X20005 – FC36M/MV Commander Module Parameter Display & Programming Manual Issue 4

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X20005 – FC36M/MV Commander Module Parameter Display & Programming Manual Issue 4

1 Introduction

Description & Stock Code	CM-(FC36M/MV) – A402131	
Complementary firing circuits & generic stock codes	**FC36M** - A34411	**FC36MV** - A34428
Backward compatibility of PIC chip	(FC36M) V34411 – from issue 3	(FC36MV) V34428 – from issue 1

The FC36M & MV parameter display/programming (Commander) module comprises a PIC microcontroller interfaced to a 20 by 2-line alphanumeric liquid crystal display (LCD). It is linked to the FC36M & MV firing module via RJ45 connectors. The programming module can be plugged and unplugged from the firing card before or after power-up.

The programming module is small and compact, with maximum overall dimensions of 175mm x 50mm x 33 mm depth and can be panel mounted or handheld. Panel cut-out should be 168mm x 45mm.

Data transmission between the parameter Commander module and the firing card is via two-wire serial communication using the Universal Synchronous Asynchronous Receiver Transmitter (USART) peripheral in each microcontroller.

Programmed parameter values and mode settings are retained in EEPROM memory of the firing card and recovered on power-up.

2 Display Specifications

2.1 Page Scrolling

Scrolling from one display page to another is achieved by using the "↑" or "↓" keys. The following pages are displayed under normal operating conditions i.e., when the firing card is operated in the open loop mode.

2.1.1 Page 1

CONTROL	L1,2,3	PHASE
50%	50Hz	BOARD

- The control level under **CONTROL** is indicated as a percentage (0 – 100 %) of the firing angle in the 0-180° range.
- The FC36MV (not FC36M) firing card senses the phase rotation sequence. Therefore, the display/programming module will display **L1,2,3** or **L3,2,1** accordingly.
- In burst fire mode, **BURST** is displayed. **PHASE** is displayed for phase angle mode.
- The FC36M & the FC36MV firing card tracks system frequency. The frequency is displayed in Hz.
- When the board-based parameters are being used, **BOARD** is displayed. When the parameters entered via the programmer are being used, **PROG** is displayed.

2.1.2 Page 2

ANALOGUE	RESISTIVE
STANDARD	LIM-OFF

All these functions are settable via the six-way dip switch on the main firing card when in BOARD mode or can be programmed when in PROG mode.

- In analogue mode, **ANALOG** is displayed and **DIGITAL** for digital mode.
- When a load is specified as resistive or inductive, **RESISTIVE**, or **INDUCTIVE** is displayed accordingly.
- If a delay in the firing sequence is selected, **DELAY** is displayed, otherwise **STANDARD** is displayed.
- When limiting is enabled, **LIM-ON** is displayed or **LIM-OFF** is displayed when limiting is disabled.

2.1.3 Page 3

SoftSTRT&STP	-	OFF
UP 5.0		DWN 5.0 sec

The SoftSTRT&STP function can be enabled via the six-way dip switch on the main firing card when in BOARD mode or can be set via the programmer when in PROG mode.

The RAMP trimmer on the main board can be adjusted to set the ramp rate when in board mode or can be set via the programmer when in PROG mode.

- When soft start/stop is enabled SoftSTRT&STP-ON is displayed. The ramp-up or soft-start and ramp down or soft-stop times in seconds are also displayed
- When soft start/stop is disabled (i.e., hard start & stop) SoftSTRT&STP-OFF is displayed. The ramp times are still displayed

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2.1.4 Page 4

Timing Calibration
0°

- This timing calibration feature allows FC36M or FC36MV timing displacement of up to +/- 30 degrees via the programmer.

2.1.5 Page 5

Swap +VE&-VE	OFF
SlewRate	5.0 sec

- **Swap +VE & -VE** displays whether the thyristor pairs are reversed or not, dependent upon the setting on the six-way dip switch when in BOARD mode or the programmer when in PROG mode
- The **slew rate** of the control signal is displayed in increments of 0.1 seconds. Range is between 0.0 to 5.0 seconds that is only settable via the programmer

2.1.6 Page 6

P	1.00	I	0.100
D	0.00		

- The "**PID**" settings are displayed on this page. Only applicable when the controller has been configured for close loop operation. Values can be adjusted via the programmer.

2.1.7 Page 7

Open-Loop	REMOTE
Current Mode	Mean

- Firing card can be configured for **OPEN LOOP** or **CLOSE LOOP** via the programmer
- **REMOTE** or **LOCAL** signal when the firing card is operating in the close loop mode

2.1.8 Page 8

Set	500A	100V
Run	0.0A	0.0V

- **Set** displays the current/voltage* setpoint. The maximum current value is dependent upon the shunt range and can be set by adjusting the ISET trimmer when in BOARD mode or via the programmer when in PROG mode.
- **Run** displays the actual run current/voltage* when calibrated.

* The voltage readings are only displayed when the firing card has been set for closed loop control.

2.1.9 Page 9

Shunt Range	800A

- When a shunt is utilised in the system, then the controller can be calibrated to display the actual current. For this the **shunt range** must be specified and is displayed on this screen. This setting is available through the calibration menu on the programmer

2.1.10 Page 10

I	LIMIT	SET	TRIP
A	0.0	500	800

This screen displays the current **LIMIT**, **SET** & **TRIP** levels. The **SET** and **TRIP** level parameters are settable via the on-board trimmers "I SET" and "I TRIP" when in BOARD mode or via the programmer when in PROG mode.

- When the **LIMIT** equals or exceeds the set level, **SET** flashes at a frequency of 1 Hz.
- When the **LIMIT** equals or exceeds the trip level (i.e., overcurrent trip), **TRIP** flashes at a frequency of 1 Hz.

2.2 Phase Fault (FC36MV only)

PHASE
FAULT

When a phase failure is detected, the display shows **PHASE FAULT** and flashes at a frequency of 1 Hz.

3 To Enter Programming Mode

ENTERING PROGRAMMING MODE

Press & hold the Enter key for two seconds to enter programming mode. Release Enter key when "**ENTERING PROGRAMMING MODE**" is displayed.
"**ENTERING PROGRAMMING MODE**" is displayed for a further two seconds. The display will then show "**Enter PIN**" if the pin access has been set on or will proceed directly to the submenu page.

3.1 Entering PIN

Enter PIN: *** 0

If PIN access has been set on, then a four-digit number will need to be entered. The factory default is 0000. With "**Enter PIN**" flashing, the digits can be incremented or decremented using the "↑"and "↓" keys. Pressing the **ENT** key will select the digit that is being displayed. This action needs to be carried out for all four digits.
Entering an incorrect PIN will cause the display to show "**Wrong PIN**" for two seconds before reverting back to the "**Enter PIN**" screen. Only on entering the correct PIN will the programmer proceed to the submenu page.

3.2 SUBMENUS

Parameters	PIN
Calibrate	Display

The display will show four submenus: **Parameters**, **Calibrate**, **PIN** & **Display** that may be selected. Pressing the "↑" or "↓" key enables the user to navigate. On pressing the **ENT** key, the appropriate flashing submenu will be selected.

3.3 Functions of the Keys During Programming Mode

3.3.1 "↑" & "↓" Keys

Press & release the "↑" or "↓" keys to increment or decrement numerical values by 1. Accelerated value increments or decrements can be achieved by pressing the key "↑" or "↓"key continuously. Please note that values are downloaded to the firing module as they are being incremented or decremented.
When programming non-numerical function, press & release the "↑" or "↓"key to toggle between choices.

3.3.2 To Confirm Values

Press & release the **ENT** key to program the next function. This will automatically be shown flashing.
Pressing & releasing **ENT** while programming the last function will take user back to the submenu page.

3.3.3 ESC Key Function During Programming Mode

Press & release the **ESC** key to program the previous function. This will automatically be shown flashing.
Pressing & releasing **ESC** while programming the first function will take user back to the submenu page.

LEAVING PROGRAMMING MODE

Pressing & releasing **ESC** whilst in the submenu page will exit programming mode. "**LEAVING PROGRAMMING MODE**" will be displayed for 2 seconds. The display/programming module reverts to display mode and the user is returned to the page from which programming mode was entered.

4 Programming

4.1 Parameters

Parameters	PIN
Calibrate	Display

The parameters that are able to be programmed are as follows, in the order shown:

CONTROL	L1,2,3	PHASE
50%	50Hz	BOARD

- **BOARD** or **PROG**: **BOARD** selects the board (Default) settings that are selected by the on board six-way dip switch and the three trimmers (ISET, ITRIP & RAMP). **PROG** selects the settings that are programmed via the programmer and ignores the position of the six-way dip switch and the three trimmers (ISET, ITRIP & RAMP).

Open-Loop	LOCAL
Current Mode	Mean

- **Open-Loop** or **Closed-Loop**: Open-Loop is the default setting for the firing card, but it can be configured to operate in Closed-Loop when a feedback signal is fed back into the firing module.
- **LOCAL** or **REMOTE**: If the closed loop option has been selected then the firing card can be configured to either operate from a **LOCAL** setpoint (Commander module) or a **REMOTE** setpoint (0-5v I/P of the firing card).
- **Current Mode** or **Volt Mode**: If the closed loop option has been selected then the firing card can be configured to either operate in **Current Mode** (constant current) or **Volt Mode** (constant voltage).
- **Mean** or **trueRMS**: Depending upon the feedback signal that is being fed back into the firing card, the user can select **Mean** or **trueRMS**. Typically, a signal fed back from a DC shunt would be considered to be **Mean** and a signal fed back from a current transformer would be seen as **trueRMS**.

The next parameter that the user can set will depend upon what the previous selections were.

For:

Open-Loop	XXXXXX
Current Mode	XXXXXX

The Next Page Is:

Set	500A	99.9V
Run	0.0V	0.0V

- **99.9V**: The user is able to set the maximum voltage (V Limit) that the system may go up to

For:

Open-Loop	XXXXXX
Current Mode	XXXXXX

The Next Page Is:

Set	500A	99.9V
Run	0.0V	0.0V

- **99.9V**: The user is able to set the constant voltage setpoint.

The next screen displayed is common to any of the mode that have been previously selected.

I	LIMIT	SET	TRIP
A	0.0	500	800

- **SET**: When the firing card is operating in **Closed loop/Current mode/LOCAL**, then this value is the constant current setpoint, otherwise it's the current limit setpoint for all other modes.
- **TRIP**: The current **TRIP** level can be set by the user. The maximum value will be dependent upon the shunt range.

The next page will only be displayed if the firing card has been configured to operate in **Closed-Loop** mode.

P	1.00	I	0.100
D	0.00		

- **PID**: The user is able to set the values for, **P** (Proportional), **I** (Integral) & **D** (Derivative)

SoftSTRT&STP	-	OFF
UP 10.0		DWN 10.0 sec

- **SoftSTRT&STP**: The user can select to enable or disable soft start & stop and also set the UP and DOWN ramp speeds. This setting is only applicable for when the firing card has been set to operate in **PROG** mode

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All options on this page are only applicable for when the firing card has been set to operate in **PROG** mode.

ANALOG	RESISTIVE
STANDARD	LIM-OFF

- **ANALOG** or **DIGITAL**: Selection of either an analogue or digital control signal.
- **RESISTIVE** or **INDUCTIVE**: Timing selection for type of load.
- **STANDARD** or **DELAY**: Standard or delay timing.
- **LIM-OFF** or **LIM-ON**: Limit can be enabled or disabled.

Timing Calibration
0°

- **Timing Calibration**: Allows firing card timing displacement of up to +/- 30 degrees. This is a global parameter so will be applicable for both **BOARD** and **PROG** modes

Swap +VE&-VE	OFF
SlewRate	5.0 sec

- **Swap +VE&-VE**: Option for reversing the drive to the thyristor pairs.
- **SlewRate**: A global parameter that is settable from 0.0 to 5.0 seconds in 0.1 second increments.

4.2 Calibrate

Parameters	PIN
Calibrate	Display

The values that can be calibrated are as follows in the order shown:

Shunt Range	800A

- Shunt Range: User settable between 10-1000A

I	LIMIT	SET	TRIP
A	0.0	500	800

- **LIMIT**: Calibration of the actual running current. This must be carried out with the aid of an external calibrated meter monitoring the current and where possible in open loop mode

Set	500A	99.9V
Run	0.0A	0.0V

- **Run**: Calibration of the actual load voltage. An external calibrated meter monitoring the load voltage must be used. This screen only displays "**V**" in closed loop mode

4.3 PIN

Parameters	PIN
Calibrate	Display

PINaccess
ON

- **PINaccess**: PIN access for programming mode can be enabled or disabled

Change PIN? YES

- **Change PIN**: For entering a custom PIN. If **NO** is selected, then display will revert back to the submenu page. If **YES** is selected, then display will proceed to the following page

Enter New PIN:
XXX 0

- **Enter New PIN**: A new PIN can be entered at this stage in the same manner as described in 3.1

ReEnter New PIN:
XXX 0

- **ReEnter New PIN**: The user will then be required to re-enter the new PIN. If an incorrect PIN entered, then "**Wrong PIN**" will be displayed for two seconds before the display returning back to the "**ReEnter New PIN**" page. Only on entering the correct PIN will the display return to the submenu page.

4.4 Display

Parameters	PIN
Calibrate	Display

AutoScroll
OFF 5 sec

- **AUTOSCROLL**: When the display is in the normal running mode the **AutoScroll** function can then either be set **ON** or **OFF**. The time period between the screen changes can also be set at this point, in the range of 1-10 seconds