

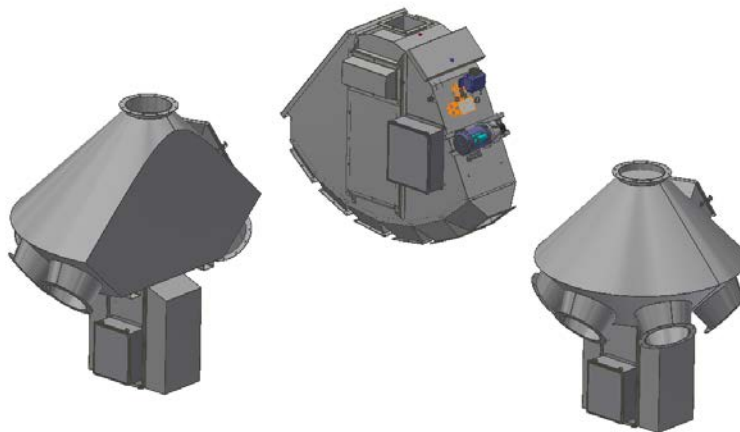


CUSTOM METAL FABRICATORS, INC.

Installation / Operation Instructions

Power Select

Ver. 3.0



(For serial # 85010 and above)

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1 Introduction

- 1.1** The CMF Power Select is a semi automatic hydro-electric positioning system for the CMF "TH" (Turn Head), "HH" (Head House), and "PD" (Pendulum) series distributors. The heart of this system is a micro PLC (Programmable Logic Controller) that controls and tracks the movement and location of the inner spout. The PLC accepts input from the human operator via a 3.5" touch screen HMI (Human Machine Interface) at the operator control panel or from a 3rd party automated system. Once a position is selected by the operator or automated system, the PLC compares the destination to the current location and determines a direction of travel selecting the shortest route on full round models. At this point, the PLC engages the hydraulic system and raises the inner spout. Once the inner spout is raised, it then rotates to the position selected and lowers into the outlet stub. The CMF Power Select incorporates several operation, safety, and diagnostic routines into the programming to inform the operator of the current status of the machine.
- 1.2** From a controls standpoint, all of the CMF series distributors are identical. This allows for simple integration of multiple units at the same facility. The following sections describe how to install various configurations of the Power Select and how to operate and maintain the system.
- 1.3** This version of the Power Select has multiple options for controlling and monitoring the unit. The default setup uses a standard Ethernet connection directly from the HMI to the Power Select. Other options include, but are not necessarily limited to:
- Controlling the Power Select without the HMI
 - Connecting the Power Select and HMI to an Ethernet network for remote monitoring / control
 - Controlling more than one Power Select using only one HMI (the HMI can be easily programmed for multiple units and scaled with the touch of a button)
 - Other connections (see [section 5](#))

Note: Any configuration other than the default 1:1 connection will require connections through an Ethernet switch. The recommended max length of any single run of Ethernet is 320' although it has been known to function without issues at longer distances. One way to easily add more length to Ethernet is to install an unmanaged switch at the first 320' and continue from there.

2 Installation

2.1 The CMF Power Select can be ordered as a complete unit factory installed on a new distributor, or by itself to be retrofit to an existing “TH” distributor installation in the field. Section 2.2 details a factory prepared unit. Section 2.3 details a field installation.

2.2 Factory Installed Unit

- 2.2.1 Upon receipt of the distributor, check for visible signs of damage that may have occurred during shipment. These include scratched paint, dented housing, oil leaking from the unit, etc.
- 2.2.2 Hang the distributor making sure that all outlet spouts are adequately supported to prevent distortion of the distributor housing.
- 2.2.3 Mount the operator control panel at the desired location. It is recommended to shield the screen from direct sunlight. Connect the communication cable between the operator control panel and the main panel (located on the Power Select). If integration into a network is desired, connect the cables to an Ethernet switch. Shielded CAT5e or higher cable is recommended for this connection. See [dwg 502950-E](#) for details.
- 2.2.4 Connect the power supply wires to the terminals provided in the main panel and the operator control panel. See electrical schematics for details.
- 2.2.5 Turn power on to the unit and the operator control panel.
- 2.2.6 Installation is complete; proceed to section 3, Operation.

2.3 TH Series Field Installation

- 2.3.1 Upon receipt of the Power Select, check for visible signs of damage that may have occurred during shipment. These include scratched paint, dented housing, oil leaking from the unit, etc.
- 2.3.2 Remove the current distributor control device and install the provided adaptor into the inner spout support pipe (dwg [503003-F](#)). **The adaptor MUST be welded to the support pipe. DO NOT drill a hole through the adaptor and use a bolt to attach the adaptor.** A bolted adaptor would allow too much “play” in the inner spout and the unit would not function properly. The existing hole in the support pipe is for manual control only (i.e. cable control). If required, the inner spout support pipe can be unbolted and removed from the distributor to weld the adaptor in place.
- 2.3.3 Remove the access covers from the Power Select.
- 2.3.4 Locate and drill (4) 7/16” diameter holes in the bottom of the distributor using the supplied dimensions (dwg [503003-F](#)), or use the Power Select frame as a template.
- 2.3.5 Raise the Power Select unit up to the bottom of the distributor, aligning the inner spout support pipe adaptor shaft with the hollow bore and keyway in the gearbox, making sure the square key is in place. Insert (4) 3/8 inch bolts through the holes in the distributor bottom and through the holes located in the top of side frames on the Power Select.
- 2.3.6 Thread the supplied “encoder bolt” assembly (dwg [503003-F](#)) through the bottom of the gear box into the support pipe adaptor and tighten.
- 2.3.7 Carefully slip the encoder shaft into the bolt with the flat area facing the setscrew in the bolt head. Tighten the setscrew. **Note:** *It is important that the encoder is mounted properly so that it can't slip, since this is how the PLC determines the spout position.*
- 2.3.8 Attach the “encoder tether” to the frame of the Power Select and to the encoder bracket with ¼” bolts and tighten.
- 2.3.9 Connect the loose M12 cable to encoder. **Note:** *This is a keyed connector. It must be rotated properly or it will not plug in.*

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- 2.3.10 Mount the operator control panel at the desired location. It is recommended to shield the screen from direct sunlight. Connect the communication cable between the operator control panel and the main panel (located on the Power Select). If integration into a network is desired, connect the cables to an Ethernet switch. Shielded CAT5e or higher cable is recommended for this connection. See [dwg 502950-E](#) for details.

- 2.3.11 Connect the power supply wires to the terminals provided in the main panel and in the operator control panel. See electrical schematics for details.

- 2.3.12 Turn on power to the main panel, and the operator control panel.

- 2.3.13 In order to make the adjustments needed for the system to function properly, it will be necessary to manually operate the unit. Manually moving (jogging) the Power Select is accomplished by starting the hydraulic pump and then pushing or pulling the red manual override disks located on the ends of the solenoid valves. (Fig 1) **Note:** *You will notice that it is much easier to push the valves than to pull them. This is normal.*

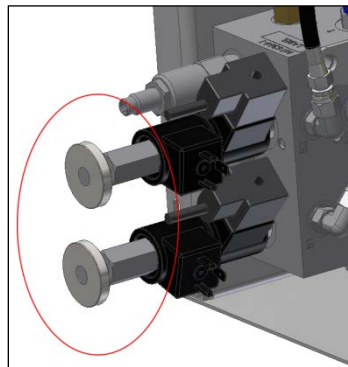


Fig. 1: Solenoid Valve Override

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2.3.14 Remove the cover from the main electrical panel and locate the motor contactor on the topmost terminal strip on the left side. In the center of the motor contactor is a blue manual override switch. Slide this manual override to the left to engage the contactor. (Fig 2) As long as this override is held, the hydraulic pump will run, supplying hydraulic pressure to the system. With the pump running, use the solenoid valve override controls to move the inner spout as outlined in the previous section. **Be sure that the inner spout is all the way UP before rotating.**

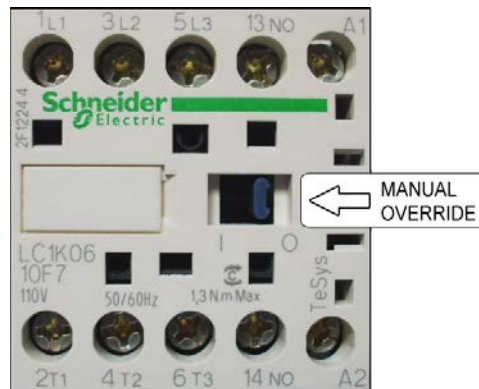


Fig. 2: Motor Contactor

2.3.15 With the lift cylinder retracted (down position), check the position of the down proximity sensor. If needed, adjust the down proximity sensor block to a point where the LED light on the sensor comes on and the block completely covers the face of the sensor with a maximum 1/16" gap between the sensor and the block. (Fig. 3) **Note:** *Intrinsically safe sensors are opposite meaning the light will come on when the sensor leaves the block, and the light will go off when the sensor is in front of the block.*

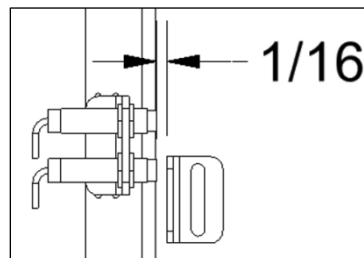


Fig. 3: Proximity Sensors

2.3.16 Jog the Power Select (UP) until the lift cylinder is fully extended (up position), check the up proximity sensor as outlined above.

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- 2.3.17 Jog the Power Select (ROTATING) until the inner spout is aligned with the **number one** outlet (dwg [503003-G](#)). Jog the inner spout (DOWN) until the lift cylinder is fully retracted (down position). Ensure that the inner spout has engaged the locator ring and the outlet stub.
- 2.3.18 It is now time to “teach” the PLC the position of each stub outlet. Section 4.1 describes this procedure. At this point it is recommended to read through section 3, Operation, before continuing the setup procedure.
- 2.3.19 After teaching the outlets, installation is complete; refer to section 3 for normal operation.

3 Operation

3.1 Operator Control Panel

- 3.1.1 The operator control panel consists of an electrical enclosure and the HMI (Human Machine Interface). The HMI is a touch screen interface that allows the operator to interact with the machine.
- 3.1.2 To navigate the HMI, there are buttons displayed on the screen. To activate a button, simply touch it lightly. Some buttons have a built in delay. Delay-type buttons must be touched and held for 1 second before the action will execute. There are also textboxes to display and input data. Just like a button, touch the textbox to edit the value. The “CMF” logo at the bottom of the screen with either take you to the “MENU” screen, or back to the “HOME” screen depending on what screen is currently displayed. Touch the banner at the top of the screen at any time to view messages.

3.2 Power Up

- 3.2.1 After the unit is installed, and power is turned on to the main panel and the operator control panel, the HMI will boot to the “Welcome” screen.
- 3.2.2 Once the operator closes the welcome screen, the HMI will display the “Home” screen (Fig 4). From the “Home” screen, the operator can see the current position of the inner spout(s) and access other screens by interacting with the buttons.

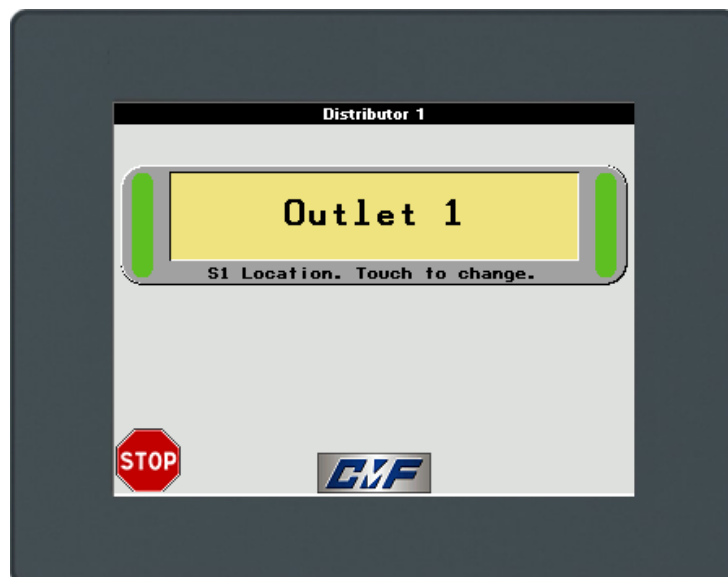


Fig. 4: Home screen

- 3.2.3 If the machine is booting up for the first time, or if any fault has occurred, the operator may see the “Machine Stop” alarm banner and a popup window with pertinent information about the fault. If the “Fault Code” popup is not visible, but the alarm banner is being displayed at the top of the screen, the operator can touch the banner to display the fault code. Touching the banner at the top of the screen will always display current information about the unit including any system faults, spout specific faults (for 2 spout units), access to the list of distributors if controlling more than one unit, and whether or not the unit is under external control from another system.



Fig. 5: Alarm/Fault Code

3.3 Selecting an Outlet

- 3.3.1 To change the position of the spout, press the button on the “Home” screen that corresponds to the spout you want to move.
- 3.3.2 From the “Outlet Selection” screen (Fig. 6), choose the outlet number that the spout should move to and **press the button for at least 1 second**. *This delay acts as an interlock to keep from accidentally changing the outlet.* After the button is pressed, the “moving” indicator will appear on the screen. When the inner spout has reached its destination, the button for the corresponding outlet will turn green and the “moving” indicator will disappear.



Fig. 6: Outlet Selection screen

4 Advanced HMI operations

4.1 Logging In

4.1.1 For advanced setup and maintenance, the operator must “Log In”. From the “Home” screen, touch **and hold** in the lower right hand corner of the screen until the “Login” screen is displayed (about 3 seconds). Touch the “Name” textbox and type the word “MANAGER” in upper case, and then press the “Enter” button. Touch the “Password” textbox and type the word “CMF” in upper case. Touch the “padlock” icon to login and confirm that the “Current User” field has changed to “MANAGER”. Touch the “home” icon to return.



Fig. 7: Invisible Button

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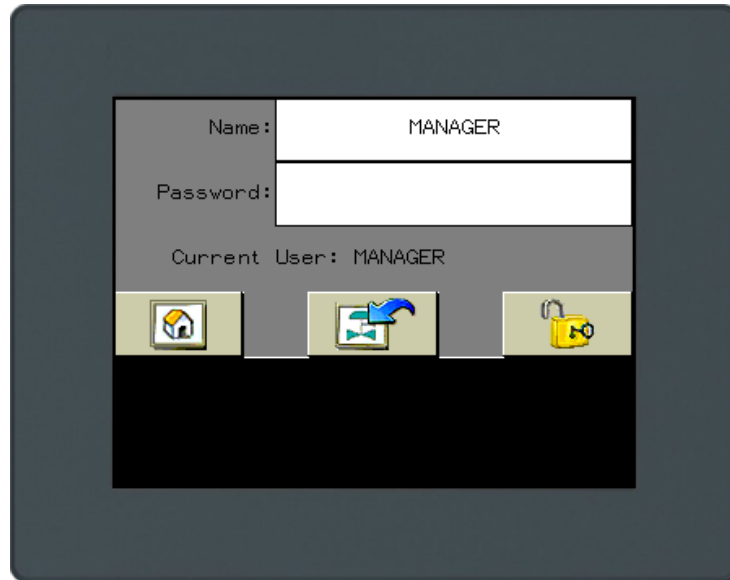


Fig. 8: Login Screen

- 4.1.2 After successfully logging in, a button will show up on the “Home” screen. Use it to enter the “Setup” screen.

4.2 Teaching Outlets

- 4.2.1 In order for the PLC to direct the spout to the proper outlet, it is required to “teach” each position and store these set points into memory.
- 4.2.2 From within the “Setup” screen, touch the “Maintenance Mode” checkbox to disable the machine automation.
- 4.2.3 Confirm that the “Number of Outlets” textbox matches the number of outlets on the distributor.
- 4.2.4 Touch the setup button for the spout being configured. For example, on a single-spout distributor, touch the “S1 Setup” button.
- 4.2.5 With the inner spout seated in the **number one** outlet as instructed in section 2.3.17. Touch **and hold** the “Set Home Position” button until the “Shaft Position” textbox displays the new value. The default “home” position of the encoder is “45”. This procedure changes the offset of the encoder so that the current inner spout position is the starting point for all other positions. **Note:** *The encoder reads a value from 0-4096. The encoder shaft position is NOT the same thing as the distributor outlet number. For example, with the inner spout at outlet #2, the encoder shaft position might be at a value of 170.*
- 4.2.6 Touch the “Teach Outlets” button.
- 4.2.7 Each outlet has a unique system identifier. For instance, (Inner Spout 1: Outlet 1) is labeled “H101”. Or (Inner Spout 2: Outlet 10) is labeled “H210”.
- 4.2.8 In order to “teach” the current outlet as “position one”, either touch **and hold** the “H101” button until the corresponding value changes or touch the textbox and enter the value manually. Jog the inner spout to the next outlet as described in section 2.3.
- 4.2.9 Repeat the procedure from section 4.2.8 for the remaining outlets, confirming that each outlet has a unique value, and that these values increment from smallest to largest. **Note:** *The values must be in order with each one being larger than the last. There can be no duplicate values. For example, (45, 170, 295, 420, 545, 670) is an acceptable range. None of the values should be “0”.*
- 4.2.10 Touch the “Backup to HMI” button. This will store the data in the HMI in case the PLC would ever need to be replaced. Touch the “Backup PLC” button. This will store the data in the PLC persistent memory area.
- 4.2.11 Touch the “Log Out” button.
- 4.2.12 Configuration is complete. Refer to section 3 for normal operation.

5 Integration

5.1 If required, the power select can be controlled by 3rd party hardware. There are 4 options available for communicating with the on board PLC.

1. Modbus RTU (serial)
2. Modbus TCP/IP (Ethernet)
3. Ethernet/IP (CIP)
4. Cam switch / Relay control (24vdc signals)

5.2 Modbus Parameters

- Baud rate: 19200
- Data Bits: 8 (RTU)
- Parity Bits: none
- Stop Bit: 2
- Response Timeout: 200ms
- Time Between Frames: 3ms
- @ node address 1

5.3 Supported Modbus Requests

5.3.1

Function	Description
3 (3h)	Read multiple internal registers %MW
6 (6h)	Write single holding register %MW
16 (10h)	Write multiple registers %MW
23 (17h)	Read/Write multiple registers %MW

For more information on Modbus, refer to www.modbus.org

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5.4 Program Memory Objects *(Note: "S2" only applies to dual spout units)*

Address	Symbol	Description	Access	Required
%MW0	CONTROL_TYPE	Type of input control. Gets set by the program by sending "RESET" from respective device. <ul style="list-style-type: none"> • CMF / HMI = "0" • Ethernet/IP = "1" • Cam/Relay = "2" • Modbus / Other = "3" (Must be set manually) 	READ/WRITE	X
%MW1	S1_OUTLET_SELECT	Spout 1 outlet select. Set this MW to the corresponding outlet position (101-130) to change the position of the spout.	READ/WRITE	X
%MW2	S2_OUTLET_SELECT	Spout 2 outlet select. Set this MW to the corresponding outlet position (201-230) to change the position of the spout.	READ/WRITE	IF DUAL SPOUTS
%MW5	NUM_INNERSPOUTS	Number of inner spouts in the distributor. Either "1" or "2".	READ/WRITE	
%MW6	NUM_OUTLETS	Total number of outlets. Set this MW to match the number of outlets on the distributor.	READ/WRITE	
%MW7	DISTRIBUTOR_TYPE	Type of distributor. (Flat Back= "1", Full Round= "2", Pendulum= "3", Head House= "4").	READ/WRITE	
%MW13	S1_CURRENT_OUTLET_ID	Spout 1 current outlet ID = 101-130 if spout position matches one of the outlet positions.	READ ONLY	
%MW23	S2_CURRENT_OUTLET_ID	Spout 2 current outlet ID = 201-230 if spout position matches one of the outlet positions.	READ ONLY	
%MW30	SYSTEM_FAULT_CODE	System Fault code for diagnostics. Gets reset to "0" by the program with "RESET". Refer to Fault Code table for details.	READ ONLY	X
%MW31	RESET	Set to "1" to reset the machine. Gets reset to "0" by the program.	READ/WRITE	X
%MW32	MACHINE_STOP	Gets set to "1" by the program if a system fault has occurred. Gets reset to "0" by the program with "RESET".	READ ONLY	X
%MW33	MAINTENANCE_MODE	Set to "1" to bypass automation and allow for manually moving of the inner spouts. Gets reset to "0" by the program with "RESET".	READ/WRITE	
%MW35	E_STOP	Set to "1" to disable the machine. Gets reset to "0" by the program with "RESET".	WRITE	X

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Address	Symbol	Description	Access	Required
%MW38	S1_MOVING	Gets set to "1" if spout 1 is moving.	READ ONLY	
%MW43	S1_AT_DESTINATION	Spout 1 is at its destination and in the hole. Gets set to "1" by the program when the condition is true. Also energizes relay output #9 on the PLC.	READ ONLY	X
%MW44	S1_FAULT_CODE	Spout specific fault code for spout 1 diagnostics. Gets set to "0" by the program with "RESET" or "S1_RESET".	READ ONLY	IF DUAL SPOUTS
%MW45	S1_RESET	Set to "1" to reset spout 1 fault. Gets set to "0" by the program.	WRITE	IF DUAL SPOUTS
%MW52	S2_MOVING	Gets set to "1" if spout 2 is moving.	READ ONLY	
%MW57	S2_AT_DESTINATION	Spout 2 is at its destination and in the hole. Gets set to "1" by the program when the condition is true. Also energizes relay output #7 on the PLC expansion module.	READ ONLY	IF DUAL SPOUTS
%MW58	S2_FAULT_CODE	Spout specific fault code for spout 2 diagnostics. Gets set to "0" by the program with "RESET" or "S2_RESET".	READ ONLY	IF DUAL SPOUTS
%MW59	S2_RESET	Set to "1" to reset spout 2 fault. Gets set to "0" by the program.	WRITE	IF DUAL SPOUTS
%MW60	MOVING	Gets set to "1" when either spout is moving.	READ ONLY	
%MW67	HEARTBEAT	Toggles from "0" to "1" every 1 second. Can be used with a timer to confirm the presence of the machine on the network.	READ ONLY	
%MW101-130	H101-H130	Spout 1 outlet positions: Used to store the unique encoder position of each outlet.	READ/WRITE	X
%MW147	S1_USER_DISABLE	Set to "1" to disable operation of spout 1. Set to "0" to enable operation. This MW is not affected by any "RESET" command and should only be used if more than ONE inner spout.	READ/WRITE	IF DUAL SPOUTS
%MW148	S2_USER_DISABLE	Set to "1" to disable operation of spout 2. Set to "0" to enable operation. This MW is not affected by any "RESET" command and should only be used if more than ONE inner spout.	READ/WRITE	IF DUAL SPOUTS
%MW201-230	H201-H230	Spout 2 outlet positions: Used to store the unique encoder position of each outlet.	READ/WRITE	IF DUAL SPOUTS

5.6 Ethernet

5.6.1 The default network parameters for the Ethernet connection are shown below. These parameters can be changed by connecting the PLC to a switch/hub and entering the IP address in a standard web browser such as Google Chrome or Mozilla Firefox. If a switch is not available, a 1:1 connection can be established with a computer provided the computers IP address is set to static and configured to use the same subnet mask as the PLC.

5.6.2 Default network parameters

PLC IP address: 192.168.1.51

HMI IP address: 192.168.1.50

Subnet mask: 255.255.255.0

5.6.3 Changing the PLC network parameters

Enter the current IP address of the PLC in the web browser address bar. Enter the username and password. Username: USER Password: USER. Once logged in, browse to the “Maintenance” tab and click “Post Conf” on the left side of the page. You can now edit the network parameters. Be very careful when editing the post file and double check your entry before clicking on the “Save” button. **For the new settings to take effect, a power cycle of the PLC is required.**

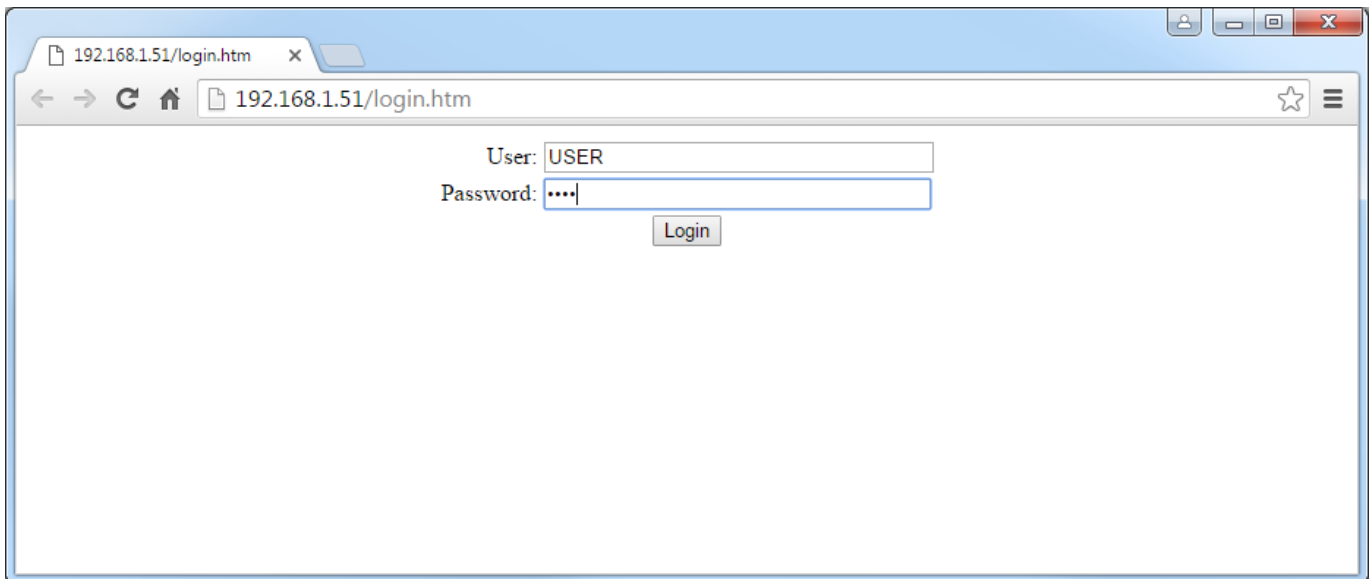


Fig. 9: PLC login



```
Load Save Post Conf loaded

# TM241CEC24R / Ethernet_1 / IPAddress
# Ethernet IP address
id[45000].pos[7].id[111].param[0] = [192, 168, 1, 51]

# TM241CEC24R / Ethernet_1 / SubnetMask
# Ethernet IP mask
id[45000].pos[7].id[111].param[1] = [255, 255, 255, 0]

# TM241CEC24R / Ethernet_1 / DeviceName
# Name of the device on the Ethernet network
id[45000].pos[7].id[111].param[5] = 'PowerSelect'

# TM241CEC24R / Serial_Line_1 / Serial Line Configuration / Baudrate
# Serial Line 1 Baud Rate in bit/s
id[45000].pos[8].id[40101].param[10000].Bauds = 19200

# TM241CEC24R / Serial_Line_1 / Serial Line Configuration / Parity
# Serial Line 1 Parity (0=None, 1=Odd, 2=Even)
id[45000].pos[8].id[40101].param[10000].Parity = 0
```

Fig. 10: PLC network settings

Note: Notice the parameters are separated by commas and NOT periods. The file will be ignored if periods are used. **For the new settings to take effect, a power cycle of the PLC is required.**

5.6.4 Changing the HMI network parameters

In order to modify the HMI network parameters, the user must login as “MANAGER” to the HMI. This process is described in section 4.1.1. After logging in, from the “Home” screen of the HMI, touch the CMF logo at the bottom of the screen to enter the “Menu” screen. Touch the “Network Settings” button. To modify the local network settings for the HMI, touch the “This HMI Network Settings” button. To modify which unit/s that this HMI can communicate with, touch the “Equipment To Control” button. **If you changed the IP address of the PLC, you have to update this parameter in the HMI in order to establish communication to the new PLC address. Note: You cannot change the actual IP address of the PLC from the HMI. This must be done within the PLC web interface as outlined in section 5.6.3, or with a script on an SD card.**

5.7 Power Select Web Interface

5.7.1 The Power Select can be commissioned and controlled via the built in web interface. To access the interface, use a standard web browser and type in the full address as follows:

<IP ADDRESS>:8080/PowerSelect.htm

Note: The address must be typed exactly as shown including “.htm”. (not .html)

For example: 192.168.1.51:8080/PowerSelect.htm

The web interface will now be visible.

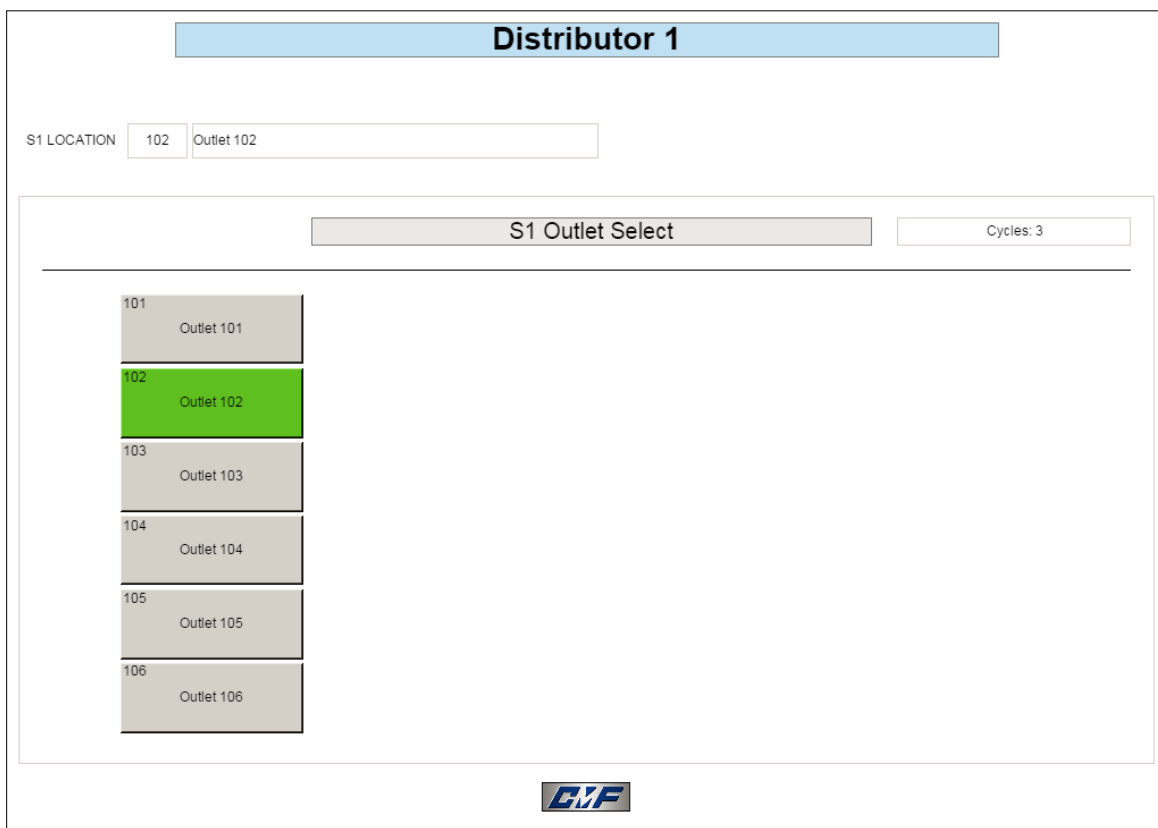


Fig. 11: Web Control Panel

5.7.2 To commission the machine, touch the CMF logo at the bottom to view the menu. Login as “MANAGER” with a password of “CMF” and then press the “Setup” button. To change the name of the distributor, click on the label “Distributor 1” and type in a new name.

5.8 Modbus TCP/IP (Ethernet)

5.8.1 The supported functions for this connection are the same as Modbus RTU. However, the communication cable is plugged into the green Ethernet port directly on the front of the PLC.

5.9 Ethernet/IP adapter

5.9.1 Output assembly instance 150(96h). Input assembly instance 100 (64h). The I/O assembly's are accessed via the Assembly Object (Class ID 04h) using attribute ID 03. The data size is "40" meaning there are 40 consecutive 16-bit unsigned integers in each assembly. Each 16-bit object is accessed by a channel/index number similar to an array.

5.9.2 Example configuration in RSlogix:

1. In the project, right click on the Ethernet equipment and select "New Module"
2. Select "Generic Ethernet Module" and click "OK"
3. In the module properties dialog, set the parameters (IP address of the Power Select, input/output assembly numbers and sizes as shown below)
4. Set "Comm Format" to "Data-INT"
5. The data should now be mapped to variables in the project

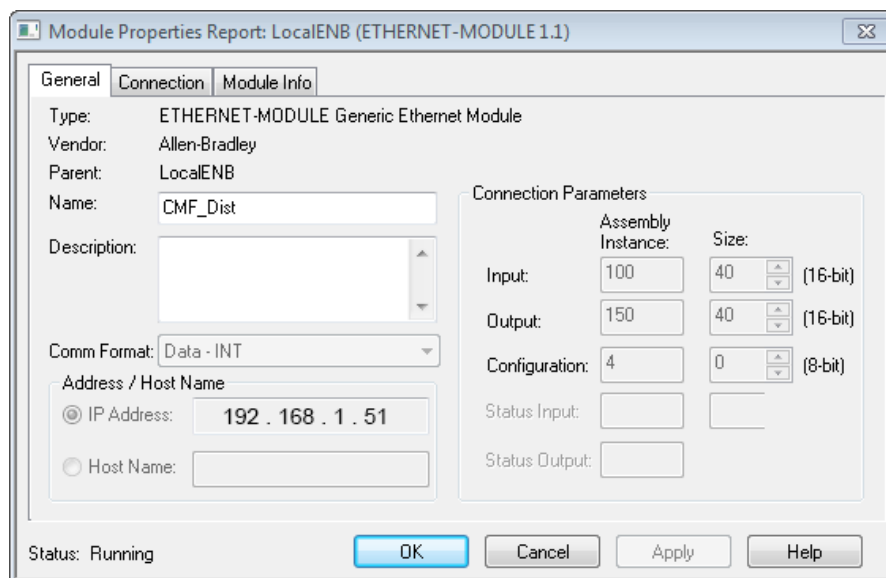


Fig. 12: RSlogix Configuration Example

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5.10 Ethernet/IP Instance Data (Note: “S2” only applies to dual spout units)

Channel	Symbol	Description	Access	Required
0	CONTROL_TYPE	Type of input control. Gets set by the program by sending “RESET” from respective device. <ul style="list-style-type: none"> • CMF / HMI = “0” • Ethernet/IP = “1” • Cam/Relay = “2” • Modbus / Other = “3” (Must be set manually) 	GET	
1	S1_OUTLET_SELECT	Spout 1 outlet select. Set this MW to the corresponding outlet position (101-130) to change the position of the spout.	GET/SET	X
2	S2_OUTLET_SELECT	Spout 2 outlet select. Set this MW to the corresponding outlet position (201-230) to change the position of the spout.	GET/SET	IF DUAL SPOUTS
3	RESET	Set to “1” using a “momentary on” to reset the machine. Gets reset to “0” by the program. Program detects rising edge.	SET	X
4	E_STOP	Set to “1” using a “momentary on” to disable the machine. Gets reset to “0” by the program with “RESET”. Program detects rising edge.	SET	X
5	MAINTENANCE_MODE	Set to “1” using a “momentary on” to bypass automation and allow for manually moving the inner spouts. Gets reset to “0” by the program with “RESET”. Program detects rising edge.	GET/SET	X
6	S1_FAULT_CODE	Spout specific fault code for spout 1 diagnostics. Gets reset to “0” by the program with “RESET” or “S1_RESET”.	GET	IF DUAL SPOUTS
7	S1_RESET	Set to “1” using a “momentary on” to reset spout 1 fault. Gets reset to “0” by the program. Program detects rising edge.	SET	IF DUAL SPOUTS
8	S2_FAULT_CODE	Spout specific fault code for spout 2 diagnostics. Gets reset to “0” by the program with “RESET” or “S2_RESET”.	GET	IF DUAL SPOUTS
9	S2_RESET	Set to “1” using a “momentary on” to reset spout 2 fault. Gets reset to “0” by the program. Program detects rising edge.	SET	IF DUAL SPOUTS
20	NUM_INNERSPOUTS	Number of inner spouts in the distributor. Either “1” or “2”.	GET	
21	NUM_OUTLETS	Total number of outlets.	GET	
22	DISTRIBUTOR_TYPE	Type of distributor. (Flat Back= “1”, Full Round= “2”, Pendulum= “3”, Head House= “4”).	GET	

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Channel	Symbol	Description	Access	Required
23	S1_CURRENT_OUTLET_ID	Spout 1 current outlet ID = 101-130 if spout position matches one of the outlet positions.	GET	
24	S1_AT_DESTINATION	Spout 1 is at its destination and in the hole. Gets set to "1" by the program when the condition is true. Also energizes relay output #9 on the PLC.	GET	X
25	S2_CURRENT_OUTLET_ID	Spout 2 current outlet ID = 201-230 if spout position matches one of the outlet positions.	GET	
26	S2_AT_DESTINATION	Spout 2 is at its destination and in the hole. Gets set to "1" by the program when the condition is true. Also energizes relay output #7 on the PLC expansion module.	GET	IF DUAL SPOUTS
27	S1_MOVING	Gets set to "1" if spout 1 is moving.	GET	
28	S2_MOVING	Gets set to "1" if spout 2 is moving.	GET	
29	S1_USER_DISABLE	Set to "1" to disable operation of spout 1. Set to "0" to enable operation. This variable is not affected by any "RESET" command and should only be used if more than ONE inner spout.	GET/SET	IF DUAL SPOUTS
30	S2_USER_DISABLE	Set to "1" to disable operation of spout 2. Set to "0" to enable operation. This variable is not affected by any "RESET" command and should only be used if more than ONE inner spout.	GET/SET	IF DUAL SPOUTS
35	HEARTBEAT	Toggles from "0" to "1" every 1 second. Can be used with a timer to confirm the presence of the machine on the network.	GET	
36	MOVING	Gets set to "1" when either spout is moving.	GET	
37	SYSTEM_READY (old)	Do not use unless existing equipment. This was replaced by "S1_AT_DESTINATION" (Channel 24).	GET	
38	MACHINE_STOP	Gets set to "1" by the program if a system fault has occurred. Gets reset to "0" by the program with "RESET".	GET	
39	SYSTEM_FAULT_CODE	System Fault code for diagnostics. Gets reset to "0" by the program with "RESET". Refer to Fault Code table for details.	GET	X

5.12 Explanation of Operation (Modbus, Ethernet, or Online)

5.12.1 In order for the machine to automate, there are a few parameters that need to be configured. If the Power Select was purchased with a distributor, this step would be done at the factory. These settings can be modified via Modbus or the built in web server.

1. Set the number of inner spouts (MW5)
2. Set the number of outlets (MW6)
3. Set the distributor type (MW7)
4. Store each outlet's unique position (MW101-MWn), where "n" is the last outlet on the distributor (106 for a 6-hole).

5.12.2 Example of a 6-hole flat back distributor with 1 inner spout.

1. Set MW5 = 1 (Number of inner spouts)
2. Set MW6 = 6 (Number of outlets)
3. Set MW7 = 1 (Distributor type)
4. Set MW101 = 45, MW102 = 215, MW103 = 385, MW104 = 555, MW105 = 725, MW106 = 895 (Values used here are just for demonstration purposes, the actual values will be based on the position of the encoder)

Note: The encoder reads a value between 0-4096. None of the outlets should have a position of "0".

In order to set up the distributor, first put the machine in to "Maintenance Mode" (set MW33 to "1"). This will bypass automation and allow manual control of the machine. Next, set the proper values for each outlet position by manually moving the inner spout to each outlet (Section 2.3.13), and then setting each corresponding memory word equal to MW10 which is the current position of the inner spout. Refer to section 4 to gain a better understanding of "Teaching Outlets".

After all memory words and outlet positions are configured, set MW31 to "1" to reset the machine. This will exit "Maintenance Mode" and clear the current fault code. The machine should now be ready for operation as long as there are no other faults (Section 5.12).

To direct the inner spout to outlet #1(101), set MW1 equal to "101". To direct the inner spout to outlet #2(102), set MW1 equal to "102", etc. To get confirmation that the spout has reached its desired outlet, check that MW43 = "1".

5.14 Cam switch / Relay control

5.14.1 Cam switch / relay control uses the physical inputs on the PLC to direct the inner spout to an outlet and to “RESET” the machine. This interface is based on Binary Coded Decimal (BCD) format. Physically, the electrician will route the +24vdc signal from the PLC and route it through a 3rd party PLC, cam switch, relay block, or other equipment to convert it to a BCD format and send that signal back to the Power Select PLC. This option provides basic machine control; however, any advanced functions or commissioning will have to be done using the built in web interface or the HMI.

5.14.2 Example:

- To direct the inner spout to outlet #3, energize inputs 8 and 9.
- To direct the inner spout to outlet #14, energize inputs 9 and 12.
- To “RESET” the machine, energize inputs 8, 9, 10, 11 at the same time.
- When the inner spout has reached its destination, the program will energize output 9 providing feedback that the spout is in position.
- If no inputs are energized and “CONTROL_TYPE” = 2 (cam/relay) then the machine will enter FAULT 15 and/or 16 until “RESET” command is received.

5.14.3 Refer to the target table below for the combination of inputs to energize to direct the inner spout to the desired outlet. **Note:** *Input 12 is only used when there are more than 14 outlets.* See [dwg 502955-E](#) for more details.

OPTIONAL
CAM/RELAY CONTROL
TARGET TABLE

PLC1 INPUTS	OUTLET POSITIONS																RESET	EXP1 OUTPUTS
	1	2	3	4	5	6	7	8	9	10	11	12	13	14				
INPUT 8	X		X		X		X		X		X		X				X	OUTPUT 0
INPUT 9		X	X			X				X			X				X	OUTPUT 1
INPUT 10				X	X	X	X					X	X	X			X	OUTPUT 2
INPUT 11								X	X	X	X	X	X	X			X	OUTPUT 3
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	RESET	
INPUT 8	X		X		X		X		X		X		X		X		X	OUTPUT 0
INPUT 9	X			X	X			X	X			X	X			X	X	OUTPUT 1
INPUT 10	X					X	X	X	X				X	X	X		X	OUTPUT 2
INPUT 11	X									X	X	X	X	X	X		X	OUTPUT 3
INPUT 12		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	OUTPUT 4

NOTE:

1. 1–14 OUTLETS ONLY REQUIRE 4 SIGNALS (ENERGIZE ALL 4 TO RESET THE MACHINE)
2. GREATER THAN 14 OUTLETS REQUIRE 5 SIGNALS (ENERGIZE ALL 5 TO RESET THE MACHINE)
3. OPTIONAL MODULE (EXP1) CAN BE ADDED FOR RELAY OUTPUT OF POSITIONS 1–30 IN BINARY CODED DECIMAL FORMAT.

Fig. 13: Target Table

6 Maintenance

- 6.1** The hydraulic system is sealed from the atmosphere, preventing the leakage of oil or the ingestion of dirt. The oil, a high grade of hydraulic fluid with a -60 degree pour point, is filtered at the factory before installation. It is recommended that the system remain sealed throughout the life of the unit to prevent contaminants from being introduced into the circuits.
- 6.2** The electrical system is comprised mainly of solid state components which require no maintenance over the life of the Power Select, even under severe operating conditions. The few mechanical switches in the system are heavy duty industrial type switches also sized to require no maintenance over the life of the Power Select.

6.3 Annual Maintenance

- 6.3.1 Remove the inspection covers from Power Select and check solenoid cables and sensor cables for signs of chafing or cracks in the insulation and replace as required.
- 6.3.2 Check hydraulic lines and fittings for signs of leakage and correct as required.
- 6.3.3 Clear away any accumulation of dust or material from inside the unit to prevent sticking of the slides.
- 6.3.4 Remove any accumulation of dust or material from the inside bottom of the distributor housing.
- 6.3.5 Inspect all mounting bolts on Power Select for signs of loosening and tighten as required.
- 6.3.6 Check the level of hydraulic fluid in the reservoir.
- 6.3.7 Replace all covers.

7 Troubleshooting

7.1 In the event of an error, the operator will be notified via the “Alarm Banner” and/or the “Fault Code” popup on the HMI (Section 3.2.3). The text will give suggestions on how to correct the problem. If the issue cannot be resolved from the operator control panel, look to the suggestions below for further guidance.

7.3 Fuses

7.3.1 If the distributor is malfunctioning, after a visual inspection, it is recommended to test for blown fuses. Within the main electrical panel, there are four or five cartridge style fuses, depending on distributor configuration, and one main circuit breaker. Within the operator control panel, there is one cartridge style fuse. If the fuse in the operator control panel is blown, the HMI will not be supplied power. For specifications and location of fuses, refer to dwg [502955-E](#).

7.4 Proximity Sensors

7.4.1 If all the fuses were determined to be good, check that the proximity sensors are functioning properly as outlined in section 2.3.15 and 2.3.16.

7.5 No Communication to HMI (Fig.8). In this case, there will be yellow triangles on some of the buttons of the HMI. Known causes of this issue are:

- No power at the Main electrical panel (at the distributor)
- Incorrect communication wiring (use a cable tester to confirm the pin outs of the RJ45 (8P8C) plugs. **The cable must be terminated in accordance with TIA/EIA-568 A or B** or crosstalk will develop and communication will fail. see dwg [502950-E](#))
- Damaged communication wiring
- Damaged equipment

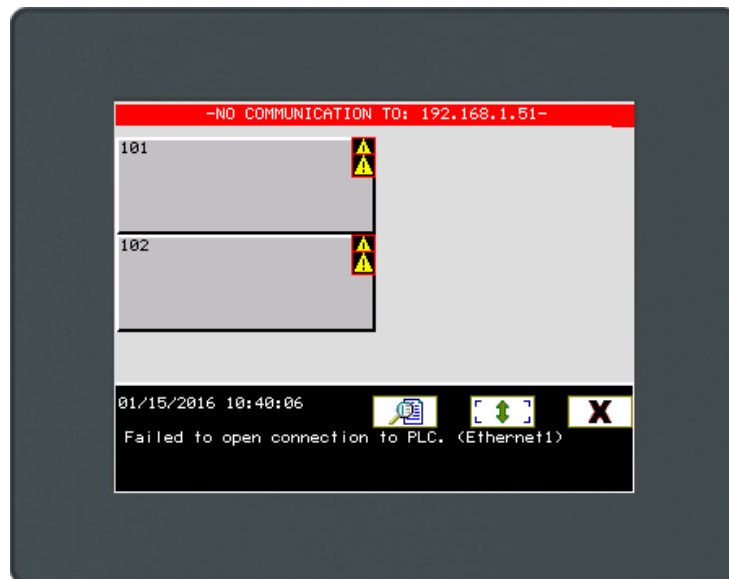


Fig. 14: No communications

7.6 In the case that none of the above suggestions has returned the system to normal operating conditions, it is recommended to contact CMF for further assistance.

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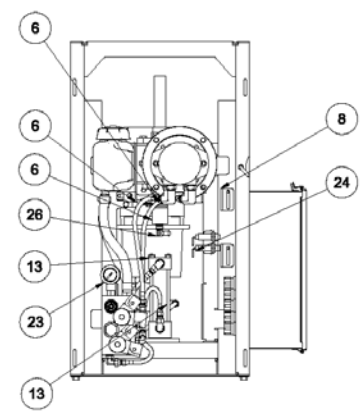
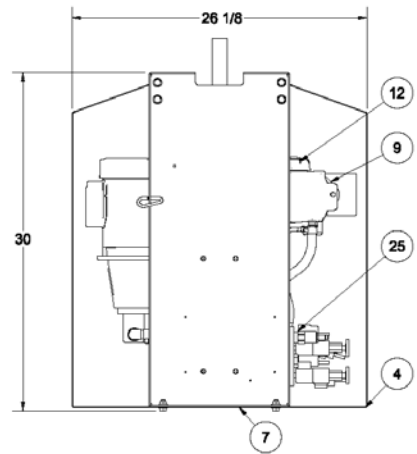
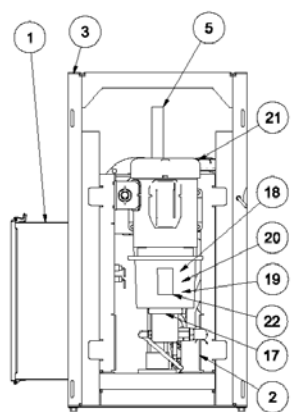
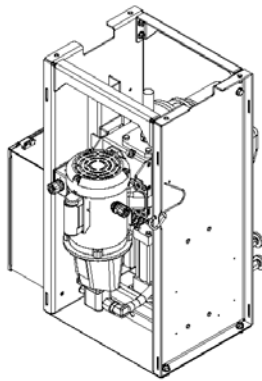
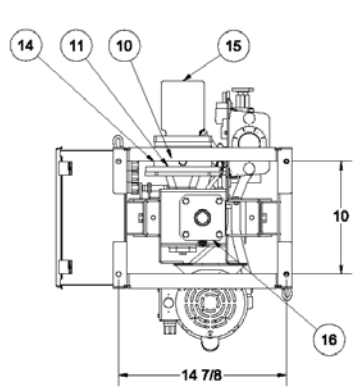
7.7 Fault Codes

Code	Description	Possible Cause	Possible Solution
0	Normal operating condition	-	-
1	Restart after power failure	Loss of power	When power is restored, press "RESET"
2	CANopen bus error	Encoder is offline, loss of 24VDC power, loose wire	Inspect CAN bus wiring and power to encoder.
3	Hydraulic pump timeout	Hydraulic pump ran for more than 3.5 minutes (7 minutes for dual spout)	Check for blockage inside distributor. If pump is running, but no movement, check fuses. Check operation of UP/DOWN sensors.
4	E-Stop	Set by the operator	Press "RESET"
5	Controller not in "RUN"	PLC scan time exceeded timeout period	Contact the factory
6	S1 out of sequence outlets	Outlet set points are not in order from smallest to largest	Set the outlets to the proper values
7	S2 out of sequence outlets	Outlet set points are not in order from smallest to largest	Set the outlets to the proper values
8	S1 proximity sensor malfunction	UP and DOWN sensors were both energized at the same time. Could be a bad sensor	Check the UP/DOWN sensors for blockage and check operation. Replace sensor if needed
9	S2 proximity sensor malfunction	UP and DOWN sensors were both energized at the same time. Could be a bad sensor	Check the UP/DOWN sensors for blockage and check operation. Replace sensor if needed
10	No 24VDC detected	Blown fuse, loose wire, or bad PLC	Use an Ohm meter to check the fuse. Check for loose wires. Contact the factory.
11	S1 has exceeded timeout period	Spout 1 did not reach destination within 3.5 minutes	Check spout for mechanical issues or blockage
12	S2 has exceeded timeout period	Spout 2 did not reach destination within 3.5 minutes	Check spout for mechanical issues or blockage
13	S1 disabled by user	Set by the operator	Toggle the "S1 Disable" feature
14	S2 disabled by user	Set by the operator	Toggle the "S2 Disable" feature
15	S1 destination out of range	S1 outlet select is higher or lower than available positions	If cam/relay, check for correct PLC inputs. Otherwise, confirm equipment is sending correct value to PLC.
16	S2 destination out of range	S2 outlet select is higher or lower than available positions	If cam/relay, check for correct PLC inputs. Otherwise, confirm equipment is sending correct value to PLC.
20	Encoder 1 error	Encoder 1 is not in "Operational" state, loss of 24VDC, loose wire	Inspect CAN bus wiring and power to encoder
21	Encoder 2 error	Encoder 2 is not in "Operational" state, loss of 24VDC, loose wire	Inspect CAN bus wiring and power to encoder
31	Maintenance Mode	Set by the operator	Press "RESET"

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Parts List					
ITEM	PART NUMBER	QTY	DESCRIPTION	STOCK NUMBER	COMPANY
1	MAIN_PANEL	1	POWER SELECT MAIN CONTROL PANEL	-	CMF
2	-010	1	LIFT FRAME	-	CMF
3	-020	1	SUPPORT FRAME	-	CMF
4	-070	2	INSPECTION COVER	-	CMF
5	-030	1	SUPPORT PIPE TO GEARBOX ADAPTOR	-	CMF
6	-090	1	PS03 ENCODER ASSEMBLY	-	CMF
7	-411	1	LOWER COVER	-	CMF
8	-420	2	UP / DOWN TRIGGER	-	CMF
9	-433	1	RESEVOIR MOUNT	-	CMF
10	503021	1	HYD MOTOR TO GEARBOX DRIVE ADAPTOR	-	CMF
11	503022	1	HYD MOTOR TO GEARBOX ADAPTOR RING	-	CMF
12	503102	1	OIL TANK 1 QUART	-	CMF
13	522501	1	CYLINDER 1 1/2 BORE 2 1/2 STROKE 5/8 ROD STYLE 2X	1 1/2MHFF2.5K	SHEFFER
14	534008	1	ADAPTOR MOTOR / GEARBOX	170499	VESCOR
15	529301	1	HYDRAULIC MOTOR 4 CIPR	TC0065AS100AAAA	PARKER
16	526001	1	HMQ818 30:1 1" BORE	HMQ218 30:1	LEESON
17	529910	1	HYDRAULIC GEAR PUMP .75GPM -6SAE PORTS	250-056	BAILEY
18	529921	1	JAW COUPLING 1/2" BORE PUMP SIDE	10421	VESCOR
19	529922	1	JAW COUPLING 5/8" BORE MOTOR SIDE	10424	VESCOR
20	529923	1	COUPLING INSERT	10393	VESCOR
21	529002	1	MOTOR 1/2 HP TEFC 56C 1725 RPM W/ BASE	102907	LEESON
22	529920	1	ADAPTER MOTOR TO HYD PUMP	202-192	BAILEY
23	525101	1	PRESURE GAUGE 0-1500 PSI -04 SAE PORT	15-100-SST-PSI/KPA	NOSHOK
24	528517	2	INDUCTIVE PROXIMITY SENSOR (2WIRE)	XS612B1MAL2	SCHNEIDER
25	529931	1	HYD MANIFOLD FOR PS03	P16364-1	FLUIDTECH
26	503118	1	CANOPEN WIRE 5-WAY 90DEG M12 4M LONG	WK 4.5T-4 / U2436-0	TURCK
27	03211	1	7/16"-20 HEX NUT THIN (UNF)	-	-



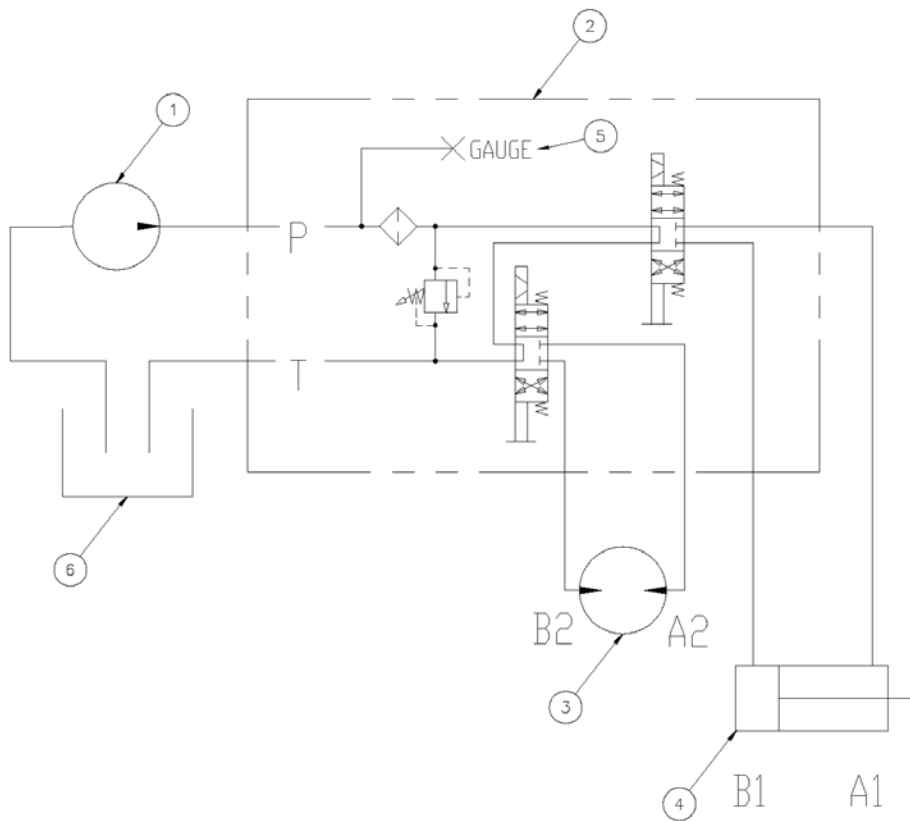
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TITLE			
POWER SELECT COMPONENTS			
DWG NO 503003-B	SHT 1 OF 1	DRAWN CW	REV 3

Installation / Operation Instructions

CMF Power Select Ver. 3.0

1	1	HYDRAULIC PUMP	529910	CMF
2	2	4 WAY MANIFOLD ASSEMBLY	529931	CMF
3	1	HYDRAULIC MOTOR	529301	CMF
4	1	CYLINDER	522501	CMF
5	1	PRESSURE GAUGE	525101	CMF
6	1	OIL TANK	503102	CMF



NOTE:

1. FOR PENDULUM DISTRIBUTOR, ITEM 3 IS REPLACED WITH A CYLINDER.
2. STANDARD CYLINDER STROKE IS 2 1/2". (522501). LARGE DISTRIBUTORS HAVE A 3 1/2" STROKE CYLINDER (522502).



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TITLE

POWER SELECT HYDRAULIC SCHEMATIC

DWG NO 503003-C

SHT 1 OF 1

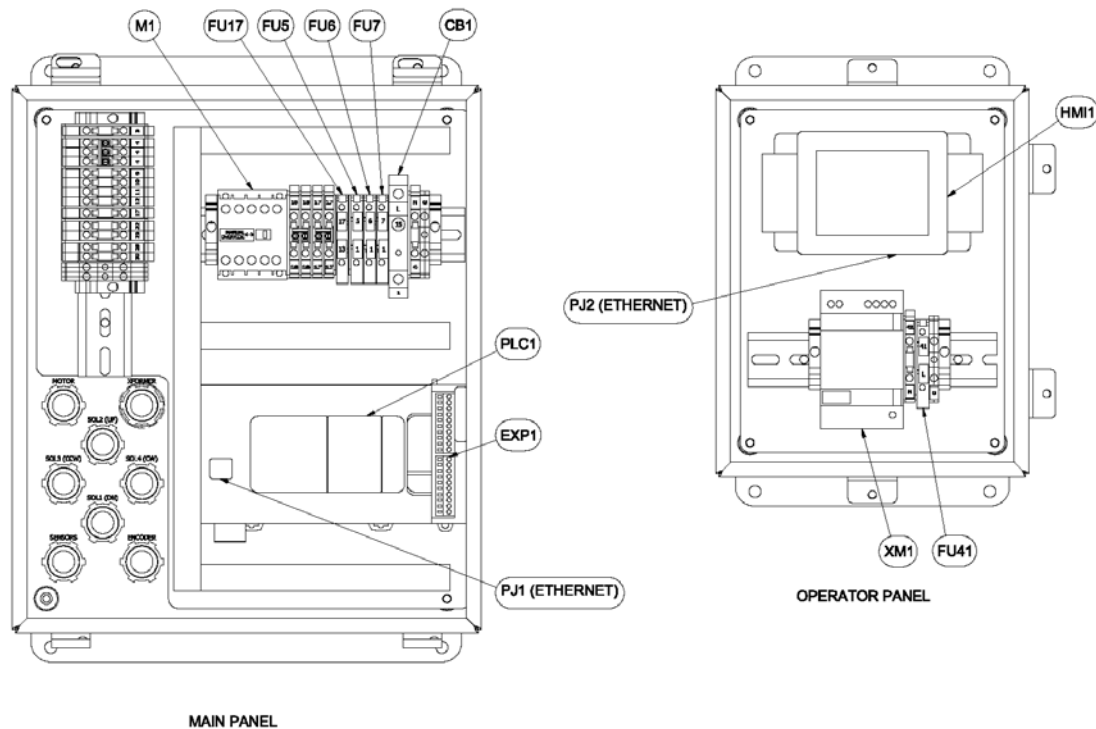
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CW

REV 2

Installation / Operation Instructions

CMF Power Select Ver. 3.0

Parts List						
ITEM	TAG	QTY	DESCRIPTION	PART NUMBER	STOCK NUMBER	COMPANY
1	CB1	1	15 AMP CIRCUIT BREAKER	528108	9080GCB150	SQUARE D
2	FU6,7,17,41	5	FUSE 2A CARTRIDGE STYLE 5X20mm	STOCK	0235002	LITTELFUSE
3	FU5	1	FUSE 3A CARTRIDGE STYLE 5X20mm	STOCK	0235003	LITTELFUSE
4	PRS1,2	2	INDUCTIVE PROXIMITY SENSOR (2WIRE)	528517	XS612B1MAL2	SCHNEIDER
5	M1	1	3 POLE NON REVERSING CONTACTOR	528200	LC1K0610F7	SCHNEIDER
6	MOT1	1	MOTOR 1/2 HP TEFC 56C 1725 RPM W/ BASE	529002	102907	LEESON
7	SOL1-4	4	SOLENOID VALVE	-	-	CMF
8	XM1	1	PHASEO POWER SUPPLY 24VDC 1.2AMP ABL8	503105	ABL8MEM24012	SCHNEIDER
9	CBL1	1	CANOPEN WIRE 5-WAY 90DEG M12 4M LONG	503118	WK 4.5T-4 / U2438-0	TURCK
10	CBL2	1	CABLE FOR ETHERNET CONNECTION	-	-	-
11	ENC1	1	ENCODER SOLID SHAFT	503101	SA36S_19MB_12V3P1C1A_EMJ_SPEC836	EPC
12	PLC1	1	CONTROLLER M241-24IO RELAY ETHERNET CAN	503120	TM241CEC24R	SCHNEIDER
13	HMI1	1	HMI 3 1/2" SCREEN	503106	HMISTU655	SCHNEIDER
14	EXP1	1	EXPANSION MODULE 16 RELAY OUTPUTS (OPTIONAL)	-	TM3DQ16R	SCHNEIDER
15	R1	1	CANopen TERMINATING RESISTOR (BUILT IN TO ENCODER)	-	-	-



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TITLE
POWER SELECT ELECTRICAL
BOM / LAYOUT

DWG NO 502955-E

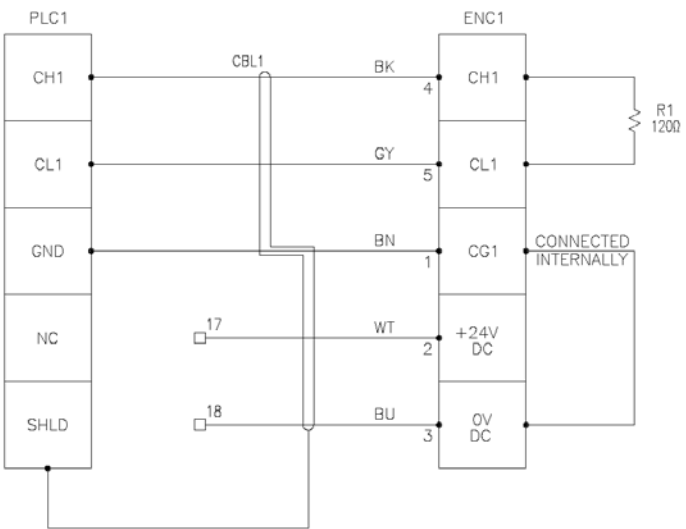
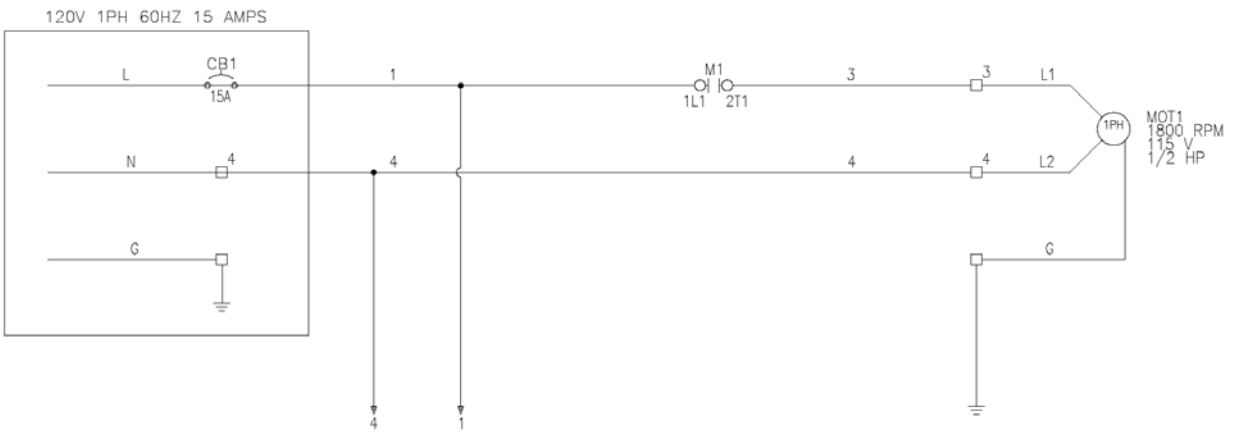
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DRAWN
CW

REV 8

Installation / Operation Instructions

CMF Power Select Ver. 3.0



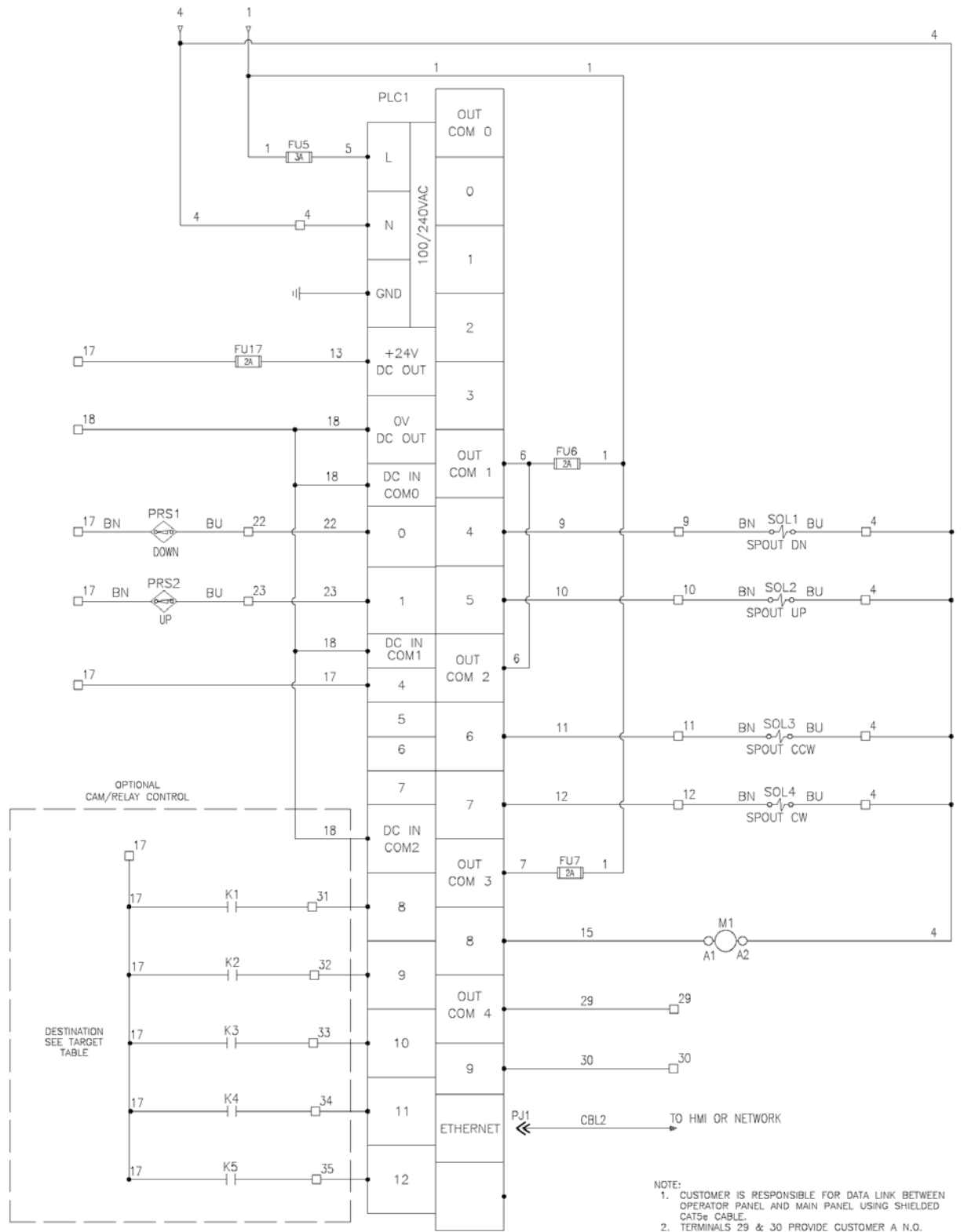
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TITLE
POWER SELECT ELECTRICAL MAIN PANEL

DWG NO 502955-E	SHT 2 OF 4	DRAWN CW	REV 8
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Installation / Operation Instructions

CMF Power Select Ver. 3.0



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TITLE
POWER SELECT ELECTRICAL MAIN PANEL

DWG NO 502955-E SHT 3 OF 4 DRAWN CW REV 8

Installation / Operation Instructions

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OPTIONAL
CAM/RELAY CONTROL
TARGET TABLE

PLC1 INPUTS	OUTLET POSITIONS														EXP1 OUTPUTS			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	RESET			
INPUT 8	X		X		X		X		X		X		X			X	OUTPUT 0	
INPUT 9		X		X		X		X		X		X		X		X	OUTPUT 1	
INPUT 10				X	X	X					X	X	X			X	OUTPUT 2	
INPUT 11							X	X	X	X	X	X	X			X	OUTPUT 3	
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	RESET	
INPUT 8	X		X		X		X		X		X		X		X		X	OUTPUT 0
INPUT 9	X			X	X		X	X			X	X	X		X		X	OUTPUT 1
INPUT 10	X				X	X	X				X	X	X		X		X	OUTPUT 2
INPUT 11	X						X	X	X	X	X	X	X		X		X	OUTPUT 3
INPUT 12		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	OUTPUT 4

- NOTE:
- 1-14 OUTLETS ONLY REQUIRE 4 SIGNALS (ENERGIZE ALL 4 TO RESET THE MACHINE)
 - GREATER THAN 14 OUTLETS REQUIRE 5 SIGNALS (ENERGIZE ALL 5 TO RESET THE MACHINE)
 - OPTIONAL MODULE (EXP1) CAN BE ADDED FOR RELAY OUTPUT OF POSITIONS 1-30 IN BINARY CODED DECIMAL FORMAT.



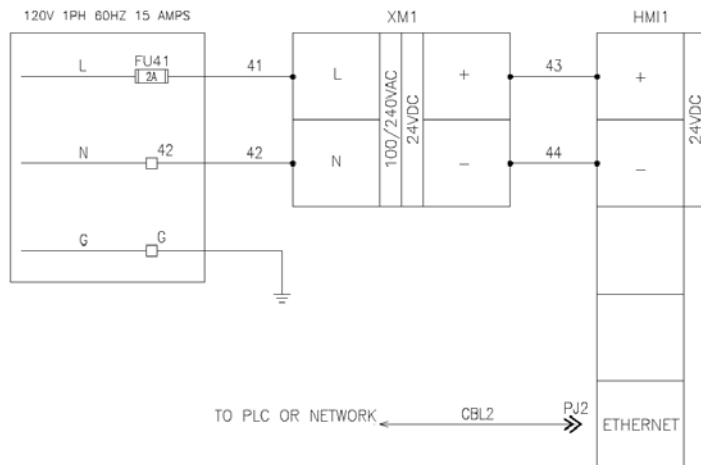
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TITLE
POWER SELECT ELECTRICAL MAIN PANEL

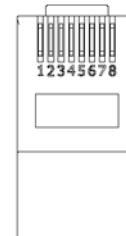
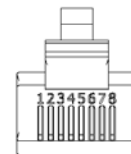
DWG NO 502955-E	SHT 4 OF 4	DRAWN CW	REV 8
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Installation / Operation Instructions

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RJ45 T568-B	
1	WHITE/orange
2	ORANGE/white
3	WHITE/green
4	BLUE/white
5	WHITE/blue
6	GREEN/white
7	WHITE/brown
8	BROWN/white



RJ45

WIRE COLORS	
BK	BLACK
BU	BLUE
BN	BROWN
GY	GRAY
WT	WHITE
RD	RED
YW	YELLOW
SHLD	BARE

NOTE:

- CUSTOMER IS RESPONSIBLE FOR DATA LINK BETWEEN OPERATOR PANEL AND MAIN PANEL USING SHIELDED CAT5e CABLE.
- TERMINALS 29 & 30 PROVIDE CUSTOMER A N.O. CONTACT (MAX 2A @ 250V AC / 125 V DC) THAT CLOSES WHEN SPOUTS ARE AT THEIR SELECTED DESTINATION (SYSTEM READY). THIS AUXILIARY SIGNAL CAN BE USED TO FURTHER AUTOMATE CUSTOMERS PROCESS.



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TITLE
POWER SELECT ELECTRICAL
(OPERATOR PANEL)

DWG NO 502950-E

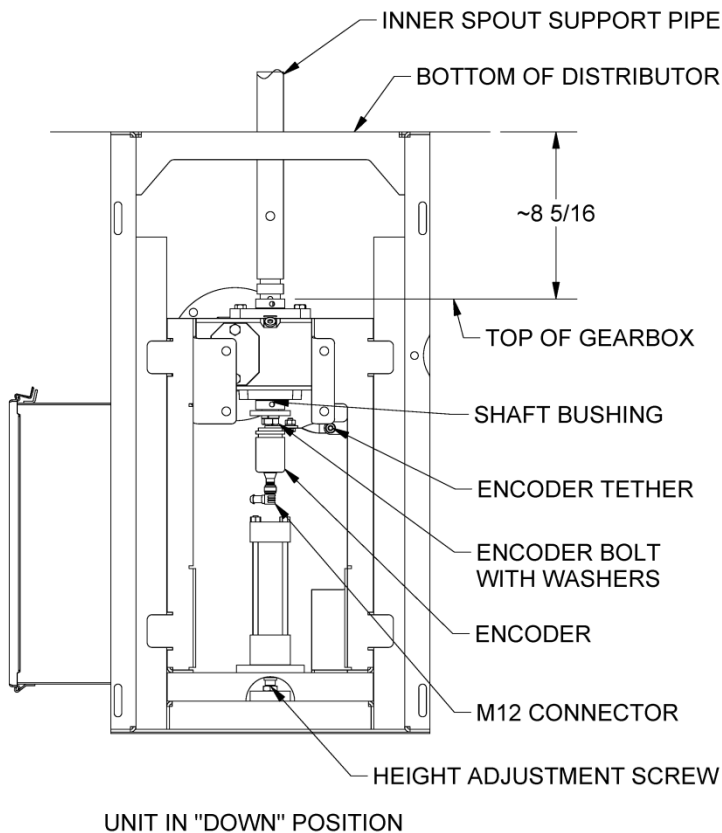
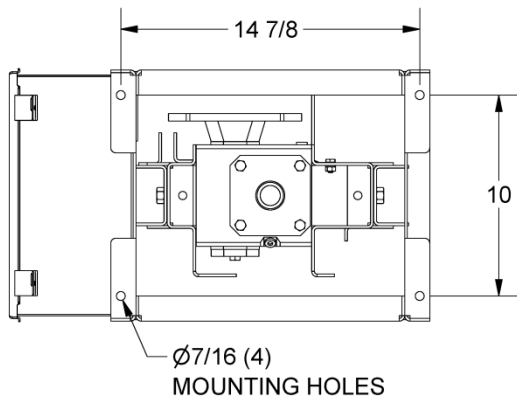
SHT 1 OF 1

DRAWN
CW

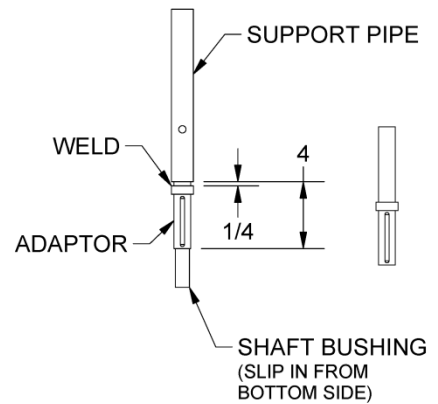
REV 0

Installation / Operation Instructions

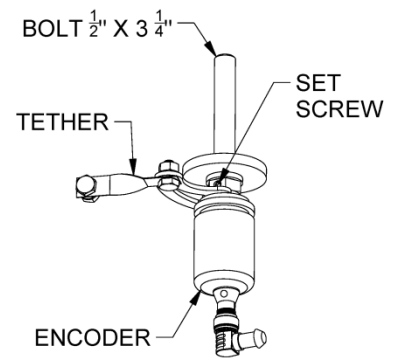
CMF Power Select Ver. 3.0



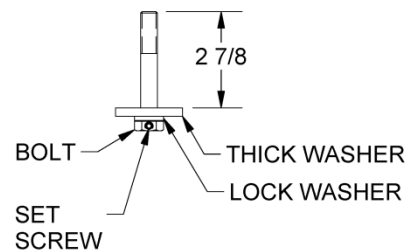
1. Download the User Manual: cmfmfg.com/downloads
2. Remove the inner spout support pipe from the distributor
3. Insert the adaptor into the support pipe and **WELD** in place
4. Re-install the support pipe in the distributor
5. Lift the Power Select to the bottom of the distributor inserting the keyed shaft into the top of the gearbox and bolt the unit in place with 4 bolts
6. Install the encoder bolt and encoder (see section 2.3.6 in the user manual)
7. When power is supplied, manually raise the unit to the UP positions and check clearance between the locator roller and the top of the locator bar. The roller should be at least 1/8" above the locator bar when the spout rotates. If required, use the adjustment screw at the end of the hydraulic cylinder to raise or lower the max height.
8. Adjust the UP and DOWN sensors (see section 2.3.15 in the user manual)



ADAPTOR INSTALL



ENCODER ASSEMBLY



ENCODER BOLT



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\\server1\inventor\CMF\Distributor\Power Select 03\Documents\User Manual\Drawg503003.F.dwg

TITLE

POWER SELECT RETROFIT INSTALLATION

DWG NO 503003-F

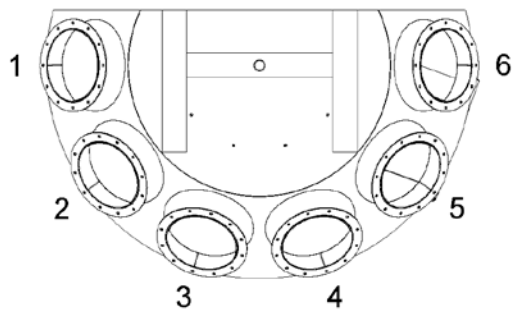
SHT 1 OF 1

DRAWN
Chris

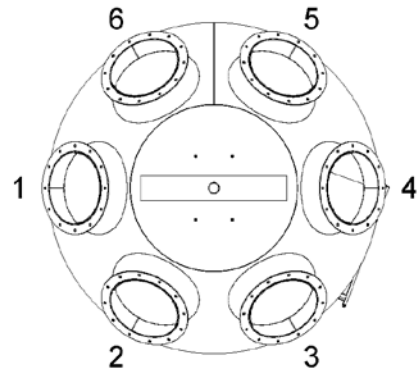
REV 5

Installation / Operation Instructions

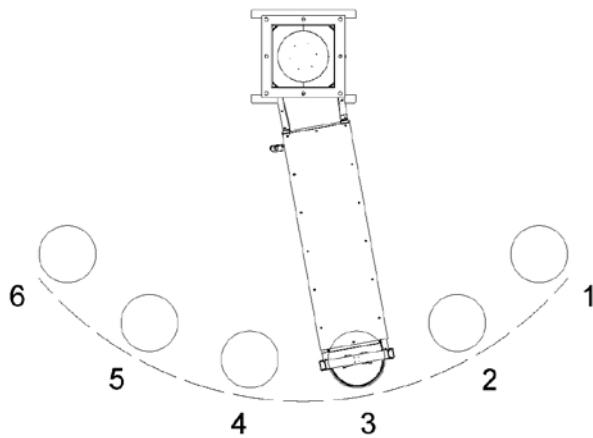
CMF Power Select Ver. 3.0



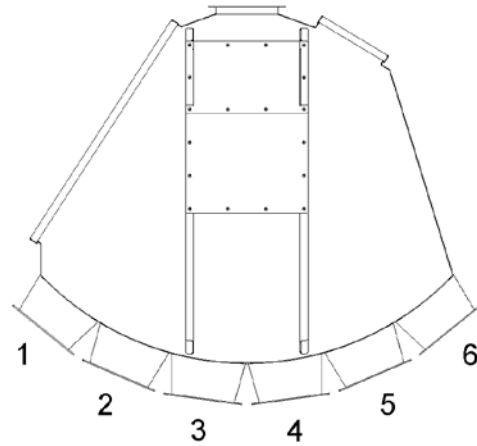
FLAT BACK
(BOTTOM VIEW)



FULL ROUND
(BOTTOM VIEW)



HEAD HOUSE
(TOP VIEW)



PENDULUM
(FRONT VIEW)

NOTE:

1. In order for the Power Select to function properly, the rotation of the outlet numbers must be correct.



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TITLE

DISTRIBUTOR OUTLET IDENTIFICATION

DWG NO 503003-G

SHT 1 OF 1

DRAWN
CW

REV 0

Installation / Operation Instructions

CMF Power Select Ver. 3.0

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