MASTERFLEX®

EtherNet/IP™

for Touchscreen Pump-Drives Manual

MasterSense™ Drives
Model L/S® **MFLX07526**-XX, **MFLX07576**-XX
Model I/P® **MFLX77421**-XX
Model B/T® **MFLX77112**-XX
Masterflex® Touchscreen Models
MFLX78018-XX; **MFLX78006**-XX

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EtherNet/IP™ Integration

Thank you for choosing Masterflex products

Integrating EtherNet/IP into your process will bring a sophisticated level of control you will find efficient, effective, and dependable.

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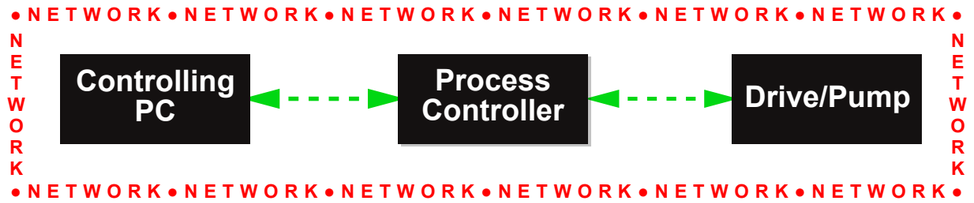
Contents

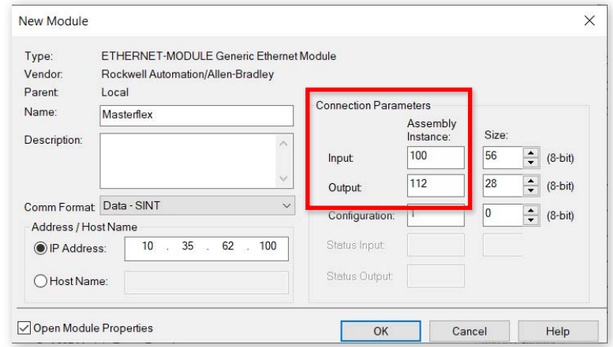
Before Setup

Theory of Operation

Typically, a process control system network includes a controlling PC, process controller, and pump-drive which are connected to each other on a network.



- When configuring the pump-drive as an EtherNet/IP module, set the process controller software to the following values (see Figure 1 below):
  Input Object Assembly = 100, Output Object Assembly = 112



Example process controller dialog box

Figure 1

Input Object Assembly:
Data from the pump-drive goes to the process controller (monitoring status data).

Output Object Assembly:
Data from the process controller goes to the pump-drive to change the status of the pump; pump status is reported to the process controller for monitoring (see below; see also Table 2 page 46 for more details).

NOTE: Disconnection times may vary based on the configured process controller software drive setpoint for RPI (Requested Packet Interval). In PLC software **RPI settings must be set to at least 100 ms.**

Setup

IP Address Assignment

"DHCP" (Dynamic Host Configuration Protocol) is the default network IP addressing method for a pump-drive (see Figure 2 below).

- Verify the network utilizes a DHCP server.

Static IP Address Assignment

To ensure stable EtherNet/IP operation it is recommended to set a custom static IP address. Do the following:

- Verify the IP address to be entered with your IT network engineer.
- Tap "STATIC" (see below).
- On the keypad, tap an "IP Address" as shown below (blue display area).
- Verify the process controller is configured for the entered IP address.
- Designate all eight-digit IP addresses *without* a leading 0, or zero-field, in the first octet.

No First-Zero IP Addresses

An IP address must NOT be entered with its first digit being a zero:

010.XXX.XXX.XX is incorrect
10.XXXX.XX.XX is correct

Figure 2

Enable EtherNet/IP

- Verify the process controller is configured to recognize the entered drive IP address.
- Tap “EtherNet/IP” on the “Menu” touchscreen (see Figure 3 below).
- On the “EtherNet/IP SETTINGS” screen, press the slider to the right to “Enable.”
- A screen displays (not shown) asking for operator confirmation, tap Confirm.

In the event of a factory reset, operators must re-enable EtherNet/IP from the “EtherNet/IP SETTINGS” menu (see below). To re-enable do the following:

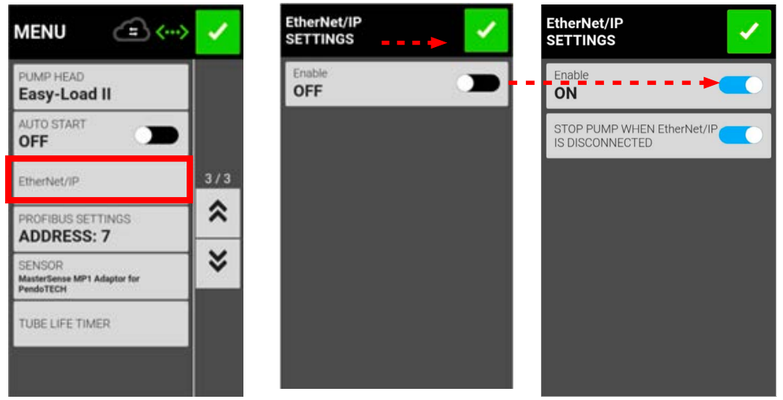
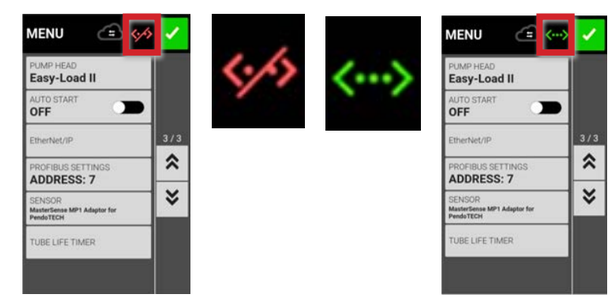


Figure 3

NOTE: Once EtherNet/IP is enabled, the pump-drive is in EtherNet/IP Monitoring Mode which means process controller software can display the current pump status.

EtherNet/IP connectivity status is displayed on the touchscreen by the EtherNet/IP Connection Status icons (see Figure 4 below).



DISCONNECTED CONNECTED

Figure 4

Enable Optional EtherNet/IP Stop-Upon-Disconnected Feature

On by default, the Stop-Upon-Disconnect feature is applicable for both EtherNet/IP Monitor and Remote Control modes. In addition, the pump-drive can be programmed to stop if there is a network disconnection—see next.

- Once EtherNet/IP is enabled, a slider with the STOP PUMP WHEN ETHERNET/IP IS DISCONNECTED feature setting displays and is active, toggle the slider to the left to deactivate (see Figure 5 below).
- A pump-drive with the feature active will stop operation if the EtherNet/IP connection is lost—a red pop-up status message displays (see middle touchscreen below).

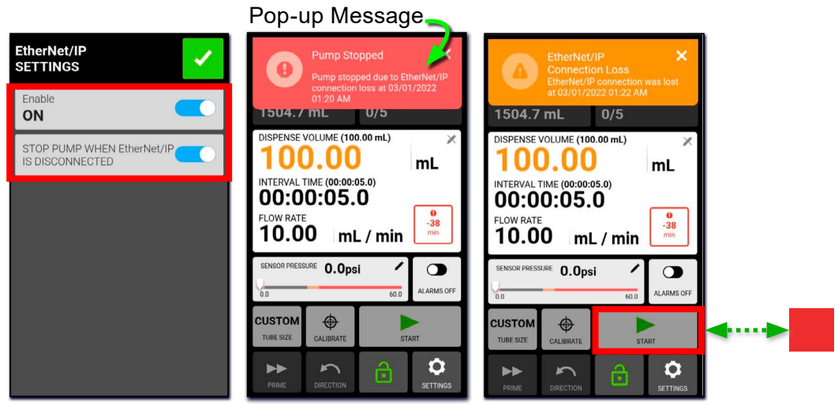


Figure 5

When the STOP PUMP WHEN ETHERNET/IP IS DISCONNECTED feature is disabled, an orange warning message displays signaling EIP (EtherNet Industrial Protocol) connection is/was lost (see above); the message displays until dismissed (the pump-drive remains running).

NOTE: If the pump-drive is power-cycled under EtherNet/IP control, operators will need to reinitiate EtherNet I/P control using the process controller software 1-to-0 transition.

FYI: Operators can initiate an emergency stop by pressing the STOP button (see above). To disable EtherNet/IP press the “Enable” slider to the left toggling to “OFF.”

Operations Input Assembly Data

Input Assembly Objects
56 bytes of process controller input data

Process controller software is required to modify pump parameters so the pump-drive can exchange parameter data with the process controller (see next page for details).

Example Process Controller Software for Input Assembly

Process controller software (see example of Allen Bradley® PLC setup, Figure 6 below) is required to modify parameter bit data in the output assembly which then commands those changes to the pump-drive and changes corresponding input assembly parameters (see Figure 6 below).

Name	Value	Force Mask	Style	Data Type	Description	Constant
Pump1:I	{...}	{...}		_05A0:002B_0001_...		
Pump1:I.ConnectionFaulted	0		Decimal	BOOL		
Pump1:I.Status_OK	1		Decimal	BOOL		
Pump1:I.Pump_Running	0		Decimal	BOOL		
Pump1:I.Dispense_On	0		Decimal	BOOL		
Pump1:I.Tube_Uncalibrated	0		Decimal	BOOL		
Pump1:I.Head_Open	0					
Pump1:I.Flow_Direction_CCW	0					
Pump1:I.Remote_Control	1		Decimal	BOOL		
Pump1:I.Dispense_Mode	0		Decimal	SINT		
Pump1:I.Tube_Size	9		Decimal	SINT		
Pump1:I.Flow_Units	1		Decimal	SINT		
Pump1:I.Cumulative_Volume	5458.6665		Float	REAL		
Pump1:I.Remaining_Dispense_Volume	100.0		Float	REAL		
Pump1:I.Remaining_Dispense_On_Seconds	5.0		Float	REAL		
Pump1:I.Remaining_Dispense_Off_Seconds	1.0		Float	REAL		
Pump1:I.Batch_Count_Current	0		Decimal	DINT		
Pump1:I.Batch_Count_Total	1		Decimal	DINT		
Pump1:I.Minimum_Flow_Rate	0.1		Float	REAL		
Pump1:I.Current_Flow_Rate	100.0		Float	REAL		
Pump1:I.Maximum_Flow_Rate	600.0		Float	REAL		

Drive Status Shown Here

Figure 6
(Example of Allen Bradley® PLC setup)

EtherNet/IP Monitoring Mode

Once enabled, a process controller will monitor pump-drive status through its input assembly (see next page for Input Assembly Object details).

During Remote Control mode the process controller can use input assembly parameters as feedback data.

Bytes/Data Type	Drive Status	Description
Byte 0-3, 32-bit INT	Bit 0: Status OK Bit 1: Pump Running Bit 2: Dispense On Bit 3: Tube Uncalibrated Bit 4: Head Open Bit 5: Reserved Bit 6: Flow Direction CCW Bit 7: Remote Control Bits 8–31: Reserved	Pump > Process control system

Byte 0 Drive Status.

Byte 0, Bit 0. Status OK			
Pump1:I.Status_OK	0	Decimal	BOOL

Byte 0, Bit 0. Status OK.

This bit has an expected value of “1” unless the general alarm pin on the back of the pump-drive has been activated. For example, the pump shuts off—low and high pressure threshold alarms will trigger the general alarm, and cause this Status OK bit to toggle from 1 (desirable state) to 0 (undesirable state). The pump-drive will report the status back to the process control system (see Figure 7 at right).

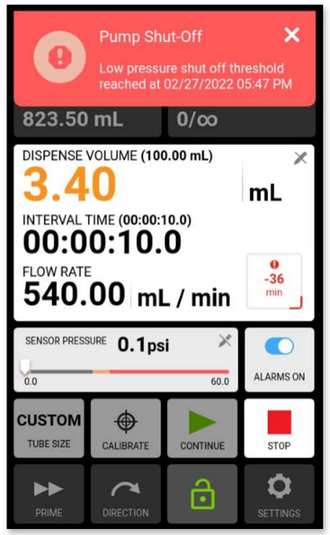


Figure 7

Byte 0, Bit 1. Pump Running.			
Pump1:I.Pump_Running	0	Decimal	BOOL

Byte 0, Bit 1. Pump Running.

Value of 1 = Pump-Drive Running

Value of 0 = Pump-Drive Stopped or Paused

The pump-drive running bit will report a value of running, or “1,” when the pump-drive motor is turning. When the pump-drive is stopped or paused the pump-drive running bit will be “0.” The pump-drive reports this information back to the process control system (see Figure 8 at right).

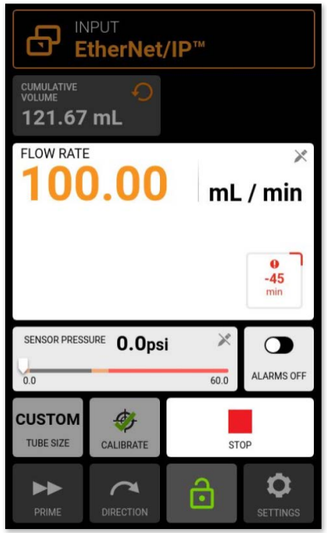


Figure 8

Byte 0, Bit 2. Dispense On.			
Pump1:I.Dispense_On	1	Decimal	BOOL

Byte 0, Bit 2. Dispense On.

Value of 1 = Pump-Drive Running or Paused

Value of 0 = Pump-Drive Stopped

The Dispense On bit will display a value of “1” when the pump-drive is running or paused. When the pump-drive is stopped, a value of “0” is displayed. In Continuous mode of operation entering a value of “0” for the flow rate will cause the Dispense On bit to remain high, or a value of “1.” The pump-drive will report this information back to the process control system (see Figure 9 at right).

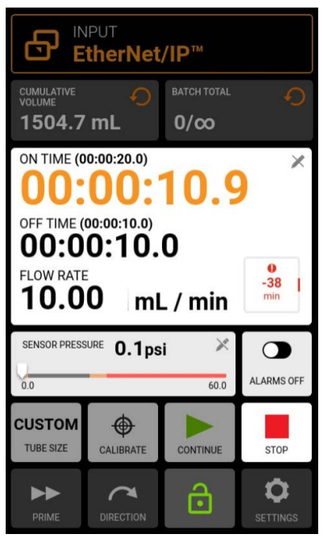


Figure 9

Byte 0, Bit 3. Tube Uncalibrated.			
Pump1:I.Tube_Uncalibrated	0	Decimal	BOOL

Byte 0, Bit 3. Tube Uncalibrated.

Value of 1 = Tube Uncalibrated

Value of 0 = Tube Calibrated

The pump-drive reports the Tube Uncalibrated bit status to the process control system, reporting a value of “1” when a tube calibration has not been done and recorded. When calibrated successfully, the value will change to a “0.” The touchscreen will display a green checkmark on the Calibrate button (see Figure 10 at right).

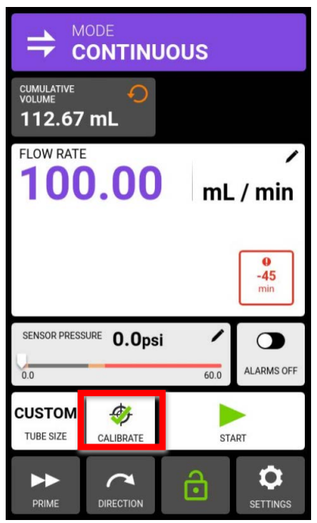


Figure 10

Byte 0, Bit 4. Head Open.			
Pump1:I.Head_Open	0	Decimal	BOOL

Byte 0, Bit 4. Head Open.

Value of 1 = Pump Head Open

Value of 0 = Pump Head Closed

The head-open bit will report a value of “1” when the pump head is open. The control system will be alerted and the pump-drive motor will not start unless the open condition is cleared (see Figure 11 at right).

NOTE: Byte 0, Bit 5 is reserved for future use.

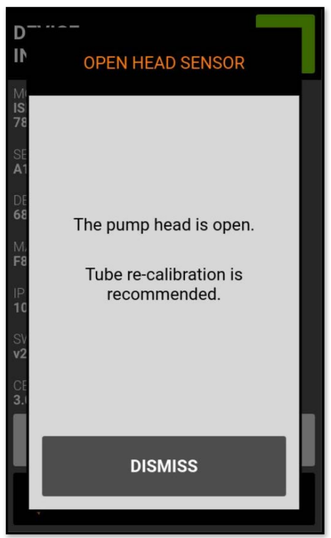


Figure 11

Byte 0, Bit 6. Flow CCW.			
Pump1:I.Flow_Direction_CCW	1	Decimal	BOOL

Byte 0, Bit 6. Flow CCW.

Value of 1 = Pump-Drive CCW

Value of 0 = Pump-Drive CW

The pump-drive is in a counterclockwise direction of motion (value of “1”) or otherwise “0” (CW). This bit will change value based on the “Set Flow Direction CCW” bit in the output assembly by which the controller commands the pump-drive (see Figure 12 at right).

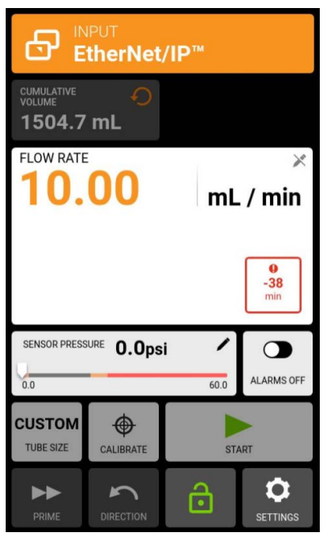


Figure 12

Byte 0, Bit 7. Remote Control.			
Pump1:I.Remote_Control	1	Decimal	BOOL

Byte 0, Bit 7. Remote Control.

Value of 1 = In Remote Control Mode

Value of 0 = Otherwise

The remote control bit will report a status of “1” if the pump drive is in EtherNet/IP remote control mode only and “0” otherwise. The EtherNet/IP banner (see Figure 13 at the right) signifies the pump-drive is in EtherNet/IP remote control mode.

Figure 13

Byte 4: Dispense Mode

Byte 4: Dispense Mode			
Pump1:I.Dispense_Mode	0	Decimal	SINT

Value of 0 = Continuous Mode

The pump-drive reports the current mode of operation to the process control system. The output assembly bit “Set Dispense Mode” can be used to change the dispense mode of operation (see Figure 14 at right).

(Continued below)

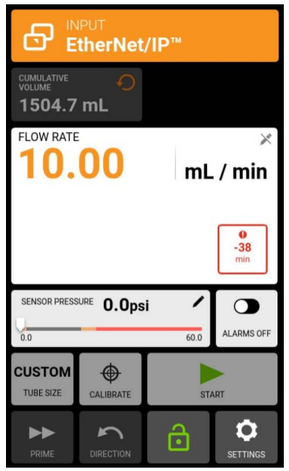


Figure 14

Byte 4: Dispense Mode (Cont.)			
Pump1:I.Dispense_Mode	1	Decimal	SINT

Value of 1 = Time Mode

See Figure 15 at right.

(Continued next page)

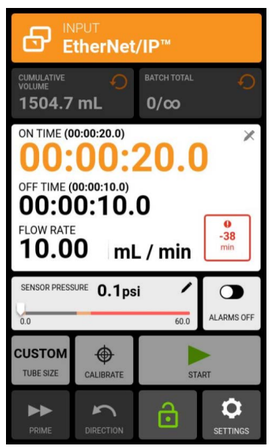


Figure 15

Byte 4: Dispense Mode (Cont.)

Byte 4: Dispense Mode (Cont.)			
Pump1:I.Dispense_Mode	2	Decimal	SINT

Value of 2 = Volume Mode

Once the mode of operation is changed in the output assembly with the “Set Dispense Mode” bit, the “Dispense Volume” field updates (see Figure 16 at right).

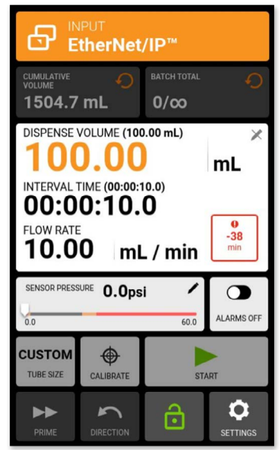


Figure 16

Byte 5. Tube Sizes.

Refer to the tube size tables section “Table 5 Tube Sizes” (page 54-71) which identifies the tube size indexes and sizes for each pump-drive model. The current tube size index and value can be found in the input assembly “Tube Size” byte (see reference tables and Figure 17 below).

Byte 5. Set Tube Sizes.			
Pump1:I.Tube_Size.0	1	Decimal	BOOL
Pump1:I.Tube_Size.1	0	Decimal	BOOL
Pump1:I.Tube_Size.2	0	Decimal	BOOL
Pump1:I.Tube_Size.3	1	Decimal	BOOL
Pump1:I.Tube_Size.4	0	Decimal	BOOL
Pump1:I.Tube_Size.5	0	Decimal	BOOL
Pump1:I.Tube_Size.6	0	Decimal	BOOL
Pump1:I.Tube_Size.7	0	Decimal	BOOL

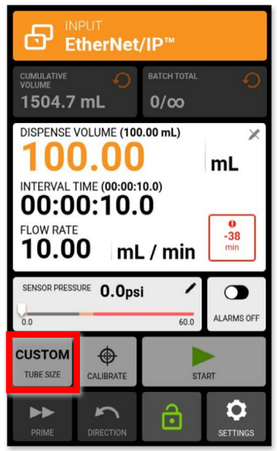


Figure 17

Byte 6. Flow Units.

See “Tables 3 and 4 for flow units” (pages 51, 52) which identifies flow unit indexes for each pump-drive model. Flow unit information is relayed from the pump-drive to the process control system (see reference table and Figure 18 below).

Byte 6. Flow Units.			
Pump1:0.Flow_Units.0	0	Decimal	BOOL
Pump1:0.Flow_Units.1	1	Decimal	BOOL
Pump1:0.Flow_Units.2	1	Decimal	BOOL
Pump1:0.Flow_Units.3	1	Decimal	BOOL
Pump1:0.Flow_Units.4	0	Decimal	BOOL
Pump1:0.Flow_Units.5	0	Decimal	BOOL
Pump1:0.Flow_Units.6	0	Decimal	BOOL
Pump1:0.Flow_Units.7	0	Decimal	BOOL

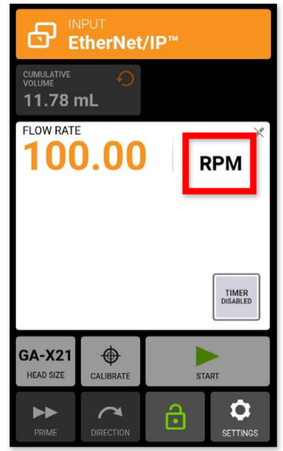


Figure 18

NOTE: Byte 7 is reserved for future use.

Byte 8–11: Cumulative Volume (Data Type: Float)

Byte 8–11. Cumulative Volume.			
Pump1:I.Cumulative_Volume	1504.7	Float	REAL

Byte 8–11 relays the Cumulative Volume of the pump-drive back to the process control system (see Figure 19 at right).

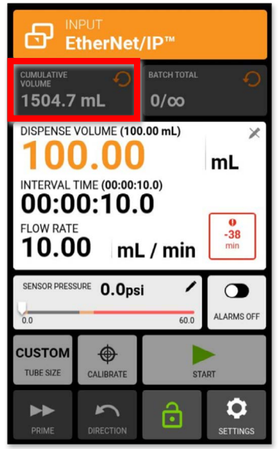


Figure 19

Byte 12–15: Remaining Dispense Volume (Data Type: Float)

Byte 12–15. Remaining Dispense Volume.			
Pump1:I.Remaining_Dispense_Volume	100.0	Float	REAL

The touchscreen displays the countdown value and reports it to the process control system. This value represents the remaining volume to be dispensed. The output assembly field of “Set Dispense Volume” is always the starting point for the countdown (see Figure 20 at right).

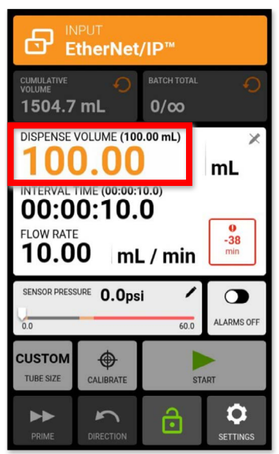


Figure 20

Byte 16–19: Remaining Dispense On Time Seconds (Data Type: Float)

Byte 16–19. Remaining Dispense On Time Seconds.			
Pump1:I.Remaining_Dispense_On_Time_Seconds	5	Decimal	SINT

The touchscreen displays this time operation mode value and reports it to the process control system. This value counts down the time remaining for a batch run cycle. This field is only applicable in Time Dispense Operational mode. The output assembly field “Set Dispense On Time Seconds” is configured for the process control system to command the pump to a certain number of dispense seconds (see Figure 21 at right).

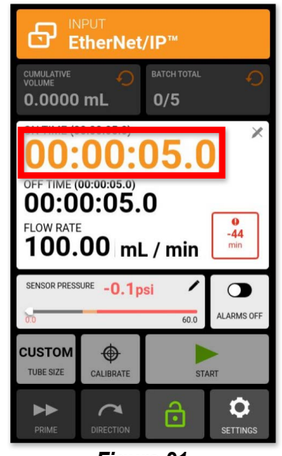


Figure 21

Byte 20–23: Remaining Dispense Off Time Seconds (Data Type: Float)

Byte 20–23. Remaining Dispense Off Time Seconds.			
Pump1:I.Remaining_Dispense_Off_Time_Seconds	5	Decimal	SINT

The touchscreen displays this Time and Volume Operation mode value which counts down the time remaining for a stopped portion of a batch cycle. After the conclusion of this timer, a new batch number begins. The output assembly field “Set Dispense Off Seconds” is used by the process control system to modify this value. This value can only be updated before the start of the batch sequence or after the value has been reset, but not intermittently (see Figure 22 at right).

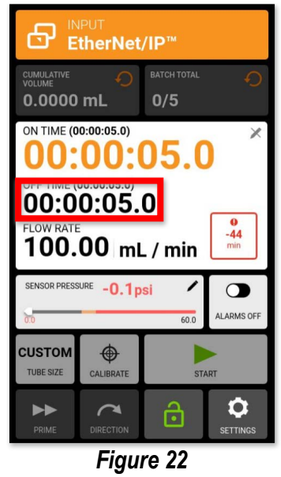
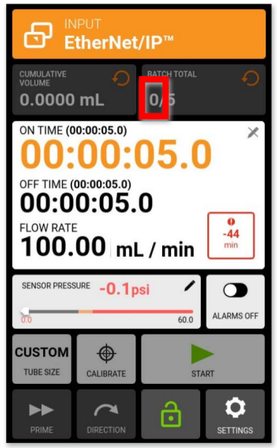


Figure 22

Byte 24–27: Batch Count Current (Data Type: 32-Bit Integer)

Byte 24–27. Batch Count Current.			
Pump1:I.Batch_Count_Current	0	Decimal	DINT

The touchscreen displays the current batch number and reports it to the process control system. This value always starts from 0 and counts to the Batch Count Total value (see Figure 23 at right).



Figur 23

Byte 28–31: Batch Count Total (Data Type: 32-Bit Integer)

Byte 28–31. Batch Count Total.			
Pump1:I.Batch_Count_Total	5	Decimal	DINT

The touchscreen displays this Time and Volume operation mode value and reports it to the process control system. This value displays the total number of batches to dispense. An operator can set this batch count number from the output assembly “Set Batch Count Total” field which can only be modified before a dispense. A value of “0” means the batch count will be infinity (see Figure 24 at right).

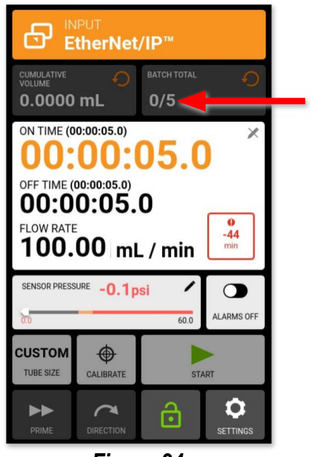


Figure 24

Byte 32–35: Minimum Flow Rate (Data Type: Float)

Byte 32-35. Minimum Flow Rate.			
Pump1:I.Minimum_Flow_Rate	0.09	Float	REAL

The touchscreen displays the Minimum Flow Rate and reports it to the process control system. If the flow units or tube size is changed from the output assembly then the Minimum Flow Rate will also be adjusted (see Figure 25 at right).

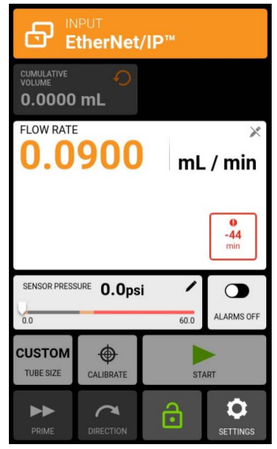


Figure 25

Byte 36–39: Current Flow Rate (Data Type: Float)

Byte 36–39. Current Flow Rate.			
Pump1:I.Current_Flow_Rate	100	Float	REAL

The touchscreen displays the Current Flow Rate and reports it to the process control system. If the flow rate is modified in the output assembly, this field updates to reflect that status (see Figure 26 at right).

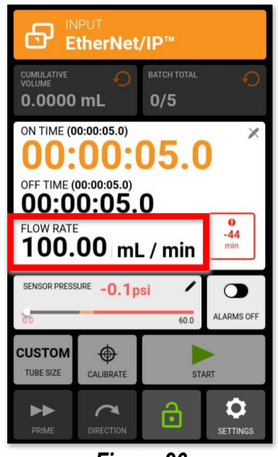


Figure 26

Byte 40–43: Maximum Flow Rate (Data Type: Float)

Byte 40–43. Maximum Flow Rate.			
Pump1:I.Maximum_Flow_Rate	540.0	Float	REAL

The touchscreen displays the Maximum Flow Rate and reports it to the process control system. If the flow units or tube size is changed from the output assembly, the minimum flow rate is also adjusted (see Figure 27 at right).

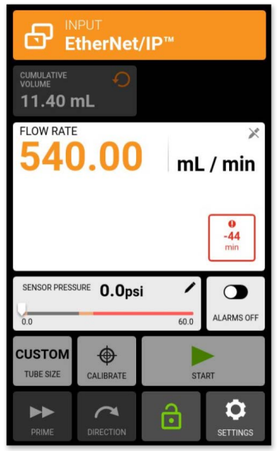


Figure 27

Byte 44–45: Remaining Dispense On Time Days (Data Type: 16-Bit Integer)

Byte 44–45. Remaining Dispense On Time Days.			
Pump1:I.Remaining_Dispense_On_Time_Days	0	Decimal	INT

The touchscreen displays and reports this value to the process control system. The value is based on the dispensing setpoint. It is represented in seconds and determines the number of days a batch remains active (see Figure 28 at the right).

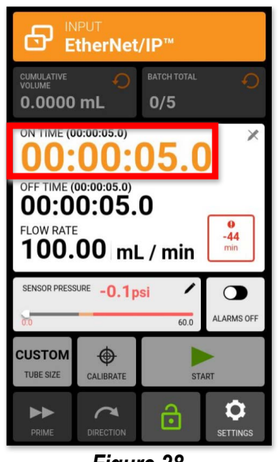


Figure 28

Byte 46: Remaining Dispense On Time Hours.

Byte 46. Remaining Dispense On Time Hours.			
Pump1:I.Remaining_Dispense_On_Time_Hours	0	Decimal	SINT

The touchscreen displays and reports this value to the process control system. The value is based on the dispensing setpoint. It is represented in hours and determines the number of hours a batch remains active (see Figure 29 at the right).

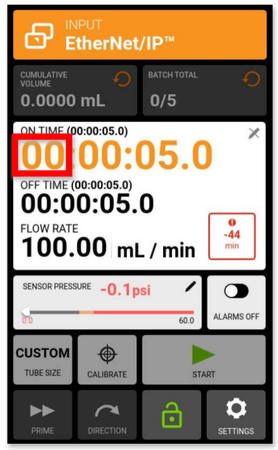


Figure 29

Byte 47: Remaining Dispense On Time Minutes

Byte 47. Remaining Dispense On Time Minutes.			
Pump1:I.Remaining_Dispense_On_Time_Minutes	0	Decimal	SINT

The touchscreen displays and reports this value to the process control system. The value is based on the dispensing setpoint. It is represented in minutes and determines the number of minutes a batch remains active (see Figure 30 at the right).

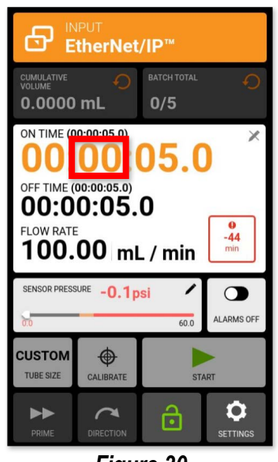


Figure 30

Byte 48: Remaining Dispense On Time Seconds

Byte 48. Remaining Dispense On Time Seconds.			
Pump1:I.Remaining_Dispense_On_Time_Seconds	05	Decimal	SINT

The touchscreen displays and reports this value to the process control system. The value is based on the dispensing set-point. It is represented in seconds and determines the number of seconds a batch remains active (see Figure 31 at the right).

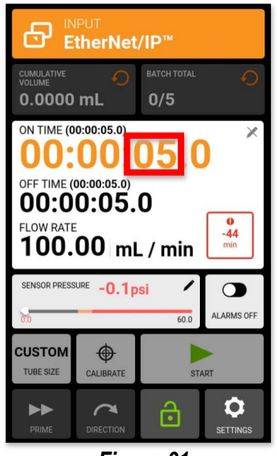


Figure 31

Byte 49: Remaining Dispense On Time Tenths

Byte 47. Remaining Dispense On Time Tenths.			
Pump1:I.Remaining_Dispense_On_Time_Tenths	0	Decimal	SINT

The touchscreen displays and reports this value to the process control system. The value is based on the dispensing set-point. It is represented in tenths of a second and determines the number of tenths of a second a batch remains active (see Figure 32 at the right).

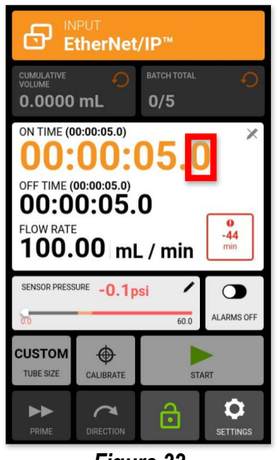


Figure 32

Byte 50: Remaining Dispense Off Time Days

Byte 50. Remaining Dispense Off Time Days.			
Pump1:I.Remaining_Dispense_Off_Time_Days	0	Decimal	INT

The touchscreen displays this Time and Volume Operation mode countdown value and reports this value to the process control system. The value is based on the number of days for the pump-drive to be idle in-between batches (see Figure 33 at right).

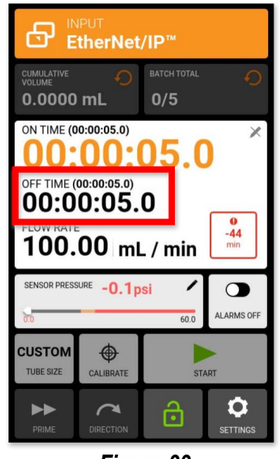


Figure 33

Byte 51: Remaining Dispense Off Time Hours

Byte 51. Remaining Dispense Off Time Hours.			
Pump1:I.Remaining_Dispense_Off_Time_Hours	0	Decimal	SINT

The touchscreen displays this Time and Volume Operation mode countdown value and reports this value to the process control system. The value is based on the number of hours for the pump-drive to be idle in-between batches (see Figure 34 at right).

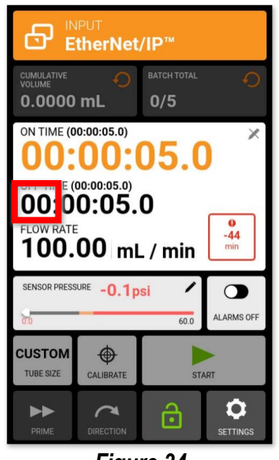


Figure 34

Byte 52: Remaining Dispense Off Time Minutes

Byte 52. Remaining Dispense Off Time Minutes.			
Pump1:I.Remaining_Dispense_Off_Time_Minutes	0	Decimal	SINT

The touchscreen displays this Time and Volume Operation mode countdown value and reports this value to the process control system. The value is based on the number of minutes for the pump-drive to be idle in-between batches (see Figure 35 at right).

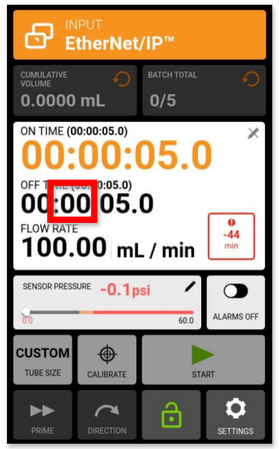


Figure 35

Byte 53: Remaining Dispense Off Time Seconds

Byte 53. Remaining Dispense Off Time Seconds.			
Pump1:I.Remaining_Dispense_Off_Time_Seconds	5	Decimal	SINT

The touchscreen displays this Time and Volume Operation mode countdown value and reports this value to the process control system. The value is based on the number of seconds for the pump-drive to be idle in-between batches (see Figure 36 at right).

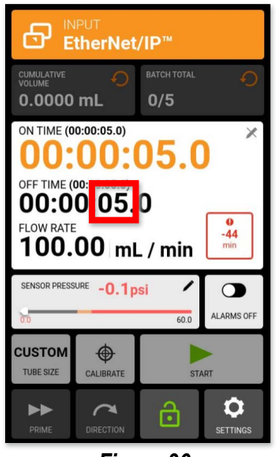


Figure 36

Byte 54: Remaining Dispense Off Time Tenths.

Byte 54. Remaining Dispense Off Time Tenths.			
Pump1:I.Remaining_Dispense_Off_Time_Tenths	0	Decimal	SINT

The touchscreen displays this Time and Volume Operation mode countdown value and reports this value to the process control system. The value is based on the number of tenths of a second for the pump-drive to be idle in-between batches (see Figure 37 at right).

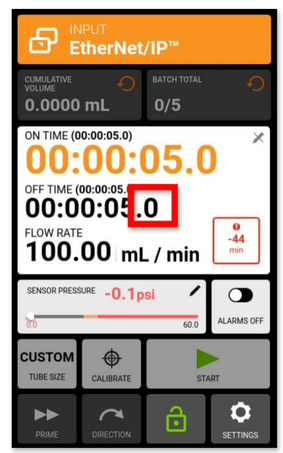


Figure 37

Table 1. Input Assembly Object Summary

Byte Value	Data Type	Description
0-3	32-bit INT	**Drive Status** Bit 0: Status OK Bit 1: Pump Running Bit 2: Dispense On Bit 3: Tube Uncalibrated Bit 4: Head Open Bit 5: Reserved Bit 6: Flow Direction CCW Bit 7: Remote Control Bits 8-31: Reserved
4	Byte	Dispense Mode
5	Byte	Tube Size
6	Byte	Flow Units
7	Byte	Reserved Pad
8–11	Float	Cumulative Volume
12–15	Float	Remaining Dispense Volume
16–19	Float	Remaining Dispense On Seconds
20–23	Float	Remaining Dispense Off Seconds
24–27	32-bit INT	Batch Count Current
28–31	32-bit INT	Batch Count Total
32–35	Float	Minimum Flow Rate
36–39	Float	Current Flow Rate
40–43	Float	Maximum Flow Rate
44–45	16-bit INT	Remaining Dispense On Time Days
46	Byte	Remaining Dispense On Time Hours
47	Byte	Remaining Dispense On Time Minutes
48	Byte	Remaining Dispense On Time Seconds
49	Byte	Remaining Dispense On Time Tenths
50	Byte	Remaining Dispense Off Time Days
51	Byte	Remaining Dispense Off Time Hours
52	Byte	Remaining Dispense Off Time Minutes
53	Byte	Remaining Dispense Off Time Seconds
54	Byte	Remaining Dispense Off Time Tenths

Operations Output Assembly Data

Output Assembly Objects
28 bytes of process controller output data

Process controller software is required to modify pump parameters so the pump drive can exchange parameter data with the process controller (see next page for details).

Enable EtherNet/IP Remote Control Mode

To enable remote control, verify the EtherNet/IP is enabled from the EtherNet/IP Settings menu on the pump-drive touchscreen (for detail see previous page 10).

Remote Control mode is required to modify parameter bit data in the output assembly which commands those changes to the pump-drive and then changes those corresponding input assembly parameters.

To initiate the process do the following:

- At the process controller, toggle the bit: "**`Pump1:O.Toggle _ Remote _ Local _ Control _ 1 _ to _ 0`**"
- When enabled, a EtherNet/IP orange message will display on the drive touchscreen indicating the pump is now in Remote Control mode (see below).

NOTE: This bit may need to be *toggled twice* depending on its last state—a 1-to-0 transition is required.

- Verify Remote Control mode is initiated.
- Verify remote control is initiated by observing a value of "1" for the "remote control" bit in the input assembly.

Example Process Controller Software

The software interface below is an example of process controller software (Allen Bradley® Rockwell Studio 5000™—your software may differ). Process controller software is required to modify data parameters bit data in the output assembly which commands those changes to the pump-drive and change those corresponding input assembly parameters (see Figure 38 below).

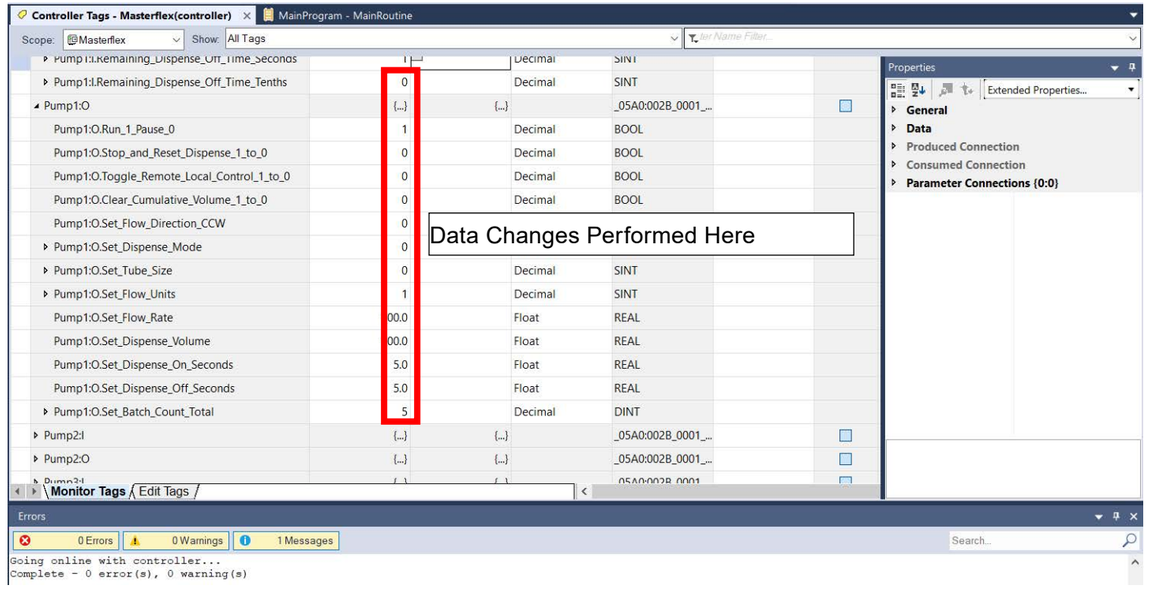


Figure 38 Example of Allen Bradley PLC Setup

Byte Value	Data Type	Description
0	Byte	**Drive Control** Bit 0: Run/Pause (1 = RUN; 0 = PAUSE Bit 1: Stop and Reset Dispense (1 to 0 transition) Bit 2: Toggle Remote/Local Control (1 to 0 transition) Bit 3: Clear Cumulative Volume (1 to 0 transition Bit 4: Reserved Bit 5: Reserved Bit 6: Set Flow Direction CCW (1-CCW; 0 = CW) Bit 7: Reserved

Byte 0. Drive Control

Byte 0, Bit 0: Run/Pause.			
Pump1:O.Run_1_Pause_0	1	Decimal	BOOL

Byte 0. Bit 0: Run/Pause.

Entered Value 1 = Run; 0 = Pause

Process controller commands the pump-drive to run or pause (see Figure 39 at right).

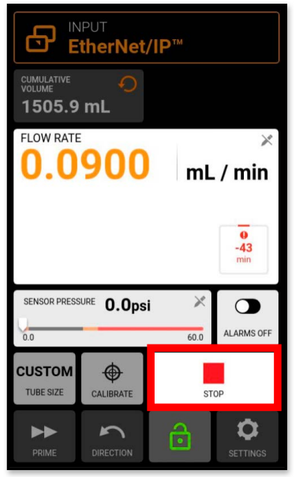


Figure 39

Byte 0, Bit 1: Stop and Reset Dispense.

Byte 0, Bit 1: Stop and Reset Dispense (1 to 0 transition).			
Pump1:O.Stop_and_Reset_Dispense_1_to_0	0	Decimal	BOOL

Process controller commands the pump-drive to stop the dispense and, in Time and Volume mode of operation, this command resets the batch count to 0. This command also clears the “Pump Running” bit to 0 and the “Dispense On” bit to 0 (see Figure 40 at right).

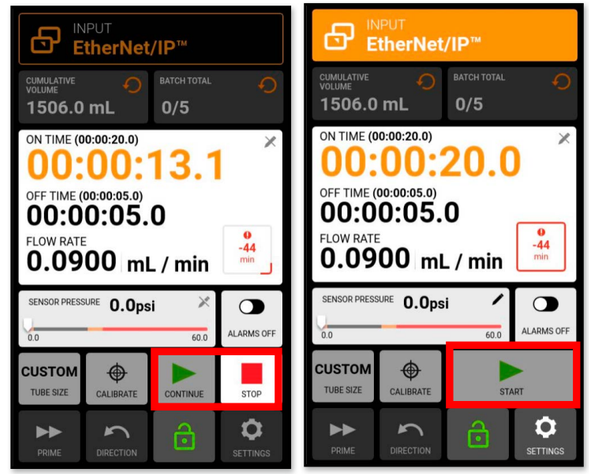


Figure 40

NOTE: In the future an enhanced EtherNet/IP feature set may include a separate reset batch count parameter.

Byte 0, Bit 2: Toggle Remote/Local Control.

Byte 0, Bit 2: Toggle Remote/Local Control (1 to 0 transition).			
Pump1:O.Toggle_Remote_Local_Control_1_to_0	0	Decimal	BOOL

Process controller commands the pump-drive to toggle from Remote to Local operation mode and vice versa. This command takes effect on a falling edge transition from 1 to 0 (see Figure 41 at right).

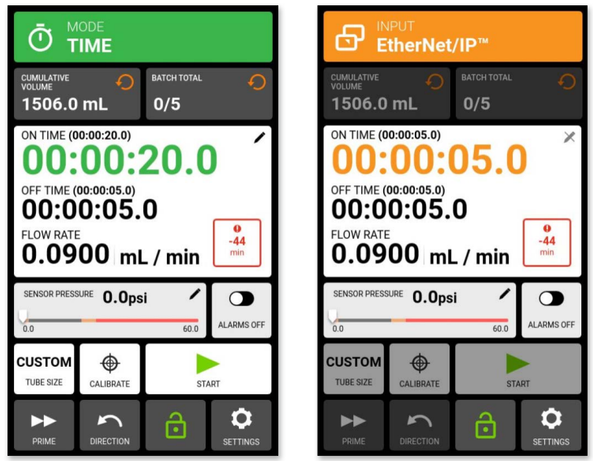


Figure 41

Byte 0, Bit 3: Clear Cumulative Volume.

Byte 0, Bit 3: Clear Cumulative Volume (1 to 0 transition).			
Pump1:O.Clear_Cumulative_Volume_1_to_0	0	Decimal	BOOL

Process controller commands the pump-drive to clear the cumulative volume recorded on the touchscreen. This command occurs on a falling edge transition from 1 to 0. The cumulative volume bit in the input assembly is also cleared as well (see Figure 42 at right).

NOTE: Bits 4 and 5 are reserved for future use.

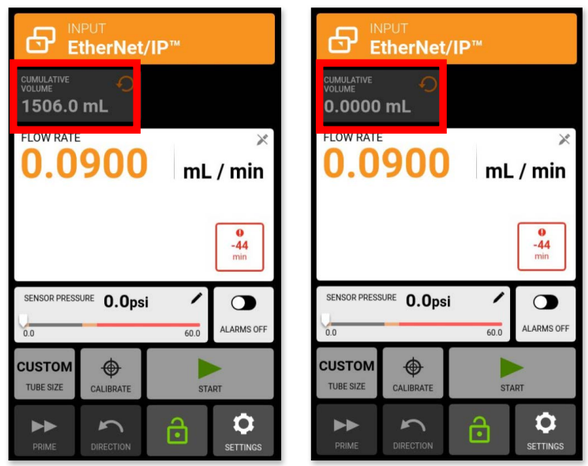


Figure 42

Byte 0, Bit 6: Set Flow Direction CCW.

Byte 0, Bit 6: Set Flow Direction CCW.			
Pump1:O.Set_Flow_Direction_CCW	1	Decimal	BOOL

Entered Value 1 = CCW 0 = CW

Process controller commands the pump-drive to change direction of flow. This command may also change the status of the input assembly bit “Flow CCW” (see Figure 43 at right).

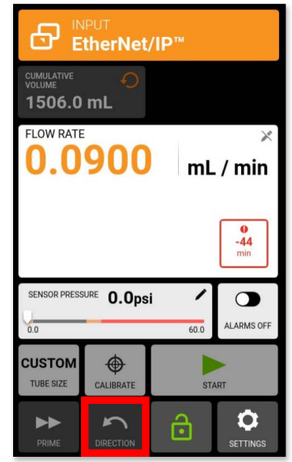


Figure 43

NOTE: Byte 1, 2, and 3 are reserved for future use.

Byte 4: Set Dispense Mode

Byte 4. Set Dispense Mode			
Pump1:O.Set_Dispense_Mode	0	Decimal	SINT

Entered Value 0 = Continuous Mode

Entered Value 1 = Time Mode

Entered Value 2 = Volume Mode

Process controller commands the pump-drive to set dispense mode bits (see Figure 44 below).

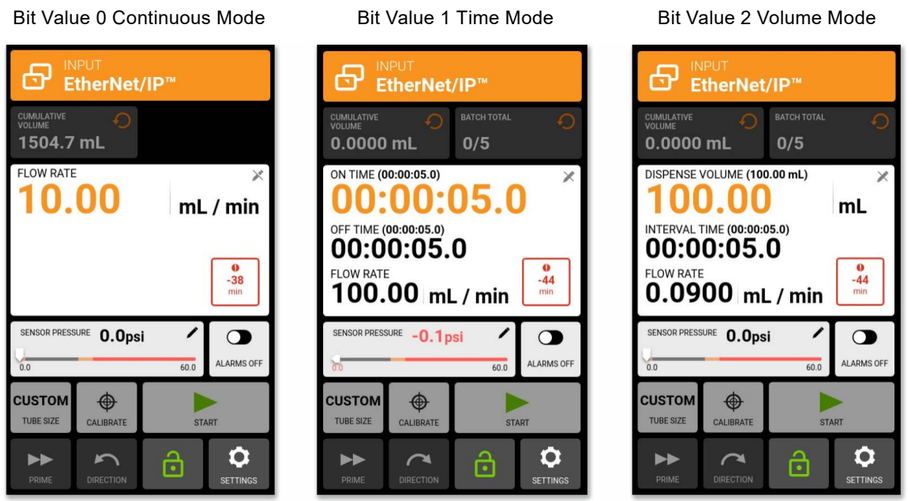


Figure 44

Byte 5: Set Tube Sizes

Refer to the tube size tables section “Table 5 Tube Sizes” (pages 54–71 which identifies the tube size indexes and sizes for each pump-drive model. The current tube size index and value can be found in the input assembly “Tube Size” byte (see reference table and Figure 45 below).

Byte 5 Set Tube Sizes			
Pump1:0,Set_Tube_Size.0	0	Decimal	SINT
Pump1:0,Set_Tube_Size.1	0	Decimal	BOOL
Pump1:0,Set_Tube_Size.2	0	Decimal	BOOL
Pump1:0,Set_Tube_Size.3	0	Decimal	BOOL
Pump1:0,Set_Tube_Size.4	0	Decimal	BOOL
Pump1:0,Set_Tube_Size.5	0	Decimal	BOOL
Pump1:0,Set_Tube_Size.6	0	Decimal	BOOL
Pump1:0,Set_Tube_Size.7	0	Decimal	BOOL

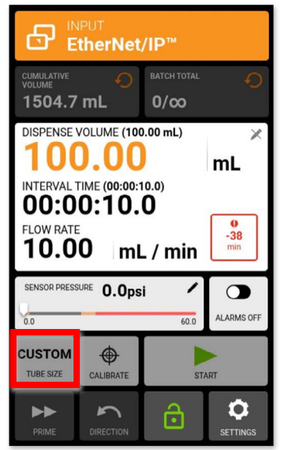


Figure 45

Byte 6: Set Flow Units.

Refer the “Byte 6 Set Flow Units” table below which identifies the flow unit index values (RPM in the example below) for all pump-drive models. The process control system commands the pump-drive to set the flow unit to a desired index. The input assembly “Flow Units” byte displays the status of this touchscreen field and then back to the process control system (see Figure 46 below).

Byte 6: Set Flow Units.			
Pump1:0,Set_Flow_Units.0	0	Decimal	SINT
Pump1:0,Set_Flow_Units.1	0	Decimal	BOOL
Pump1:0,Set_Flow_Units.2	0	Decimal	BOOL
Pump1:0,Set_Flow_Units.3	0	Decimal	BOOL
Pump1:0,Set_Flow_Units.4	0	Decimal	BOOL
Pump1:0,Set_Flow_Units.5	0	Decimal	BOOL
Pump1:0,Set_Flow_Units.6	0	Decimal	BOOL
Pump1:0,Set_Flow_Units.7	0	Decimal	BOOL

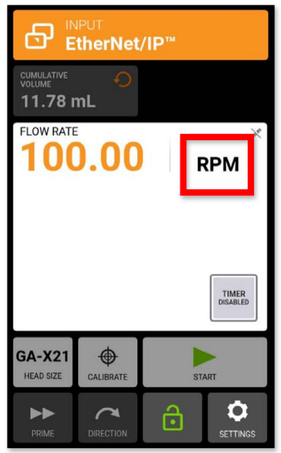


Figure 46

NOTE: Byte 7 is reserved.

Byte 8–11: Set Flow Rate (Data Type: Float).

Byte 8–11: Set Flow Rate.			
Pump1:O.Set_Flow_Rate	100.0	Float	REAL

Process control system commands the pump-drive to a certain flow rate. This flow rate is updated in the input assembly under the “current flow rate” field and displays on the touchscreen (see Figure 47 at right).

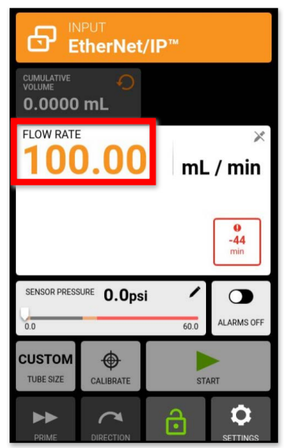


Figure 47

Byte 12–15: Set Dispense Volume (Data Type: Float).

Byte 12–15: Set Dispense Volume.			
Pump1:O.Set_Dispense_Volume	100.0	Float	REAL

Process control system commands the pump drive to dispense a certain volume every batch in Remote Volume mode (see Figure 48 at right).

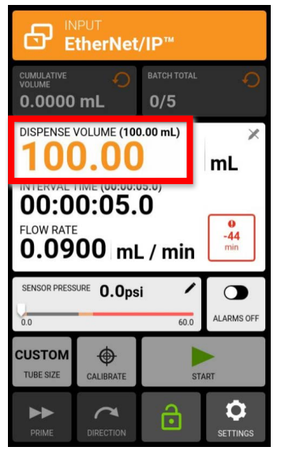


Figure 48

Byte 16–19: Set Dispense On Seconds (Data Type: Float).

Byte 16–19 Set Dispense On Seconds			
Pump1:O.Set_Dispense_On_Seconds	5.0	Float	REAL

Process controller commands the pump-drive to run a dispense batch for a certain number of seconds. The input assembly bit “Dispense Remaining on Seconds” counts down from this value (see Figure 49 at right).

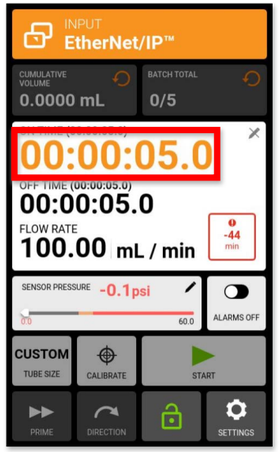


Figure 49

Byte 20–23: Set Dispense Off Seconds (Data Type: Float).

Byte 20-23 Set Dispense Off Seconds			
Pump1:O.Set_Dispense_Off_Seconds	5.0	Float	REAL

Process controller commands the pump-drive to stop the dispensing in between batches for a specified number of seconds. The input assembly bit “Remaining Dispense Off Seconds” counts down from this value (see Figure 50 at the right).

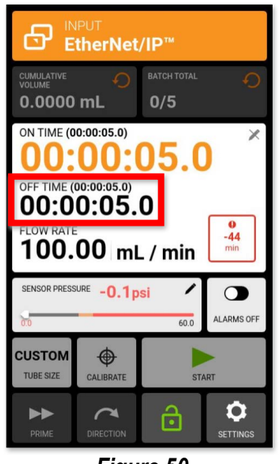


Figure 50

Byte 24–27: Set Batch Count Total (0 = Infinite; Date Type: 32-Bit Integer)

Byte 24–27 Set Batch Count Total			
Pump1:O.Set_Batch_Count_Total	5	Decimal	DINT

The process controller commands the pump-drive to set the total number of batches to a specified number where 0 = infinite. This value is only applicable in Time and Volume Dispense modes and the input assembly bit “Batch Count Total” reports this information from the pump-drive to the controller (see Figure 51 at right).

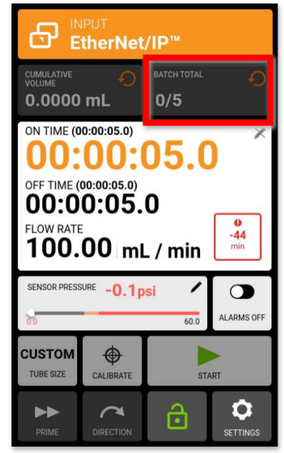


Figure 51

Additional Functions

Table 2. Output Assembly Object Summary

Byte Value	Data Type	Description
0	Byte	**Drive Control** Bit 0: Run/Pause (1 = RUN; 0 = PAUSE) Bit 1: Stop and Reset Dispense (1 to 0 transition) Bit 2: Toggle Remote/Local Control (1 to 0 transition) Bit 3: Clear Cumulative Volume (1 to 0 transition) Bit 4: Reserved Bit 5: Reserved Bit 6: Set Flow Direction CCW (1 = CCW, 0 = CW) Bit 7: Reserved
1	Byte	Reserved Pad
2	Byte	Reserved Pad
3	Byte	Reserved Pad
4	Byte	Set Dispense Mode (0 = CONT, 1 = Time, 2 = VOL)
5	Byte	Set Tube Size
6	Byte	Set Flow Units
7	Byte	Reserved Pad
8–11	Float	Set Flow Rate
12–15	Float	Set Dispense Volume
16–19	Float	Set Dispense On Seconds
20–23	Float	Set Dispense Off Seconds
24–27	32-bit INT	Set Batch Control Total (0 = infinite)

Set Dispense Modes Operating in EtherNet/IP Remote Control

The pump-drive can operate in Continuous, Time Dispense, or Volume Dispense modes while operating in EtherNet/IP Remote Control (see Figure 52 below).

To control the pump-drive through EtherNet/IP, the process controller changes the data values specified in Table 2 (see previous page 46). To monitor pump status, the process controller uses specific data values in Table 1 (see page 52 for details).

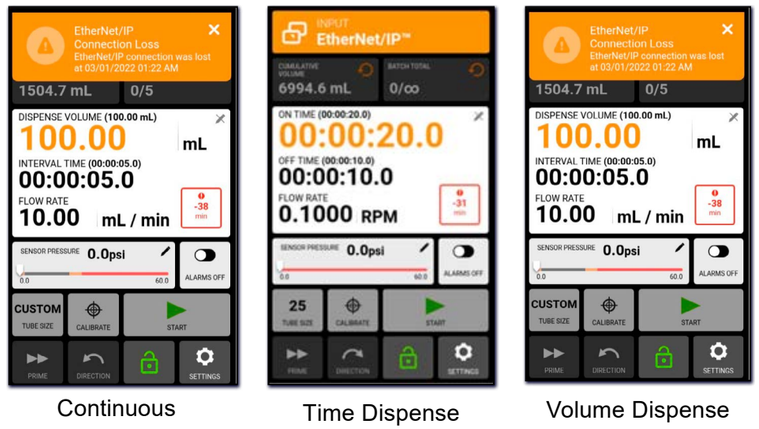
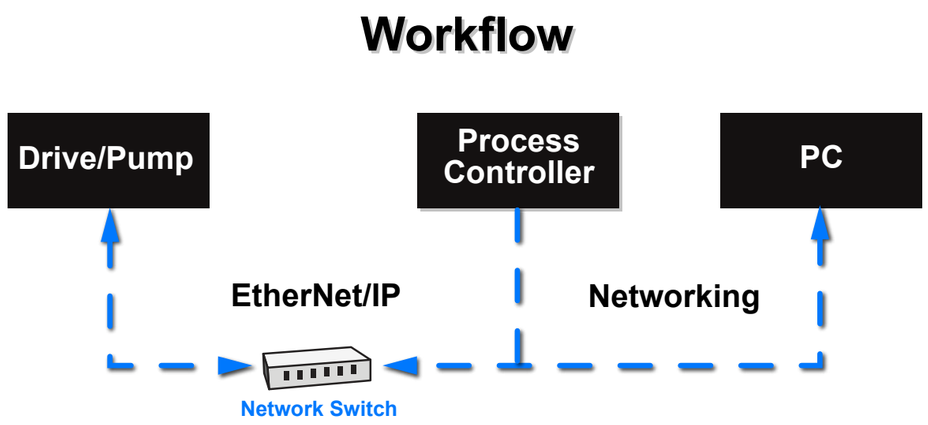


Figure 52



Set Flow Rate and the Pause Features

To set flow rate for the process controller, do the following:

- Enter **flow rate** and **flow unit values**. Both "`Pump1:O.Set _ Flow _ Units`" and "`Pump1:O.Set _ Flow _ Rate`" should be simultaneously sent to initially set a flow rate.

NOTE: For version 2.24 it is not required to enter the flow units correctly before a flow rate change can be initiated.

Flow Units

Flow units are set by indexing from 1 to N, where N is the maximum index number of flow units offered by a pump-drive. See Tables 3 and 4 (pages 52, 53) for how to map between index and real flow units.

NOTE: Index 0 (zero) is not valid.

Flow Rate Notes

- Any software version prior to v2.24.0 an indexing of 0 is allowed.
- As of v2.24.0 an index of 0 allows the pump-drive to accept local flow units.
- If flow rate values are higher than the maximum allowed, the flow rate will clamp at the maximum pump speed.
- If flow rate values are lower than the minimum allowed flow rate, but greater than zero, the flow rate will clamp at the minimum pump speed.
- In Continuous mode of operation, a flow rate of zero will enable a Pause state (no visible display on the touchscreen; see Figure 53 next page); this allows for an ability to stop and restart the drive without changing the entered start and stop values.
- Under this scenario, in Continuous mode a pump-drive will resume operation with only a flow rate change.

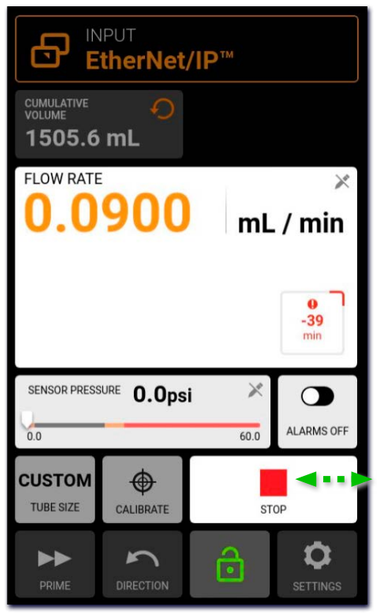
Mode Notes

- In Time Dispense or Volume Dispense modes, the flow rate cannot be changed while a pump-drive is operating.
- In Time Dispense or Volume Dispense modes, a zero flow rate can only be set before a batch sequence is started or reset.
- When paused, a pump-drive dispense status provides an active status, and the pump-drive running status will provide a zero value in the input assembly (see below).

  "`Pump1:I.Pump _ Running`" = 0
  "`Pump1:I.Dispense _ On`" = 1

Example of Commanded Flow Rate Scenarios

Flow Rate Value (as sent from process controller)	**Flow Unit**	**Pump Result**
105	%	Maximum Flow: 100
85	%	85
0.0001	µl	Minimum Flow: 0.1
0	%	“Pause”



Continuous Pause mode shown here shows the Stop button acting as a Pause button.

PAUSE

Figure 53

Appendix

Table 3. Ismatec® EtherNet/IP™ Flow Units.

Flow Unit Index						
Model Series MFLX78018-xx, MFLX78006-xx						
Index	**ISM160** MFLX 78018-1X/2X	**ISM351** MFLX 78018-40	**ISM352** MFLX 78018-42	**ISM4000** MFLX 78018-50	**ISM1800** MFLX 78018-60	**IPC** MFLX 78006-XX
1	mL/min	mL/min	mL/min	mL/min	mL/min	mL/min
2	mL/hr	mL/hr	mL/hr	mL/hr	mL/hr	mL/hr
3	L/day	L/day	L/day	L/day	L/day	L/day
4	oz/min	oz/min	oz/min	oz/min	oz/min	oz/min
5	oz/hr	oz/hr	oz/hr	oz/hr	oz/hr	oz/hr
6	µL/min	µL/min	µL/min	µL/min	µL/min	µL/min
7	µL/hr	µL/hr	µL/hr	µL/hr	µL/hr	µL/hr
8	RPM	RPM	RPM	RPM	RPM	RPM
9	%	%	%	%	%	%

NOTE: Depending on the pump-drive model, the Index start value (shown above) may represent a different value instead of 1.

Table 4. MasterSense EtherNet/IP Flow Units.

Flow Index Units								
Model Series MFLX77421-xx, MFLX07526-xx, MFLX07576-xx, MFLX77112-xx, MFLX78018-xx								
Index	**IP500**	**IP650** MFLX 77421-XX	**LS100** MFLX 07526-2X	**LS600** MFLX 07526-1X MFLX 07576-1X	**LS250** MFLX 07576-40	**BT321** MFLX 77112-XX	**Gear6000** MFLX 78018-50	**PistonQ1800** MFLX 78018-60
1	mL/min	mL/min	mL/min	mL/min	mL/min	mL/min	mL/min	mL/min
2	mL/hr	mL/hr	mL/hr	mL/hr	mL/hr	L/min	mL/hr	mL/hr
3	L/min	L/min	L/min	L/min	L/min	L/hr	L/min	L/min
4	L/hr	L/hr	L/hr	L/hr	L/hr	L/day	L/hr	L/hr
5	L/day	L/day	L/day	L/day	L/day	gal/min	L/day	L/day
6	gal/min	gal/min	µL/min	µL/min	µL/min	gal/hr	µL/min	µL/min
7	gal/hr	gal/hr	µL/hr	µL/hr	µL/hr	gal/day	µL/hr	µL/hr
8	gal/day	gal/day	gal/min	gal/min	gal/min	cu m/hr	gal/min	gal/min
9	oz/min	oz/min	gal/hr	gal/hr	gal/hr	RPM	gal/hr	gal/hr
10	oz/hr	oz/hr	gal/day	gal/day	gal/day	%	gal/day	gal/day
11	cu m/hr	cu m/hr	oz/min	oz/min	oz/min		oz/min	oz/min
12	RPM	RPM	oz/hr	oz/hr	oz/hr		oz/hr	oz/hr
13	%	%	cu m/hr	cu m/hr	cu m/hr		cu m/hr	cu m/hr
14			RPM	RPM	RPM		RPM	RPM
15			%	%	%		%	%

Tables 5. Tube Sizes.

ISM160/Cassette Pumps						
Cassette Type	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./ Rev.
6RLR	1	0.13	0.0003	0.224	No	0.0014
6RLR	2	0.19	0.0006	0.448	No	0.0028
6RLR	3	0.25	0.0010	0.768	No	0.0048
6RLR	4	0.38	0.0022	1.76	No	0.011
6RLR	5	0.44	0.0028	2.24	No	0.014
6RLR	6	0.51	0.0038	3.04	No	0.019
6RLR	7	0.57	0.0046	3.68	No	0.023
6RLR	8	0.64	0.0060	4.8	No	0.03
6RLR	9	0.76	0.0084	6.72	No	0.042
6RLR	10	0.89	0.0114	9.12	No	0.057
6RLR	11	0.95	0.0126	10.08	No	0.063
6RLR	12	1.02	0.0146	11.68	No	0.073
6RLR	13	1.09	0.0162	12.96	No	0.081
6RLR	14	1.14	0.0180	14.4	No	0.09
6RLR	15	1.22	0.0200	16	No	0.1
6RLR	16	1.33	0.0220	17.6	No	0.11
6RLR	17	1.42	0.0260	20.8	No	0.13
6RLR	18	1.52	0.0300	24	No	0.15
6RLR	19	1.65	0.0340	27.2	No	0.17

ISM160/Cassette Pumps (Cont.)						
Cassette Type	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./ Rev.
6RLR	20	1.75	0.0380	30.4	No	0.19
6RLR	21	1.85	0.0420	33.6	No	0.21
6RLR	22	2.03	0.0500	40	No	0.25
6RLR	23	2.29	0.0580	46.4	No	0.29
6RLR	24	2.54	0.0660	52.8	No	0.33
6RLR	25	2.79	0.0740	59.2	No	0.37
6RLR	26	3.17	0.0860	68.8	No	0.43
8RLR	1	0.13	0.0002	0.176	No	0.0011
8RLR	2	0.19	0.0005	0.368	No	0.0023
8RLR	3	0.25	0.0008	0.656	No	0.0041
8RLR	4	0.38	0.0019	1.504	No	0.0094
8RLR	5	0.44	0.0026	2.08	No	0.013
8RLR	6	0.51	0.0034	2.72	No	0.017
8RLR	7	0.57	0.0042	3.36	No	0.021
8RLR	8	0.64	0.0052	4.16	No	0.026
8RLR	9	0.76	0.0072	5.76	No	0.036
8RLR	10	0.89	0.0098	7.84	No	0.049
8RLR	11	0.95	0.0112	8.96	No	0.056
8RLR	12	1.02	0.0126	10.08	No	0.063

ISM160/Cassette Pumps (Cont.)

Cassette Type	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
8RLR	13	1.09	0.0138	11.04	No	0.069
8RLR	14	1.14	0.0156	12.48	No	0.078
8RLR	15	1.22	0.0176	14.08	No	0.088
8RLR	16	1.33	0.0200	16	No	0.1
8RLR	17	1.42	0.0220	17.6	No	0.11
8RLR	18	1.52	0.0260	20.8	No	0.13
8RLR	19	1.65	0.0300	24	No	0.15
8RLR	20	1.75	0.0320	25.6	No	0.16
8RLR	21	1.85	0.0340	27.2	No	0.17
8RLR	22	2.03	0.0400	32	No	0.2
8RLR	23	2.29	0.0480	38.4	No	0.24
8RLR	24	2.54	0.0580	46.4	No	0.29
8RLR	25	2.79	0.0620	49.6	No	0.31
8RLR	26	3.17	0.0700	56	No	0.35
12RLR	1	0.13	0.0002	0.1488	No	0.00093
12RLR	2	0.19	0.0004	0.336	No	0.0021
12RLR	3	0.25	0.0008	0.608	No	0.0038
12RLR	4	0.38	0.0018	1.408	No	0.0088
12RLR	5	0.44	0.0022	1.76	No	0.011

ISM160/Cassette Pumps (Cont.)

Cassette Type	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./ Rev.
12RLR	6	0.51	0.0032	2.56	No	0.016
12RLR	7	0.57	0.0038	3.04	No	0.019
12RLR	8	0.64	0.0048	3.84	No	0.024
12RLR	9	0.76	0.0066	5.28	No	0.033
12RLR	10	0.89	0.0088	7.04	No	0.044
12RLR	11	0.95	0.0098	7.84	No	0.049
12RLR	12	1.02	0.0112	8.96	No	0.056
12RLR	13	1.09	0.0126	10.08	No	0.063
12RLR	14	1.14	0.0134	10.72	No	0.067
12RLR	15	1.22	0.0150	12	No	0.075
12RLR	16	1.33	0.0166	13.28	No	0.083
12RLR	17	1.42	0.0188	15.04	No	0.094
12RLR	18	1.52	0.0200	16	No	0.1
12RLR	19	1.65	0.0240	19.2	No	0.12
12RLR	20	1.75	0.0250	20	No	0.125
12RLR	21	1.85	0.0260	20.8	No	0.13
12RLR	22	2.03	0.0300	24	No	0.15
12RLR	23	2.29	0.0340	27.2	No	0.17
12RLR	24	2.54	0.0380	30.4	No	0.19
12RLR	25	2.79	0.0420	33.6	No	0.21
12RLR	26	3.17	0.0480	38.4	No	0.24

ISM321/Miniflex 2 Channel					
Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
1	13	0.008	14	Yes	0.04
2	14	0.028	49	Yes	0.14
3	16	0.108	189	Yes	0.54
4	25	0.210	367.5	Yes	1.05
5	CUSTOM	0.008	14	Yes	0.04

ISM321/Miniflex 2 Channel					
1	13	0.008	14	Yes	0.04
2	14	0.028	49	Yes	0.14
3	16	0.108	189	Yes	0.54
4	CUSTOM	0.008	14	Yes	0.04

IPC-N/2-Stop Cassette Pumps						
Pump Head	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
IPC-11	1	0.13	0.00039	0.039	No	0.0035
IPC-11	2	0.19	0.00066	0.068	No	0.0060
IPC-11	3	0.25	0.00099	0.101	No	0.0090
IPC-11	4	0.38	0.00220	0.225	No	0.0200
IPC-1	5	0.44	0.00281	0.287	No	0.0255
IPC-11	6	0.51	0.00380	0.388	No	0.0345
IPC-11	7	0.57	0.00460	0.470	No	0.0418
IPC-11	8	0.64	0.00580	0.593	No	0.0527
IPC-11	9	0.76	0.00810	0.828	No	0.0736
IPC-11	10	0.89	0.01100	1.125	No	0.1000
IPC-11	11	0.95	0.01199	1.226	No	0.1090
IPC-11	12	1.02	0.01399	1.431	No	0.1272
IPC-11	13	1.09	0.01599	1.636	No	0.1454
IPC-11	14	1.14	0.01700	1.738	No	0.1545
IPC-11	15	1.22	0.02000	2.045	No	0.1818

IPC-N/2-Stop Cassette Pumps (Cont.)						
Pump Head	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
IPC-11	16	1.33	0.02200	2.250	No	0.2000
IPC-11	17	1.42	0.02599	2.658	No	0.2363
IPC-11	18	1.52	0.03000	3.068	No	0.2727
IPC-11	19	1.65	0.03499	3.579	No	0.3181
IPC-11	20	1.75	0.03900	3.988	No	0.3545
IPC-11	21	1.85	0.04300	4.398	No	0.3909
IPC-11	22	2.03	0.05200	5.318	No	0.4727
IPC-11	23	2.29	0.06300	6.443	No	0.5727
IPC-11	24	2.54	0.07500	7.670	No	0.6818
IPC-11	25	2.79	0.08899	9.101	No	0.8090
IPC-11	26	3.17	0.11000	11.250	No	1.0000
IPC 45						
IPC-45	1	0.13	0.0016	0.16	No	0.0035
IPC-45	2	0.19	0.0027	0.27	No	0.0060
IPC-45	3	0.25	0.0041	0.41	No	0.0090
IPC-45	4	0.38	0.0090	0.90	No	0.0200
IPC-45	5	0.44	0.0115	1.15	No	0.0255
IPC-45	6	0.51	0.0155	1.55	No	0.0345
IPC-45	7	0.57	0.0188	1.88	No	0.0418

IPC 45 (Cont.)						
Pump Head	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
IPC-45	8	0.64	0.0237	2.37	No	0.0527
IPC-45	9	0.76	0.0331	3.31	No	0.0736
IPC-45	10	0.89	0.0450	4.50	No	0.1000
IPC-45	11	0.95	0.0491	4.91	No	0.1090
IPC-45	12	1.02	0.0572	5.72	No	0.1272
IPC-45	13	1.09	0.0654	6.54	No	0.1454
IPC-45	14	1.14	0.0695	6.95	No	0.1545
IPC-45	15	1.22	0.0818	8.18	No	0.1818
IPC-45	16	1.33	0.0900	9.00	No	0.2000
IPC-45	17	1.42	0.1063	10.63	No	0.2363
IPC-45	18	1.52	0.1227	12.27	No	0.2727
IPC-45	19	1.65	0.1431	14.31	No	0.3181
IPC-45	20	1.75	0.1595	15.95	No	0.3545
IPC-45	21	1.85	0.1759	17.59	No	0.3909
IPC-45	22	2.03	0.2127	21.27	No	0.4727
IPC-45	23	2.29	0.2577	25.77	No	0.5727
IPC-45	24	2.54	0.3068	30.68	No	0.6818
IPC-45	25	2.79	0.3641	36.41	No	0.8090
IPC-45	26	3.17	0.4500	45.00	No	1.0000

LS100						
Tube Type	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
Standard	1	13	0.0012	6	No	0.06
	2	14	0.0042	21		0.21
	3	15	0.0340	170		1.7
	4	16	0.0160	80		0.8
	5	17	0.0560	280		2.8
	6	18	0.0760	380		3.8
	7	24	0.0560	280		2.8
	8	35	0.0760	380		3.8
	9	36	0.0960	480		4.8
EZ Load	1	13	0.0012	6	Optional EZ	0.06
	2	14	0.0042	21		0.21
	3	16	0.0160	80		0.8
	4	25	0.0340	170		1.7
	5	17	0.0560	280		2.8
	6	18	0.0760	380		3.8
	7	15	0.0340	170		1.7
	8	24	0.0560	280		2.8
	9	CUSTOM	0.0012	6		0.06

LS100 (Cont.)						
Tube Type	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
EZ Load II	1	13	0.0012	6	Optional	0.06
	2	14	0.0042	21		0.21
	3	16	0.0160	80		0.8
	4	25	0.0340	170		1.7
	5	17	0.0560	280		2.8
	6	18	0.0760	380		3.8
	7	15	0.0340	170		1.7
	8	24	0.0560	280		2.8
	9	35	0.0760	380		3.8
	10	36	0.0960	480		4.8
	11	CUSTOM	0.0012	6		0.06
EZ Load 3	1	13	0.00120	6	No	0.06
	2	14	0.00420	21		0.21
	3	16	0.01600	80		0.8
	4	25	0.03400	170		1.7
	5	17	0.05600	280		2.8
	6	18	0.07600	380		3.8
	7	15	0.03400	170		1.7
IPC	26	3.17	0.4500	45.00	No	1.0000

LS100 (Cont.)

Tube Type	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
EZ Load 3	8	24	0.05600	280	No	2.8
	9	35	0.07600	380		3.8
	10	36	0.09600	480		4.8
	11	CUSTOM	0.0012	6		0.06
High Performance	1	16	0.018	90	Optional	0.9
	2	25	0.038	190		1.9
	3	17	0.060	300		3
	4	18	0.076	380		3.8
	5	15	0.036	180		1.8
	6	24	0.060	300		3
	7	35	0.086	430		4.3
	8	36	0.116	580		5.8
	9	14 High Pressure	0.006	30		0.3
	10	16 High Pressure	0.018	90		0.9
	11	15 High Pressure	0.034	170		1.7
	12	24 High Pressure	0.048	240		2.4
	13	CUSTOM	0.006	30		0.3

LS100 (Cont.)

Tube Type	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
Cytoflow 2	1	16	0.03	170	No	1.7
	2	25	0.08	390		3.9
	3	17	0.12	610		6.1
	4	18	0.17	860		8.6
	5	15	0.08	400		4
	6	24	0.12	620		6.2
	7	35	0.19	950		9.5
	8	36	0.26	1280		12.8
	9	CUSTOM	0.03	170		1.7
Cytoflow 3	1	16	0.03	160	No	1.6
	2	25	0.07	350		3.5
	3	17	0.11	560		5.6
	4	18	0.15	770		7.7
	5	15	0.07	350		3.5
	6	24	0.11	570		5.7
	7	35	0.16	780		7.8
	8	36	0.19	960		9.6
	9	CUSTOM	0.03	160		1.6
Other	1	CUSTOM	0.0012	6		0.06

LS250						
Pump Head	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
		Thin Wall Tubes				
Ultrapharm	1	11	0.00048	6	Yes	0.024
	2	13	0.00146	18.25		0.073
	3	14	0.00490	61.25		0.245
	4	16	0.01744	218		0.872
	5	25	0.04072	509		2.036
	6	17	0.05320	665		2.66
		Thick Wall Tubes				
	7	15	0.04096	512		2.048
	8	24	0.06424	803		3.212
	9	35	0.07976	997		3.988
	10	36	0.09768	1221		4.884
	11	CUSTOM	0.00048	6		0.024

LS600						
Pump Head	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
Standard	1	13	0.006	36	No	0.06
	2	14	0.021	126		0.21
	3	15	0.170	1020		1.7
	4	16	0.080	480		0.8
	5	17	0.280	1680		2.8
	6	18	0.380	2280		3.8
	7	24	0.280	1680		2.8
	8	35	0.380	2280		3.8
	9	36	0.480	2880		4.8
EZ Load	1	13	0.0060	36	Optional	0.06
	2	14	0.0210	126		0.21
	3	16	0.0800	480		0.8
	4	25	0.1920	1152		1.92
	5	17	0.2800	1680		2.8
	6	18	0.3800	2280		3.8
	7	15	0.1700	1020		1.7
	8	24	0.2800	1680		2.8
	9	CUSTOM	0.0060	36		0.06

LS600 (Cont.)

Pump Head	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
EZ Load II	1	13	0.0060	36	Optional	0.06
	2	14	0.0210	126		0.21
	3	16	0.0800	480		0.8
	4	25	0.1700	1020		1.7
	5	17	0.2800	1680		2.8
	6	18	0.3800	2280		3.8
	7	15	0.1700	1020		1.7
	8	24	0.2800	1680		2.8
	9	35	0.3800	2280		3.8
	10	36	0.4800	2880		4.8
	11	CUSTOM	0.006	36		0.06
EZ Load 3	1	13	0.0060	36	No	0.06
	2	14	0.0210	126		0.21
	3	16	0.0800	480		0.8
	4	25	0.1700	1020		1.7
	5	17	0.2800	1680		2.8
	6	18	0.3800	2280		3.8
	7	15	0.1700	1020		1.7

LS600 (Cont.)

Pump Head	Index	Tube Size	Min Flow Rate mL/min	Max Flow Rate mL/min	OHS Fit	Vol./Rev.
EZ Load 3	8	24	0.2800	1680	No	2.8
	9	35	0.3800	2280		3.8
	10	36	0.4800	2880		4.8
	11	CUSTOM	0.006	36		0.06
High Performance	1	16	0.090	540	Optional	0.9
	2	25	0.187	1122		1.87
	3	17	0.307	1842		3.07
	4	18	0.377	2262		3.77
	5	15	0.180	1080		1.8
	6	24	0.300	1800		3
	7	35	0.430	2580		4.3
	8	36	0.580	3480		5.8
	9	CUSTOM	0.09	540		0.9
Cytoflow 2	1	16	0.17	1020	No	1.7
	2	25	0.39	2340		3.9
	3	17	0.61	3660		6.1
	4	18	0.86	5160		8.6
	5	15	0.40	2400		4
	6	24	0.62	3720		6.2

LS600 (Cont.)						
Pump Head	**Index**	**Tube Size**	**Min Flow Rate mL/min**	**Max Flow Rate mL/min**	**OHS Fit**	**Vol./Rev.**
Cytoflow 2	7	35	0.95	5700	No	9.5
	8	36	1.28	7680		12.8
	9	CUSTOM	0.17	1020		1.7
Cytoflow 3	1	16	0.16	960	No	1.6
	2	25	0.35	2100		3.5
	3	17	0.56	3360		5.6
	4	18	0.77	4620		7.7
	5	15	0.35	2100		3.5
	6	24	0.57	3420		5.7
	7	35	0.78	4680		7.8
	8	36	0.96	5760		9.6
	9	CUSTOM	0.16	960		1.6
Other	1	CUSTOM	0.006	36		0.06
IPC	26	3.17	0.4500	45.00	No	1.0000

IP650						
Pump Head	**Index**	**Tube Size**	**Min Flow Rate mL/min**	**Max Flow Rate mL/min**	**OHS Fit**	**Vol./Rev.**
Standard	1	73	1.23	8000	No	12.30769231
	2	82	2.00	13000		20
EZ Load	1	26	0.62	4000	Optional	6.153846154
	2	73	1.23	8000		12.30769231
	3	82	2.00	13000		20
	4	CUSTOM	0.62	4000		6.153846154
		Precision/Thin Wall Tube Sizes				
Rapid-Load (3-Roller)	1	26	0.62	4000	Optional	6.153846154
	2	73	1.23	8000		12.30769231
	3	82	2.00	13000		20
		Precision/Thick Wall Tube Sizes				
	4	70	1.23	8000		12.30769231
	5	88	2.62	17000		26.15384615
	6	89	2.92	19000		29.23076923
	7	CUSTOM	0.62	4000		6.153846154
High Performance	1	70	1.23	8000	No	12.30769231
	2	88	2.62	17000		26.15384615
	3	89	2.92	19000		29.23076923
	4	CUSTOM	1.23	8000		12.30769231
Other	1	CUSTOM	0.62	4000		6.153846154

BT321/Connected						
Index	**Tube Size**	**Min Flow Rate mL/min**	**Max Flow Rate mL/min**	**OHS Fit**	**mL./Rev.**	**Reversible (default - 0)**
1	87	647.6635	18899.9985	Yes	58.8785	n/a
2	91	1439.2521	41999.9931		130.8411	n/a
3	CUSTOM	647.6635	18899.9985		58.8785	n/a
BT321-HP220/Connected						
1	87	647.6635	18899.9985	Yes	58.8785	n/a
2	91	1439.2521	41999.9931		130.8411	n/a
3	CUSTOM	647.6635	18899.9985		58.8785	n/a

Masterflex EtherNet/IP EDS Download File

An EDS file is an Electronic Data Sheet file (see partial example below) which outlines the input and output data that the EtherNet/IP-capable pump-drive can communicate with a process controller. Without this file the process controller cannot understand input/output data structure the pump-drive uses to communicate data remotely over the EtherNet/IP.

Additionally, without an EDS file the process of configuring and establishing communication between a process controller and the pump-drive, a manual tedious procedure can be required to establish communications. Instead, when an EDS file is loaded into the process controller software input/output data communication structures are automatically recognized and created in a seamless manner.

Scan the QR code below to download the EDS code document in a zip file.

```
$ EZ-EDS Version 3.21.1.20161208 Generated Electronic Data Sheet

[File]
        DescText = "Masterflex";
        CreateDate = 02-03-2017;
        CreateTime = 13:48:06;
        ModDate = 07-21-2017;
        ModTime = 10:38:47;
        Revision = 1.14;
        1_IOC_Details_License = 0x741D74B8;

[Device]
        VendCode = 1440;
        VendName = "Masterflex part of Avantor";
        ProdType = 43;
        ProdTypeStr = "Generic Device";
        ProdCode = 1;
        MajRev = 3;
        MinRev = 2;
        ProdName = "Masterflex";

[Device Classification]
        Class1 = EtherNetIP;

[Params]
        Param1 =
                0,              $ reserved, shall equal 0
                ,,              $ Link Path Size, Link Path
                0x0230,         $ Descriptor
                0xC1,           $ Data Type
                1,              $ Data Size in bytes
                "Status OK",    $ name
                "",             $ units
                "",             $ help string
                ,,0,            $ min, max, default data values
                ,,,,            $ mult, div, base, offset scaling
                ,,,,            $ mult, div, base, offset links
                ;               $ decimal places
        Param2 =
                0,              $ reserved, shall equal 0
                ,,              $ Link Path Size, Link Path
                0x0230,         $ Descriptor
                0xC1,           $ Data Type
                1,              $ Data Size in bytes
                "Pump Running", $ name
                "",             $ units
                "",             $ help string
                ,,0,            $ min, max, default data values
                ,,,,            $ mult, div, base, offset scaling
                ,,,,            $ mult, div, base, offset links
                ;               $ decimal places
        Param3 =
                0,              $ reserved, shall equal 0
                ,,              $ Link Path Size, Link Path
                0x0230,         $ Descriptor
                0xC1,           $ Data Type
                1,              $ Data Size in bytes
                "Dispense On",  $ name
```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