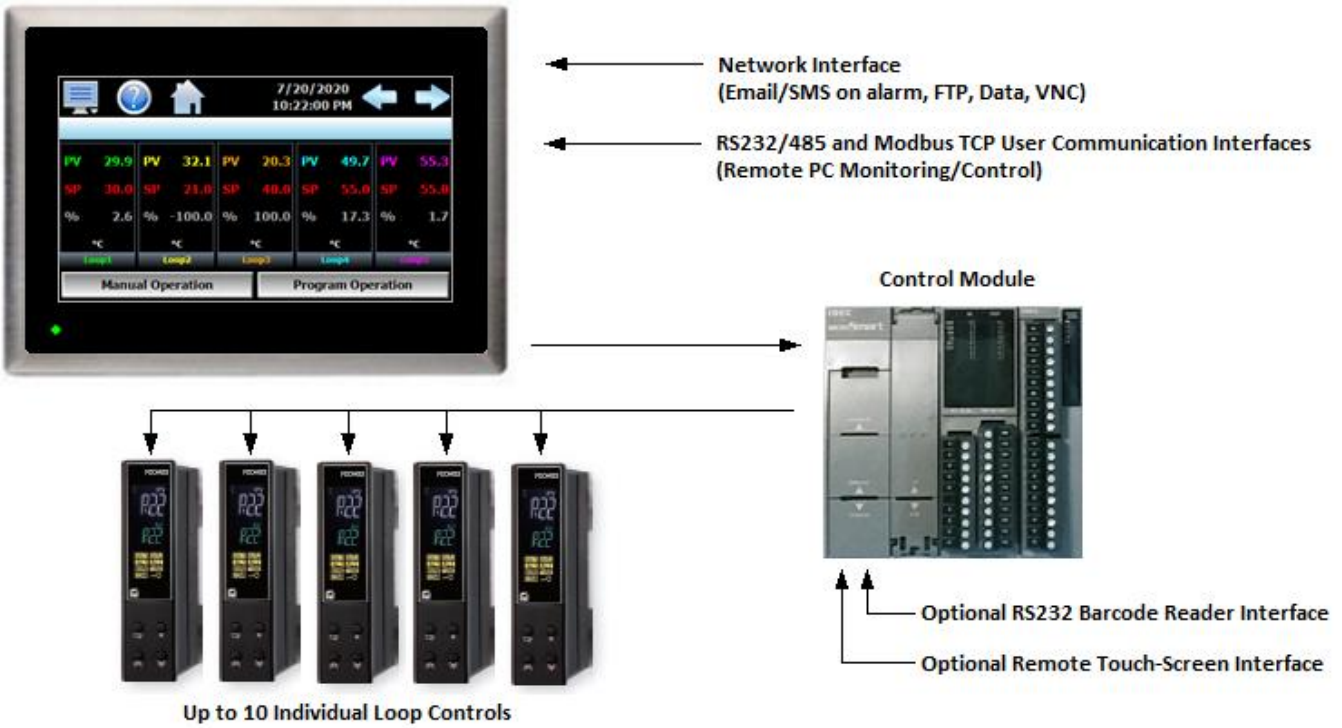
MCT-CM Multi-loop Control System
Description, Specifications and Part Number Matrix

The MCT-CM Multi-loop Control System combines all of the features of typical loop controls, video/chart recorders and data logging systems into a single, intuitive device. Email (supporting SSL/TLS), SMS (text messaging), FTP, FileWeb, DataWeb (file transfer protocols for automated data backup and web database interface) and remote viewing/control (via Web server/VNC server) are standard with the MCT-CM and can be accessed via LAN/WAN using a PC, tablet or smart phone device.

The MCT-CM is offered in 4.3" and 7" color touch screen interfaces with standard "Smart Device" user interface features for multi-loop OEM control applications (up to 10 loops). All loop configuration and runtime user access are configurable at the device with no PC software required. OEM's have the ability to configure runtime features (screen availability, menus, language, etc...) to easily customize the system to their requirements. These configurations can be imported/exported to any other MCT-CM device for setup within minutes by the touch of a button.

In addition to a maximum of ten loops of control, the MCT-CM can also provide up to an additional 15 inputs for process monitoring for a total of 25 process inputs. The base system is provided with eight 24Vdc digital inputs (DI) and 8 relay outputs. The MCT-CM can be expanded to a total of 16 digital inputs and 32 digital outputs. It also provides the capability of accepting up to 14 analog inputs for remote set point control as well providing 7 analog outputs capable of retransmitting system variables (PV, SP or %Out) to other devices. The 0-10Vdc or 4-20mA user selectable signals are provided through the addition of optional analog expander cards.

Individual process controls, one for each loop in the system, provide reliable, consistent and accurate control by distributing the process control requirements of the system among multiple processors. Each loop control provides full auto tune functionality with high resolution, universal process inputs. When coupled with the built-in ramping programmer, it allows for automatic, timed control of all processes and outputs of the system.



MCT-CM Multi-loop Control System
Description, Specifications and Part Number Matrix

The MCT-CM is ordered as three components: the color touch screen, firmware and the Control Module (CM) with its assorted options. The loop controls are ordered separately.

MCT-CM Sample Part Numbers

(minimum of 3 component part numbers is required; (1) Display, (2) Firmware and (3) Control Module)

Item #	Product	Sample Part Number	Description
1	Display	FDC-0450-1011-000BN	4.3" display, 11-36 VDC power input, SD slot, Ethernet
2	CM Firmware	SD-4CM	CM Control Module Firmware (inserted into display SD slot)
3	Control Module	CM6-0000-010	Base CM, no optional serial communications, DI, DO, AI or AO and (1) 8-chanel monitor card (T/C)
	Options		
	Power Supply	PS5R-SV24	100-240VAC power input, Output 24VDC 60W (2.5A)
	Cable	CA-232-8A	Cable from display to control module (DB9 connector (display), pigtail on CM, (8ft)
	Loop Controls	9300-413001	9300 1/16 DIN control, input #1 universal (T/C, RTD, mA &Vdc) Input #2 linear (mA & Vdc may be used as monitor input) Output #1 mA PID, RS485 communications

Item #1 — Model FDC-0450 (4.3") / FDC-0730 (7") Color Touch Screen

FDC – 0450 – FDC – 0730 –	1	0	1	1	0	0	0	B	N
Order Matrix #	1	2	3	4	5	6	7	8	9

(1) Power Input
1: 11 to 36 VDC

(2) Sound Output
0: None

(3) SD Card Slot
1: Yes

(4) Ethernet
1: Yes

(5) Network
0: None

(6) Software
0: None

(7) Enclosure
0: Standard

(8) Overlay Color
B: Black Overlay

(9) Special Code
N: Neutral Overlay (no name/logo)

Item #2 — MCT-CM Control Software

Order Matrix # **SD - [ ] CM**

(order #4 designates software for i4.3 display and #7 designates software for i7 display) ; (i.e. SD-4CM = SD for FDC-450 HMI)

MCT-CM Multi-loop Control System
Description, Specifications and Part Number Matrix

Item #3 **Control Module** *(loop controls ordered separately)*

CM6 - ☐ ☐ ☐ ☐ ☐ ☐ ☐ (note 3)

Order Matrix # 1 2 3 4 5 6 7

1. Control Module (CM) Application Software (Note 3)

0: CM22: CM software for SIF52 to FDC C-Series R22 (note 1)
2: CM30: CM software for SIF52 to FDC 300 Series (note 1)

7: CM22: CM software for US2000B to FDC C-Series R22 (note 1)
8: CM30: CM software for US2000B to FDC 300 Series (note 1)
9: Special

Note: As specified above the CM includes the appropriate SD card to
Note: As specified above the CM includes the appropriate SD card to support dual communication to the HMI and loop control(s) via the FC6A-SIF52 or the separate component US2000B.

The USB2000B requires a Cat5 patch cable to connect to FC6A PLC and 9-pin null modem cable to the HMI Display; see page 4.

2. Optional Serial Communications (Note 2)

0: None
1: FC6A-PC3 RS485 Modbus RTU port (slave)*
2: FC6A-PC1 RS232 port for Barcode Reader **
3: Both FC6A-PC3 and FC6A-PC1

Note: Order of either communication option will also include the required FC6A-HPH1 cartridge adapter.

*RS485 Modbus RTU port allows installation of remote display.
**Bar Code Reader input is compatible for serial-based barcode readers.

3. Optional Digital Inputs (Note 2)

0: None
1: FC6A-N08B1 8-digital input card (24Vdc)
2: FC6A-N08A11 8-digital input card (120Vac)

Note: The above optional digital inputs (DI) are in addition to the eight 24Vdc digital inputs that are standard on the CM; system maximum of 16 digital inputs.

4. Optional Digital Outputs (Note 2)

0: None
1: FC6A-T08P1 8-digital output– TTL 24Vdc (source)
2: FC6A-R081 8-digital output - Relay (240Vac 2-amps)
3: FC6A-T16P1 16-digital output– TTL 24Vdc (source)
4: FC6A-R161 16-digital output - Relay (240Vac 2-amps)

Combination DO modules (maximum of 24 optional DO)

A: Item 1 / qty 2
B: Item 1 / qty 3
C: Item 2 / qty 2
D: Item 2 / qty 3
E: Item 1 qty 2 & Item 2 qty 1
F: Item 1 qty 1 & Item 2 qty 2
G: Items 1 & 3
H: Items 1 & 4
J: Items 2 & 3
K: Items 2 & 4

Note: The above optional digital outputs (DO) are in addition to the 8 DO that are standard on the CPU; maximum of 32 DO.

5. Optional Analog I/O (Note 2) (DIN Rail Mount – plug into CM)

0: None
1: 1 A-IO card **FC6A-L03CN1** (4-20mA or 0-10Vdc IO)
2: 2 A-IO cards **FC6A-L03CN1** (4-20mA or 0-10Vdc IO)
3: 3 A-IO cards **FC6A-L03CN1** (4-20mA or 0-10Vdc IO)
4: 4 A-IO cards **FC6A-L03CN1** (4-20mA or 0-10Vdc IO)
5: 5 A-IO cards **FC6A-L03CN1** (4-20mA or 0-10Vdc IO)
6: 6 A-IO cards **FC6A-L03CN1** (4-20mA or 0-10Vdc IO)
7: 7 A-IO cards **FC6A-L03CN1** (4-20mA or 0-10Vdc IO)

Note: Each I/O card has qty 2 Remote Setpoint input and quantity 1 Retransmission output configurable for PV, SP or %Out

6. Optional Monitor Inputs (Note 1) (serial connection to CM)

0: None
1: IO-8TCS: (8-thermocouple input module - isolated)
2: IO-6RTD: (6-RTD input module)
3: IO-8AIIS: (8- input module 0-20 / 4-20mA - isolated)
4: IO-8AIVS: (8-analog input 0-10 / 2-10Vdc—isolated)

Combination Monitor Input Modules (maximum of 2 & 15 points)

A: Item 1 / qty 2
B: Item 2 / qty 2
C: Item 3 / qty 2
D: Item 4 / qty 2
E: Items 1 & 2
F: Items 1 & 3
G: Items 1 & 4
H: Items 2 & 3
I: Items 2 & 4
J: Items 3 & 4

7. Special

0: None

Note 1: Maximum of 2 monitor input cards monitoring a maximum of 15 monitor card inputs. With specific CM software (CM30), the loop control's input #2 may be configured as a monitor point. System maximum of 15 monitor points made up of loop control input #2, inputs of monitor cards or combination of both.

Note 2: CM will support up to 7 expansion modules (the monitor point input module is not a CM expansion module).

Note 3: CM6-XXXXXXX includes the following standard components:

Part #: FC6A-D16R1CEE
Control Module with 8 Digital Inputs (DI) and 8 Relay Outputs (DO)

Part #: FC6A-SD
SD Memory Card with specified loop control firmware and dual communication device.

All other CM (Control Module) options are packaged separately and like the FC6A-SIF52 must be plugged into the FC6A-D16R1CEE bus as described in the manual. The exception is the Monitor Card(s) and US2000B used in lieu of SIF52 communication card, which are not part of the FC6A-D16R1CEE bus and have separate power supply and RS485 communication wiring. The Monitor Card as well as any loop controls are wired to the serial RS485 FC6A-SIF52 card or US2000B dual communication devices.

MCT-CM Multi-loop Control System
Description, Specifications and Part Number Matrix

Control System Options *(ordered separately as needed)*

System Power Supply (input 100-240VAC / Output 24VDC)

PS5R-VD24	60W power supply (2.5A)

System Reset Timer

GE1A-C10HA110/SR2P-06	Reset Timer and socket (DIN RAIL)

Note: Timer is recommended for proper system restart due to momentary power interruptions (<500ms) which can cause erroneous operation.

USB Memory Stick

UDF115-8GB	8GB High Capacity USB Memory Stick (3VDC)

Replacement SD Memory Card

SD-4CM***** SD Memory Card preloaded with MCT-CM i4.3 application software for FDC430 4.3" HMI

SD-7CM***** SD Memory Card preloaded with MCT-CM i7 application software for FDC730 7" HMI

***** Specify:

- Communication Module SIF52 or US2000B
- Loop Control Model 9300 or R22

Cable FC6A-SIF52 Communication Module: SIF52 to HMI Display

SIF52:	CA-232-8A	Cable (2.5 meters) from SIF52 to HMI Display

Cables US2000B Communication Module: FC6A PLC to US2000B and US2000B to HMI Display

US2000B:	CA-CAT5e-10ft	Cable (10ft.) Ethernet CAT5e patch cable; US2000B to FC6A PLC
US2000B:	DB9F-DB9F-10ft	Cable (10-ft.) DB9 Female - DB9 Female; US2000B to HMI Display

Cable Notes: Consult factory for different cable lengths, DB9 angle connectors, etc.

DIN Rail Mounting Adapter for 1/16DIN Controls

DRA-16	1/16 DIN Rail Mounting Adapter

NOTES: SCADA (Supervisory Control & Data Acquisition)

The MCT-CM Graphic User Interface (GUI) touch screen provides a full SCADA feature set providing ease of use with either an icon menu system with finger navigation or traditional Menu bar, data acquisition, alarm manager, operator audit trail, multi-level security with user rights, LAN connections and more.

The GUI provides ease of configuration, use & support.

- System Configuration for loop, monitor point, alarm, digital input & output assignment / logic, language selection, enable/disable features and more, all without an external device/PC.
- Loop & Monitor Views: view Loop and/or Monitor Points in single, dual and Overview views.
- Trend Views: 8 Trend Views to view up to 8 values per view for Loop and Monitor inputs with each offering configurable L/R axis and time
- Profile: Virtually unlimited number of profiles with each profile having up to 99 steps with up to 32 events and output defeat/step.
- File Management: View and copy/move/delete Profile, Alarm, Historical Data (data log files) and operator audit trial files. File transfer via LAN features (FTP or email) or USB flash memory.
- Support: View loop & digital IO status, force loop & digital outputs and more. OEM configurable "reset factory default" feature.
- LAN: Remote Access & touch screen operation (VNC), email/SMS on alarm, email historical, alarm & audit trail files on-demand, Web Page (view only) and FTP of alarm, audit and historical data files on demand or automatically (2AM every day).

Data Acquisition:

- Data log up to10 control loops (PV, SP & % out) and up to 15 optional Monitor Point PVs (up to 25 PV inputs, 10 SP, PID % out; 45 max.).
- Data Log interval: configurable 2-seconds to 31-minutes.
- File Start/Stop: Configurable; operator on-demand, on system boot, profile ramp-soak start/end or digital input.
- File Interval: Once started a data log file is configurable to auto end and start new file with the same name as previous file with an appended time/date name. Configurable time interval is from 1 to 31 days.
- File name: Operator entered file name with fields for batch & lot information or if started with a profile, name is the same as profile name. (all file names appended with date-time to the second.)
- Operator Comments/Events: Unlimited operator comments/events linked to each file entered manually or via serial Bar Code Scanner.
- File Type: Data Log files are saved in .csv format.
- Digital Signatures: Automatic system signature as well as user entered digital signatures for each data file are supported. Digital Signatures allow the data file to be validated (data has not been altered). Files may be validated on the display or on a PC with Orion Data Viewer.
- Historical Data File: View data log files on the display. Chart is auto-scaled on an X & Y axis for time and units. After data is copied/moved via LAN (FTP or email) or USB Memory, may be viewed on PC utilizing Excel or FDC's free Orion Data Viewer.

NOTES: Monitor Inputs – Optional

(DIN Rail Mount w/serial connection to CM or 300 Series PID control input #2)

Monitor Inputs:
System maximum of 15 monitor points made up of FDC 300 Series loop control input #2, FDC-IO Monitor cards or combination of both.

The FDC-IO modules are DIN rail mount 8-channel isolated thermocouple, RTD (6-channel) or 8-channel linear mA or VDC input modules. A maximum of 2 Monitor input cards may be specified.

FDC's 300 Series loop control's input #2 may be configured as a monitor point with input #2 supporting linear mA or VDC inputs.

Each monitor point is configurable for Alarm setpoints and for profiles step advance "wait for" as well as Delta SP logic

Information on the FDC-IO modules may be found at the following Link: http://www.futuredesigncontrols.com/FDC-IO_Modules.html

NOTES: Power Supply – Optional

Power Capacity Required (Watts) - A base system without options requires ~30 watts of 24Vdc power. The 60W power supply offered is sufficient to power all standard and optional components.

Note: The power supply should be used to power MCT-CM components only and not OEM or other end user components or devices.

NOTES: Configurable Control Logic

Profile Functions (ramp/soak)
The MCT-CM provides for a virtually unlimited number of profiles each with up to 99 steps and up to 32 configurable events per step. Profile functions Start (from any step #), Hold, Continue, Halt (end) are initiated from the display or from DI. Also standard is Step logic for Holdback (Guaranteed Soak) "Wait For" and Delta SP logic per step.

- The "Wait For" step advance logic includes digital inputs and/or loop / monitor points achieving a "wait for" SP.
- The Delta SP may be enabled per step to provide a SP offset (delta) added or subtracted to the highest or lowest loop and/or monitor value sent to the target loop control(s).

Profile selection by serial bar code scan is supported. Refer to section on serial communication.

Configurable Loop Control:
Each of the loop controls PID settings may be configured via the operator interface as well as be used as components in Cascade logic blocks.

Alarm Configuration:
Alarm Annunciation and History File
All alarms except those configured as silent* are annunciated on the display command bar, offer configurable "buzzer" volume and may be reset and cleared by the operator. All alarms, except "silent" are saved in a daily alarm history file with all Alarm configurations allowing for both delayed on and off times.

System Alarms
System Alarms include loss of communication with loop & monitor points, configurable call back, audible and more; may be mapped to one of the digital outputs (maximum of 32 digital outputs).

DIN Control Loop Alarms (a maximum of 30 alarms for loop & monitor):
The loop controls (up to 10) may have up to 30 alarms configured per loop. The alarms may be configured as latching or not, silent*, inhibit logic and to defeat any digital output. Alarms may be mapped to one of the digital outputs (maximum of 32 digital outputs).

Alarm types include:
- Process, Deviation and Percent Output with all configurable as low, high or both.

Monitor Input (a maximum of 30 alarms for loop & monitor):
Each channel may be configured as Process high or low alarms, latching or not, silent*, inhibit and/or to defeat any digital output. Alarms may be mapped to one or more of the standard or optional digital outputs (max of 32 digital outputs)

*Silent Alarms
Alarms may be configured as "silent" with no annunciation of the alarm action nor is it written to the alarm history file; Silent Alarms may be viewed as control output logic.

Digital Input and Output (DIO) Configuration
Digital Outputs (DO): CPU includes 8-digital output (6-relay & 2-TTL) with optional 8 or 16 output card (24VDC or relay); max of 32 DO.

All Digital Outputs (DO) offer:
- Configurable cycle times to pulse an output or no cycle - on 100%
- Configurable time delay to automatically turn DO on as well as off
- Configure DO with counter & alarm message (time on or cycles)

Digital Outputs are configurable as:
- Alarms: Loop, monitor point or digital input alarms
- Event outputs: may be used in ramp soak profiles or when a profile is not running may be enabled/disabled manually.
- Profile Status Output status: run, hold & step change
- Digital Input Outputs: Output active as a result of Digital Inputs

Digital Inputs (DI): CPU includes 8-digital inputs (24VDC).
Optional 8- digital input module (24VDC or 120VAC), maximum of 16 DI.

Digital Inputs are configurable as: (all DI offer configurable time delay (timers) to recognize the DI occurrence.
- Alarm Input
- Alarm Reset (applicable to alarms configured as "latching")
- Data Acquisition start / stop.
- Profile functions; start, hold, continue, end (all events off) and step "wait for" logic.
- Control Output: A DI can enable a DO.
- Defeat Logic; disable/defeat specific or groups of DO and/or DI
- Halt Defrost.
- Redundancy: enable a product redundancy Load Timer
- Disable Communication to loop control SP
  - SP communication disabled: SP values may be changed at loop controls while still monitoring & data log all values.

NOTES: Security and User Audit Trail

The MCT-CM security model provides tools to add up to 30 users to the system. Each user must have a unique ID, full name and password. Four user levels are provided, System, User, Supervisor and Administrator levels. Specific access rights to over 40 functions can be assigned to each user level as well as password aging and authentication may be implemented globally (applies to all user groups).

Operator Audit Trail
With Security enabled the Operator Audit Trail will display all user actions that affected the system for any given day. Each time a user take an action that affect the operation of the system (changing a set point, start/stop data logging, changes an alarm set point, acknowledge and alarm, etc.), the action is written to a file with a time/date stamp along with the user name or "system" if a user is not logged in. Audit Trail files are encrypted and may be viewed on the display or exported and viewed the free PC based Orion Data Viewer software.

NOTES: Analog I/O: Optional (DIN Rail Mount to CM)

Analog I/O (Input/Output):

- Remote Setpoint: Cards accept two 4-20mA or 2-10Vdc inputs to be transmitted as SP values via the serial link to specific DIN controllers.

- Retransmission: Cards have one 4-20mA or 0-10VDC signals configurable as PV, Setpoint or % Out values from specific DIN controls.

- Maximum number of cards is 7:
14 remote set point inputs* and 7 retransmitted PV, Setpoint or % Output values. Refer to the order matrix notes on the maximum number of expansion modules. If other optional cards are specified utilizing all 7 Analog cards is not possible. (* The maximum number of loops is 10.)

NOTES: System Configuration

MCT-CM has an embedded configuration program and normal runtime allowing full customization & configuration directly from the GUI.

OEM Configuration Program allows:
- Number of Loop Controls, Monitor Points, Digital Inputs, Digital Outputs, Events and Analog I/O with naming assignment for all types.

- Company name, address and telephone are configurable and seen on the system start up splash screen and header on the view only web page.

- Main startup view and menu/features configuration (enable/disable).

Runtime Configuration
The remaining system configuration is completed from the runtime application.

Configuration Import/Export
Simple Import/Export function allows complete configurations to be quickly & easily imported to other MCT-CM control systems via the USB port.

OEM Configuration of "Reset Defaults" button
To minimize support MCT-CM offers an OEM configurable "Reset Default Settings" utility to allow the end user to reset the system configuration to the OEM's configuration when shipped.

NOTES: Loop Controls (Serial connection to CM)

Control Module (CM) Software for Loop Controls:
The MCT-CM supports up to 10 PID loop controls and up to 15 monitor points. Monitor Points may be the 2nd Analog Input standard on FDC's 300 Series loop controls or the FDC-IO modules. The FDC-IO modules are available as 8-T/C, 6-RTD, 8-mA or 8-VDC inputs.

The **CM22 & CM30 software** allows connection to Future Design Controls 300 Series panel mount & DIN Rail Mount C22 loop controls..

Loop controllers are ordered separately.

The FDC 300 Series is available in 1/32, 1/16, 1/8 and 1/4 DIN sizes with DIN rail mounting available for both the 1/32 and 1/16 DIN sizes.

The C22 is a DIN Rail mount PID loop control. Information on these Series controllers may be found at the following links:
http://www.futuredesigncontrols.com/300.HTM
http://www.futuredesigncontrols.com/C-Series.HTM

NOTES: LAN Ethernet Communication (connection to Display)

The MCT-CM as standard offers LAN connectivity through an Ethernet port located on the touch screen display.

The LAN features include email/SMS messaging on alarm, LAN based FTP, cloud based FTP & Data Streaming, create emails, email opened data, alarm or audit trail files, remote access (web and VNC embedded servers) and national time server time synchronization as standard. The web and VNC servers allow remote access using a PC, tablet or other smart devices.

NOTES: Modbus Communications (Slave to Master)

The MCT-CM includes Modbus RTU via serial RS485 and Ethernet TCP/IP ports on the touch screen display to connect to 3rd party Modbus master devices. Refer to the MCT-CM Communication section of the user manual.

NOTES: Serial Communication Modules FC6A-PC1 & FC6A-PC3 Supports Bar Code Serial Communication and a 2nd Touch Display

FC6A-PC1 RS232 Serial input for barcode readers:
The FC6A-PC1 RS232 serial input option allows the MCT-CM to receive up to 16 characters from a standard compatible serial Barcode reader.

MCT-CM allows the bar code scanner to be configured to select a Profile ramp/soak file or to insert an operator event (message) into a running data log file.

-Bar Code Profile Selection:
Data from the bar code reader will prompt the operator if the scanned profile name should be loaded and started.

-Bar Code Data Logging Operator Event Input
Data from the bar code reader will insert operator events into a running historical data file; there is no limit to the number of events that may be entered manually or with a bar code scanner.

FC6A-PC3 Serial RS485 to support a 2nd Remote Display:
The FC6A-PC3 serial port provides the ability to connect a 2nd touch screen display.

FC6A-HPH1 Cartridge Adapter
Specifying the FC6A-PC1 and/or FC6A-PC3 modules will also automatically include the required FC6A-HPH1 cartridge adapter

Note: *As referenced above under Modbus Communications, the MCT-CM includes an RS485 Serial and TCP/IP Modbus ports as standard on the 4.3" and 7" touch screen displays to allow 3rd party software R/W access to specific registers within the system.*

NOTES: Language Configuration

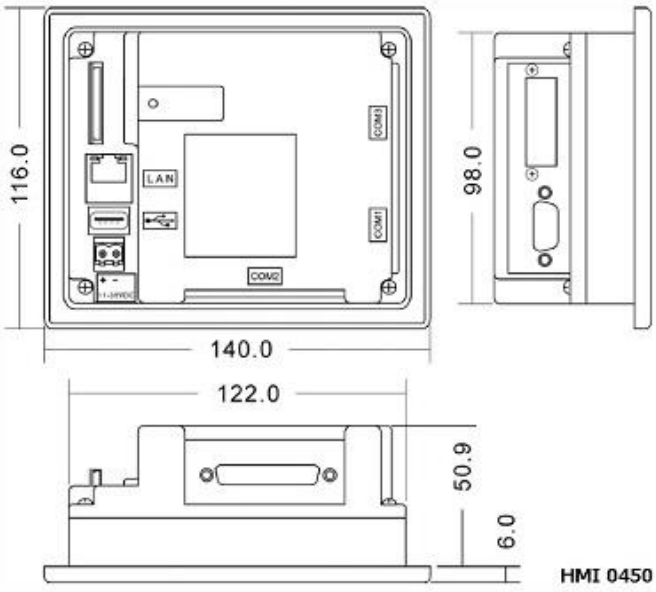
MCT-CM provides a one-button language configuration for the following languages.

✓ Chinese Simplified
✓ Chinese Traditional
✓ English
✓ French
✓ German
✓ Italian
✓ Japanese
✓ Korean
✓ Portuguese
✓ Russian
✓ Spanish

DISCLAIMER: English is the default language for the MCT control system. All other language selections provided through translation from the English language. FDC does not guarantee the accuracy or validity of alternative language selections and shall not be liable for any damages or losses, whether direct, indirect, incidental, special, consequential or any other damages for misinterpretation of other languages. FDC offers a free, PC based application which allows the end user or OEM to create the translation files for the desired language selection. The translation files can then be copied to the MCT control system in order to provide a more accurate or desired translation.

Display Panel Mounting and Overall Dimensions

FDC 450 4.3” Display

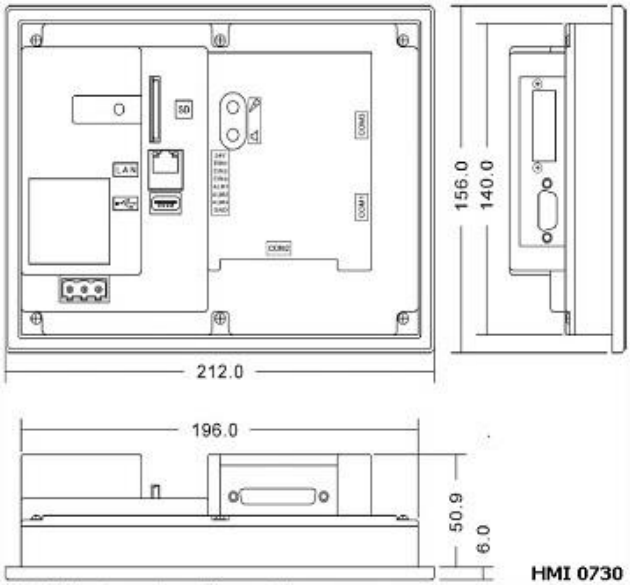


Note: All dimensions are in mm. Tolerance +/- 1 mm.

Panel cutout: 123^{+1} X 99^{+1}

COM1 DB9, Male
COM2 DB25, Female
COM3 Network option
USB port
LAN, Ethernet (RJ45)
Power supply
SD slot

FDC 730 7” Display



Note: All dimensions are in mm. Tolerance +/- 1 mm

Panel cutout: 197^{+1} X 141^{+1}

COM1 DB9, Male
COM2 DB25, Female
COM3 Network option
USB port
LAN, Ethernet (RJ45)
Power supply
SD slot

FUTUREDESIGN CONTROLS

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