



Style 6032
UNIVERSAL II CONTROL
INSTALLATION, OPERATION & MAINTENANCE MANUAL



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SAFETY SUMMARY

SIGNAL WORD DEFINITION

Per the ANSI Z535.4 standard, the following signal words and definitions are used to indicate hazardous situations:



DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.



WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.



CAUTION indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It is also used to alert against unsafe practices.

GENERAL SAFETY PRECAUTIONS

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

Safety Instruction - Read Manual! Failure to follow operating instructions could result in death or serious injury. Read and understand the operator's manual before using the monitor/turret.



Safety Instruction - Trained Personnel Only! Death or serious injury could result if proper inspection, installation, operation and maintenance procedures are not observed. Installation, operation and maintenance to be performed by trained and authorized personnel only. Proper eye protection should be worn when servicing the monitor/turret.



SPECIFIC SAFETY PRECAUTIONS

The following are safety precautions that are related to specific procedures and therefore appear elsewhere in this publication for emphasis. These are recommended precautions that personnel must understand and apply during specific phases of installation, operation and maintenance.

Safety Instruction - Operation! For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.



Safety Instruction – Operation! Make sure all power has been disconnected and disable flow prior to performing maintenance.



Safety Instruction - Trained Personnel Only! Only trained and qualified personnel should perform installation, adjustments, and servicing. Only a properly trained and qualified certified electrician should perform electric installations and service.



Safety Instruction - Operation! Charge the monitor/turret slowly. Rapid charging may cause a pressure surge that has the potential to cause an injury, or damage to the unit.



Safety Instruction - Operation! DO NOT stow or deploy the monitor/turret while flowing. Pressing the stow or deploy buttons causes the nozzle to move automatically and the water stream may cause damage to equipment or injury to personnel.



Safety Instruction - Operation! Aim the monitor/turret in a safe direction before pumping water through it. (i.e. Away from power lines)



Safety Instruction - Operation! DO NOT exceed the maximum pressure or flow ratings of the monitor/turret. Exceeding these ratings may lead to an injury or may cause damage to the monitor/turret.



Safety Instruction - Operation! DO NOT install shutoffs on the outlet of the monitor/turret. Shutoffs increase the potential for pressure surges due to water hammer, which have the potential to cause an injury or damage to the monitor/turret.



Safety Instruction - Operation! Keep all personnel out of the Danger Zone in front of the outlet of the nozzle when the water source is attached. Dangerous flow velocities can cause serious injury.



Safety Instruction – Operation! Not designed for explosive environments.



Entanglement Hazard! Tangled cables can cause equipment damage. Ensure control cables are not tangled and are free to pay out as monitor/turret is operated.



Safety Instruction – Operation! All operators must read the Operation section of this manual and be properly trained.



Safety Instruction – Operation! Use only appropriate Akron Brass Company nozzles. Use of any other nozzles could affect the speed or operation of the monitor/turret.



Safety Instruction – Installation! Make the connection of the vehicle and/or auxiliary battery the final step.



Safety Instruction – Operation! The monitor/turret contains moving parts. Keep hands, fingers, and objects away from pinch points.

CHAPTER 1

INTRODUCTION

1.1 SAFETY PRECAUTIONS

Refer to the Safety Summary for precautions to be observed while operating or servicing this equipment.

1.2 INTRODUCTION

This manual covers the installation, operation, troubleshooting and maintenance instructions for the Style 6032 Universal Control II. The manual should be reviewed in its entirety. This manual is intended to provide installation, operation and maintenance information for all Universal II configurations. Contact the Akron Brass factory with any additional questions before performing any procedures outlined in this manual.

1.3 DESCRIPTION

The Universal II is a product used to control Akron Brass monitors and turrets. The unit is designed for installation on any vehicle for the purpose of providing control of Akron Brass electrically operated monitors or turrets. Refer to Figure 1-1 for identification of the Universal II Control Box.



Figure 1-1 Universal II Control Box

1.4 TECHNICAL INFORMATION

1.4.1 Power Requirements

The Universal II will operate from either 12 or 24 volt DC power with no customer changes necessary, although Monitors and Turrets must be ordered as 12 or 24 volt for their proper operation. While the Universal II can operate below 10 volts, for optimum performance, a minimum of 11 volts (for 12 volt monitors/turrets, 22 volts for 24 volt monitors/turrets) is required at the Universal II J1 connector. The DC power is internally protected with a 30 amp non-serviceable fuse. This fuse is strictly for wiring protection and should never need replacement under normal conditions. It is recommended that an external 20 amp slow blow fuse be placed in series with the vehicle battery positive lead. The DC power for the Universal II is supplied through a 29 pin Deutsch connector (J1). The DC power connects to pins 1 and 2, and they accept up to 12 AWG wire. See section 2.4.3 for pin-out information and schematics and section 2.5 for wiring connection detail. The electronic system has built-in reverse polarity protection. Long runs of cable can introduce voltage/power loss. For long runs, it may be necessary to add an intermediate junction box fed by 10 AWG or heavier wiring with a short 12 AWG run applied to the Universal II. If you need assistance in assessing wiring needs associated with long wiring runs, contact Akron Brass technical support.

INPUT POWER REQUIREMENT:

12VDC (Min: 11VDC; Max: 14VDC) OR
24VDC (Min: 22VDC; Max: 28VDC)

• **RECOMMENDED POWER WIRE SIZE:** 12VDC: 10AWG
24VDC: 12AWG

• **REQUIRED FUSE:** 12VDC: 20 amp Slow Blow
24VDC: 10 amp Slow Blow

• **PEAK AMP DRAW:** 50amp for 100ms

1.4.2 Environmental Specifications Requirements

The Universal II has been designed to be mounted on a vehicle and tolerate the harsh environments encountered in this application.

The environmental specifications are listed below:

Operating Temperature Range: -40°C - 55°C

Enclosure Environmental Rating: IP67 Equivalent

CHAPTER 2

INSTALLATION

⚠ WARNING

Safety Instruction -Trained Personnel Only! Only trained and qualified personnel should perform installation, adjustments, and servicing. Only a properly trained and qualified certified electrician should perform electric installations and service.

⚠ CAUTION

Safety Instruction – Installation! Make the connection of the vehicle and/or auxiliary battery the final step.

2.1 INTRODUCTION

The Universal II has been designed to provide ease of installation. This section of the manual provides the procedures that must be followed to insure a successful installation. Be sure to read and understand the entire installation procedure before you begin.

Table 2-1 provides a list of tools and materials required to install and test the Universal II.

Wrenches	Deutsch Crimping tool (HDT-48-00)
Screwdrivers	Wire cutter/stripper
#8-32, M4, or M6 Mounting Hardware (4 req'd)	Multimeter (to verify power is turned OFF)
Torque wrench	Clean Shop Rags
	Deutsch contact removal tools

Table 2-1 Tools and Materials Required for Installation

2.2 UNPACKING

Unpack the Universal II as follows:

1. Carefully open and remove all parts from shipping container.
2. Inspect for any shipping damage. If damage has occurred, notify carrier.
3. Be sure that all components are included and that the required tools are readily available.

2.3 ATTACHING TO VEHICLE

2.3.1 Universal II

If the Universal II is to be mounted in a well, be certain that adequate drainage is provided. While the unit has been designed to withstand adverse environmental conditions, it cannot be submerged.

The Universal II has two options for mounting:

1. Through hole mounting. The through hole mounting holes provided on the Universal II are .177 inches in diameter and suitable for #8 or M4 screws. These allow inserting screws from the top side and into threaded holes on the customer's back panel.
2. Mounting with threaded inserts. There are four threaded inserts in the enclosure bottom which are M6 X 1.0. These allow screws to be inserted from behind the customer's back panel and into these inserts on the Universal II enclosure bottom.

Mounting hole locations for methods 1 and 2 above are shown in Figure 2-1. Please note that it is important that the mounting surface be flat. Sufficient room should also be allowed in mounting location to insure cabling does not have sharp bends close to the connectors.

DO NOT OVERTIGHTEN SCREWS AS INSERTS COULD BE DAMAGED OR ENCLOSURE

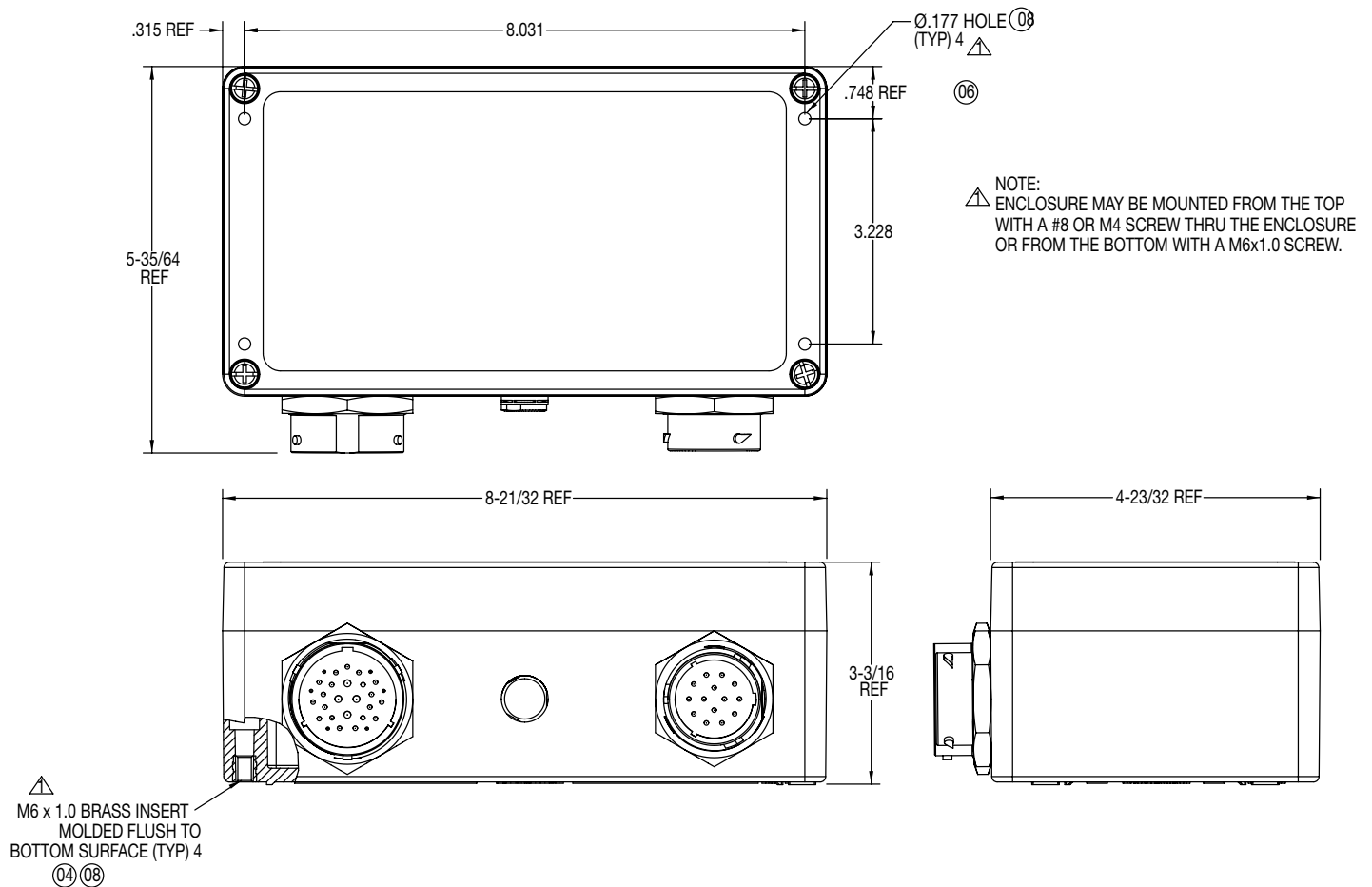


Figure 2-1 Universal II Mounting Hole Locations

2.4 CABLE(S) INSTALLATION (J2 Connector)

2.4.1 Monitor/Turret Cable

Monitors and Turrets designed for use with the Universal II come fitted with a harness and connector ready for direct plug-in to the Universal II. While these are configured for “plug and play” installation, removal of the connector to run through a bulkhead may be necessary from time to time. In that event, or in the event of troubleshooting, Table 2-2 is provided for reference.

2.4.2 General Monitor/Turret Connector Pin-out

14 Pin Male 16 AWG Connector – HDP26-18-14SE-L017			
Pin Number	Type	Potential Function	Comments
A	Analog Common		(Ground)
B	Analog, Switch, PWM In #1	Rotation Position	
C	Analog, Switch, PWM In #2	Elevation Position	
D	Analog, Switch, PWM In #3	Inclination Sensor	(Auto-Level)
E	Analog Exc.		(+5 volts)
F	Appliance Loop	(Tied to Gnd if non “Smart Harness”)	(LIN Bus)
G	H-Bridge Axis #1	+ (Up)	Elevation
H		- (Close)	
J	H-Bridge Axis #2	+ (Left)	Rotation
K		- (Right)	
L	H-Bridge Axis #3	+ (Fog)	Pattern
M		- (Stream)	
N	H-Bridge Axis #4	+ (Low)	Gallonage
P		- (High)	

Table 2-2 Monitor/Turret Connector Pin-out

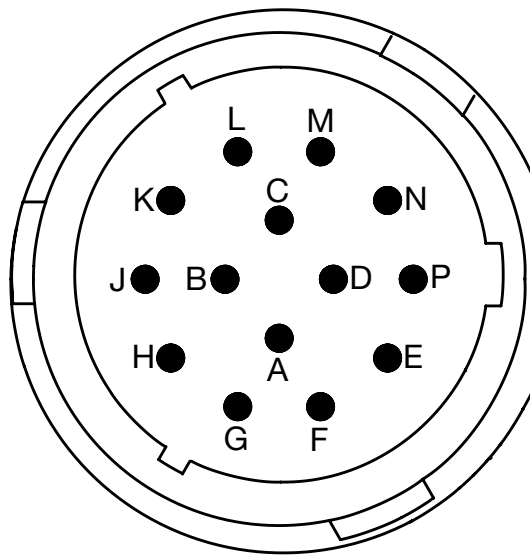


Figure 2-2 Monitor Connector (Looking into Universal II)

2.4.3 DC Power/Signal Cable (J1 Connector)

This 29 pin connector provides a connection point for power as well as signals to/from the vehicle. The recommended connector is a Deutsch part number HDP26-24-29SE. The wires are best crimped in the pins although careful soldering is possible. A crimping tool is available from Ladd Industries part number HDT-48-00 (AKRON #773426). Please refer to Table 2-3 and Figure 2-3 for pin-out information. NOTE: For ease of installation, a connector kit including connector, pins, and sealing plugs (for unused pins) is available as part number 121721 from Akron Brass. The Universal II can also be ordered with this mating connector kit.

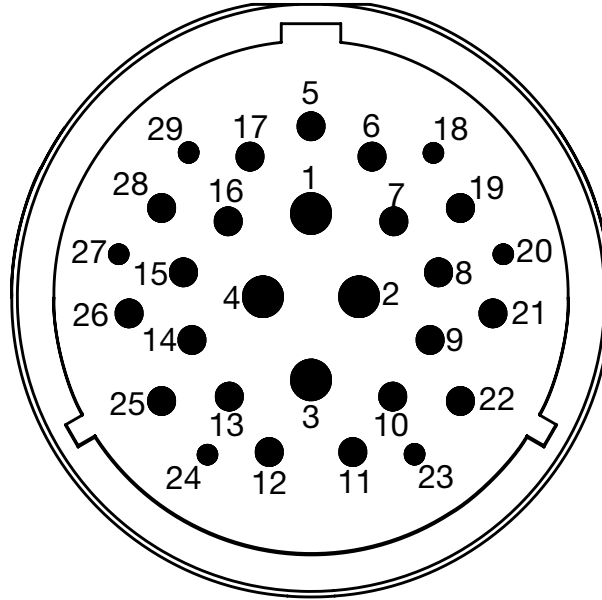


Figure 2-3 DC Power/Signal Connector (Looking into Universal II)

2.4.4 Generic DC Power/Signal Connector Pin-out

(Example below from part number 60320014 – 3356 Trident Dual Gallonage monitor)

29 Pin Male Mixed AWG Connector – HDP26-24-29SE				
Pin Number	Type	Potential Function	Comments	AWG
1	Power Input (Vehicle)	+ Battery	Main Battery	12
2		- Battery		12
3	Power Input (Aux. Battery Box)	+ Battery	Auxiliary Battery (Optional)	12
4		- Battery		12
5	H-Bridge Axis #5	+ (Open)	Electric-Riser or Valve	16
6		- (Close)		16
7	Logic Output #1	Panel LED	Current Sourcing (2 Amps Max.)	16
8	Logic Output #2	Discharge ON		16
9	Logic Output #3	High Gallonage		16
10	Bi-stable Relay Contact Output (Form C)	Common	(Enable Output to Warning Light Circuit or other)	16
11		N.O. (1 amp Max.)		16
12		N.C. (1 amp Max.)		16
13	Switch Input #1	Enable Input	(Fixed Function)	16
14	Switch Input #2	(+v) Right/Left (-v)		16
15	Switch Input #3	(+v) Up/Down (-v)		16
16	Switch Input #4	(+v) Stream/Fog (-v)		16
17	Switch Input #5	Discharge (+v)		16
18	Switch Input #6	Gallonage High(+v)/Low(-v)		20
19	Switch Input #7	Oscillate: Start/Set(+v) Pause/Resume (-v)		16
20	Switch Input #8	(+v) Deploy/Stow (-v)		20
21	Switch Input #9	Monitor Specific Option		16
22	Battery + Out	(Peripheral Power) 1 Amp Max.	Communications to vehicle bus and/or smart peripherals	16
23	Data +	To external J1939 vehicle CAN bus		20
24	Data -			20
25	Battery - Out	(Peripheral Power) Common-Ground		16
26	Data+	NOT USED		16
27	Data-			20
28	Data+	NOT USED		16
29	Data-			20

Table 2-3 Generic DC Power/Signal Connector Pin-out

See Appendix for wiring specific to your monitor. (Reference the part number on your Universal II enclosure to identify your specific monitor configuration. This part number can be found on a label between the J1 and J2 connectors).

2.5 CONNECTING REMOTE DEVICES

2.5.1 PINS 1 & 2: Vehicle Battery (Power Source)

The vehicle battery must be connected to pins 1 and 2 of the DC Power/Signal connector. Pin 1 must connect to +Battery and pin 2 must connect to -Battery (usually chassis, ground, or common). It is recommended that a 20 amp slow blow fuse be connected in series with the +Battery wire. Refer to section 1.4.1 for additional information.

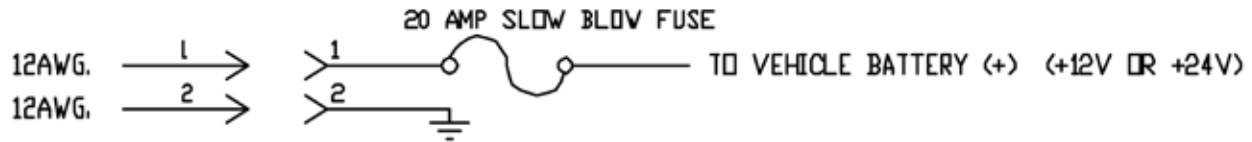


Fig. 2-4

2.5.2 PINS 3 & 4: Auxiliary Battery (Optional)

Long power wiring runs can cause excessive voltage drop for 12VDC systems. 24 volt systems are typically not affected by longer runs of power cabling. If your 12 volt system power wiring runs exceed the length in table 2-4, an auxiliary battery is recommended. Pins 3 and 4 provide the connection for an optional auxiliary battery. Pin 3 must connect to auxiliary battery positive, and pin 4 must connect to auxiliary battery negative. These two pins are checked by the Universal II at power-up to see if an auxiliary battery is connected. If one is sensed, it is engaged and a small amount of trickle charge is applied. If this optional feature is not used, it is recommended these pin locations be fitted with Deutsch pin sealing plugs. Contact Akron Brass technical support if you have additional questions about the use of this feature.

Wire Gauge	Max Recommended Cable Length (12VDC systems)
12 AWG	16 Feet
10 AWG	25 Feet

Table 2-4 Maximum power wire lengths without Auxiliary battery

2.5.3 PINS 5 & 6: Hi-Riser or Valve Control

Pins 5 & 6 are optional outputs used to send power to an electric valve motor or an electric monitor riser. Both of these functions are optional. Check wiring diagrams specific to the Universal II being installed to determine which function is enabled. If these outputs are not used, it is recommended these pin locations be fitted with Deutsch pin sealing plugs.

2.5.4 PINS 7-9: Logic Outputs

Pins 7 through 9 are current protected solid state power outputs. The output pin is connected to positive system voltage when turned on. Pin 7 powers the operator station LED when installed. Pin 8 is typically used to power an indicator light for the discharge (when software is configured to control a valve with the joystick trigger). It is turned on when the trigger is pushed. Pin 9 is typically used to power an indicator light indicating when the unit is in high gallonage. It is turned off when unit is switched to low gallonage.

Please refer to the appendix for the particular version Universal II for their assigned functions. Refer to Figure 2-5 for wiring examples. If any logic outputs are not used, it is recommended these pin locations be fitted with Deutsch pin sealing plugs.



Fig. 2-5

2.5.5 PINS 10-12: Relay Contact Output

Pins 10 through 12 connect to an internal latching relay contact. This floating bi-stable contact is dedicated to an interlock function because its state is true regardless of whether the Universal II is powered or not. It is by default assigned to indicating whether or not the monitor/turret is stowed (parked). Because it is floating, it may be connected to either battery positive or negative for driving loads such as pilot lights or external relays. Refer to Figure 2-6 for examples of connecting an external load. This contact is not rated for dry circuits and so should have at least a 10 mA load minimum. It does not have arc suppression. Therefore, if driving a relay coil, external suppression should be provided. A typical usage would be for a warning light to alert the driver the monitor/turret is not properly stowed/parked. If this optional feature is not used, it is recommended these pin locations be fitted with Deutsch pin sealing plugs.

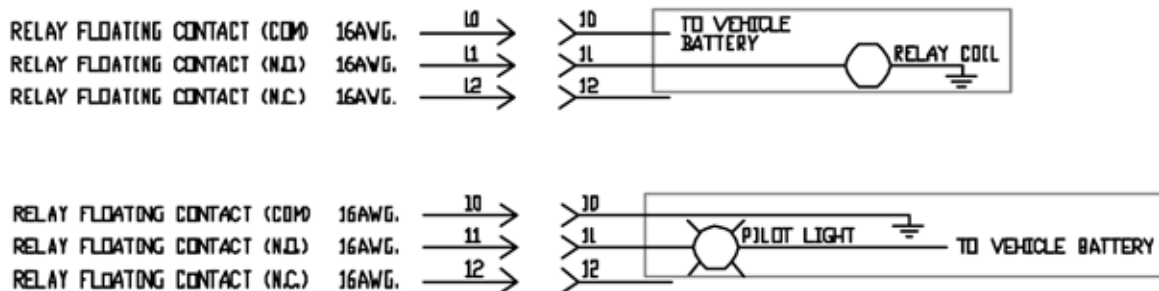


Figure 2-6 Relay Contact Output Wiring

2.5.6 PIN 13: Enable Input

Switch Input #1 (Pin 13) is dedicated to interlock functionality. NOTE: This switch input must be connected to battery common or ground in order for the Universal II to function. This input is typically used for connecting a parking brake switch to this input to prevent operation of the monitor/turret without first setting the parking brake. If interlock functionality is undesired, this pin should be hard-wired to Battery common or ground.

2.5.7 PINS 14-21: Switch Inputs

Switch Inputs #2 to #9 (pins 14 to 21) are primarily intended for toggle switch inputs. Their function varies depending on configuration. An Akron Brass Operator Station can be used or user can provide their own switch inputs. Please refer to the Appendix for the particular version Universal II for their assigned function. The Universal II version is identified by a barcode label on the outside of the enclosure between the J1 and the J2 connectors that includes the part number (6032XXXX) and revision level. Each input recognizes three distinct states – open, connected to +Bat, and connected to –Bat. A typical toggle switch connection is shown in Figure 2-7. Use of relay contacts could also be implemented if care is taken to insure there is never a case in which the battery is shorted out. A form C contact is a good choice in which the common is tied to the switch input. High/Low Gallonage control would be an example of where relay contacts could be used.

Figure 2-8 shows connection of an Akron Brass switch box. Note the hard-wired connection into Switch Input #1 to continuously enable the monitor. Also note that pins 22 and 25 supply power to the operator station LED. See section 2.5.8 for more detail.

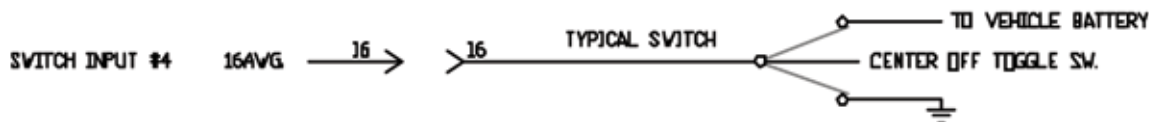


Fig. 2-7

Unused switch input pins should be fitted with Deutsch pin sealing plugs. These are included in the connector kit if purchased from Akron Brass.

NOTE: If any of the switch inputs are still connected to battery + after power is removed from the Universal II (i.e. the switch inputs are not powered directly from the U2 as shown), the control will not properly shut down due to leakage currents through the inputs. Insure that battery + for the switch inputs is disconnected along with power to the Universal II.

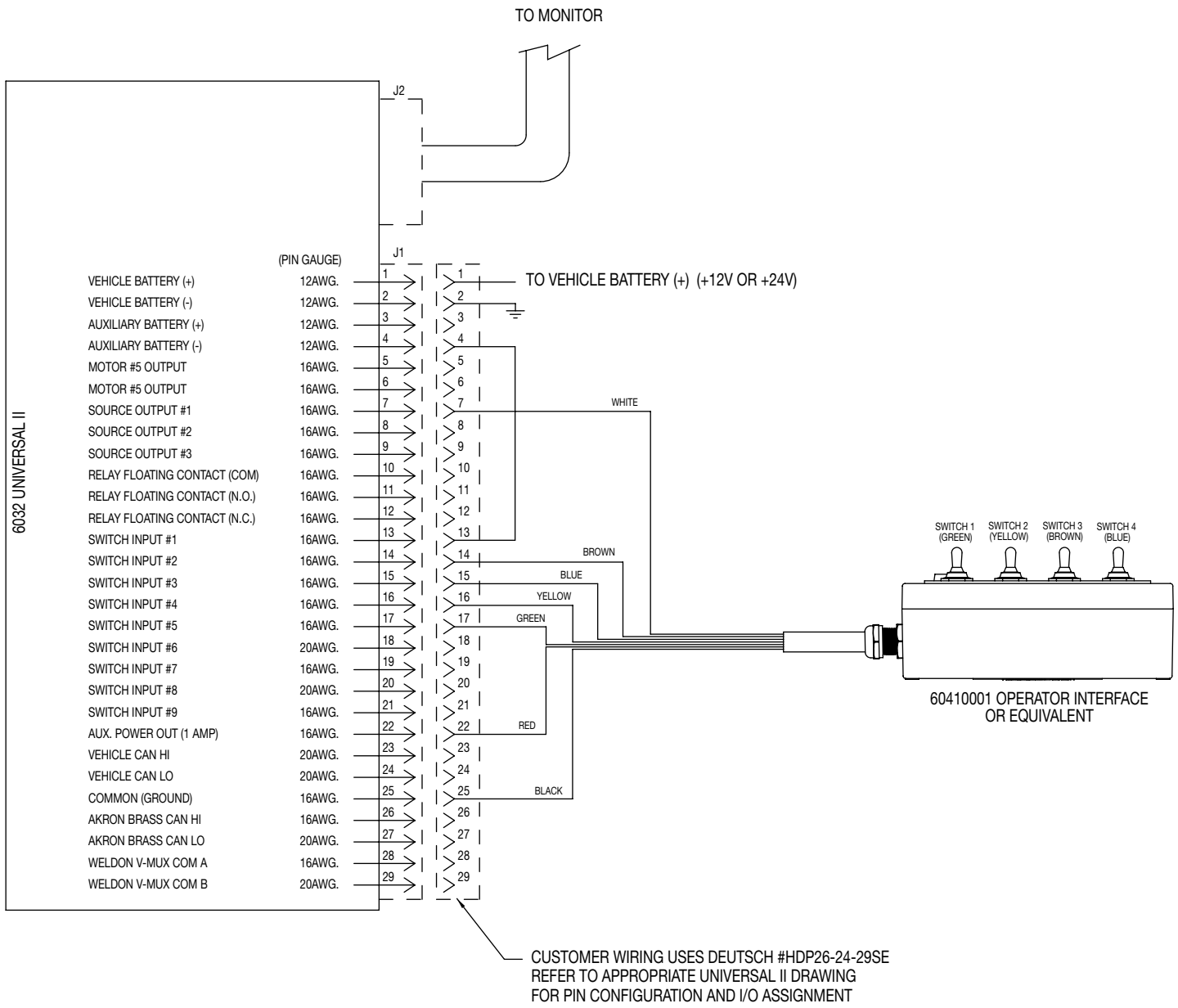


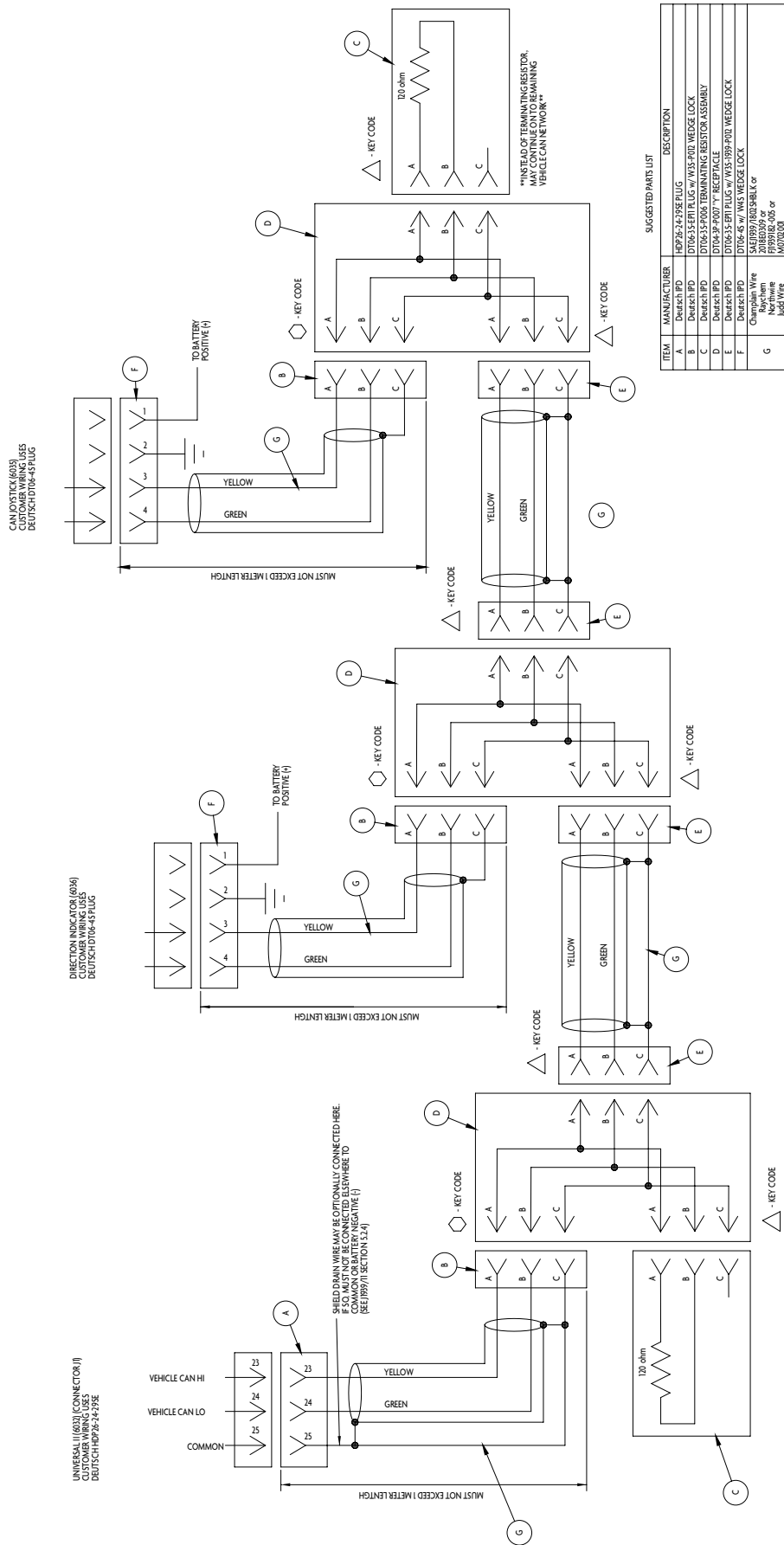
Figure 2-8 Operator Interface Wiring

2.5.8 PINS 22 & 25: Peripheral Power Output

To simplify wiring, power is provided out to peripheral devices such as joysticks, operator stations, direction indicators, etc. Pins 22 and 25 provide +Battery and –Battery power out respectively. This output is internally protected by a 1 amp self-resetting fuse. Refer to Figure 2-8 for example of how this is used with an operator station. If this optional feature is not used, it is recommended these pin locations be fitted with Deutsch pin sealing plugs.

2.5.9 PINS 23 & 24: J1939 Vehicle CAN Bus

The Universal II J1939 Vehicle CAN Bus is available on pins 23 and 24. Pin 23 is CAN-HI, and pin 24 is CAN-LO. Preferred connection to these pins should be made with J1939/11 compliant wiring. See Figure 2-9 for additional details. NOTE: Termination resistors are critical to reliable performance. If this optional feature is not used, it is recommended these pin locations be fitted with Deutsch pin sealing plugs.



SUGGESTED PARTS LIST

ITEM	MANUFACTURER	DESCRIPTION
A	Deutch IPD	HEP25-29-39SE PLUG
B	Deutch IPD	DT06-35-1500L W/SE AND WEDGE LOCK
C	Deutch IPD	DT06-35-1500L TERMINATING RESISTOR ASSEMBLY
D	Deutch IPD	DT04-39-1007 "Y" RECEPTACLE
E	Deutch IPD	DT06-35-1500L EPT PLUG w/ W/SE 1939-F010 WEDGE LOCK
F	Deutch IPD	DT06-45 W/ W/SE WEDGE LOCK
G	Champion Wire	SAE J1939 8002RHBLK or Nylon 1939B06-05 or 1939B06-06 or Judd Wire M0703D01

Figure 2-9 J1939 CAN Wiring

2.5.10 PINS 26 & 27: Not Used

It is recommended these pin locations be fitted with Deutsch pin sealing plugs.

2.5.11 PINS 28 & 29: V-MUX Communication Bus (Optional)

Connection to a VMUX communications bus is available on pins 28 and 29. Pin 28 is VMUX A and Pin 29 is VMUX B. Not all software versions support VMUX communication. Contact Akron Brass technical support for details of your particular version. If this optional feature is not used, it is recommended these pin locations be fitted with Deutsch pin sealing plugs.

2.6 PRE-OPERATIONAL CHECK



For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.

Before operating the Universal II and monitor/turret, be sure that there are no potential obstructions. Visually inspect the unit for any damage. If damage is apparent, do not use the system. Have it serviced prior to use. Check for any objects which might obstruct motion of the monitor/turret or cause binding. Remove any material that may hinder monitor/turret function.

CHAPTER 3

OPERATING INSTRUCTIONS

⚠ WARNING

All operators must read the Operation section of this manual and be properly trained.

⚠ WARNING

Keep personnel clear of monitor/turret discharge path during operation.

⚠ WARNING

For outdoor use only. Do not use in areas that have been classified as hazardous as defined in Article 500 of the National Electric Code.

3.1 THEORY OF OPERATION

The Universal II control system is based on a distributed intelligence control structure. Each device in the system has a circuit board with an embedded micro controller. These devices include (but are not limited to): the 6032 Universal II Control Box, the 6033 Mini Universal, the 6034 CAN Operator Interface, the 6035 CAN Joystick, the 6036 CAN Direction Indicator, the 6037 CAN Wireless Interface, and the associated handheld Remote Control(s). These boards “talk” to each other over an SAE J1939 compliant CAN serial communications link.

The 6032 Control Box at the heart of the system is a software-defined universal controller. Its inputs and outputs are pre-programmed at the factory to match the particular monitor/turret it is used with. Please refer to the Appendix for the particular version Universal II for their assigned function. The Universal II version is identified by a barcode label on the outside of the enclosure between the J1 and J2 connectors that includes the part number (6032XXXX) and revision level.

Additionally, there are many parameters that can be configured by the user. These can be configured using the processes defined in section 3.2.

3.2 INITIAL SYSTEM SETUP

The Universal II allows many configuration options during setup.

The following functions can be configured in the setup mode:

- Right, Left, Up and Down soft limits
- Monitor orientation (sideways or inverted mounting)
- Obstacle Avoidance
- Stow and Deploy positions
- Position Sensor zero
- Restore Factory Defaults

To enter the setup mode for the above functions, follow these steps:

1. Turn power off to Universal II
2. Press and **HOLD** stream switch (can be done on Joystick or toggle switch box)
3. Turn power on to Universal II while continuing to hold the stream switch
4. Wait 3-4 seconds and release the stream switch

The Universal II should now be in setup mode. When it is setup mode, the LED on the operator station will be slowly blinking (a short blink followed by a long pause). If it is not slowly blinking, turn the power off and repeat steps 1-4.

All setup functions options except Stow and Deploy can be scrolled through by pressing the stream switch. Each time the stream switch is pressed, another function is active for configuration. If a function is configured and saved using the fog switch, it will automatically move to the next function. For example, the first time the stream switch is pressed, the right soft limit is ready for programming (LED CODE 1-1). If it is pressed again, the left soft limit is ready for programming (LED CODE 1-2). If the left soft limit is set and the fog switch is pressed, it will automatically move to the up soft limit without having to press stream again (LED CODE 1-3). Alternately, activating the Stream command will abort this mode without storing the position and forward the user to the next Soft Limit Position mode. Entering the Stow and Deploy programming modes can only be accomplished by activating the Stow or Deploy switch while at the start of the setup menu (LED CODE 1 Slow blink). (See sections 3.2.2 and 3.2.3 for more detail).

To aid in determining which setup menu the Universal II is in, the LED on the operator station has been programmed to blink a different code for each function. Table 3-1 below lists the LED codes for each function. The codes have two parts. The LED code will start with either one or two short blinks, a short pause, another series of short blinks, and then a long pause. The first number in the LED code is the one or two blinks and the second number is the second series of blinks before the long pause.

Any of the following functions may be configured by stopping at that function and performing the operation (see sections 3.2.1 – 3.2.3 for detailed information on configuration of each function).

Setup Menu Function	LED code
Setup Mode Start	1 slow blink
Right Soft Limit	1-1
Left Soft Limit	1-2
Up Soft Limit	1-3
Down Soft Limit	1-4
Monitor Orientation	1-7
Zero Position Sensors	1-8
Restore Factory defaults	1-9
Obstacle avoidance Disable	2-1
Obstacle Avoidance Manual Operation	2-2
Obstacle Avoidance Auto Operation	2-3
Obstacle Avoidance Learn	2-4
Cafs Dry Valve Position	2-5
Cafs Wet Valve Position	2-6
Stow/Deploy Rotation Position	2-7
Collision Zone ON	2-8
Collision Zone OFF	2-9
Electric Riser OFF	3-1
Electric Riser ON	3-2
Stow	1-5
Deploy	1-6

Table 3-1 Setup mode LED codes

While any and all of these configurations are optional, if a monitor/turret orientation is mounted sideways or inverted, the monitor orientation will need to be configured for proper operation. If at any point it is determined that an undesirable mode is active, it is possible to abort the mode by removing power to the Universal II prior to activating the Fog input. If it is determined that an undesired function may have been saved, it may be desirable to use the “Restore Factory Defaults” function (LED CODE 1-9). When all desired changes have been made, cycling power will return the monitor/turret to normal operation with the changes made in effect. The changes can also be saved by pressing the fog switch when in setup start mode (one single blink).

3.2.1 Soft Limit Positions, Monitor Orientation, and Obstacle Avoidance

The monitor/turret may have a range of motion greater than necessary for a given application. For instance, a monitor/turret with a rotation range of 355° would have too much rotational range for use as a bumper turret. Soft limits can be set to shorten the rotational and elevation range. **NOTE: Use of this function will clear all stored obstacle avoidance option profile data and require the obstacle avoidance to be re-programmed.** Factory defaults are set to a soft limit location beyond the hard stops so that the monitor will have full range of motion between hard stops until the soft limits are set. The soft limits are strictly OPTIONAL and do not need to be configured.

3.2.1.1 Right (Blink Code 1-1) – In this mode, Up, Down, Left, and Right functions will be active. **Move the monitor to the right position that is to be set as the soft limit. When in the position desired for the right soft limit, press the Fog switch.** The new right soft limit is now set and the left soft limit is active for programming. Alternately, activating the Stream command will abort this mode without storing the position and forward the user to the left Soft Limit Position mode.

3.2.1.2 Left (Blink Code 1-2) – In this mode, Up, Down, Left, and Right functions will be active. **Move the monitor to the left position that is to be set as the soft limit. When in the position desired for the left soft limit, press the Fog switch.** The new left soft limit is now set and the up soft limit is active for programming. Alternately, activating the Stream command will abort this mode without storing the position and forward the user to the up Soft Limit Position mode.

3.2.1.3 Up (Blink Code 1-3) – In this mode, Up, Down, Left, and Right functions will be active. **Move the monitor to the up position that is to be set as the soft limit. When in the position desired for the down soft limit, press the Fog switch.** The new up soft limit is now set and the down soft limit is active for programming. Alternately, activating the Stream command will abort this mode without storing the position and forward the user to the down Soft Limit Position mode.

3.2.1.4 Down (Blink Code 1-4) – In this mode, Up, Down, Left, and Right functions will be active. Move the monitor to the down position that is to be set as the soft limit. When in the position desired for the down soft limit, press the Fog switch. The new down soft limit is now set and the monitor orientation setup is active for programming. Alternately, activating the Stream command will abort this mode without storing the position and forward the user to the monitor orientation Soft Limit Position mode.

3.2.1.5 Monitor Orientation (Blink Code 1-7) – There are instances when it is desirable to mount the monitor/turret other than in the factory default “flange on the bottom” position. In those instances, this function prevents having to change the wiring of switches or re-programming CAN joysticks to handle changes in Up/Down – Left/Right behavior. It is only necessary to program the monitor orientation when the monitor/turret is mounted on its side or upside down. When in this mode, determine which of the four inputs (Up, Down, Left, or Right) results in “Up” movement. The last movement made prior to pressing the Fog switch will be used as the new Up motion and will remap the other inputs accordingly. **Move the monitor in whatever the current “Up” motion is and then press the Fog switch. The new orientation is now saved and the Position Sensor Zero setup mode is active for programming.** If the Stream switch is pressed at any time before the Fog switch, the monitor orientation will remain unchanged and the user will be placed in Position Sensor Zero mode. **NOTE: Use of this function will clear all stored obstacle avoidance profile data and require the obstacle avoidance option to be re-programmed.**

3.2.1.6 Position Sensor Zero (Blink Code 1-8) – It is often difficult for the vehicle manufacturer to mount the monitor/turret in the precise position where “straight ahead and level” matches the calibration of the monitor/turret at the Akron Brass factory. Use of this mode allows the user to “re-zero” the sensors at the desired “straight ahead and level” position. **First, use the Up/Down Left/Right to position the monitor/turret “straight ahead and level”. When the desired position has been reached, press the Fog switch. The new zero position is now set and the Restore Factory Defaults mode is now active for programming.** If no Fog action is taken but Stream is activated, the position sensor values will remain unchanged and the user will be forwarded to the Restore Factory Defaults mode. **NOTE: All soft limit, stow/deploy positions, and CAN position reporting will be impacted by this operation. If needed, this setting should be done prior to setting other soft limits. NOTE: Use of this function will clear all stored obstacle avoidance profile data.**

3.2.1.7 Restore Factory Defaults (Blink code 1-9) – Occasionally, it may be desirable to return to factory defaults. **To restore factory defaults when in this mode, press the fog switch. This will clear all user settings and return the user to the beginning of setup.** The following settings will be reset to factory default:

- All soft limits will get set to maximum.
- Position sensor “zero” values will return to the values set at the factory.
- Monitor orientation will get reset to standard position.
- Stow and Deploy positions are reset to zero degrees as established at the factory.
- Obstacle Avoidance profile data is cleared and disabled.

It is possible to abort this mode prior to activating the Fog input by simply removing power to the Universal II. Alternately, activating the Stream input will forward the user to Disable Obstacle Avoidance mode (Blink Code 2-1).

3.2.1.8 Disable Obstacle Avoidance (Blink Code 2-1) – **Once in this mode, to disable obstacle avoidance, press the fog switch once. This will disable Obstacle Avoidance, clear the Obstacle Avoidance profile, and returns the user to the beginning of setup mode. Factory default is obstacle avoidance disabled.** Activating the Stream input will forward the user to Obstacle Avoidance Manual Operation mode.

3.2.1.9 Obstacle Avoidance Manual Operation (Blink Code 2-2) – Manual operation mode requires the operator to manually move the monitor around obstacles. When an obstacle is encountered, movement in that direction stops until the operator moves the monitor/turret around the obstacle. **Once in this mode, to select manual obstacle avoidance, press the fog switch once to set manual obstacle avoidance operation.** Manual obstacle avoidance is now active. Activating the Stream input will forward the user to Obstacle Avoidance Auto Operation setup mode.

3.2.1.10 Obstacle Avoidance Auto Operation (Blink Code 2-3) – Auto operation mode does not require the operator to move up and down to go around an obstacle. When an obstacle is encountered, movement in that direction stops and the Universal II automatically navigates up, over, and back down) around the obstacle as long as the joystick is maintained in the horizontal command (right or left). **Once in this mode, to select auto obstacle avoidance, press the fog switch once to set auto obstacle avoidance operation.** Auto obstacle avoidance is now active. Activating the Stream input will forward the user to Obstacle Avoidance Learn setup mode.

3.2.1.11 Obstacle Avoidance Learn (Blink Code 2-4) – This function elevation sets The Lower Limits across the horizontal range of the monitor. For instance, a monitor located on the center of a cab roof might need to raise the nozzle slightly to avoid hitting the corners of the cab as it sweeps from side to side. Use of this mode allows the user to program a horizontal profile that will go around one or more obstacles. As the monitor is moved from side to side (either right to left, or left to right), the vertical position values are stored at one degree increments. Backing up will overwrite previous data. If a horizontal area is not learned, that area will be inaccessible later. **To program an obstacle avoidance profile, follow these steps:**

1. Enable either manual or automatic obstacle avoidance.
2. Move turret to the lower left or right or lower right soft limit.
3. Sweep until the first obstacle is encountered. Stop movement before the obstacle is reached.
4. Move horizontally up over and back down until the obstacle is cleared.
5. Continue moving toward the opposite side. Repeat steps 2 and 3 if any other obstacles are encountered.
6. When the opposite horizontal soft limit is reached. Press the fog switch. The new Obstacle avoidance profile is now saved and the user is returned to the beginning of the setup mode.

The same procedure can also be followed from right to left. It is important that the entire rotational range is covered during the programming procedure. Activating the Stream input at any time will discard any profile data that has already been saved and return the user to the beginning of setup mode.

3.2.1.12 CAFS Dry position learn mode (Blink Code 2-5) – This function sets the discharge valve open position for a “dry” compressed air foam setting. Essentially, this setting will allow the valve to open to a programmable position based on time. Before entering the CAFS programming mode, make sure the “WATER ON/REMOTE/OFF” toggle switch is in the “REMOTE” position. Enter the “CAFS DRY” learn mode by pressing the “Stream” switch until the blink code of 2-5 is obtained on the operator station LED. The control system will automatically close the discharge valve if it is not closed. To set the valve open position, use the “Water ON/REMOTE/OFF” toggle switch. The discharge valve will move toward open when the switch is in the on position and toward closed when the switch is in the off position. If you move too far open, you can use the “Water Off” switch to move the valve back toward closed. When the Water switch is in the center position (“Remote”) the valve will stop moving. To save the final valve position, press the “FOG” switch on the joystick or operator station. Pressing the “Stream” switch at this point will put you into “CAFS Wet” position setting mode.

3.2.1.13 CAFS Wet position learn mode (Blink Code 2-6) - This function sets the discharge valve open position for a “wet” compressed air foam setting. Essentially, this setting will allow the valve to open to a programmable position based on time. Before entering the CAFS programming mode, make sure the “WATER ON/REMOTE/OFF” toggle switch is in the “REMOTE” position. Enter the “CAFS WET” learn mode by pressing the “Stream” switch until the blink code of 2-6 is obtained on the operator station LED. The control system will automatically close the discharge valve if it is not closed. To set the valve open position, use the “Water ON/REMOTE/OFF” toggle switch. The discharge valve will move toward open when the switch is in the on position and toward closed when the switch is in the off position. If you move too far open, you can use the “Water Off” switch to move the valve back toward closed. When the Water switch is in the center position (“Remote”) the valve will stop moving. To save the final valve position, press the “FOG” switch on the joystick or operator station. Pressing the “Stream” switch at this point will take you back to the beginning of setup mode.

3.2.1.14 Stow Rotation Position (Blink Code 2-7) – This function sets the horizontal position that the 3440 DeckMaster with position feedback monitor must achieve before it will begin moving the middle elbow to the stowed position. The default position is straight ahead. This only applies to the 3440 DeckMaster with the position feedback option.

3.2.1.15 XT Zone Interlock On (Blink Code 2-8) - This function enables the extra travel zone interlock on a 3598 StreamMaster XT monitor. When this function is enabled, the elevation motor will stop at 90 degrees above horizontal until a permissive input is received on J1 pin 21 on the U2 logic box. When the permissive signal is present, the monitor will be allowed to move into the extra travel zone (+90 to +120 degrees). If the monitor is in the extra travel zone and the permissive signal is removed, the monitor will lower itself back to the +90 degree position. The factory default for this function is on. This function only applies to the 3598 StreamMaster XT monitor.

3.2.1.16 XT Zone Interlock Off (Blink Code 2-9) -This function turns off XT Zone Interlock (see 3.2.1.15) and allows the 3598 StreamMaster XT monitor to freely move into the extra travel zone (+90 to +120 degrees). This function only applies to the 3598 StreamMaster XT monitor.

3.2.1.17 Electric Riser Off (Blink Code 3-1) – This function disables the electric riser (Style 3406) when used with the 3440 DeckMaster monitor. This is the factory default setting. This function only applies to the 3440 DeckMaster monitors, both with and without the position feedback option. When off, the electric riser will not move during the stow or deploy sequence.

3.2.1.18 Electric Riser On (Blink Code 3-2) – This function enables the electric riser (Style 3406) when used with the 3440 DeckMaster monitor. When on, during deploy, the electric riser will lift the monitor up and then the monitor will deploy. During stow, the monitor will stow and then the electric riser will retract.

3.2.2 Stow (Blink code 1-5) To enter the Stow programming mode, momentarily press the Stow switch when in the beginning of setup mode (1 slow blink). To verify you are in the Stow programming mode, verify that the Panel LED is blinking a pattern of one short blink, a short pause, then five short blinks, and a long pause. While in this mode, Up, Down, Left, and Right functions will be active. Movement will not be constrained by soft limits, allowing a stow position that is outside the normal operational envelope. However, obstacle avoidance will be disregarded while learning the stow position, so care must be taken to avoid obstacles manually while learning the stow position. When in the desired stow position, there are two methods of completion. Activating the Fog command will save the position and cause the nozzle to go to the fog setting during the stow sequence, and return the user to the beginning of the setup mode. Activating the Stream command will save the position and cause the nozzle to go to the stream setting during the stow sequence, and return the user to the beginning of setup mode. This mode may be aborted by activating the Stow input again which will return the user to the beginning of setup mode. The factory default stow position is “straight ahead and level” as defined by the sensor zeroing (see section 3.2.1.6).

3.2.3 Deploy (Blink code 1-6)

To enter the Deploy programming mode, momentarily press the Deploy switch when in the beginning of setup mode (1 slow blink). To verify you are in the Deploy programming mode, verify that the Panel LED is blinking a pattern of one short blink, a short pause, six short blinks, and a long pause. While in this mode, Up, Down, Left, and Right functions will be active. Movement will be constrained to whatever soft limits that are in effect. However, obstacle avoidance will be disregarded while learning the deploy position, so care must be taken to avoid obstacles manually while learning the deploy position. When in the desired deploy position, there are two methods of completion. Activating the Fog command will save the position and cause the nozzle to go to the fog setting during the deploy sequence, and return the user to the beginning of the setup mode. Activating the Stream command will save the position and cause the nozzle to go to the stream setting during the deploy sequence, and return the user to the beginning of setup mode. This mode may be aborted by activating the Deploy input again which will return the user to the beginning of setup mode. The factory default deploy position is “straight ahead and level” as defined by the sensor zeroing (see section 3.2.1.6).

3.3 DESCRIPTION OF SWITCH FUNCTIONS

The Universal II has nine switch inputs located on the vehicle connector (see Figure 2.3 and Table 2.3). Below are the various functions that the Universal II switch inputs can provide. Each variant of 6032 will have some combination of these, but not necessarily all or in the order presented here. These inputs are typically driven by variants of the style 6041 Toggle switch Operator Station.

NOTE: The Universal II switch inputs are three-state inputs. Refer to section 2.5.6 for additional information and proper wiring.

3.3.1 Enable Switch (J1 Pin 13)

This switch input functionality is provided across the full line of 6032 variants. It provides capability for interlocking operation of the monitor/turret with the state of condition(s) outside the system for safety purposes. Examples might be a parking brake set, a lighting mast retracted, or a roof ladder deployed. This input must not be left “floating” or disconnected if the monitor/turret is to operate. Connection to either +Battery or -Battery (usually ground) by switch, hardwiring, or some other appropriate device will enable monitor operation.

3.3.2 Master Monitor/Turret Up/Down Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with momentary positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “Up” position, the monitor/turret will be driven upward until the switch is released, a soft-limit is encountered, a hard stop is encountered, or some other disabling function is encountered. When the common of the switch is connected to –Battery (usually ground) by moving the toggle to the “Down” position, the monitor/turret will be driven downward until the switch is released, a soft-limit is encountered, a hard stop is encountered, or some other disabling function is encountered.

3.3.3 Master Monitor/Turret Left/Right Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with momentary positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “Right” position, the monitor/turret will be driven to the right until the switch is released, a soft-limit is encountered, a hard stop is encountered, or some other disabling function is encountered. When the common of the switch is connected to –Battery (usually ground) by moving the toggle to the “Left” position, the monitor/turret will be driven to the left until the switch is released, a soft-limit is encountered, a hard stop is encountered, or some other disabling function is encountered.

3.3.4 Master Nozzle Pattern Fog/Stream Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with momentary positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “Stream” position, the nozzle will be driven such that the pattern will become more straight stream in discharge nature until the switch is released, the limit of adjustment is reached, or some other disabling function is encountered. When the common of the switch is connected to -Battery (usually ground) by moving the toggle to the “Fog” position, the nozzle will be driven such that the pattern will become more fog in discharge nature until the switch is released, the limit of adjustment is reached, or some other disabling function is encountered.

3.3.5 Monitor/Turret Stow/Deploy Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with momentary positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “Deploy” position for two seconds continuously, the monitor/turret will be driven until the position of the monitor/turret matches that of the “taught” Deploy position, any Up, Down, Left, Right switch input or comparable Joystick command activation provides an E-Stop function, or some other disabling function is encountered. If an E-Stop is performed, the only way to continue is to either reinitiate the “Deploy” function, or to initiate the “Stow” function. No other type of movement is permitted. Movement is always first to raise to the highest point of the obstacle avoidance profile (if enabled, see section 3.2.1) before traversing left or right to ensure any obstacles are avoided. If obstacle avoidance is disabled, the monitor will move to the “taught” position normally.

When the common of the switch is connected to -Battery (usually ground) by moving the toggle to the “Stow” (Park) position for two seconds continuously, the monitor/turret will be driven until the position of the monitor/turret matches that of the “taught” Stow position, any Up, Down, Left, Right switch input or comparable Joystick command activation provides an E-Stop function, or some other disabling function is encountered. If an E-Stop is performed, the only way to continue is to either reinitiate the “Deploy” function, or to initiate the “Stow” function. No other type of movement is permitted. Movement is always first to raise to the highest point of the obstacle avoidance profile (if enabled, see section 3.2.1) before traversing left or right to ensure any obstacles are avoided. If obstacle avoidance is disabled, the monitor will move to the “taught” position normally.

3.3.6 Slave Monitor/Turret Up/Down Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with momentary positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “Up” position, the monitor/turret will be driven upward until the switch is released, a soft-limit is encountered, a hard stop is encountered, a Master Up/Down switch is activated, or some other disabling function is encountered. When the common of the switch is connected to –Battery (usually ground) by moving the toggle to the “Down” position, the monitor/turret will be driven downward until the switch is released, a soft-limit is encountered, a hard stop is encountered, a Master Up/Down switch is activated, or some other disabling function is encountered.

3.3.7 Slave Monitor/Turret Left/Right Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with momentary positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “Right” position, the monitor/turret will be driven to the right until the switch is released, a soft-limit is encountered, a hard stop is encountered, a Master Left/Right switch is activated, or some other disabling function is encountered. When the common of the switch is connected to –Battery (usually ground) by moving the toggle to the “Left” position, the monitor/turret will be driven to the left until the switch is released, a soft-limit is encountered, a hard stop is encountered, a Master Left/Right switch is activated, or some other disabling function is encountered.

3.3.8 Slave Nozzle Pattern Fog/Stream Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with momentary positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “Stream” position, the nozzle will be driven such that the pattern will become more straight stream in discharge nature until the switch is released, the limit of adjustment is reached, a Master Fog/Stream switch is activated, or some other disabling function is encountered. When the common of the switch is connected to -Battery (usually ground) by moving the toggle to the “Fog” position, the nozzle will be driven such that the pattern will become more fog in discharge nature until the switch is released, the limit of adjustment is reached, a Master Fog/Stream switch is activated, or some other disabling function is encountered.

3.3.9 Flow Rate High/Low Switch

When this switch input functionality is provided, it is best fed by a two position maintained toggle switch so that flow rate (sometimes referred to as the gallonage control) will be evident by looking at the toggle switch position. When the common of the switch is connected to +Battery by moving the toggle to the “High” position, the monitor/turret flow baffle will be driven toward the high flow rate position until the limit of adjustment is reached, or some other disabling function is encountered. When the common of the switch is connected to - Battery by moving the toggle to the “Low” position, the monitor/turret flow baffle will be driven toward the low flow rate position until the limit of adjustment is reached, or some other disabling function is encountered.

3.3.10 Oscillation Set/Start – Pause/Resume Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with momentary positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “Set/Start” position, the monitor/turret rotation will be driven toward the right until the switch is released, a soft-limit is encountered, or a hard-limit is encountered. That point will be assigned the rightmost travel point in the auto-oscillate profile. The monitor/turret will again automatically reverse direction and move to the left until the “Set/Start” switch is pushed and released, a soft-limit is encountered, or a hard-limit is encountered. That point will be assigned the leftmost travel point in the auto-oscillate profile. The monitor/turret will then automatically oscillate back and forth between those two points until the common of the switch is connected to -Battery by moving the toggle to the “Pause/Resume” position, a Left or Right command is received from a switch or joystick input, or some other disabling function is encountered. Use of the “Pause/Resume” switch will only pause oscillation, and pushing the Pause/Resume switch a second time will cause oscillation to be resumed using the current positions. Use of a Left or Right command will cancel oscillation and the profile will be cleared. The monitor can be moved up and down during oscillation without cancelling the oscillation function.

3.3.11 Discharge On/Remote/Disable Switch

When this switch input functionality is provided, it is best fed by a center-off toggle switch with maintained positions each side of center off. When the common of the switch is connected to +Battery by moving the toggle to the “On” position, the Discharge output (logic output #3 and H-Bridge Axis #5 output) will be driven such that the discharge will be turned on regardless of any external device (joystick) until the switch is returned to the “Remote” or “Off” position. When the common of the switch is connected to -Battery (usually ground) by moving the toggle to the “Off” position, the Discharge output ((logic output #3 and H-Bridge Axis #5 output) will be driven such that the discharge will be turned off regardless of any external device (joystick) until the switch is returned to the “Remote” or “On” position. When the switch is in the center or “Remote” position, control of the discharge output(s) is turned over to the state of remote devices (i.e. Joystick trigger).

3.3.12 Collision Zone Permissive

When this switch input functionality is provided, it is normally driven by some type of limit switch. To provide the maximum flexibility, it will accommodate a PNP sourcing or NPN sinking device as well as a normal electromechanical limit switch. The use of this is to force an operational envelope subset on the monitor/turret when certain external conditions apply. An example might be a ladder being extended beyond the monitor on occasion which would need to partially restrict movement of the monitor. This input is active in the permissive condition. It needs connected to either +Battery or –Battery to permit movement into the collision zone.

3.4 DESCRIPTION OF LOGIC OUTPUT FUNCTIONS

The Universal II has three logic outputs located on the vehicle connector (see Figure 2-3 and Table 2-3). Below are the various functions that the Universal II logic outputs can provide. Each variant of 6032 will have some combination of these, but not necessarily all or in the order presented here.

NOTE: The Universal II logic outputs are protected high-side drivers. Refer to section 0 for additional information and proper wiring.

3.4.1 Panel LED

The Panel LED output is normally tied to the LED located in Akron Brass four switch operator stations such as the 60410003. This LED primarily indicates whether or not the monitor/turret is stowed. It also is used to present various codes by associated flash sequences.

3.4.2 Discharge Output

The Discharge output goes true (energizing the attached load) whenever agent discharge is called for by a toggle switch input, Joystick trigger switch, CAN message, or other input. For further details, refer to section 3.3.11.

3.4.3 Gallonage High Output

The Gallonage High output goes true (energizing the attached load) whenever a high flow rate is called for by a toggle switch input, CAN message, or other input. For further details, refer to section 3.3.9.

3.4.4 Safe Zone Output

The Safe Zone output goes true (energizing the attached load) whenever the monitor/turret is not within a collision zone. For further details, refer to section 3.3.12. Active when safe provides the best failsafe condition for a broken wire.

3.5 PRIORITY OF COMMAND INPUTS

Command inputs can have multiple sources. One source is from digital master inputs as outlined in section 3.3. Then digital slave inputs have 2nd priority. Command inputs can also come from J1939 CAN messages as outlined in CHAPTER 5. These command inputs take the form of standard J1939 Joystick messages. The digital inputs have the highest priority. Then Joystick1 commands (node 33) take the next lower priority followed by Joystick2 commands (node34) and on down to Joystick6 commands (node 38) which has the lowest priority. Thus a Master/Slave hierarchy can be established by assigning CAN input device addresses according to the desired priority.

3.6 NORMAL OPERATION

The monitor/turret may be moved by any of the command inputs mentioned above. For instance, if an attached joystick is pulled back, the monitor/turret will move upward. If the joystick is moved to the right, the monitor/turret will move to the right. Similarly, if the toggle switch attached to the Fog/Stream digital input is activated in the Fog direction, the nozzle pattern will become more dispersed. Movement of the monitor/turret will be confined inside the envelope established by the soft limits. If soft limits are not set, movement will be confined by the hard stops of the monitor/turret.

3.7 OBSTACLE AVOIDANCE OPERATION

Movement of the monitor may be further constrained by the OAP (Obstacle Avoidance Profile) as setup in section 3.2.1.11. If in the process of moving left or right an OAP constraint is reached, horizontal movement of the monitor/turret will stop until the operator raises the monitor turret above the OAP value (see section 3.2.1.9). Optionally, this can be setup to happen automatically such that the monitor/turret will raise just enough to stay within the OAP (see section 3.2.1.10). As horizontal movement continues and the OAP permits, the monitor/turret will return to the same level it was at prior to encountering the obstacle.

CHAPTER 4

MAINTENANCE AND SERVICE INSTRUCTIONS

4.1 MAINTENANCE INSTRUCTIONS

The Universal II has no user-serviceable parts, but steps can be taken to extend its trouble-free operation.

- Periodically check cabling for insulation cracking and wire connections for frayed wires.
- Insure there is no standing water around the enclosure.
- Check all mounting hardware to insure proper tightness.

4.2 ELECTRICAL TROUBLESHOOTING

4.2.1 Operating Environment

One of the most common causes of improper operation is trying to operate outside of the stated system requirements. (See section 1.4.1 for DC power requirements). A good method of checking the voltage at the Universal II is to connect a voltmeter to the wires/pins of the Peripheral Power Output on the DC Power/Signal cable (pins 22 and 25). Refer to section 2.4 and Figure 2-8 for additional information. This will give a good indication of power loss across the DC cabling. For long runs, it may be necessary to add an intermediate junction box in the DC cable so that DC power can be applied closer to the Universal II.

4.2.2 Common Electrical Issues

Symptom	Potential Cause	What to Check
Totally Inoperative	Lack of Power	Remove the Power/Signal Cable connector from the Universal II box. Check for voltage approximately equal to vehicle battery voltage between pins 1 and 2.
		Another method is to place your ear close to the Universal II, during power-up. A relay energizing should occur with an accompanying “click” sound.
	Not Enabled	Remove the Power/Signal Cable connector from the Universal II box. Check for continuity between pin 13 and pin 1, or pin 13 and pin 2.
		With the system powered and fully connected, measure the voltage on any one of the switch inputs that are either floating or unconnected.
	Internal Fuse Blown	Leaving the Power/Signal Cable connected, remove the Monitor Cable. Check the voltage between pin 22 and 25 (Peripheral Power) on the Power/Signal Cable, and check the voltage between pin A and E of the Monitor Cable jack on the Universal II.
Switches function properly, but CAN Joystick and other network devices do not	CAN bus is improperly wired	Check CAN bus wiring
	CAN bus is improperly terminated	Turn off system power and remove the Power/Signal Cable connector. Measure the resistance between pins 23 and 24.

CHAPTER 5

CAN MESSAGING

5.1 CAN ADDRESS CLAIMING

5.1.1 Prerequisite Knowledge

It is assumed that the reader has some level of familiarity with CAN networking and terminology, and the AB product. This information is not intended to be a tutorial on CAN, nor AB product operation, but rather a resource for information concerning the requirements and techniques involved in implementing a CAN control interface to the AB product.

5.1.2 CAN Physical Layer

AB CAN physical layer requirements are the same as the SAE J1939 Standard:

- CAN 2.0B devices
- 29 bit CAN message headers
- 250K bits per second
- Proper bus wiring, terminations, etc.

5.1.3 Address Claiming

Rather than using a pre-assigned CAN node address, AB devices use the J1939 method of address claiming, detailed in 'SAE J1939-81 Network Management'. Although the integrator must be aware of this, it is not necessary for them to understand or use this technique. Integrator considerations regarding this are summarized in Appendix A.

5.1.4 General Message Characteristics

To allow AB devices to cooperatively communicate on a vehicle bus shared with other message traffic, all AB messages utilize the point-to-point and broadcast ranges of message IDs set aside in 'SAE J1939-71 Vehicle Application Layer' for vendors to use to transmit data not otherwise defined in the J1939 specification. The messages are structured as follows:

```
Header (29 bits)  2  22  11  00  0
                  8...43..... 65.....87 .....0
                  [A]    0011101111 [ B ] [ C ]
```

- [A] = 3 bits, Priority (7 = 111 = lowest, 0 = 000 = highest)
2 bits, 00
8 bits, 0xEF
[B] = 8 bits, Target node, or 0xFF for Broadcast
[C] = 8 bits, Source node

Note that the Priority field is used only for bus arbitration. All messages are parsed based on the low order 26 bits of the header.

Data length – 1 to 8 bytes

Data byte 0 – Message type

Data bytes [1-7] – Data for message type (0 to 7 bytes)

No logical messages are spanned across multiple physical CAN messages.

Input Messages

J1939 Basic Joystick Message (PGN 0xFDD6)

Header (29 bits) 2 22 11 00 0
8 ... 43.....65..... 87.....0
0110011111011010110 [A]

3 bits, Priority 3 (011)

2 bits, 00

16 bits, PGN 0xFDD6

[A] = 8 bits, Source (Joystick node address, 0x33 – 0x38)

Data length – 8 bytes

Data byte 0 1 2 3 4 5 6 7
bit 7.....07.....07.....07.....07.....07.....07.....0
AABBCCDDAAAAAAAAEEFFGGHHEEEEEEJJKLLLLMMNNPPQQRRSSTTUUVVWWXXYY

[A] = 10 bits, X position in 0.1% (unsigned binary, LSB...MSB)
[B] = 2 bits, X right (+) status (00 Off, 01 On, 10 Error, 11 N/A)
[C] = 2 bits, X left (-) status (00 Off, 01 On, 10 Error, 11 N/A)
[D] = 2 bits, X neutral status (00 Off, 01 On, 10 Error, 11 N/A)
[E] = 10 bits, Y position in 0.1% (unsigned binary, LSB...MSB)
[F] = 2 bits, Y forward (+) status (00 Off, 01 On, 10 Error, 11 N/A)
[G] = 2 bits, Y back (-) status (00 Off, 01 On, 10 Error, 11 N/A)
[H] = 2 bits, Y neutral status (00 Off, 01 On, 10 Error, 11 N/A)
[J] = 2 bits, X detent status (00 Off, 01 On, 10 Error, 11 N/A)
[K] = 2 bits, Y detent status (00 Off, 01 On, 10 Error, 11 N/A)
[L] = 4 bits, (unused)
[M] = 2 bits, Switch 1 status (00 Off, 01 On, 10 Error, 11 N/A)
[N] = 2 bits, Switch 2 status (00 Off, 01 On, 10 Error, 11 N/A)
[P] = 2 bits, Switch 3 status (00 Off, 01 On, 10 Error, 11 N/A)
[Q] = 2 bits, Switch 4 status (00 Off, 01 On, 10 Error, 11 N/A)
[R] = 2 bits, Switch 5 status (00 Off, 01 On, 10 Error, 11 N/A)
[S] = 2 bits, Switch 6 status (00 Off, 01 On, 10 Error, 11 N/A)
[T] = 2 bits, Switch 7 status (00 Off, 01 On, 10 Error, 11 N/A)
[U] = 2 bits, Switch 8 status (00 Off, 01 On, 10 Error, 11 N/A)
[V] = 2 bits, Switch 9 status (00 Off, 01 On, 10 Error, 11 N/A)
[W] = 2 bits, Switch 10 status (00 Off, 01 On, 10 Error, 11 N/A)
[X] = 2 bits, Switch 11 status (00 Off, 01 On, 10 Error, 11 N/A)
[Y] = 2 bits, Switch 12 status (00 Off, 01 On, 10 Error, 11 N/A)

Example – 0CFDD633 [8] 1 0 7D 04 6 4 00 10 00 00

This message from the joystick at CAN node address '0x33' indicates its current state:

The joystick is actuated 50% to the right and 40% back

[X position= 0x1F4 | 500]

[X right (+) status = 01]

[Y position= 0x190 | 400]

[Y back (-) status = 01]

Switch 2 is on / closed

[Switch 2 status = 01]

Refer to Appendix B for more information on how joystick input is handled.

Status Messages – Broadcast

Message type 0xFF – Address Announcement

This message is issued to inform the integrator what CAN node address has been claimed for use by the AB device having the indicated PIN (15 digit unique Product Identification Number). The integrator should save the source node from the message header to use as the destination node in all messages for this device, and to check the source node of an incoming message to determine if it is from this device. The first 4 digits of the PIN are used to identify the AB device type:

1032 – 6032xxxx Universal II
1034 – 6034xxxx Operator Station
1035 – 6035xxxx Joystick
1036 – 6036xxxx Direction Indicator
1037 – 6037xxxx Wireless Interface
1040 – 6040xxxx Forestry controller
1042 – 6042xxxx Portable Electric controller

Header (29 bits) 2 22 11 00 0
8 ... 43.....65..... 87.....0
1100011101111111111 [A]

3 bits, Priority 6 (110)
2 bits, 00
8 bits, 0xEF
8 bits, Target (0xFF - Broadcast)
[A] = 8 bits, Source (AB node address)

Data length – 8 bytes
Data byte 0 1 2 3 4 5 6 7
bit 7..... 07.....07.....07.....07.....07.....07.....07.....0
1111111 [A][B] [C] [D]

8 bits, Message type 0xFF
[A] 7 bits, PIN digit 5 (ASCII character)
[B] 7 bits, PIN digit 6 (ASCII character)
[C] 12 bits, PIN digits 1-4 (unsigned binary MSB...LSB)
[D] 30 bits, PIN digits 7-15 (unsigned binary MSB...LSB)

Example – 18EFFF80 [8] FF 83 15 02 26 02 1A 0B

This message indicates that the device with PIN '1032AE100801035' has claimed CAN node address '0x80' and is ready to issue and accept CAN messages.

[PIN digit 5 = 0x41 | 'A']
[PIN digit 6 = 0x45 | 'E']
[PIN digits 1-4 = 0x408 | 1032]
[PIN digits 7-15 = 0x26021A0B | 100801035]

Refer to Appendix A for more detailed information regarding how this message should be processed.

Status Messages – Broadcast (continued)

Message type 0x01 – Position / Limit Status

This message is issued periodically (100ms) indicating axis positions, travel limit status, et.al. It is used by the 6036xxxx Direction Indicator to obtain rotation and elevation positions for display.

Header (29 bits) 2 22 11 00 0
8.....43..... 65.....87.....0
11000111011111111111 [A]

3 bits, Priority 6 (110)
2 bits, 00
8 bits, 0xEF
8 bits, Target (0xFF - Broadcast)
[A] = 8 bits, Source (AB node address)

Data length – 8 bytes

Data byte 0 1 2 3 4 5 6 7
bit 7.....07.....07.....07.....07..... 07..... 07.....07.....0
00000001 [A] BCC [D] EFGGHHJJKLLMMNPPQRRSSTT

8 bits, Message type 0x01
[A] 12 bits, Rotation position in 0.1° (unsigned binary MSB...LSB)
[B] 2 bits, Rotation Right status (00 Off, 01 On, 10 Error, 11 N/A)
[C] 2 bits, Rotation Left status (00 Off, 01 On, 10 Error, 11 N/A)
[D] 12 bits, Elevation position in 0.1° (unsigned binary MSB...LSB)
[E] 2 bits, Elevation Up status (00 Off, 01 On, 10 Error, 11 N/A)
[F] 2 bits, Elevation Down status (00 Off, 01 On, 10 Error, 11 N/A)
[G] 2 bits, Rotation Right hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[H] 2 bits, Rotation Left hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[J] 2 bits, Elevation Up hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[K] 2 bits, Elevation Down hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[L] 2 bits, Pattern Stream hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[M] 2 bits, Pattern Fog hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[N] 2 bits, Axis 4 Positive hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[P] 2 bits, Axis 4 Negative hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[Q] 2 bits, Axis 5 Positive hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[R] 2 bits, Axis 5 Negative hard stop (00 Off, 01 On, 10 Error, 11 N/A)
[S] 2 bits, (currently unused) (00 Off, 01 On, 10 Error, 11 N/A)
[T] 2 bits, Calibrated status (00 Off, 01 On, 10 Error, 11 N/A)

Example – 18EFFF80 [8] 01 1D 94 03 71 00 00 41

This message indicates the status of the unit at CAN node address '0x80':

Rotation position is +47.3° (+ right of 0°, - left of 0°)

[Rotation position= 0x1D9 | 473]

[Rotate Right status= 01]

Elevation position is -5.5° (+ above 0°, - below 0°)

[Elevation position= 0x037 | 55]

[Elevation Down status= 01]

Discharge valve is on / open

[Axis 5 Positive hard stop = 01]

Unit has been calibrated

[Calibration status = 01]

Status Messages – Broadcast (continued)

Message type 0x81 – Rotation Limits

This message is issued periodically (100ms) to allow the 6036xxxx Direction Indicator to display programmed soft limits or oscillation limits.

Header (29 bits) 2 22 11 00 0
8.....43.....65.....87.....0
1100011101111111111 [A]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

8 bits, Target (0xFF - Broadcast)

[A] = 8 bits, Source (AB node address)

Data length – 6 bytes

Data byte 0 1 2 3 4 5
bit 7..... 07.....07.....07.....07.....0
10000001 [A] [B] [C]

8 bits, Message type 0x81

[A] 16 bits, Rotation Left limit in 0.1° (signed binary MSB...LSB)

[B] 16 bits, Rotation Right limit in 0.1° (signed binary MSB...LSB)

[C] 8 bits, Flags (bit map)

0x80 – Oscillation active 1.....
(currently unused) .111111

Example – 18EFFF80 [6] 81 FE D4 01 C2 80

This message indicates the status of the unit at CAN node address '0x80':

Oscillation Left limit is - 30.0° (+ right of 0°; - left of 0°)

[Rotation Left limit = 0xFED4 | -300]

Oscillation Right limit is +45.0° (+ right of 0°; - left of 0°)

[Rotation Right limit = 0x01C2 | +450]

Unit is oscillating

[Flags = 0x80]

Status Messages – Broadcast (continued)

Message type 0x82 – Elevation Limits

This message is issued periodically (100ms) to allow the 6036xxxx Direction Indicator to display programmed soft limits.

Header (29 bits) 2 22 11 00 0
8....43.....65.....87.....0
1100011101111111111 [A]

3 bits, Priority 6 (110)
2 bits, 00
8 bits, 0xEF
8 bits, Target (0xFF - Broadcast)
[A] = 8 bits, Source (AB node address)

Data length – 6 bytes

Data byte 0 1 2 3 4 5
bit 7.....07.....07.....07.....07.....07.....0
10000010 [A] [B] [C]

8 bits, Message type 0x82
[A] 16 bits, Elevation Down limit in 0.1° (signed binary MSB...LSB)
[B] 16 bits, Elevation Up limit in 0.1° (signed binary MSB...LSB)
[C] 8 bits, Flags (bit map)
(currently unused) 11111111

Example – 18EFFF80 [6] 82 FF 38 03 84 00

This message indicates the status of the unit at CAN node address '0x80':

Elevation Down soft limit is -20.0° (+ above 0°, - below 0°)
[Elevation Down limit = 0xFF38 | -200]
Elevation Up soft limit is +90.0° (+ above 0°, - below 0°)
[Elevation Up limit = 0x0384 | +900]

Status Messages – Broadcast (continued)

Message type 0x83 – CAN Outputs

This message is issued periodically (100ms) to allow the 6037xxxx Wireless Interface to display status indications.

Header (29 bits) 2 22 11 00 0
8... 43.....65.....87.....0
11000111011111111111 [A]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

8 bits, Target (0xFF - Broadcast)

[A] = 8 bits, Source (AB node address)

Data length – 3 bytes

Data byte 0 1 2

bit 7.....07.....07.....0

10000011 [A]

8 bits, Message type 0x83

[A] 16 bits, Flags (bit map)

0x0010 – Deployed status1....

(currently unused) 111111111.1111

Example – 18EFFF80 [3] 83 00 10

This message indicates the status of the unit at CAN node address '0x80':

Unit is deployed / not stowed

[Flags = 0x0010]

Status Messages – Poll / Response

Message type 0x02 – Fault Status Poll

Header (29 bits) 2 22 11 00 0
 8.....43.....65.....87.....0
 1100011101111 [A] [B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (AB node address)

[B] = 8 bits, Source (Integrator node address)

Data length – 1 byte

Data byte 0

bit 7.....0

00000010

8 bits, Message type 0x02

Example – 18EF8005 [1] 02

This message requests fault status from the AB unit at CAN node address '0x80' to be sent to the Integrator unit at CAN node address '0x05'.

Message type 0x03 – Firmware Version Poll

Header (29 bits) 2 22 11 00 0
 8..... 43.....65.....87..... 0
 1100011101111 [A] [B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (AB node address)

[B] = 8 bits, Source (Integrator node address)

Data length – 1 byte

Data byte 0

bit 7.....0

00000011

8 bits, Message type 0x03

Example – 18EF8005 [1] 03

This message requests firmware version information from the AB unit at CAN node address '0x80' to be sent to the Integrator unit at CAN node address '0x05'.

Status Messages – Poll / Response

Message type 0x04 – pCode Version Poll

Header (29 bits) 2 22 11 00 0
8.....43.....65..... 87.....0
1100011101111 [A] [B]

3 bits, Priority 6 (110)
2 bits, 00
8 bits, 0xEF
[A] = 8 bits, Target (AB node address)
[B] = 8 bits, Source (Integrator node address)

Data length – 1 byte
Data byte 0
bit 7.....0
00000100

8 bits, Message type 0x04

Example – 18EF8005 [1] 04

This message requests pCode version information from the AB unit at CAN node address '0x80' to be sent to the Integrator unit at CAN node address '0x05'.

Message type 0x05 – Config Version Poll

Header (29 bits) 2 22 11 00 0
8.....43.....65.....87.....0
1100011101111 [A] [B]

3 bits, Priority 6 (110)
2 bits, 00
8 bits, 0xEF
[A] = 8 bits, Target (AB node address)
[B] = 8 bits, Source (Integrator node address)

Data length – 1 byte
Data byte 0
bit 7.....0
00000101

8 bits, Message type 0x05

Example – 18EF8005 [1] 05

This message requests config version information from the AB unit at CAN node address '0x80' to be sent to the Integrator unit at CAN node address '0x05'.

Status Messages – Poll / Response (continued)

Message type 0x02 – Fault Status Response

Header (29 bits) 2 22 11 00 0
 8... 43..... 65..... 87.....0
 1100011101111 [A] [B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (Integrator node address)

[B] = 8 bits, Source (AB node address)

Data length – 5 bytes

Data byte 01 2 3 4
 bit 7..... 07..... 07.....07.....07.....0
 00000010 [A]

8 bits, Message type 0x02

[A] 32 bits, Flags (bit map)

	3	2	1	0	0
	1	3	5	7	0
0x80000000 – S12 firmware	1	.....	.....	.....	.....
0x40000000 – CAN overrun out	1	.....	.....	.....	.....
0x00800000 – External EEPROM	.....	1	.....	.....	.....
0x00400000 – Real-time clock	.....	1	.....	.....	.....
0x00200000 – Vbulk fuse	.....	1	.....	.....	.....
0x00100000 – pCode fault 4	.....	1	.....	.....	.....
0x00080000 – pCode fault 3	.....	1	.....	.....	.....
0x00040000 – pCode fault 2	.....	1	.....	.....	.....
0x00020000 – pCode fault 1	.....	1	.....	.....	.....
0x00010000 – pCode syntax	.....	1	.....	.....	.....
0x00008000 – XGATE firmware	.....	1	.....	.....	.....
0x00004000 – CAN overrun in	.....	1	.....	.....	.....
0x00000100 – Digital output 3	.....	1	.....	.....	.....
0x00000080 – Digital output 2	.....	1	.....	.....	.....
0x00000040 – Digital output 1	.....	1	.....	.....	.....
0x00000020 – Motor axis 5	.....	1	.....	.....	.....
0x00000010 – Motor axis 4	.....	1	.....	.....	.....
0x00000008 – Motor axis 3	.....	1	.....	.....	.....
0x00000004 – Motor axis 2	.....	1	.....	.....	.....
0x00000002 – Motor axis 1	.....	1	.....	.....	.....
0x00000001 – Internal EEPROM	.....	1	.....	.....	.....
(currently unused)	.....	11111	.....	11111	.....

Example – 18EF0580 [5] 02 00 00 00 00

This response indicates the unit at CAN node address '0x80' has no faults.
 [Flags = 0x00000000]

Status Messages – Poll / Response (continued)

Message type 0x03 – Firmware Version Response

Header (29 bits) 2 22 11 00 0
8...43.....65.....87.....0
1100011101111 [A] [B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (Integrator node address)

[B] = 8 bits, Source (AB node address)

Data length – 7 bytes

Data byte 0 1 2 3 4 5 6
bit 7.....07.....07.....07.....07.....07.....0
00000011[A][B][C][D][E][F]

8 bits, Message type 0x03

[A] 8 bits, Fixed boot major version (unsigned binary)

[B] 8 bits, Fixed boot minor version (unsigned binary)

[C] 8 bits, Bootloader major version (unsigned binary)

[D] 8 bits, Bootloader minor version (unsigned binary)

[E] 8 bits, System code major version (unsigned binary)

[F] 8 bits, System code minor version (unsigned binary)

Example – 18EF0580 [7] 03 01 01 02 01 01 0C

This response indicates the unit at CAN node address '0x80' has firmware:

Fixed boot – version 1.01

[Fixed boot major version = 0x01 | 1]

[Fixed boot minor version = 0x01 | 1]

Bootloader – version 2.01

[Bootloader major version = 0x01 | 1]

[Bootloader minor version = 0x02 | 2]

System code – version 1.12

[System code major version = 0x01 | 1]

[System code minor version = 0x0C | 12]

Status Messages – Poll / Response (continued)

Message type 0x04 – pCode Version Response

Header (29 bits) 2 22 11 00 0
8... 43.....65.....87.....0
1100011101111[A][B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (Integrator node address)

[B] = 8 bits, Source (AB node address)

Data length – 7 bytes

Data byte 0 1 2 3 4 5 6
bit 7.....07.....07.....07.....07.....07.....0
00000100 [A][B][C][D]

8 bits, Message type 0x04

[A] 16 bits, Style number (unsigned binary MSB...LSB)

[B] 16 bits, Subtype number (unsigned binary MSB...LSB)

[C] 8 bits, pCode major version (unsigned binary)

[D] 8 bits, pCode minor version (unsigned binary)

Example – 18EF0580 [7] 04 0D 1C 00 0E 01 05

This response indicates the unit at CAN node address '0x80' has pCode:

Style – 3356 (Trident)

[Style number = 0x0D1C | 3356]

Subtype – 14 (Novotechnik sensors)

[Subtype number = 0x000E | 14]

Version – 1.05

[pCode code major version = 0x01 | 1]

[pCode code minor version = 0x05 | 5]

Status Messages – Poll / Response (continued)

Message type 0x05 – Config Version Response

Header (29 bits) 2 22 11 00 0
 8... 43.....65.....87.....0
 1100011101111 [A][B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (Integrator node address)

[B] = 8 bits, Source (AB node address)

Data length – 7 bytes

Data byte 0 1 2 3 4 5 6
 bit 7.....07.....07.....07.....07.....07.....07.....0
 00000101 [A][B][C]

8 bits, Message type 0x05

[A] 32 bits, Config type (unsigned binary MSB...LSB)

[B] 8 bits, Config major version (unsigned binary)

[C] 8 bits, Config minor version (unsigned binary)

Example – 18EF0580 [7] 05 03 98 69 0E 01 05

This response indicates the unit at CAN node address '0x80' has Config:

Type – 60320014 (Trident, Novotechnik sensors)

[Config type = 0x0398690E | 60320014]

Version - 1.05

[Config major version = 0x01 | 1]

[Config minor version = 0x05 | 5]

Configuration Messages – Request / Ack

Message type 0x41 – Zero Axis Positions Request

Header (29 bits) 2 22 11 00 0
8.....43.....65.....87.....0
1100011101111 [A] [B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (AB node address)

[B] = 8 bits, Source (Integrator node address)

Data length – 1 byte

Data byte 0

bit 7.....0
01000001

8 bits, Message type 0x41

Example – 18EF8005 [1] 41

This poll from the integrator at CAN node address '0x05' is directed to the unit at CAN node address '0x80' requesting it to set its zero positions for rotation (axis 1) and elevation (axis 2) to their current positions.

Message type 0x41 – Zero Axis Positions Ack

Header (29 bits) 2 22 11 00 0
8... 43.....65.....87.....0
1100011101111 [A] [B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (Integrator node address)

[B] = 8 bits, Source (AB node address)

Data length – 1 byte

Data byte 0

bit 7.....0
01000001

8 bits, Message type 0x41

Example – 18EF0580 [1] 41

This response indicates the unit at CAN node address '0x80' has completed setting its zero positions for rotation (axis 1) and elevation (axis 2) to their current positions.

ASCII Bidirectional Data Pipe Messages (internal / diagnostic use)

Message type 0xFE – ASCII Bidirectional Data Pipe Send

Header (29 bits) 2 22 11 00 0
8... 43..... 65.....87.....0
1100011101111 [A] [B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (AB node address | Diagnostic node address)

[B] = 8 bits, Source (Diagnostic node address | AB node address)

Data length – 2 to 8 bytes

Data byte 0 1 2 3 4 5 6 7
bit 7.....07.....07.....07.....07.....07.....07.....0
11111110 [A] [A] ...

8 bits, Message type 0xFE

[A] = 8 bits, ASCII character

Example – 18EF80F9 [4] FE 41 42 43

This message from the diagnostic tool at CAN node address '0xF9' sends the 3 ASCII characters 'ABC' to the unit at CAN node address '0x80'.

Message type 0xFE – ASCII Bidirectional Data Pipe Ack

Header (29 bits) 2 22 11 00 0
8... 43.....65.....87.....0
1100011101111 [A] [B]

3 bits, Priority 6 (110)

2 bits, 00

8 bits, 0xEF

[A] = 8 bits, Target (Diagnostic node address | AB node address)

[B] = 8 bits, Source (AB node address | Diagnostic node address)

Data length – 1 byte

Data byte 0
bit 7.....0
11111110

8 bits, Message type 0xFE

Example – 18EFF980 [1] FE

This response from the unit at CAN node address '0x80' acknowledges the receipt of an ASCII Bidirectional Data Pipe Send from the diagnostic tool at CAN node address '0xF9'.

Appendix A – Address Claiming

Address claiming, detailed in ‘SAE J1939-81 Network Management’, is the technique used by AB devices to acquire a node address on the CAN network. It is generally compatible with devices using fixed node addresses, as the fixed node address range is 127 (0x7F) and below, with the dynamic address range 128 (0x80) and above. AB devices start claiming addresses at 128 (0x80), so as long as integrator devices use node addresses less than 128 (0x80), or use address claiming, there are no node addressing conflicts.

The negotiation normally takes place within 2-3 seconds of system power up, but if ‘hot pluggable’ devices are added to the bus later, it can occur again at that time. The J1939 spec defines a priority scheme that includes the possibility of a device successfully claiming an address, and then later losing it to a higher priority device.

To address this and relieve the integrator of concerns about the specific mechanics of address claiming, AB devices issue a type 0xFF ‘Address Announcement’ message upon successful address claim. If they lose their address later and must claim another, they again issue the Address Announcement. The interested integrator node(s) should listen for this message and use its source node address to update their node address for the AB device.

In the case of multiple AB devices on a CAN bus, it is up to the integrator to use the PIN field of the address announcement to differentiate among them. One suggested way to do this is to have the integrator device ‘remember’ the identity of a specific AB device, and use that to select the address announcement to use for the node address of the device of interest.

If the integrator for some reason cannot or does not want to process CAN messages early enough to see the address announcement at power up, they can issue the following J1939 broadcast message:

18EAFFFE [3] 00 EE 00

All devices which have claimed addresses will broadcast a J1939 message with their address information (these can be ignored). AB devices will also broadcast a message type 0xFF address announcement, which the integrator can then process as required.

Appendix B – Handling of Joystick Input Data

Joystick inputs are mapped to 6032xxxx inputs as follows:

- X axis right – Rotate Right with proportional speed control
- X axis left – Rotate Left with proportional speed control
- Y axis back – Elevate Up with proportional speed control
- Y axis forward – Elevate Down with proportional speed control
- Switch 1 – Pattern Stream
- Switch 2 – Pattern Fog
- Switch 3 – Discharge Trigger
- Switch 4 – Oscillate On
- Switch 5 – Gallonage High
- Switch 6 – Gallonage Low
- Switch 7 – Oscillate Pause
- Switch 8 – Unpark / Deploy
- Switch 9 – Park / Stow
- Switch 10 – Enable permissive
- Switch 11 – (currently unused)
- Switch 12 – (currently unused)

The 6032xxxx will accept input requests from multiple sources and will try to honor any and all non-conflicting requests. Conflicting requests will be handled according to the following default priority scheme (meaning input requests from a particular source will override conflicting requests from all lower priority sources):

- Highest - Physical input switches
 - Joystick at CAN node address 0x33
 - Joystick at CAN node address 0x34
 - Joystick at CAN node address 0x35
 - Joystick at CAN node address 0x36
 - Joystick at CAN node address 0x37
- Lowest - Joystick at CAN node address 0x38

If a 6037xxxx Wireless Interface is attached, it appears to the 6032xxxx as a joystick at one of the above addresses.

J1939 joysticks broadcast their messages on a periodic basis, usually every 100ms or less. If the 6032xxxx does not receive any message from a joystick for 200ms, the input buffer for that joystick is cleared, stopping any manual motion that was being requested from that address.

CHAPTER 6

UNIVERSAL II VARIANT DETAILS 3356 TRIDENT W/ WABASH POSITION SENSORS (OBSOLETE)

6.1 60320004

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Discharge Out (Sourcing Out, 2 Amps Max.)
8	Output #2	Gallonage High (Sourcing Out, 2 Amps Max.)
9	Output #3	Gallonage Low (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w`n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f`f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Gallonage High/L`o`w`) Connect to +Bat for High, to –Bat for Low (Gallonage)
19	Switch Input #7	(Osc. Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Unpark/P`a`r`k`) Connect to +Bat for Right, to –Bat for Left (Deploy/S`t`o`w`)
21	Switch Input #9	(Unused)
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-501 for up to date details.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(ON) Discharge moves on when pin 5 positive with respect to pin 6
6		(OFF) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Switch Panel LED (Sourcing Out, 2 Amps Max.)
8	Output #2	Safe Zone (Sourcing Out, 2 Amps Max.) Energized when not in Collision zone
9	Output #3	Discharge ON (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f`t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w`n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f`f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Slave Right/L`e`f`t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
19	Switch Input #7	(Slave Up/D`o`w`n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
20	Switch Input #8	(Slave Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
21	Switch Input #9	(Collision Zone Permissive) Connect to +Bat or –Bat to unrestrict movement
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-503 for up to date details.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Switch Panel LED (Sourcing Out, 2 Amps Max.)
8	Output #2	Discharge ON (Sourcing Out, 2 Amps Max.)
9	Output #3	Unused (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w`n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f`f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Unused)
19	Switch Input #7	(Osc. Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Unused)
21	Switch Input #9	(Unused)
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-504 for up to date details.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Discharge Out (Sourcing Out, 2 Amps Max.)
8	Output #2	Unused (Sourcing Out, 2 Amps Max.)
9	Output #3	Unused (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f`t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w`n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f`f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Lights) Connect to +Bat to Energize, Disconnect for Off
19	Switch Input #7	(Osc. Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Harness ID2) Customer Proprietary
21	Switch Input #9	(Harness ID1) Customer Proprietary
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-505 for up to date details.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Switch Panel LED (Sourcing Out, 2 Amps Max.)
8	Output #2	Discharge Out (Sourcing Out, 2 Amps Max.)
9	Output #3	Unused (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f`t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w`n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f`f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Unused)
19	Switch Input #7	(Osc. Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Unused)
21	Switch Input #9	(Unused)
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-506 for up to date details.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Switch Panel LED (Sourcing Out, 2 Amps Max.)
8	Output #2	Discharge ON (Sourcing Out, 2 Amps Max.)
9	Output #3	Gallorage High (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f` t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w`n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f`f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Gallorage High/L`o`w`) Connect to +Bat for High, to –Bat for Low (Gallorage)
19	Switch Input #7	(Osc. Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Unpark/P`a`r`k`) Connect to +Bat for Right, to –Bat for Left (Deploy/S`t`o`w`)
21	Switch Input #9	(Unused)
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-507 for up to date details.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Switch Panel LED (Sourcing Out, 2 Amps Max.)
8	Output #2	Discharge Out (Sourcing Out, 2 Amps Max.)
9	Output #3	Cafs ON signal ON in either Dry or Wet modes. Output stays ON if valve is open or closed (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f` t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w`n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f`f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Unused)
19	Switch Input #7	(Osc. Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Unpark/P`a`r`k`) Connect to +Bat for Right, to –Bat for Left (Deploy/S`t`o`w`)
21	Switch Input #9	(Cafs Dry/Water/Cafs Wet) Connect to +Bat for Cafs Dry, -Bat for Cafs Wet, N.C. for Water
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-509 for up to date details.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Switch Panel LED (Sourcing Out, 2 Amps Max.)
8	Output #2	Discharge Out (Sourcing Out, 2 Amps Max.)
9	Output #3	Unused (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f` t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w` n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f` f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Unused)
19	Switch Input #7	(Oscillation Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Unpark/P`a`r`k`) Connect to +Bat for Right, to –Bat for Left (Deploy/S`t`o`w`)
21	Switch Input #9	(Unused)
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-508 for up to date details.

CHAPTER 7

REVISIONS

Revision 0, October 2010: Initial Release.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Switch Panel LED (Sourcing Out, 2 Amps Max.)
8	Output #2	Discharge Out (Sourcing Out, 2 Amps Max.)
9	Output #3	Unused (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f` t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w` n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f` f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Unused)
19	Switch Input #7	(Oscillation Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Unpark/P`a`r`k`) Connect to +Bat for Right, to –Bat for Left (Deploy/S`t`o`w`)
21	Switch Input #9	(Unused)
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-508 for up to date details.

CONNECTOR – J1		
Pin	Function	Configuration
1	Vehicle Battery +	Vehicle Battery +
2	Vehicle Battery -	Chassis/Ground/Negative
3	Aux. Battery + (Optional)	Positive
4	Aux. Battery - (Optional)	Negative
5	H-Bridge – Axis 5	(On) Discharge moves on when pin 5 positive with respect to pin 6
6		(Off) Discharge moves off when pin 6 positive with respect to pin 5
7	Output #1	Switch Panel LED (Sourcing Out, 2 Amps Max.)
8	Output #2	Discharge Out (Sourcing Out, 2 Amps Max.)
9	Output #3	Cafs ON signal ON in either Dry or Wet modes. Output stays ON if valve is open or closed (Sourcing Out, 2 Amps Max.)
10	Bistable Relay Contact Output (Form C)	Common
11		N.O. Contact (1 Amp Max.) Connected to pin 10 when Parked (Stowed)
12		N.C. Contact (1 Amp Max.) Connected to pin 10 when Unparked (Deployed)
13	Switch Input #1	(Enable) Connect to +Bat. Or –Bat. Disconnect to Disable
14	Switch Input #2	(Master Right/L`e`f` t`) Connect to +Bat for Right, to –Bat for Left (Rotation)
15	Switch Input #3	(Master Up/D`o`w` n`) Connect to +Bat for Up, to –Bat for Down (Elevation)
16	Switch Input #4	(Master Stream/F`o`g`) Connect to +Bat for Stream, to –Bat for Fog (Pattern)
17	Switch Input #5	(Discharge On/O`f` f`) Connect to +Bat for On, to –Bat, or N.C. for Off
18	Switch Input #6	(Unused)
19	Switch Input #7	(Osc. Set/P`a`u`s`e`) Connect to +Bat for Set, to –Bat for Pause (Oscillation)
20	Switch Input #8	(Unpark/P`a`r`k`) Connect to +Bat for Right, to –Bat for Left (Deploy/S`t`o`w`)
21	Switch Input #9	(Cafs Dry/Water/Cafs Wet) Connect to +Bat for Cafs Dry, -Bat for Cafs Wet, N.C. for Water
22	Aux. Power Out	(Communications Power) (Aux. Power – 1 Amp)
23	CAN HI	Vehicle CAN – J1939 (optional)
24	CAN LO	Vehicle CAN – J1939 (optional)
25	Common	(Communications Power) (Common – Ground)
26	CAN HI	(Unused)
27	CAN LO	(Unused)
28	DATA +	DATA B(+) RS-485 (Optional)
29	DATA -	DATA A(-) RS-485 (Optional)

NOTE: It is always best to consult the control drawing D-1032-509 for up to date details.

NOTES:



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