Instructions - Parts

Communications Gateway Module Installation Kit

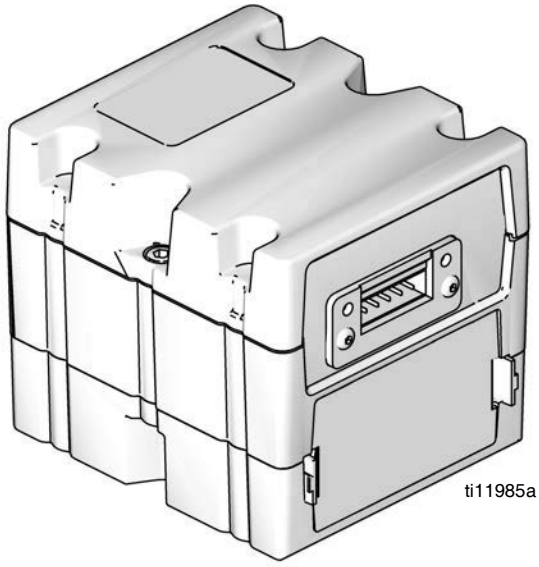
3A6338H

EN

For use with Electric Fixed Ratio (EFR) systems to provide fieldbus communications abilities. For professional use only.

Important Safety Instructions

Read all warnings and instructions in this manual and in your system manual before using the equipment. Save these instructions.



CGM with DeviceNet connector shown

Contents

Related Manuals

Manual	Description
312864	Communications Gateway Module, Instructions - Parts
3A6165	Electric Fixed Ratio Proportioner, Setup - Operation
406987	GCA CAN Cables, Reference
3A8115	Voltex™ Dynamic Mix Valve, Instructions - Parts

Models

Part	Description
25B127	DeviceNet CGM Kit
26A700	EtherNet/IP CGM Kit
26A701	PROFIBUS CGM Kit
26A702	PROFINET CGM Kit

Overview

The Communications Gateway Module (CGM) provides a control link between the Electric Fixed Ratio (EFR) system and a selected fieldbus. This provides the means for report monitoring and control by external automation systems.

NOTE: Visit help.graco.com for updated EFR software, maps, and the network configuration files listed below.

- EDS file: DeviceNet or Ethernet/IP fieldbus networks
- GSD file: PROFIBUS fieldbus networks
- GSDML: PROFINET fieldbus networks
- ACD file: DeviceNet or Ethernet/IP fieldbus networks

The following components are included in the CGM Installation Kit.

Ref.	Description	Qty.
A	CGM Kit	1
AA	Gateway Module	1
AB	Mounting Bracket	1
B	Screw, #10-32 x .50	2
C	Washer, #10, Nylon	2
D	Communication Cable (not shown)	1

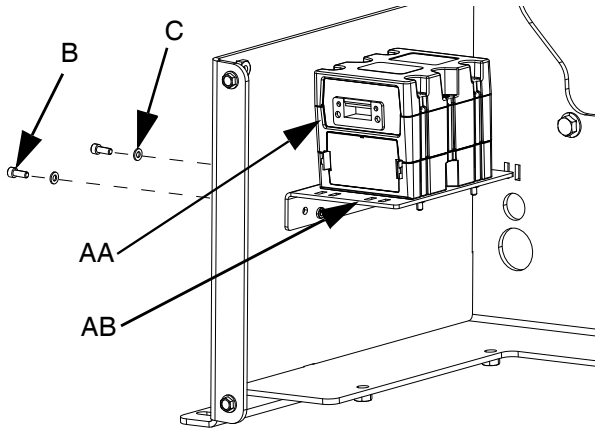


FIG. 1

CGM Software

The following software is must be installed on the CGM module to work properly with the EFR CGM map 19A796.

- 17P796, version 3.01.004

Installation

⚠ WARNING

ELECTRIC SHOCK HAZARD

To avoid electric shock, make sure the system power is OFF before connecting or disconnecting CAN cables.

PRESSURIZED FLUID HAZARD

This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow Pressure Relief Procedure when you stop spraying and before cleaning, checking or servicing the equipment.

PERSONAL PROTECTIVE EQUIPMENT

Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns.

1. Ensure the system power is OFF and pressure has been relieved. Follow the Pressure Relief Procedure in the Electric Fixed Ratio Proportioner, Setup - Operation manual.
2. Remove the pump yoke shroud (F) and frame cover (G) from the EFR system.

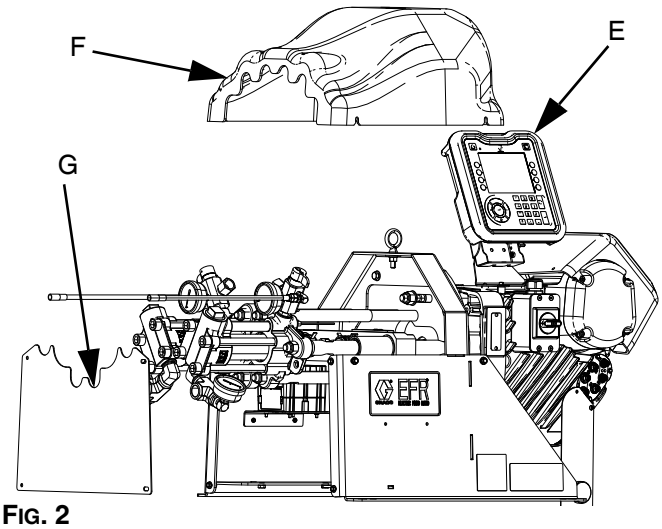


FIG. 2

3. Mount the CGM Kit (A) inside the system frame with two screws (B) and washers (C).

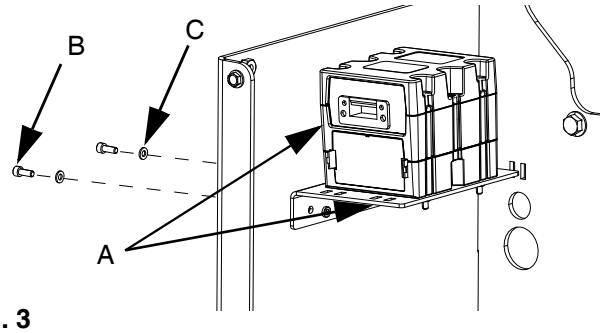


FIG. 3

4. Secure the CAN cable (CAN) and the fieldbus cable (FB) to the frame using the cable ties (H) provided, and route them through the protected opening as shown in FIG. 4.

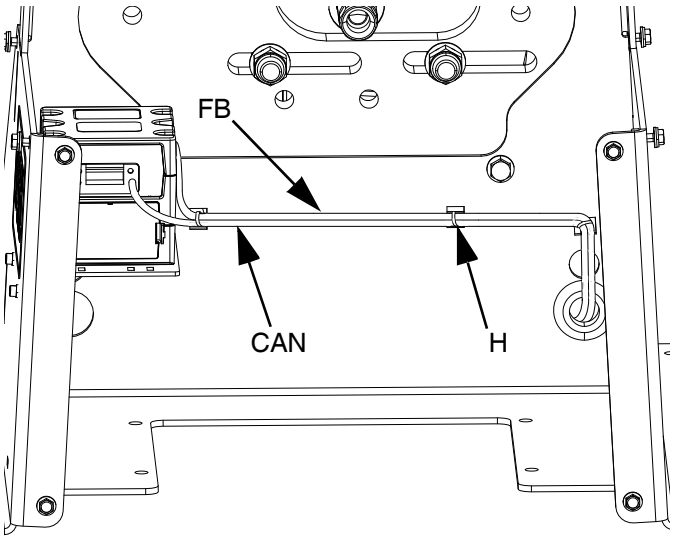


FIG. 4

5. Connect the CAN cable from either CAN connection on the CGM to port 1 or port 2 on the EFR.

NOTICE

Ensure the CAN cable is connected to an appropriate CAN connection. Failure to connect the CAN cable correctly can result in damage to the CGM module.

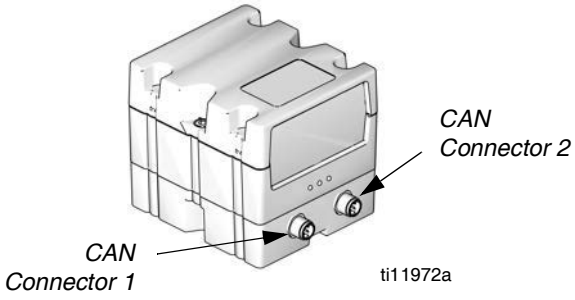


FIG. 5: Cable Connections

6. If used, connect the Ethernet, DeviceNet, PROFINET, or PROFIBUS cable (FB) to the CGM as applicable. Connect the other end of the cable to the fieldbus device.

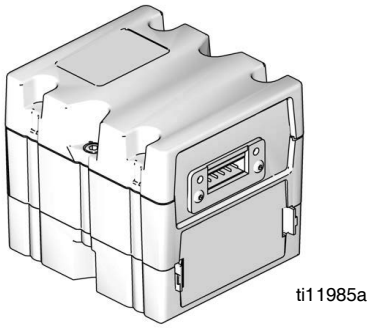


FIG. 6: Cable Connections

7. Reinstall the pump yoke shroud (F) and the frame cover (G) onto the EFR system.

8. Using token 19A534, perform the Install or Update Data Map procedure in the Communications Gateway Module, Instructions – Parts manual. See **Related Manuals** on page 2.

9. Perform the **Setup** procedure on page 5 to configure the fieldbus.

NOTE: To produce an accurate dispense, the dispense valve must be controlled directly by the EFR. See the Electric Fixed Ratio Proportioner, Setup - Operation manual for I/O integration of the dispense valve with the EFR.

NOTE: See **Automation Outputs (signals from PLC to EFR System)** on page 25 for information on triggering a dispense through the EFR using the CGM. To produce accurate starts/stops, it is recommended to use discrete I/O to trigger a dispense. See the Electric Fixed Ration Proportioner, Setup-Operation manual for instructions on I/O integration of the triggering signal.

Setup

EFR and PLC Connection

Verify the PLC connection parameters are setup correctly.

NOTE: The connection between the EFR and PLC will not be made if the PLC connection parameters are not set up correctly.

Standard Gateway Map: 19A796	
Comm. Format	**Data-SINT**
Input Assembly Instance	100
Input Byte Size	42
Output Assembly Instance	150
Output Byte Size	22

Gateway Screens

The Gateway screens are used to configure the fieldbus. If the CGM is correctly installed, the Gateway Screens will automatically be shown under the Integration chapter of the ADM. Cycle power to the EFR once configuration of the CGM is complete. See page 3 for installation instructions.

1. With the system on and enabled, press  to access the Setup screens.
2. Press the left arrow key once to navigate to the main Gateway screen. See FIG. 7.

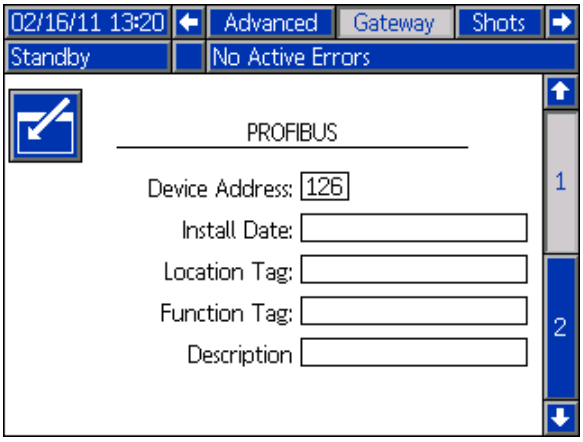


FIG. 7: Example Fieldbus Screen

PROFIBUS Fieldbus Screens

These screens are shown only if a PROFIBUS Fieldbus CGM is installed.

Screen 1

This screen enables the user to set the device address, install date, location tag, function tag, and description.

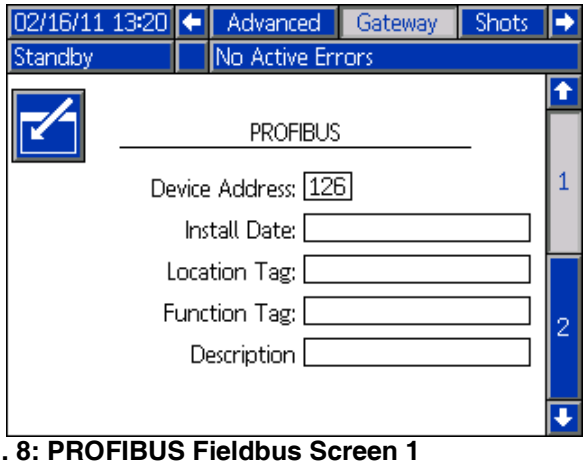


FIG. 8: PROFIBUS Fieldbus Screen 1

Screen 2

This screen displays the hardware revision, system serial number, and data map identification information.

NOTE: The map identification information should be as follows:

Map name: EFRCGM_19A796
Map ID: 00001
Map Revision: 001, 001
Map Date: 01/24/2019

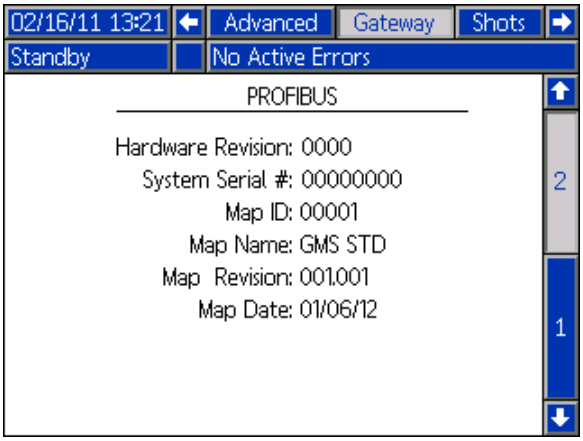


FIG. 9: PROFIBUS Fieldbus Screen 2

PROFINET Fieldbus Screens

These screens are shown only if a PROFINET Fieldbus CGM is installed.

Screen 1

This screen enables the user to set the IP Address, DHCP settings, subnet mask, gateway, and DNS information.

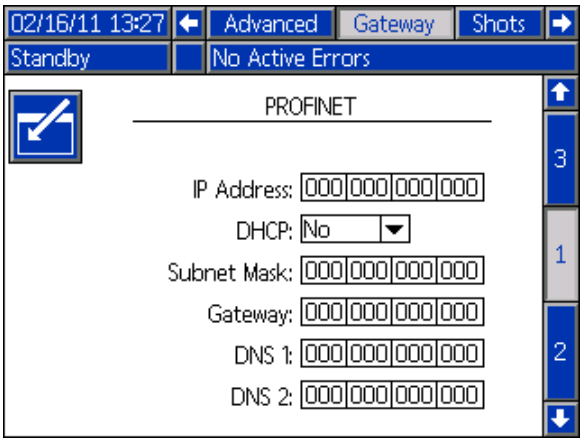


FIG. 10: PROFINET Fieldbus Screen 1

Screen 2

This screen enables the user to set the station name, install date, location tag, function tag, and description.

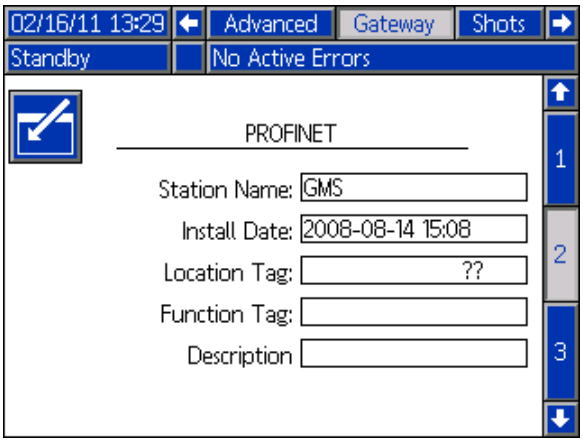


FIG. 11: PROFINET Fieldbus Screen 2

Screen 3

This screen displays the hardware revision, system serial number, and data map identification information.

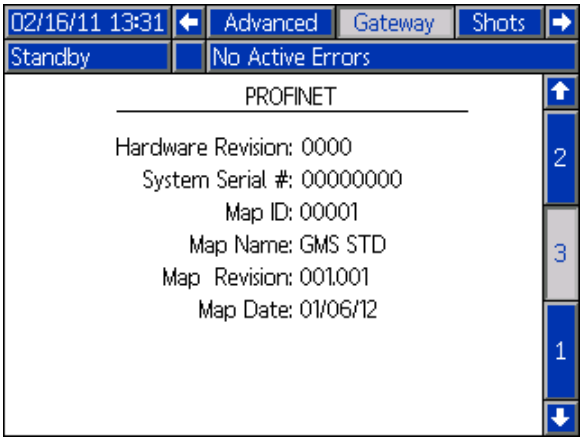


FIG. 12: PROFINET Fieldbus Screen 3

EtherNet/IP Fieldbus Screens

These screens are shown only if an EtherNet/IP Fieldbus CGM is installed.

Screen 1

This screen enables the user to set the IP address, DHCP settings, subnet mask, gateway, and DNS information.

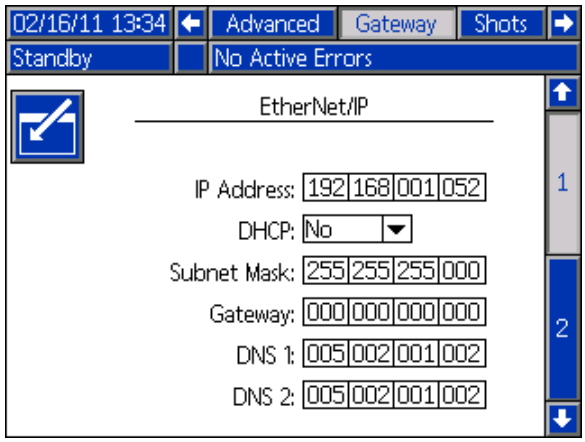


FIG. 13: EitherNet/IP Fieldbus Screen 1

Screen 2

This screen displays the hardware revision, system serial number, and data map identification information.

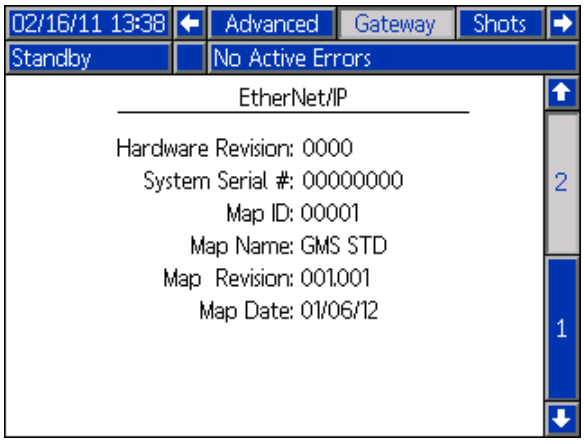


FIG. 14: EtherNet/IP Fieldbus Screen 2

DeviceNet Fieldbus Screen

This screen is shown only if a DeviceNet Fieldbus CGM is installed.

This screen enables the user to set the device address and baud rate, as well as view the hardware revision, system serial number, and data map identification information.

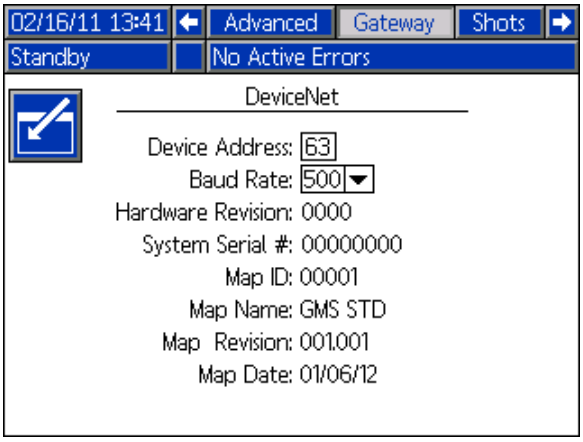


FIG. 15: DeviceNet Fieldbus Screen

Available Internal Data

See **Appendix A - I/O Signal Descriptions** on page 22 for additional details regarding each input/output. Unless stated otherwise:

- In each instance, bytes are stored in little endian order (most significant to least significant).
- PROFIBUS and PROFINET data must be mirrored by the PLC to get the correct data out on the PLC side. When the data is mirrored, the least significant byte is inserted into the most significant spot, and the most significant byte is inserted into the least significant spot.

Example:

Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Original Data	0	0	1	1	1	0	0	1	1	0	1	1	0	1	1	1
Mirroring Data	0	1	1	1	1	0	1	1	1	0	0	1	0	0	1	1

- Values sent through the CGM are subject to the same maximum and minimum restrictions as those experienced through the ADM. For example, flow rates cannot be set to a value less than zero.

NOTE: Automation Outputs can be monitored by the corresponding Automation Inputs to verify the EFR received the data correctly.

Automation Inputs (signals from EFR system to PLC)

Instance ID	Description	Data Type	BIT	Input Byte Index's
1	Heartbeat To PLC	Boolean	0	0
	System On	Boolean	1	
	System Ready	Boolean	2	
	Alarms Present	Boolean	3	
	Deviations Present	Boolean	4	
	Advisories Present	Boolean	5	
	Current Sequence is Playing	Boolean	6	
	Current Sequence is Paused	Boolean	7	
	Current Sequence is Stopped	Boolean	8	1
	Dispense Valve Open	Boolean	9	
	System is Priming	Boolean	10	
	System is Purging	Boolean	11	
	System is Parking	Boolean	12	
	System is Depressurizing	Boolean	13	
	Gel Shot is Running	Boolean	14	
	EFR is Dispensing	Boolean	15	
	ADM Lockout is Active	Boolean	16	2
	Incrementing Step Time is Active	Boolean	17	
	PLC Monitor Only is Active	Boolean	18	
	PLC to EFR Heartbeat is Enabled and Required to Control	Boolean	19	
	Voltex Dynamic Mix Valve, Motor Running	Boolean	20	
	EFR Dispense Wait Completed for Dispensing *◆	Boolean	21	
	Voltex Dynamic Mix Valve, Motor is at Target Speed	Boolean	22	
	Voltex Dynamic Mix Valve, Air Injection Valve Opened	Boolean	23	
	Red Tank is Filling	Boolean	24	3
	Red Tank Fill Level Bit 1	Boolean	25	
	Red Tank Fill Level Bit 2	Boolean	26	
	Blue Tank is Filling	Boolean	27	
	Blue Tank Fill Level Bit 1	Boolean	28	
	Blue Tank Fill Level Bit 2	Boolean	29	
	System is Recirculating	Boolean	30	
	{Reserved Bits}	Boolean	31	
2	Current Active Sequence	uint8	0-7	4
3	Current Step of the Active Sequence	uint8	0-7	5
4	Time Remaining to Complete Step (*or time completed starting from 0) (XX.X s)	uint16	0-7	6
			8-15	7
5	Red Pump Outlet Pressure (XXXX.X bar)	uint16	0-7	8
			8-15	9
6	Blue Pump Outlet Pressure (XXXX.X bar)	uint16	0-7	10
			8-15	11
7	Red Pump Inlet Pressure (XXXX.X bar)	uint16	0-7	12
			8-15	13

Instance ID	Description	Data Type	BIT	Input Byte Index's
8	Blue Pump Inlet Pressure (XXXX.X bar)	uint16	0-7	14
			8-15	15
9	Pump Flow Rate (XXXX cc/min)	uint16	0-7	16
			8-15	17
10	Active Error Number Requiring Acknowledgment	uint8	0-7	18
11	Active Operator Mode Dispense Flow Rate (XXXX cc/min)	uint16	0-7	19
			8-15	20
12	Data Exchanged Element Selected	uint8	0-7	21
13	Data Exchanged Element Value	uint16	0-7	22
			8-15	23
14	Selected Step of the Active Sequence	uint8	0-7	24
15	Selected Step Amount (XXXX.XX)	uint32	0-7	25
			8-15	26
			16-23	27
			24-31	28
16	Selected Step Shot Type	uint8	0-7	29
17	Selected Step Flow Rate (XXXX cc/min)	uint16	0-7	30
			8-15	31
18	Selected Step Calibration (XX.XX)	uint16	0-7	32
			8-15	33
19	Total Sequence Amount Requested (XXXX.XX cc)	uint32	0-7	34
			8-15	35
			16-23	36
			24-31	37
20	Total Sequence Amount Dispensed (XXXX.XX cc)	uint32	0-7	38
			8-15	39
			16-23	40
			24-31	41

* *Refer to output bit "Step Time for Input Bytes 6 and 7 to Count Up Request." If set, this data will increment starting from 0 during an active dispense.*

◆ *If start and stop are time critical, do not use the EFR EFR Gateway Run Sequence timing diagram shown on page 16, or the EFR Gateway Run Sequence in Operator Mode timing diagram shown on page 17. Instead, use the EFR Gateway Run Sequence Operator Sequence with Voltex timing diagram shown on page 18, and the EFR Gateway Run Sequence with Voltex timing diagram shown on page 19 to control the sequence on the PLC. This will ensure that the motor is up to speed when commanding the bead to start and stop.*

Automation Outputs (signals from PLC to EFR system)

Instance ID	Description	Data Type	BIT	Output Byte Index's
1	System Enable Request	Boolean	0	0
	System Shutdown Request	Boolean	1	
	Start Current Sequence/Step, Trigger Operator Mode	Boolean	2	
	Pause Current Sequence	Boolean	3	
	Stop Current Sequence	Boolean	4	
	Priming Request	Boolean	5	
	Purge Request	Boolean	6	
	Parking Request	Boolean	7	
	Depressurizing Request	Boolean	8	1
	*ADM Lockout Request	Boolean	9	
	❖ Increment Step Time for Input Bytes 6 and 7 Request	Boolean	10	
	◆ PLC Monitor Only Request	Boolean	11	
	† PLC to EFR Heartbeat Enable Request	Boolean	12	
	‡ Heartbeat to EFR	Boolean	13	
	Voltex Dynamic Mix Valve, Motor On Request	Boolean	14	
	Voltex Dynamic Mix Valve, Air Injection Open Request	Boolean	15	
	Red Tank Auto/Manual Fill Request	Boolean	16	2
	Blue Tank Auto/Manual Fill Request	Boolean	17	
	Recirculation Request	Boolean	18	
	{Reserved Bits}	Boolean	19	
	{Reserved Bits}	Boolean	20	
	{Reserved Bits}	Boolean	21	
	{Reserved Bits}	Boolean	22	
	{Reserved Bits}	Boolean	23	
3	Desired Active Sequence	uint8	0-7	3
4	Acknowledging of the Active Error Number	uint8	0-7	4
5	Desired Operator Mode Dispense Flow Rate (XXXX cc/min)	uint16	0-7	5
			8-15	6
6	Data Exchanged Element Desired	uint8	0-7	7
7	Data Exchanged Element Desired Value	uint16	0-7	8
			8-15	9
8	Desired Step of the Active Sequence	uint8	0-7	10
9	Desired Step Amount (XXXX.XX)	uint32	0-7	11
			8-15	12
			16-23	13
			24-31	14
10	Desired Step Shot Type	uint8	0-7	15
11	Desired Step Flow Rate (XXXX cc/min)	uint16	0-7	16
			8-15	17
12	Desired Step Calibration (XX.XX)	uint16	0-7	18
			8-15	19

Instance ID	Description	Data Type	BIT	Output Byte Index's
13	{Reserved Word}	uint16	0-7	20
			8-15	21

* If set, control of the EFR from the ADM will be disabled.

❖ If set, the "Time Remaining to Complete Step" data from previous table will increase starting from 0.

◆ If set, all requests outlined in the table above will be ignored by the EFR system, except "Acknowledging of the Active Error Number" and "System Shutdown Request."

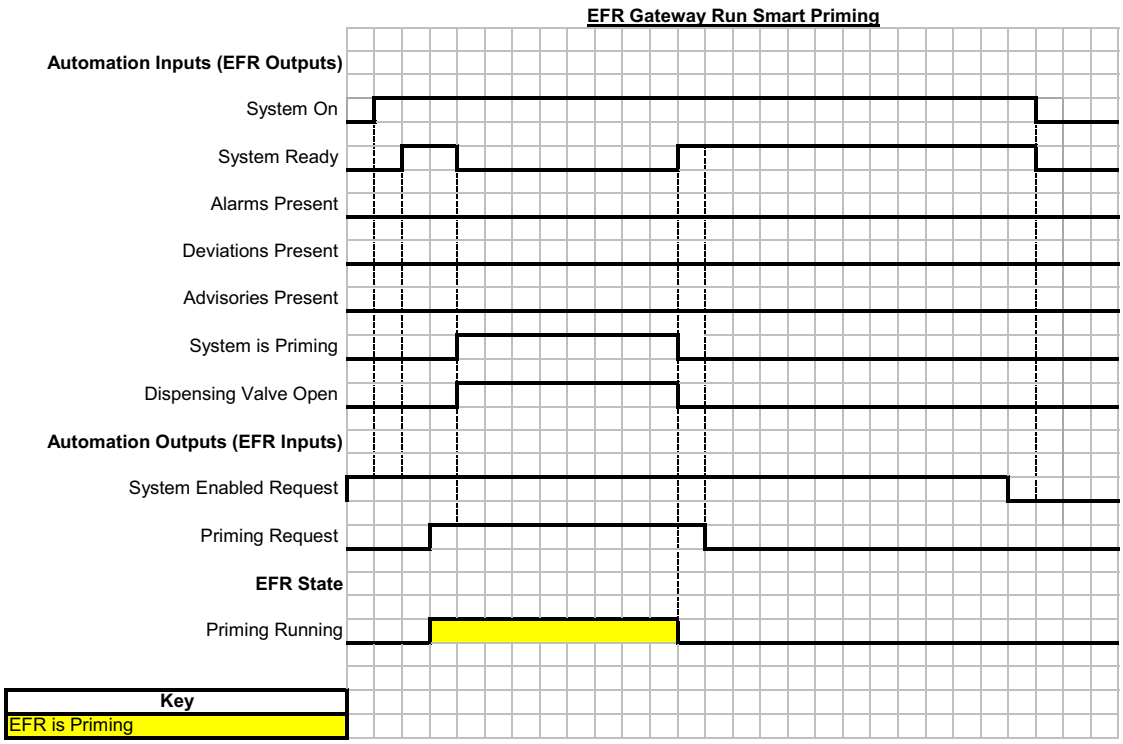
† If set, the PLC must provide a valid "Heartbeat to EFR" signal to the EFR to control the system. If a valid signal is removed, the EFR system will shut down.

‡ If the "PLC to EFR Heartbeat Request" bit is set, the PLC must provide a dynamic signal (high, then low, then high, then low, …), changing at a maximum time of every 10 seconds.

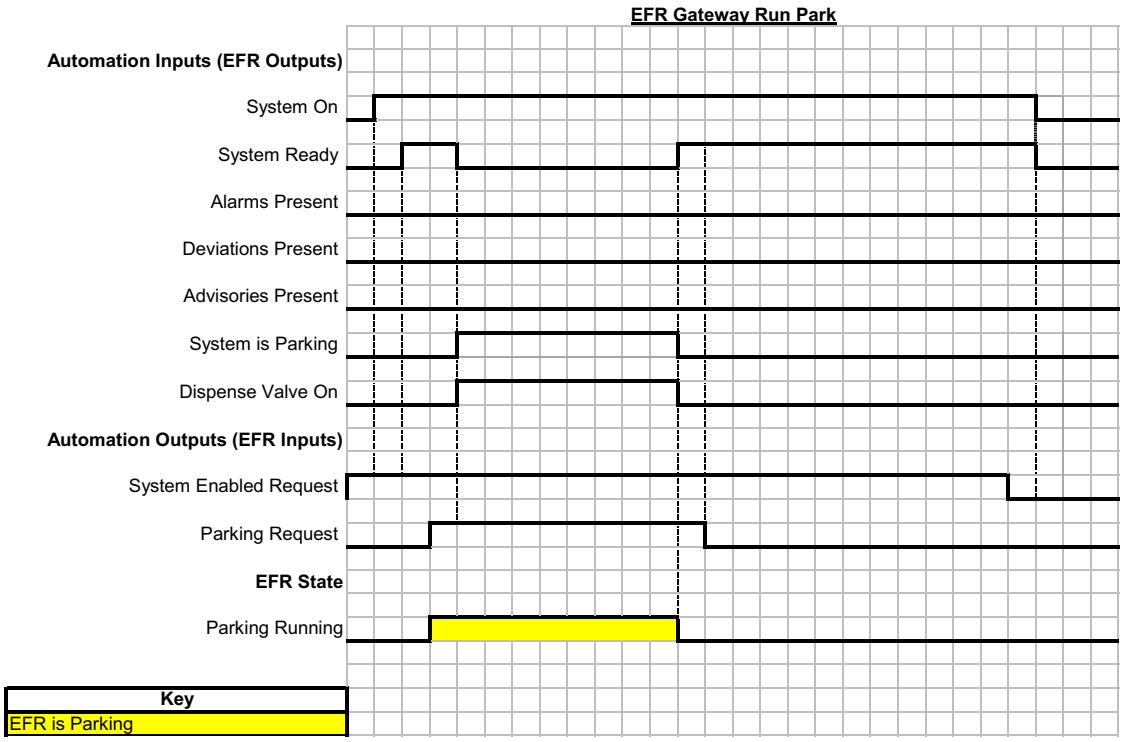
CGM General Timing Diagrams

NOTE: A 50ms delay is suggested between each CGM signal.

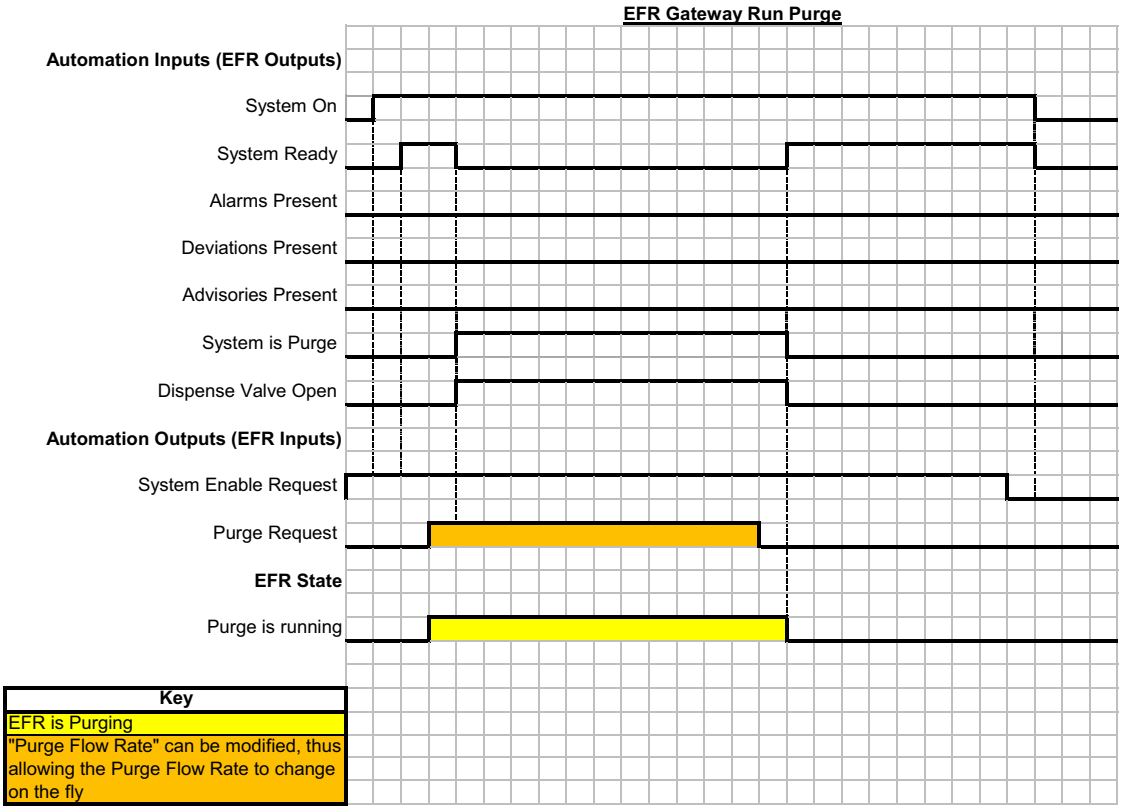
NOTE: In the diagrams shown below, the ID# corresponds to the Instance ID in the Automation Inputs and Outputs table.



When the Priming Request bit is ON, the EFR will start priming as long as the System On bit is also ON. If the System On bit or the Priming Request bit is OFF, the EFR will stop priming.

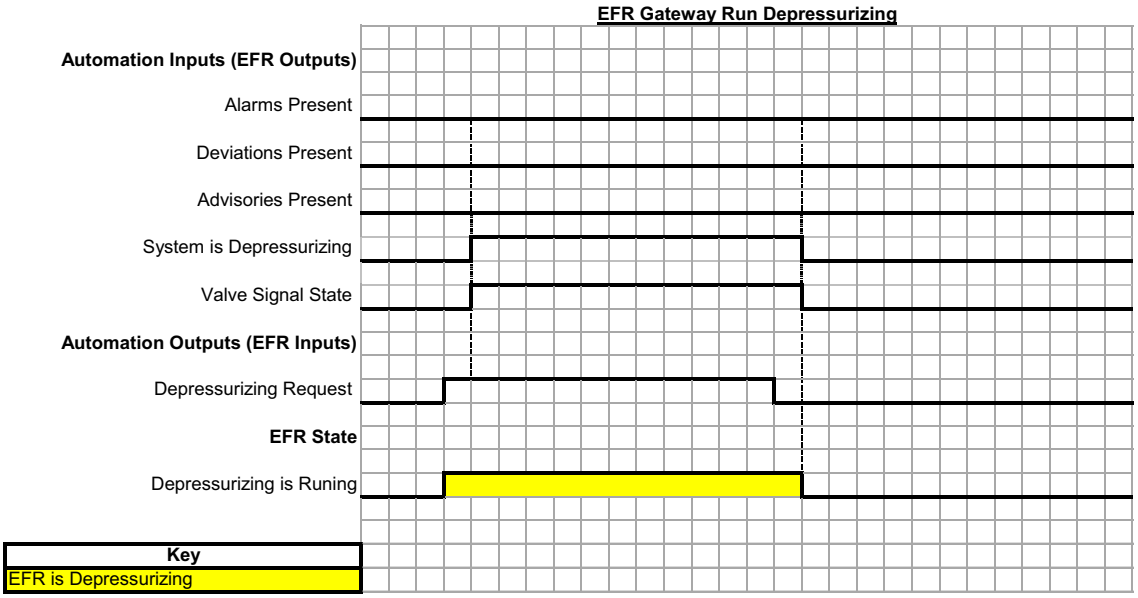


When the Parking Request bit is ON, the EFR will start parking as long as the System On bit is also ON. If the System On bit or the Parking Request bit is OFF, the EFR will stop parking.

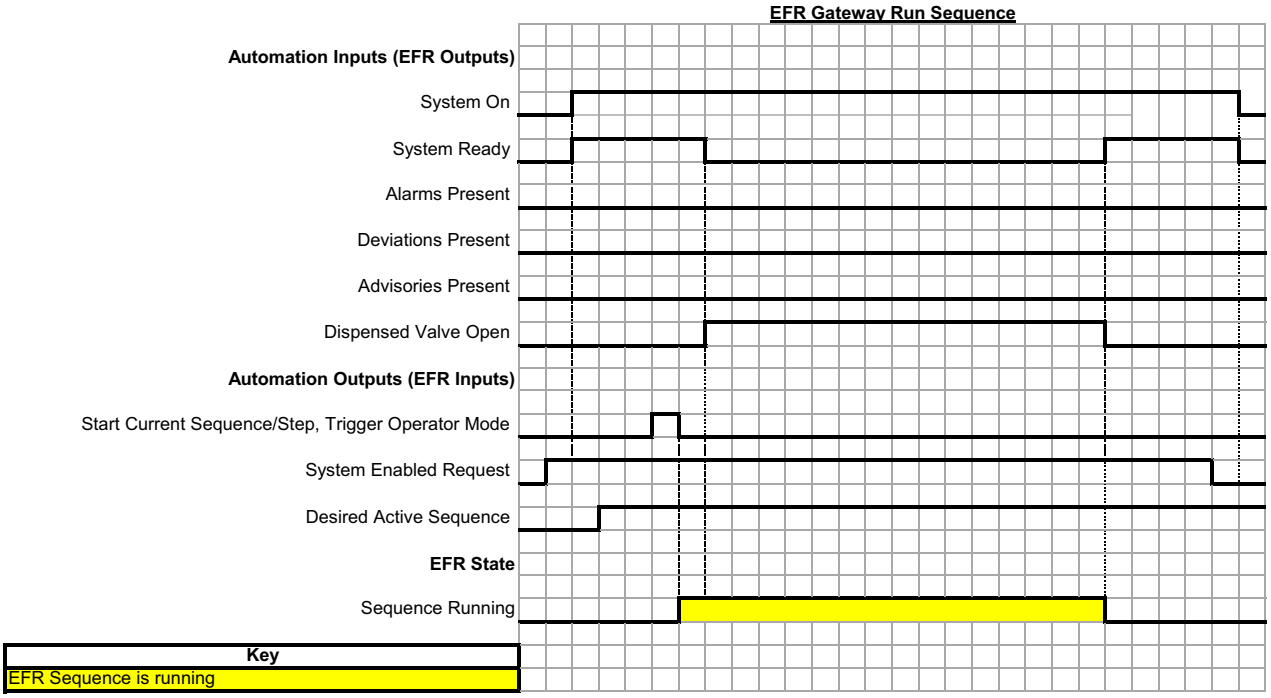


When the Purge Request bit is ON, the EFR will start purging as long as the System On bit is also ON. If the System On bit or the Purge Request bit is OFF, the EFR will stop purging.

The purge flow rate can be modified quickly through the data exchange.

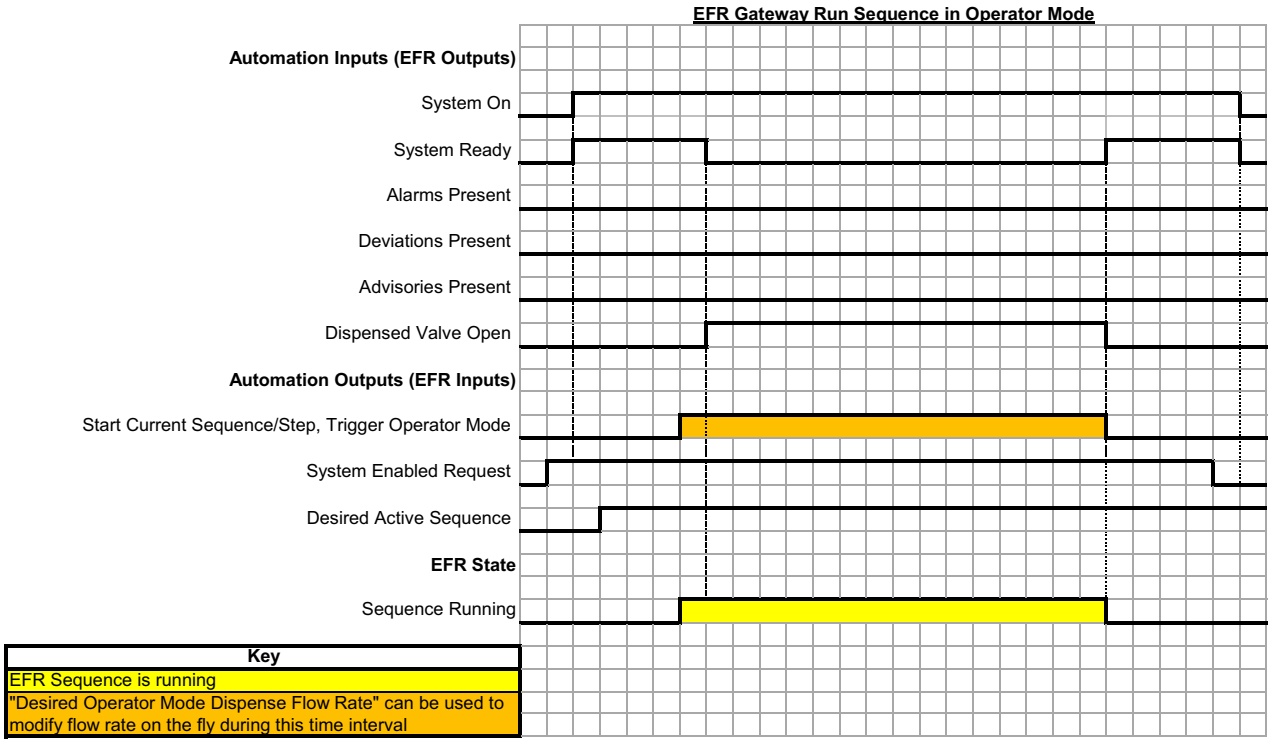


When the Depressurizing Request bit is ON, the EFR will start depressurizing. The EFR will only stop depressurizing if the Depressurizing Request bit if OFF.



If the sequence is not in operator mode, a pulse on the Start Current Sequence/Step, Trigger Operator Mode bit will play the active sequence.

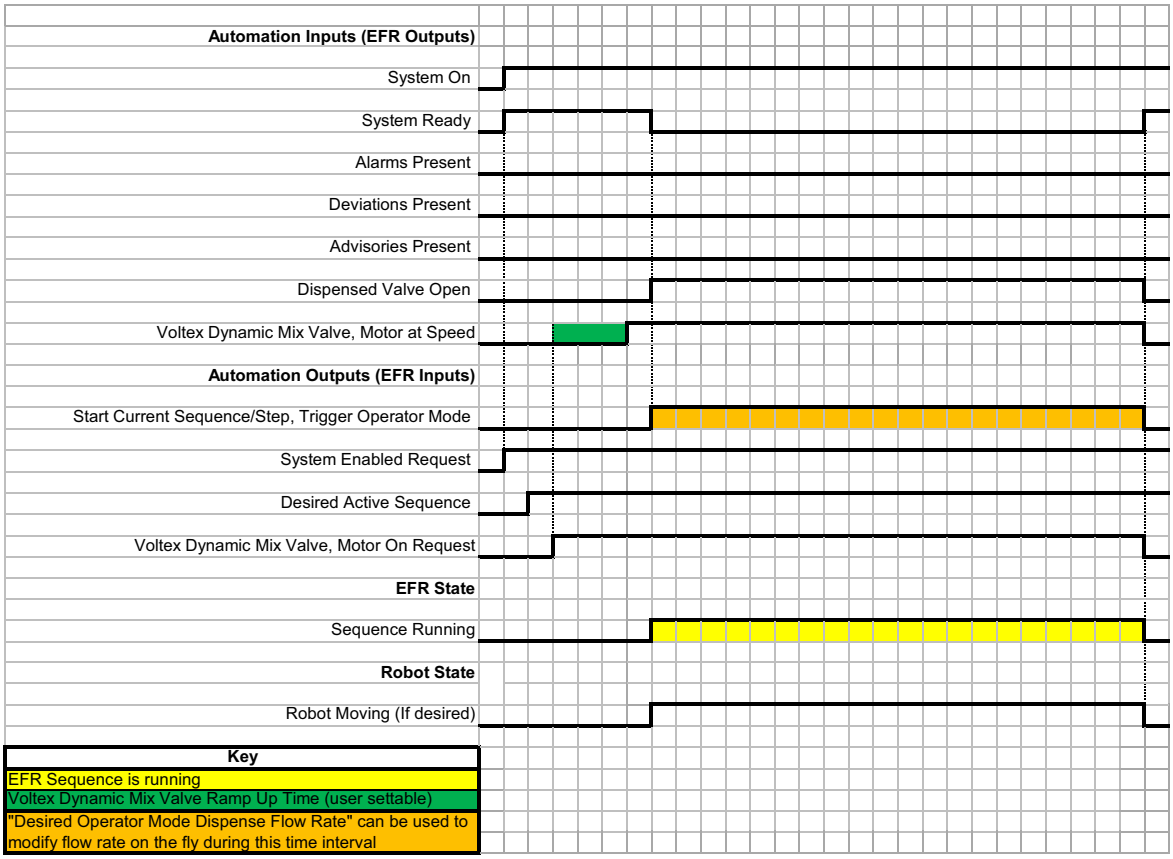
Sending the Desired Active Sequence byte is optional. If the The Desired Active Sequence byte is not sent, the current active sequence stored in the EFR will be used.



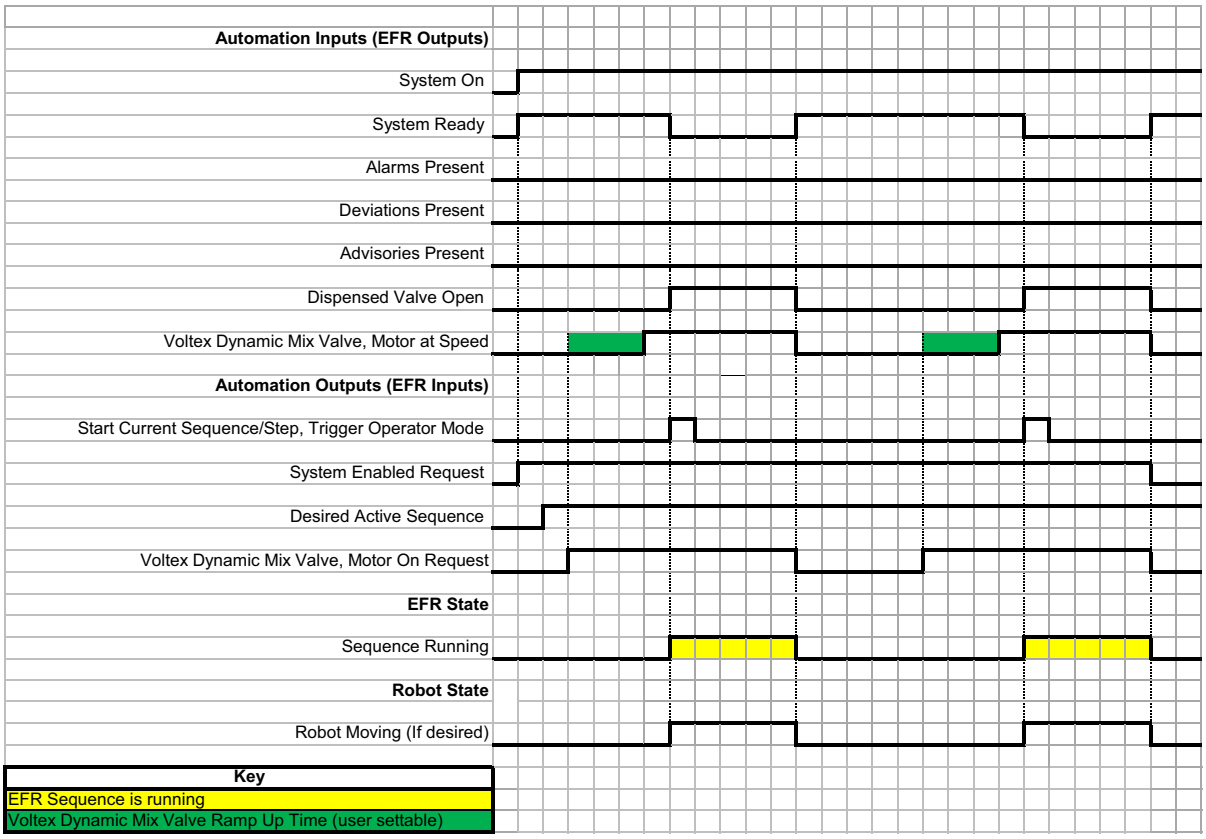
If there is a step in operator mode throughout the active sequence, the EFR will only dispense that step if the Start Current Sequence/Step, Trigger Operator Mode bit remains ON. Once the Start Current Sequence/Step, Trigger Operator Mode bit is OFF, the EFR will continue with the active sequence.

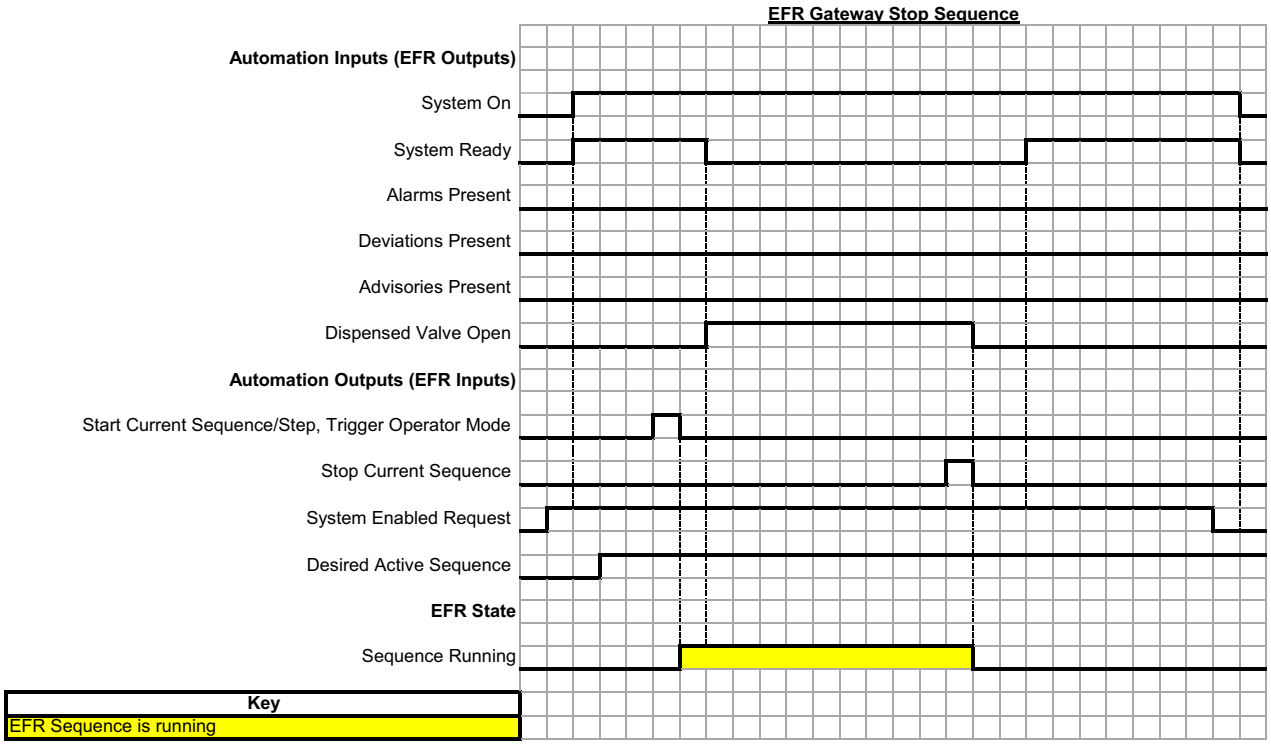
Sending the Desired Active Sequence byte is optional. If the The Desired Active Sequence byte is not sent, the current active sequence stored in the EFR will be used.

EFR Gateway Run Operator Sequence with Voltex



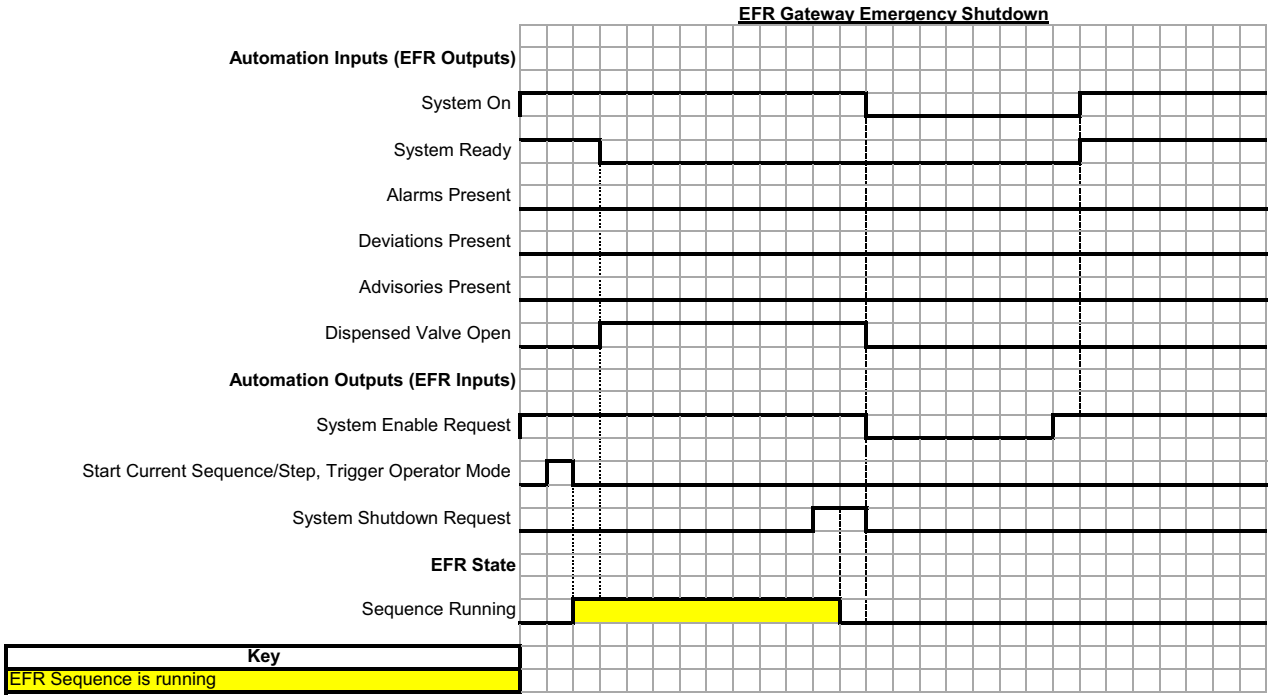
EFR Gateway Run Sequence with Voltex





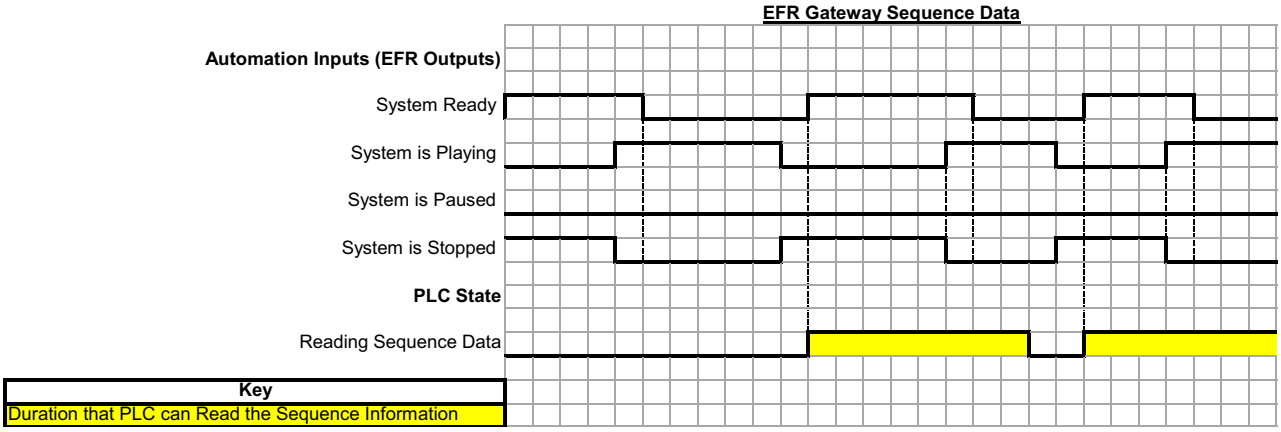
An ON pulse across the Stop Current Sequence bit will stop the active sequence.

Sending the Desired Active Sequence byte is optional. If the The Desired Active Sequence byte is not sent, the current active sequence stored in the EFR will be used.



An ON pulse across the System Shutdown Request bit will stop the sequence and turn the System On bit OFF, making the system inactive.

A toggle OFF followed by a toggle ON of the System Enabled Request bit will put the system back into the active state after the EFR has shut down.



The Sequence Data must be read before the EFR finishes running another sequence. If the Sequence Data is not read before finishing the sequence, the data will be overwritten with new Sequence Data.

The Sequence Data consists of:

- Total Sequence Amount Requested
- Total Sequence Amount Dispensed
- Sequence Start Outlet Pressure for Red Pump
- Sequence Start Outlet Pressure for Blue Pump
- Sequence End Outlet Pressure for Red Pump
- Sequence End Outlet Pressure for Blue Pump
- Sequence Inlet Pressure for Red Pump
- Sequence Inlet Pressure for Blue Pump

Appendix A - I/O Signal Descriptions

This section provides details about the CGM Automation Input and Output Signals.

Automation Inputs (signals from EFR system to PLC)

Heartbeat to PLC

Heartbeat to PLC is a Boolean signal that toggles at a frequency of 1 Hz. This signal toggles so the PLC can confirm the EFR is connected.

NOTE: The EFR is monitoring the fieldbus connection as well. If the fieldbus connection stops transferring data, the EFR will automatically shut down.

System On

System On is a Boolean signal that indicates the active or inactive state of the machine. A value of 1 indicates the machine is ON or active, and a value of 0 indicates the machine is OFF or inactive.

NOTE: The system must be ON or active for the machine to dispense.

System Ready

System Ready State is a Boolean signal that indicates when the machine is ready to receive the next command.

NOTE: the system will not be ready to receive the next command if the EFR is dispensing, loading a sequence, or if an active alarm is present.

Alarms Present

Alarms Present is a Boolean signal that indicates the alarms present on the EFR.

NOTE: When an alarm is present, the EFR requires the operator's attention and will shut down immediately.

Deviations Present

Deviations Present is a Boolean signal that indicates the deviations present on the EFR.

NOTE: When a deviation is present, the EFR is warning the operator of potential problem(s) that may need immediate attention to avoid shutdown time.

Advisories Present

Advisories Present is a Boolean signal that indicates the advisories present on the EFR.

NOTE: When an advisory is present, the EFR is warning the operator of potential problem(s) that may need attention in the future to avoid shutdown time.

Current Sequence is Playing

Current Sequence is Playing is a Boolean signal that indicates when the sequence is dispensing/running.

Current Sequence is Paused

Current Sequence is Paused is a Boolean signal that indicates when the sequence is paused.

Current Sequence is Stopped

Current Sequence is Stopped is a Boolean signal that indicates when the sequence is stopped.

Dispense Valve Open

Dispense Valve Open is a Boolean signal that indicates when the valve is open.

System is Priming

System is Priming is a Boolean signal that indicates when the system is priming.

System is Purging

System is Purging is a Boolean signal that indicates when the system is purging.

System is Parking

System is Parking is a Boolean signal that indicates when the system is parking.

System is Depressurizing

System is Depressurizing is a Boolean signal that indicates when the system is depressurizing.

Gel Shot is Running

Gel Shot is Running is a Boolean signal that indicates when the system is dispensing as a result of the gel timer.

EFR is Dispensing

EFR is Dispensing is a Boolean signal that indicates when the system is dispensing.

Voltex Dynamic Mix Valve, EFR Dispense Wait Completed for Dispensing

EFR Dispense Wait Completed for Dispensing is a boolean that is used only when the EFR Dispense Wait Enable feature is enabled. This variable will remain low while the EFR is waiting for the Voltex Dynamic Mix Valve to get up to speed after a dispense is triggered. Once up to speed, the variable will be set to high and the machine will begin dispensing.

Voltex Dynamic Mix Valve, Ramp Up Completed for Dispensing

Ramp Up Completed for Dispensing is a boolean signal that indicates when the Voltex Dynamic Mix Valve has completed its ramp up time and should be dispensing.

Voltex Dynamic Mix Valve, Motor is at Target Speed

Motor is at Target speed is a boolean signal that indicates when the motor has reached the target speed.

Voltex Dynamic Mix Valve, Air Valve Opened

Air Valve Opened is a boolean signal that represents when the air valve is opened or closed.

Red Tank is Filling

Red Tank is filling is a boolean signal that represents the tank filling status. While this bit is true, the tank is refilling. Once this bit is false, that means that the tank has completed the fill process, or an error/cancellation has occurred to stop the filling process

Red Tank Fill Level

Red Tank Fill Level is a two bit that represents the tank fill level. The following values correspond to the different states of the fill level.

Bit 1	Bit 2	Status
0	0	Sensor Error
1	0	Low Level
0	1	Medium Level
1	1	High Level

Blue Tank is Filling

Blue Tank is filling is a boolean signal that represents the tank filling status. While this bit is true, the tank is refilling. Once this bit is false, that means that the tank has completed the fill process, or an error/cancellation has occurred to stop the filling process

Blue Tank Fill Level

Blue Tank Fill Level is a two bit that represents the tank fill level. The following values correspond to the different states of the fill level.

Bit 1	Bit 2	Status
0	0	Sensor Error
1	0	Low Level
0	1	Medium Level
1	1	High Level

System is Recirculating

System is Recirculating is a boolean signal that represents when the EFR is recirculating material.

Current Active Sequence

Current Active Sequence is an integer that represents the active sequence selected on the EFR.

Example: If the byte has a value of 33, sequence 33 is the active sequence selected.

Current Step of the Active Sequence

Current Step of the Active Sequence is an integer that represents the active step the EFR is currently running on the Current Active Sequence.

Example: If the byte has a value of 4, step 4 is the active step currently running.

Time Remaining to Complete Step

Time Remaining to Complete Step is a 16bit integer that represents the remaining time required to complete the Current Step of the Active Sequence.

Red Pump Outlet Pressure

Red Pump Outlet Pressure is a 16bit integer that represents the outlet pressure on the red pump.

Blue Pump Outlet Pressure

Blue Pump Outlet Pressure is a 16bit integer that represents the outlet pressure on the blue pump.

Red Pump Inlet Pressure

Red Pump Inlet Pressure is a 16bit integer that represents the inlet pressure on the red pump.

Blue Pump Inlet Pressure

Blue Pump Inlet Pressure is a 16bit integer that represents the inlet pressure on the blue pump.

Pump Flow Rate

Pump Flow Rate is a 16bit integer that represents the current flow rate of the pump.

Active Error Number Requiring Acknowledgment

See **Appendix D - Error Number Requiring Acknowledgment** on page 39.

Active Operator Mode Dispense Flow Rate

Active Operator Mode Dispense Flow Rate is a 16bit integer that represent the PCL desired flow rate for the EFR, which is used to override the flow rate of the operator mode step.

Data Exchange Element Selected

See **Appendix B - Data Exchanged** on page 27.

Data Exchange Element Value

See **Appendix B - Data Exchanged** on page 27.

Selected Step of the Active Sequence

See **Appendix C - Sequence Step Data Exchange** on page 37.

Selected Step Amount

See **Appendix C - Sequence Step Data Exchange** on page 37.

Selected Step Shot Type

See **Appendix C - Sequence Step Data Exchange** on page 37.

Selected Step Flow Rate

See **Appendix C - Sequence Step Data Exchange** on page 37.

Selected Step Calibration

See **Appendix C - Sequence Step Data Exchange** on page 37.

Total Sequence Amount Requested

Total Sequence Amount Requested is a 32bit integer that represent the amount requested by the EFR during the active sequence. This integer will only be populated after the active sequence finishes dispensing.

Total Sequence Amount Requested

Total Sequence Amount Dispensed is a 32bit integer that represent the amount dispensed by the EFR during the active sequence. This integer will only be populated after the active sequence finishes dispensing.

Automation Outputs (signals from PLC to EFR System)

System Enable Request

System Enable Request is a bit used to turn on/activate the system. It has the same function as the  button. Set this bit to 1 to turn on/activate the system, and set it to 0 to turn off/deactivate the system.

System Shutdown Request

System Shutdown Request is a bit used to immediately shut down the system. It has the same function as the  button. Set this bit to 1 to immediately shut down the EFR. Once the EFR has shut down, set this bit to 0 to clear the shutdown request.

Start Current Sequence/Step, Trigger Operator Mode

Start Current Sequence/Step, Trigger Operator mode is a bit used to play and trigger a sequence. Set this bit to 1 to start the sequence. Once the sequence is dispensing, set this bit to 0 to clear the request.

NOTE: When running in operator mode, this bit must remain high (1) for operator mode to be triggered. Once this bit is low (0), operator mode will be stopped and the EFR will continue with the active sequence.

Pause Current Sequence

Pause Current Sequence is a bit used to pause the active sequence. Set this bit to 1 to pause the current active sequence. Once the sequence is paused, set this bit to 0 to clear the request.

Stop Current Sequence

Stop Current Sequence is a bit used to stop the active sequence. Set this bit to 1 to stop the current active sequence. Once the sequence is stopped, set this bit to 0 to clear the request.

Priming Request

Priming Request is a bit used to turn the priming feature ON and OFF. Set this bit to 1 to start the smart priming feature. This bit can be set to 0 at any time during smart priming to stop the smart priming feature.

NOTE: Once the smart priming request is completed, set this bit to 0.

Purging Request

Purging Request is a bit used to turn the purging feature ON and OFF. Set this bit to 1 to turn the purging feature ON. When the PLC is ready to stop purging, set this bit to 0 to turn the purging feature OFF.

Parking Request

Parking Request is a bit used to turn the parking feature ON and OFF. Set this bit to 1 to start the parking feature. This bit can be set to 0 at any time while the pump is parking to stop the parking feature.

NOTE: Once the parking request is completed, set this bit to 0.

Depressurizing Request

Depressurizing Request is a bit used to turn the depressurizing feature on and off. Set this bit to 1 to turn the depressurize feature ON. When the PLC is ready to stop depressurizing, set this bit to 0 to turn the depressurizing feature OFF.

Voltex Dynamic Mix Valve, Air Injection Open Request

Air Injection Open Request is a bit used to open and close the air injection valve of the Voltex Dynamic Mix Valve. Set this bit to 1 to turn open the valve. When the valve is ready to be closed, set this bit to 0.

Red Tank Auto/Manual Fill Request

Red Tank Auto/Manual Fill Request is a bit used to request a fill command to the tank. While the tank is in auto/manual fill mode, set this bit to 1 to start the filling process. To cancel the filling process at any time, set this bit to 0. Once the tank is done refilling, set this bit to 0 for the next fill request command.

Blue Tank Auto/Manual Fill Request

Blue Tank Auto/Manual Fill Request is a bit used to request a fill command to the tank. While the tank is in auto/manual fill mode, set this bit to 1 to start the filling process. To cancel the filling process at any time, set this bit to 0. Once the tank is done refilling, set this bit to 0 for the next fill request command.

Recirculation Request

Recirculation Request is a bit used to turn the recirculation feature on and off, depending on the recirculation mode. When the PLC is ready to begin recirculation, set this bit to 1. When the PLC is ready to stop recirculation, set this bit to 0. Recirculation mode can be found using the Data Exchange, Recirculation Mode element. See **Recirculation Mode** on page 35 for further explanation of the Recirculation Request bit interface for each recirculation mode.

NOTE: If a PLC is integrated with the EFR, it is highly recommended that the recirculation mode is set to manual, and the PLC is set to control the logic when the EFR is placed in and out of recirculation through the Recirculation Request bit.

Desired Active Sequence

Desired Active Sequence is a byte used to request a new active sequence. If the value supplied is within the operable range, the value will be accepted by the EFR and reflected back to the Current Active Sequence of the Automation Inputs. The operable range of this byte corresponds to the number of sequences the EFR can hold, which is 1 to 50.

Acknowledging the Active Error Number

See **Appendix D - Error Number Requiring Acknowledgment** on page 39.

Desired Operator Mode Dispense Flow Rate

Desired Operator Mode Dispense Flow Rate is a byte used to request a new operator mode dispense flow rate to the EFR. If the value supplied is within the operable range and the EFR is running in operator mode, the value will be accepted by the EFR and reflected back to the Active Operator Mode Dispense Flow Rate of the Automation Inputs.

Data Exchange Element Desired

See **Appendix B - Data Exchanged** on page 27.

Data Exchange Element Desired Value

See **Appendix B - Data Exchanged** on page 27.

Desired Step of the Active Sequence

See **Appendix C - Sequence Step Data Exchange** on page 37.

Desired Step Amount

See **Appendix C - Sequence Step Data Exchange** on page 37.

Desired Step Shot Type

See **Appendix C - Sequence Step Data Exchange** on page 37.

Desired Step Flow Rate

See **Appendix C - Sequence Step Data Exchange** on page 37.

Desired Step Calibration

See **Appendix C - Sequence Step Data Exchange** on page 37.

Voltex Dynamic Mix Valve, Motor On Request

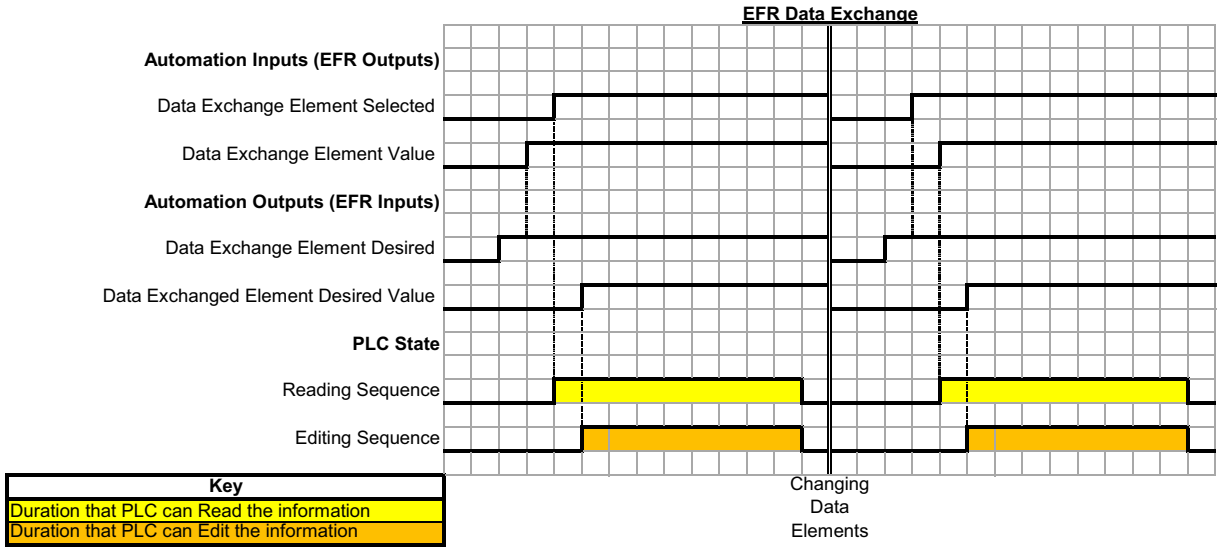
Motor On Request is a bit used to turn the motor of the Voltex Dynamic Mix Valve on and off. Set this bit to 1 to turn the depressurize feature on. When the motor is ready to turn off, set this bit to 0.

Appendix B - Data Exchanged

The Data Exchange is a condensed structure used to read and edit a number of different variables in one data location. If multiple data exchanges are needed, they must be cycled through.

Below is a timing diagram showing the Data Exchange portion of EFR CGM Map.

NOTE: A 50ms delay is suggested between each CGM signal.



When the PLC needs to use the Data Exchange, the Data Exchange Element Desired must first be sent to the EFR. Initially, the Data Exchange Element Selected and the Data Exchange Element Value are set to zero to signal the data in the Data Exchange is invalid. Once the EFR returns the Data Exchange Element Value, followed by the Data Exchange Element Selected, the PLC can compare the Data Exchange Element Selected to the Data Exchange Element Desired and confirm the data is correct for the Data Exchange Element Desired. Once the Data Exchange Automation Inputs are confirmed, the Data Exchanged Element Desired Value can be used to request a new value. If the value supplied is within the operable range of the element, the EFR will accept the new value and will return that value to the Data Exchange Element Value.

EFR Data Exchange Elements

Data Exchange Element (base 10 integer)	Description	Data Type
1	Dispense Mode	uint8
2	ADM Rate Units	uint8
3	ADM Pressure Units	uint8
4	Pressure Imbalance Alarm Enabled	bool
5	Pressure Imbalance Alarm Level (XXXX.X bar)	uint16
6	Red Pump Size (XXX.XX cc)	uint16
7	Blue Pump Size (XXX.XX cc)	uint16
8	Red Pump Specific Gravity (X.XXX)	uint16
9	Blue Pump Specific Gravity (X.XXX)	uint16
10	Gel Timer Enabled	bool
11	Gel Timer Idle Period (XX s)	uint16
12	Gel Timer Alarm Period (XX s)	uint16
13	Gel Timer Repeat Sequence Until (XX cc)	uint16
14	Gel Timer Sequence Selected	uint8
15	Smart Prime Repeat Until (XX cc)	uint16
16	Smart Prime Sequence Selected	uint8
17	Purge Flow Rate (XXXX cc/min)	uint16
18	Over Pressure Alarm(XXXX.X bar)	uint16
20	Integration External Trigger Enabled	bool
21	Integration External Trigger Status	bool
22	Integration Smart Prime Enabled	bool
23	Integration Smart Prime Status	bool
24	Integration System Enabled	bool
25	Integration System Status	bool
26	Integration Analog Flow Rate Enabled	bool
27	Integration Analog Flow Rate Status (XXXX mV)	bool
28	Integration Sequence Selected Enabled	bool
29	Integration Sequence Selected Status	uint8
30	Red Pump Cycles (XXXX cycles)	uint16
31	Red Pump Lifetime Cycles (XXXX cycles)	uint16
32	Blue Pump Cycles (XXXX cycles)	uint16
33	Blue Pump Lifetime Cycles (XXXX cycles)	uint16
34	Dispense Valve Open Cycles (XXXX cycles)	uint16
35	Dispense Valve Open Lifetime Cycles (XXXX cycles)	uint16
36	Desired Number of Times to Run the Sequence	uint16
37	Actual Number of Times the Sequence has Ran	uint16
38	Mixed Material Specific Gravity (X.XXX)	uint16
39	Sequence Start Outlet Pressure for Red Pump (XXXX.X bar)	uint16
40	Sequence Start Outlet Pressure for Blue Pump (XXXX.X bar)	uint16
41	Sequence End Outlet Pressure for Red Pump (XXXX.X bar)	uint16
42	Sequence End Outlet Pressure for Blue Pump (XXXX.X bar)	uint16
43	Sequence Inlet Pressure for Red Pump (XXXX.X bar)	uint16

Data Exchange Element (base 10 integer)	Description	Data Type
44	Sequence Inlet Pressure for Blue Pump (XXXX.X bar)	uint16
45	Voltex Dynamic Mix Valve, Motor Target Speed (XXXX rpm)	uint32
46	Voltex Dynamic Mix Valve, Motor Ramp Up Time (XXXX ms)	uint32
47	Voltex Dynamic Mix Valve, EFR Dispense Wait Enable	bool
48	Voltex Dynamic Mix Valve, Air Nucleation Enable	bool
49	Voltex Dynamic Mix Valve, Air Nucleation Delay Time (XXXX ms)	uint32
50	Voltex Dynamic Mix Valve, Air Nucleation On Time (XXXX ms)	uint32
51	Voltex Dynamic Mix Valve, Air Nucleation Off Time (XXXX ms)	uint32
52	Voltex Dynamic Mix Valve, Actual Motor Speed (XXXX.X rpm)	uint32
53	Voltex Dynamic Mix Valve, Red Valve Pressure (XXXX.X bar)	uint32
54	Voltex Dynamic Mix Valve, Blue Valve Pressure (XXXX.X bar)	uint32
55	Red Tank Refill Setting	uint8
56	Red Tank Refill Timeout (XX minutes)	uint32
57	Red Tank Sensor Configuration Installed	uint8
58	Blue Tank Refill Setting	uint8
59	Blue Tank Refill Timeout (XX minutes)	uint32
60	Blue Tank Sensor Configuration Installed	uint8
61	Recirculation Flow Rate (xxxx cc/min)	uint16
62	Park Using Recirculation Valves Enabled	bool
63	Park After Recirculation is Completed Enabled	bool
64	Recirculation Mode	uint8
65	Recirculation Timer On Time (xx minutes)	uint16
66	Recirculation Timer Off Time (xx minutes)	uint16
67	Recirculation Timer Time Remaining (xx.x seconds)	uint16
68	Voltex Dynamic Mix Valve, Motor Spinning Disable for Dispensing	bool
69	Voltex Dynamic Mix Valve, Air Nucleation Disable for Dispensing	bool

Below is a list of explanations of each individual Data Exchange Element.

Dispense Mode

Dispense Mode tells the EFR system whether the system is in weight or volume mode. The following values correspond to the various dispense modes offered by the EFR.

Value	Dispense Mode State
0	Weight Mode
1	Volume Mode

ADM Rate Units

ADM Rate Units tells the EFR system what units the rate will be displayed in on the ADM. The following values correspond to the various rate units the EFR ADM offers.

Value	Rate Units State
0	Per Minute
1	Per Second
2	Per Hour

ADM Pressure Units

ADM Pressure Units tells the EFR system what units the pressure will be displayed in on the ADM. The following values correspond to the various pressure units the EFR ADM offers.

Value	Pressure Units State
0	PSI
1	Bar

Pressure Imbalance Alarm Enabled

Pressure Imbalance Alarm Enabled is a boolean that can enable or disable the ability to view pressure imbalances between the red pump and the blue pump. The following values correspond to the different states the Pressure Imbalance Alarm boolean can be set to.

Value	Pressure Imbalance Alarm State
0	Not Enabled
1	Enabled

Pressure Imbalance Alarm Level

Pressure Imbalance Alarm Level is an integer used to trigger the pressure imbalance alarm.

Red Pump Size

Red Pump Size is an integer used to define the size of the red z pump.

Blue Pump Size

Blue Pump Size is an integer used to define the size of the blue z pump.

Red Specific Gravity

Red Specific Gravity is an integer used to define the specific gravity of the material in the red z pump.

Blue Specific Gravity

Blue Specific Gravity is an integer used to define the specific gravity of the material in the blue z pump.

Gel Timer Enabled

Gel Timer Enabled is a boolean that can enable or disable the Gel Timer feature. The following values correspond to the different states the Gel Timer boolean can be set to.

Value	Gel Timer Enabled State
0	Not Enabled
1	Enabled

Gel Timer Idle Period

Gel Timer Idle Period is an integer used to define the idle state of the gel timer before the gel timer causes a dispense.

Gel Timer Alarm

Gel Timer Alarm is an integer used to define the alarm state of the gel timer.

Gel Timer Repeat Unit

Gel Timer Repeat Unit is an integer used to define the amount of material dispensed for the gel timer shot.

Gel Timer Sequence Selected

Gel Timer Sequence Selected is an integer used to define the sequence that will run when the gel timer expires.

NOTE: To use the active sequence as the selected sequence for the gel timer, a new value of zero must be sent across the data exchange. If a new value of zero is not sent, the number sent across the data exchange will correspond to the sequence selected for the gel timer.

Smart Prime Repeat Unit

Smart Prime Repeat Unit is an integer used to define the amount of material dispensed for the smart prime.

Smart Prime Sequence Selected

Smart Prime Sequence Selected is an integer used to define the sequence that will run when smart prime is enabled.

NOTE: To use the active sequence as the selected sequence for smart prime, a new value of zero must be sent across the data exchange. If a new value of zero is not sent, the number sent across the data exchange will correspond to the sequence selected for the gel timer.

Purge Flow Rate

Purge Flow Rate is an integer used to define the flow rate at which the Purge Request will dispense.

Over Pressure Alarm

Over Pressure Alarm is an integer used to define the maximum pressure that can be reached before the EFR shuts down and returns the error.

Integration External Trigger Enabled

Integration External Trigger Enabled is a boolean that can enable usage of the Integration Trigger I/O pin. The following values correspond to the different states of the Integration External Trigger Enabled boolean.

Value	Integration Trigger Enabled State
0	Not Enabled
1	Enabled

Integration External Trigger Status

Integration External Trigger Status is a boolean that shows the status of the Integration Trigger I/O pin. The following values correspond to the different states of the Integration External Trigger Status boolean.

Value	Integration Trigger Status State
0	Not Active
1	Active

Integration Smart Prime Enabled

Integration Smart Prime Enabled is a boolean that can enable usage of the Integration Smart Prime I/O pin. The following values correspond to the different states of the Smart Prime Enabled boolean.

Value	Integration Smart Prime Enabled State
0	Not Enabled
1	Enabled

Integration Analog Flow Rate Status

Integration Analog Flow Rate Status is an integer used to define the voltage on the Analog Flow Rate I/O pin.

Integration Smart Prime Status

Integration Smart Prime Status is a boolean that shows the status of the Integration Smart Prime I/O pin. The following values correspond to the different states of the Smart Prime Status boolean.

Value	Integration Smart Prime Status State
0	Not Active
1	Active

Integration System Enabled

Integration System Enabled is a boolean that can enable usage of the Integration System I/O pin. The following values correspond to the different states of the Integration System Enabled boolean.

Value	Integration System Enabled State
0	Not Enabled
1	Enabled

Integration System Status

Integration System Status is a boolean that shows the status of the Integration System I/O pin. The following values correspond to the different states of the Integration System Status boolean.

Value	Integration System Status State
0	Not Active
1	Active

Integration Analog Flow Rate Enabled

Integration Analog Flow Rate Enabled is a boolean that can enable usage of the Integration Analog Flow Rate I/O pin. The following values correspond to the different states of the Integration Analog Flow Rate Enabled boolean.

Value	Integration Analog Flow Rate Enabled State
0	Not Enabled
1	Enabled

NOTE: This integer can only be read by the PLC.

Integration Sequence Selected Enabled

Integration Sequence Selected Enabled is a boolean that can enable usage of the Integration Sequence Selected I/O pins on the ADM. The following values correspond to the different states of the Sequence Selected Enabled boolean.

Value	Integration Sequence Selected Enabled State
0	Not Enabled
1	Enabled

Integration Sequence Selected Status

Integration Sequence Selected Status is an integer used to define the active sequence on the EFR by using I/O pins on the ADM as bits. When read, the integer results in the Active Sequence in the EFR system.

Example: If the integer has a value of 2, the Active Sequence is 2.

NOTE: This integer can only be read by the PLC.

Red Pump Cycles

Red Pump Cycles is an integer used to define the number of times the red pump has cycled. This can be reset by sending a value zero from the PLC over the Data Exchange.

Red Pump Lifetime Cycles

Red Pump Lifetime Cycles is an integer used to define the number of times the pump has cycled during its lifetime.

NOTE: This integer can only be read by the PLC.

Blue Pump Cycles

Blue Pump Cycles is an integer used to define the number of times the blue pump has cycled. This can be reset by sending a value zero from the PLC over the Data Exchange.

Blue Pump Lifetime Cycles

Blue Pump Lifetime Cycles is an integer used to define the number of times the pump has cycled during its lifetime.

NOTE: This integer can only be read by the PLC.

Dispense Valve Cycles

Dispense Valve Cycles is an integer used to define the number of times the dispense valve has opened. This can be reset by sending a value zero from the PLC over the Data Exchange.

Dispense Valve Lifetime Cycles

Dispense Valve Lifetime Cycles is an integer used to define the number of times the dispense valve has opened during its lifetime.

NOTE: This integer can only be read by the PLC.

Desired Number of Times to Run the Sequence

Desired Number of Times to Run the Sequence is an integer used to define the number of times the sequence will run.

Example: If the integer is 5, the sequence will run 5 times before the dispense is finished.

Actual Number of Times the Sequence has Ran

Actual Number of Times the Sequence has Ran is an integer used to define the number of times the sequence has run out of the desired number.

Example: If the integer is 10, the sequence has run 10 of X times. X represents the Desired Number of Times to Run the Sequence.

NOTE: This integer can only be read by the PLC.

Mixed Material Specific Gravity

Mixed Material Specific Gravity is an integer used to define the specific gravity of the mixed material.

NOTE: This integer can only be read by the PLC.

Sequence Start Outlet Pressure for Red Pump

Sequence Start Outlet Pressure for Red Pump is an integer that represents the outlet pressure of the red pump once the active sequence begins dispensing.

NOTE: This integer will only be populated after the active sequence is done dispensing.

NOTE: This integer can only be read by the PLC.

Sequence Start Outlet Pressure for Blue Pump

Sequence Start Outlet Pressure for Blue Pump is an integer that represents the outlet pressure of the blue pump once the active sequence begins dispensing.

NOTE: This integer will only be populated after the active sequence is done dispensing.

NOTE: This integer can only be read by the PLC.

Sequence End Outlet Pressure for Red Pump

Sequence End Outlet Pressure for Red Pump is an integer that represents the outlet pressure of the red pump once the active sequence is done dispensing.

NOTE: This integer will only be populated after the active sequence is done dispensing.

NOTE: This integer can only be read by the PLC.

Sequence End Outlet Pressure for Blue Pump

Sequence End Outlet Pressure for Blue Pump is an integer that represents the outlet pressure of the blue pump once the active sequence is done dispensing.

NOTE: This integer will only be populated after the active sequence is done dispensing.

NOTE: This integer can only be read by the PLC.

Sequence Inlet Pressure for Red Pump

Sequence Inlet Pressure for Red Pump is an integer that represents the inlet pressure of the red pump for the current sequence being dispensed.

NOTE: This integer will only be populated after the active sequence is done dispensing.

NOTE: This integer can only be read by the PLC.

Sequence Inlet Pressure for Blue Pump

Sequence Inlet Pressure for Blue Pump is an integer that represents the inlet pressure of the blue pump for the current sequence being dispensed.

NOTE: This integer will only be populated after the active sequence is done dispensing.

NOTE: This integer can only be read by the PLC.

Voltex Dynamic Mix Valve, Motor Target Speed

Motor Target Speed is an integer used to define the speed of the Voltex Dynamic Mix Valve mixer. The speed ranges between 0 rpm and 4400 rpm.

Voltex Dynamic Mix Valve, Motor Ramp Up Time

Motor Ramp Up Time is an integer used to define the period of time in which the motor will reach the Motor Target Speed.

Voltex Dynamic Mix Valve, EFR Dispense Wait Enable

EFR Dispense Wait Enable is a boolean used to make the EFR wait until the Voltex Dynamic Mix Valve motor speed has reached the target speed before dispensing. If not enabled, the EFR will begin to dispense as soon as the dispensing signal is received.

Value	EFR Dispense Wait
0	Disabled
1	Enabled

Voltex Dynamic Mix Valve, Air Nucleation Enable

Air Nucleation Enable is a boolean that allows the air nucleation to run when a dispensing signal is received by the Voltex Dynamic Mix Valve.

Value	Air Nucleation
0	Disabled
1	Enabled

Voltex Dynamic Mix Valve, Air Nucleation Delay Time

Air Nucleation Delay Time is an integer used to delay the start of air nucleation after a dispensed signal is received. This time must expired before the air nucleation can toggle between the on and off timers.

Voltex Dynamic Mix Valve, Air Nucleation On Time

Air Nucleation On Time is an integer used to define the amount of time that the air nucleation will stay on before toggling off.

Voltex Dynamic Mix Valve, Air Nucleation Off Time

Air Nucleation Off Time is an integer used to define the amount of time that the air nucleation will stay off before toggling on.

Voltex Dynamic Mix Valve, Actual Motor Speed

Actual Motor Speed is an integer that represents the actual speed that the motor is currently running at.

Voltex Dynamic Mix Valve, Red Valve Pressure

Red Valve Pressure is an integer that represents the actual pressure of the red material in the valve.

Voltex Dynamic Mix Valve, Blue Valve Pressure

Blue Valve Pressure is an integer that represents the actual pressure of the blue material in the valve.

Red Refill Setting

Red Refill Setting is an integer that defines the mode the tank stand is in. The following values correspond to the different modes available for the tank stand.

Value	Refill Setting
0	Disable
1	Monitor Only
2	Manual Fill
3	Auto Top-Off

Red Refill Timeout

Red Refill Timeout is an integer that defines the amount of time the tank stands will fill before the auto refill timeout deviation will occur and stop the refill process if the full level is not reached.

Red Sensor Configuration Installed

Red Sensor Configuration Installed is an integer that defines the configuration of the sensor on the tank stand. The following values correspond to the different configurations available for the tank stand.

Value	Configuration
1	Low and High Sensor Installed
2	Low and Mid Sensor Installed
3	Mid and High Sensor Installed
4	Low, Mid, and High Sensor Installed

Blue Refill Setting

Blue Refill Setting is an integer that defines the mode the tank stand is in. The following values correspond to the different modes available for the tank stand.

Value	Refill Setting
0	Disable
1	Monitor Only
2	Manual Fill
3	Auto Top-Off

Blue Refill Timeout

Blue Refill Timeout is an integer that defines the amount of time the tank stands will fill before the auto refill timeout deviation will occur and stop the refill process if the full level is not reached.

Blue Sensor Configuration Installed

Blue Sensor Configuration Installed is an integer that defines the configuration of the sensor on the tank stand. The following values correspond to the different configurations available for the tank stand.

Value	Configuration
1	Low and High Sensor Installed
2	Low and Mid Sensor Installed
3	Mid and High Sensor Installed
4	Low, Mid, and High Sensor Installed

Recirculation Flow Rate

Recirculation Flow Rate is an integer used to define the flow rate at which material will be recirculated.

Park Using Recirculation Valves Enabled

Park Using Recirculation Valves is a boolean that, when enabled, will command the EFR to use the recirculation valves instead of the dispense valves when parking the pumps.

Value	Park Using Recirculation Valves
0	Not Enabled
1	Enabled

Park After Recirculation is Complete Enabled

Park After Recirculation is Complete is a boolean that, when enabled, will command the EFR to automatically park the pump once recirculation is complete.

Value	Park After Recirculation is Complete
0	Not Enabled
1	Enabled

Recirculation Mode

Recirculation Mode is an integer that defines the mode in which the recirculation will run. The following values correspond to the different configurations available for Recirculation Mode.

Value	Recirculation Mode
0	Disable
1	Manual
2	Timer

Disable Mode: The EFR will disable all recirculation features.

Manual Mode: The EFR will recirculate by sending a 1 to Recirculation Request. The EFR will continue to recirculate until the Recirculation Request is set to 0.

Timer Mode: The EFR will recirculate for a specific amount of time after a preset amount of time has expired. To start the timer mode recirculation feature, set the Recirculation Request to 1. When ready to continue the dispense, set the Recirculation Request to 0, and trigger a dispense.

Recirculation Timer On Time

Recirculation Timer On Time is an integer that defines the amount of time that the recirculation Timer Mode will use to keep the system recirculating.

Recirculation Timer Off Time

Recirculation Timer Off Time is an integer that defines the amount of time that the recirculation Timer Mode will wait until it starts the Recirculation Time On Time.

Recirculation Timer Time Remaining

Recirculation Timer Time Remaining is an integer used to define the amount of time remaining before the recirculation toggles to on/off.

Voltex Dynamic Mix Valve, Motor Spinning Disable for Dispensing

Motor Spinning Disable for Dispensing is a boolean that, when set high, will command the Voltex Dynamic Mix Valve to not spin while dispensing.

Value	Motor Spinning During a Dispense State
0	Enabled
1	Disabled

Voltex Dynamic Mix Valve, Air Nucleation Disable for Dispensing

Air Nucleation Disable for Dispensing is a boolean that, when set high, will command the Voltex Dynamic Mix Valve to not run Air Nucleation while dispensing.

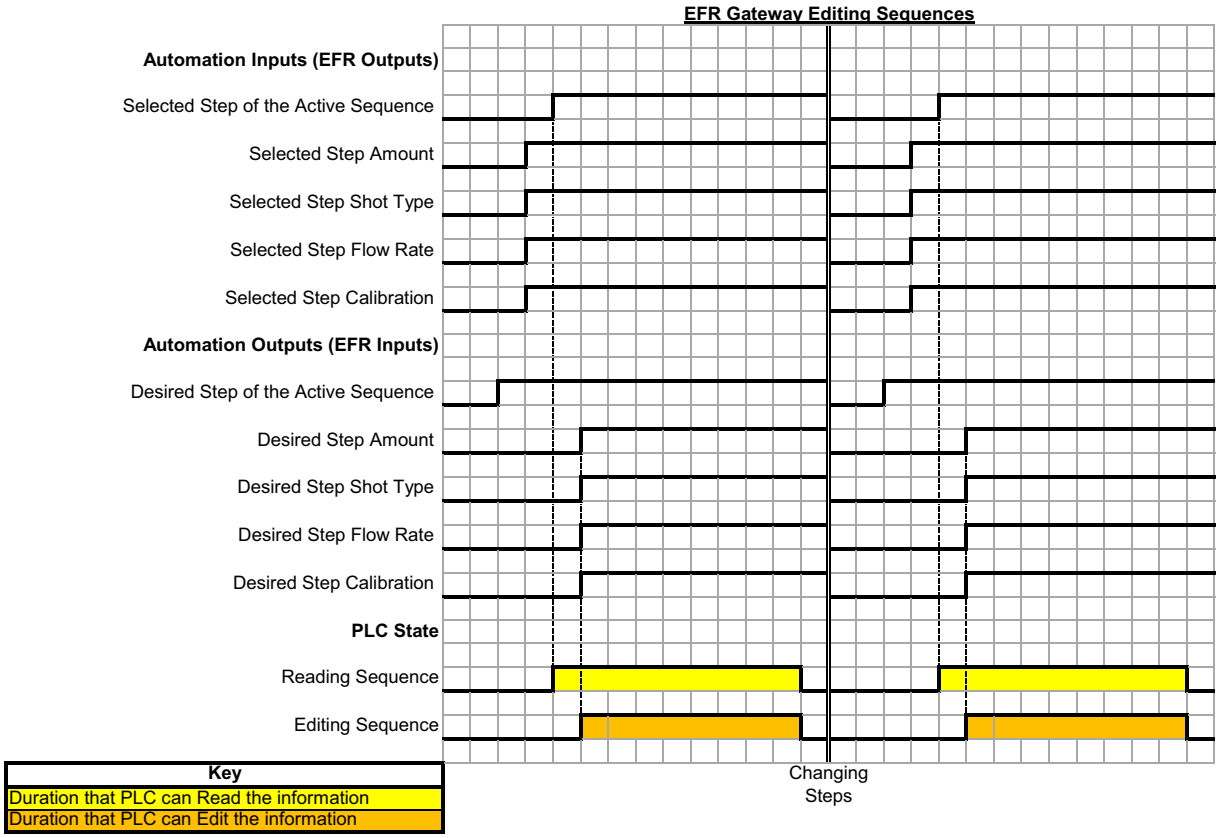
Value	Air Nucleation During a Dispense State
0	Enabled
1	Disabled

Appendix C - Sequence Step Data Exchange

The Sequence Data Exchange is a condensed structure used to read and edit a number of steps in a sequence across a set of bytes. If multiple steps of sequences are needed, they must be cycled through.

Below is a timing diagram showing the Sequence Step Data Exchange portion of EFR CGM Map.

NOTE: A 50ms delay is suggested between each CGM signal.



When utilizing the Sequence Step Data Exchange, the first element that must be passed to the EFR is the Desired Step of the Active Sequence. Once the EFR receives that element, the EFR will update the Sequence Step Data Exchange Automation Inputs Elements for the desired step. After the Sequence Step Data Exchange Automation Inputs Elements have been updated, the Selected Step of the Active Sequence can be used to confirm the desired step data has populated the Sequence Step Data Exchange Automation Inputs Elements. Once the data has been confirmed for the desired step, the Sequence Step Data Exchange Automation Outputs Elements can be used to request new values to the EFR. If the values supplied are within the operable range of the elements, the EFR will accept the values and reflect the new values to the corresponding elements of the Sequence Step Data Exchange Automation Inputs Elements.

Sequence Step Data Exchange Automation Inputs Elements consist of:

- Selected Step of the Active Sequence
- Selected Step Amount
- Selected Step Shot Type
- Selected Step Flow Rate
- Selected Step Calibration

Sequence Step Data Exchange Automation Outputs Elements consist of:

- Desired Step of the Active Sequence
- Desired Step Amount
- Desired Step Shot Type
- Desired Step Flow Rate
- Desired Calibration

See the **EFR Sequence Step Data Exchange Elements** for further explanations of the Sequence Step Data Exchange Automation Outputs Elements and Sequence Step Data Exchange Automation Inputs Elements.

NOTE: If the Desired Step of the Active Sequence changes, the process of the Sequence Step Data Exchange will start over again, as shown in the timing diagram.

EFR Sequence Step Data Exchange Elements

Desired/Selected Step of the Active Sequence

Desired/Selected Step of the Active Sequence is a byte used to define the sequence step information that can be edited or read through the other elements of the sequence step data exchanged. When reading or writing to this element, the value will correspond with the step that can be read or edited.

Example: If 3 is shown, step 3 can be edited or read.

Desired/Selected Step Amount

Desired/Selected Step Amount is a 32bit integer used to define the step amount for the Desired Selected Step of the Active Sequence. When reading or writing to this element, the sequence step amount has two decimal places, and the units are always reflected by the integer in Selected Sequence Step Shot Type.

Desired/Selected Step Shot Type

Desired/Selected Step Shot Type is a byte used to define the step type for the Desired Selected Step of the Active Sequence. The table below shows the corresponding values and units that can be written or read from the EFR.

Value	Sequence Step Type State	Units
0	Step CC Continue*	cc
1	Step Grams Continue*	grams
2	Step Seconds Continue*	seconds
3	Step CC Break**	cc
4	Step Grams Break**	grams
5	Step Seconds Break**	seconds
6	Operator Mode	N/A

* *Continue means the EFR will not wait on an external trigger from the Trigger I/O pin or the Start Current Sequence/Step, Trigger Operator Mode bit. The EFR will immediately continue into that step.*

** *Break means the EFR will wait on an external trigger from the Trigger I/O pin or the Start Current Sequence/Step, Trigger Operator mode bit before moving into that step.*

Desired/Selected Step Flow Rate

Desired/Selected Step Flow Rate is a 16bit integer used to define the step flow rate for the Desired Selected Step of the Active Sequence.

Desired/Selected Step Calibration

Desired/Selected Step Calibration is a 16bit signed integer used to define the step calibration for the Desired Selected Step of the Active Sequence. The units for this are always reflected by the integer in the Selected Sequence Step Shot Type.

Appendix D - Error Number Requiring Acknowledgment

The Error Number Requiring Acknowledgment is a structure that allows the PLC to monitor, acknowledge and clear errors on the EFR system.

Below is a list of errors the EFR can return through the CGM. If active, each error will return a value to the Active Error Number Requiring Acknowledgment location of the map. See the Error Value column for the corresponding value of each error. When an error is returned through the Active Error Number Requiring Acknowledgment location of the map, the error must be acknowledged. To acknowledge an error, the value of the error that was returned must be copied to the Acknowledging of the Active Error Number location of the map. Once the error value has been copied and sent, the EFR will clear the error and will not update the Active Error Number Requiring Acknowledgment location until the error has been cleared inside the EFR.

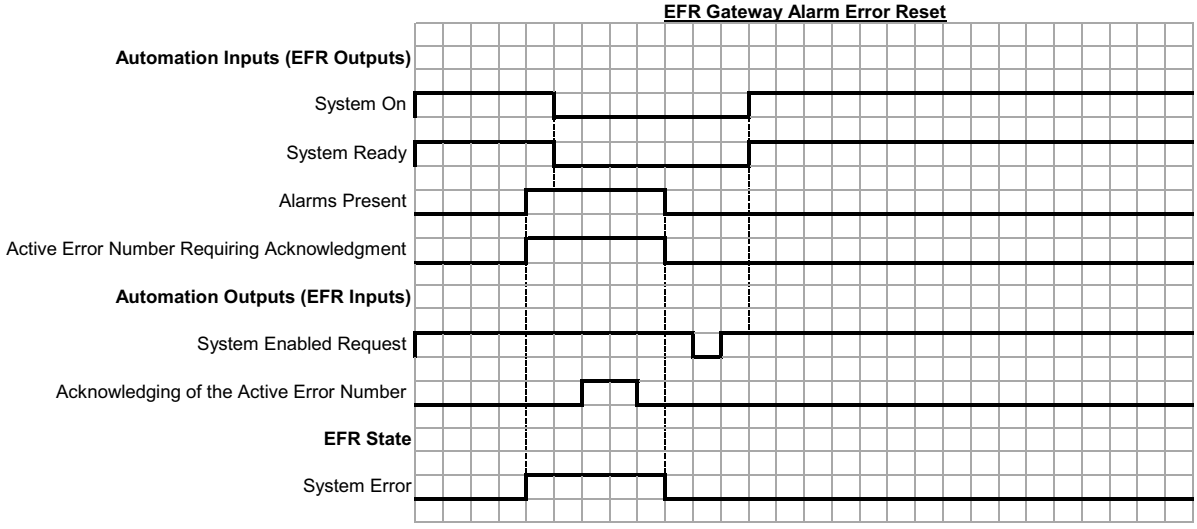
NOTE: See the timing diagrams below for information regarding the timing of signals. A 50ms delay is suggested between each CGM signal.

NOTE: See help.graco.com for further explanation of each error code.

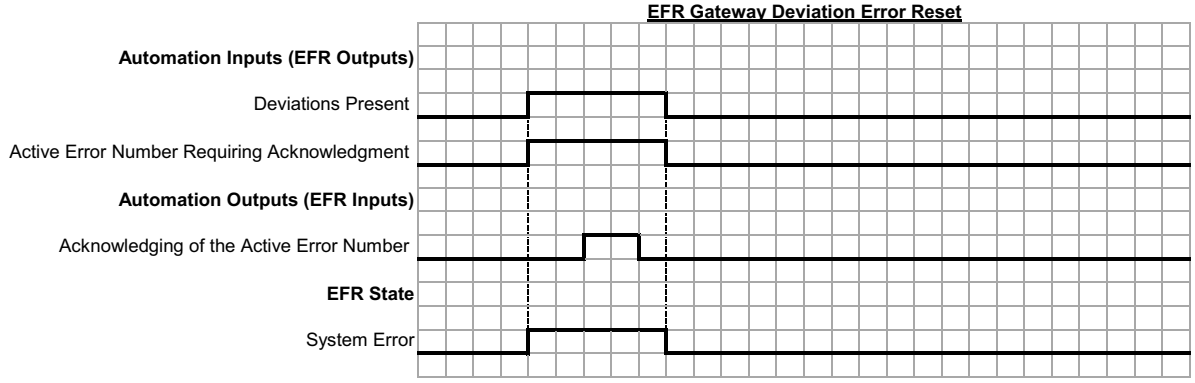
Error Code	Error Description	Error Type	Error Value
P4DA	High Pressure Red Side	Alarm	1
P4DB	High Pressure Blue Side	Alarm	2
P6DA	Red Pressure Disconnected	Alarm	3
P6DB	Blue Pressure Disconnected	Alarm	4
P7DA	Pressure Imbalance Red Side	Alarm	5
P7DB	Pressure Imbalance Blue Side	Alarm	6
V1NX	Motor Under Voltage	Alarm	8
V4NX	Motor Over Voltage	Alarm	9
T4NX	Motor Temperature	Alarm	10
T4NX	Motor Board Temperature	Alarm	11
WBNX	Motor Encoder	Alarm	12
WMNX	Motor IPC Communication	Alarm	13
WMNX	Motor Board Hardware	Alarm	14
WMNX	Motor Board Exception	Alarm	15
A4NX	Motor Switch Current	Alarm	16
P3DA	High Pressure Red Side Warning	Deviation	17
P3DB	High Pressure Blue Side Warning	Deviation	18
S1NX	Invalided Sequence Step Warning	Deviation	19
W5NX	Motor Encoder Calibration Warning	Deviation	20
CACA	ADM Disconnected	Advisory	21
CACF	FCM Disconnected	Advisory	22
CACM	Motor Disconnected	Advisory	23
CACC	CGM Disconnected	Advisory	24
CCCC	CGM Fieldbus Disconnected	Advisory	26
P6FA	Inlet Pressure Red Side Disconnected	Advisory	27
P6FB	Inlet Pressure Blue Side Disconnected	Advisory	28
DHDA	Leak Detected Red Side	Advisory	30

DHDB	Leak Detected Blue Side	Advisory	31
F3NX	High Flow Rate	Advisory	32
P3FA	High Inlet Pressure Red Pump	Advisory	33
P3FB	High Inlet Pressure Blue Pump	Advisory	34
DDDA	Red Pump Cavitation	Advisory	35
DDDB	Blue Pump Cavitation	Advisory	36
DBDX	Bubble Detected	Advisory	37
P4FX	High Inlet Pressure	Advisory	38
MAA0	Pump A Cycles Exceeds Set Limit on ADM	Advisory	39
MAB0	Pump B Cycles Exceeds Set Limit on ADM	Advisory	40
MED1	Dispense Valve Cycles Exceeds Set Limit on ADM	Advisory	41
CACV	Voltex Dynamic Mix Valve, Disconnected	Advisory	42
CAC1	Red Tank Disconnected	Advisory	43
CAC2	Blue Tank Disconnected	Advisory	44
P4DC	High Pressure Alarm Outlet A	Alarm	53
P4DD	High Pressure Alarm Outlet B	Alarm	54
P1DA	Low Pressure Alarm Outlet A	Alarm	55
P1DB	Low Pressure Alarm Outlet B	Alarm	56
P4FA	High Pressure Alarm Inlet A	Alarm	57
P4FB	High Pressure Alarm Inlet B	Alarm	58
P1FA	Low Pressure Alarm Inlet A	Alarm	59
P1FB	Low Pressure Alarm Inlet B	Alarm	60
P3DC	High Pressure Deviation Outlet A	Deviation	69
P3DD	High Pressure Deviation Outlet B	Deviation	70
P2DA	Low Pressure Deviation Outlet A	Deviation	71
P2DB	Low Pressure Deviation Outlet B	Deviation	72
P3FC	High Pressure Deviation Inlet A	Deviation	73
P3FD	High Pressure Deviation Inlet B	Deviation	74
P2FA	Low Pressure Deviation Inlet A	Deviation	75
P2FB	Low Pressure Deviation Inlet B	Deviation	76
B3CX	Gel Shot - Not In Location	Deviation	77
WVCX	Voltex Dynamic Mix Valve, Motor Fault	Deviation	97
L3TA	High Red Material Level	Deviation	107
L2TA	Low Red Material Level	Deviation	108
L6TA	Red Auto Refill Timeout	Deviation	109
L1TA	Red Fill Sensor Fault	Deviation	110
L3TB	High Blue Material Level	Deviation	115
L2TB	Low Blue Material Level	Deviation	116
L6TB	Blue Auto Refill Timeout	Deviation	117
L1TB	Blue Fill Sensor Fault	Deviation	118

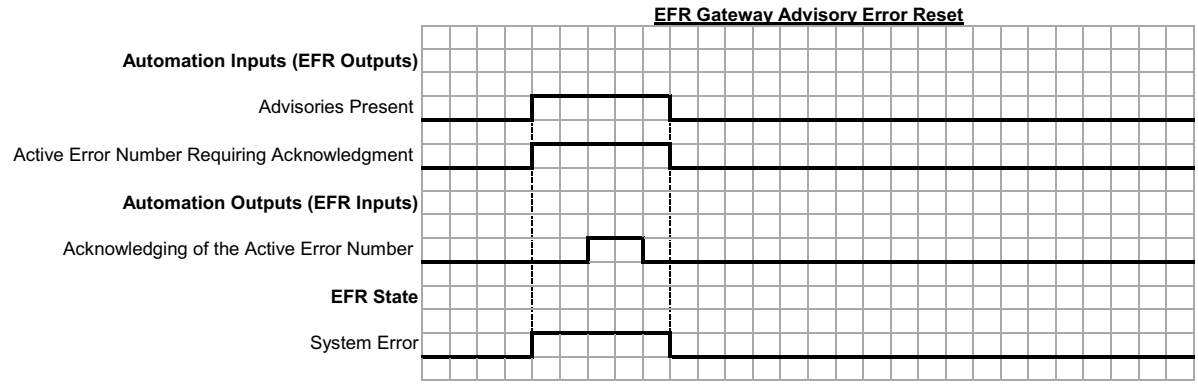
EFR Gateway Alarm Error Reset



EFR Gateway Deviation Error Reset



EFR Gateway Advisory Error Reset



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