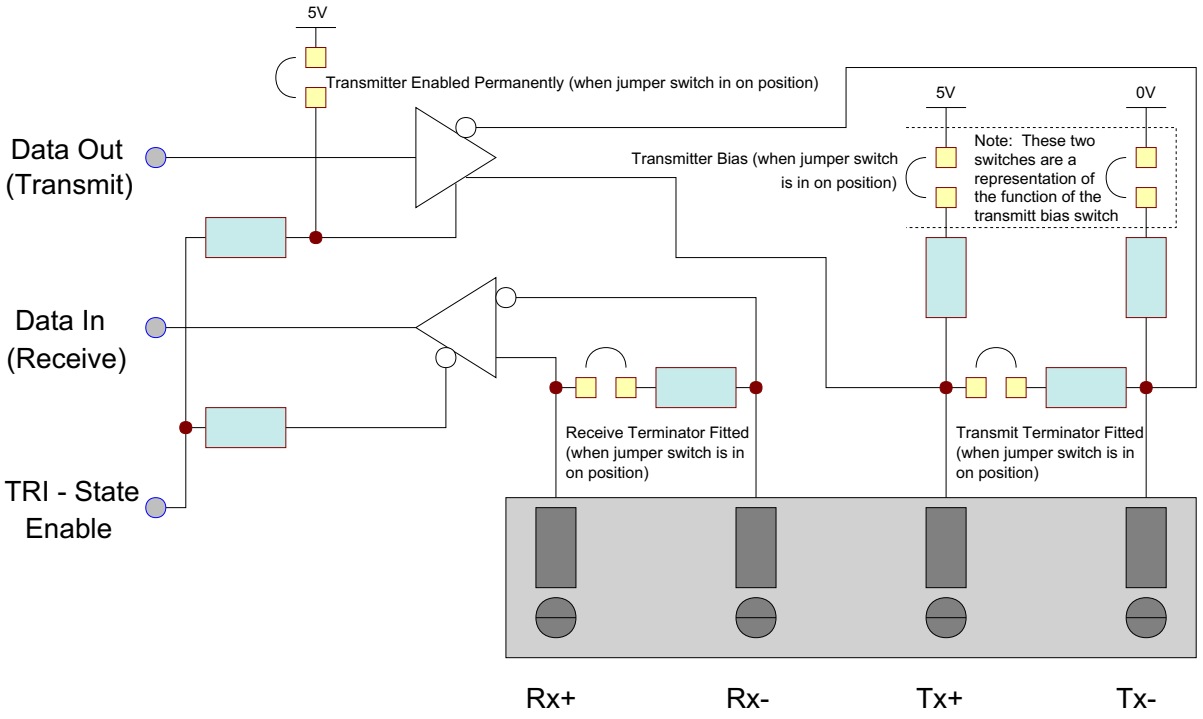
* RS485 allows up to 32 units to be connected together in a multidrop.
* The maximum cable length is 1200 metres.
* Stub lengths from a junction box to a FMT-200 should be no more than 500 mm.
* Use screened cable with twisted pairs.
* The screens should be continuous throughout the cable run and connected to a good earth at one end only.

A number of jumpers allow users to configure terminating resistors and enable options for the transmitters and receivers of both ports.

The diagram below shows the position and function of each of the eight jumpers.



RS485 Jumper Selection



Link	Link Fitted	Link Removed	Comments
Transmitter Enable	Transmitter Permanently enabled	Transmitter only enabled when the port is sending out data	Fit this link if the transmitter is only connected to one or more receivers. Do not fit the link if the transmitter is connected to other transmitters in a multidrop.
Transmitter Bias	Transmitter biased	Transmitter Tri State	Fit this link if you need to bias the transmitter lines to 5v and 0V (TxD+ and TxD- respectively)(via 620Ω resistors). This is useful in electrically noisy environments. Note: A maximum of two transmitters on any one multidrop network should have these links fitted.
Transmit Terminator	120Ω resistor fitted between Tx+ and Tx-	No resistor fitted	Fit terminating resistors to the devices at each end of the cable run only. If required.
Receive Terminator	120Ω resistor fitted between Rx+ and Rx-	No resistor fitted	Fit terminating resistors to the devices at each end of the cable run only. If required.

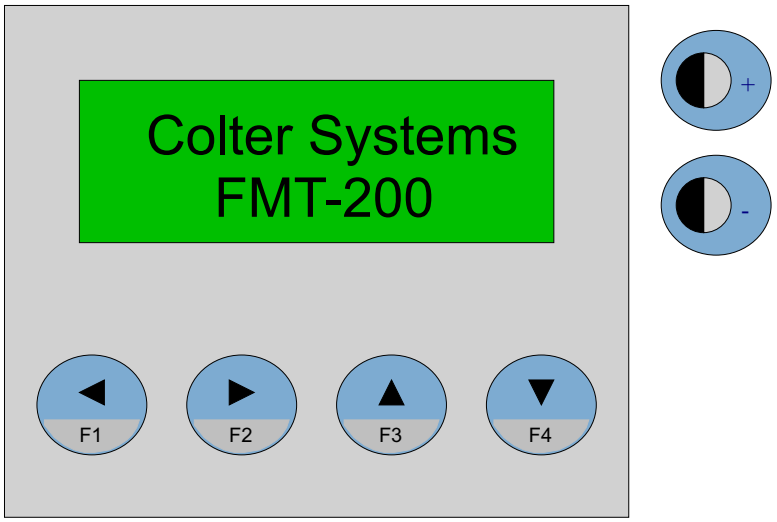
Changing the Battery

The internal battery can be replaced as follows.

* Disconnect the FMT from all external connections and remove from panel.
* Undo 3 screws from each end of the case and remove the bottom cover.
* The battery can now be seen in the middle of the PCB and replaced with one of the same type. If in doubt new batteries are available from your supplier.

NOTE: Depending on the state of charge of the old battery you have up to one minute to swap the batteries before volatile information (such as date/time and preserved facilities) is lost.

Integral Display & Function Keys



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The FMT-200 range of controllers incorporates a two line by sixteen character LCD display.
The display is treated by the FMT as serial port 8.
Information can be printed on the display by use of the 'Text' function, specifying the text string number as usual and port number 8.
Printing on the display can use all the existing control codes to incorporate date and time, register contents etc.
To control the cursor position three control codes have a special function when sent to the display...

* %#0C - Clear display and position the cursor at the start of the first line.
* %#0D (or %r) - Position the cursor at the start of the first line.
* %#0A (or %l) - Position the cursor at the start of the second line.

Using The FMT-200 function Keys
The FMT-200 includes four general purpose 'function keys' underneath the display.
To enable your application program to use these keys, four internal flags and one internal register have been assigned as explained in the table below...

Facility	Short symbol name	Long Symbol Name	Function
IR78	KeyCod	Key_Codes	Function Keys as bit pattern. Bit 0 = F1, Bit 3 = F4
IF40	Key-F1	Key-F1	Function Key F1, ON when pressed.
IF41	Key-F2	Key-F2	Function Key F2, ON when pressed.
IF42	Key-F3	Key-F3	Function Key F3, ON when pressed.
IF43	Key-F4	Key-F4	Function Key F4, ON when pressed.

High Speed Features

The FMT-200 hardware includes circuitry to process high speed events on inputs 0 to 7. These inputs can be configured to implement one of the following high speed facilities.

* Incremental Pulse Encoder.
* High Speed Counter.
* Fast Edge Catching
* Interrupt Driven Instruction Language Modules (see note)

The FMT-200's support eight inputs (I0 - I7) using W0 - W3 as counters.
The operation of the high speed features is set-up in one of the Internal Registers - IR74 to IR77 (in FLEX2) or by using the 'high speed' page in the project configuration window of FLEX32. For more information see our additional datasheet titled "High Speed Features".

Note: The FMT range has the ability to benefit from interrupt driven instruction language modules. This will enable a module to execute if an external interrupt is detected i.e when an input is switched on by some external signal.
The entire module will be executed when the input that is specified comes on. To make a module interrupt controlled you should either select 'Control' in the Instruction Module Editor (FLEX32) or in the project configuration screen (FLEX 2).
The maximum number of steps of code that can be executed in one interrupt is twenty, more than this and the firmware will raise an 'Input Interrupt overrun' error.

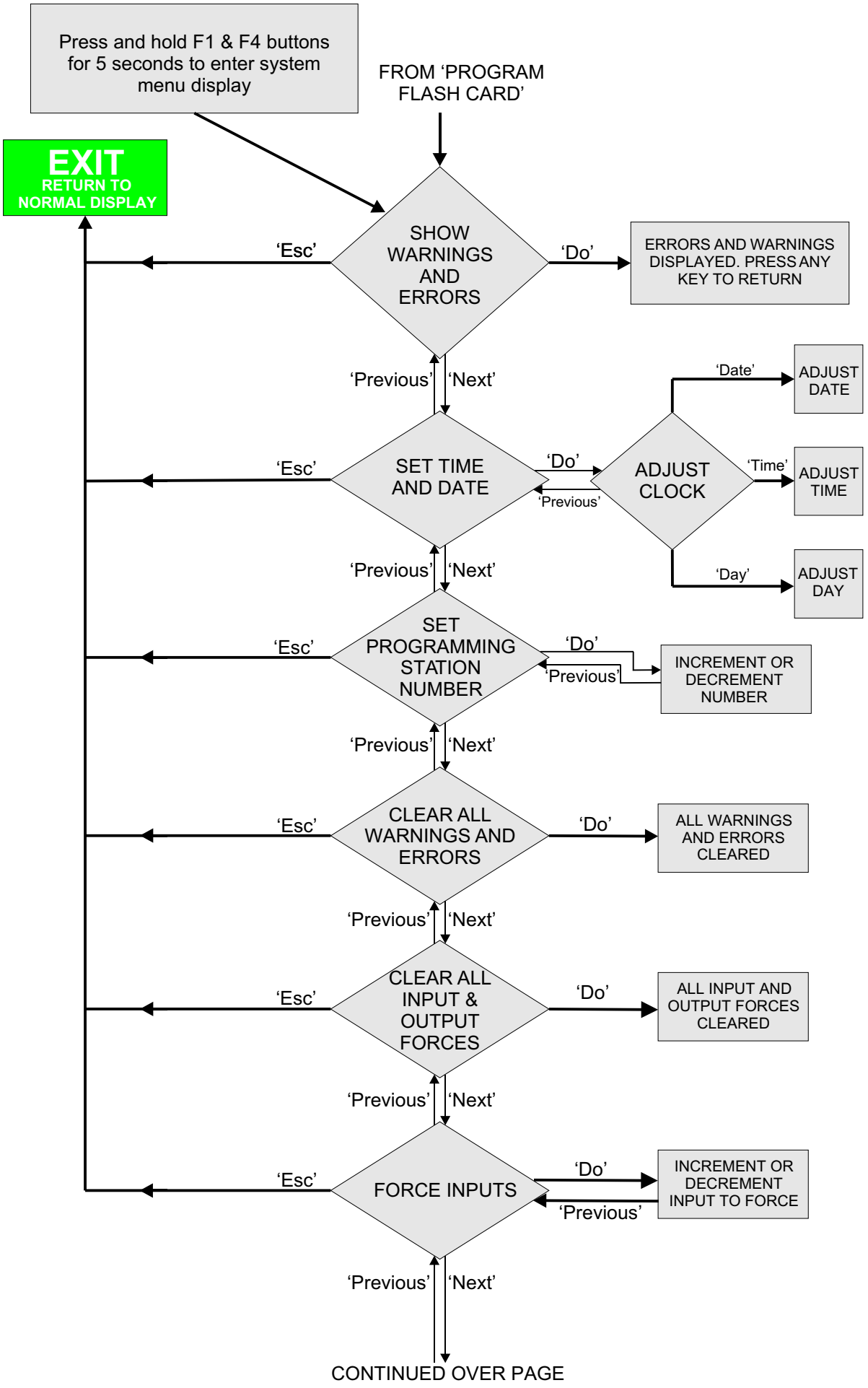
System Menu Display

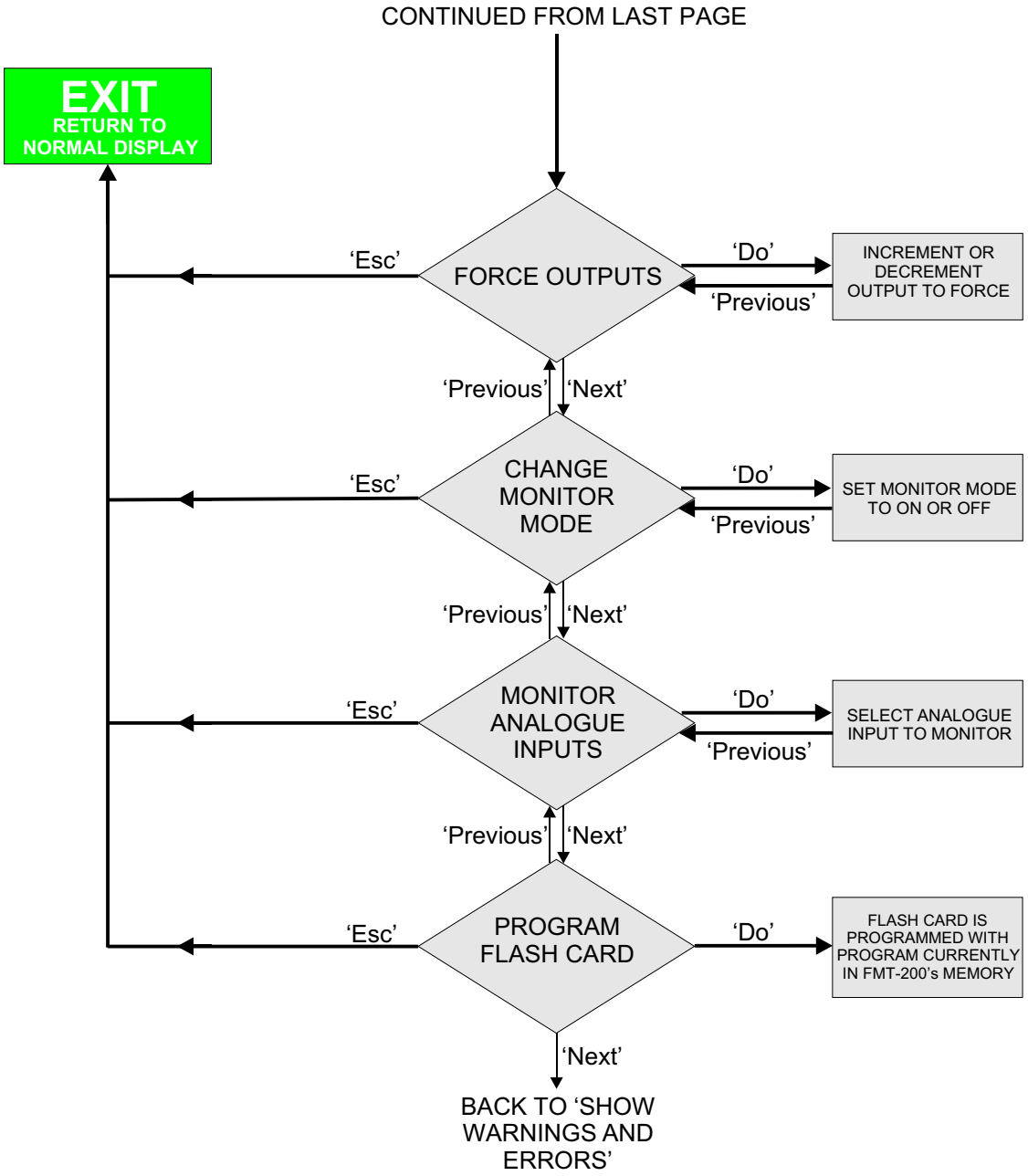
The keypad and the LCD display on the FMT-200J allow access to the 'System Menu Display'. This feature allows monitoring and configuring of the FMT-400 system without the need to use Flex32.
Please see the following flowchart outlining the key features of the 'System Menu Display.

NOTES:

Programming Station Number:
The 'System Menu Display' allows the programming station number to be set this is useful if you have several FMTs connected together on a network and it is required to only send a new program to one FMT, if this FMT was set to station number 1 and the FLEX package was set to download to station 1 then only this FMT would receive the new program, it is possible to have up to 256 different stations on one network.

Monitor Mode:
The 'System Menu Display' allows 'Monitor Mode' to be set to 'on' or 'off'. If monitor mode is set 'on' then it is only possible to monitor the operation of the FMT-400 using Flex32, however it is not possible to make any changes to the program or modify any facilities using Flex32.


Press and hold F1 & F4 buttons for 5 seconds to enter system menu display
FROM 'PROGRAM FLASH CARD'
EXIT
RETURN TO NORMAL DISPLAY
SHOW WARNINGS AND ERRORS
'Esc'
'Do'
ERRORS AND WARNINGS DISPLAYED. PRESS ANY KEY TO RETURN
'Previous'
'Next'
SET TIME AND DATE
'Esc'
'Do'
'Previous'
ADJUST CLOCK
'Date'
ADJUST DATE
'Time'
ADJUST TIME
'Day'
ADJUST DAY
'Previous'
'Next'
SET PROGRAMMING STATION NUMBER
'Esc'
'Do'
'Previous'
INCREMENT OR DECREMENT NUMBER
'Previous'
'Next'
CLEAR ALL WARNINGS AND ERRORS
'Esc'
'Do'
ALL WARNINGS AND ERRORS CLEARED
'Previous'
'Next'
CLEAR ALL INPUT & OUTPUT FORCES
'Esc'
'Do'
ALL INPUT AND OUTPUT FORCES CLEARED
'Previous'
'Next'
FORCE INPUTS
'Esc'
'Do'
'Previous'
INCREMENT OR DECREMENT INPUT TO FORCE
'Previous'
'Next'
CONTINUED OVER PAGE



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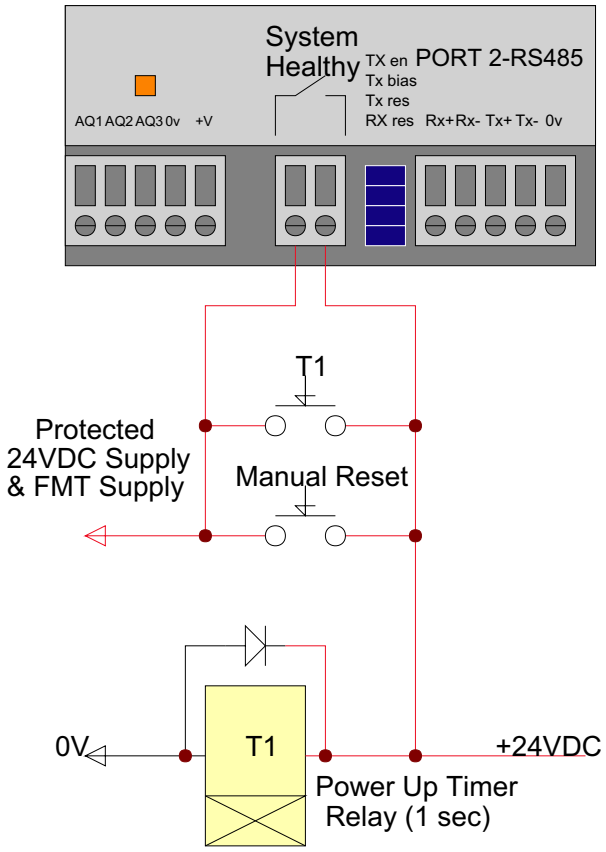
Critical Applications

The FMT (or indeed any microprocessor based control system) must never be used in an application where failure of the device will endanger human life. When controlling machines such as presses, guillotines, etc. any critical functions must firstly fail safe and secondly be electrically or mechanically devised so that any failure cannot endanger personnel. When an application will not harm personnel but PLC malfunction will damage machinery or product we recommend utilising the System Healthy output. A typical circuit could be as follows:



External Flash Card

The FMT-200J has a socket to accept a plug in Flash Card. This card can be used to store a program for example: build a library of different programs on different cards or data. Or the flash card can be used for data logging purposes or storing other data.

There are three modes, these are:

- Programme storage.
- Programme storage with auto-update.
- User Data store.

To set the mode select the 'Flash Card' page from the project configuration screen.
For more information on the flash card please see the FMT-FC256 data sheet.

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External Flash Card (continued)

Important Note: When using the flash card (FMT-FC256) to store user programs. You must ensure that the exactly the same firmware that was present in the FMT-200 when the program was downloaded to the flash card is also present when the program is loaded back from the flash card into the FMT-200. Failure to do this will probably lead to the program that is in the flash card being unable to be run in the FMT-200 and will probably cause errors and/or warnings to be raised.

EMC Compliance

The standard range of FMT products are fully tested and CE marked in accordance with the following standards:

* RF Emissions to EN55022 Class B
* Mains Emissions to EN55022 Class B
* RF Immunity to IEC 801-3 (1984)
* Fast Transients to IEC 801-4
* Electrostatic Discharge to IEC 801-2

In order for a particular installation to meet the regulations it is necessary to ensure that external equipment is connected correctly.

Installation / Earthing

The FMT-200J is mounted by four M5 keyhole slots on centres of 338 mm by 100 mm. It is recommended that a minimum gap of 60 mm be provided from the outside of the FMT case to any trunking around it. It is also recommended that high voltage and high current cables be routed elsewhere in the panel to avoid running next to the FMT.

For the purposes or electrical safety and for EMC compliance the caisng of the FMT-200J should be earthed to the surrounding gear plate using the earth stud provided on the casing.

Note: Ensure screw terminals are fully un-screwed before inserting wire and tightening the screw. The reason for this is if the screw is screwed up and then the wire is inserted then the wire will go underneath the saddle clamp of the terminal which may not be initially obvious but will be an unreliable connection. To test for a secure connection, tug the wire and check that it can not be removed after tightening up the terminal screw.

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Date: 10 May 2005

Order Codes

Part Number
FMT-200J

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