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Addendum No. 2

Delaware Heath & Social Services
Fire Pump & Domestic Water Booster Pump Replacement
Herman M. Holloway DHSS Campus
OMB/DFM/DHSS Contract No: MC3501000048/52

Tt Project No. 200-26912-16011

Addendum No. 2
to
Drawings and Project Manual

March 9, 2017

To: ALL BIDDERS

This ADDENDUM forms a part of the BIDDING AND CONTRACT DOCUMENTS and modifies the following documents:

Original DRAWINGS dated March 2, 2017
PROJECT MANUAL dated March 2, 2017 and

Acknowledge receipt of the ADDENDUM in the space provided on the FORM OF PROPOSAL

This ADDENDUM consists of five (5) pages and the following:

CHANGES TO PROJECT MANUAL

2.1 Spec Section 13 34 19: Metal Building Systems:

A. Article 2.1; Manufacturer's; Paragraph A:

1. **ADD** the following to the end of paragraph:

"Varco Products as the Standard of Design and Construction. Pre-Approved equivalents acceptable."

2.2 Spec Section 21 11 00: Facility Fire-Suppression Water-Service Piping

A. Article 3.5: Backflow Preventer Installation; Paragraph A:

1. **ADD** the following Subparagraph in its entirety;

"1. Backflow preventer Operational testing shall be in accordance with NFPA 2016, Chapter 25; Section 25.2.5, Backflow Preventer Assemblies."

2.3 Spec Section 21 13 13: Wet-Pipe Sprinkler System

A. Article 3.7; Field Quality Control; Paragraph A:

1. **ADD** the following Subparagraph in its entirety:

" 7. Wet Pipe Sprinkler System shall be pressure tested in accordance with NFPA 2016, Chapter 25, Section 25.2.1, Hydrostatic Tests."

2.4 Spec Section 21 31 16: Diesel-Drive, Centrifugal Fire Pump

A. Article 2.7: Underground Fuel Oil Piping: Paragraph G

1. **ADD** the following Subparagraph in its entirety:

"12. Interconnection between leak detection/location system and building monitoring system to include conduit, wiring, etc. required to connect system. Shall be by the BAS Contractor.

2. **ADD** the following Subparagraph 13 in its entirety:

"13. BAS Open Protocol Interface: Provide BACnet, LONtalk or Modlus, BAS Interface to remotely monitor system points.

a. **ADD** the following Subparagraph 13.a in its entirety:

"a. Provide a Penn Alert to BACnet converter, Part No. # 8027856, configured to interface with PAL-AT AY30 Series leak detection system. The converter shall be in a weather proof installation enclosure with appropriate conduit connections. Converter requires 100-240 VAC, 0.88A Maximum power in accordance with local codes.

"b. BACnet readable/writeable Points list as follows.

Leak Detection System

Minimum Event Message from Modbus to the BACnet

1) Input-1: Cable-1: Status
2) Input-2: Cable-1: Number of Alarms in the Alarm Queue
3) Input-3: Cable-1: Distance or Probe Number
4) Input-4: Cable-2: Status
5) Input-5: Cable-2: Number of Alarms in the Alarm Queue
6) Input-6: Cable-2: Distance or Probe Number
7) Input-7: Cable-3: Status
8) Input-8: Cable-3: Number of Alarms in the Alarm Queue
9) Input-9: Cable-3: Distance or Probe Number
10) Input-10: Cable-4: Status
11) Input-11: Cable-4: Number of Alarms in the Alarm Queue
12) Input-12: Cable-4: Distance or Probe Number
13) Output-13: Cable-2: Clear Alarm Queue

2.5 Spec Section 22 11 13: Facility Water Distribution Piping

A. Article 3.8; Backflow Preventer Installation

1. **ADD t**he following Paragraph in its entirety;

"F. Backflow Preventers operational testing shall be in accordance with International Plumbing Code (IPC) 2012, Chapter 3, Section 312.10.2 Testing"

2. **CHANGE** Paragraph D.1 to Paragraph E.

3. For Backflow Preventer Test Kit, Refer to Spec Section 21 11 00; Facility Fire Suppression Water Service Piping; Article 2.4; Backflow Preventers; Paragraphs B.1 &2.

2.6 Spec Section 26 29 23: Variable-Frequency Motor Controllers

A. Article 1.8; Quality Assurance;

1. **ADD** the following Paragraph in its entirety:

"B. Source Limitations: Obtain domestic water pump controllers and associated from single source or producer."

"1. Controllers and associated equipment must be supplied by the respective domestic water pumps manufacturer/vendor."

2.7 Spec Section 26 29 33: Controllers for Fire Pump Drivers

A. Article 1.8; Quality Assurance; Paragraph B:

1. **ADD** the following Subparagraph in its entirety:

"1. Controllers and associated equipment must be supplied by their respective fire and pressure maintenance pumps manufacturer/vendor."

B. Article 2.2; Controllers for Diesel-Drive Fire Pumps; Paragraph F; Optional Features: Subparagraph 4:

1. **ADD** the following Subparagraph in its entirety;

"a. Interconnection between controllers and BAS monitoring system shall be by the BAS Contractor."

2. **REFER** to Attachment A for Diesel Controller readable/writeable points list:

C. Article 2.3; Controllers for Pressure-Maintenance (Jockey) Pumps:

1. **ADD** the following Paragraph in its entirety:

"D. Optional Features:"

"1. BAS Open Protocol Interface via BACnet, LONtalker Modbus for monitoring system points remotely.

2. **REFER** to Attachment B for the Jockey Controller readable/writeable points list:

D. Article 2.4; Standard Duplex Pump Control Panel; Paragraph L;

1. **ADD** the following Subparagraph in its entirety:

"3. Monitoring System shall be by the BAS Contractor."

2. Subparagraph 2**:**

a. **CHANGE** "Lighting" to read "the VFD"

3. **ADD** the following Subparagraph in its entirety:

"3. Refer to the BACnet readable/writable points list listed under Article 2.8 Accessories; Paragraph K; Subparagraph 1."

E. Article 2.8; Accessories; Paragraph K;

1. **REFER** to Attachment C for the Pump VFD Display Point List.

CHANGES TO DRAWINGS

2.8 Sheet FP102:

A. Detail 1/FP102: Fire Booster Pumps Plan New Work

1. **ADD** Sketch FP/SK-0.01 indicating the installation of a Flow Meter and the Corresponding Piping Modification.

2. **Clarifications:** All Power wiring by the Electrician: Pump Control Wiring and Alarms by Fire Protection Contractor or their Electrical Subcontractor.

3. **ADD** the word "Controller" to the title of Diagram

B. Detail 2/FP102: Fire Booster Pumps Elevation New Work.

1. **ADD** Sketch FP/SK-0.02 indicating the installation of a Flow Meter and the Corresponding Piping Modification

C. Fire Pump Test Meter Installation Instructions.

1. Please see the attached Fire Pump Test Meter

2.9 Sheet FP601

A. Detail 1/FP601: Automatic Fire Suppression System-Schematic Detail

1. **ADD** Sketch Sketch FP/SK-0.03 indicating the installation of a Flow Meter and the Corresponding Piping Modification

2.10 Sheet E-601

A. 2/E-602: Jockey Pump Wiring Diagram

1. **REPLACE** Jockey Pump Wiring Diagram with attached Sketch E/SK-0.01 of a revised Jockey Pump Wiring Diagram

B. 4/E-602: Potable Water Pump Wiring Diagram

1. **ADD** the word "Controller" to the title of the diagram.

2. **Clarification:** All Power Wiring shall be by the Electrician.

C. 5/E-602: Fire Pump Wiring Diagram

1. **ADD** the word "Controller" to the title of the diagram.

2. **Clarification:** All Power wiring by the Electrician. Electrician to wire all exterior lights. Pump Control Wiring and Alarms by the Fire Protection Contractor or their Electrical Subcontractor.

END OF ADDENDUM 02

Attachments:

Attachment A-Diesel Controller Point List
Attachment B-Jockey Controller Point List
Attachment C-Pump VFD Display Points List
Fire Pump Test Meter Installation Instructions
FP/SK-0.01
FP/SK-0.02
FP/SK-0.03
E/SK-0.01

ATTACHMENT A:
PUMP VFD POINTS LIST

5 BACnet Objects

5.1.1 Analog Input- and Output Objects

Control the frequency converter from the BACnet network using 'objects'. The various types of 'objects' and their descriptions are shown in the following tables. In the following tables all available objects are shown. The availability of objects depends on the mounting of the B and/or C options.

	Object_Name	Present_Value		
ID	Default name	Parameter	Unit	Option
AI:0	Analog Input 53	1662	%	
AI:1	Analog Input 54	1664	%	
AI:2	Analog In X30/11	1675	%	MCB 101
AI:3	Analog In X30/12	1676	%	MCB 101
AI:4	Analog In X42/1	1830	V	MCB 109
AI:5	Analog In X42/3	1831	V	MCB 109
AI:6	Analog In X42/5	1832	V	MCB 109

Table 5.1 Analog Inputs Object Map

	Object_Name	Present_Value					
ID	Default name	Parameter	Unit	Writeable	Cmd.able	Timeout	Option
AO:0	Terminal 42 Output Bus Control	653	%	x	x	x	
AO:1	Pulse out #27 Bus Control	593	%	x	x	x	
AO:2	Pulse out #29 Bus Control	595	%	x	x	x	
AO:3	Terminal X30/8 Output Bus Control	663	%	x	x	x	MCB 101
AO:4	Analog Output X42/7	2643	V	x	x	x	MCB 109
AO:5	Analog Output X42/9	2653	V	x	x	x	MCB 109
AO:6	Analog Output X42/11	2663	V	x	x	x	MCB 109

Table 5.2 Analog Outputs

ID	Object_Name			Present_Value					
	Default name	Writeable	EEPROM	Parameter	Unit	Writeable	Cmd.able	Timeout	Option
AV:0	Reserved for VFD profile								
AV:1	Input Reference 1	x	x	Note 1	%	x	x	x	
AV:2	Input Reference 2			Note 1	%	x	x	x	
AV:3	Output Speed	x	x	Note 2	%				
AV:4	PID Feedback			Note 3	%				
AV:5	Motor Current	x	x	1614	Amps				
AV:6	Power	x	x	1610	kW				
AV:7	Reserved for VFD profile								
AV:8									
AV:9									
AV:10									
AV:11									
AV:12									
AV:13									
AV:14									
AV:15	Motor Thermal			1618	%				
AV:16	Reserved for VFD profile								
AV:17									
AV:18									
AV:19									
AV:20									
AV:21	Operating Hours			1500	Hours				
AV:22	Running Hours			1501	Hours				
AV:23	kWh Counter			1502	kWh				
AV:24	Motor Voltage			1612	V				
AV:25	Frequency			1613	Hz				
AV:26	Torque			1622	%				
AV:27	DC Link Voltage			1630	V				
AV:28	Heatsink Temp.			1634	Deg				
AV:29	Inverter Thermal			1635	%				
AV:30	Setpoint 1			2021	%	x			
AV:31	Bus Feedback 1			894	%	x			
AV:32	Reserved for P, I, D								
AV:33									
AV:34									
AV:35	Setpoint 2			2022	%	x			
AV:36	Bus Feedback 2			895	%	x			

ID	Object_Name			Present_Value					
	Default name	Writeable	EEPROM	Parameter	Unit	Writeable	Cmd.able	Timeout	Option
AV:37	Reserved for P, I, D								
AV:38									
AV:39									
AV:40	Setpoint 3			2023	%	x			
AV:41	Bus Feedback 3			896	%	x			
AV:42	Reserved for P, I, D								
AV:43									
AV:44									
AV:45	Running Bypass			3111	Hours				MCO 104
AV:46									
AV:47									
AV:48									
AV:49									
AV:50	Alarm Log: Error Code			1530	NONE				
AV:51	Fault Code			Note 4	NONE				
AV:52	PID Start Speed			2083	Hz	x			
AV:53	On Reference Bandwidth			2084	%	x			
AV:54	PID Proportional Gain			2093	NONE	x			
AV:55	PID Integral Time			2094	Sec	x			
AV:56	PID Differentiation Time			2095	Sec	x			
AV:57	PID Diff. Gain Limit			2096	NONE	x			

Table 5.3 Analog Values

[1] Either AV:1 or AV:2 controls the drive reference. Only one of them can control the frequency converter at a time and BV:2 decides which one.

[2] This value is not directly available in the frequency converter. The value must be calculated as follows:

$$AV\#3 = \frac{Par.\ 16-17}{Par.\ 4-13} \times 100\,\%$$

[3] This value is not directly available in the frequency converter. The value must be calculated as follows:

$$AV\#4 = \frac{Par.\ 16-52}{Par.\ 20-14} \times 100\,\%$$

[4] VLT® HVAC Drive fault codes are transmitted as an analog value in AV:51. The Fault codes are mapped as shown in table on following page. The VLT® HVAC Drive alarm codes are shown as well for comparison.

The following table shows the mapping of the FC102 alarmcodes and their mapping to the BACnet's fault codes.

Fault codes	Fault Code	VLT® HVAC Drive Alarms	Fault Descriptions
Communication Error	1	17, 34	Loss of communication with the network
Over Current	2	13, 40, 41, 42, 59	Instantaneous Output Current has exceeded inverter rated or programmed value
Over Temperature	3	11, 29, 65, 69, 74, 244, 245, 247	Heat sink Temperature Limit has been reached
Over Speed Deviation	4	49, 62	Inverter has exceeded maximum or programmed limit
Over Voltage	5	5, 7, 64	DC Bus Voltage has exceeded inverter limit
Under Voltage	6	1, 6, 8	DC Bus Voltage is lower than required inverter limit
Short Circuit	7	16	Inverter Output has shorted Phase to Phase
Ground Fault	8	14	Inverter Output Grounding Current has exceeded manufacturer
Motor Overload	9	10, 50-58, 222	Motor is overloaded
Inverter Overload	10	9	Timed over current fault
Over Torque Detection	11	12	Programmed limit for torque has been exceeded
External Fault	12	142	External fault has been activated in the inverter. This is a hard fault that must be reset
Operator Interface Error	13	-	Inverter programming or operational interface malfunction
Load Loss	14	3, 95, 229	Load on the Motor is less than programmed limit of system. An Example is a broken belt or coupling
Configuration Error	15	70, 76, 79, 81, 82, 91	Errors exist in the programmed or operational configuration of the inverter
Feedback Failure	16	60, 90, 192	Required system operational feedback (signal or sensor) is not responding as expected for correct system operation
Output Phase Loss	17	30, 31, 32	One or more of the output phases from the inverter to the motor are open
Motor Stall	18	99	Motor is operating in stall region and not able to accelerate
Power Unit Error	19	4, 33, 36, 37, 46, 228, 246	Error sensed on the power section of the inverter
Input Phase	20	-	Input single phase or low line voltage condition
Internal Drive Failure	21	23, 27, 38, 39, 47, 48, 73, 85, 86	FC102 specific fault.

Table 5.4 Mapping of Fault Codes

5.1.2 Binary Input- and Output Objects

	Object_Name	Present_Value		
ID	Default name	Parameter	Bit number	Option
BI:0	Digital input Term 33	1660	0	
BI:1	Digital input Term 32	1660	1	
BI:2	Digital input Term 29	1660	2	
BI:3	Digital input Term 27	1660	3	
BI:4	Digital input Term 19	1660	4	
BI:5	Digital input Term 18	1660	5	
BI:6	Digital input Term 37	1660	6	
BI:7	Digital input GPIO Term X30/2	1660	9	MCB 101
BI:8	Digital input GPIO Term X30/3	1660	8	MCB 101
BI:9	Digital input GPIO Term X30/4	1660	7	MCB 101
BI:10..BI:15 are reserved for P1660/x (MCB 115)				

Table 5.5 Binary Inputs

	Object_Name	Present_Value					
ID	Default name	Parameter	Bit number	Writeable	Cmd.able	Timeout	Option
BO:0	Digital Output Term 27	590	0	x	x	x	
BO:1	Digital Output Term 29	590	1	x	x	x	
BO:2	GPIO Output Term X30/6	590	2	x	x	x	MCB 101
BO:3	GPIO Output Term X30/7	590	3	x	x	x	MCB 101
BO:4	Relay 1	590	4	x	x	x	
BO:5	Relay 2	590	5	x	x	x	
BO:6	Option B Relay 1 Output	590	6	x	x	x	MCB 105
BO:7	Option B Relay 2 Output	590	7	x	x	x	MCB 105
BO:8	Option B Relay 3 Output	590	8	x	x	x	MCB 105
BO:9..BO:39 are reserved for Output P590/x (MCB 115)							

Table 5.6 Binary Outputs

	Object_Name			Present_Value						
ID	Default name	Writeable	EEPROM	Parameter	Bit number	Writeable	Cmd.able	EEPROM	Timeout	Option
BV:0	Reserved for VFD profile									
BV:1	RUN/STOP Command	x	x	CTW=047c + Reversing bit 15	6 reverse 15	x	x		x	
BV:2	REF 1 / REF 2 Select	x	x	Note 1	n/a	x	x	x	x	
BV:3	Fault Reset Command	x	x	CTW	7	x				
BV:4	RUN / STOP Monitor	x	x	STW	1					
BV:5	OK / FAULT Monitor	x	x	STW	3, 6, 7					
BV:6	HAND / AUTO Reference	x	x	16-95	1					
BV:7	Reserved for VFD profile									
BV:8										
BV:9										
BV:10										
BV:11										
BV:12										
BV:13										
BV:14										
BV:15										
BV:16										
BV:17										
BV:18										
BV:19										
BV:20										
BV:21	Warning	x	x	STW	7					
BV:22	Trip	x	x	STW	3					
BV:23	Triplock			STW	6					
BV:24	Coasting			CTW	3	x	x		x	
BV:25	CW/CCW			CTW	15	x	x		x	
BV:26	Jog			CTW	8	x	x		x	
BV:27	Reset			CTW	7	x	x		x	
BV:28	Reset KWh Counter			1506	n/a	x				
BV:29	Reset Running Hours Counter			1507	n/a	x				
BV:30	Reverse			STW	1					
BV:31	Speed = reference			STW	8					
BV:32	Bus control			STW	9					
BV:33	Running	x	x	STW	11					
BV:34	Ramp 1/ Ramp 2			CTW	9	x	x			
BV:35	ECB Test Mode			3110	0					MCO 104

ID	Object_Name			Present_Value						
	Default name	Writeable	EEPROM	Parameter	Bit number	Writeable	Cmd.able	EEPROM	Timeout	Option
BV:36	ECB Drive Mode			3110	1					MCO 104
BV:37	ECB auto. Bypass Enable			3110	2					MCO 104
BV:38	ECB Bypass Mode			3110	3					MCO 104
BV:39	Reserved for ECB (MCO 104) - 3110 bit 4..10									
BV:40										
BV:41										
BV:42										
BV:43										
BV:44										
BV:45										

5.1.3 Multi-state Value Objects

ID	Object_Name	Present_Value				Timeout
	Default name	Parameter	Bit number	Writeable	Cmd.able	
MSV:0	Smart Logic Controller State	1638	n/a			
MSV:1	Active Setup	CTW	13 and 14	x	x	x

5.1.4 Real Time Clock Variable

The frequency converter has a built-in real-time clock. The standard real-time clock has no battery backup function, which will lead to a loss of time if the drive is un-powered. Some BACnet Master's can be programmed to send out the date and time as a Broadcast Telegram on a regular basis. The BACnet Interface will update the real-time clock of the drive if it receives the time synchronization telegram.

5.1 Feedback to Network

The BACnet option provides several output variables (nvo's) objects to the network, containing important -, motor- and I/O feedback data. The BACnet option transmits bound network variables only and sends feedback data when there is a change in value.

Influence of the digital input terminals upon the Control Mode, *8-50 Coasting Select* to *8-56 Preset Reference Select*
The influence of the digital input terminals upon control of the frequency converter can be programmed in *8-50 Coasting Select* to *8-56 Preset Reference Select*.

8-01 Control Site overrules the settings in *parameters 8-50 to 8-56* and Terminal 37, Safe Stop overrules any parameter.

Each of the digital input signals can be programmed to logic AND, logic OR, or to have no relation to the corresponding bit in the control word. In this way a specific control command i.e. stop / coast, can be initiated by the fieldbus only, fieldbus AND Digital Input, or Fieldbus OR Digital input terminal.

In order to control the frequency converter via BACnet, *8-50 Coasting Select* must be set to either Bus [1], or to Logic AND [2] and *8-01 Control Site* must be set to Digital and ctrl. word [0] or Controlword only [2].

5.2 BIBBs

ReadProperty	Execute
WriteProperty	Execute
DeviceCommunicationControl	Execute
ReinitializeDevice	Execute
I-Am	Initiate
I-Have	Initiate
TimeSynchronization	Execute
Who-Has	Execute
Who-Is	Execute

5.3.1 Object/Property Support Matrix

The following table summarises the Object Types and Properties supported:								
Property	Device	Binary input	Binary output	Binary value	Analog input	Analog output	Analog value	Multistage value
Object identifier	X	X	X	X	X	X	X	X
Object Name	X	X	X	X	X	X	X	X
Object Type	X	X	X	X	X	X	X	X
System Status	X							
Vendor Name	X							
Vendor Identifier	X							
Model Name	X							
Firmware Revision	X							
Appl. Software Revision	X							
Location	X							
Description	X							
Protocol Version	X							
Protocol Revision	X							
Services Supported	X							
Object List	X							
Max. APDU Length	X							
Segmentation Support	X							
Local Time	X							
Local Date	X							
APDU Timeout	X							
Number APDU Retries	X							
Max Master	X							
Max Info Frames	X							
Device Address Binding	X							
Database Revision	X							
Present Value		X	X	X	X	X	X	X
Status Flags		X	X	X	X	X	X	X
Event State		X	X	X	X	X	X	X
Reliability		X	X	X	X	X	X	X
Out-of-Service		X	X	X	X	X	X	X
Number of States								X
State Text								X
Units					X	X	X	
Priority Array			X	X*		X	X*	X*
Relinquish Default			X	X*		X	X*	X*
Polarity		X	X					
Active Text		X	X	X				
Inactive Text		X	X	X				
*For commandable values only								

ATTACHMENT B:
DIESEL CONTROLLER POINTS LIST

Diesel controller event message descriptions corresponding to event ID

Numeric IDs defined in the current release will retain their meanings in later releases. As additional features are added and events defined, this list may expand; therefore user applications should treat unspecified IDs as "unknown" rather than hard errors. This list may include numeric IDs which do not apply to a specific installation due to feature set (particularly optional features).

ID	Event message description
1	Engine Running
2	Engine Stopped
3	Low Clock Battery
4	Fail to Start
5	Fail to Start Noted
6	Call to Start
7	Over Voltage
8	Under Voltage
9	Battery Normal
10	Nominal Voltage
11	Nominal Voltage
12	Interlock On
13	Interlock Off
14	Deluge Open
15	Deluge Closed
16	Low Pressure
17	Normal Pressure
18	Manual Stop Button
19	Manual Stop Released
20	Local Start On
21	Local Start Clear
22	Remote Start Run
23	Remote Start Term
24	Emergency Run On
25	Emergency Run Clear
26	User 1 On
27	User 1 Off
28	User 2 On
29	User 2 Off
30	User 3 On
31	User 3 Off
32	User 4 On
33	User 4 Off
34	User 5 On
35	User 5 Off
36	User 6 On
37	User 6 Off
38	User 7 On
39	User 7 Off
40	User 8 On
41	User 8 Off
42	Secondary ECM On
43	Secondary ECM Clear
44	Emergency Switch On
45	Emergency Switch Off
46	Motor Start Checked
47	Pressure Fail
48	Pressure in range
49	Reserved

ID	Event message description
50	Reserved
51	USB drive near full
52	USB drive has space
53	USB drive error
54	USB drive OK
55	Pressure Log
56	Pressure Log Run
57	Database Clear
58	System Reset
59	Disk Dump
60	Disk Dump Clear
61	Data Log Cleared
62	Clock Set Entered
63	Clock Set Complete
64	Low Suction Pressure
65	Suction Pressure Clear
66	Pump Room Trouble
67	Pump Room Normal
68	Zone Enabled
69	Zone Disabled
70	Zone Call To Star
71	Zone Start Done
72	Weekly Test Running
73	Weekly Test Done
74	Parameters Reset
75	Passwords Reset
76	Service due – line 1 message
77	Service Due Reset
78	Flow Meter On
79	Flow Meter Clear
80	Fuel Spill Input
81	Fuel Spill Clear
82	Engine Over speed
83	Engine Over speed Clear
84	Engine Temp High
85	Engine Temp High OK
86	Oil Pressure Low
87	Oil Pressure Low OK
88	Fuel Level Low
89	Fuel Level Low OK
90	Fuel Level High
91	Fuel Level High OK
92	Low Pump Room Temp
93	Pump Room Temp. OK
94	Reservoir High
95	Reservoir High Clear
96	Reservoir Low
97	Reservoir Low Clear
98	Relief Valve Open

ID	Event message description
99	Relief Valve Closed
100	Charger 1 Fail
101	Charger 1 Recovered
102	Charger 2 Fail
103	Charger 2 Recovered
104	Battery 1 Trouble
105	Battery 1 Clear
106	Battery 2 Trouble
107	Battery 2 Clear
108	Crank 1 Button
109	Crank 1 Button Clear
110	Crank 2 Button
111	Crank 2 Button Clear
112	Calibration Error
113	Cal. Error Cleared
114	No Control Voltage
115	Control Voltage OK
116	Missing Battery
117	Missing Battery OK
118	AC Power Lost
119	AC Power Restored
120	Test In Progress
121	Test Completed
122	Automatic Start
123	Automatic Start Clr
124	City Water Press LOW
125	City Water Press OK
126	Low Suction Level
127	Suction Level OK
128	Target Alarm
129	Target Alarm Clear
130	Main Switch Off
131	Main Switch Auto
132	Main Switch Manual
133	Jockey Pump Running
134	Jockey Pump Off
135	Jockey Pump Trouble
136	Jockey Pump OK
137	Battery 1 Out
138	Battery 1 Out Off
139	Battery 2 Out
140	Battery 2 Out Off
141	Charger 1 Out
142	Charger 1 Out Off
143	Charger 2 Out
144	Charger 2 Out Off
145	Weekly Test Due
146	Weekly Test Due Clear
147	System Overpressure

ID	Event message description
148	System Pressure OK
149	Fuel Injector Fail
150	Fuel Injector OK
151	Primary Fail Start
152	Primary Fail Clear
153	Primary Interrupt
154	Primary Int. Cleared
155	Reserved
156	Coil continuity 1 Fail
157	Coil continuity 2 Fail
158	AC Power Loss Start
159	AC voltage high
160	AC voltage normal
161	AC voltage low
162	Secondary Crank
163	Secondary Crank Off
164	AC Power Loss Delay
165	Fuel Valve Relay Status
166	Low Pressure Sensor
167	Auto start Input
168	Auto start Input Off
169	Reserved
170	Pressure Delta
171	Cranking 1
172	Cranking 2
173	Reserved
174	USB Drive Found
175	USB Access
176	USB Open
177	USB Open Failed
178	USB Writing
179	USB closed
180	Mode Off OFF
181	Mode Auto OFF
182	Mode Manual OFF
183	Reserved

ID	Event message description
184	Test Button
185	Test Failed
186	Test Override
187	Auto Shutdown Disabled
188	Auto Shutdown Enabled
189	Manual Start
190	Reserved
191	Daylight Savings
192	Service due – line 2 message
193	Reserved
194	Reserved
195	Reserved
196	Reserved
197	Reserved
198	Reserved
199	Reserved
200	Duty pump
201	Standby pump
202	Unit available
203	Unit not available
204	Dump valve On
205	Dump valve Off
206	Shutdown activated
207	Shutdown released
208	User input On
209	User input Off
210	New firmware load
211	New firmware detected
212	Reserved
213	Reserved
214	Reserved
215	Reserved
216	Reserved
217	Reserved
218	Reserved
219	Reserved

ID	Event message description
220	Reserved
221	Input 26 ON
222	Input 26 OFF
223	Input 27 ON
224	Input 27 OFF
225	Input 28 ON
226	Input 28 OFF
227	Input 29 ON
228	Input 29 OFF
229	Input 30 ON
230	Input 30 OFF
231	Reserved
232	Reserved
233	Reserved
234	Reserved
235	Manual Test Input
236	Manual Test Clear
237	Tank 1 Fail Input
238	Tank 1 Fail Clear
239	Tank 2 Fail Input
240	Tank 3 Fail Clear
241	Service Due line 3
242	Service Due line 4
243	
244	
245	
246	
247	
248	
249	
250	
251	

ATTACHMENT C:
JOCKEY PUMP CONTROLLER POINTS LIST

Jockey controller event message descriptions corresponding to event ID

Numeric IDs defined in the current release will retain their meanings in later releases. As additional features are added and events defined, this list may expand; therefore user applications should treat unspecified IDs as "unknown" rather than hard errors. This list may include numeric IDs which do not apply to a specific installation due to feature set (particularly optional features).

ID	Event message description	ID	Event message description	ID	Event message description
1	Pump Running	38	Reserved	75	Reserved
2	Pump Stopped	39	Reserved	76	Reserved
3	Low Clock Battery	40	Reserved	77	Reserved
4	Fail to Start	41	Reserved	78	Reserved
5	Fail to Start Noted	42	Reserved	79	Pressure Log
6	Call to Start	43	Reserved	80	Pressure Log Run
7	Reserved	44	Reserved	81	Database Clear
8	Reserved	45	Reserved	82	System Reset
9	Reserved	46	Reserved	83	Reserved
10	Reserved	47	Reserved	84	Reserved
11	Reserved	48	User 1 On	85	Data Log Cleared
12	Reserved	49	User 1 Off	86	Clock Set Entered
13	Reserved	50	User 2 On	87	Clock Set Complete
14	Phase Failure	51	User 2 Off	88	Reserved
15	Phase Reversal	52	User 3 On	89	Reserved
16	Reserved	53	User 3 Off	90	Reserved
17	Motor Overload	54	User 4 On	91	Reserved
18	Reserved	55	User 4 Off	92	Reserved
19	Reserved	56	User 5 On	93	Reserved
20	Reserved	57	User 5 Off	94	Reserved
21	Reserved	58	User 6 On	95	Reserved
22	Reserved	59	User 6 Off	96	Reserved
23	Reserved	60	User 7 On	97	Reserved
24	Reserved	61	User 7 Off	98	Reserved
25	Reserved	62	User 8 On	99	Reserved
26	Reserved	63	User 8 Off	100	Reserved
27	Motor Normal	64	User 9 On	101	Reserved
28	Interlock On	65	User 9 Off	102	Reserved
29	Interlock Off	66	Reserved	103	Reserved
30	Reserved	67	Reserved	104	Reserved
31	Reserved	68	Reserved	105	Reserved
32	Low Pressure	69	Reserved	106	Parameters Reset
33	Normal Pressure	70	Reserved	107	Passwords Reset
34	Reserved	71	Pressure Fail	108	Service due – line 1 message
35	Reserved	72	Pressure in range	109	Service Due Reset
36	Reserved	73	Reserved	110	Reserved
37	Reserved	74	Reserved	111	Reserved

ID	Event message description
112	Reserved
113	Reserved
114	Reserved
115	Reserved
116	Automatic Start
117	Automatic Start Clear
118	Reserved
119	Reserved
120	Reserved
121	Reserved
122	Reserved
123	Reserved
124	Reserved
125	Reserved
126	Reserved
127	Reserved
128	Reserved
129	Reserved
130	Main Switch Off
131	Main Switch Auto
132	Main Switch Manual
133	System Overpressure
134	System Pressure OK
135	Reserved
136	Reserved
137	Reserved
138	Reserved
139	Reserved
140	Reserved
141	Reserved
142	Reserved
143	Reserved
144	Reserved
145	Reserved
146	Reserved
147	Reserved
148	Reserved
149	Reserved
150	Reserved
151	Auto start Input Off
152	Reserved
153	Pressure Delta
154	1CR

ID	Event message description
155	Reserved
156	Reserved
157	Reserved
158	Reserved
159	Reserved
160	Reserved
161	Reserved
162	Reserved
163	Reserved
164	Reserved
165	Reserved
166	Reserved
167	Reserved
168	Reserved
169	Reserved
170	Reserved
171	Reserved
172	Reserved
173	Reserved
174	Daylight Savings
175	Service due – line 2 message
176	Reserved
177	Reserved
178	Reserved
179	Reserved
180	Mode Off OFF
181	Mode Auto OFF
182	Mode Manual OFF
183	Reserved
184	Reserved
185	Reserved
186	Reserved
187	Reserved
188	Reserved
189	Reserved
190	Reserved
191	Reserved
192	Reserved
193	New firmware load
194	New firmware detected
195	Reserved
196	Reserved
197	Reserved

ID	Event message description
198	Reserved
199	Reserved
200	Reserved
201	Reserved
202	Reserved
203	Reserved
204	Reserved
205	Reserved
206	Reserved
207	Reserved
208	Reserved
209	Reserved
210	Reserved
211	Reserved
212	Reserved
213	Reserved
214	Reserved
215	Reserved
216	Reserved
217	Reserved
218	Reserved
219	Reserved
220	Reserved
221	Reserved
222	Reserved
223	Reserved
224	Service Due line 3
225	Service Due line 4

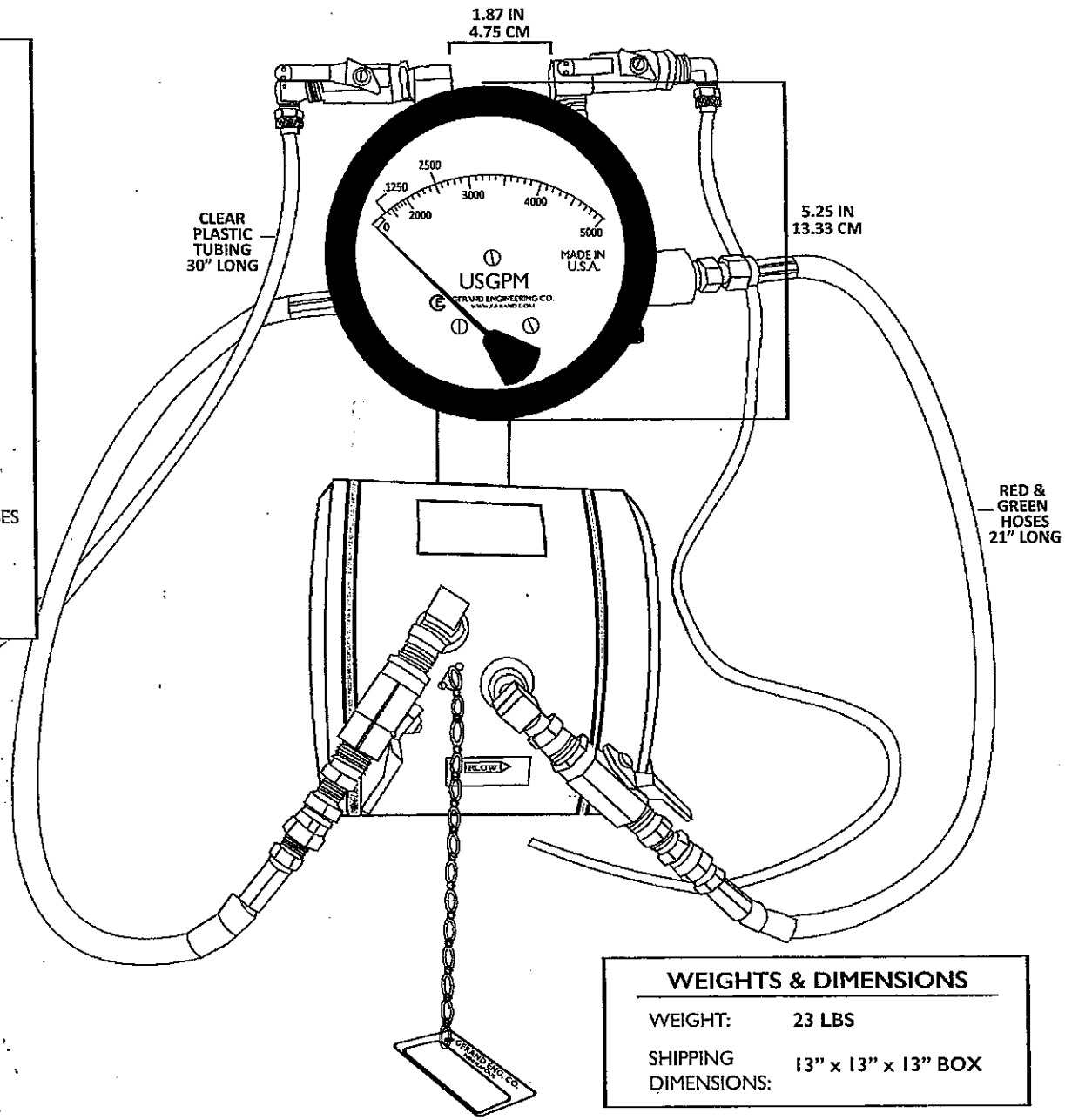
FIRE PUMP TEST METER
CATALOG CUT SHEET

GERAND ENGINEERING
2300 EDGEWOOD AVE S, MINNEAPOLIS, MN 55426
952.374.1320 WWW.GERAND.COM

FIRE PUMP TEST METER
K-2500-8

CONSTRUCTION & SPECIFICATIONS

MATERIALS:	CA36 ASTM B16 BRASS
VALVES:	RATED AT 600 WOG *VALVE BODY:* CAST BRONZE ASTM B584 *TAIL PIECE:* CA-360 B-16 *BALL:* BRASS CA-360 HARD CHROME P *LATED SEALS:* REINFORCED PTFE, 15% *GLASS FILLED HANDLE:* STEEL ASTM B633 W/ZINC PLATING
BRASS FITTING:	PIPE NIPPLE - B16 / 1/8" NEEDLE VALVE-B16 DISCONNECTS-B16
ID TAG:	CHAIN: BRASS TAG: ALUMINUM -3.21" THICK #200 MILL SET SCREW: STEEL ZINC PLATED
HOSES:	GOODYEAR 3/16" FREON CHARGING HOSES WITH NYTRIEE CORE, POLYESTER BRAID AND NYTRILE COVER WITH PVC FOR ABRASION RESISTANCE.



METER DATA

CONSTRUCTION:	ALUMINUM BODY
OPERATION:	BUNA "N" DIAPHRAGM
ACCURACY:	±2.0%
TEMPERATURE:	200° F MAX
PRESSURE:	1500 PSI MAX
APPROX. WEIGHT:	3 LBS/EACH

4 1/2" DIAL STANDARD - 6" AVAILABLE

WEIGHTS & DIMENSIONS

WEIGHT:	23 LBS
SHIPPING DIMENSIONS:	13" x 13" x 13" BOX

GERAND ENGINEERING CO.
11504 K-TEL DRIVE, MINNETONKA, MN 55431 952.374.1320 WWW.GERAND.COM

Fire Pump Test Meter Installation Instructions

Materials shipped will be as follows:

– One factory calibrated direct reading GPM meter with vent valves and clear hoses assembled and attached to the meter. The lens of the meter has an "FM Approved" sticker adhered to it as well as a metal meter tag with the Gerand model number, maximum rated PSI and serial number.

– One calibrated Gerand venturi with an attached metal tag listing the venturi size, the pump GPM, the meter range and the PSI rating. Adhered to the venturi is a "flow sticker" with an arrow showing the direction of flow and the suggested minimum straight upstream and downstream pipe diameters.

– One set of 500 PSI hoses with color code ends and brass fittings to connect meter to the venturi.

– One metal installation/operation tag permenently attached to meter via brass chain.

Installation instructions:

– The venturi must be installed in the line with the flow in the system going in the same direction as the arrow shown on the venturi, and with a minimum of (5) straight pipe diameters upstream and (2) straight pipe diameters downstream of the venturi. If the system has been piped with many elbows, we suggest longer straight runs upstream and downstream. These pipe diameters must also be the same pipe size as the venturi.

– The meter is then attached via the screws to the welded bracket on the venturi.

– Once the meter has been secured to the venturi, screw the valveless end on the hoses into the meter (red to red, and green to green) and the valve fitted ends into the venturi (red to red, and green to green).