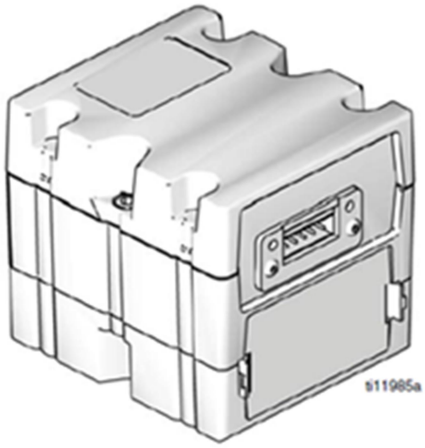
Instructions - Parts

Communications Gateway Module Installation Kit

EN

For use with* HFR/NVH *systems to provide fieldbus communications abilities. For professional use only.

Important Safety Instructions
Read all warnings and instructions in your system manual. Save all instructions.



CGM with DeviceNet connector shown

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Contents

Revision History:

Date:	Changes:
Feb. 2-9, 2021	**Initial Document Creation.**
Feb. 10, 2021	Added Data Exhange row(s)
Feb. 11, 2021	Made output byte count even, required for some field bus formats.
Feb. 18, 2021	Updated Figure 0 image.
Feb. 22, 2021	Updated I175 to a Ready Signal for the User.
March 8 -9, 2021	Re-assigned many designation pointers, in Appendix B.
March 24-25, 2021	Updated based on recent testing & development of the interface. Separated manual tank fill read/ write requests into separate commands in data exchange table.
April 30, 2021	Removed Preliminary watermark from sheets. Replaced figure 0 image. Added content to Appendix A section.
June 16, 2021	Added "Run Screens Displaying Available Data" sub-section, and figures 9 & 10. Added error numbers 280 & 281 to Error table. Added Sequence & Sequence Position Sub-section.
July 28, 2021	Updated Appendix C with an Item # column and clarified expected possible error numbers to be generated by HFR/ NVH system.
August 11, 2021	Added content to "Current Tank Level Status" in Data exchange #120 entry.
Feb. 21, 2022	Assigned Clean Out Rod functions to output bit O40, and bit 10 of "Additional Status Bits" (#140 of Data Exchange) from previous spare designations.
Mar. 25, 2022	Added item numbers 271 & 272 to Data Exchange table in Appendix B.

Related Manuals

Manual	Description
313997	HFR™ Setup & Operation Manual.
3A2175	HFRL & HFRS Setup & Operation Manual
3A2797	HFR™ for NVH Foam-Cart, Setup & Operation Manual
3A1704	Communications Gateway Module Installation Kit – for HFR or NVH systems.
312864	Communications Gateway Module, Instructs - Parts

Overview

The Communications Gateway Module (CGM) provides a control link between the HFR (Hydralic Fixed Ratio) or NVH (Noise, vibration & Harshness foam) Dispense type systems using a selected fieldbus. The CGM interface provides the means for report monitoring and control by external automation systems, robot or PLC.

See **Available Internal Data** for a list of internal data from and to the HFR/ NVH system that can be viewed or modified by the PLC/ Robot fieldbus master. The data in that section is intended to be an alternative, smaller sized and more reliable map for controlling a HFR or NVH system than the communication interface defined in Graco manual 3A1704. Furthermore, this newer map will support some of the newer features provided by the HFR product, such as a Dynamic Mixer option, ability to change recirculation flow rates, and ability to request a dispense using the field bus interface. Both maps are supported by the HFR/ NVH system.

Order Graco Map token assembly 19C802, USB stick assembly 19C885 or kit assembly 26B872 to get the interface described in this document.

When the corresponding map outlined in this document is installed, the Map ID field and Map Name fields should be as the image provided in figure 0 on the corresponding Gateway setup screen on the HFR/NVH ADM display module. The Gateway setup screens are described later.

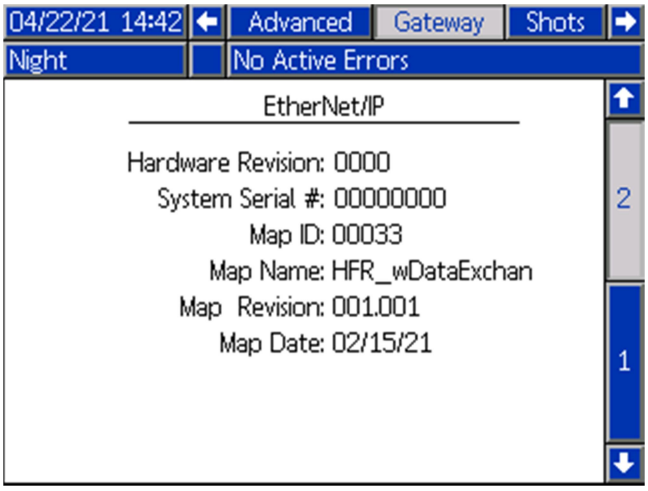


Figure 0: New HFR Map ID & Name Image:

Installation

1. Install the CGM in the desired location

   a. Remove access cover (D). Loosen two screws (C) and remove CGM (A) from base (B).

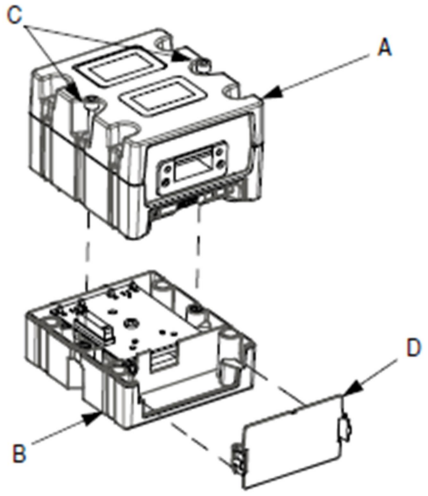
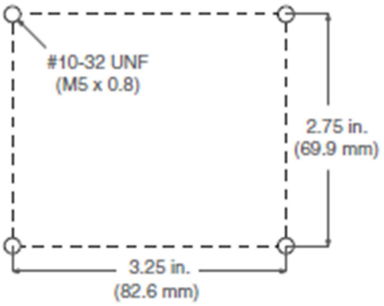


FIG. 1

   b. Mount base (B) in desired location with four screws supplied in this kit. See the following mounting dimensions.



c. Mount CGM (A) on base (B) with two screws (C).

2. Install access cover (D).

3. Connect CAN cable from either CAN connection on the CGM to the CAN connection found on the CGM to the CAN connection found on the bottom of the ADM.

NOTICE

To avoid severe damage to GCA modules, ensure the CAN cable is connected to the appropriate CAN connection.

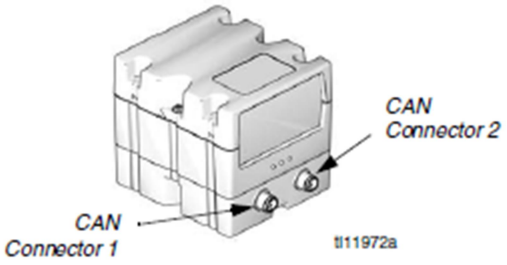


FIG. 2: Cable Connections

4. If used, connect the ethernet, DeviceNet, or PROFIBUS cable to the CGM as applicable. Connect the other end of the cable to the FieldBus device.

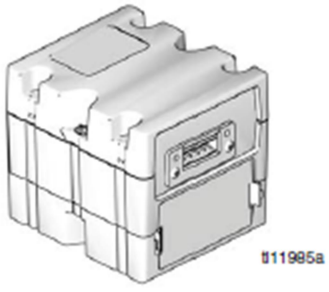


FIG. 3: Cable Connections

5. Perform the Install or Update Data Map procedure in CGM manual 312864.

6. See **Available Internal Data** for details on FieldBus pinout setup.

7. Perform **Setup** to configure the fieldbus.

Setup – Gateway Screens

The Gateway screens are used to configure the fieldbus. These screens are shown only if a CGM is correctly installed in your system. See **Installation**.

1. With the system on and enabled, press  to access the Setup screens.

2. Press the left arrow key once to to navigate to the main Gateway screen. See Fig. 10.

EtherNet/IP Fieldbus Screens

These screens are shown only if you have a EtherNet/IP Fieldbus CGM installed.

Screen 1

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

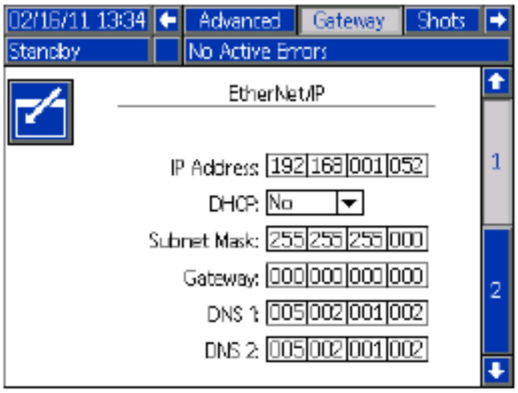


FIG. 10: EtherNet/IP Fieldbus Screen 1

Screen 2

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

FIG. 11: EtherNet/IP Fieldbus Screen 2

DeviceNet Fieldbus Screen

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

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

FIG. 12: DeviceNet Fieldbus Screen

ProfiBus Fieldbus Screen

These screens shown only if you have a PROFIBUS Fieldbus CGM installed.

Screen 1

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

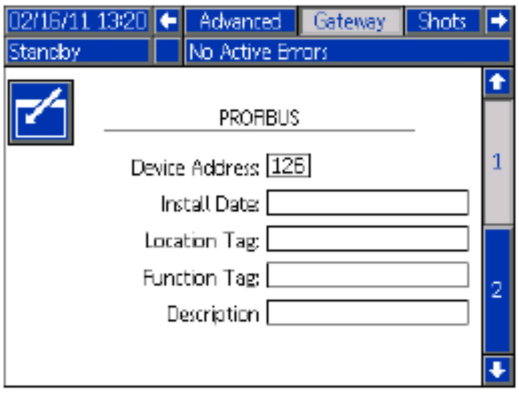


FIG. 5: PROFIBUS Fieldbus Screen 1

Screen 2

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

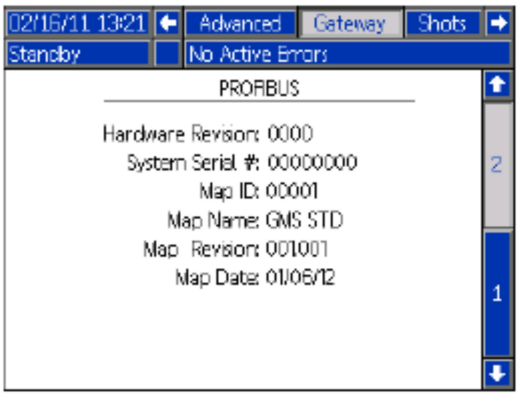


FIG. 6: PROFIBUS Fieldbus Screen 2

PROFINET Fieldbus Screens

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

Screen 1

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

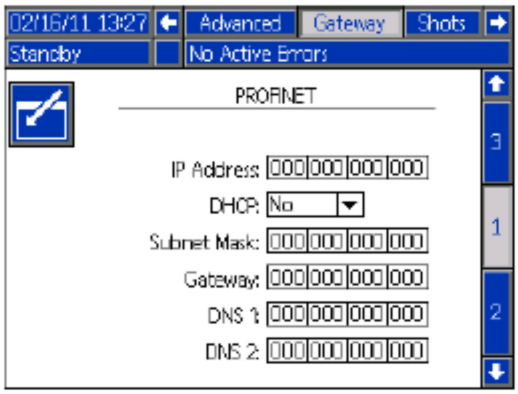


FIG. 7: PROFINET Fieldbus Screen 1

Screen 2

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

FIG. 8: PROFINET Fieldbus Screen 2

Available Internal Data

See **Appendix A – I/O Signal Descriptions** for additional details regarding each input/output.
Unless stated otherwise,

- Bytes are stored in each instance in little endian order. (byte order within instance: least significant…most significant)
- Values are subject to the same maximum and minimum restrictions of the ADM.

Input Data (Signals from HFR/NVH to PLC/ Controlling Logic)

In-stance	Byte (s)	Input Bit(s)	Description
0	0 – 1	I00 – I15	Current Pressure, Blue Pump (in 0.01 of bar units)
1	2- 3	I16 – I31	Current Pressure, Red Pump (in 0.01 of bar units)
2	4 -5	I32 – I47	Current Flow Rate (in 0.01 of cc/sec or g/sec units)
3	6 – 7	I48 – I63	Flow Rate or pressure Set Point for Current or Next Dispense (in 0.01 cc/sec, 0.01 g/sec or 0.01 bar units)
4	8 - 9	I64 – I79	Current Dispense Duration, which counts up starting from 0 (in 0.01 second units).
5	10 - 13	I80 – I111	Amount for current Dispense (In 0.01 CC or 0.01 Gram units, starting from 0)
6	14 - 17	I112 – I143	Amount Set point for Current Dispense (In 0.01 CC, 0.01 Gram, or 0.001 second units, Shot & Sequence Modes)
7	18	I144 – I151	Current Mode Selected.
8	19	I152 – I159	Current Active Shot Number (1-100, Shot Mode) or Sequence Position (1-20, Sequence Mode).
9	20	I160 – I167	Current Sequence number (1-26, for A-Z) selected (Sequence mode only)
10	21	I168	Heart Beat from HFR/NVH MCM (#)
		I169	Dispense Valve Open/ Dispense Active
		I170	Recirculation Valve Opened (HFR Only)
		I171	System Startup Command Active
		I172	Pumps are Parked
		I173	High Pressure Recirculation Active (NVH Only)
		I174	Cold Startup Active (Currently NVH Only)
		I175	System is “Ready” for Dispense Request.
11	22 - 23	I176 – I191	Configurable Data Element 1 ($). Default: Additional Status Bits (See Appendix B, #140)
12	24 - 25	I192 – I207	Configurable Data Element 2 ($). Default: Error Number Requiring Acknowledgement (0 = None) (%)
13	26 – 27	I208 – I223	Data Exchange Interface - Pointer Last Serviced (*)
14	28 - 31	I224 – I255	Data Exchange Interface – Input Data Element (*)

Notes:

* - See Appendix B for Data Exchange Interface details.

- Heart Beat signal change from high to low, and low to high at a 0.25 hertz rate.

% - Refer to Table for Error Numbers (Appendix C), and appendix B #151 & 152 for details.

$ - Refer to Appendix B or Data Exchange section (starting on #161) on how to set up the configurable data registers.

Output Data (Signals from PLC to HFR/ NVH System)

In-stance	Byte (s)	Output Bit(s)	Description
0	0	O00 – O07	Mode Select Command
1	1	O08 – O15	Shot Number (1-100) or Sequence Position (1-20) Command. (Shot or Sequence modes only)
2	2	O16 – O23	Sequence Number Select (1-26)
3	3	O24	Dispense Valve Open Request (Standby Mode Only)
		O25	Recirculation Valve Open Request (HFR Only)
		O26	System Startup Command
		O27	Park Pump(s) Request (Standby Mode Only)
		O28	High Pressure Recirculation Request (NVH Only)
		O29	Dispense Request (@)
		O30	Spare Command bit 1
		O31	Spare Command bit 2
4	4 - 5	O32	Turn On System Request
		O33	PLC/ Robot (CGM) Control Request
		O34	Heart Beat from PLC (#)
		O35	ADM Lock Out Request
		O36	Red Tank Manual Fill Request
		O37	Blue Tank Manual Fill Request
		O38	Turn ON Temperature Zones command
		O39	Disable Dispensing Request (ADM, PLC & Footswitch).
		O40	Clean Out Rod Activate Command (L-Head, Full Circ. Systems Only).
		O41	TBD Bit Command2
		O42	TBD Bit Command3
		O43	TBD Bit Command4
		O44	TBD Bit Command5
		O45	TBD Bit Command6
		O46	TBD Bit Command7
		O47	TBD Bit Command.8
5	6 - 7	O48 – O63	Flow Rate or Pressure Set Point Command for Selected Dispense (in 0.01 cc/sec, 0.01 g/sec or 0.01 bar units, Operator or Shot Modes only).
6	8 – 9	O64 – O79	Flow Rate Set Point for Circulation (HFR Only). (in 0.01 cc/sec, 0.01 g/sec units)
7	10 – 11	O80 – O95	Error Number Acknowledgement Command (0 = None) (%)
8	12 – 13	O96 – O111	Configurable Data Command 1 ($). Default: None
9	14 – 15	O112 – O127	Configurable Data Command 2 ($). Default: None
10	16 – 17	O128 – O143	Configurable Data Command 3 ($). Default: None
11	18 – 19	O144 – O159	Configurable Data Command 4 ($). Default: None
12	20 – 21	O160 – O175	Data Exchange Interface – Data Pointer Command (*)
13	22 – 25	O176 – O207	Data Exchange Interface – Output Data Element (*)
14	26 - 29	O208 – O239	Dispense Amount Set point for Selected Dispense (In 0.01 CC, 0.01 Gram, or 0.001 second units, Shot Mode Only, System must be idle or Circulating)

Notes:

* - See Appendix B for Data Exchange Interface details.

- Heart Beat signal from PLC need to change state (high to low, and low to high) at least every 4 to 5 seconds. This signal is necessary for the PLC Control the HFR or NVH system.

% - Refer to Table for Error Numbers (Appendix C), and appendix B #151 & 152 for details.

$ - Refer to Appendix B or Data Exchange section (starting on #161) on how to set up the configurable data registers.

@ - Dispense Request to the HFR is similar to a dispense request using a foot switch (Operator Mode – Press and hold (= 1) entire shot duration, Shot & Sequence modes tap (= 1) to start then release (= 0) and repeat during dispense to abort if necessary).

Run Screens Displaying Available Data

In HFR/ NVH system software version 1.13.009 or later, two run screens are provided to illustrate the data between the HFR or NVH system, and the controlling PLC or Robot logic. The screens are available if the HFR/ NVH system detects the presence of a CGM module with the correct Map ID (33).

The 1st run screen (to the left of the main home screen) provides graphical representations of the data provided to the controlling logic. As indicated in figure 9 below, the bit data below is ON (high) when the circle graphic is Green, and off (low) when the graphic is Grey.

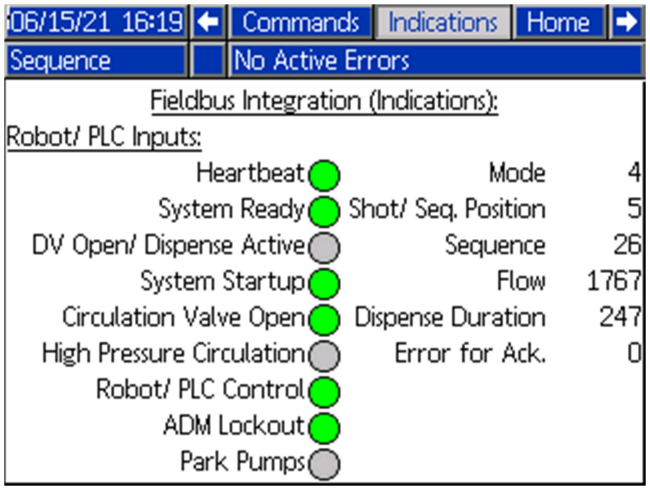


Figure 9: New Fieldbus Data "Indications" Screen.

The 2nd screen, the Fieldbus "Commands" run screen provides graphical representations for the control data requested from the PLC or Robot to the HFR/ NVH logic. Like the figure 9 screen previously described, the Figure 10 "Commands" screen provides a Green graphic when a bit request is ON (high), and a grey graphic when the bit command is Off or low.

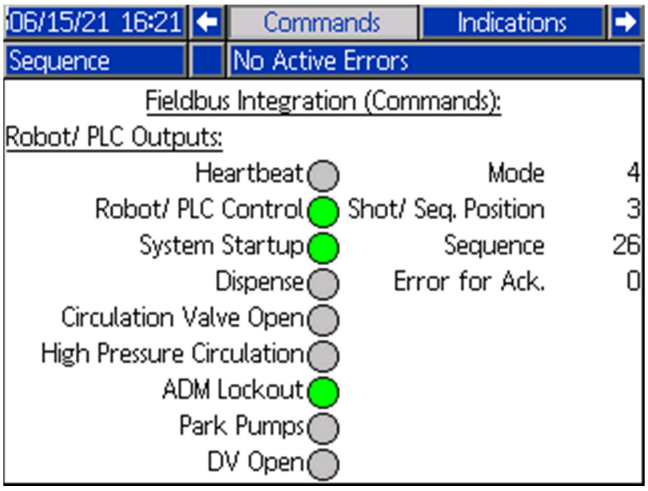


Figure 10: New Fieldbus Data "Commands" Screen.

Appendix A – I/O Signal Descriptions

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

PLC/ Robot (CGM) Control Request (O33):

This bit must be set (high) before the HFR or NVH will honor any output request from the PLC, robot or controlling logic. Furthermore, the controlling logic needs to provide a dynamic signal to O34 (Heart Beat from PLC (#)) before requesting control of the HFR or NVH system (refer to "#" note). A simple logic rung where the heat beat output from the HFR (I168) is provided to O34 will satisfy this condition. If the controlling logic only wants to monitor HFR/ NVH activity, clear or make O33 low.

Mode Selection (Input Instance 7, Output Instance 0)

These signals represent the mode of the HFR or NVH system. The following modes are available:

Mode Num.	Mode Name	Description
1	Disabled	Mode when system is OFF. System is off and dormant.
2	Standby	Mode for Parking the pumps, starting circulation (NVH), opening the Dispense Valve. Can NOT dispense in this mode.
3	Shot	Mode for dispensing set amount of material. Up 100 shot recipes (recipe is a dispense rate ((flow or pressure)) and amount) are available.
4	Sequence	Mode for dispensing a sequence of up to 20 shot recipes. Up to 26 sequences can be used and stored by the HFR/ NVH.
5	Operator	Mode for dispensing at a given rate, with no pre-calculated amount.
7	Night	Mode for recirculating and conditioning the materials, while machine not in use. Can NOT dispense material in this mode.

Shot Number (Input instance 8, Output Instance 1):

Shot recipes are typically defined on the ADM shot setup screen pages. A shot consists of a dispense rate (flow or pressure) and an amount dispensed (volume, weight or time). The rate is determined if the machine is in constant flow or constant pressure modes. The amount is determined if in volumetric, weight or a time based amount mode. Both the rate and amount selections are available on the System #1 setup screen on the ADM.

Sequence and Sequence Positions (Input Instances 8 & 9, Output Instances 1 & 2):

When in sequence mode, this data element represents the current (input) or selected (output) position of sequence of shot recipes. The HFR/ NVH system provides capability for 26 different sequences (A – Z), each with up to 20 positions. The sequences can be defined using the "Sequences" setup screens in the ADM. Positions in possible 20 positions can be skipped, and the HFR/ NVH will automatically execute the next defined position. So for instance, if the controlling PLC requests Sequence Y (#25) position 1, as illustrated in figure 11 below, the HFR will execute shot 11 from position 1, shot 12 from position 2, ... shot 15 from position 5, and finish the sequence with shot 16 from position 9 after each dispense request (O29). To execute the entire sequence, the controlling PLC needs generated 6 dispense requests when the dispense is to occur. If the controlling PLC requests a position or sequence which is NOT defined (for instance, sequence Y position 7), the un-defined portion of the request will be ignored.

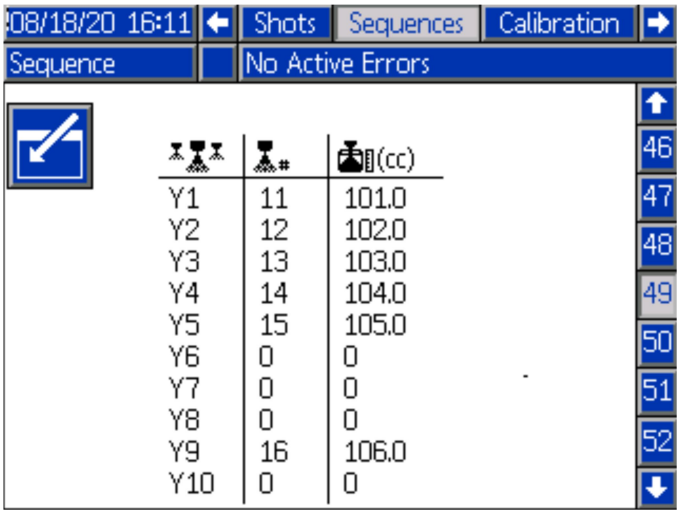


Figure 11: Typical Sequence Definition screen

System Startup Control (I171, O26)

Setting this bit (O26) will request the following, based on the figuration of the HFR or NVH system:

- Will start the pumps to circulate material at the Recirculation flow rate, if in Night mode, “Auto Circulate Between Dispenses” feature is on and pumps are idle (Shot, sequence or Operator modes) or if “HFR Recirculation Valves are Installed” and the recirculation valves are opened (“  ”) when in Shot, sequence or Operator modes.
- Will pressurize the pumps if in operator mode, making system ready for dispensing if using the manual controlled “Fusion/ P2” dispense valve option only.
- Will start the pumps into low pressure circulation mode, and will start the cold start process (if at start up condition) if an NVH system.

Clearing the System Startup bit will perform the opposite as described above.

High Pressure Recirculation (I173 and O28):

Setting this bit will command the NVH or Full recirculation system into High Pressure mode, required to dispensing material.

Cold Startup Active (I174):

This indication informs the PLC that a cold startup process is active. If active, the NVH system is slowly starting the pumps and applying heat to the materials to lower the material viscosity (and consequently pump pressures) preparing the materials for dispense. As the process continues, the NVH will slowly increase the material flow as the pump pressures lower due to lowering of the material viscosities. When the process is completed (typically taking about ½ an hour), the materials are ready for dispensing. This process is started by setting the System Startup Control bit after the NVH system has been idle for some time.

System is “Ready” for Dispense Request. (I175):

This informs the controlling logic it is OK to request a dispense. If set, there are no active alarms, system is in a dispensing mode (Operator, shot or sequence), and circulating material if necessary (“Auto Circulation between Dispenses ON” or circulation is ON if a NVH system).

Dispense Request (O29):

This PLC output can be used in place of the foot switch input into the HFR for requesting dispenses. However, if the excessive field bus traffic is present or the field bus has many nodes, the request response time may not be as fast or consistent as using the foot switch input.

ADM Lock Out (O35), Bit 2 Indication from Additional Status Bits register:

If active, all keys on the ADM will be disabled with exception of the ADM RED key, the run screen navigation keys and the user will be able to acknowledge errors. The soft keys will be visible but will be indications only.

If the controlling PLC clears the PLC/ Robot (CGM) Control Request output (O33), an active ADM lockout condition will be automatically cleared.

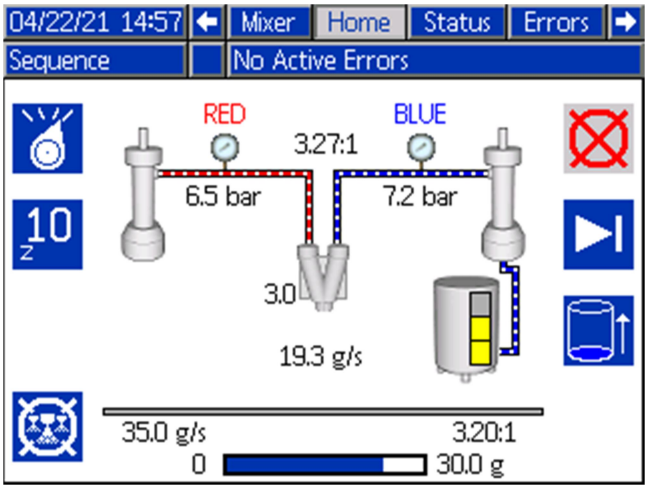


Figure 12: HFR Automatically circulating after a Sequence Z dispense, in ADM Lockout mode.

Appendix B – Data Exchange Interface

This is bi-directional interface which provides both transmit and reception of data between the HFR/ NVH system, and the controlling logic (PLC, robot or equivalent). The interface allows a large amount of data to exchange between the systems, while only occupying a very small portion of the map to support the exchange. The interface also allows for future expansion of data without changing the map structure.

To get, receive or read data from the HFR/ NVH system, the controlling PLC needs to:

1. Write to the “Data Exchange Interface – Data Pointer Command” location on the map (output bytes 20 – 21, O160 – O175) a value corresponding to the data the PLC wants to receive.
2. Wait for the HFR to provide the same “Data Exchange Interface - Pointer Last Serviced “ number written in the previous step at input byte locations 26 – 27 (I208 – I223).
3. Read the requested data at input byte locations 28 – 31 (I224 – I255), “Data Exchange Interface – Input Data Element”.

To write or transmit data to the HFR system, the controlling PLC needs to

A. Write the data for the HFR system to “Data Exchange Interface – Output Data Element” location, output byte locations 22 – 25 (O176 – O207).

B. Write to the “Data Exchange Interface – Data Pointer Command” location on the map (output bytes 20 – 21, O160 – O175) a value corresponding to the data the PLC wants to transmit to the HFR.

C. The HFR will echo back to the PLC the “Data Pointer” and the “Data Element “ after the HFR system processes the data transmit request to input locations 26 – 27 (I208 – I223), and input locations 28 – 31 (I224 – I255) respectively.

Note 1: When changes are made over the data exchange interface, the HFR/ NVH system display screen may not update immediately. It may be necessary to navigate away from the screen then back to it, or a new dispense may need to be triggered.

Note 2: All Read designations on the Data Exchange are assigned and Even numbers, whereas all Write designations are assigned an Odd number assignments.

Data Exchange Interface Pointer Designation Table

Data Exchange Pointer Designa-tion	Description	Comments, Data Element descriptions	Read/ Write
0	Interface Not Active		
1	Red Material Tank Heat, Set point temperature	Set or Get Set Point temperature, in 0.1 C^0 units.	Write
2			Read
3	Blue Material Tank Heat, Set Point temperature	Set or Get Set Point temperature, in 0.1 C^0 units.	Write
4			Read
5	Red Material Inline Heater, Set point temperature	Set or Get Set Point temperature, in 0.1 C^0 units.	Write
6			Read
7	Blue Material Inline Heater, Set Point temperature	Set or Get Set Point temperature, in 0.1 C^0 units.	Write
8			Read
9	Red Material Hose Heat, Set point temperature	Set or Get Set Point temperature, in 0.1 C^0 units.	Write
10			Read
11	Blue Material Hose Heat, Set Point temperature	Set or Get Set Point temperature, in 0.1 C^0 units.	Write
12			Read
13	Red Material Chiller Temperature, Set point temperature	Set or Get Set Point temperature, in 0.1 C^0 units.	Write
14			Read
15	Blue Material Chiller Temperature, Set Point temperature	Set or Get Set Point temperature, in 0.1 C^0 units.	Write
16			Read
80	Red Material Tank Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
82	Blue Material Tank Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
84	Red Tank Blanket Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
86	Blue Tank Blanket Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read

Pointer Designa-tion	Description	Comments, Data Element descriptions	Read/ Write
88	Red Material Inline Heater Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
90	Blue Material Inline Heater Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
92	Red Material Hose Heat Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
94	Blue Material Hose Heat, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
96	Red Material Chiller Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
98	Blue Material Chiller Zone, temperature	Current Zone Actual Temperature, in 0.1 C^o units.	Read
102	Heater Zones Enabled Bit Masks	Bit 0 = Red Tank Zone Enabled (1) or Disabled (0). Bit 1 = Blue Tank Zone Enabled or Disabled. Bit 2 = Red Inline Heater Enabled or Disabled. Bit 3 = Blue Inline Heater Enabled or Disabled. Bit 4 = Red Hose Heater Enabled or Disabled. Bit 5 – Blue Hose Heater Enabled or Disabled. Bit 6 = Red Chiller Enabled or Disabled. Bit 7 = Blue Chiller Enabled or Disabled.	 Read
103	Heater Zones On/ Off Bit Masks	Bit 0 = Red Tank Zone Turned ON (1)/ Off (0). Bit 1 = Blue Tank Zone Turned ON/ Off. Bit 2 = Red Inline Heater Turned ON/ Off. Bit 3 = Blue Inline Heater Turned ON/ Off. Bit 4 = Red Hose Heater Turned ON/ Off. Bit 5 – Blue Hose Heater Turned ON/ Off. Bit 6 = Red Chiller Turned ON/ Off. Bit 7 = Blue Chiller Turned ON/ Off.	Write
104			Read
120	Current Tank Level Status	Least Significant Byte – Red Tank Level 2nd Significant Byte – Blue Tank Level Level indications/ Byte: 1 = Material is below Low Level sensor. 2 = Material between Low and High Level (2nd) sensors. 3 = Tank Full (at 2nd sensor, or above). 7 = Material at or above top sensor (“Report xxx High Level in bit 2” feature ON).	Read
121	Tank Filling Control/ Status, Red Tank	1 = Active Filling (Read) or Manual Fill Request (Write). 0 = Filling NOT Active (Read), or Abort Manual Fill (Write).	Write
122			Read
123	Tank Filling Control/ Status, Blue Tank	1 = Active Filling (Read) or Manual Fill Request (Write). 0 = Filling NOT Active (Read), or Abort Manual Fill (Write).	Write
124			Read
130	Ratio, Setpoint	In 0.001:1 units of measure. So for instance, a value of 23680 = 23.680:1. Ratio may be inverted based on the setting of the “Ratio:” control selection on the System #3 setup screen. Ratios are either volumetric or weight depending upon the “Flow Units” Selection on the ADM Advanced #2 setup screen.	Read

Pointer Designa-tion	Description	Comments, Data Element descriptions	Read/ Write
132	Ratio, Actual	In 0.001:1 units of measure. So for instance, a value of 23721 = 23.721:1. Ratio may be inverted based on the setting of the "Ratio:" control selection on the System #3 setup screen. This data is only valid if HFR or NVH has a Ratio Monitoring option installed.	Read
140	Additional Status Bits	Bit 0: Heart Beat Signal from HFR/ NVH ADM Module. Bit 1: System is "Ready" for Dispense Request. Bit 2: ADM Lockout Active. Bit 3: PLC/ Robot Control Active. Bit 4: Active/ Valid PLC Heart Beat Signal Received by HFR. Bit 5: Alarm is Active Bit 6: Deviation is Active. Bit 7: Advisory is Active. Bit 8: Spare Bit indication for future use. Bit 9: Dispensing is Disabled (ADM, PLC & Footswitch). Bit 10: Clean Out Rod Process Active (L-Head Systems Only) Bits 11 – 15: Spare bit indications for future use.	Read
151	Error number requiring Acknowledgement	See error number table in next section. Writing to this register with the error number read, will clear the Error code pop-up window from the HFR screen. If the condition is still present after acknowledgement, the same error number acknowledged will be provided in the next read instruction below.	Write
152			Read
154	Error Number Active in System	See error number table in next section. If more than 1 error is present, the next read will provide the second error number present. If only 2 errors are present, the 3rd read will provide the 1st error provided. If this register is assigned one of the read configurable data registers (see next items in table), if more than 1 error is present, the HFR will present all the active error numbers at approximately a 1 hertz rate.	Read
161	Set or Read Register "Configurable Data Element 1" Assignment (Input instance 11, I176 – I191)	Register assignments must be an Even number, and correspond to the Read Assignments in this Table. Once set (Write), the HFR/ NVH will remember the assignment, even after a power cycle. Register assignments should be 16 bits wide data, or smaller.	Write
162			Read
163	Set or Read Register "Configurable Data Element 2" Assignment (Output instance 12, I192 – I207)	Register assignments must be an Even number, and correspond to any Read Assignment in this Table. Once set (Write), the HFR/ NVH will remember the assignment, even after a power cycle. Register assignments should be 16 bits wide data, or smaller.	Write
164			Read
181	Set or Read Register "Configurable Data Command 1" Assignment (Output instance 8, O88 – O103)	Register assignments must be an Odd number, and correspond to any Write Assignment in this Table. Once set (Write), the HFR/ NVH will remember the assignment, even after a power cycle. Register assignments should be 16 bits wide, or smaller.	Write
182			Read

Pointer Designa-tion	Description	Comments, Data Element descriptions	Read/ Write
183	Set or Read Register "Configurable Data Command 2" Assignment (Output instance 9, O104 – O119)	Register assignments must be an Odd number, and correspond to any Write Assignment in this Table. Once set (Write), the HFR/ NVH will remember the assignment, even after a power cycle. Register assignments should be 16 bits wide, or smaller.	Write
184			Read
185	Set or Read Register "Configurable Data Command 3" Assignment (Output instance 10, O120 – O135)	Register assignments must be an Odd number, and correspond to any Write Assignment in this Table. Once set (Write), the HFR/ NVH will remember the assignment, even after a power cycle. Register assignments should be 16 bits wide, or smaller.	Write
186			Read
187	Set or Read Register "Configurable Data Command 4" Assignment (Output instance 11, O136 – O151)	Register assignments must be an Odd number, and correspond to any Write Assignment in this Table. Once set (Write), the HFR/ NVH will remember the assignment, even after a power cycle. Register assignments should be 16 bits wide, or smaller.	Write
188			Read
200	Mixed Material in Current or Last Dispense	Sum of Blue and Red Materials Dispensed (In 0.01 CC or 0.01 Gram units)	Read
202	Blue Material in Current or Last Dispense	(In 0.01 CC or 0.01 Gram units)	Read
204	Red Material in Current or Last Dispense	(In 0.01 CC or 0.01 Gram units)	Read
206	Mixed Material Resettable Counter	Sum of Blue and Red Resettable Counters (In 0.01 CC or 0.01 Gram units)	Read
208	Blue Material Resettable Counter	(In 0.01 CC or 0.01 Gram units)	Read
210	Red Material Resettable Counter	(In 0.01 CC or 0.01 Gram units)	Read
212	Pump Resettable Counter	(in pump cycles)	Read
213	Reset All Resettable Material Counters	Will set all the resettable counters to 0. System must be idle (Pumps NOT moving) for this command to execute.	Write
220	Mixed Material Total Counter	Sum of Blue and Red material dispensed from HFR or NVH (In 1 CC or 1 Gram units)	Read
222	Blue Material Total Counter	Sum of Blue material dispensed from HFR or NVH (In 1 CC or 1 Gram units)	Read
224	Red Material Total Counter	Sum of Red material dispensed from HFR or NVH (In 1 CC or 1 Gram units)	Read
226	Total Pump Cycle Counter	Total number of pump cycles for the NVH/ HFR system.	Read
231	Dynamic Mixer Speed Set Point.	In RPM. Only valid if using Dynamic Mixer (Voltex) option.	Write
232			Read
234	Dynamic Mixer Actual Speed	In RPM. Only valid if using Dynamic Mixer (Voltex) option.	Read

Pointer Designa-tion	Description	Comments, Data Element descriptions	Read/ Write
235	Dynamic Mixer Air Nucleation On Time	In milli-second increments. Only valid if using Dynamic Mixer (Voltex) option, and "Air Nucleation" turned ON (System #4 setup screen).	Write
236			Read
237	Dynamic Mixer Air Nucleation Off Time	In milli-second increments. Only valid if using Dynamic Mixer (Voltex) option, and "Air Nucleation" turned ON (System #4 setup screen).	Write
238			Read
239	Dynamic Mixer, Motor Ramp Up Time	In milli-second increments. Only valid if using Dynamic Mixer (Voltex) option.	Write
240			Read
241	Dynamic Mixer, On/ Off State/ Request	1 = Motor On (read), or Turn ON Request (write). If sending a Turn On Request, the system should be idle and Not dispensing.	Write
242			Read
243	Dynamic Mixer, Air Nucleation On/ Off State/ Request	1 = Air On (read), or Air ON Request (write). If sending a Turn On Request, the system should be idle and Not dispensing.	Write
244			Read
251	Recirculation Flow Rate Set Point	Set (Write) or get (read) the recirculation flow rate set point in in 0.01 cc/sec, 0.01 g/sec units (HFR Systems with Circulation Valves Installed).	Write
252			Read
253	Low pressure Circulation Percentage	Set (Write) or get (read) the Low pressure Circulation flow rate percentage (System #2 Setup screen). Values of 10 – 90 % allowed (NVH Systems only).	Write
254			Read
260	Read System Version	A 32-bit string in the format of 0xXXCCBBAA. 0xCC…Build Version 0xBB…Minor Version 0xAA…Major Version	Read
262	Read System Date	A 32-bit string in the format of 0xDDCCBBAA. 0xDD…Year (0x0D corresponds to 2013) 0xCC…Month (0x0A corresponds to October) 0xBB…Day 0xAA…Day of Week (0x01 Corresponds to Monday)	Read
271	Cavitation Errors Disabled	Set (Write) or get (read) if the Cavitation Error generation logic is Disabled (= 1, not recommended for production use) or Enabled (= 0, if logic is Active). Refer to "Cavitation Errors Disabled" option on ADM Advanced #3 setup screen for current state.	Write
272			Read
273 – 65,xxx	Reserved for Future Use		

Notes:

Appendix C – Error Number Tables:

The following table documents all the possible error numbers and codes generated by a HFR or NVH system. If no error is present, a 0 will be provided in the corresponding register ("No Active Errors"). The Code column indicates the 4 digit code presented to the user on the ADM. The following error codes have been assigned one of the 3 possible levels, documented in column 4:

- Alarm ("A") – Most severe, typically shutting down the system.
- Deviation ("D") – Less severe condition which may or may not shut down the system.
- Advisory ("V") – Simply a warning, which does NOT shut down a system.

The last column reflects the text description provided to the user (when HFR/ NVH configured to English) when the error number is generated.

Item #:	Error Number	Code	Level	Description (English)
0	0	N/A	--	No Active Errors
1	1	T4N1	A	Blue Motor Temp. Shutdown
2	2	T3N1	V	Blue Motor Temp. Cutback
3	3	T4H1	A	Blue MCM Oil Temp. Shutdown
4	4	T3H1	D	Blue MCM Oil Temp. Cutback
5	5	MBH1	A	Blue MCM Low Oil Level
6	6	A4H1	A	Blue Motor Over Current
7	7	A4N1	A	Blue Motor Over Current
8	8	A4M1	A	Blue Motor Over Current
9	9	A9C1	A	Blue Motor Over Current
10	10	T4C1	A	Blue MCM High Temp.
11	11	V4H0	A	Blue MCM Overvoltage
12	12	V1H1	A	Blue MCM Undervoltage
13	13	WBH1	A	Blue Motor Encoder Fault
14	14	WMH 1	D	Blue Motor Controller Fault
15	15	MBN1	V	Blue Motor Low Performance
16	16	WKH1	A	Blue Motor High Speed
17	17	N4A1	D	Blue Pump Failed to Move
18	18	WSC0	D	Invalid Setpoint Request
19	19	B9C0	D	Small Shot Request
20	20	P4D0	A	Pressure Imbalance
21	21	DSC0	A	Pumps Not Defined
22	22	D5A1	D	Invalid Learn Mode Data Blue
23	23	500	D	Invalid Weight Cal. Data
24	24	D6A1	A	Blue Position Sensor Fault
25	25	P6A1	A	Red Pressure Sensor Fault
26	26	P6B2	A	Blue Pressure Sensor Fault
27	27	D1A1	D	Blue Setpoint Not Reached
28	28	D4A1	D	Blue Setpoint Exceeded
29	30	P4A1	A	Red Pressure Shutdown
30	31	P4B2	A	Blue Pressure Shutdown
31	32	DFA1	D	Red Pump Not Parked
32	33	F7D1	D	Blue Pump Failed to Stall
33	34	WSD0	D	Invalid Gel Timer Definition
34	35	DDA1	D	Red Pump Cavitation

Item #:	Error Number	Code	Level	Description (English)
35	36	DDB2	D	Blue Pump Cavitation
36	43	WDF1	D	Dispense Valve Open Problem
37	44	WDF1	A	Dispense Valve Failed to Close
38	62	WSC0	D	Invalid Setpoint Request
39	63	B9C1	D	Small Shot Request
40	69	P4A1	A	Red Pressure Shutdown
41	72	DDA1	D	Red Pump Cavitation
42	73	T9A6	A	Red Blanket Temp. Cutoff
43	74	T9B5	A	Blue Blanket Temp. Cutoff
44	75	T9A3	A	Red Inline Temp. Cutoff
45	76	T9B1	A	Blue Inline Temp. Cutoff
46	77	A8A6	D	No Red Blanket Current
47	78	A8B5	D	No Blue Blanket Current
48	79	A8A3	D	No Red Inline Current
49	80	A8B1	D	No Blue Inline Current
50	81	A8A2	D	No Red Hose Current
51	82	A8B4	D	No Blue Hose Current
52	83	A8B7	D	No Red Chiller Current
53	84	A8B8	D	No Blue Chiller Current
54	85	A4A6	A	Red Blanket Overcurrent
55	86	A4B5	A	Blue Blanket Overcurrent
56	87	A4A3	A	Red Inline Overcurrent
57	88	A4B1	A	Blue Inline Overcurrent
58	89	A4A2	A	Red Hose Overcurrent
59	90	A4B4	A	Blue Hose Overcurrent
60	91	A4A7	A	Red Chiller Overcurrent
61	92	A4B8	A	Blue Chiller Overcurrent
62	93	A7A6	A	Red Blanket Control Fault
63	94	A7B5	A	Blue Blanket Control Fault
64	95	A7A3	A	Red Inline Control Fault
65	96	A7B1	A	Blue Inline Control Fault
66	97	A7A2	A	Red Hose Control Fault
67	98	A7B4	A	Blue Hose Control Fault
68	99	A7A7	A	Red Chiller Control Fault
69	100	A7B8	A	Blue Chiller Control Fault
70	101	V4A6	A	Red Blanket Overvoltage
71	102	V4B5	A	Blue Blanket Overvoltage
72	103	V4A3	A	Red Inline Overvoltage
73	104	V4B1	A	Blue Inline Overvoltage
74	105	V4A2	A	Red Hose Overvoltage
75	106	V4B4	A	Blue Hose Overvoltage
76	107	V4A7	A	Red Chiller Overvoltage
77	108	V4B8	A	Blue Chiller Overvoltage

Item #:	Error Number	Code	Level	Description (English)
78	117	T9C6	A	Red Blanket Ctrl Shutdown
79	118	T9C5	A	Blue Blanket Ctrl Shutdown
80	119	T9C3	A	Red Inline Ctrl Shutdown
81	120	T9C1	A	Blue Inline Ctrl Shutdown
82	121	T9C2	A	Red Hose Ctrl Shutdown
83	122	T9C4	A	Blue Hose Ctrl Shutdown
84	123	T9C7	A	Red Chiller Ctrl Shutdown
85	124	T9C8	A	Blue Chiller Ctrl Shutdown
86	125	WMC 6	V	Red Tank Con. Cutback
87	126	WMC 5	V	Blue Tank Con. Cutback
88	127	WMC 3	V	Red Inline Con. Cutback
89	128	WMC1	V	Blue Inline Con. Cutback
90	129	WMC2	V	Red Hose Con. Cutback
91	130	WMC4	V	Blue Hose Con. Cutback
92	131	WMC7	V	Red Chiller Con. Cutback
93	132	WMC8	V	Blue Chiller Con. Cutback
94	133	T4A6	A	Red Tank High Fluid Temp.
95	134	T4B5	A	Blue Tank High Fluid Temp.
96	135	T4A3	A	Red Inline High Fluid Temp.
97	136	T4B1	A	Blue Inline High Fluid Temp.
98	137	T4A2	A	Red Hose High Fluid Temp.
99	138	T4B4	A	Blue Hose High Fluid Temp.
100	139	T4A7	D	Red Chiller High Fluid Temp.
101	140	T4B8	D	Blue Chiller High Fluid Temp.
102	141	WMA6	A	Red Blanket High Temp.
103	142	WMB5	A	Blue Blanket High Temp.
104	143	T1A6	D	Red Tank Low Fluid Temp.
105	144	T1B5	D	Blue Tank Low Fluid Temp.
106	145	T1A3	D	Red Inline Low Fluid Temp.
107	146	T1B1	D	Blue Inline Low Fluid Temp.
108	147	T1A2	D	Red Hose Low Fluid Temp.
109	148	T1B4	D	Blue Hose Low Fluid Temp.
110	149	T1A7	D	Red Chiller Low Fluid Temp.
111	150	T1B8	D	Blue Chiller Low Fluid Temp.
112	151	T3AE	D	Red Tank High Fluid Temp.
113	152	T3BD	D	Blue Tank High Fluid Temp.
114	153	T3AA	D	Red Hose High Fluid Temp.
115	154	T3BC	D	Blue Hose High Fluid Temp.
116	155	T3AF	D	Red Chiller High Fluid Temp.
117	156	T3BG	D	Blue Chiller High Fluid Temp.
118	157	T2AE	D	Red Tank Low Fluid Temp.
119	158	T2BD	D	Blue Tank Low Fluid Temp.

Item #:	Error Number	Code	Level	Description (English)
120	159	T2AA	D	Red Hose Low Fluid Temp.
121	160	T2BC	D	Blue Hose Low Fluid Temp.
122	161	T2AF	D	Red Chiller Low Fluid Temp.
123	162	T2BG	D	Blue Chiller Low Fluid Temp.
124	163	T30X	V	Dispensing Disabled: High Temp.
125	164	T20X	V	Dispensing Disabled: Low Temp.
126	165	T8A6	D	No Heat Red Tank
127	166	T8B5	D	No Heat Blue Tank
128	167	T8A3	D	No Heat Red Inline
129	168	T8B1	D	No Heat Blue Inline
130	169	T8A2	D	No Heat Red Hose
131	170	T8B4	D	No Heat Blue Hose
132	171	T8A7	D	No Cooling Red Chiller
133	172	T8B8	D	No Cooling Blue Chiller
134	173	T6A6	A	Red Tank RTD Fault
135	174	T6B5	A	Blue Tank RTD Fault
136	175	T6A3	A	Red Inline RTD Fault
137	176	T6B1	A	Blue Inline RTD Fault
138	177	T6A2	A	Red Hose FTS Fault
139	178	T6B4	A	Blue Hose FTS Fault
140	179	T6A7	A	Red Chiller RTD Fault
141	180	T6B8	A	Blue Chiller RTD Fault
142	181	T6C6	A	Red Blanket RTD Fault
143	182	T6C5	A	Blue Blanket RTD Fault
144	183	T6C7	A	Red Tank Monitor RTD Fault
145	184	T6C8	A	Blue Tank Monitor RTD Fault
146	185	WM06	A	Red Tank Con. Fault (High Relay Curr., or I)
147	186	WM05	A	Blue Tank Con. Fault (High Relay Curr.)
148	187	WM03	A	Red Inline Con. Fault (High Relay Curr.)
149	188	WM01	A	Blue Inline Con. Fault (High Relay Curr.)
150	189	WM02	A	Red Hose Con. Fault (High Relay Curr.)
151	190	WM04	A	Blue Hose Con. Fault (High Relay Curr.)
152	191	WM07	A	Red Chiller Con. Fault (High Relay Curr.)
153	192	WM08	A	Blue Chiller Con. Fault (High Relay Curr.)
154	193	WMC 6	A	Red Tank Con. Fault (Unexpected Relay I)
155	194	WMC 5	A	Blue Tank Con. Fault (Unexpected Relay I)
156	195	WMC 3	A	Red Inline Con. Fault (Unexpected Relay I)
157	196	WMC 1	A	Blue Inline Con. Fault (Unexpected Relay I)
158	197	WMC 2	A	Red Hose Con. Fault (Unexpected Relay I)

Item #:	Error Number	Code	Level	Description (English)
159	198	WMC 4	A	Blue Hose Con. Fault (Unexpected Relay I)
160	199	WMC 7	A	Red Chiller Con. Fault (Unexpected Relay I)
161	200	WMC 8	A	Blue Chiller Con. Fault (Unexpected Relay I)
162	201	P4H3	A	High Accumulator Pressure
163	202	P1H3	A	Low Accumulator Pressure
164	203	T4H3	A	High Mix Head Oil Temp.
165	204	MBH3	A	Low Mix Head Oil Level
166	205	DEH3	A	Soft Stop Asserted
167	206	A4H3	A	Mix Head Motor Overload
168	207	WDF3	A	M1 Material Extend Fault
169	208	WDD3	A	M1 Cleanout Extend Fault (Cleanout Rod)
170	211	L111	D	Red Low Material Level
171	212	L122	D	Blue Low Material Level
172	213	L311	D	Red High Material Level
173	214	L322	D	Blue High Material Level
174	215	L6A1	D	Red Auto Refill Timeout
175	216	L6B2	D	Blue Auto Refill Timeout
176	217	L8A1	D	Red Fill Sensor Fault
177	218	L8B2	D	Blue Fill Sensor Fault
178	220	MMUX	V	USB: Logs Full
179	221	R4D0	A	High Ratio
180	222	R3D0	D	High Ratio
181	223	R1D0	A	Low Ratio
182	224	R2D0	D	Low Ratio
183	225	F4A0	A	High Flow Red
184	226	F3A0	D	High Flow Red
185	227	F4B0	A	High Flow Blue
186	228	F3B0	D	High Flow Blue
187	229	F1A0	A	Low Flow Red
188	230	F2A0	D	Low Flow Red
189	231	F1B0	A	Low Flow Blue
190	232	F2B0	D	Low Flow Blue
191	233	N1D0	A	Low Dispense Amount
192	234	N4D0	A	High Dispense Amount
193	235	N2D0	D	Low Dispense Amount
194	236	N3D0	D	High Dispense Amount
195	238	CAC2	A	Comm. Error Blue MCM
196	239	CAC3	A	Comm. Error Red Tank
197	240	CAC4	A	Comm. Error Blue Tank
198	241	CAC5	A	Comm. Error Mix Head
199	243	CAC7	A	Comm. Error Ratio Monitor
200	244	CAA6	A	Comm. Error Red Blanket
201	245	CAB5	A	Comm. Error Blue Blanket
202	246	CAA3	A	Comm. Error Red Inline
203	247	CAB1	A	Comm. Error Blue Inline
204	248	CAA2	A	Comm. Error Red Hose
205	249	CAB4	A	Comm. Error Blue Hose

Item #:	Error Number	Code	Level	Description (English)
206	250	CAA7	A	Comm. Error Red Chiller
207	251	CAB8	A	Comm. Error Blue Chiller
208	252	CACN	A	Comm. Error Field Bus
209	253	CUCN	A	Field Bus Heartbeat Failure
210	254	CACP	A	Comm. Error Discrete I/O
211	255	CACR	A	Comm. Error Pendant
212	260	W0U0	A	USB Update Failed
213	262	DR6B	D	Check Flowmeter Blue
214	263	DR6A	D	Check Flowmeter Red
215	265	L9AX	D	Red Tank Leak Detected
216	266	L9BX	D	Blue Tank Leak Detected
217	267	L9A0	A	Prepoly Refresh Time Expired
218	268	P3RX	D	High Recirculation Pressure
219	269	T8CX	V	Heater(s) are OFF
220	270	CAC9	A	Comm. Error Sm. Dispense
221	271	P6F1	D	Red Inlet Pressure Sensor Fault
222	272	P6F2	D	Blue Inlet Pressure Sensor Fault
223	273	P2F1	D	Low Red Pump Input Pressure
224	274	P2F2	D	Low Blue Pump Input Pressure
225	275	P3F1	D	High Red Pump Input Pressure
226	276	P3F2	D	High Blue Pump Input Pressure
227	277	WMCX	V	Questionable Shot Recipe Detected
228	278	WBD1	D	Mixer motor fault
229	279	CAD1	A	Comm. Error Mixer
230	280	P9H1	V	Accumulator Charges too Frequently
231	281	P6H1	A	Power Pack Pressure Sensor Fault