



Digitally Controlled Water Distribution System (DCWDS) User, Maintenance & Troubleshooting Manual



Including Service Parts and Schematics



Digitally Controlled Water Distribution System (DCWDS) User & Maintenance Manual



For application with:
DCWDS G2 SYSTEM – LEVEL 1

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DCWDS Overview

Open Loop Energy's DCWDS is a variable water spray system designed for large mining water trucks. Its main purpose is to control the amount of water pumped onto the road based on the ground speed of the water truck. As the truck accelerates, the water pump will increase the flow rate, and as the truck decelerates, the water pump will decrease the flow rate.

The G2 system also controls additional water truck related functions such as sprayers, water cannon (monitor), lights, drains, and other auxiliary functions.

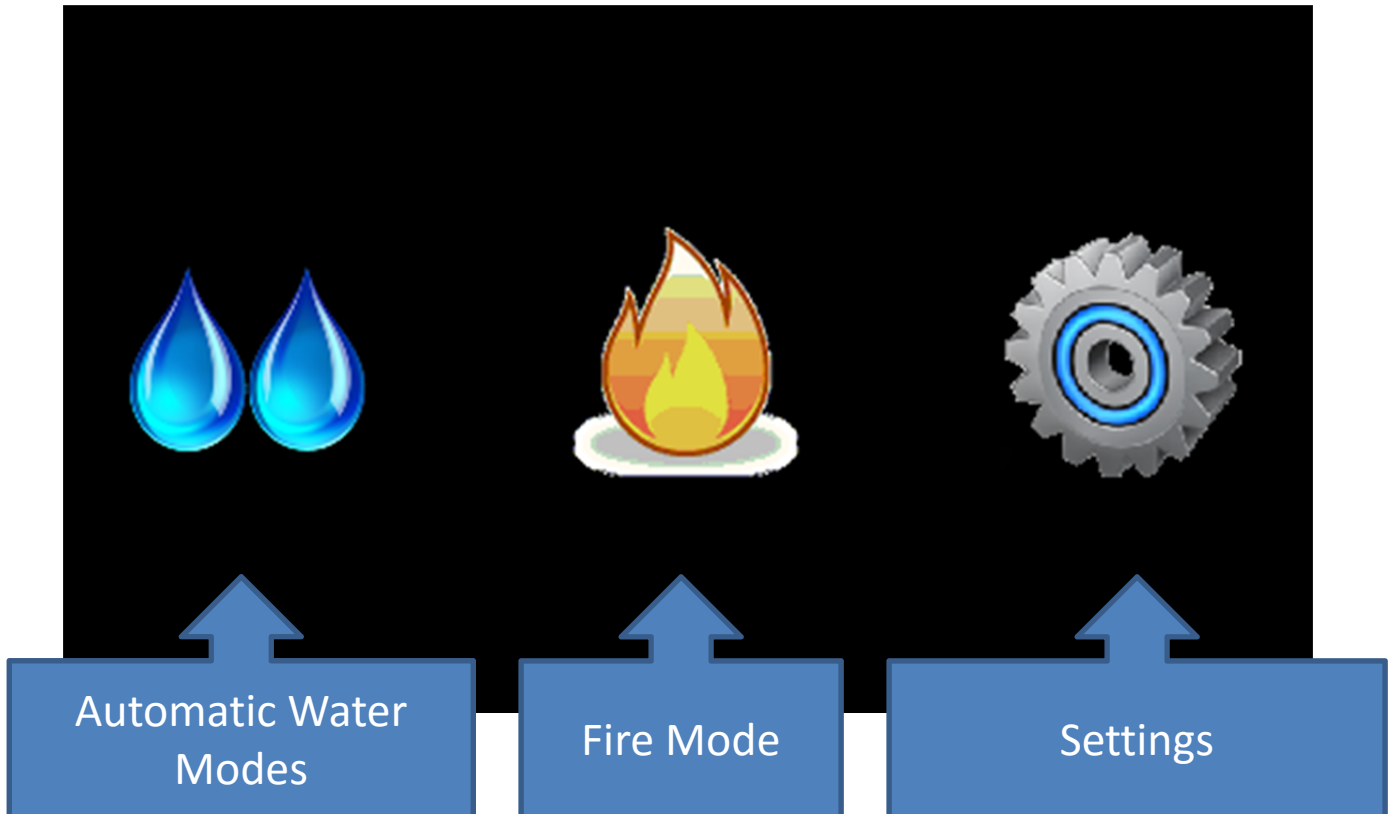
All functions on the control console are touch screen sensitive. There is also a rotary encoder, and an external joystick to control the water cannon functions.

G2 Level 1 - Basic Platform

- Stand alone
- CAN BUS (J1939)
- Expandable
- Faster, higher resolution screen
- Reduced wiring
- Custom programming for Mine Profile

Getting Started

Main or Home Screen



Automatic Water Modes: Continuous Spray, Intermittent Spray, Checker and Zig Zag Pattern Spray – *Ground speed sensitive*

Fire Mode: *Not relative to ground speed.* The water is manually adjustable and all water cannon controls are available as well as all rear sprayers button

****To enter a watering mode, touch the screen on the mode you would like to enter (Automatic or Fire)**

Settings: To set-up water truck specific information during initial installations or during a touch screen replacement

Automatic Watering Modes

There are four types of watering modes that can be selected while in watering mode: **Continuous, Intermittent, Checker and Zigzag**

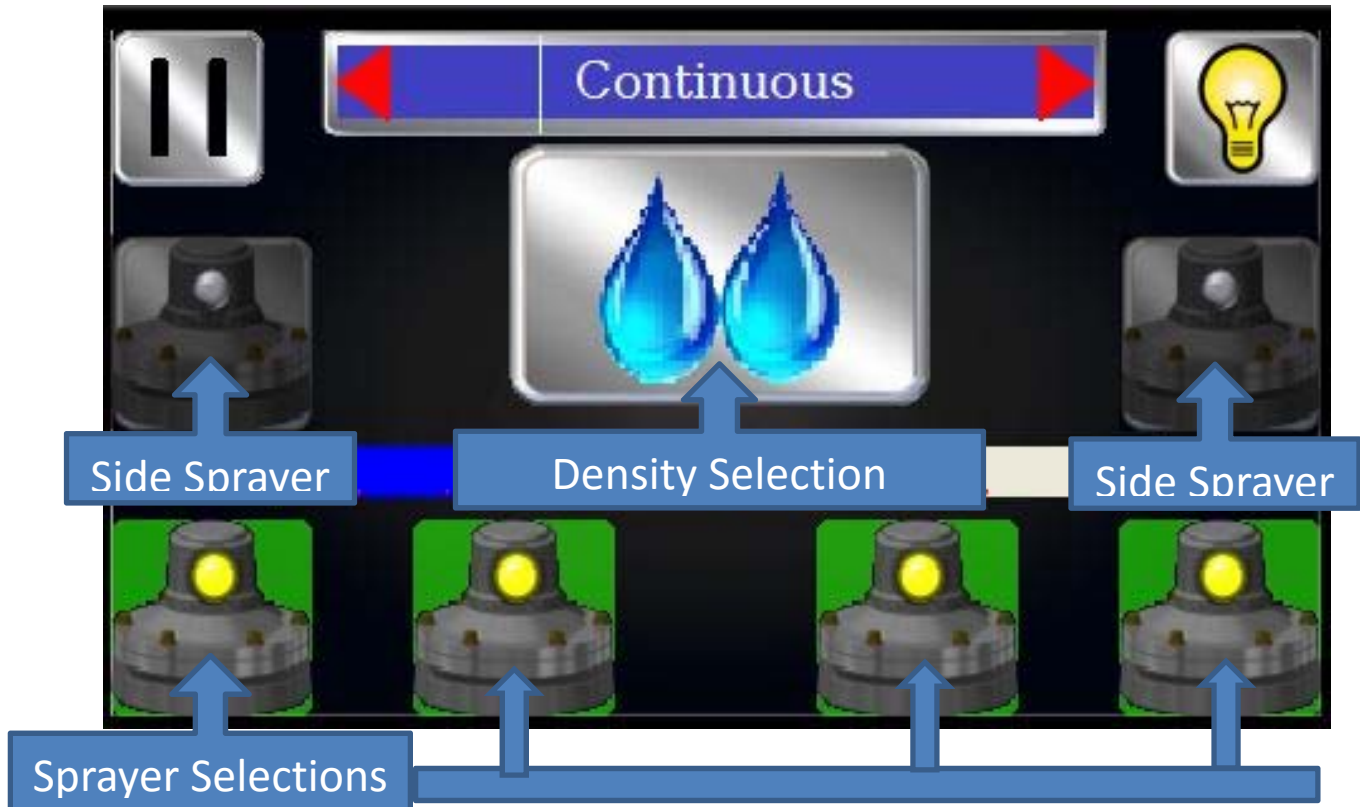
When you first enter watering mode, continuous is default. You can change watering types by touching the top of the screen near the blue bar. Touch the screen again to enter the next possible watering type.





Automatic Watering Modes

CONTINUOUS



Description:

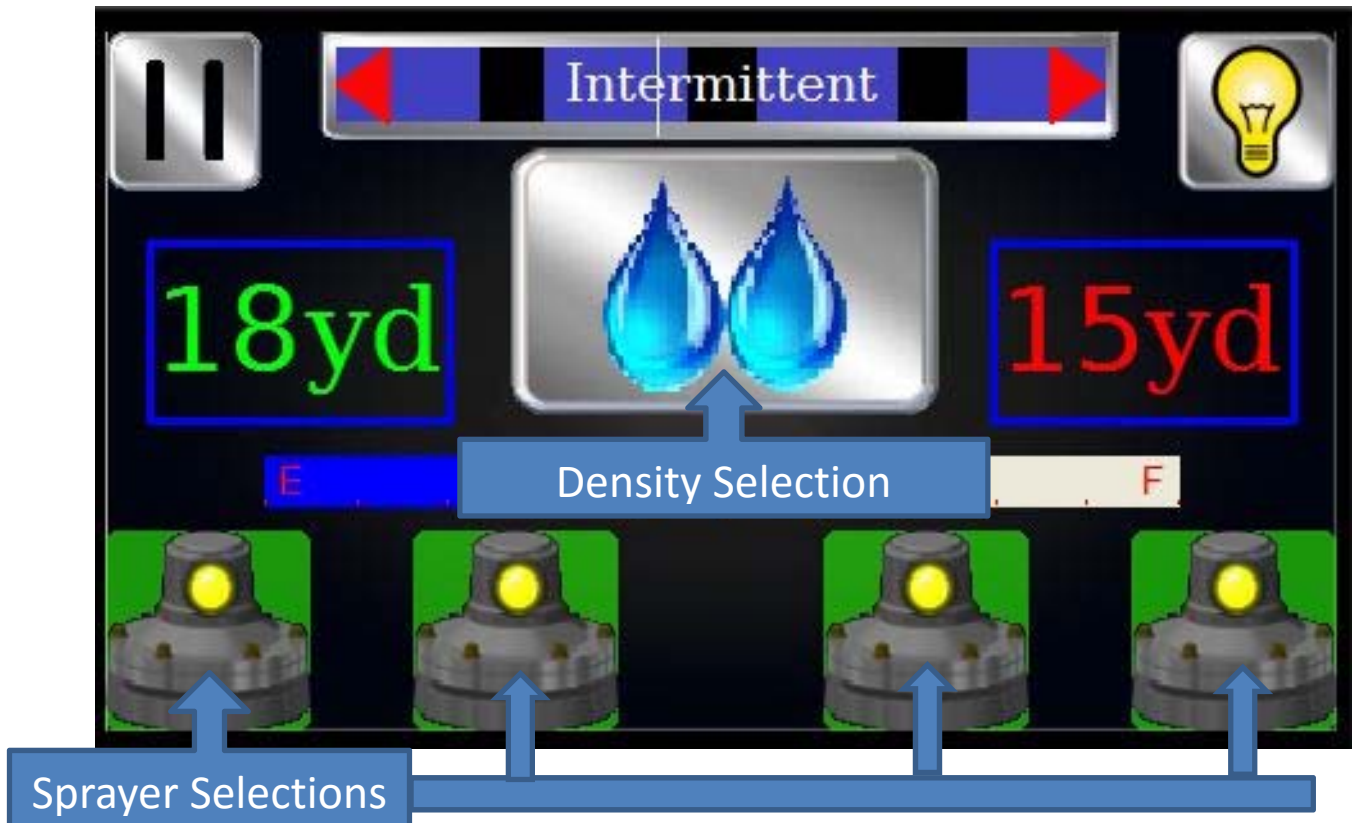
Continuous mode is for continuous spray using a selection of rear and/or side sprayers. Continuous spray is in relation to ground speed so the water flow will be automatically adjusted based on the ground speed of the vehicle.

The water droplet icons in the center of the screen indicate the density selection. The DCWDS has three possible density application selections:
Light (one droplet), Medium (two droplets), Heavy (three droplets).

You can change this selection by touching the screen on the water droplets. Touch again to cycle to the next higher selection. This selection will remain until it is changed by the operator regardless of power or reboots.

Automatic Watering Modes

INTERMITTENT



Description:

Intermittent mode will automatically spray an intermittent pattern on the roadway based on distance for the pattern. Intermittent is also relative to the ground speed of the vehicle and will automatically adjust water output based on the ground speed.

Automatic Watering Modes

INTERMITTENT

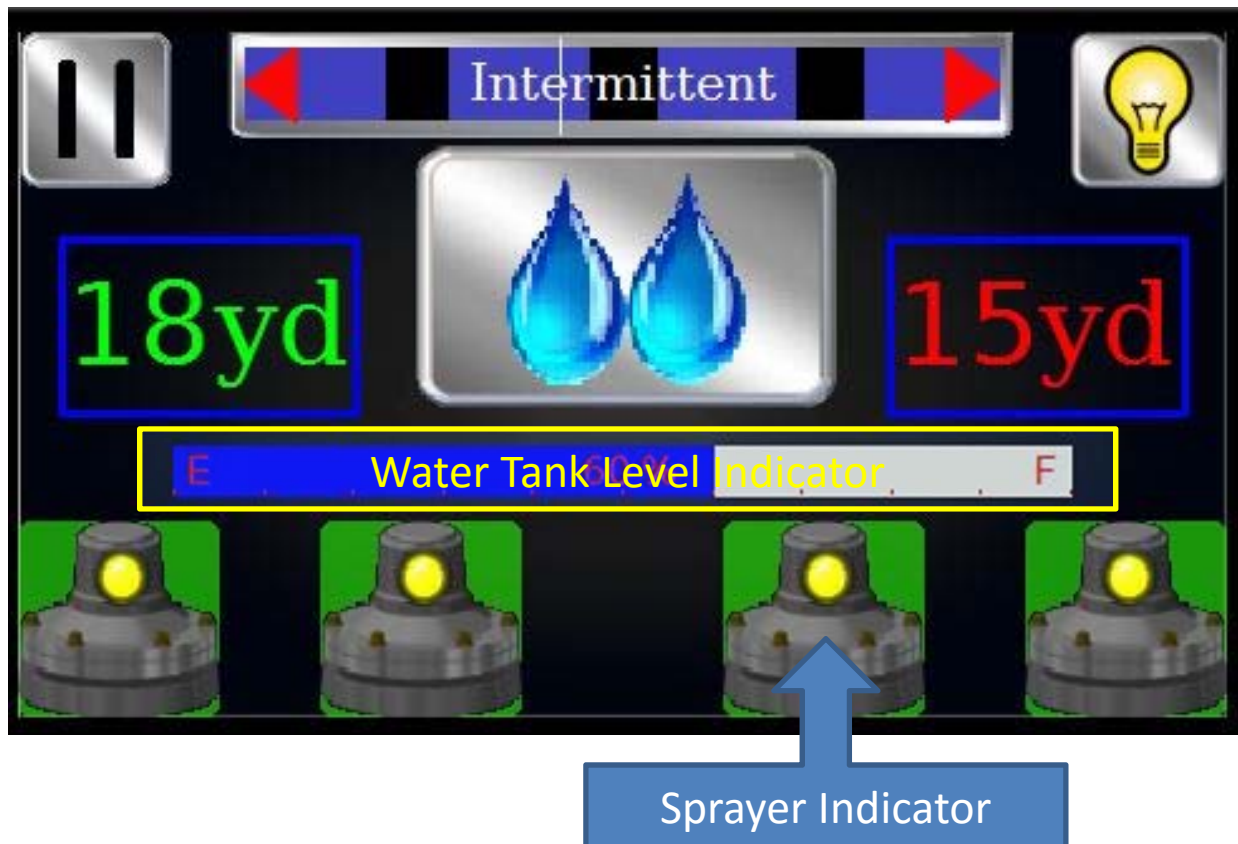


The intermittent spray pattern can be adjusted in yards or meters using the green and red values shown above. To adjust the values for distance ON (green) or distance OFF (red), touch the value you would like to adjust, and then turn the encoder knob on the upper right hand side of the screen. When you reach the value you would like to use, press the encoder knob to confirm.



Automatic Watering Modes

INTERMITTENT

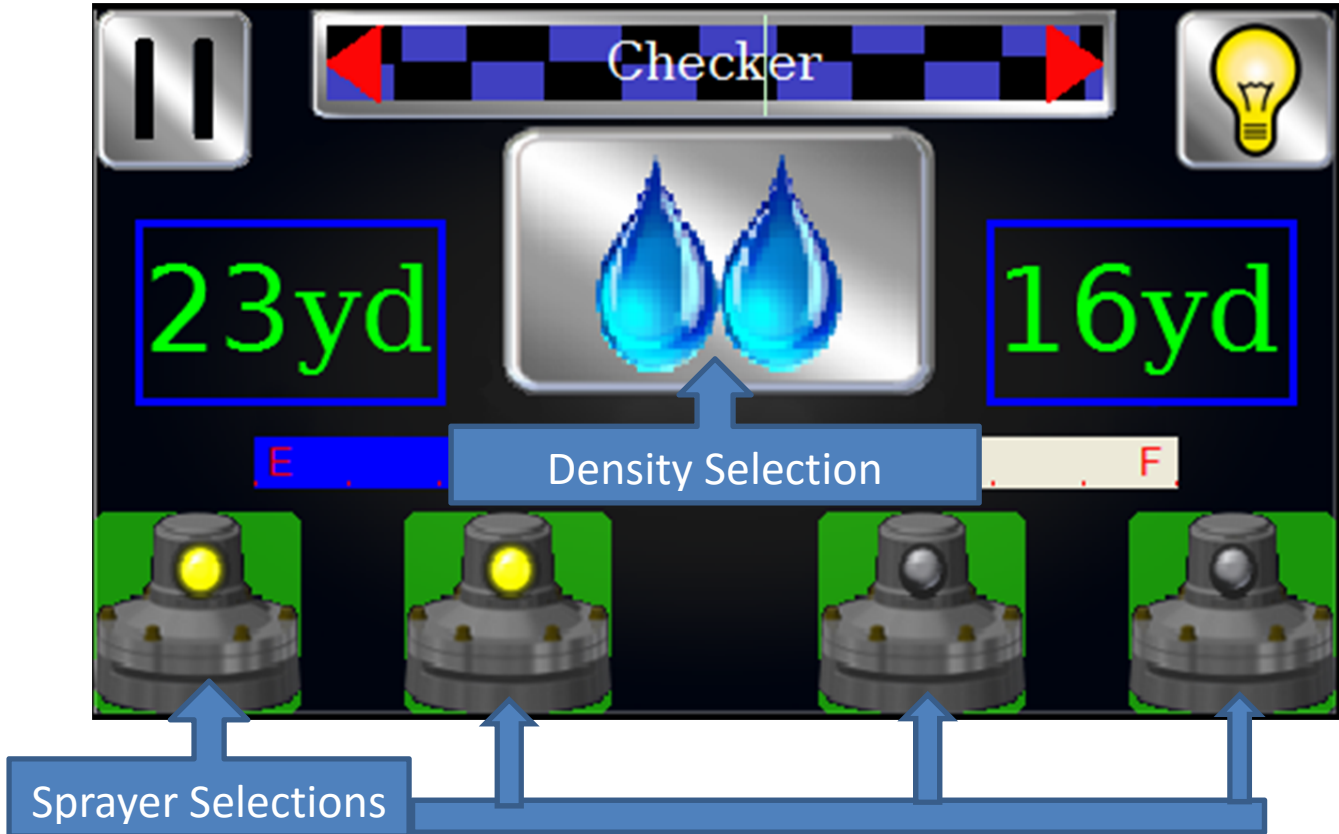


There is also a water tank level sensor installed with the DCWD System that displays the approximate water level remaining in the tank.

The yellow indicator light shown above indicates whether a sprayer is currently activated or not during the intermittent spray pattern.

Automatic Watering Modes

CHECKER



Description:

Checker mode will automatically spray a checker board pattern on the roadway based on distance for the pattern. Checker is also relative to the ground speed of the vehicle and will automatically adjust water output based on the groundspeed.

Automatic Watering Modes

CHECKER

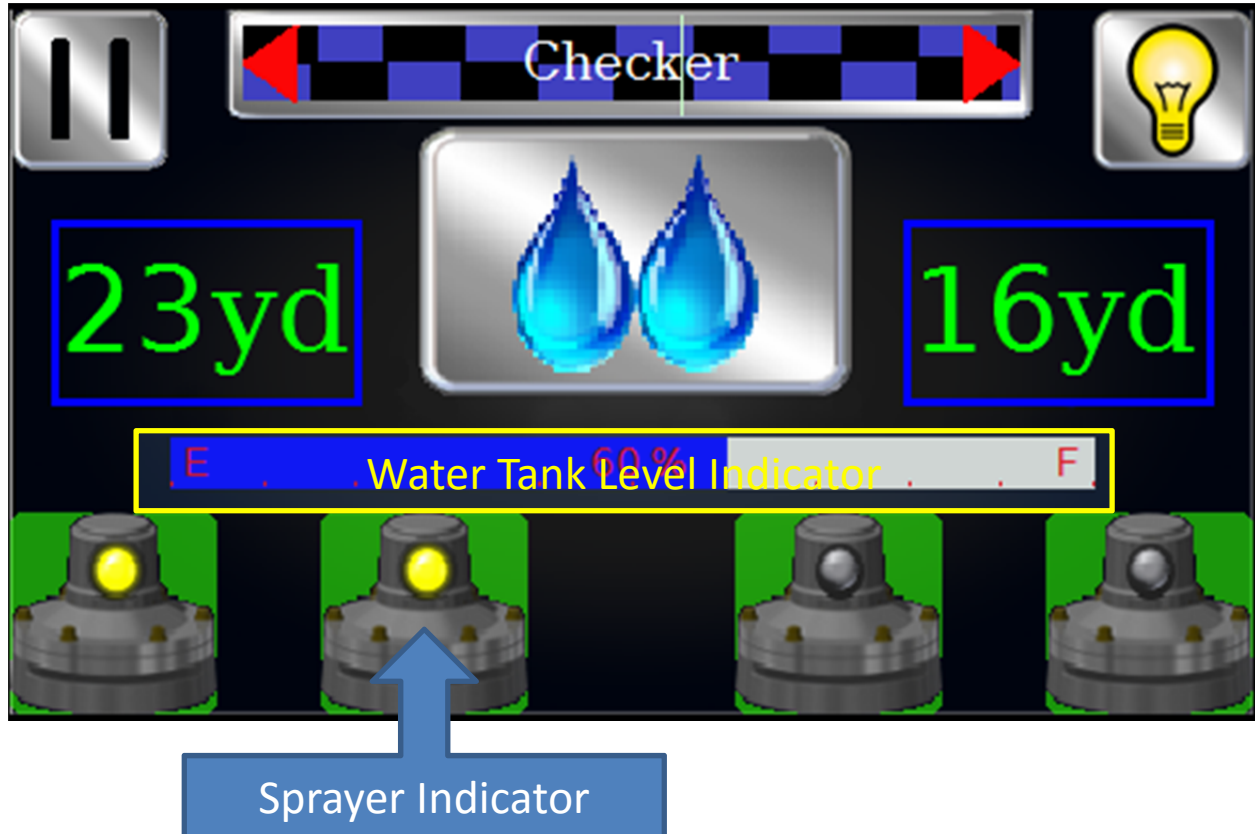


The checker board spray pattern can be adjusted in yards or meters using the green values shown above. To adjust the values for distance LEFT or distance RIGHT, touch the value you would like to adjust, and then turn the encoder knob on the upper right hand side of the screen. When you reach the value you would like to use, press the encoder knob to confirm. Note: Values in Green are the distance the water will spray on the respective side of the vehicle.



Automatic Watering Modes

CHECKER

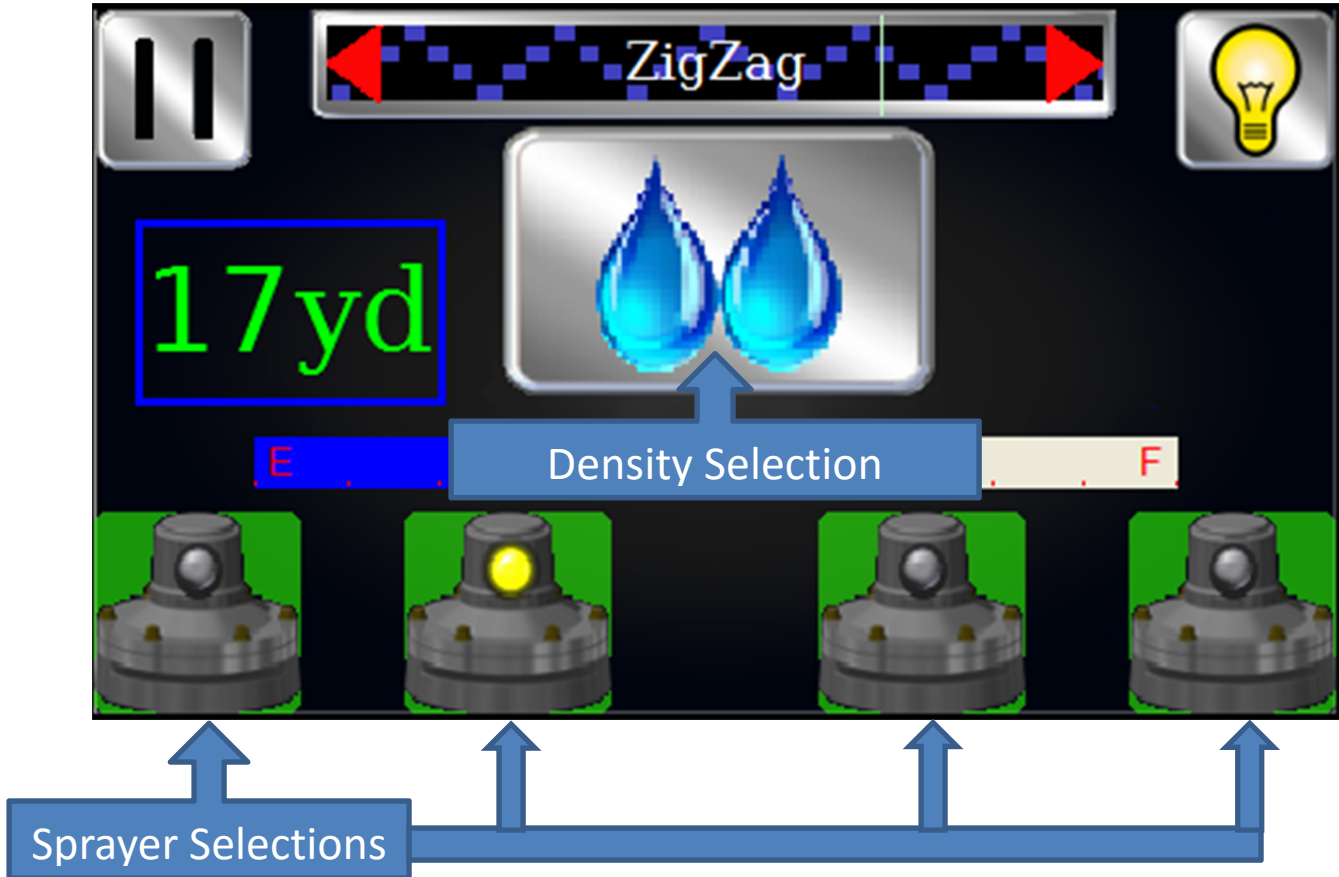


There is also a water tank level sensor installed with the DCWD System that displays the approximate water level remaining in the tank.

The yellow indicator light shown above indicates whether a sprayer is currently activated or not during the checker board spray pattern. In this example, the left side is active and the right side is not active.

Automatic Watering Modes

ZIG-ZAG

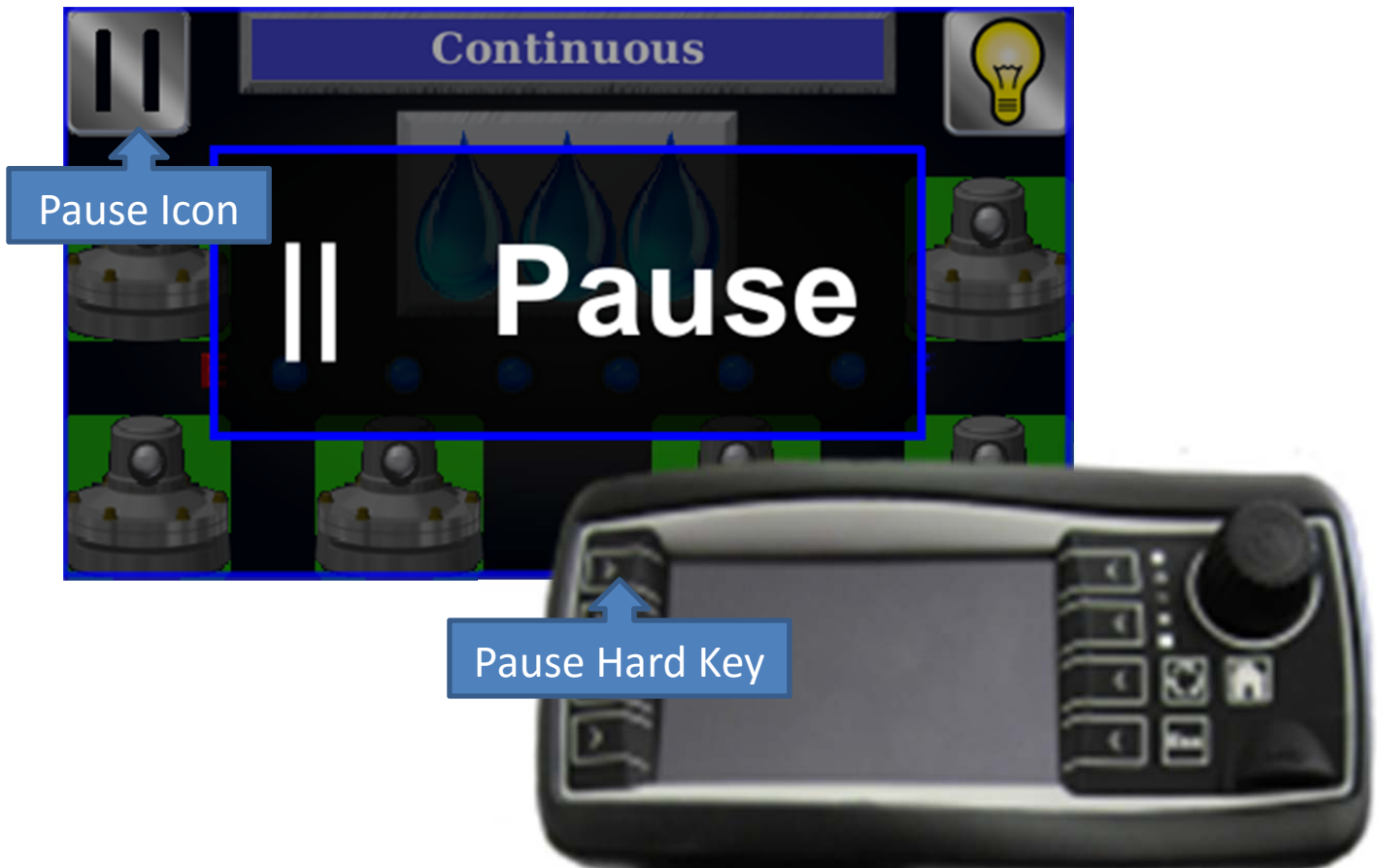


Description:

Zigzag mode will automatically spray a Zigzag pattern on the roadway based on distance for the pattern. This mode will sequentially cycle through each sprayer one at a time to create a Zigzag pattern. Zigzag is also relative to the ground speed of the vehicle and will automatically adjust water output based on the ground speed.

Automatic Watering Modes

PAUSE



During operation of any Automatic Water Mode you can pause watering which stops all sprayers from spraying water until you touch the screen enabling normal operation again.

You can pause at any time by pressing the pause icon in the upper left corner of the touch screen or by pressing the hard key next to the icon.

Pressing the pause icon on the touch screen or the hard key next to the icon will resume normal operation as well.

Auxiliary Functions



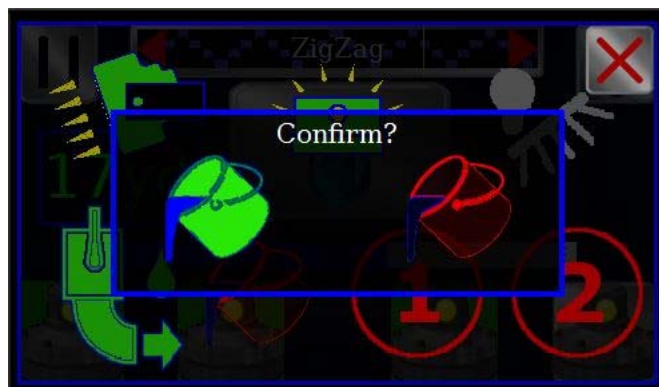
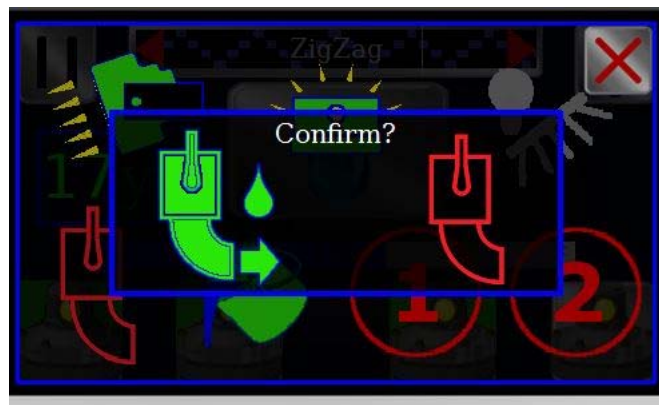
During operation of any Automatic Water Mode, or Fire Mode you can enter the auxiliary functions screen.

You can enter the auxiliary functions screen at any time by pressing the Auxiliary icon, or by pressing the Auxiliary hard key next to the icon from home screen.

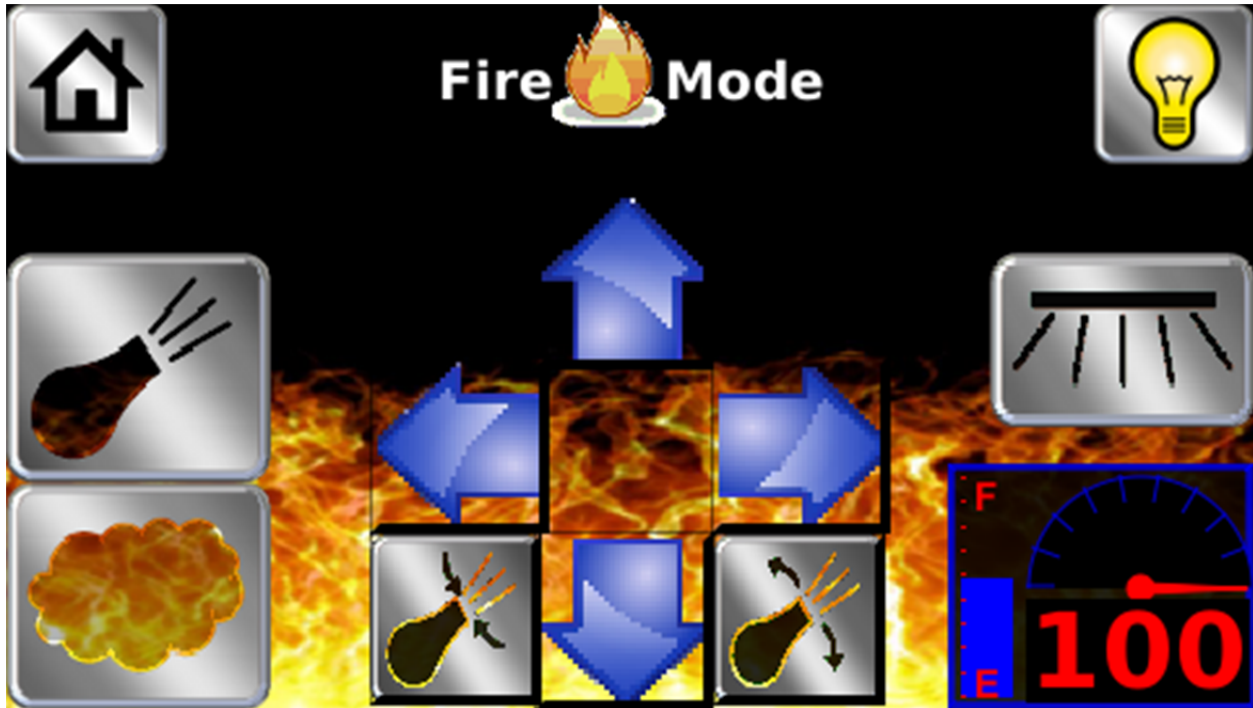
Pressing the Auxiliary icon on the touch screen or the hard key next to the icon will resume normal operation.

Pressing the auxiliary hard key while in the home screen will allow activation of auxiliary functions from the home screen.

Auxiliary Functions



Fire Mode



Water pump output indication in percent

Description:

Fire mode is used when operating the water cannon/monitor, or when ground speed based watering is not desired. There is an option to use the water cannon/monitor, firefighting foam with the cannon, and all rear sprayers. The water output is controlled using engine RPM and the joystick encoder to adjust water flow up or down.

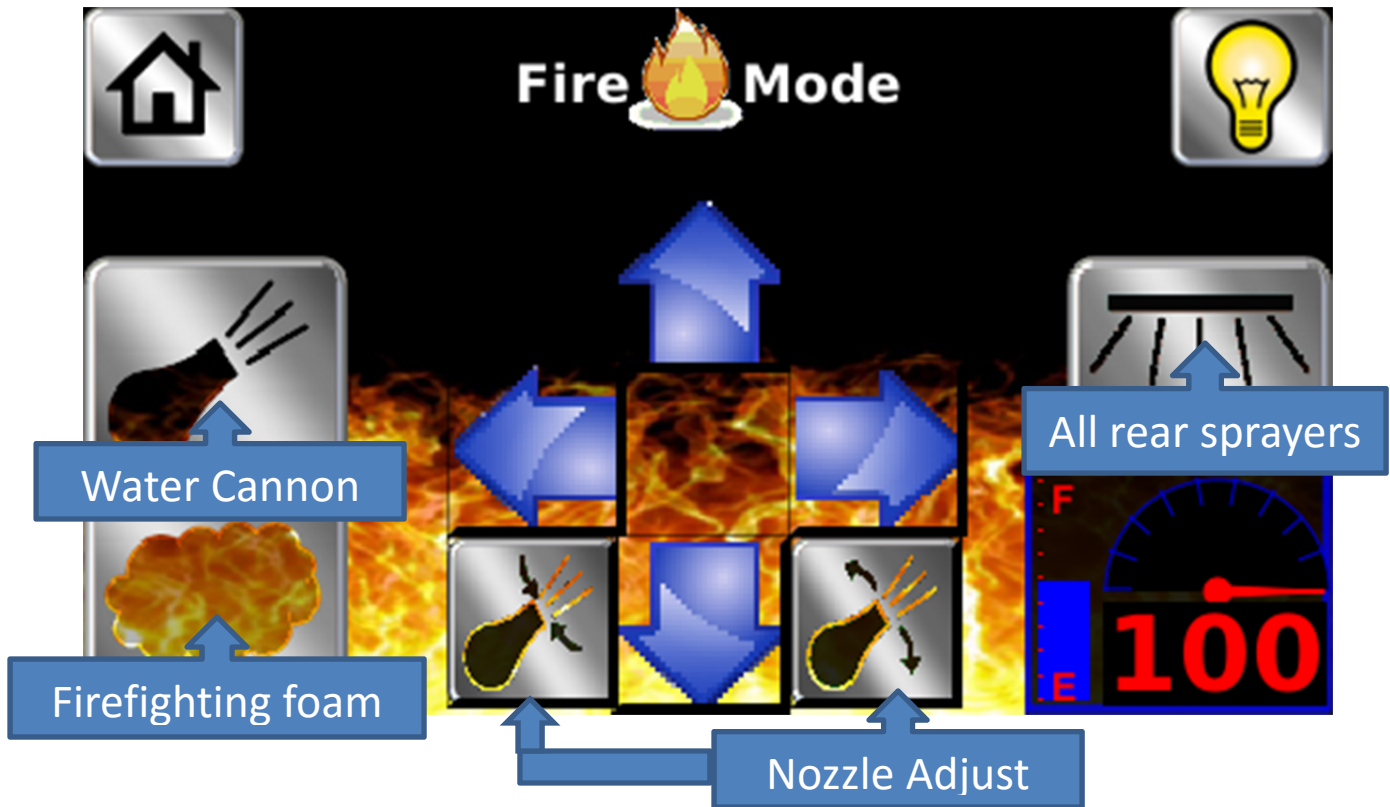
The joystick is used to move the water cannon/monitor, and also rotates to adjust the water flow which is indicated on the touch screen as a gauge.

The water cannon/monitor can also be moved using the touch screen arrows shown above.



Encoder Knob

Fire Mode



On the fire mode screen, you can activate the water cannon/monitor by touching the icon.

You can also activate all rear sprayers and firefighting foam by touching the respective icons shown above. When active, the center of the icon will illuminate in green.

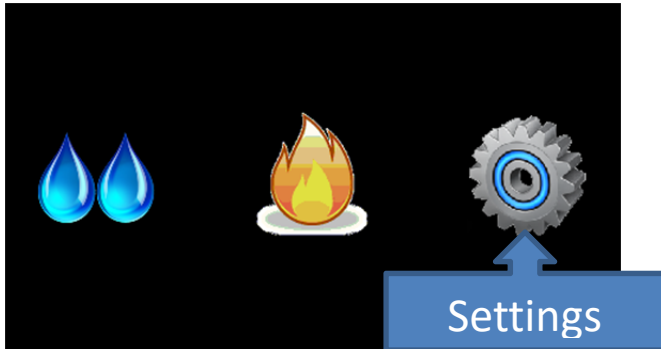
In this example all rear sprayers are active.

Cannon/Monitor, All rear sprayers, and Foam can all be activated using the keypad on the joystick. When activated using the joystick keypad, the icons on the touch screen will illuminate in green.

Joystick Keypad



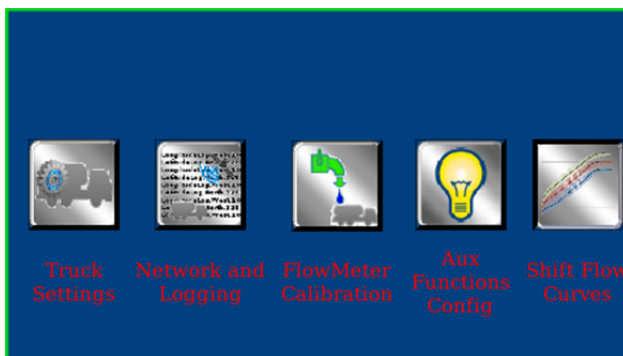
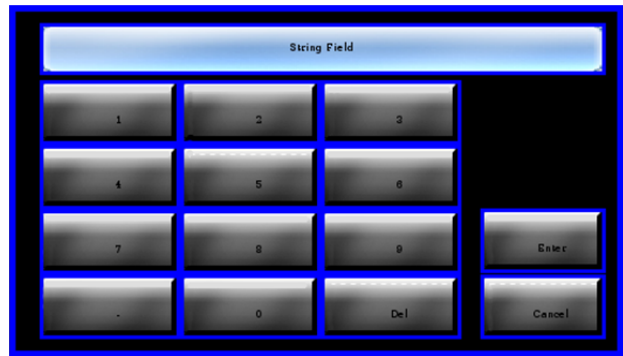
Settings



To enter settings pages touch the gear icon on the home screen.

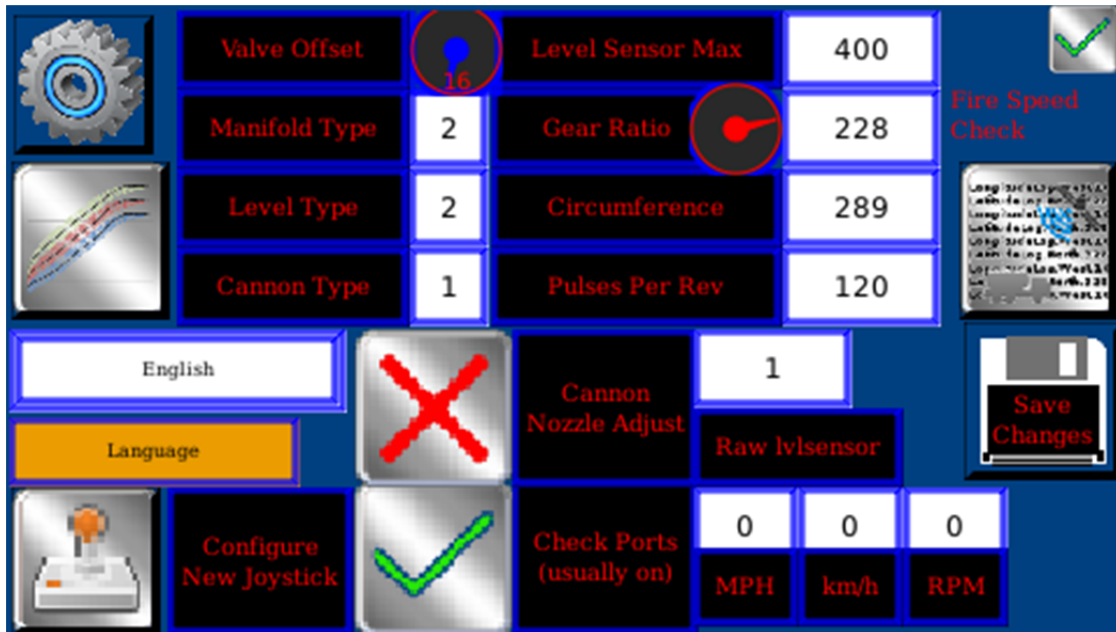
You will then have to enter the Pin Number to gain access to the settings screen and touch the “enter” button to proceed.

NOTE: If you type the wrong Pin Number You will automatically return to the home screen.



Once in the settings screen you have several options:
 Truck Settings, Network and Logging, Flow Meter Calibration
 Aux Functions Config and Shift Flow Curves.

Truck Settings

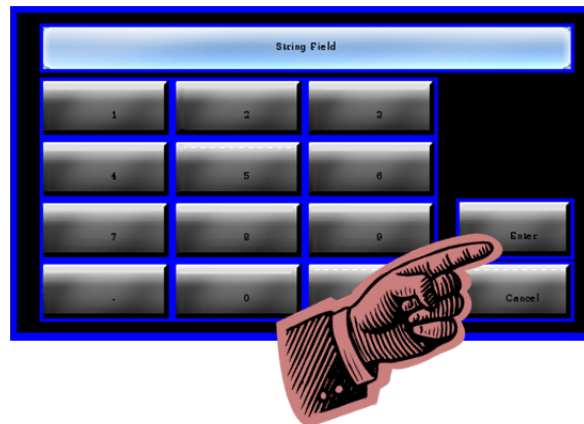


Truck settings are usually for installation technicians setting up a system for the first time. However, if a new touch screen or joystick is installed, the truck settings may need to be input here.

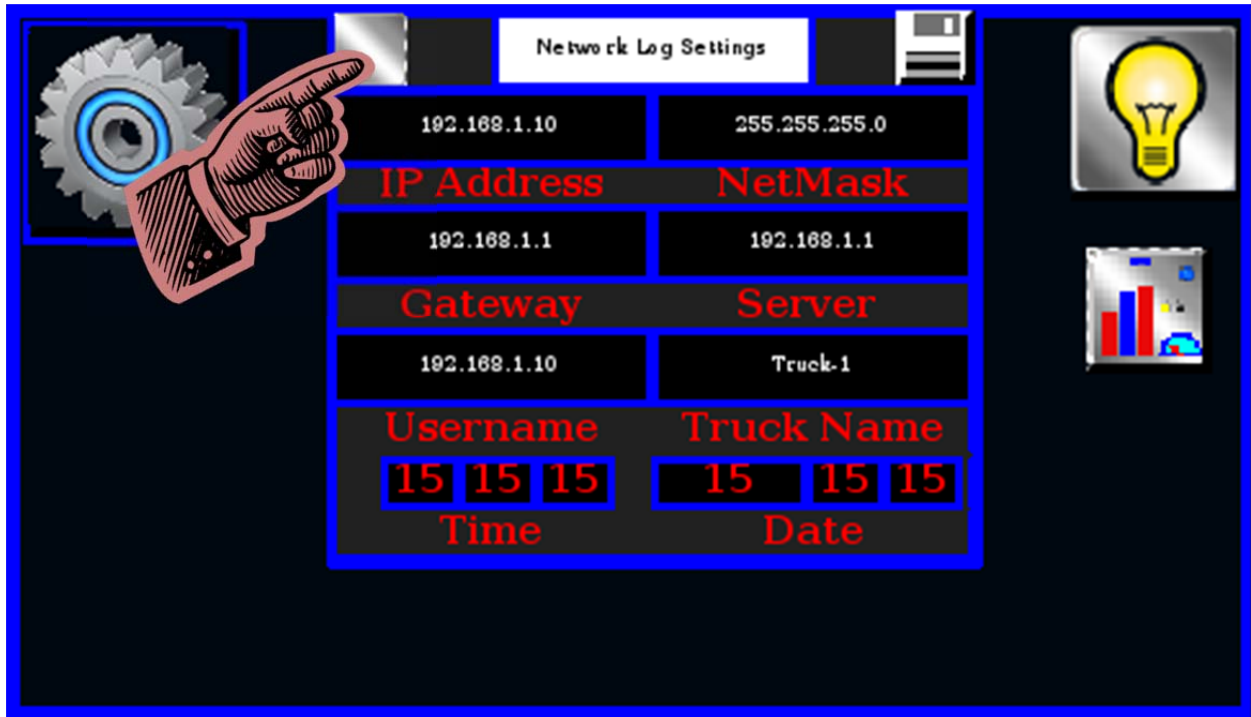
After installing a new joystick, press the joystick icon on this page for 1-2 seconds to configure and connect with the new joystick.

For the settings required, please contact Open Loop Energy for more information.

To change a value for each setting, touch the number field next to the appropriate label. A numeric keypad will pop up for you to enter the value required. After you have entered the correct value, touch the enter button on the screen.



Network and Logging Settings

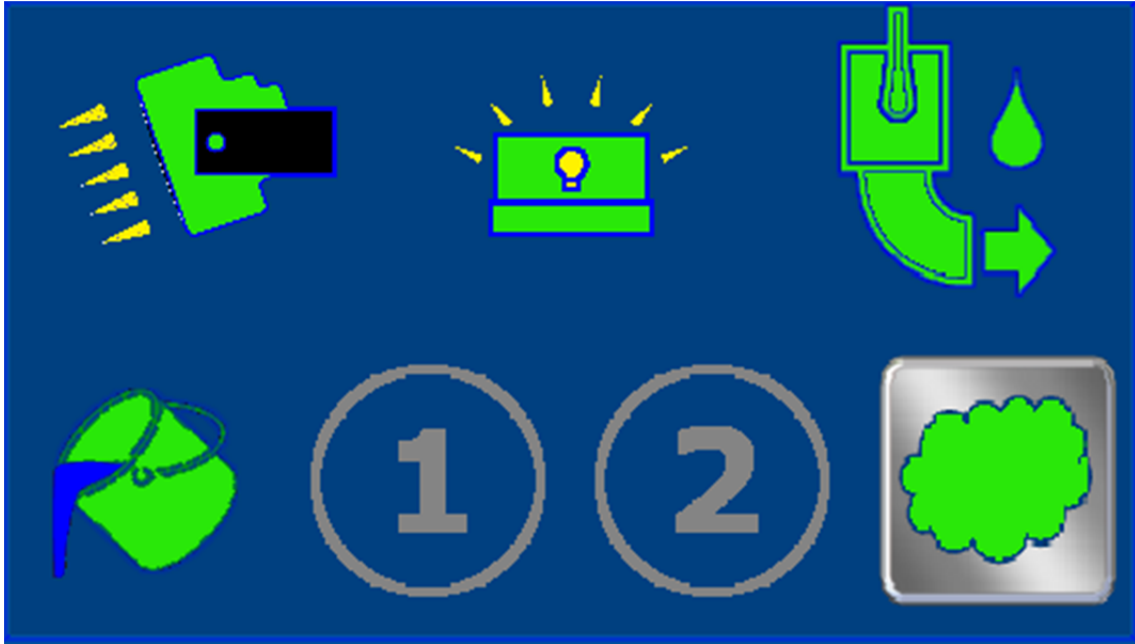


In this screen, Data Logging can be enabled or disabled by touching the silver button to the left of the page title as shown above. If the logging function is enabled, there will be a green check mark on the silver button. If it is disabled, there will be nothing on the silver button as shown above.

The truck name field is used to name the log files if data logging is enabled. Equipment numbers or other short description may be entered here with a maximum length of 32 characters with no special characters. Dashes (-) and underscores (_) are ok to use for truck names.

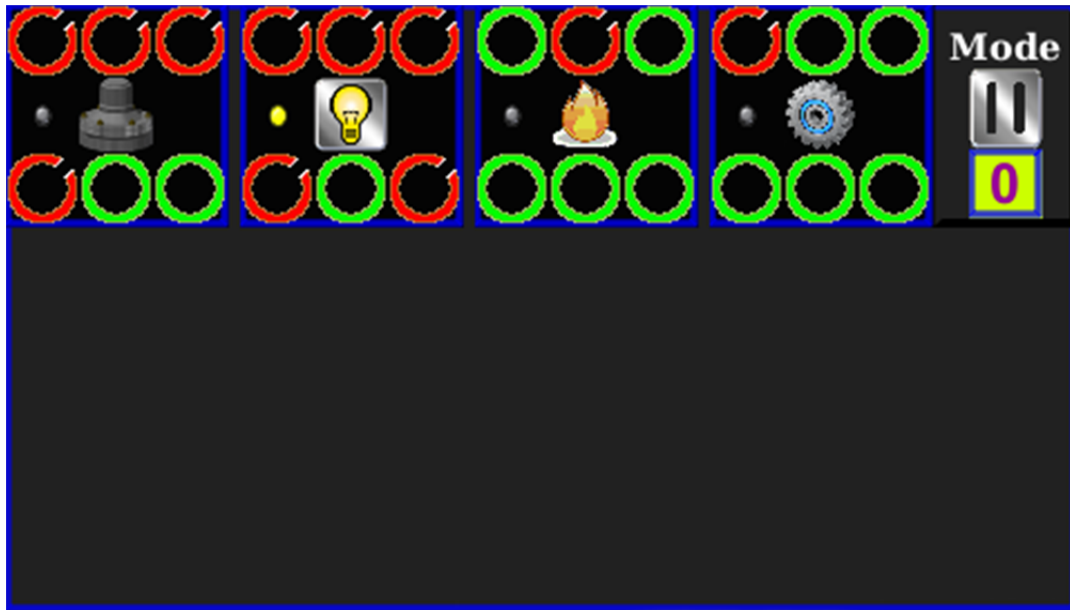
Please consult Open Loop Energy for more information about the network settings.

Aux Functions Configuration



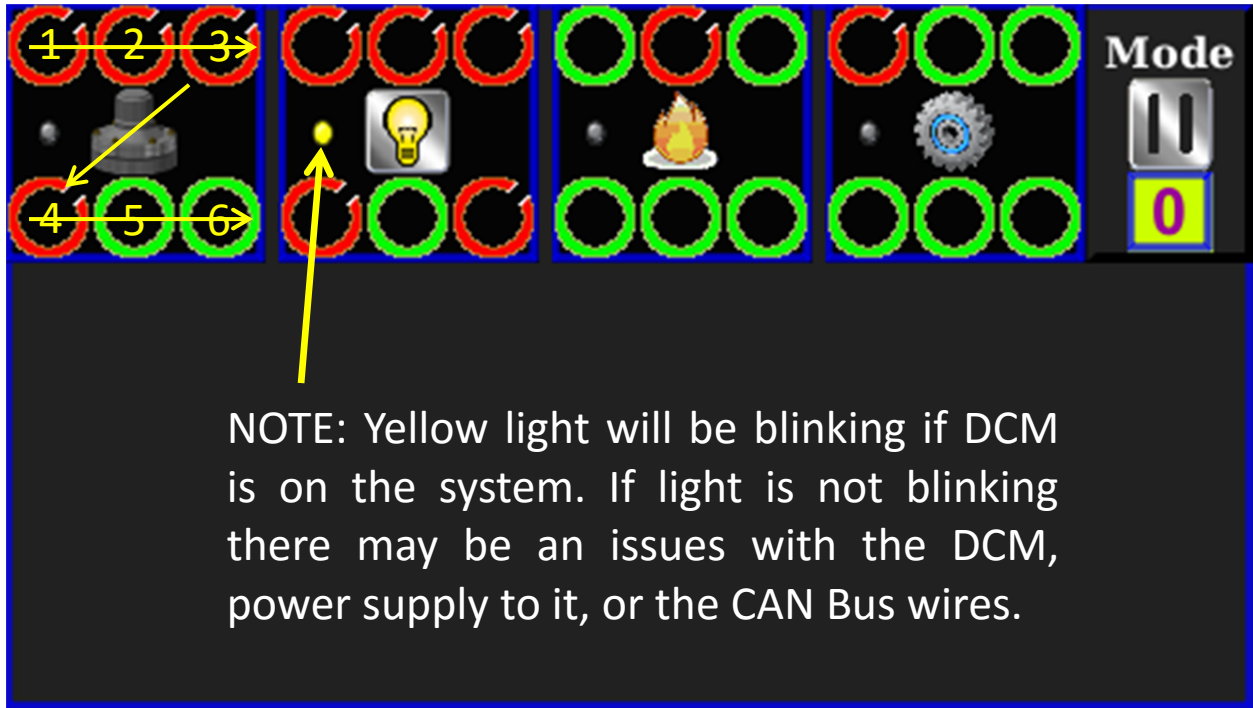
The aux functions configuration screen allows you to enable or disable auxiliary functions. Certain available outputs may be disabled when not in use, or for other reasons using this screen. When the icon is highlighted in green, it is enabled. If it is grey, the function is disabled and cannot be turned on by the operator. This helps to reduce confusion for operators by only showing the functions that are available to them in color.

Troubleshooting Screens




The troubleshooting screens are designed to give a maintenance person the ability to see errors, and test functions of the DCWD system without using the operator touch screens. These troubleshooting screens can be accessed using the lower left hard key next to the touch screen as shown above. The most inclusive troubleshooting screen as shown above can be accessed from the home screen.

Troubleshooting Screens

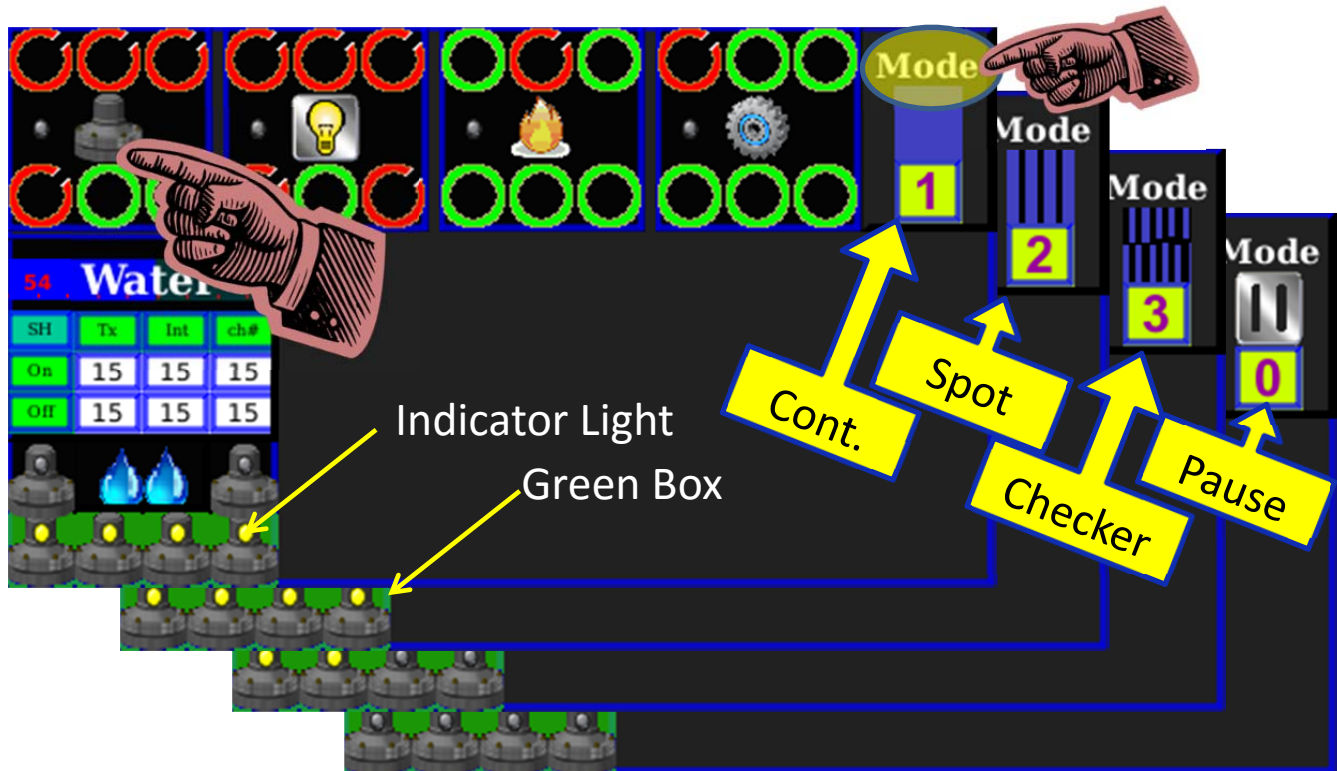


The above screen shot will appear once the hard key is pressed from the home screen. Each of the four blue boxes above represents the individual DCMs that are on the control network.

Internal to each box there are 6 circles; each represents the 6 outputs of the DCMs. Starting from the upper left circle and moving from left to right, the outputs are numbered from 1 to 6 as shown with the yellow arrows on DCM #1. The circles provide the user with information about the output connectivity. If the circle is complete and **green** then that circuit is complete. If the circle is not complete and **red** then the circuit is open. Not shown in this screen is what the circle looks like if there is a short; the circle will be complete and **red** with a diagonal line through the circle (similar to a no smoking sign ) .

NOTE: The output circles will show green in this screen at the onset of the system. A signal must be sent from the outputs before actual status of the connections are displayed.

Troubleshooting Screens



When touched, the blue boxes will provide more comprehensive information for troubleshooting. As indicated above, when the button for DCM #1 is pushed a menu pops up. From the pop up menu the spray heads can be controlled and the system can function in all modes (Continuous, Spot, Checker and Zigzag). In order to toggle between spray modes simply press the word “Mode” on the upper right hand portion of the screen.

In addition to mode control, the menu offers individual spray head control coupled with yellow indicator lights located on each spray head. The indicator lights provide verification that the heads are receiving a signal from the DCM. In order for the heads to turn on they must also be enabled by the touch. You will notice if the heads are enabled by a green box that outlines the head.

Troubleshooting Screens



When you press the second box for DCM #2 the corresponding menu will be enabled. This menu will allow you control of the auxiliary functions (drain BFV, dump bar, beacon lights, DCWD lights, etc.) as applicable. Under each function you will again find a yellow indicator light to show whether or not the function is receiving the proper signal from the DCM. If one presses a function and it turns green but the indicator light remains grey (off) then there is a connection issue with that function.

NOTE: No spray head control is offered using this menu.

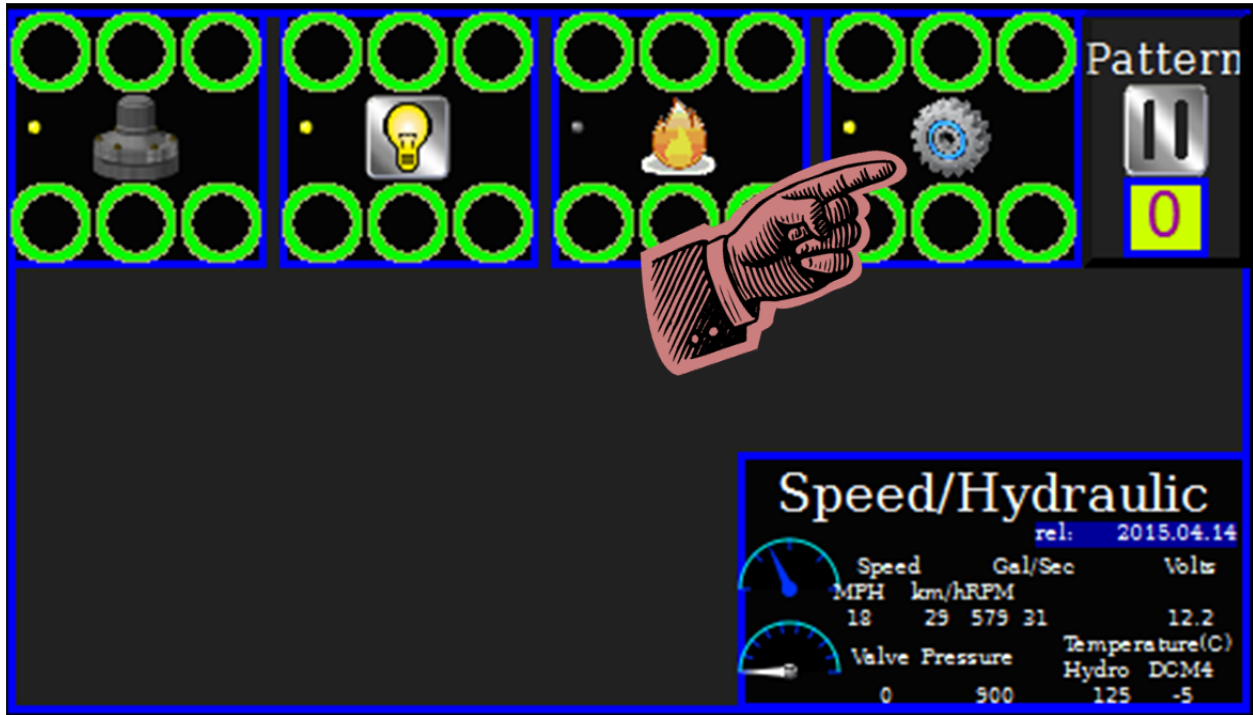
Troubleshooting Screens



The third box is for DCM #3. This menu will provide control over fire mode. It is important to note that the system spray will be paused once the third box is pressed. In order to enable control the word “FireControl” must be pressed toward the center portion of the screen.

Once control is enabled you can cycle through all functions of fire mode: cannon, foam (if applicable) and all rear heads. Another troubleshooting technique this menu provides is for the joystick controls. On each arrow (up, down, left, right) in the above snap shot there is an indicator light. You can verify that the joystick is transmitting the correct signal by moving the joystick in a desired direction and visually looking for the corresponding indicator light to illuminate. No indication means there is a broken or improper connection. If there is indication, but the cannon is not reacting properly then there is a mechanical issue outside of the system’s control.

Troubleshooting Screens



The final box is for DCM #4. After activating the menu you will see two separate gauges. The first gauge will show the ground speed of the truck in MPH. Since the system uses ground speed to control the spray of water it must maintain a speed signal at all times in order for proper system control. If you are in this menu while the truck is moving check to see if the speedometer on the dash and this gauge coincide. If no speed is noticed on the menu then there is a connection issue.

The second gauge is the hydraulic output value (from 0-100) based on user settings via the joystick encoder nob.

Troubleshooting Screens



The previous screen shots have shown the individual menus that each DCM related to. The above screen shot simply shows that you can enable all of the menus at one time and toggle between each one and their functions.

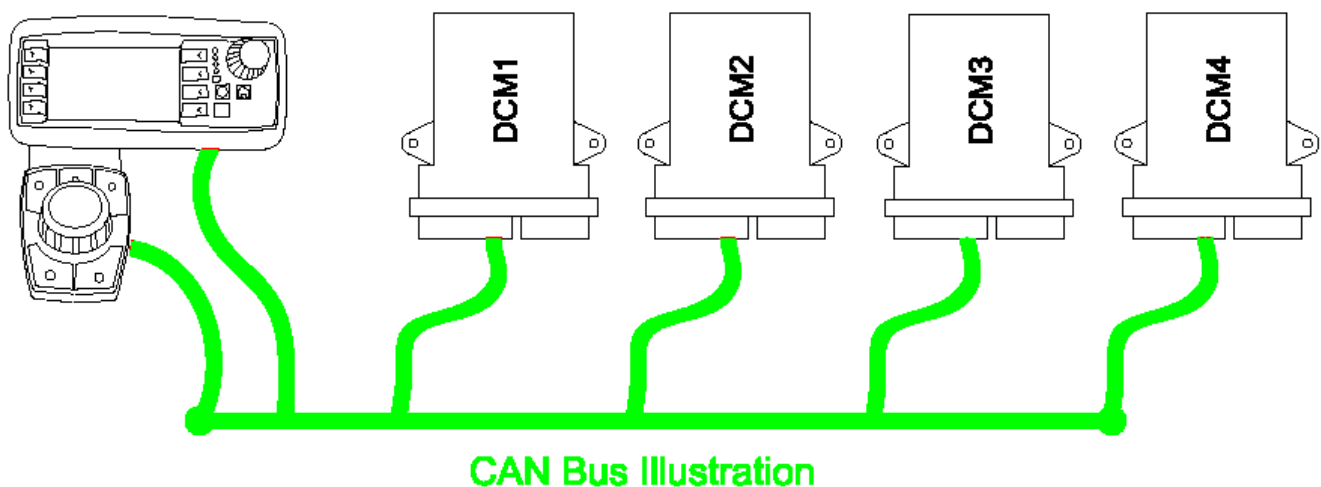
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Digitally Controlled Water Distribution (DCWD) System Description:

The Open Loop Energy DCWD G2 System uses hydraulics and electronics to control dust suppressing liquid output based on vehicle ground speed. Using a touch screen operator interface, three to five Digital Control Modules (DCMs), and a special hydraulic manifold, the system receives a speed signal from a sensor and controls liquid output based on the vehicle ground speed. The hydraulic manifold controls the water pump drive motor which varies the RPM of the water pump. All the functionality for the manifold, sprayers, water cannon, power drains, lights and other auxiliary functions are controlled by various DCMs located near their respective solenoid valves or relays. The DCMs, touch screen interface, and the water cannon joystick are all networked together using J1939 CAN Bus protocol to seamlessly integrate all the water truck controls together. The CAN Bus network utilizes a single two-wire cable tree to connect all the electronic controls while another three-wire cable tree supplies power and ground to all the electronic components. The power cable incorporates two isolated power feeds, one to power the DCMs and another to power auxiliary functions i.e. Lights that require high amperage.

Figure 1 shows the basic concept for the DCWD system using CAN Bus vehicle networking. Each DCM controls a group of system functions and is located as close as possible to the respective solenoids or control relays.

Fig. 1



DCM2 is an extension of DCM1 and is generally located in the same area as DCM1. DCM2 controls auxiliary functions such as: work lights, beacon light, power drain, power dump bar, and AUX1 and AUX2. AUX1 and AUX2 can be used to control any features that are non-standard on water trucks, or can be configured to control functions such as the water cannon butterfly valve if it is located near DCM2 rather than DCM3.

DCM3 is dedicated to the control of the water cannon generally installed on large mining water trucks. DCM3 controls the motion of the water cannon as well as optional features such as firefighting foam and the water cannon butterfly valve. DCM3 is generally located near the water cannon, but can be located in the tank front enclosure near DCMs 1 and 2 for electric water cannons.

DCM4 is used to control the variable hydraulic manifold generally located inside the vehicle frame near the transmission. DCM4 also receives input from the speed sensor generally located on the vehicle transmission as well as information from the filter condition switch. Speed-sensor-signal information and filter-condition information is relayed from DCM4 to DCM1 over the CAN Bus network.

Fig. 2 shows the basic concept for power feed on the DCWD system. The power feed follows the routing of the CAN Bus Network cable and is comprised of two independent power feed wires and a common ground wire. The power feed is split in its routing to feed DCM4 with power near the variable hydraulic manifold inside the frame. See figure 3 for a detail diagram on how the power wires are spliced using a sealed Splice-Pak connector. One power wire is used for the DCWD system DCMs and the other feeds power to the control relays that power lights, electric water cannons, and other auxiliary functions such as power drains and dump bars.

There are also two power wires that feed the Power Feed Box. One is connected to a constant power source from the vehicle battery, and the other is connected to an ignition-only power source. The only component that receives constant power from the vehicle battery is the touch screen user interface. All other components are fed power from the ignition-only power wire. The ignition-only power is divided into two wires that feed the DCMs and the auxiliary functions.

Fig. 2

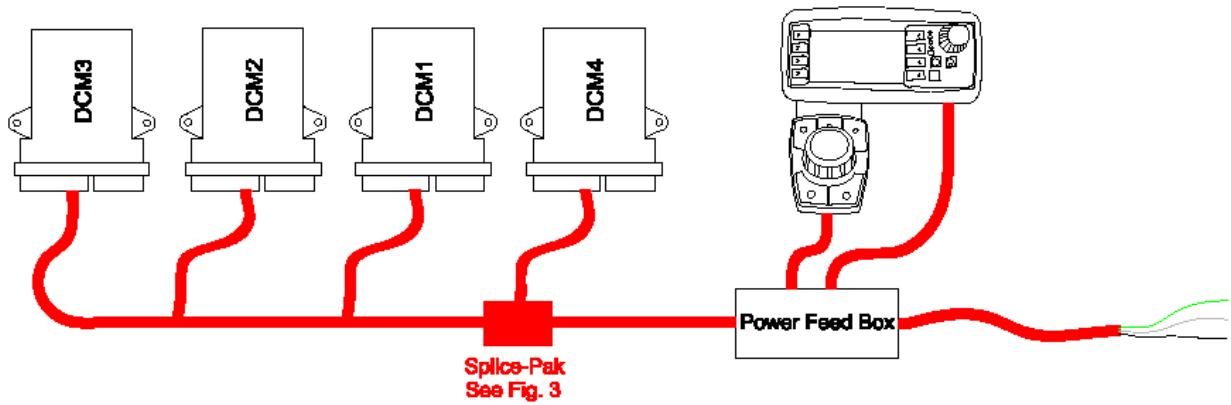


Fig. 3

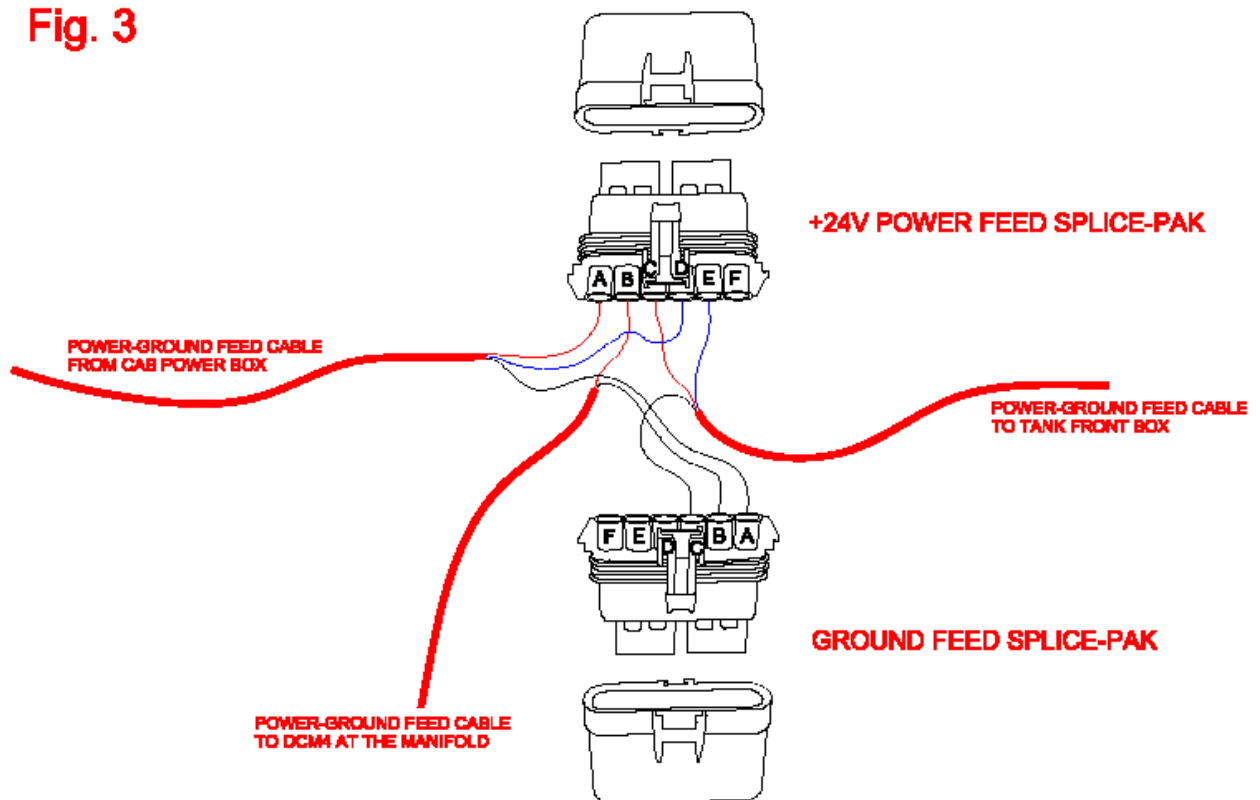


Fig. 4 shows the cable routing from the power feed box to the tank front box located on the front of the water tank.

Fig. 4

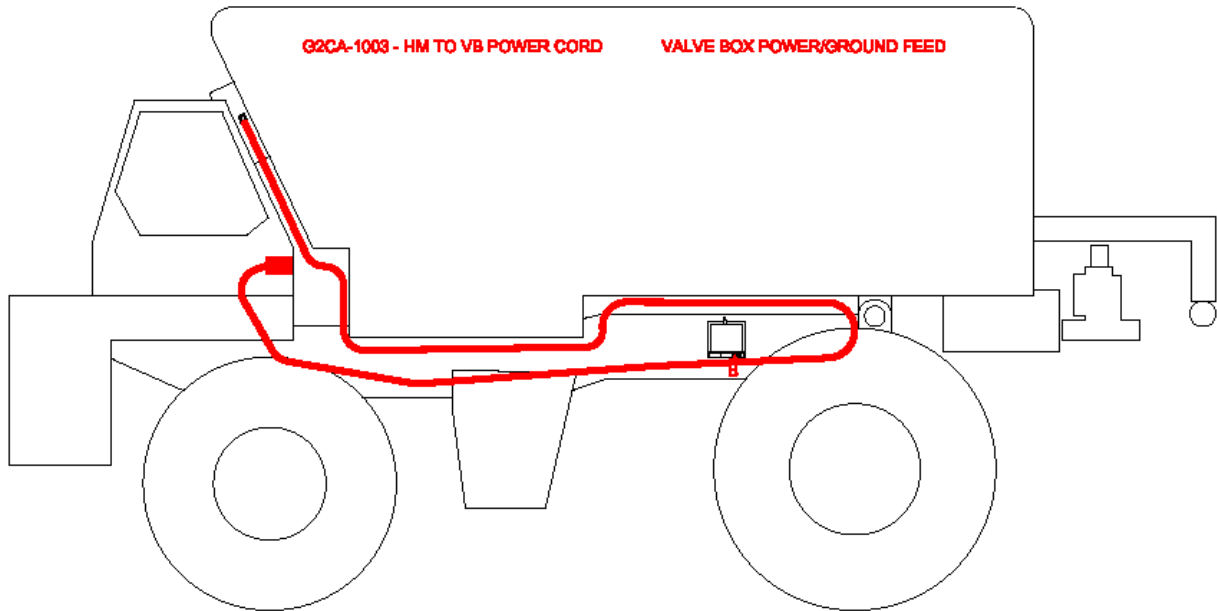


Fig. 5 shows the CAN Bus cable routing from the cab to the tank front box located on the front of the water tank.

Fig. 5

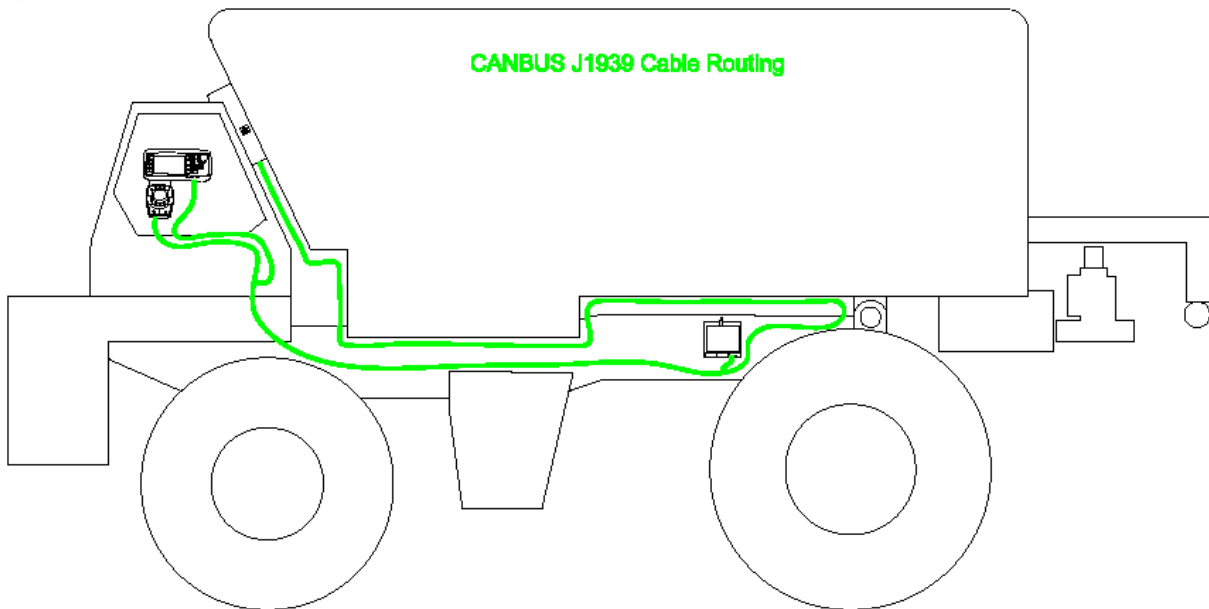
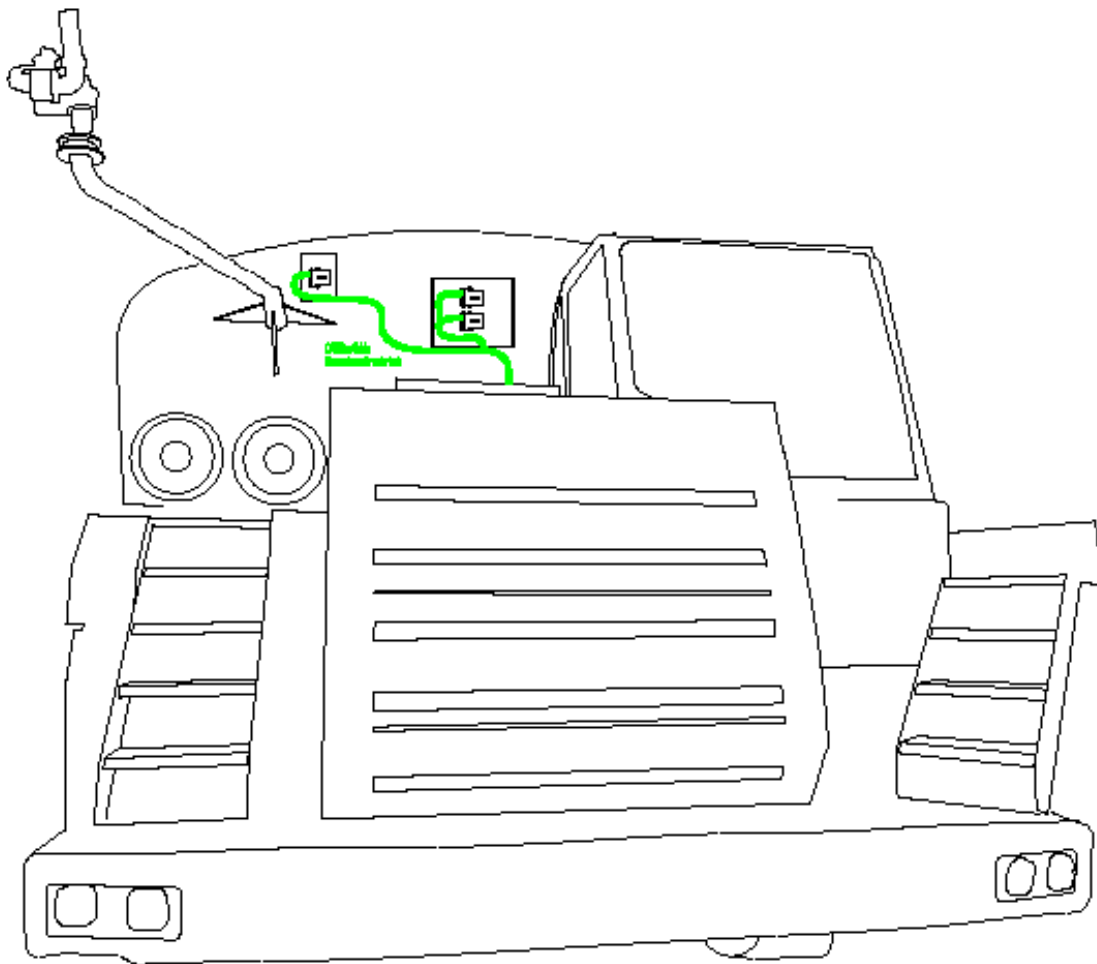


Fig. 6

Hydraulic Plumbing - Main Working Lines

The main hydraulic working lines for the DCWD system connect to a hydraulic pump on the water truck, a return line on the hydraulic tank, and to the water pump drive motor working ports. The hydraulic lines conduct the primary hydraulic power through the DCWD variable valve manifold to run the water pump on the vehicle. On many CAT trucks, the return line is connected to the brake cooler before the oil returns to tank. The lines should be installed so that there is no interference or physical contact with sharp edges or other hydraulic lines.

Fig. 7 shows the hydraulic plumbing on a typical larger size CAT (785, 789, 793) water truck, other water trucks are generally plumbed using the same concept, and however there may not be any pressure screen filters or brake coolers before returning to tank. In Fig. 7, the hydraulic pressure supply line runs from the hoist pump, to the OEM filter screen, then to the DCWD main manifold and is connected to the "P" port as marked on the manifold.

Fig. 7

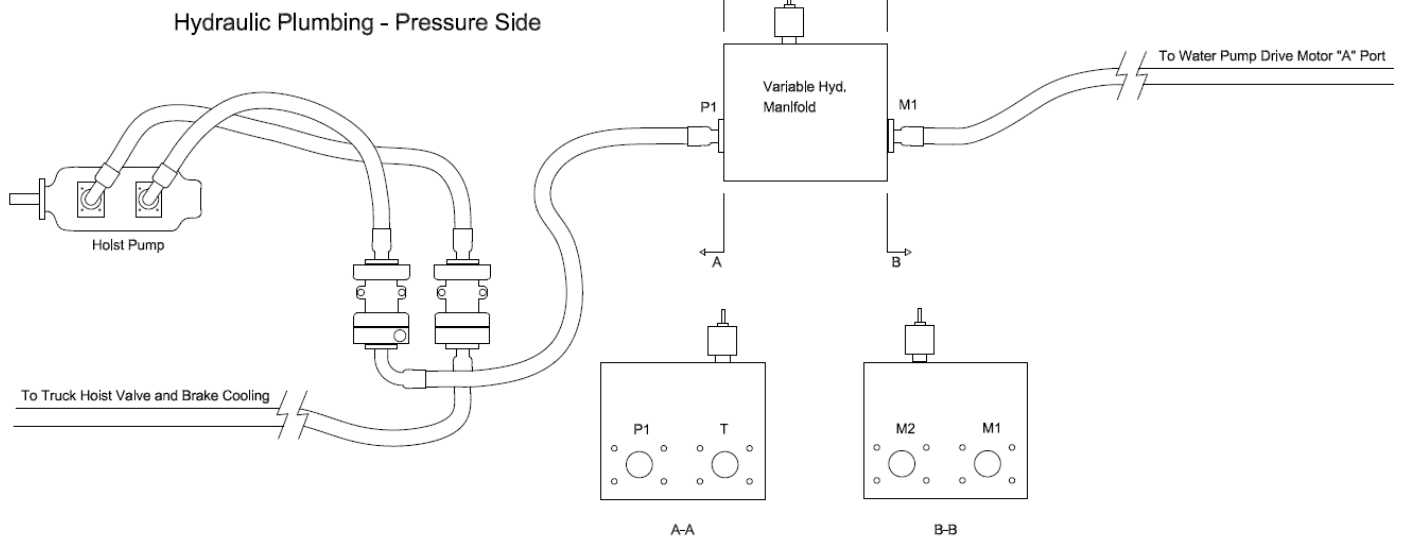
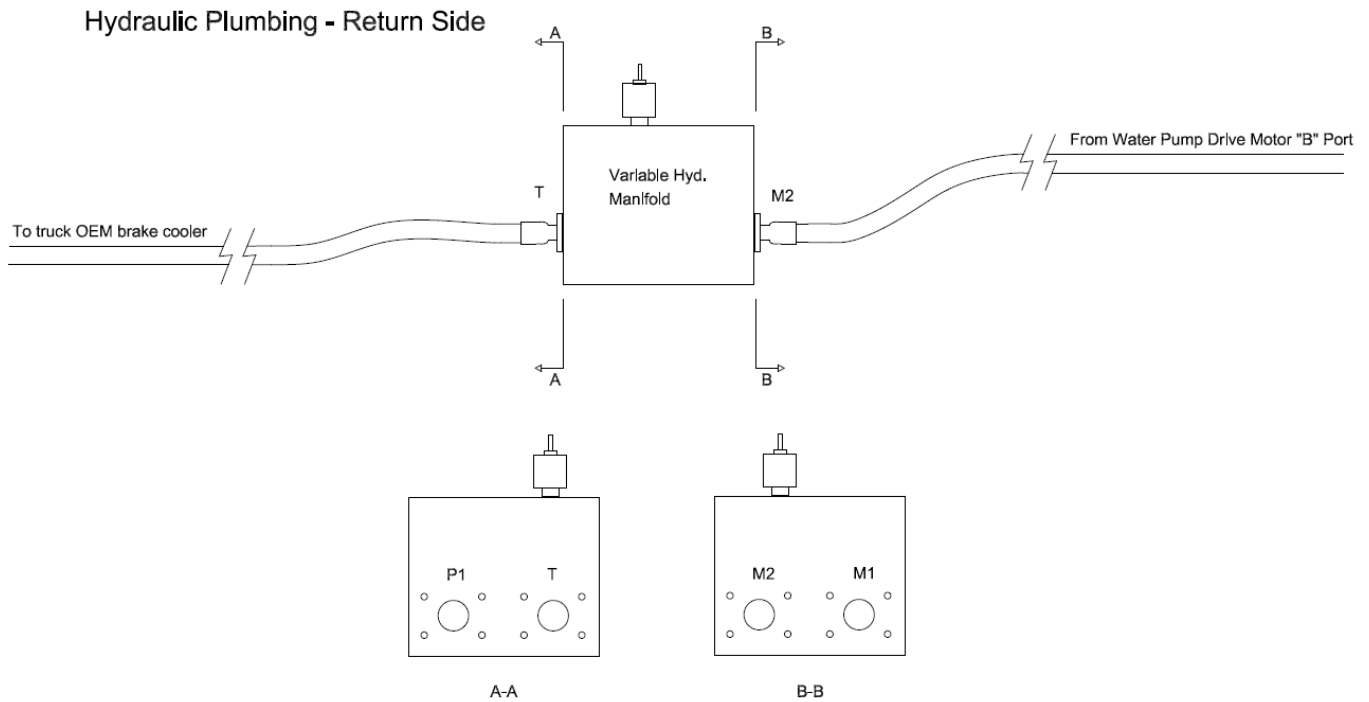


Fig. 8 shows the hydraulic plumbing on a typical CAT water truck. Other water trucks are generally plumbed using the same concept; however there may not be any brake coolers before the hydraulic lines return to tank. Some water trucks are plumbed with the return lines connected directly to the hydraulic tank on the vehicle.

Fig. 8

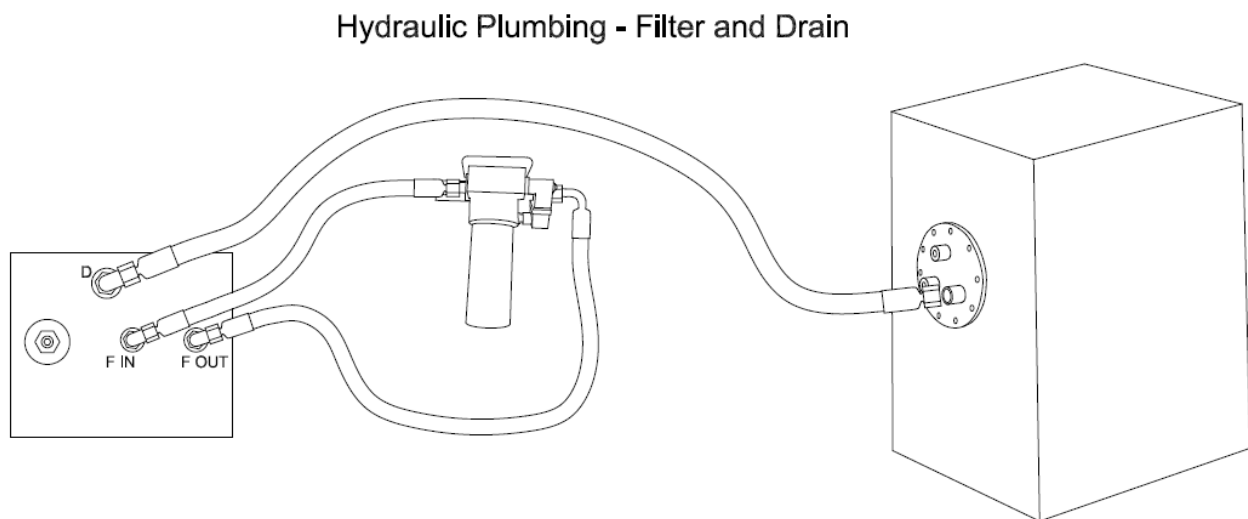


Hydraulic Pilot Filter and Drain Lines

The hydraulic pilot line filter is used to protect the sensitive hydraulic components found in the DCWD valve manifold. The pilot proportional valve uses oil from the filtered source to change the water pump drive RPM. The filter is a high-pressure design with a cartridge style filter element. The filter housing also has a differential pressure switch installed to alert the operator if a filter is clogged and needs changed. The pressure switch is connected to DCM4 which is located near the filter housing, underneath the variable hydraulic valve manifold. DCM4 relays filter condition to the touch screen display to indicate if the filter is clogged. The filter element should be changed on a regularly scheduled maintenance program to avoid problems associated with a clogged pilot line filter element.

Fig. 9 shows the hydraulic filter and drain plumbing on a typical CAT water truck. Other makes and models may have a different means of returning the drain line oil to the hydraulic tank. The port on the manifold marked "F IN" stands for "filter in" from the hydraulic pilot filter outlet. The port marked "F OUT" stands for "filter out" which sends pilot oil out to the pilot filter inlet. The port marked "D" stands for "drain" which is plumbed directly back to the hydraulic tank on the machine.

Fig. 9



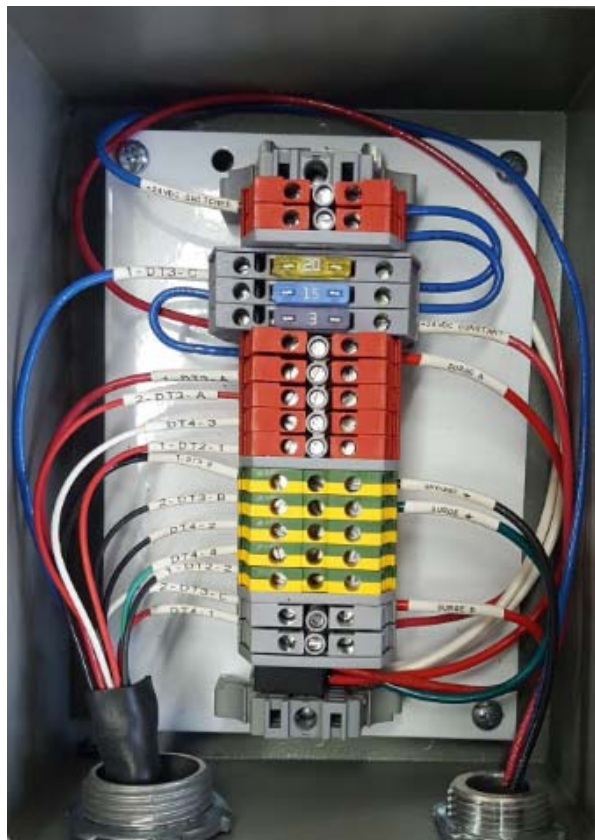
Power Feed Box Descriptions

The power feed box (shown below) is located behind the operator cab near the connections to the circuit breakers. See Fig. 4. The primary function of the power feed box is to distribute 24VDC power and ground feeds to the various components found on the DCWD system. The box is fed with an ignition only switched power feed, a constant battery feed, and a ground connection that is tied to an official cab ground lug. Within the box there is a surge suppressor, three power fuses, and a junction terminal strip to connect power cords for various electrical components.

The surge suppressor receives the power directly from the power feed cable. Its purpose is to protect the electronic components from any kind of power surge from the vehicle power system, or from outside power surge sources. The next components after the surge suppressor are fuses with in-line fuse holders that connect to the junction terminal strip as shown below. The 15 or 20 amp fuse is for the main system power feed. The 3 amp fuse is for the constant battery power that is connected to the system touch screen only. No other components are connected to this power source. There is a third 20 or 25 amp fuse that feeds the blue auxiliary wire on the power & ground out cable. This fuse is to protect the wiring and equipment from problems with auxiliary functions such as lights, drains, and electric water cannons. It may be necessary to change these fuses if any power supply problems are diagnosed by maintenance personnel.

The power feed box and its related components can be seen in detail on drawing # DCWD-0582-00 in the schematics and drawings section of this manual. The detail shown below only includes the power feed box schematic. See figure on next page.

DCWD-PB Power Distribution Box



Tank Front Box Description

The Tank Front J-Box shown below contains the electrical wiring for the three DCM's including DCM1, DCM2 and DCM3. In addition to the DCMs, the J-Box contains control relays for auxiliary functions, air valves (if using air to control sprayers), power-ground distribution stations for the DCMs, control relays, and all the necessary input/output local wiring. Drawing # DCWD-0587 in the mechanics parts and service section gives the specific electrical schematic for this box. The TFE also contains additional fuses at the power-ground distribution strip that protect specific electrical components.



Troubleshooting

1. Touch screen is on but will not boot up.
2. Touch screen is on but will not respond to touch.
3. Touch screen is on but sprayer selection buttons will not turn on when touched.
4. Touch screen will not turn on.
5. A DCM does not show a blinking yellow indicator on the diagnostic screen.
6. The diagnostic screen does not indicate a speed value or indicates an incorrect speed value.
7. Sprayer stuck open or leaking water.
8. Intermittent mode is not spraying an intermittent pattern.
9. Checker mode is not spraying a checker pattern.
10. Zigzag mode is not spraying a zigzag pattern.
11. Sprayer is not spraying water when indicator light is on.
12. No water pressure or reduced water pressure.
13. System is burning fuses.
14. Cargo pump drive motor will not rotate.
15. Cargo pump motor always rotates and will not stop with engine running.
16. Dump bar or drain butterfly valve will not actuate.
17. Front or side sprayers will not turn on.
18. Drain butterfly valve opens but will not close.
19. Testing spray head solenoid valve connection shows only 7-18 volts.
20. System will not spray water in any mode but fire mode.
21. System sprays water all the time including side sprayers.
22. Water cannon moves but will not spray water when turned on.
23. Water cannon will not move.
24. Water Tank Level sensor is indicating an incorrect value.

1. Touch screen is on, but will not boot up
 - A. Contact Open Loop Energy technical service department
 - B. Change the touch screen user control
2. Touch screen is on, but will not respond to touch
 - A. Cycle power to the entire system by turning off the machine master power switch and turning back on after 10 seconds
 - B. Attempt to reach the diagnostic screen by pressing the lower left hard key next to the touch screen area of the control
 - I. If you reach the diagnostic screen make sure all the DCM yellow lights are blinking about once per second
 - II. If all lights are blinking, check for any errors on the diagnostic screen. (Refer to operating manual for diagnostic screen information)
 - III. If no DCM lights are blinking or if one of the DCM lights is not blinking, check the CAN Bus cable connections and cable condition.
 - a. Replace CAN Bus cable to the touch screen control
 - C. Replace touch screen user control
 - D. Contact Open Loop Energy technical service to have a technician attempt a software re-load
3. Touch screen is on but sprayer selections will not turn on when touched
 - A. View diagnostic screen by pressing the lower left hard key next to the touch screen area of the control from the Home screen. Look for errors on DCM1 and make sure DCM1 has a blinking yellow light that should blink about once per second. (See operating manual for diagnostic screen information)
 - B. If there are errors on DCM1 determine the cause of the error. Errors can include open circuits or short circuits in the wiring due to damaged wiring or connections. Errors can also be caused by failed solenoid valves or failed DCMs.
 - I. Check all wiring and connections and cycle the ignition power on the truck and attempt operation.
 - II. Replace the related solenoid valve, cycle power using the ignition switch, and attempt operation.

4. Touch screen will not turn on
 - A. Check fuses in the power-ground feed box located behind the operator cab. You will need to remove the four screws to access the fuses.
 - B. Check the power-ground feed cable for the touch screen. Check the condition of the cable as well as the connections.
 - C. Use a multi-meter to check voltage at the touch screen control connector. Use procedure 01 in the procedures section of this manual to check voltage.
 - D. Replace the touch screen control.
5. A DCM does not show a blinking yellow indicator on the diagnostic screen
 - A. Locate the DCM and look for illuminated LED lights that will indicate the DCM is receiving power.
 - I. No LEDs illuminated
 - a. Check power cable and connections to the DCM
 - b. Use a multi-meter to check voltage at the DCM connector using procedure 02.
 - c. Replace the DCM with the appropriate part number.
 - II. LEDs illuminated
 - a. Check the CAN Bus cable and connections for damage.
 - b. Cycle power using the main power switch before trying again if a suspected fault is found. This will reboot the DCMs.
 - c. Replace the CAN Bus cable leading to the DCM.
 - d. Replace the DCM with the appropriate part number.
6. The diagnostic screen does not indicate a speed value or indicates an incorrect speed value
 - A. View the diagnostic screen by pressing the lower-left hard key next to the touch screen area of the control. Check to see if DCM4 (Gear icon) has a yellow blinking light that blinks about once per second. If

there is no blinking light there is a communication problem with DCM4 which reads speed sensor information.

- I. Locate DCM4 and check for illuminated LEDs on the DCM.
 - a. LEDs illuminated
 - i. Check CAN Bus cable and connections for damage
 - ii. Replace DCM4
 - b. LEDs not illuminated
 - i. Check power-ground feed cable and connections for damage.
 - ii. Use a multi-meter to check voltage. Use procedure 03 to check voltage.
 - iii. Check power feed fuses in power feed box located behind operator cab.
 - iv. Replace DCM4
 - B. Locate the speed sensor or speed signal tap. Inspect the cable and connections for damage.
 - C. Replace speed sensor or signal conditioner card.
7. Sprayer stuck open or leaking water
- A. Sprayer mechanically stuck open or closed. Test for function and fix or replace the sprayer.
 - B. Air control solenoid valve not providing correct air signal to sprayer. Check that the air line is properly plumbed to the correct port of the sprayer.
 - C. *Applies to hydraulic actuated spray heads only – Engine RPM may not be high enough to build pilot pressure within hydraulic valve bank – initiate high engine RPM to build proper hydraulic pressure to activate the hydraulic actuated spray head.
 - D. Check for correct 24VDC signal from system to the air valve – repair wiring, replace solenoid valve, or exchange with another valve to see if problem persists.

Note: when checking for 24VDC signal the valve must be connected to the wires leading to the DCM. If the valve is disconnected from the DCM, the DCM will detect an open circuit and will send a reduced voltage on the disconnected wire.

- E. Check for proper air or hydraulic pressure required to actuate the sprayer. Air pressure should be between 80-90 psi on the air regulator. Hydraulic pressure should be between 500-600psi at high idle.
- F. View the diagnostic screen by pressing the lower left hard-key from the home screen and look for errors on DCM1.
 - I. Errors present
 - a. Inspect wiring for damage or loose connection on the solenoid valve that controls the sprayer. If a fault is found, re-boot the DCM by turning ignition power off then back on after 2-3 seconds.
 - II. No errors present
 - a. Re-perform the steps listed in this section (#7)
- 8. Intermittent mode is not spraying an intermittent pattern
 - A. One or two sprayers exhibiting the problem
 - I. Follow steps in troubleshooting item number 7.
 - B. All sprayers exhibiting the problem.
 - I. View the diagnostic screen by pressing the lower left hard key near the touch screen area from the Home screen. Press the DCM4 (gears) icon to view the speed indication. See if the screen shows the correct speed indication in relation to the truck speedometer.
 - a. Wrong speed indication
 - i. Follow troubleshooting item number 6.
 - b. Correct speed indication
 - i. Check air or hydraulic pressure feed to the solenoid valves that control the sprayer actuation.

9. Checker mode is not spraying a checker pattern
 - A. One or two sprayers exhibiting the problem
 - I. Follow steps in troubleshooting item number 7.
 - B. All sprayers exhibiting the problem.
 - I. View the diagnostic screen by pressing the lower left hard key near the touch screen area from the Home screen. Press the DCM4 (gears) icon to view the speed indication. See if the screen shows the correct speed indication in relation to the truck speedometer.
 - a. Wrong speed indication
 - i. Follow troubleshooting item number 6.
 - b. Correct speed indication
 - i. Check air or hydraulic pressure feed to the solenoid valves that control the sprayer actuation.
10. Z-Pattern mode is not spraying a zigzag pattern
 - A. One or two sprayers exhibiting the problem
 - I. Follow steps in troubleshooting item number 7.
 - B. All sprayers exhibiting the problem.
 - I. View the diagnostic screen by pressing the lower left hard key near the touch screen area from the Home screen. Press the DCM4 (gears) icon to view the speed indication. See if the screen shows the correct speed indication in relation to the truck speedometer.
 - a. Wrong speed indication
 - i. Follow troubleshooting item number 6.
 - b. Correct speed indication
 - i. Check air or hydraulic pressure feed to the solenoid valves that control the sprayer actuation.
11. Sprayer not spraying water when indicator is on
 - A. Follow steps in troubleshooting item number 7.

12. No water pressure or reduced water pressure

- A. Perform cargo pump motor RPM check. The cargo pump should be turning between 1800-2200 rpm. Follow procedure 04 in the procedures section of this manual.
- B. Perform water pressure check. Should see 60-80 psi water pressure at the pump discharge. Follow procedure 05 in the procedures section of this manual.
- C. Perform hydraulic pressure check using procedure 06 in the procedures section of this manual.
- D. Ensure water level in the tank is adequate to prime water pump. The water level should be above the level of the water pump.

13. System is burning fuses

- A. Most likely a power source problem. Check +24VDC feed wires.
- B. Check for electric continuity and cross continuity on electrical conductors to tank front enclosure to correct corresponding connection – disconnect line you are checking that leads to the solenoid.
- C. Check the in-line blade type fuses from the main power source in back of cab.
- D. Check each branch of wire for ground continuity – isolate each electrical branch to find the short to ground and repair as necessary.

14. Water pump will not rotate

- A. Perform hydraulic pressure check using procedure 06 In the procedures section of this manual.
- B. Check diagnostics screen for any errors related to DCM4. If there are errors, check wiring to the proportional valve located on the DCWD manifold.
- C. Check proportional valve solenoid resistance 22-95ohms.
- D. Check for mechanical movement (shaft rotation) at cargo pump shaft coupling from motor to pump.
- E. Cargo pump motor worn - usually wears at same rate as hoist pump – replace or send in for evaluation.

- F. Hoist pump worn - load check pump for overall efficiency.
 - G. Check proportional valve setting. Valve adjustment should be full counterclockwise.
 - H. Replace proportional solenoid valve.
15. Cargo pump motor always rotates and will not stop with engine running
- A. Check diagnostics screen for any errors. If there are errors, check wiring to the proportional valve from DCM4.
 - B. Replace proportional solenoid valve.
 - C. Replace DCM4 with appropriate part number.
16. Dump bar or drain Butter Fly Valve (BFV) will not actuate
- A. Water valve mechanically stuck open or closed. Look for any disconnected mechanical linkages while testing for function.
 - B. Valve flapper may be seized into position.
 - I. Air Control Systems: Check air regulator for proper air pressure (90psi). Check that air line is properly plumbed to the correct port of the actuator.
 - II. Hydraulic Control Systems: Check hydraulic pressure at the control valve. Regulated pressure adjustment should read 500psi.
 - C. Check diagnostic screen on touch screen control for any errors. If there are errors, check or replace wiring to the solenoid valve that controls the dump bar or drain.
 - D. Replace solenoid valve that controls dump bar or drain.
17. Front or side sprayers will not turn on
- A. Check to see if heads have been disabled or do not exist.
 - B. Air Control System: Check air regulator for proper air pressure (90 PSI). Check that air line is properly plumbed to correct port of the actuator.
 - C. Hydraulic Control System: Check regulated hydraulic pressure on control valve manifold. Pressure should be adjusted to 500psi.
 - D. Check diagnostics screen for any errors. If there are errors, check wiring to the solenoid valves the control the side sprayers.

- E. Replace Solenoid Valve
 - F. If there are errors and wiring problems cannot be found, replace DCM1
 - G. Replace Spray Heads
18. Drain butterfly valve opens but will not close
- A. This valve may close when all or most of the water has drained out of the tank. The force of the actuator may not overcome the force of the water flow out of the tank.
19. Testing spray head solenoid valve connection shows only 7-18 volts
- A. This is an indication that one of the DCM outputs has an "open" circuit fault. This circuit connection must be identified, restored, and power must be reset to the unit. Reset power by cycling the ignition switch.
 - B. Check for proper operation of interface relays mounted in the tank front enclosure if applicable.
 - C. Check truck power source voltage for proper output voltage.
20. System will not spray water in any mode but fire mode
- A. Check to see if the speed sensor is providing a signal to system by entering into "OLE diagnostic screen". Press lower left button one time and allow screen to respond. Touch the DCM4 icon (Gear) and observe speed indication in MPH. This should compare with the OEM truck instrumentation indication while test driving the truck.
 - B. Zero or incorrect indication means either the wiring or connections to the speed sensor are broke, out of place or defective – repair or replace as necessary.
 - C. Perform cargo pump motor RPM, water pressure and hydraulic (hoist pump supply) pressure checks in fire mode, at high idle (leave spray heads and cannon off during this check). Should see results of 1800-2200 RPM, 60-80 PSI water and 1000-1300 PSI hydraulic (varies depending on water level).
 - D. Load test hoist pump with flow meter, pressure gauge and load valve.
 - E. Check for water flow bypass, including piping inside water tank.
 - F. Check for water flow restriction in suction line to cargo (water) pump.

- G. Check leakage rate on cargo pump motor case drain line.
- H. Check for back pressure on return line of cargo pump motor.
- I. Check DCWD pilot line filter element.
- J. Check proportional relief valve WTCM-05 **Type 1 hydraulic manifold** or WTCM-720-03 **Type 2 hydraulic manifold** for contamination or replace.
- K. Check main relief valve WTCM-07 **Type 1 hydraulic manifold** or WTCM-720-06 **Type 2 hydraulic manifold** for contamination or replace.
- L. Cargo pump (water) worn or inefficient – replace or send in for evaluation.
- M. Hoist pump worn or inefficient – replace or send in for evaluation.

21. System sprays water all the time including side sprayers

- A. Check for proper air pressure or air leaks within the system and the spray head(s) – reset air pressure or replace air line if defective and repair any air leaks. Perform air check by observing air pressure on system regulator, see *Figure 2.00* (80-90 PSI), turn off supply ball valve and watch how fast or slow air pressure diminishes, fast indicates a leak. (Absence of air pressure will allow water pressure when pump is on to hold open each head and spray water. Heads need air to assist the off function while water pump rotates).
- B. Check that air line is properly plumbed to correct port of the actuator.
- C. Check the rocker switch on the CE-0020, *Figure 6.00*, to see if the switch is faulty and replace.

22. Water cannon moves but will not spray water when turned on

- A. Water valve mechanically stuck open or shut – look for any disconnected mechanical linkages while testing for function. Valve flapper may be seized into closed position.
- B. Special operator instructions may apply to truck due to existing hydraulic valve function ability, understand the switching and relay operation (Watermark cannon) engine RPM must be at high level to produce hydraulic pressure adequate enough to move BFV actuator.

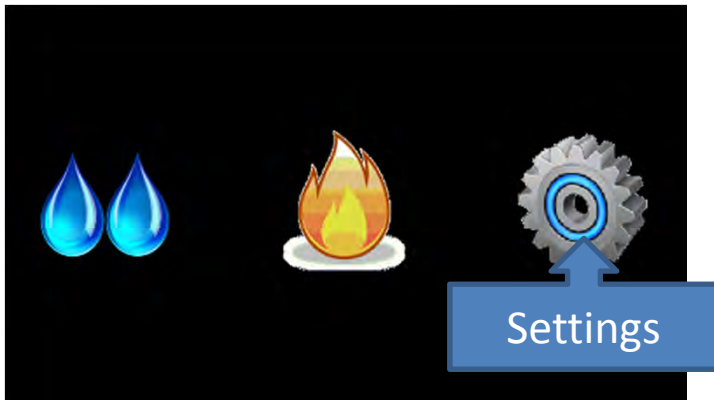
23. Water cannon will not move

- C. Special operator instructions may apply to truck due to existing hydraulic valve function ability, understand the switching and relay operation (Watermark cannon) engine RPM must be at high level to produce hydraulic pressure adequate enough to move BFV actuator.

24. Water Tank Level sensor is indicating an incorrect value

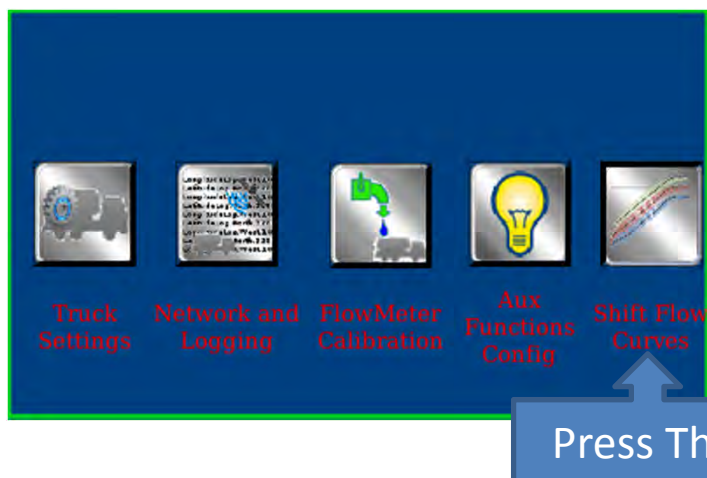
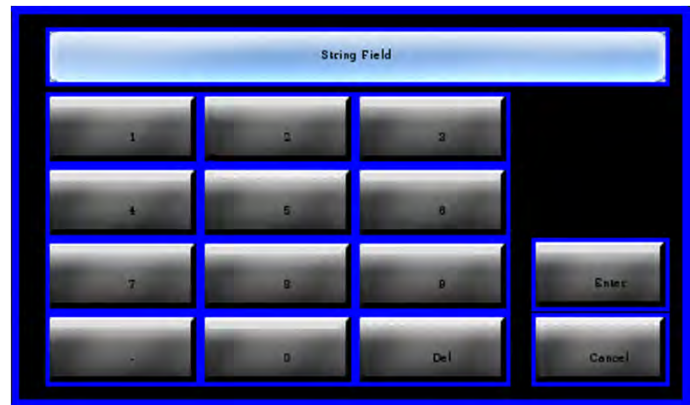
- A. Check all connections and connectors for water level sensor. Check wire diagram (RED is +24VDC, BLACK is ground and WHITE is signal) and make corrections if necessary.
- B. Remove tank level sensor and check port for silting or blockage to the sensor.
- C. Replace sensor with new.

Settings



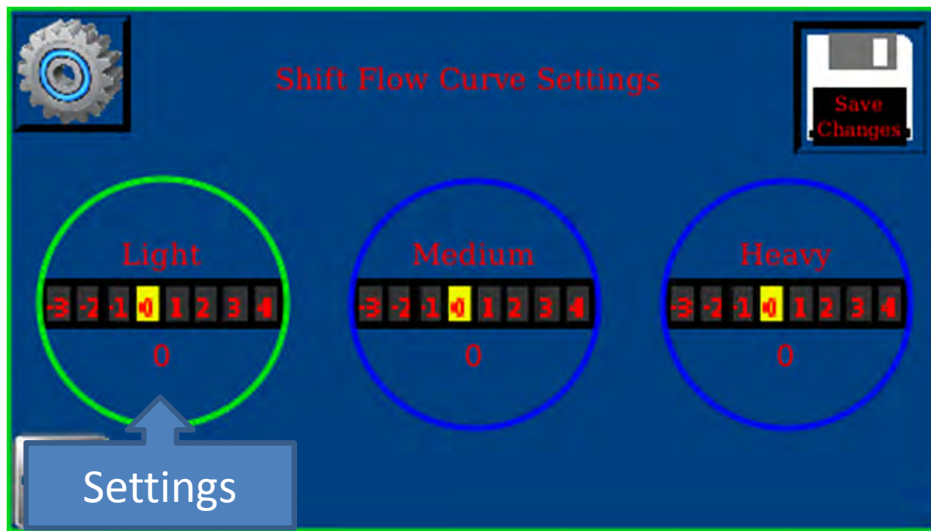
To enter settings pages, touch the gear icon on the home screen.

You will then have to enter the pin number to gain access to the settings screen and touch the “enter” button to proceed. Note: If you type the wrong pin number you will automatically return to the home screen.

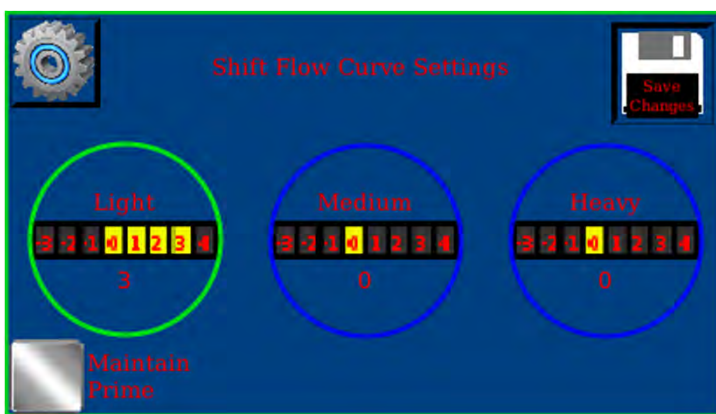


Once in the settings screen you have three options:
Truck Settings, Network and Logging, and Aux Functions Config.

Settings



Select desired water density (Light, Medium, or Heavy) you want to adjust, and turn the encoder knob CW to advance for more water or CCW to retreat for less water to make the adjustment.



Repeat for each water density and once settings are made press Save Changes button in upper right corner. To complete, press the Home button.

Procedure Guide

1. Voltage check at the touch screen

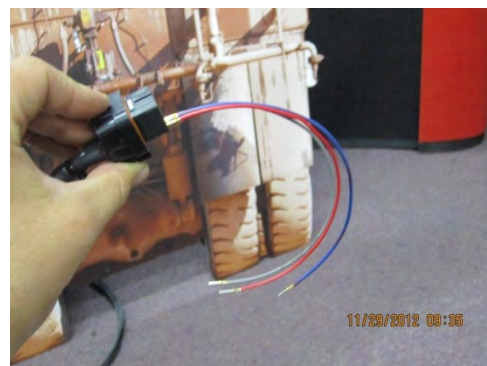
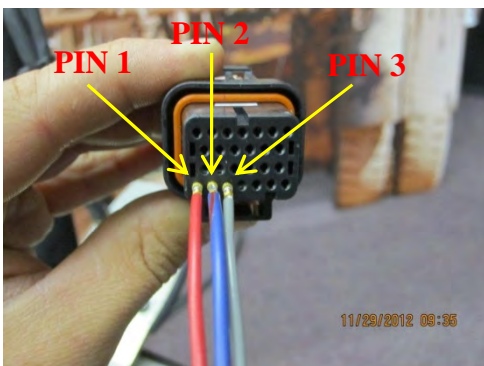
- a) Turn main power switch and the ignition to the on position.
- b) Remove the screen from the RAM mount.



- c) Unplug the 26 pin connector from the back of the screen.



- d) Install test leads to pins one (1), two (2) and three (3), where pin 1 is main +24VDC, pin 2 is ignition +24VDC and pin 3 is the battery ground.



- e) Using a multi-meter check voltage through pin 1 (main power) and pin 3 (ground).
 - i) If **no** voltage is present check continuity through the power cable from pin 1 to the power feed behind the cab. If cable has been damaged, repair and call Open Loop Technician to come and replace the cable. If continuity is good open the power supply box (behind the cab) and check for blown fuses.



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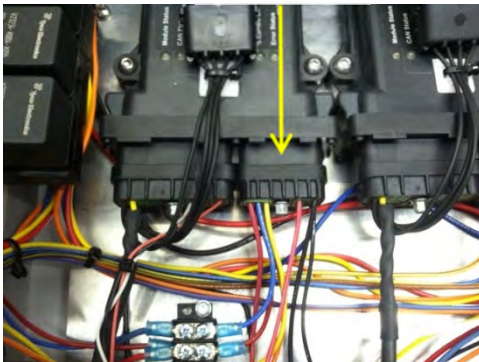
- ii) If voltage is noticed move onto checking voltage through pin 2 (ignition) and pin 3.
- iii) Repeat continuity check and fuse inspection as described above.



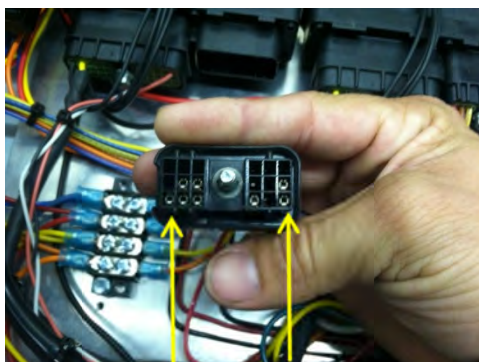
- f) Main power feed and ignition power are both needed for proper screen operation.

2. Voltage check at a DCM

- a) Turn on main power switch and ignition to on position.
- b) Remove P2 plug from DCM using 1/4" nut driver.



- c) Once P2 plug is removed, locate pin locations P2A1 & P2F1, and place multi-meter leads in pin locations to test power. (Repeat this procedure on pin locations P2A2 & P2F2 as well.)



- d) Once voltage has been confirmed, replace P2 plug to its respective location.

3. RPM check at the water pump

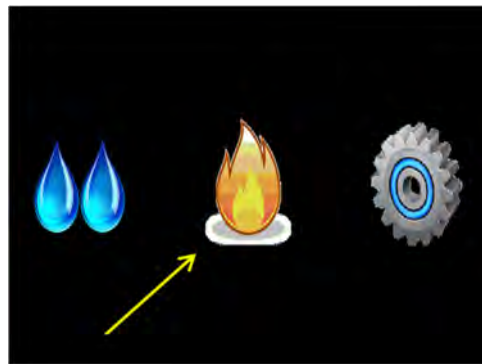
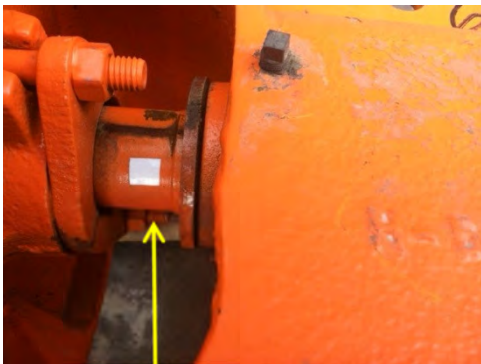


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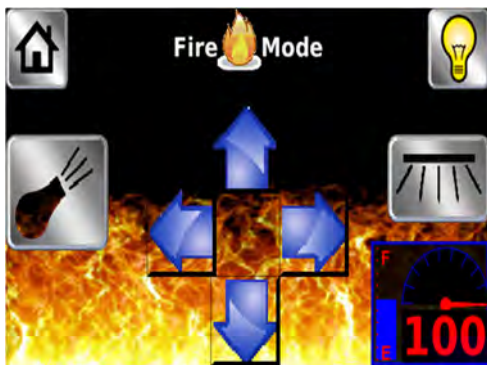
- a) Locate shaft on water pump. (Will most likely need to be sprayed with a degreaser, cleaned and wiped dry.)



- b) Measure RPM's using a tachometer gun. First place retro-reflective tape on clean dry pump shaft. Then, start the water truck and put the spray system into fire mode.



- c) In Fire mode, use the joystick to adjust the proportional valve to 100% by turning it clockwise, then rev the truck to high idle.





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- d) While in fire mode and at high idle, point tachometer gun at the retro-reflective tape to measure the RPM's.



4. Water pressure check at the pump

- a) While the water truck is not running, locate the test port area on the water pump.



- b) Thread the necessary fitting arrangement with a pressure gauge into the test port. (We recommend leaving in a ball valve for convenience of draining water in the winter time.)



- c) Once the gauge is in place, start the water truck, put the spray system into fire mode, and turn the proportional valve to 100% with the truck at high idle. (For step C, Refer to RPM check at water pump)

5. Hydraulic pressure check at the manifold

- a) xxx



Maintenance



NOTE: When performing maintenance on the Water Truck Distribution Control System all federal, state, and company applicable standard safety and environmental practices should be followed.



Prior to work on the system insure there is no pressure in the system.



Hydraulic fluid may be hot, take precautions to avoid contact with skin.

There are two manufacturer's recommended regularly scheduled preventative maintenance procedures. The first one is to replace the hydraulic filter element (Donaldson P167838) and the second one is to replace the air filter element (Wilkerson MSP-96-649).

Hydraulic Pressure Filter:

This filter was installed to provide improved system cleanliness, to achieve the maximum life span of the relief valves and control components. This filter has an electronic pressure differential switch which provides visual indication to the operator at the control box touch screen. This will alert the operator of the need for a filter replacement.

The hydraulic filter is located adjacent to the hydraulic manifold inside the rear tires and shall be changed during the truck's normally scheduled PM or as needed per the electronic filter element indication "**CHANGE FILTER!**" on the touch screen.

Lock out the truck per company procedures.

1. Lock out the truck per company procedures.
2. Thread off the filter element housing.
3. Remove the old filter element.
4. Clean threads on housing and base.
5. Install the new filter element.
6. Thread on the filter element housing.
7. Remove lockouts per company procedures.



Figure 1.00 – Pilot Line Filter Assembly



Troubleshooting Components

OLE's Type 2 V7.32 -7.34 Control Manifold Assembly

Return flow back pressure valve WTCM-720-07

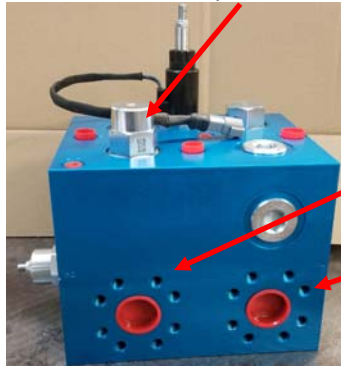


Figure 2-3.00 – WTCM-720-07

Proportional relief cart valve WTCM-720-03



Figure 2-4.00 – WTCM-720-03

“L control” manual over-ride option



Figure 2-4.01 – WTCM-720-03

The L control (Manual Override - Adjustable) allows one to manually adjust the valve in case of an electrical failure. The L control also allows one to troubleshoot and test the truck's hoist pump. **The normal adjustment of the “L” control is fully counter-clockwise with lock nut securing its position**

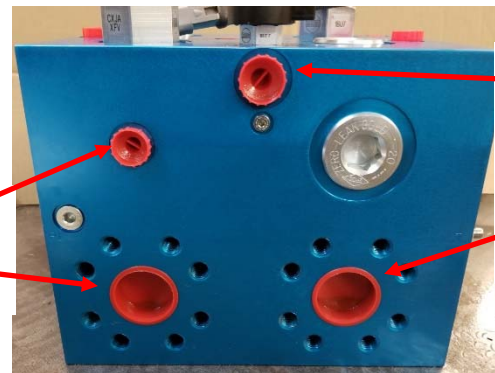


Figure 2-6.00



Figure 2-5.00 – WTCM-720-06

Gauge Ports – M2 & Tank

Filter In/Out Ports

P2 Port for head and cannon valves

Main Relief cart valve WTCM-720-06



Figure 2-6.01



Individual components of sensitivity:

DCWD-0564, Hydraulic Manifold:

Component #3, WTCM-720-03 Valve (Figure 2-4.00 & 2-4.01):

This valve provides a pilot signal to the WTCM-720-06 valve. This valve receives its analog electronic input from the speed sensor via the DCWD DCM. Failure of this valve will cause irregular spray density control or loss of density control. This valve is sensitive to hydraulic system contamination. If this valve fails, there is a manual over ride adjustment that will allow a continuous high-density spray and pump rotation. **The hydraulic filter, mentioned above in the maintenance portion of this guide, filters all hydraulic flow through this valve; hence the need to change the filter element on a regular PM basis i.e. 500-hour increments. Please note that normal adjustment of the “L” control is fully counter-clockwise with lock nut securing its position.**

Component #6, WTCM-720-06 Valve (Figure 2-5.00):

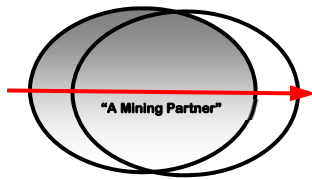
This valve is pre-set to 1,700 PSI and is important that it remains at this setting for proper function of the DCWD system. It controls the amount of hydraulic power that is flowing through the valve into the cargo pump motor. It receives its hydraulic pilot signal from the WTCM-720-03 which varies the position of the poppet inside this valve. Ultimately the poppet controls the overall density of the water spray by directing a specific amount of hydraulic flow (directly related to the trucks ground speed) to the cargo pump motor and the remaining (unneeded) flow that is dumped back to the tank. This valve can fail open, shut, or mid-stroke. Testing can be accomplished by verifying operation of the WTCM-720-03 valve, which pilots the WTCM-720-06. This valve is sensitive to hydraulic system contamination; excessive contamination can cause irregular water density control or loss of density control.

Component #7, WTCM-720-07 Valve (Figure 2-3.00):

This valve simply controls the amount of back pressure from the cargo pump motor returning to tank. The sole purpose of this valve is to stop rotation of the cargo pump motor when there is no signal going to WTCM-720-03. This valve is pre-set to 300 PSI and is important that it remains at this setting for proper function of the DCWD system.

Port Arrangement/identification (Figure 2-6.00 & 2-6.01):

General identification of valve ports reference.



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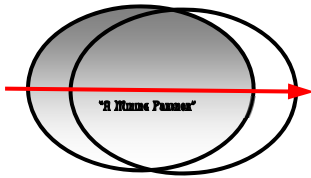
Winnemucca, NV 89445



Hoist Pump Loading Procedure 06 for DCWD

Note: This process will require two people.

- Perform all safety specific requirements before continuing.
- With the engine off, Mechanic 1 to climb under the tank and turn the high-pressure ball valve installed at "M1" port of DCWD valve to the closed position.
- Install a 0-3000 PSI or larger pressure test gauge on the hoist pump outlet or the DCWD "TP" test port.
- Mechanic 2 start the truck engine with Mechanic 1 at the DCWD valve.
- Mechanic 1 to increase the "L" control setting (PV) fully clockwise to manually override controls and direct all hydraulic flow to the closed high-pressure ball valve and pressure relief valve WTCM-720-06 inlet. **Original setting is to be fully counter clockwise for "L" control.**
- Mechanic 1 read and record the hydraulic pressure on test gauge with the truck engine at low speed idle.
- At this point, Mechanic 2 in the cab to increase the truck engine to high idle while Mechanic 1 reads and records the hydraulic pressure on test gauge.
- The pressure on the gauge is the actual pressure the hoist pump is creating.
- If the pressure is lower than 1700 PSI at high engine speed, adjust WTCM-720-06 (large cart valve on side of DCWD valve) exactly one complete revolution clockwise observing test gauge reading while performing this. If the pressure fails to reach 1700 PSI, the hoist pump is suspect of failure.
- Turn the truck engine off; reverse all processes restoring all settings and the ball valve to their original positions.



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901 West 6th Street
 Winnemucca, NV 89445



DCWD PARTS LIST REV20150422

qty	part number	description
1	DCWD-G2-CCJA-MASTER	G2 CONTROL CONSOLE WITH JOYSTICK ASSEMBLY
	SUB COMPONENTS	
1	DCM-G2-TS1	OPUS SERIES A3S TOUCH SCREEN
1	DCWD-G2-JS1	SYSTEM JOYSTICK J1939 TYPE 1
1	101U	RAM-101 STANDARD ARM AND BASES
	101U-D (ALTERNATE)	RAM-101 LONG ARM AND BASES
1	DCWD-0151	OLE FABRICATED A3 JOYSTICK MOUNT
1	DCM-G2-DCM1	DIGITAL CONTROL MASTER MODULE 1
1	DCM-G2-DCM2	DIGITAL CONTROL MASTER MODULE 2
1	DCM-G2-DCM3	DIGITAL CONTROL MASTER MODULE 3
1	DCM-G2-DCM4	DIGITAL CONTROL MASTER MODULE 4 AT HM
1	DCWD-PB-HOL483 (ASSEMBLY)	POWER BOX FOR DCWD
	SUB COMPONENTS	
1	FSP-4002-MC	SURGE PROTECTOR 24VDC
1	ZERODT	SURGE PROTECTOR 24VDC
1	DCWD-MA-MBA-V7 (ASSEMBLY)	DCWD MAIN MANIFOLD ASSEMBLY TYPE 2 VER 7.30
	SUB COMPONENTS	
1	DCWD-0564	MAIN HYDRAULIC MANIFOLD SYSTEM
	SUB COMPONENTS	
1	WTCM-720-02	CHECK CART VALVE 100 PSI
1	WTCM-720-03	PROPORTIONAL RELIEF CART VALVE
1	WTCM-720-06	VENTABLE RELIEF CART VALVE 1700 PSI
1	WTCM-720-07	POPPET RELIEF CART VALVE
1	WTCM-720-24VDC	COIL 24VDC
1	BVDM15FL1113AZZA	ISOLATION BALL VALVE AT M1 PORT
1	DCWD-0115	MANIFOLD MOUNT BRACKET TYPE 2
1	DCWD-PLFA (ASSEMBLY)	PILOT LINE FILTRATION ASSEMBLY
	SUB COMPONENTS	
1	P167838	DONALDSON REPLACEMENT FILTER ELEMENT 6μ PILOT FILTER ASSEMBLY
1	P569634	ELECTRONIC INDICATOR ASSEMBLY
1	CP5100-1080000	CONNECTOR DIN 43650
1	DCWD-0163	PLF INDEPENDENT MOUNT BRACKET
	DCWD-0179-001 (ALTERNATE)	PLF MOUNT BRACKET AT 0115 MFLD
1	DCWD-CMA-G2 (ASSEMBLY)	OLE DCWD CANNON MANIFOLD ASSEMBLY
	SUB COMPONENTS	



<p>1 DCWD-0568</p> <p>SUB COMPONENTS</p> <p>1 DCWD-0344</p> <p>3 DCWD-0345</p> <p>1 DCWD-0346</p> <p>1 DCWD-0348</p> <p>1 DCWD-0349</p> <p>1 DCWD-0350</p> <p>1 DCWD-0351</p> <p>1 DCWD-0352</p> <p>1 DCWD-0353</p> <p>1 DCWD-0354</p> <p>1 DCWD-HMA-G2 (ASSEMBLY)</p> <p>SUB COMPONENTS</p> <p>1 DCWD-0567</p> <p>SUB COMPONENTS</p> <p>7 DCWD-0344</p> <p>3 DCWD-0346</p> <p>1 DCWD-G2-JBOX (ASSEMBLY)</p> <p>SUB COMPONENTS</p> <p>6 75325</p> <p>7 DCWD-0360</p> <p>7 DCWD-0362</p> <p>- DCWD-0372</p> <p>9 229-676</p> <p>1 229-691</p> <p>2 229-686</p> <p>1 DCWD-APSA</p> <p>SUB COMPONENTS</p> <p>1 M28-04-BH00</p> <p>1 R28-04-F000</p> <p>1 MSP-96-649</p> <p>2 GPA-96-612</p> <p>2 GPA-96-602</p> <p>1 GPA-96-601</p> <p>1 4FMC7</p> <p>1 25500278</p> <p>1 20500110</p> <p>1 DCWDS-STC-6T5631-KIT</p> <p>SUB COMPONENTS</p> <p>1 DCWDS-STC-6T5631</p>	<p>HYDRAULIC CANNON CONTROL MANIFOLD 4 STATION</p> <p>DC CART VALVE FOR HEAD & BFV ACTUATION SINGLE SOL 24VDC</p> <p>DC CART VALVE FOR CANNON ACTUATION DOUB SOL 24VDC</p> <p>CAVITY PLUG FOR DCWD-0567-8</p> <p>PRESSURE REDUCING FIX SET 500 PSI</p> <p>PRESSURE REDUCING FIX SET 1500 PSI</p> <p>PRESSURE REDUCING FIX SET 600 PSI</p> <p>CAVITY PLUG, C-10-3, 1-2 OPEN AND 3 BLOCKED</p> <p>COIL 24VDC W/DEUTSCH DT06 RECEPTACLE</p> <p>COIL SPACER FOR DCWD-0352 AND DCWD-0345</p> <p>CHECK CART VALVE FOR DCWD-0567/8</p> <p>HEAD & ACCESSORY HYDRAULIC MANIFOLD ASSEMBLY</p> <p>HYDRAULIC HEAD VALVE MANIFOLD 10 STATION</p> <p>DC CART VALVE FOR HEAD & BFV ACTUATION SINGLE SOL 24VDC</p> <p>CAVITY PLUG FOR DCWD-0567-8</p> <p>JUNCTION BOX ENCLOSURE ASSEMBLY (JBOX)</p> <p>RELAY 24VDC 5 TERMINAL</p> <p>AIR VALVE 4w2p 24 VDC Sol Spring Offset w/ Din Connector Coil Body</p> <p>DIN CONNECTOR, SURGE SUPPRESSION</p> <p>AIR VALVE 4w2p 24 VDC Sol Spring Offset - coil connection at manifold base (if a</p> <p>MANIFOLD BLOCK 1 STATION</p> <p>END PLATE KIT</p> <p>Cover Plate MARK 8 NUMATICS</p> <p>AIR PREPARATION STAND ASSEMBLY</p> <p>COALESCING FILTER 1/2 IN. W/AUTO DRAIN</p> <p>AIR LINE REGULATOR 1/2 IN.</p> <p>REPLACEMENT AIR FILTER ELEMENT</p> <p>MODULAR CONNECTING MTG BRACKET 1/2 NPT</p> <p>BRACKET FOR MODULAR CONNECTOR</p> <p>MODULAR CONNECTOR (MIDDLE)</p> <p>PRESSURE GAUGE 1/4 NPT CBM</p> <p>OETIKER QUICK CONNECT MALE 1/2 IN. PLUG</p> <p>OETIKER QUICK CONNECT FEMALE 1/2 IN. COUPLING</p> <p>ASSEMBLY TRANSMISSION SPEED SENSOR AND HOUSING ADDITIONAL CAVITY ON CAT 773B, 777B, 777C, 777D, 785, 785B, 789 AND 789B</p> <p>SPEED TRANSMISSION COVER OLE FABRICATED</p>
---	--



1 258-4521

B SPEED SENSOR

1 DCWDS-STC-1608281-KIT

KIT TO MODIFY TRANSMISSION SPEED SENSOR COVER FOR ADDITIONAL CAVITY ON CAT 793D

SUB COMPONENTS

1 DCWDS-STC-1608281

SPEED TRANSMISSION COVER OLE FABRICATED

1 258-4521

B SPEED SENSOR

DCWD ACCESSORY COMPONENTS

6	MX80 WO	WATERMARK AIR OPERATED SPRAY HEAD 80MM
6	300198	MEGA AIR OPERATED SPRAY HEAD 3 IN.
1	300409	MEGA DROP IN DIAPHRAGM REPAIR FOR 300198
	71A-	
6	3	BMC SPRAY HEAD 3 IN
6	DCWD-0359	QUICK EXHAUST VALVE
12	329035300	GRUVLOK 7401 RIDGID COUPLING 3 IN.
1	DCWD-0355	BUTTERFLY VALVE ANSI 2.5 INCH HYDRAULIC ACTUATED
1	DCWD-0356	BUTTERFLY VALVE ANSI 3 INCH HYDRAULIC ACTUATED
1	DCWD-0358	VALVE, BUTTERFLY 8" ANSI W/HYD CYLINDER ACTUATOR BFV
6	DCWD-0332	OLE POSITIVE DUAL ACTING HYD SPRAY HEAD
1	DCWD-0364	HYDRAULIC CYL FOR DUAL ACTING SPRAY HEAD
2	DCWD-SW1-SHR-BLUE	OLE BLUE LIGHT RING
1	DCWD-0328	TANK LEVEL PRESSURE SENSOR TYPE 1
1	DCWD-0329	TANK LEVEL PRESSURE SENSOR TYPE 2
1	DCWD-0323	SIGNAL CONDITIONER CORD ADAPTER
1	DCWD-0330	SPEED SENSOR 01C DUAL OUTPUT FOR KOMATSU HD785-5, -7
1	DCWD-0331	SPEED SENSOR 02C DUAL OUTPUT FOR KOMATSU HD1500-5, 330M
1	DCWD-0340	PRESSURE/TEMPERATURE SENSOR FOR LEVEL 2 SYSTEM 0-3K
2	DCWD-0341	FLOW SENSOR FOR SPRAY BAR LEVEL 2
2	DCWD-0342	FLOW SENSOR WELDMIT CARBON STEEL
2	DCWD-0343	FLOW SENSOR WELDMIT STAINLESS STEEL
1	DCWD-0199	CENTRIFIGAL WATER PUMP B4 AND CPM300 ASSEMBLY
1	DCWD-CPM300	MOTOR HYD CARGO 3 INCH
1	DCWD-CPM250	MOTOR HYD CARGO 2.5 INCH
1	DCWD-CPM250225	MOTOR HYD CARGO DOUBLE GEAR 2/2.25 INCH
1	65004OLE	SHAFT COUPLING CPM SPLINE TO SPLINE
1	DCWD-0347	SHAFT COUPLING KEYWAY TO SPLINE
1	DCWD-0200	FRANKLIN PUMP W/HYD MOTOR ADAPTER, CPM300 HYD MOTOR, SHAFT COUPLING , G
1	DCWD-0204	COVERS
1	DCWD-0205	FRANKLIN PUMP AND CPM250225 DBL SEC MOTOR COMPLETE ASSEMBLY
1	DCWD-0369-001	FRANKLIN PUMP ONLY W/PUMP MOTOR ADAPTER, NO HYD MOTOR, NO SHAFT COUPLI
1	DCWD-0369-002	GASKET, SUMP 6 INCH I.D. 10" O.D. FOR ADAPTER TO SUMP BOX REF040922
1	DCWD-0369-003	6 INCH ANSI FLANGE GASKET BUNA, PUMP INLET TO ADAPTER REF302527
1	DCWD-0370	4 INCH ANSI FLANGE GASKET BUNA
1	DCWD-0373	FRANKLIN PUMP W/HYD MOTOR ADAPTER, COUPLER , GASKETS AND STEEL PORT SHIPP
1	DCWD-0374	NOZZLE HYDRAULIC ACTUATED FOAM 2.5NH HOSE ADPT L/BELLOW
1	DCWD-0357	B4 WATER PUMP ASSEMBLY, NO HYD MOTOR
	DCWD-0383	MONITOR HYDRAULIC MOTOR OPERATED WITH STANDARD NOZZLE AND 3" ANSI CONN
	DCWD-0384	3 INCH BUTTERFLY VALVE HYD HOSE REEL



- 1 DCWD-ABHWC MONITOR HYDRAULIC MOTOR OPERATED W/ NOZZLE (HYD ADJUST/AKROFOAM) AND 3
- 1 DCWD-0373 NOZZLE HYDRAULIC ACTUATED FOAM 2.5NH HOSE ADPT L/BELLOW
- 1 DCWD-0339 HEAT EXCHANGER SEA WATER ASSEMBLY W/ MOUNTS
- 1 DCWD-0194-001 HIGH FLOW MANIFOLD ATTACHMENT OPTION
- 1 DCWD-0366 PLUMBING KIT FOR HEAT EXCHANGER KOMATSU, GATE VLV, WYE STRAINER, SUMP COV
- DCWD -0387 BFV 3" air acutated

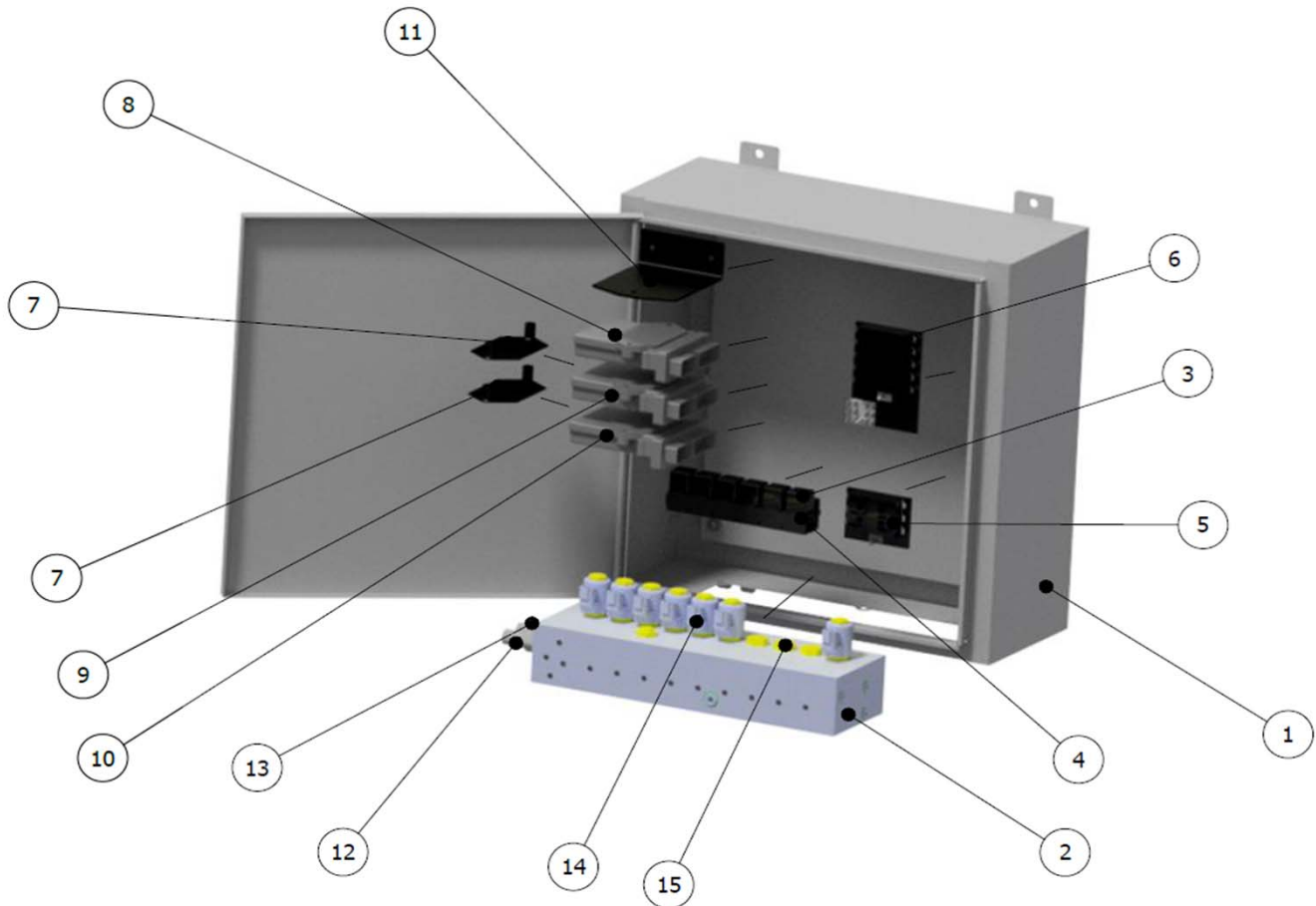
DCWD MAIN MANIFOLD ASSEMBLY TYPE 1 VER 7.12

SUB COMPONENTS

- 1 WTCM-05 PROPORTIONAL RELIEF CART VALVE
- 1 WTCM-06 CHECK CARTRIDGE VALVE
- 1 WTCM-07 VENTABLE RELIEF VALVE 1700 PSI
- 1 WTCM-08 DIRECTIONAL DIVERTER VALVE D08 SLAVE
- 1 WTCM-09 SOLENOID CART VALVE
- 1 WTCM-10 SECONDARY RELIEF CART VALVE 1900 PSI
- 1 WTCM-11 CHECK CARTRIDGE VALVE
- 1 WTCM-12 CHECK CARTRIDGE VALVE
- 1 WTCM-24VDC COIL 24VDC FOR 05, 09

CC

J-Box Enclosure Fitted for Hydraulic Heads and Other Accessories



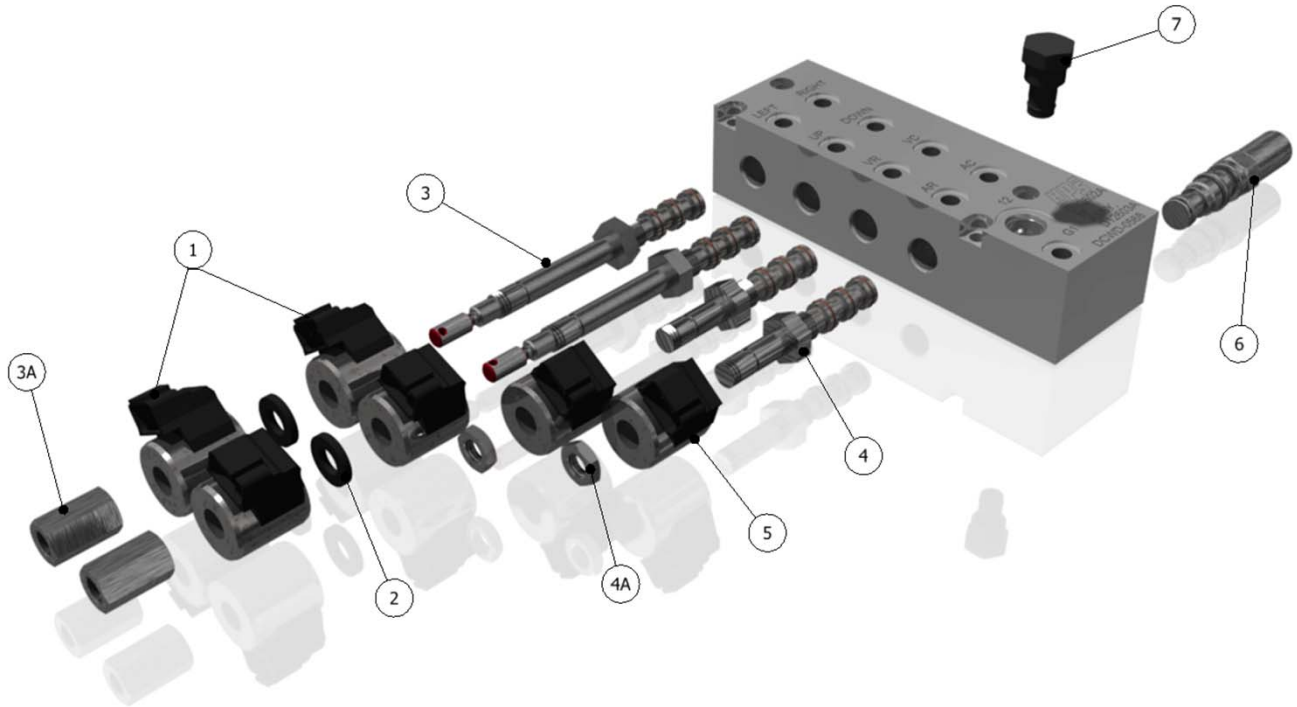
Item #	Description	Part Number
1	20 x 20 x 8 NEMA 12 W/ 20 x 20 Panel	AB-20208N & AB-2020TP
2	VALVE HYD HEAD AND ACCESSORY CONTROL MANIFOLD	DCWD-0567
3	+24 VDC Relay	75325
4	Relay Base	75280
5	6 Gang Fuse Block w/ Ground Terminal	46060
6	10 Gang Fuse Block w/ Ground Terminal	46062
7	DCM Mount Spacer	DCWD-0167
8	DCM Digital Control Module G2 - with SoftwareDCM1 Position	DCM-G2-DCM1
9	DCM Digital Control Module G2 - with SoftwareDCM2 Position	DCM-G2-DCM2
10	DCM Digital Control Module G2 - with SoftwareDCM3 Position	DCM-G2-DCM3
11	DCM Mount Bracket TFE	DCWD-0166
12	VALVE PRESSURE REDUCING DCWD PRESET TO 1500 PSI	DCWD-0379-150
13	VALVE PRESSURE REDUCING DCWD PRESET TO 550 PSI	DCWD-0379-055
14	CART VALVE, 4W2P, W/24VDC SOLENOID	DCWD-0344A
15	CAVITY PLUG FOR DCWD-0567-8	DCWD-0346

Controller Mount in Cab

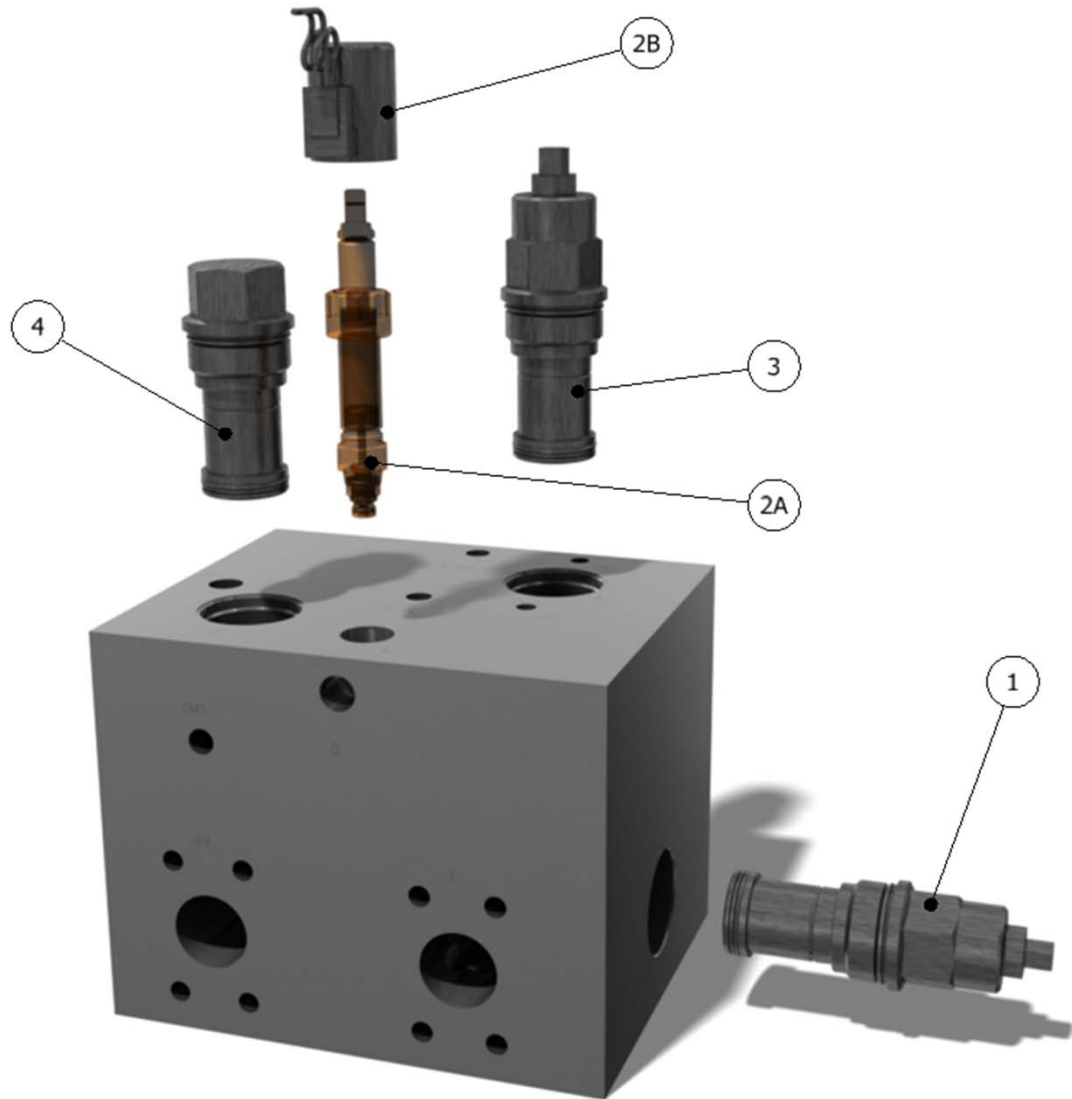


Item #	Description	Part Number
1	TOUCH SCREEN 4.3"	DCM-G2-TS1
2	SYSTEM JOYSTICK J1939 TYPE 1	DCWD-G2-JS1
3	TS1 & JOYSTICK MOUNT	DCWD-0151
4	RAM-101 STANDARD OR LONG ARM & TWO 1.5" ROUND BALL BAS	101U/101U-D
5A	777F CONTROL MOUNT	DCWD-0165
5B	G2 FLOOR STAND FOR B SIZE RAM MOUNT	DCWD-0155 & DCWD-0159
5C	CONTROL CONSOLE MOUNTING BRACKET	DCWD-0169

DCWD-0568-2 ASSEMBLY
 FOR HYDRAULIC OPERATED CANNON/MONITOR



Item #	Description	Part Number
1	Coil	DCWD-0352
2	Coil Spacer	DCWD-0353
3	Solenoid Valve	DCWD-0345
3A	Nut	INCL W/DCWD-0345
4	Solenoid Valve	DCWD-0344
4A	Nut	INCL W/DCWD-0344
5	Coil	DCWD-0352
6	VALVE PRESSURE REDUCING DCWD PRESET TO 550 PSI	DCWD-0379-055
7	Check Valve	DCWD-0354



Item #	Description	Part Number
1	VENTABLE RELIEF VALVE PRESET 1700 PSI	WTCM-720-06
2A *	PROPORTIONAL RELIEF VALVE	WTCM-720-03
2B *	CART VALVE COIL 24VDC REPLACEMENT	WTCM-720-24VDC
3	POPPET CART RELIEF VALVE	WTCM-720-07
4	CHECK CART VALVE 100 PSI	WTCM-720-02

* ITEM #2 WTCM-720-03 INCLUDES CART AND COIL



Open Loop Energy Inc.

P.O. Box 391
Safford, AZ 85548-0391

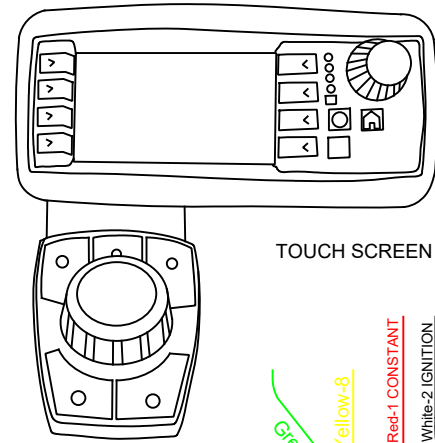
901 West 6th Street
Winnemucca, NV 89445



Drawing Number	Drawing Description	Truck
DCWD-0587	G2 DCWD HYD SYSTEM OVERALL CONTROL SCHEMATIC C SIZE DRAWING ILLUSTRATES THE OVERALL CONTROL OF G2 SYSTEM THIS IS AN OVERVIEW OF ALL FOLLOWING DRAWINGS	
DCWD-0582-00 (82-00)	G2 OPERATOR STATION ELE SCHEMATIC ILLUSTRATES A3 TOUCH SCREEN & JOYSTICK PINOUT CONNECTIONS INCLUDING THE POWER BOX (DCWD-PB) WIRE SCHEMATIC	
DCWD-0582-01 (82-01)	G2 DCWD CANNON CONTROL ILLUSTRATES WIRE PINOUT ON DCM3 CONNECTORS WHICH CONTROLS THE CANNON MOVEMENTS, CANNON ON, AND FOAM IF APPLICABLE	
DCWD-0582-02 (82-02)	G2 DCWD CANNON ELECTRIC MOTOR CONTROL (IF APPLICABLE) ILLUSTRATES WIRE PINOUT ON DCM3 CONNECTORS AND POLARITIES WHICH CONTROLS THE CANNON MOVEMENTS, CANNON ON, AND FOAM (IF APPLICABLE)	
DCWD-0582-03 (82-03)	G2 POWER DISTRIBUTION AND RIGHT JBOX CONNECTIONS ILLUSTRATES THE WIRE DIAGRAM FOR PRIMARY AND SECONDARY +24VDC AND GROUND FEEDS INCLUDING POWER RELAYS FOR LIGHTS	
DCWD-0582-04 (82-04)	G2 PRIMARY CONTROL MODULE DCM1 ILLUSTRATES WIRE PINOUT ON DCM1 CONNECTORS WHICH CONTROLS UP TO SIX SPRAY HEADS - ALSO PROVIDES LEVEL SENSOR POWER/GROUND AND RECEIVES IT'S INPUT SIGNAL	
DCWD-0582-05 (82-05)	G2 SECONDARY CONTROL MODULE DCM2 ILLUSTRATES WIRE PINOUT ON DCM2 CONNECTORS WHICH CONTROLS DRAIN, DUMP BAR, WORK LIGHTS AND FLASHING BEACON LIGHT ALSO TWO EXTRA OUTPUTS AUX1 AND AUX2	
DCWD-0587-06 (87-06)	HEAD AND FUNCTION HYDRAULIC CONTROL VALVES ILLUSTRATES THE WIRE DIAGRAM FOR 8 TO 10 EACH HYD VALVES THAT CONTROL SPRAY HEADS, DRAIN AND CANNON BFV (IF APPLICABLE) THIS INCLUDES INFORMATION ON HOW THEY ARE INTERFACED TO CONTROL MODULES DCM1, 2 AND 3	

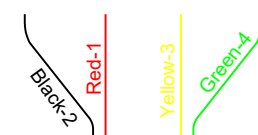


Drawing Number	Drawing Description	Truck
DCWD-0582-08 (82-08)	G2 CAB TO TANK FRONT ELE SCHEMATIC ILLUSTRATES CORD ROUTING AND WIRE DIAGRAM OF SEALED SPLICE PACK SYSTEMS FOR POWER DISTRIBUTION FROM CAB REAR AREA TO REAR PIVOT AREA AND TO THEN TO THE TANK FRONT AREA	
DCWD-0582-09 (82-09)	G2 MAIN HYDRAULIC MANIFOLD CONTROL ILLUSTRATES THE PINOUT ON DCM4 CONNECTORS WHICH CONTROLS THE PRESSURE VALVE ON THE MAIN MANIFOLD AND ELECTRONIC DIVERTER VALVE (IF APPLICABLE) THIS ALSO INTERFACES WITH INDICATOR ON PILOT LINE FILTERS, SPEED SENSOR, HYDRAULIC PRESSURE SENSOR, AND WATER FLOW SENSORS	
DCWD-0587-10 (87-10)	G2 CANNON HYDRAULIC CONTROL VALVES ILLUSTRATES THE WIRE DIAGRAM FOR THE HYDRAULIC CANNON CART VALVES THAT CONTROL CANNON MOVEMENT, CANNON BFV AND NOZZLE ADJUSTMENT IF APPLICABLE	
DCWD-0587-11 (87-11)	G2 JBOX LEFT CONNECTIONS ILLUSTRATES THE WIRE DIAGRAM FOR JBOX LEFT SIDE RECEPTACLES	
DCWD-0582-12 (82-12)	G2 OCTA-BOX LEFT CONNECTIONS ILLUSTRATES THE WIRE DIAGRAM FOR OCTA-BOX LEFT SIDE RECEPTACLES	
DCWD-0583A	G2 DCM 1 & 2 PINOUT CHART ILLUSTRATES THE WIRE DIAGRAM OR PINOUT ASSIGNMENT FOR 30 AND 18 PIN METRI-PAK CONNECTORS ON EACH MODULE	
DCWD-0583B	G2 DCM 3 & 4 PINOUT CHART ILLUSTRATES THE WIRE DIAGRAM OR PINOUT ASSIGNMENT FOR 30 AND 18 PIN METRI-PAK CONNECTORS ON EACH MODULE	

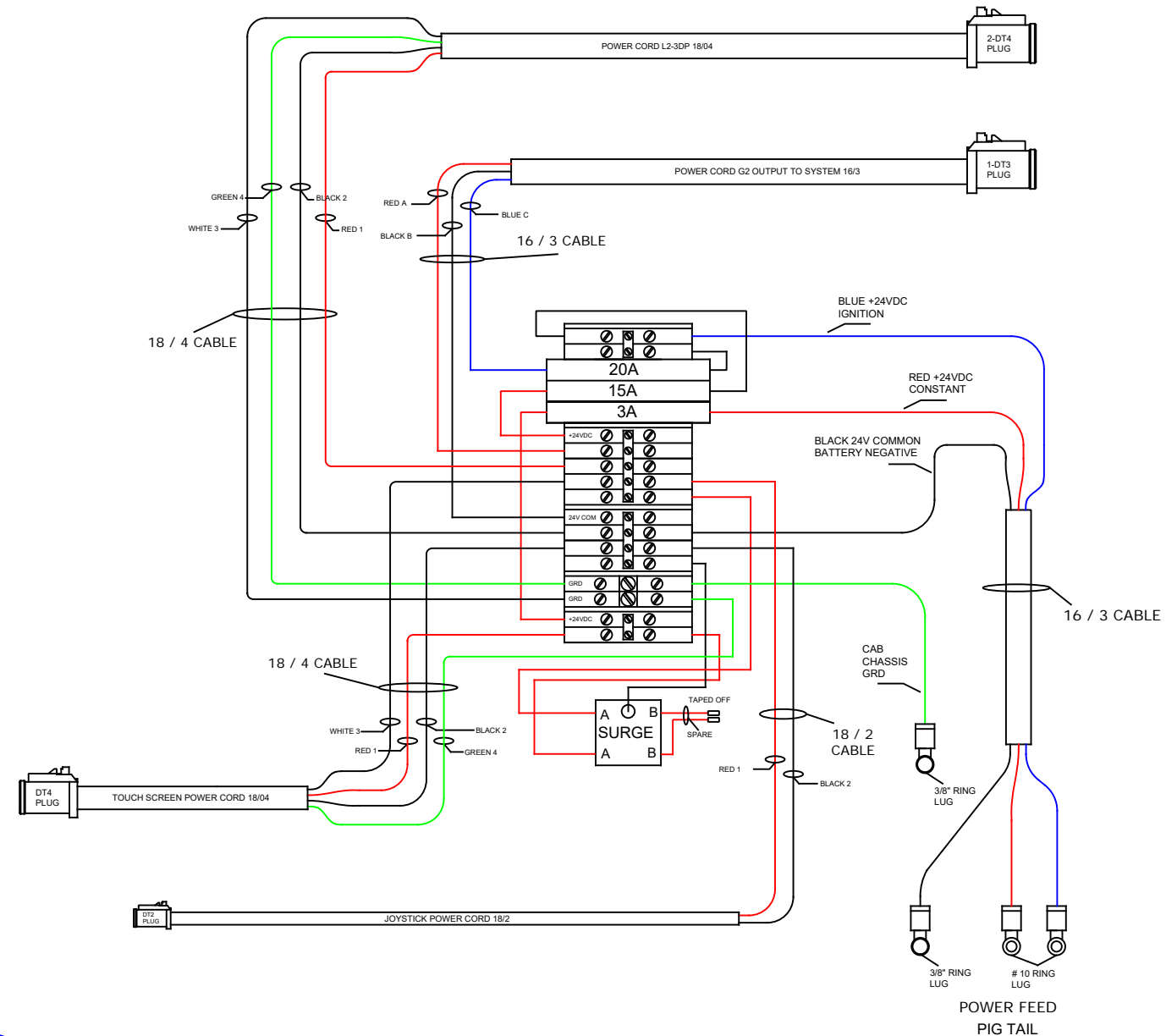
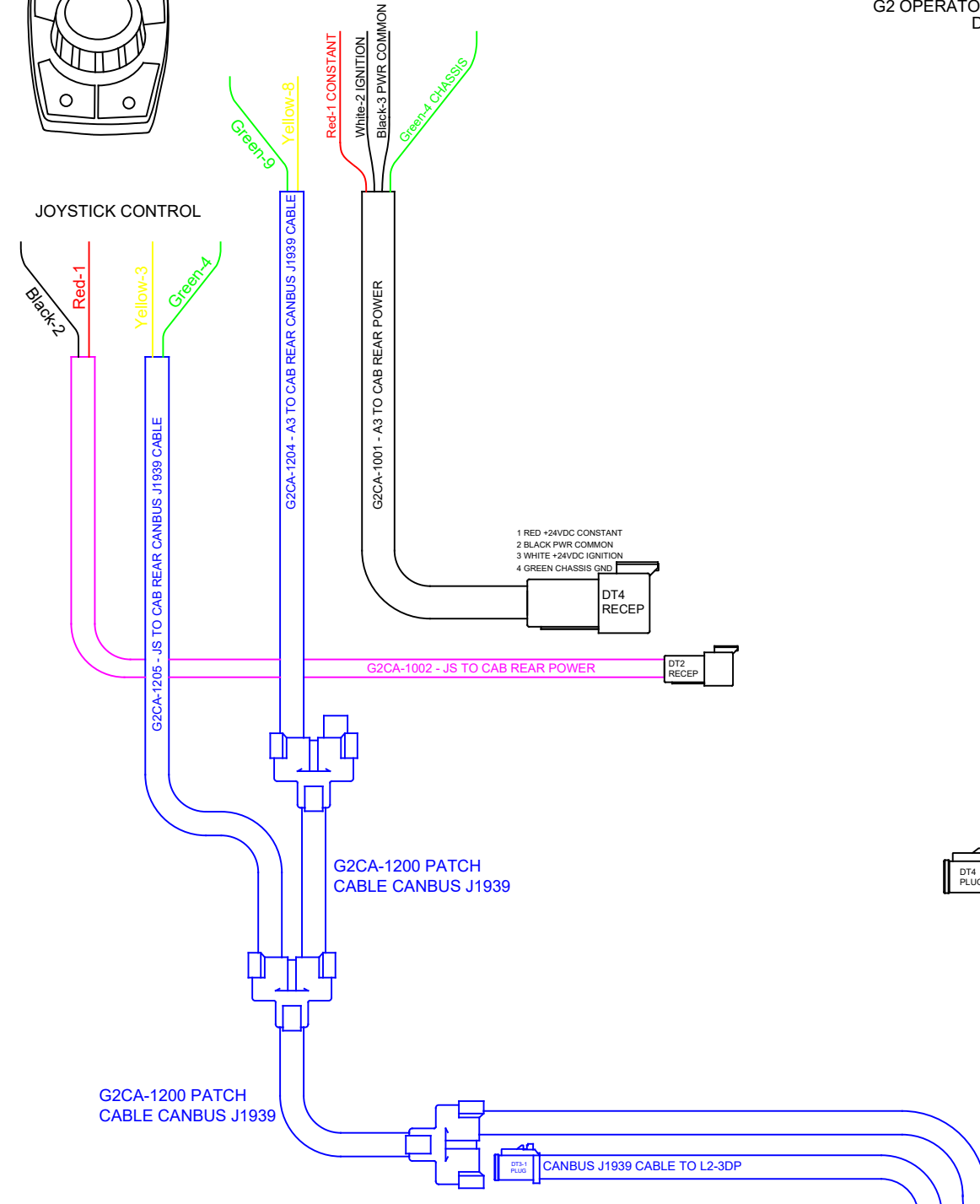


TOUCH SCREEN CONTROL

JOYSTICK CONTROL

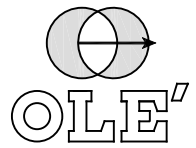


G2 OPERATOR STATION AND CAB REAR AREA
DWG#: DCWD-0582-00



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Materials	REVISIONS	DATE
	PWR BOX OUTPUT FOR L2-3PD	05/31/18

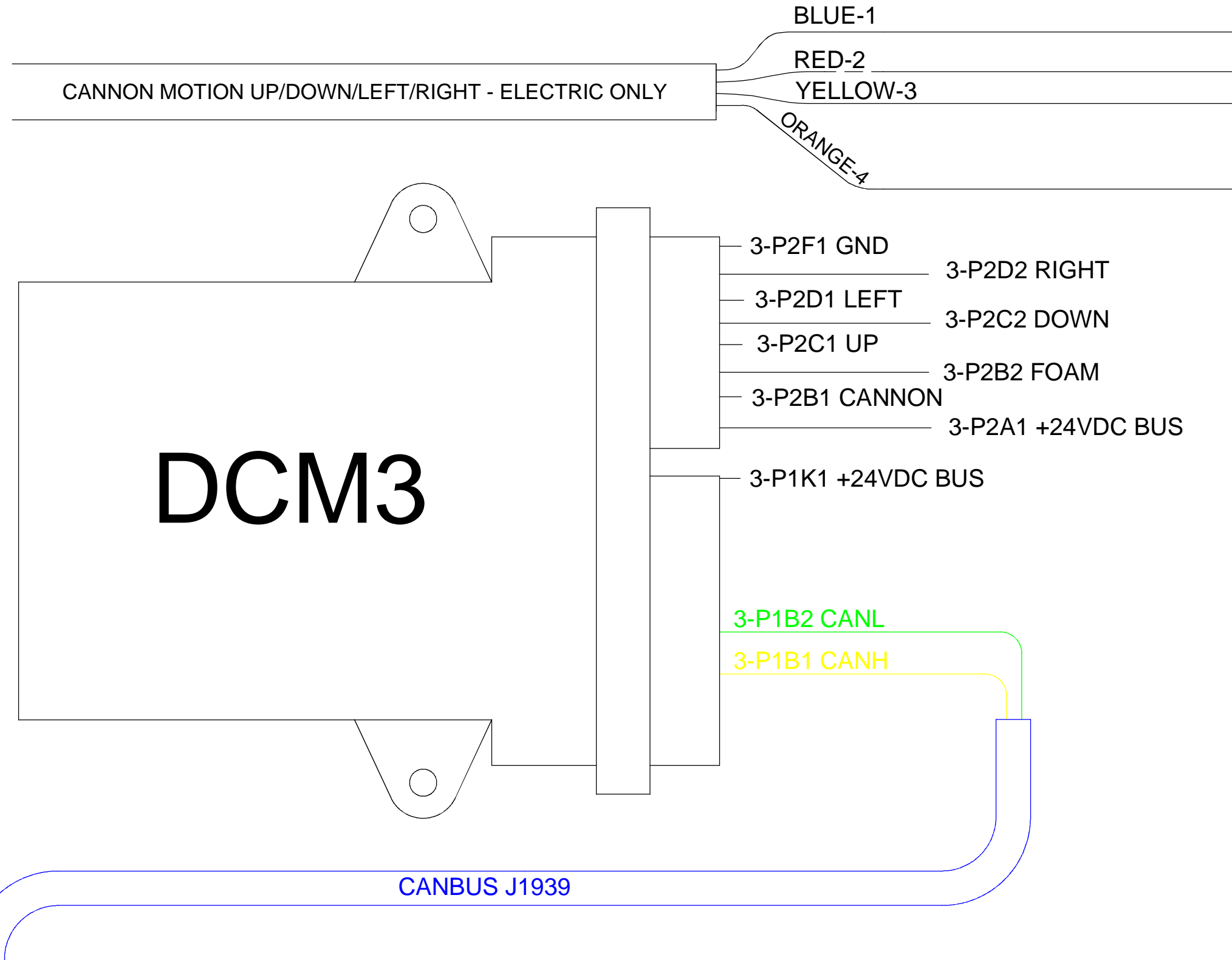


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UNLESS OTHERWISE SPECIFIED, X ± .1 .XXX ± .003
TOLERANCES ARE TO BE: °XX ± .01 ANGLES ± 1°

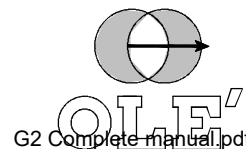
PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 OPERATOR STATION AND CAB AREA	
SCALE NTS	PART #
DATE 11/16/2012	APPROVED BY-
DWG NO. DCWD-0582-00	DRAWN BY CHAD ROLFE

G2 CANNON CONTROL
 DWG#: DCWD-0582-01



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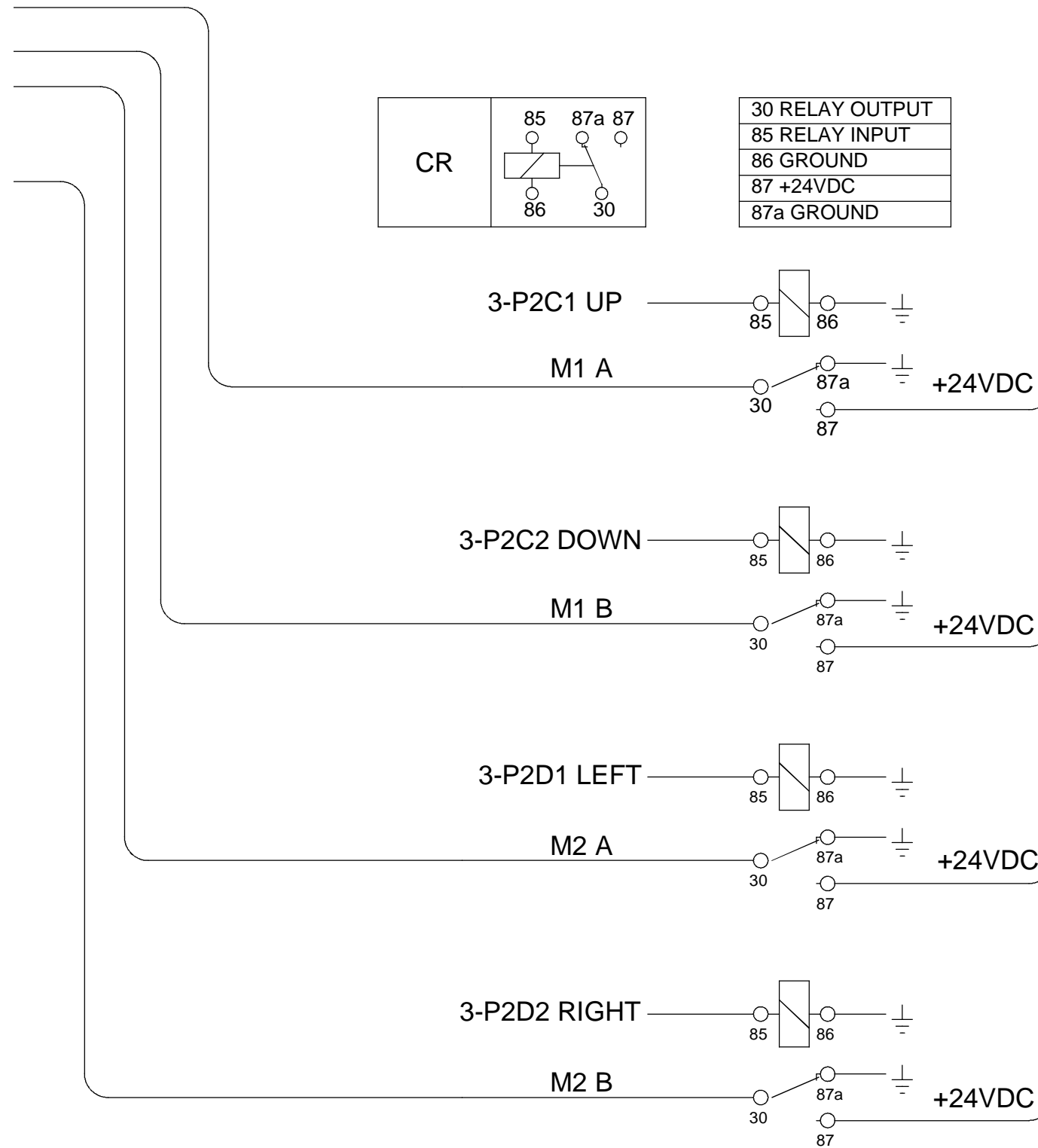
Materials	REVISIONS	DATE



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UNLESS OTHERWISE SPECIFIED, X ± .1 .XXX ± .003
 TOLERANCES ARE TO BE: .XX ± .01 ANGLES ± 1°

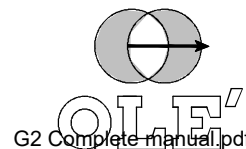
PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 CANNON CONTROL	
SCALE NTS	PART #
DATE 11/16/2012	APPROVED BY-
DWG NO. DCWD-0582-01	DRAWN BY CROLFE

12/04/2019
G2 CANNON ELE MOTOR CONTROL
 DWG#: DCWD-0582-02



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Materials	REVISIONS	DATE

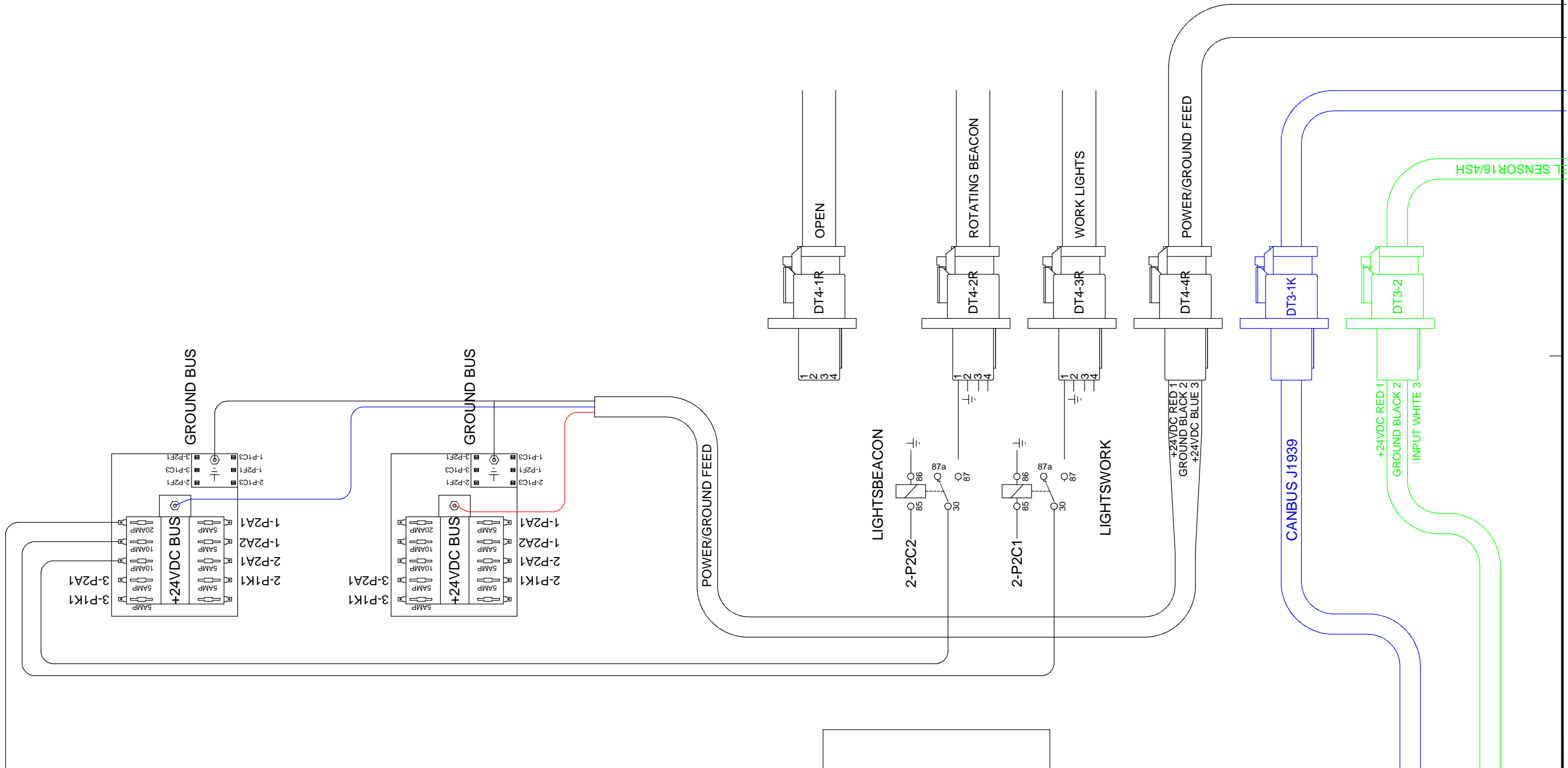


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UNLESS OTHERWISE SPECIFIED, X ± .1 .XXX ± .003
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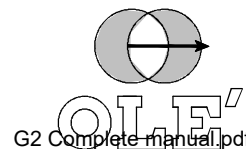
PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 CANNON ELE MOTOR CONTROL	
SCALE NTS	PART #
DATE 11/16/2012	APPROVED BY-
DWG NO. DCWD-0582-02	DRAWN BY CROLFE

G2 POWER DIST AND RIGHT JBOX CONNECTIONS
DWG#: DCWD-0582-03



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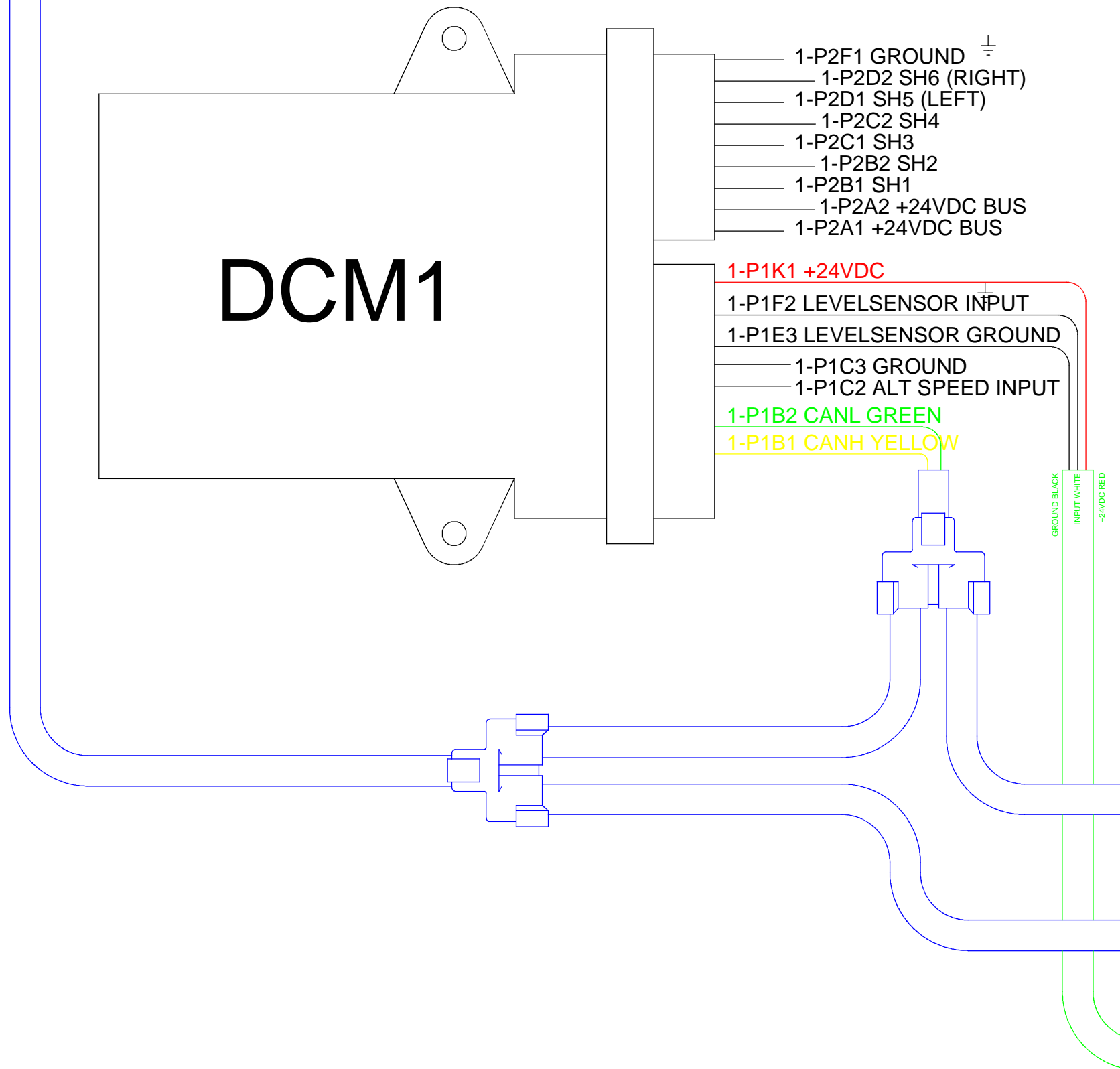
UNLESS OTHERWISE SPECIFIED, X ± .1 .XXX ± .003
TOLERANCES ARE TO BE: .XX ± .01 ANGLES ± 1°

PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 POWER DIST AND RIGHT JBOX CONNECTIONS	
SCALE NTS	PART #
DATE 11/16/2012	APPROVED BY-
DWG NO. DCWD-0582-03	DRAWN BY CROLFE

12/04/2019

G2 PRIMARY CONTROL

DWG#: DCWD-0582-04



DCM1

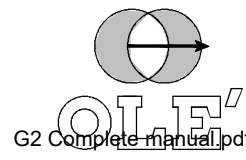
- 1-P2F1 GROUND \perp
- 1-P2D2 SH6 (RIGHT)
- 1-P2D1 SH5 (LEFT)
- 1-P2C2 SH4
- 1-P2C1 SH3
- 1-P2B2 SH2
- 1-P2B1 SH1
- 1-P2A2 +24VDC BUS
- 1-P2A1 +24VDC BUS

- 1-P1K1 +24VDC
- 1-P1F2 LEVELSENSOR INPUT
- 1-P1E3 LEVELSENSOR GROUND
- 1-P1C3 GROUND
- 1-P1C2 ALT SPEED INPUT
- 1-P1B2 CANL GREEN
- 1-P1B1 CANH YELLOW

GROUND BLACK
INPUT WHITE
+24VDC RED

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Materials	REVISIONS	DATE



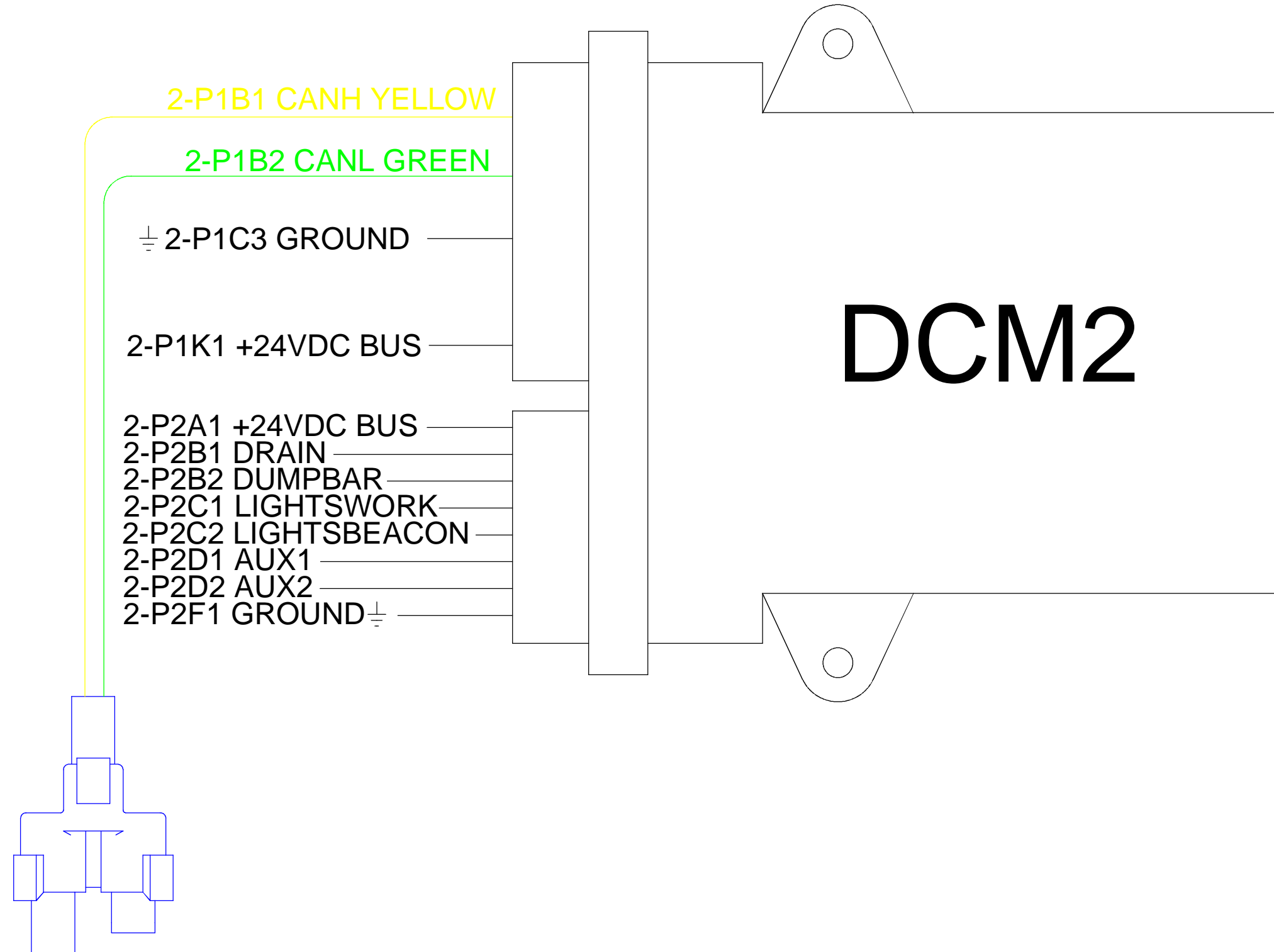
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SAFFORD, AZ

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TOLERANCES ARE TO BE: .XX ± .01 ANGLES ± 1°

PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 PRIMARY CONTROL	
SCALE NTS	PART #
DATE 11/16/2012	APPROVED BY-
DWG NO. DCWD-0582-14	DRAWN BY CROLFE

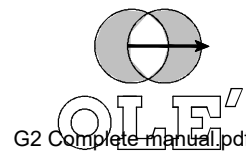
G2 SECONDARY CONTROL

DWG#: DCWD-0582-05



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Materials	REVISIONS	DATE

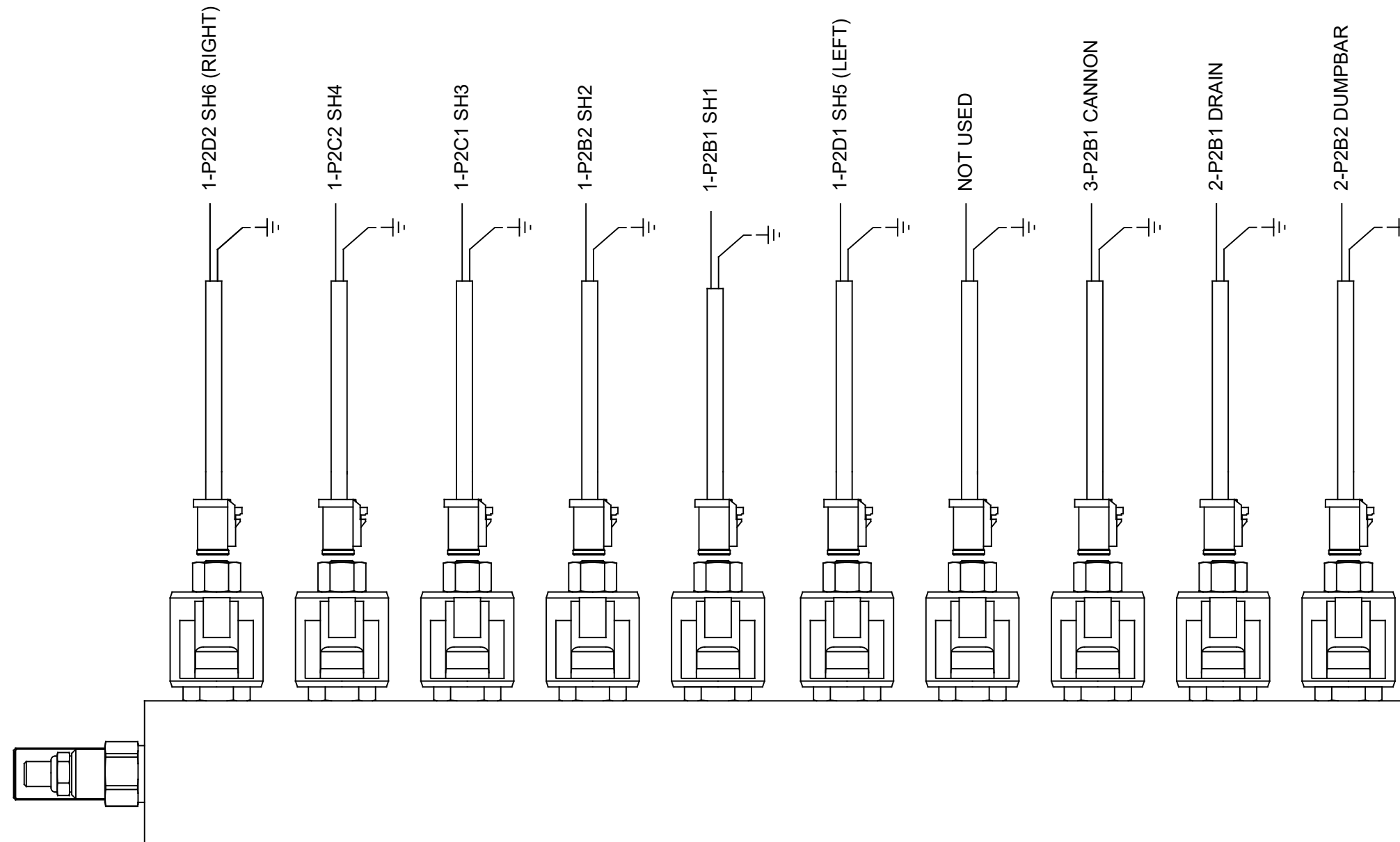


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TOLERANCES ARE TO BE: .XX ± .01 ANGLES ± 1°

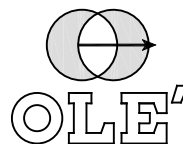
PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 SECONDARY CONTROL	
SCALE NTS	PART #
DATE 11/16/2012	APPROVED BY-
DWG NO. DCWD-0582-05	DRAWN BY CROLFE

HEAD AND FUNCTION HYDRAULIC CONTROL VALVES
 DWG#: DCWD-0587-06



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Materials	REVISIONS	DATE



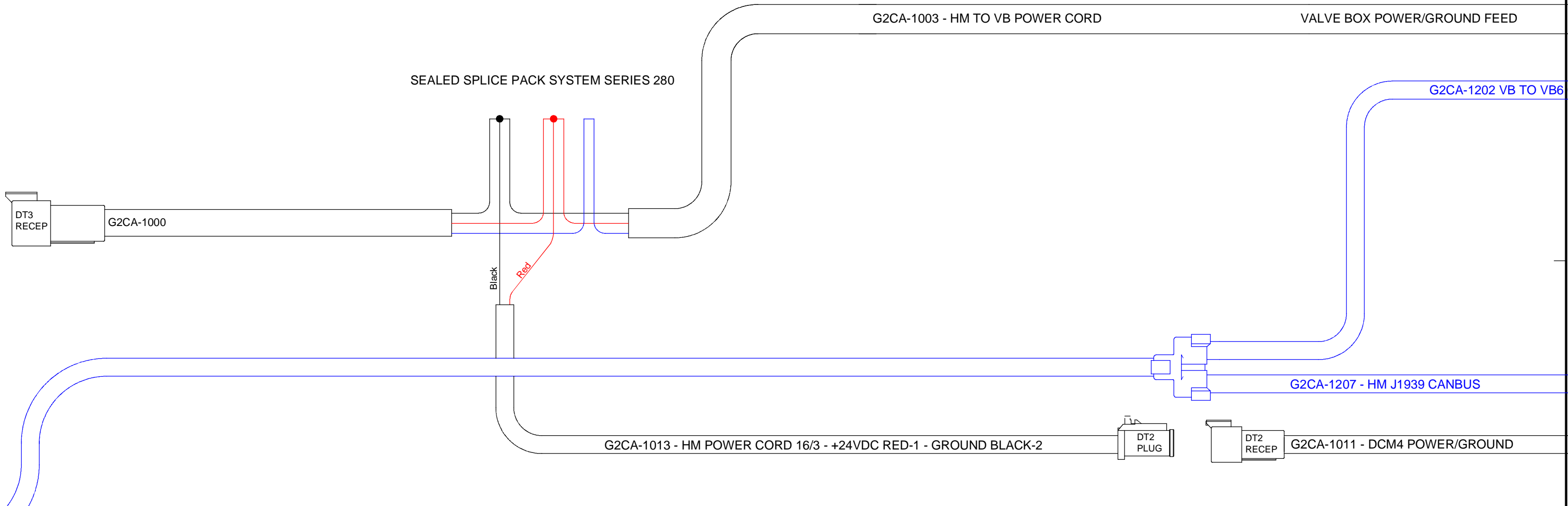
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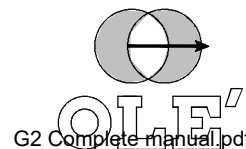
G2 Complete manual.pdf

PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. HEAD AND FUNCTION HYD CONTROL VALVES	
SCALE NTS	PART #
DATE 09/01/2017	APPROVED BY-
DWG NO. DCWD-0587-06	DRAWN BY CHAD ROLFE

G2 CAB TO TANK FRONT AREA
 DWG#: DCWD-0582-08



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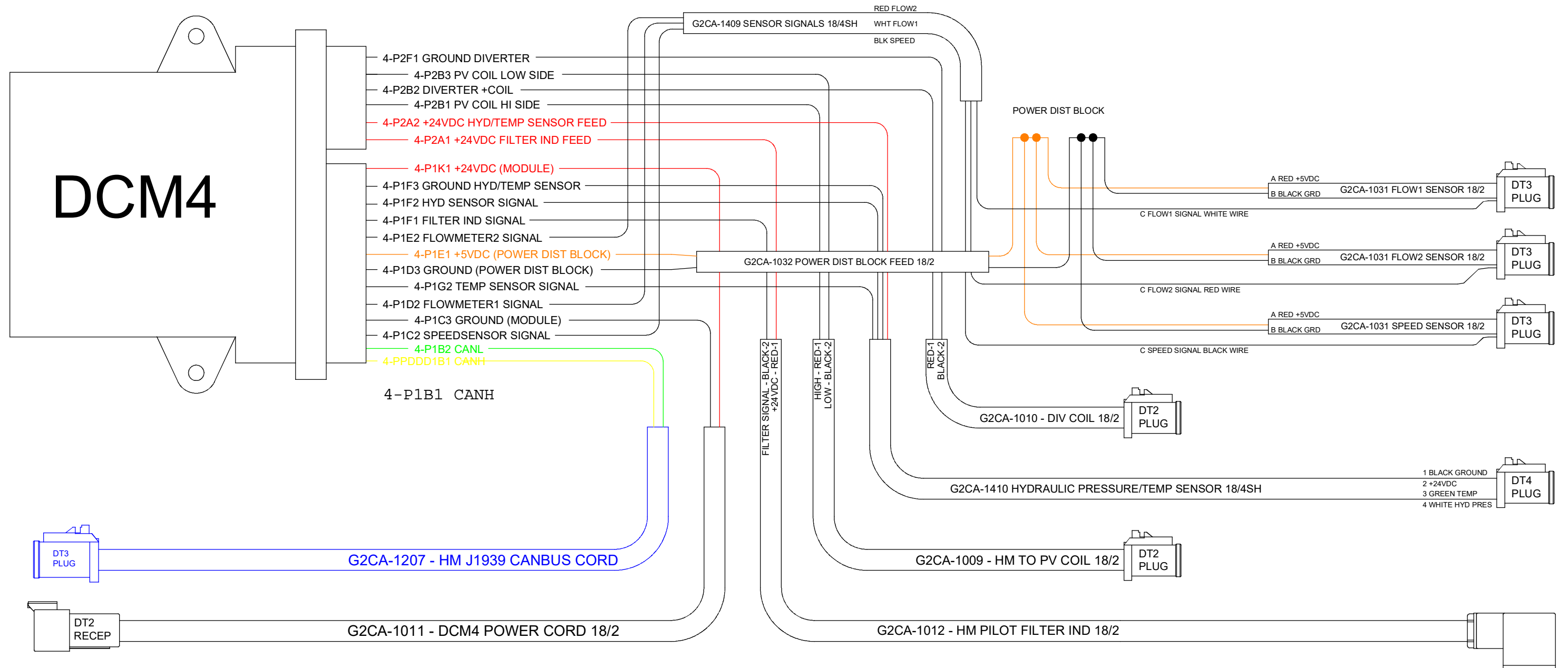


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Materials	REVISIONS	DATE

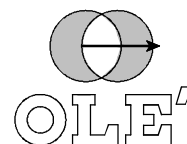
PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 CAB TO TANK FRONT AREA	
SCALE NTS	PART #
DATE 11/116/2012	APPROVED BY-
DWG NO. DCWD-0582-08	DRAWN BY CROLFE

G2 HYDRAULIC MANIFOLD CONTROL DWG#: DCWD-0582-09



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Materials	REVISIONS	DATE
	CORDS ADDED OR MODIFIED	09/18/2013



G2 Complete manual.pdf

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PROJECT
DIGITALLY CONTROLLED WATER DISTRIBUTION

DESC.
G2 HYDRAULIC MANIFOLD CONTROL

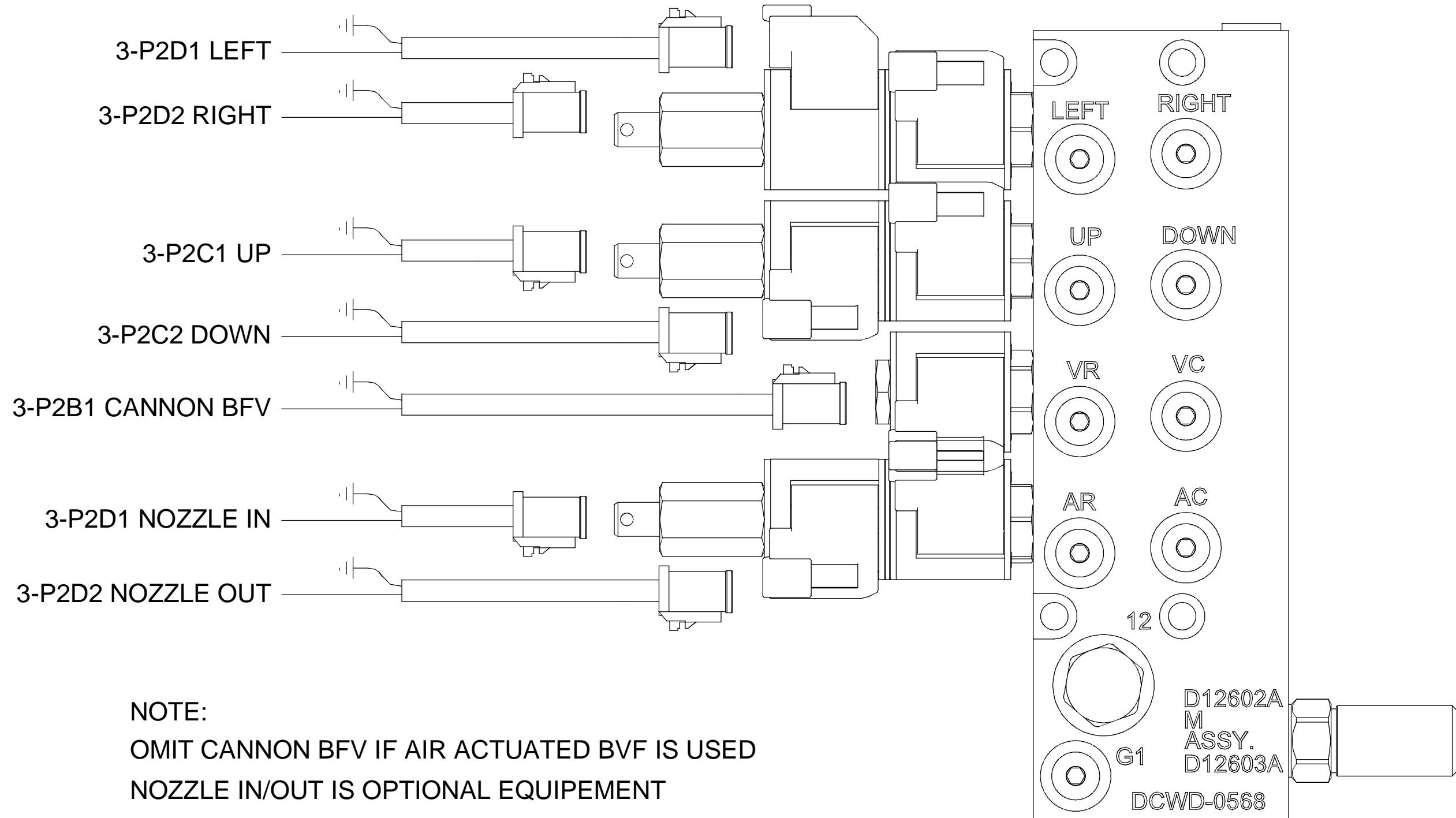
SG-LE NTS PART #

DATE 05/28/2013 APPROVED BY-

DWG NO. DCWD-0582-09 DRAWN BY CROLFE

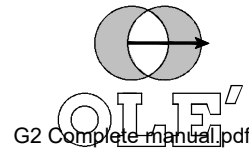
HYDRAULIC CANNON CONTROL VALVES

DWG#: DCWD-0587-10



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Materials	REVISIONS	DATE

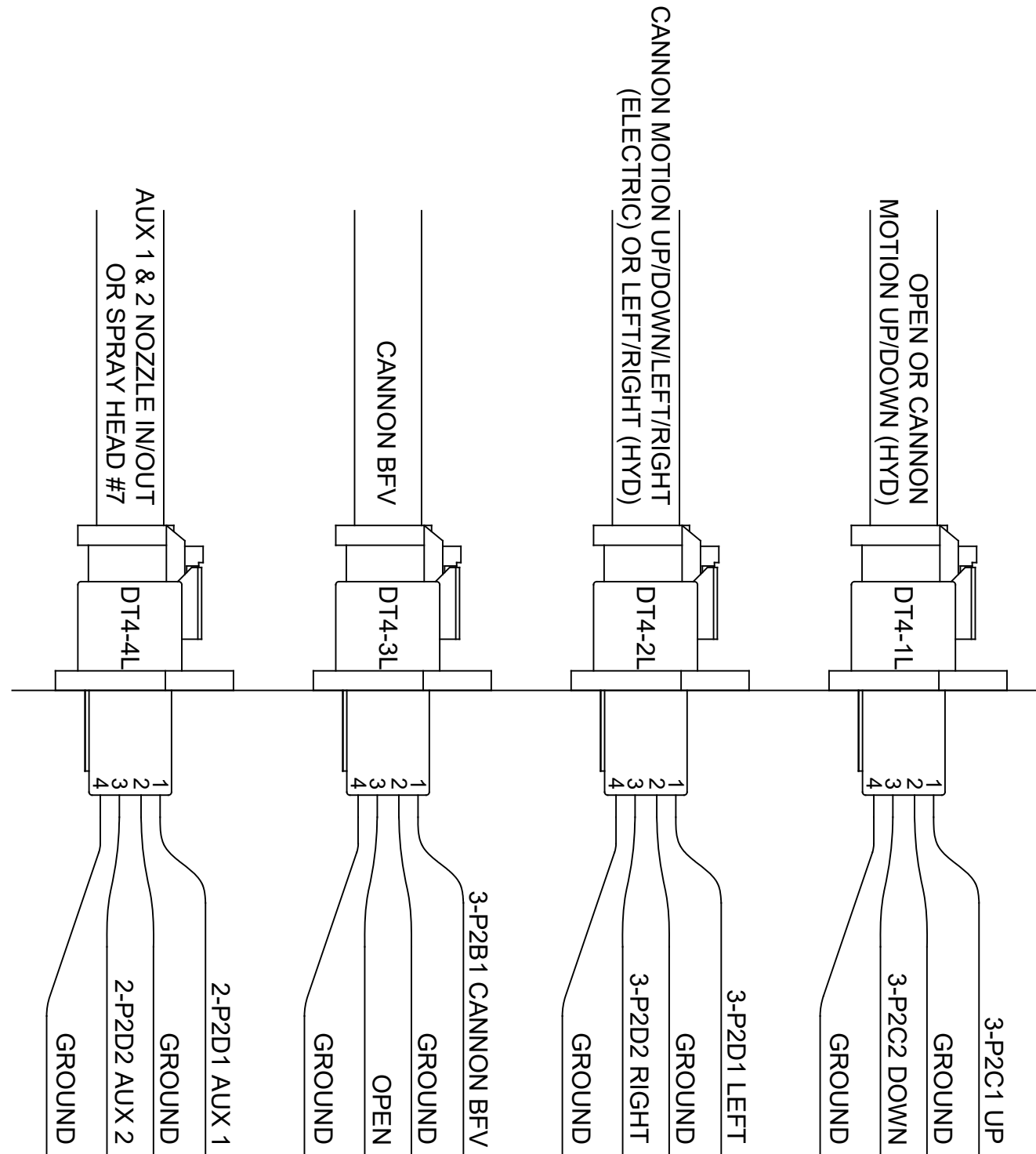


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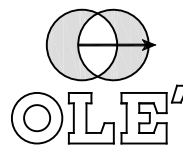
PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. HYDRAULIC CANNON CONTROL VALVES	
SCALE NTS	PART #
DATE 11/16/2012	APPROVED BY-
DWG NO. DCWD-0587-10	DRAWN BY CROLFE

G2 JBOX LEFT CONNECTORS
 HYDRAULIC CANNON VALVE
 DWG#: DCWD-0587-11



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Materials	REVISIONS	DATE



G2 Complete manual.pdf

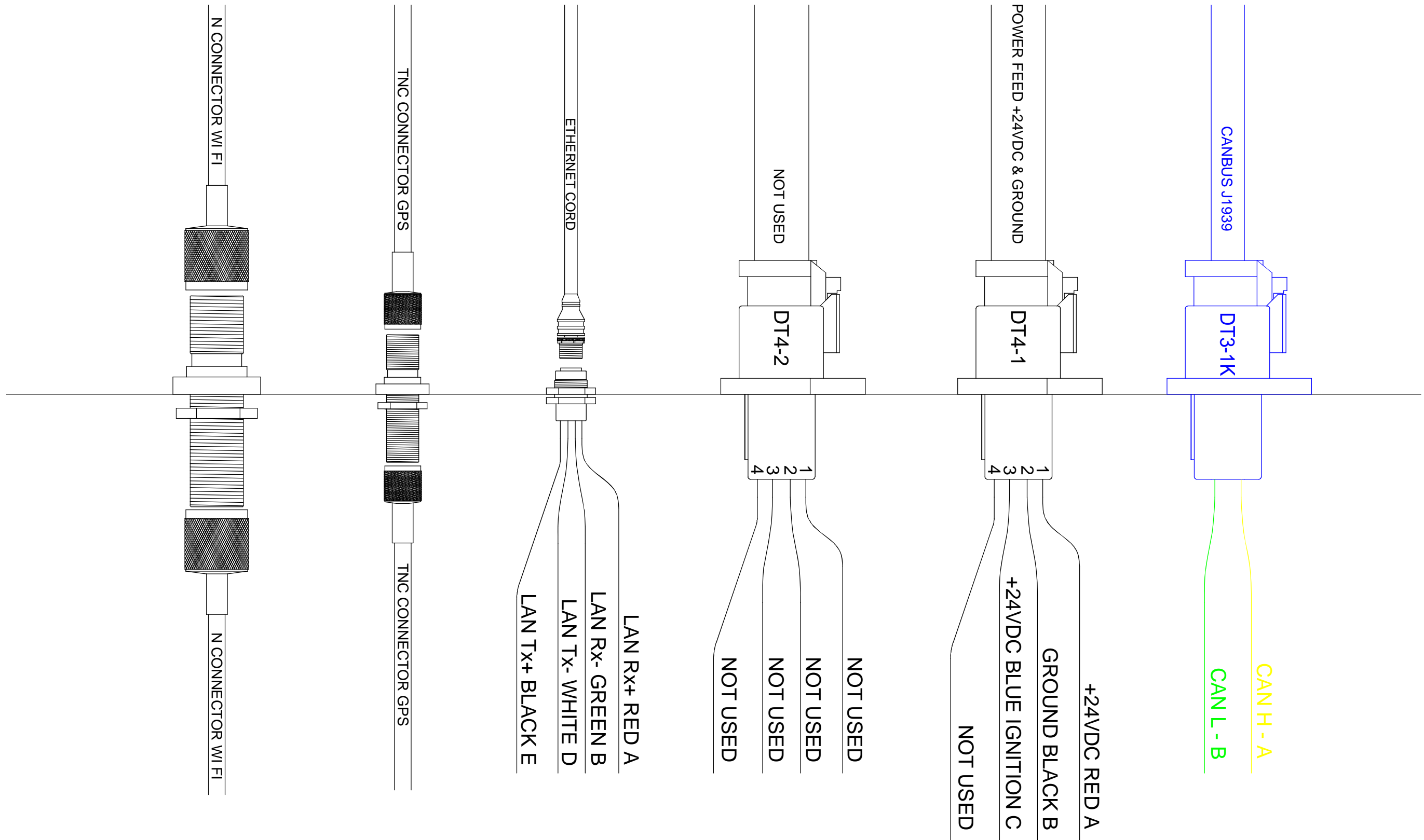
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 TOLERANCES ARE TO BE .XX ± .01 ANGLES ± 1°

PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 JBOX LEFT CONNECTIONS	
SCALE NTS	PART #
DATE 11/16/2012	APPROVED BY-
DWG NO. DCWD-0587-11	DRAWN BY CROLFE

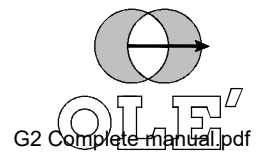
G2 OCTA-BOX LEFT CONNECTORS
DWG#: DCWD-0582-12

12/04/2019



PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. G2 OCTA-BOX CONNECTION INTERFACE	
SCALE NTS	PART #
DATE 05/29/2013	APPROVED BY-
DWG NO. DCWD-0582-12	DRAWN BY CROLFE

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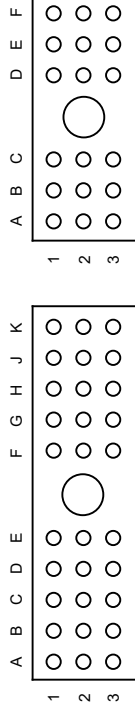


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Materials	REVISIONS	DATE

G2 DCM 1-2 PINOUT CHART
 DWG#: DCWD-0583A (DRAWING 1 OF 2)

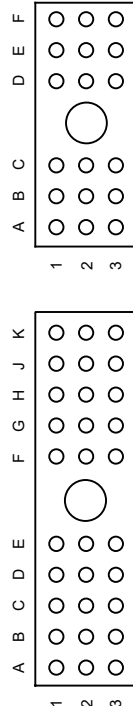


DCM1 30 PIN Metri-Pak (P1)

PIN	FUNC	NAME	PIN	FUNC	NAME	PIN	FUNC	NAME
A1	RXD	RS232 Receive Data	D2	Uni2	Not Used	G3	GND	Ground
A2	TXD	RS232 Transmit Data	D3	Gnd	Not Used	H1	Dig3	LevelSwitch40
A3	RTS	RS232 Request to Send	E1	Ref	Not Used	H2	Ana3	Not Used
B1	CANH	CAN High (Yellow)	E2	Uni3	Not Used	H3	GND	Not Used
B2	CANL	CAN Low (Green)	E3	Gnd	Level Sensor Ground (BLK)	J1	Dig4	LevelSwitch60
B3	GND	RS232 Ground	F1	Dig1	HydroSwitch	J2	Dig5	LevelSwitch80
C1	CAN1H	Not Used	F2	Ana1	Level Sensor Input (WHT)	J3	Dig6	LevelSwitch100
C2	Uni1	Not Used	F3	GND	Not Used	K1	+Pwr	+Power In 24V
C3	GND	Ground	G1	Dig2	LevelSwitch20	K2	Dig7	Not Used
D1	CAN1L	Not Used	G2	Ana2	Not Used	K3	Dig8	Not Used

DCM1 18 PIN Metri-Pak (P2)

PIN	FUNC	NAME	PIN	FUNC	NAME
A1	+PWR	+24VDC Power In	C1	HS3	SH3
A2	+PWR	Level Sensor +24VDC	C2	HS4	SH4
A3	PWM1	Not Used	C3	PWM2	Not Used
B1	HS1	SH1	D1	HS5	SH5
B2	HS2	SH2	D2	HS6	SH6
B3	PWM1	Not Used	D3	PWM3	Not Used



DCM2 30 PIN Metri-Pak (P1)

PIN	FUNC	NAME	PIN	FUNC	NAME
A1	RXD	RS232 Receive Data	D2	Uni2	Not Used
A2	TXD	RS232 Transmit Data	D3	Gnd	Not Used
A3	RTS	RS232 Request to Send	E1	Ref	Not Used
B1	CANH	CAN High (Yellow)	E2	Uni3	Not Used
B2	CANL	CAN Low (Green)	E3	Gnd	Not Used
B3	GND	RS232 Ground	F1	Dig1	Not Used
C1	CAN1H	Not Used	F2	Ana1	Not Used
C2	Uni1	Not Used	F3	GND	Not Used
C3	GND	Ground	G1	Dig2	Not Used
D1	CAN1L	Not Used	G2	Ana2	Not Used

DCM2 18 PIN Metri-Pak (P2)

PIN	FUNC	NAME	PIN	FUNC	NAME
A1	+PWR	+24VDC Power In	C1	HS3	Lights Work
A2	+PWR	Not Used	C2	HS4	Lights Beacon
A3	PWM1	Not Used	C3	PWM2	Not Used
B1	HS1	Drain	D1	HS5	Aux1
B2	HS2	Dump Bar	D2	HS6	Aux2
B3	PWM1	Not Used	D3	PWM3	Not Used

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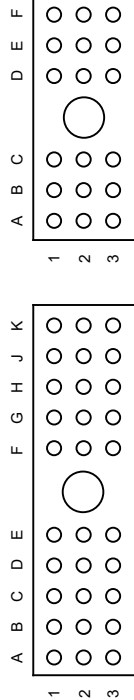
Materials	REVISIONS	DATE

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PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. DCM 1-2 PINOUT CHART	
SCALE NTS	PART #
DATE 08/07/2012	APPROVED BY
DWG NO. DCWD-0583A	DRAWN BY CROLFE

G2 DCM 3-4 PINOUT CHART
 DWG#: DCWD-0583B (DRAWING 2 OF 2)

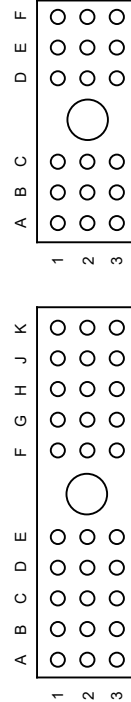


DCM3 30 PIN Metri-Pak (P1)

PIN	FUNC	NAME	PIN	FUNC	NAME	PIN	FUNC	NAME
A1	RXD	RS232 Receive Data	D2	Unr2	Not Used	G3	GND	Not Used
A2	TXD	RS232 Transmit Data	D3	Gnd	Not Used	H1	Dig3	Not Used
A3	RTS	RS232 Request to Send	E1	Ref	Not Used	H2	Ana3	Not Used
B1	CANH	CAN High (Yellow)	E2	Unr3	Not Used	H3	GND	Not Used
B2	CANL	CAN Low (Green)	E3	Gnd	Not Used	J1	Dig4	Not Used
B3	GND	RS232 Ground	F1	Dig1	Not Used	J2	Dig5	Not Used
C1	CAN1H	Not Used	F2	Ana1	Not Used	J3	Dig6	Not Used
C2	Unr1	Not Used	F3	GND	Not Used	K1	+Pwr	+Power In 24V
C3	GND	Not Used	G1	Dig2	Not Used	K2	Dig7	Not Used
D1	CAN1L	Not Used	G2	Ana2	Not Used	K3	Dig8	Not Used

DCM3 18 PIN Metri-Pak (P2)

PIN	FUNC	NAME	PIN	FUNC	NAME	PIN	FUNC	NAME
A1	+PWR	Not Used	C1	HS3	Cannon UP	E1	GND	Not Used
A2	+PWR	Not Used	C2	HS4	Cannon DOWN	E2	PWM2	Not Used
A3	PWM1	Not Used	C3	PWM2	Not Used	E3	PWM3	Not Used
B1	HS1	Cannon	D1	HS5	Cannon LEFT	F1	GND	Ground
B2	HS2	Foam	D2	HS6	Cannon RIGHT	F2	GND	Ground
B3	PWM1	Not Used	D3	PWM3	Not Used	F3	GND	Not Used



DCM4 30 PIN Metri-Pak (P1)

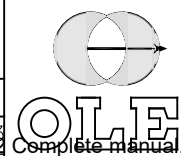
PIN	FUNC	NAME	PIN	FUNC	NAME	PIN	FUNC	NAME
A1	RXD	RS232 Receive Data	D2	Unr2	Flow/Meter1 Signal	G3	GND	Not Used
A2	TXD	RS232 Transmit Data	D3	Gnd	Ground (Power Dist Block)	H1	Dig3	Not Used
A3	RTS	RS232 Request to Send	E1	Ref	+5V Ref (Power Dist Block)	H2	Ana3	Not Used
B1	CANH	CAN High (Yellow)	E2	Unr3	Flow/Meter2 Signal	H3	GND	Not Used
B2	CANL	CAN Low (Green)	E3	Gnd	Not Used	J1	Dig4	Not Used
B3	GND	RS232 Ground	F1	Dig1	Filter Signal	J2	Dig5	Not Used
C1	CAN1H	Not Used	F2	Ana1	HydroPressure Input White	J3	Dig6	Not Used
C2	Unr1	Speed Sensor Signal	F3	GND	HydroPressure Ground	K1	+Pwr	+Power In 24V (MODULE)
C3	GND	Ground (MODULE)	G1	Dig2	Not Used	K2	Dig7	Not Used
D1	CAN1L	Not Used	G2	Ana2	Temp Sensor Input Green	K3	Dig8	Not Used

DCM4 18 PIN Metri-Pak (P2)

PIN	FUNC	NAME	PIN	FUNC	NAME	PIN	FUNC	NAME
A1	+PWR	Filter Ind +24VDC Feed	C1	HS3	Not Used	E1	GND	Not Used
A2	+PWR	HydroPressure +24VDC	C2	HS4	Not Used	E2	PWM2	Not Used
A3	PWM1	Not Used	C3	PWM2	Not Used	E3	PWM3	Not Used
B1	HS1	Proportional Valve HI	D1	HS5	Not Used	F1	GND	Type 1 Diverter Coil Ground
B2	HS2	Type 1 Diverter +Coil	D2	HS6	Not Used	F2	GND	Not Used
B3	PWM1	Proportional Valve LO	D3	PWM3	Not Used	F3	GND	Not Used

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Materials	REVISIONS	DATE
	PINOUT ASSIGNMENT MODS	09/18/13



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PROJECT	DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC.	DCM 3-4 PINOUT CHART	
SCALE	NTS	PART #
DATE	05/24/2013	APPROVED BY
DWG NO.	DCWD-0583B	DRAWN BY
		CROLFE



3.17 LED Indicators

The DVC710 has four Red/Green LEDs, positioned on top of the module. They are labeled: Module Status, CAN Status, % Current C/P and Error Status.



DVC710 LED Layout

Operation

When a Bios or application is being downloaded to the controller all LED's will be off. The Following is a list of the individual LED behaviors:

Module Status	
LED STATE	MEANING
Off	There is no power applied to the module.
On GREEN	The module is operating in a normal condition.
Flashing GREEN	Device is in standby state. May need servicing.
On RED	Module has an unrecoverable fault.
On YELLOW	System Disabled active.
Flashing RED	Low Supply Voltage.



CAN Status	
LED STATE	MEANING
Off	There is no J1939 device (or other DVCs) in the project.
On GREEN	Communication established with another DVC module through DVC Devicenet.
Flashing GREEN	Waiting to establish communication with another DVC (i.e. DVC61) or J1939 Bus Enabled.
On RED	The device has detected an error that has rendered it incapable of communicating on the network.
Flashing RED	The DVC Devicenet communication is in a timed-out state.

% Current O/P	
LED STATE	MEANING
Off (Outputs Disabled) GRN (0-33%) YEL (34-66%) RED (66-100%)	
Flashing GREEN	PWM or High Side output Open circuit detected
Flashing RED	PWM or High Side output Short circuit detected

Error Status	
LED STATE	MEANING
Off	No errors
On RED	PWM1 Open or Short Detected
On GREEN	PWM2 Open or Short Detected
Flashing YELLOW	High Side Open or Short Detected
Multi Digit Blink Code	Application defined blink codes.

The Status LED

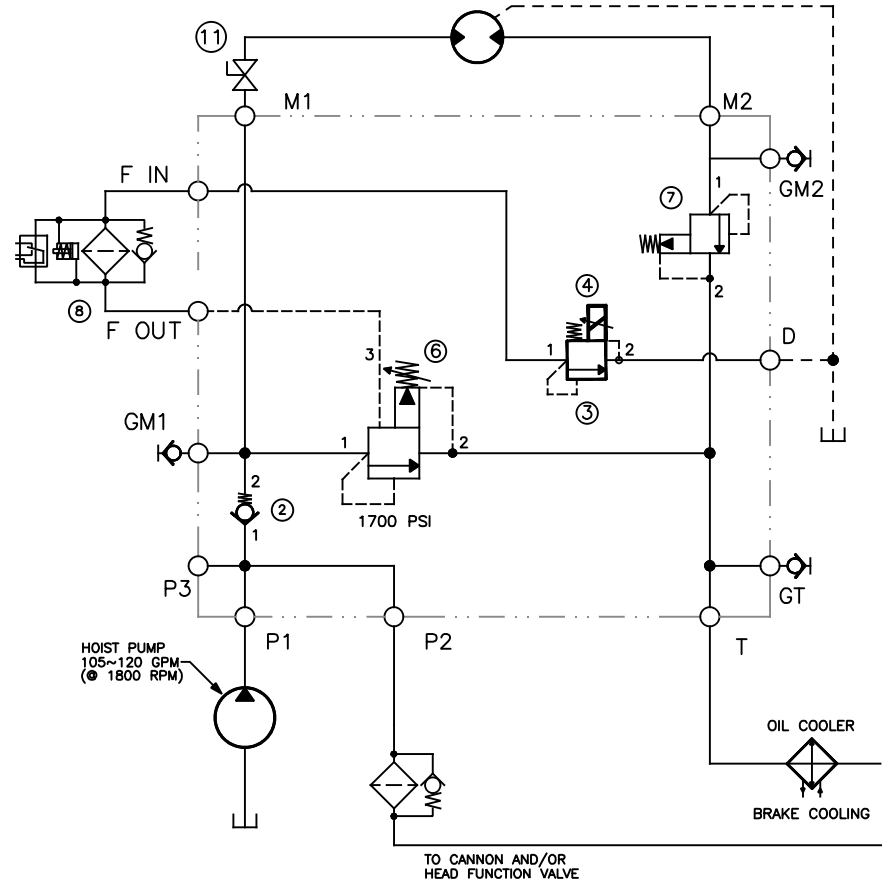
The programmer can send different single or multi digit blink codes to the status LED by using the application variable "Blinkcode". In the application code, the programmer would assign a 1, 2 or 3 digit non-zero value to the Blinkcode variable (i.e. Blinkcode = 501). The BIOS would then read this value and then start flashing the Status LED to the assigned code, for example, in the example above (Blinkcode = 501) the Status LED would flash 5 times followed by a short pause then flash 10 times followed by a short pause then flash once then stop if no other code has been assigned. If a new code was assigned during the time that the code was flashing, there would be a longer pause before the next code began flashing. After the BIOS reads a blink code it will reset the Blinkcode variable to 0 allowing the application to test and see if the BIOS is ready for the next blink code assignment.

The following is an example of valid Blink Code assignments:

[0]	No Blink Code Assigned
[1 - 9]	Single Digit Blink Code
[10 - 99]	Two Digit Blink Code
[100 - 999]	Three Digit Blink Code
[>999]	Invalid assignment, BIOS would ignore this and reset the Blinkcode variable to 0

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	DCWD-0564	MANIFOLD ASSEMBLY MAIN VALVE 6061-T6 ALUMINUM
2	1	WTCM-720-02	CHECK CART VALVE 100 PSI
3	1	WTCM-720-03	PROPORTIONAL RELIEF CART VALVE
4	1	WTCM-720-24VDC	COIL REPLACEMENT
5	1	xxxx	xxxx
6	1	WTCM-720-06	VENTABLE RELIEF CART VALVE 1700 PSI
7	1	WTCM-720-07	POPPET RELIEF CART VALVE FIXED SET 300 PSI
8	1	DCWD-PLFA	DCWD FILTER ASSEMBLY W/ELECTRONIC CLOG INDICATOR
8A	1	P167838	DCWD FILTER ELEMENT
11	1	BVDM15FL1113AZZA	ISOLATION VALVE

ITEM	PORT CONNECTIONS
T	1-1/2" FLANGE CODE 61
D	#8 SAE O-RING BOSS
M1	1-1/2" FLANGE CODE 61
M2	1-1/2" FLANGE CODE 61
GM1	#6 SAE O-RING BOSS
P1	1-1/2" FLANGE CODE 61
P2	#8 SAE O-RING BOSS
P3	#4 SAE O-RING BOSS
F IN	#6 SAE O-RING BOSS
F OUT	#6 SAE O-RING BOSS
GT	#4 SAE O-RING BOSS
GM2	#4 SAE O-RING BOSS



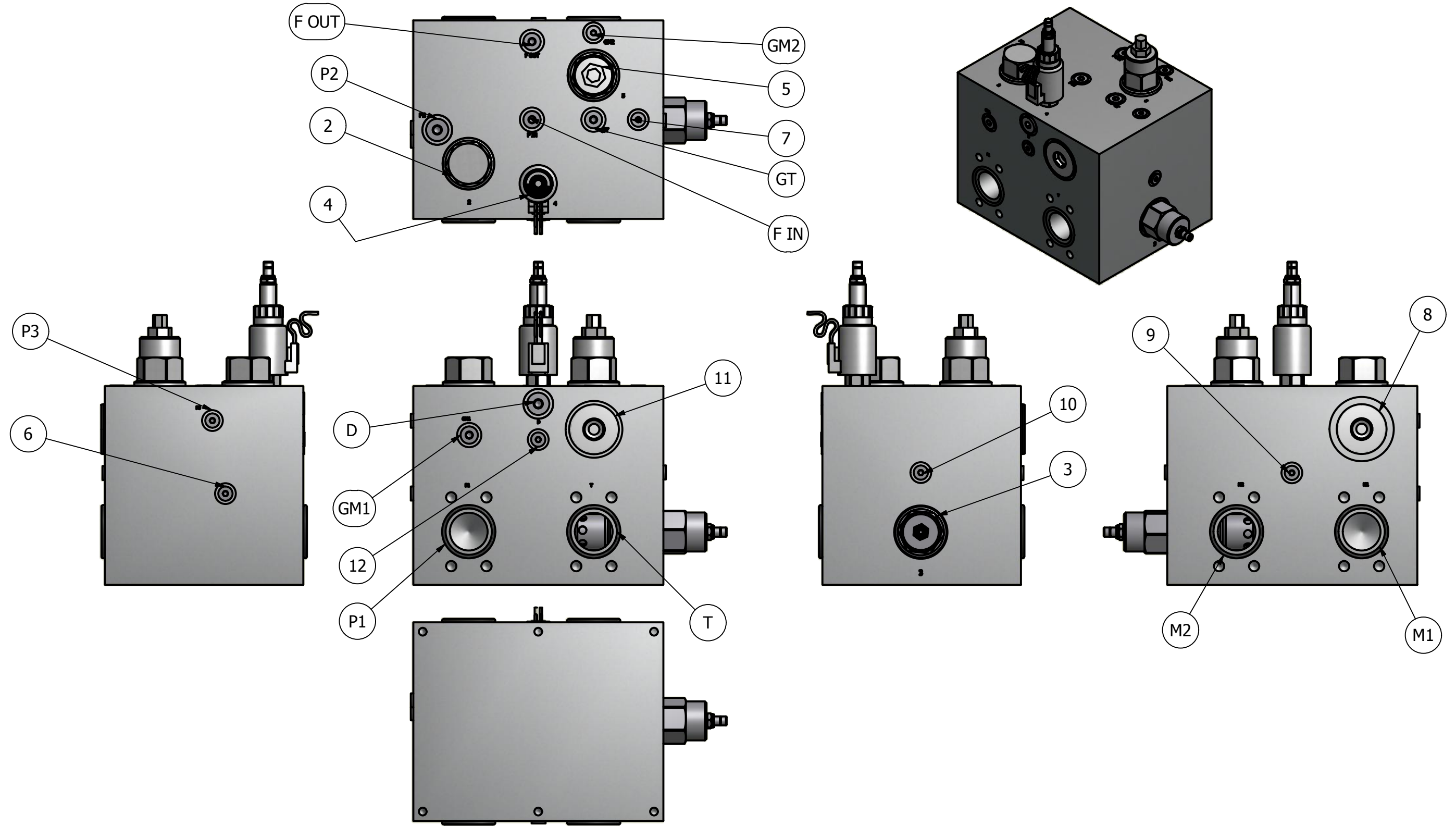
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PROJECT DIGITAL CONTROLLED WATER DISTRIBUTION	
DESC. CONTROL MANIFOLD HYDRAULIC SCH V7.32	
SCALE N.T.S.	PART # DCWD-0564
DATE 10/30/2014	APPROVED BY Page 92 of 101
DWG NO. DCWD-0564	DRAWN BY CHAD ROLFE

Materials	REVISIONS	DATE
	M1 VALVE	06/02/15



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MATERIALS	REVISIONS	DATE



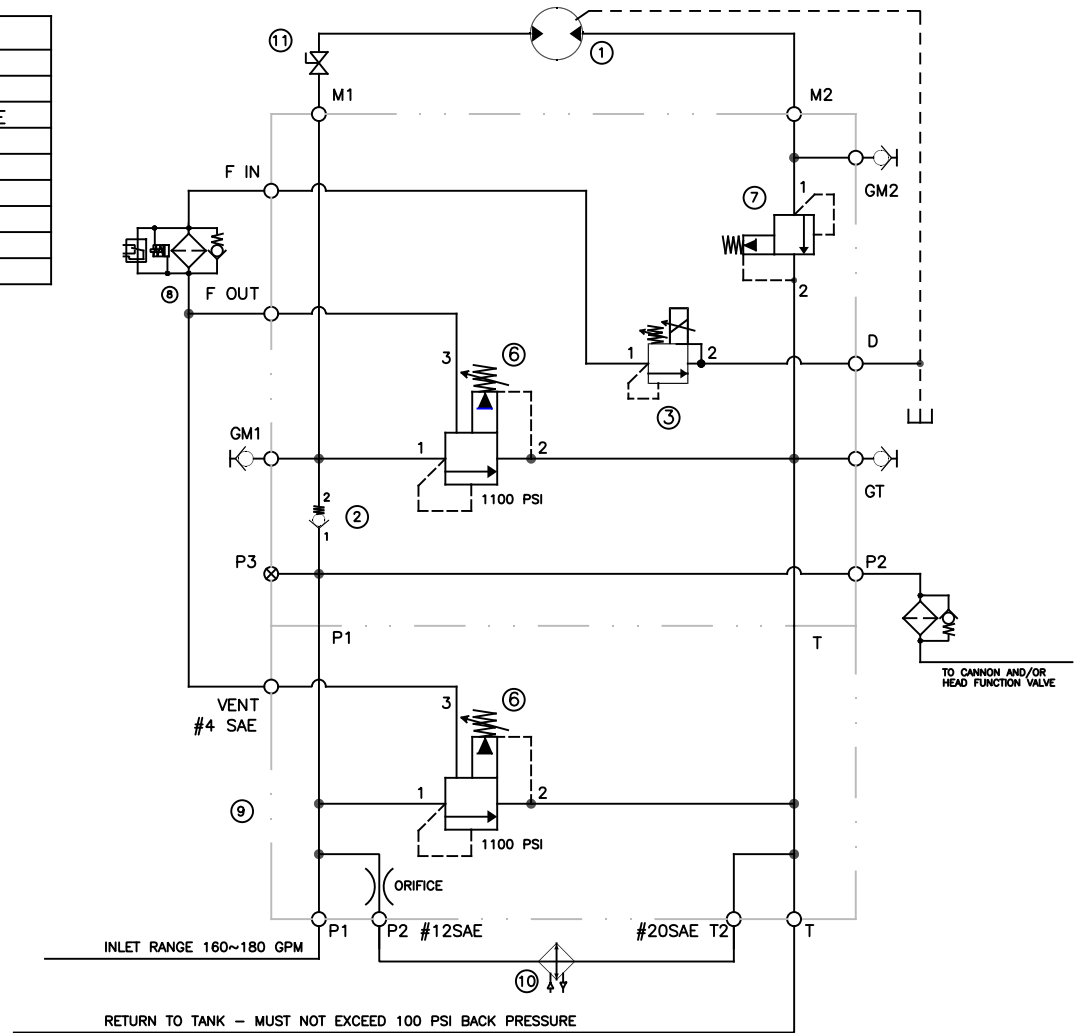
PROJECT: DIGITALLY CONTROLLED WATER DISTRIBUTION		
DESCRIPTION: DCWD MANIFOLD		
SCALE:	PART # DCWD-0564	
DATE: 8/30/2012	SHEET # 2 OF 2	WORK ORDER # DCWD-0564
FILE NAME:	DRAWN BY: Keith Payne	

12/04/2019

DCWD VALVE

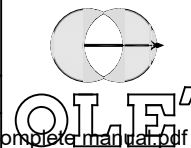
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	XXXX	CARGO PUMP GEAR MOTOR
2	1	WTCM-720-02	CHECK CART VALVE
3	1	WTCM-720-03	ELECTRO-PROPORTIONAL CART RELIEF VALVE
6	2	WTCM-720-06	PILOT OPERATED RELIEF CART VALVE
7	1	WTCM-720-07	POPPET RELIEF CART VALVE FIX SET
8			
9	1	DCWD-0194	HIGH FLOW MANIFOLD ATTACHMENT OPTION
10	1	DCWD-0338	HYDRAULIC OIL COOLER, WATER COOLED

ITEM	PORT CONNECTIONS
T	1-1/2" FLANGE CODE 61
D	#8 SAE O-RING BOSS
M1	1-1/2" FLANGE CODE 61
M2	1-1/2" FLANGE CODE 61
GM1	#6 SAE O-RING BOSS
P1	1-1/2" FLANGE CODE 61
P2	#8 SAE O-RING BOSS
P3	#4 SAE O-RING BOSS
F IN	#6 SAE O-RING BOSS
F OUT	#6 SAE O-RING BOSS
GT	#4 SAE O-RING BOSS
GM2	#4 SAE O-RING BOSS



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Materials	REVISIONS	DATE



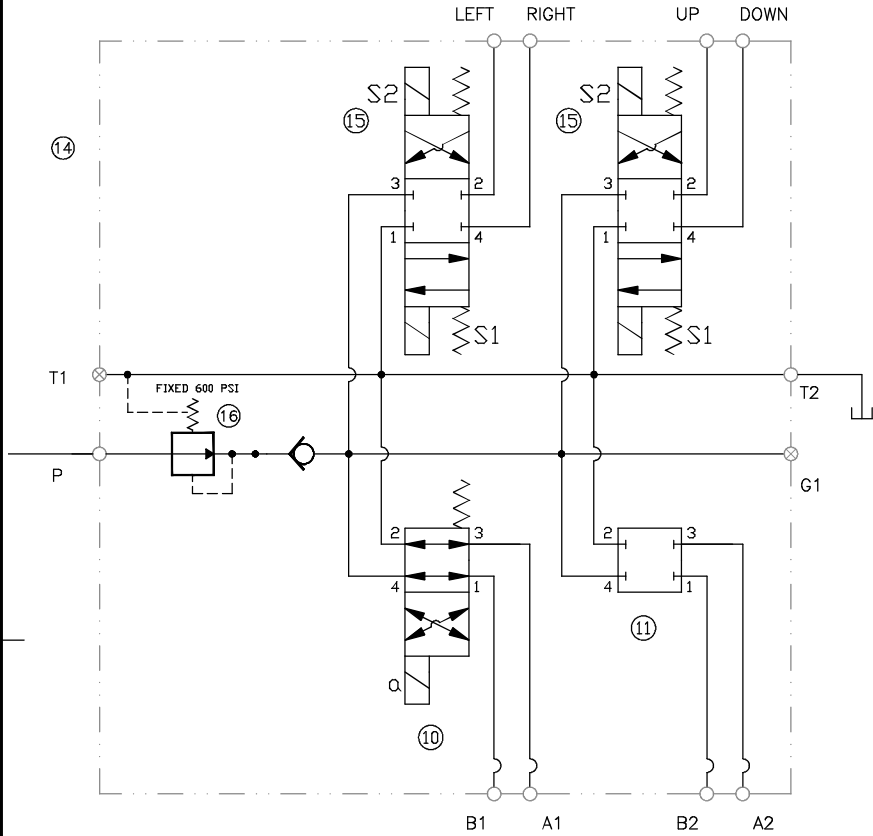
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UNLESS OTHERWISE SPECIFIED, X ± .1 .XXX ± .003
TOLERANCES ARE TO BE: .XX ± .01 ANGLES ± 1°

PROJECT DIGITALLY CONTROLLED WATER DISTRIBUTION	
DESC. HYDRAULIC SCHEMATIC REV. 0	
SCALE N.T.S.	PART # N/A
DATE 07/13/2017	APPROVED BY- Page 94 of 101
DWG NO. DCWD-0598-00	DRAWN BY CHAD ROLFE

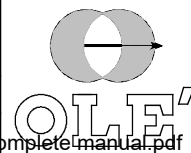
12/04/2019



ITEM	QTY	PART NUMBER	DESCRIPTION
10	1	DCWD-0344	CART SOLENOID VALVE 4W2P 24VDC
11	1	DCWD-0346	CART CAVITY PLUG
14	1	DCWD-0568	HYDRAULIC VALVE ASSEMBLY CMA
15	2	DCWD-0345	CART VALVE 4W3P DOUB SOL 24VDC
16	1	DCWD-0350	PRESSURE REDUCING FIX SET 600 PSI

ITEM	PORT CONNECTIONS
P, T1, T2	#6 SAE O-RING BOSS
G1	#4 SAE O-RING BOSS
UD-0, UD-1, LR-0, LR-1	#6 SAE O-RING BOSS
V-0, V-1, A-0, A-1	#6 SAE O-RING BOSS

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UNLESS OTHERWISE SPECIFIED, X ± .1 .XXX ± .003
TOLERANCES ARE TO BE: .XX ± .01 ANGLES ± 1°

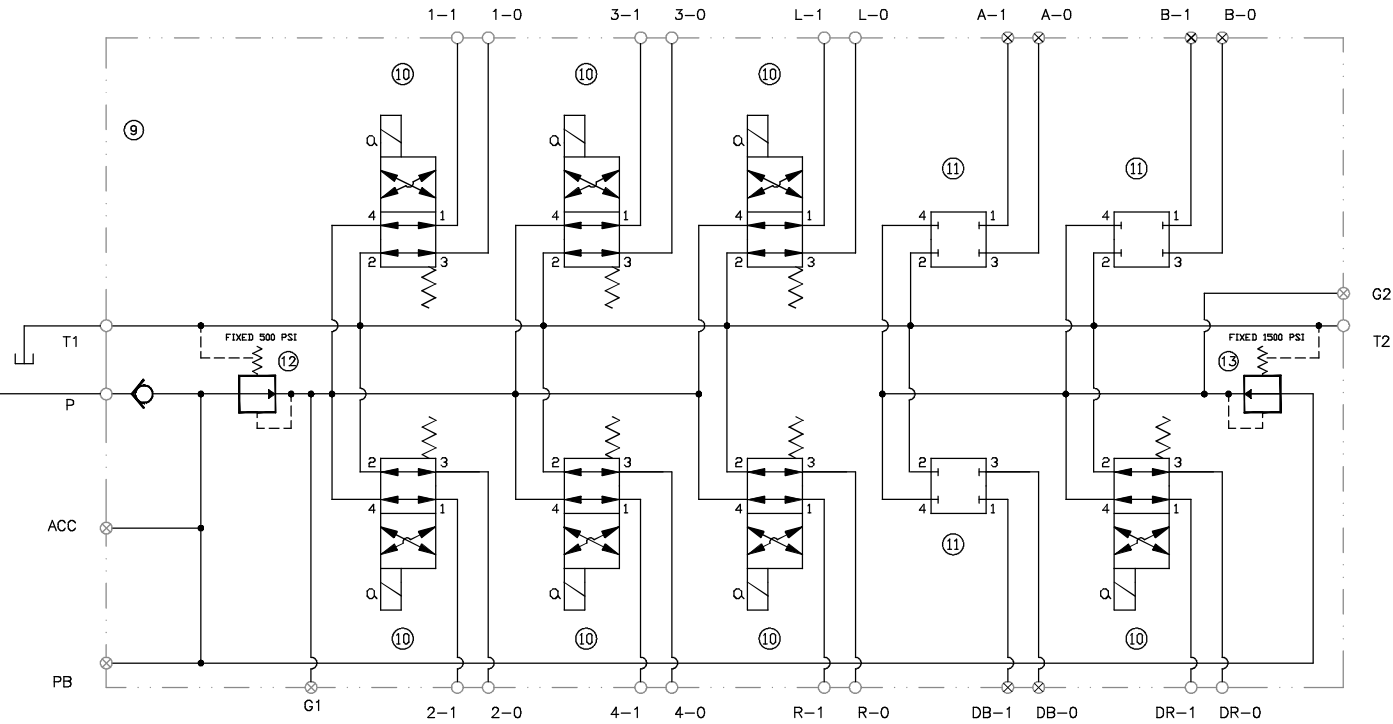
PROJECT DIGITAL CONTROLLED WATER DISTRIBUTION	
DESC. CANNON CONTROL MANIFOLD HYDRAULIC SCH	
SCALE N.T.S.	PART # N/A
DATE 10/30/2014	APPROVED BY— CHAD ROLFE
DWG NO. DCWD-0568B	DRAWN BY CHAD ROLFE

Materials	REVISIONS	DATE

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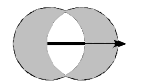
12/04/2019



ITEM	QTY	PART NUMBER	DESCRIPTION
9	1	DCWD-0567	HYDRAULIC VALVE ASSEMBLY HMA
10	7	DCWD-0344	CART SOLENOID VALVE 4W2P 24VDC
11	3	DCWD-0346	CART CAVITY PLUG
12	1	DCWD-0348	PRESSURE REDUCING FIX SET 500 PSI
13	1	DCWD-0349	PRESSURE REDUCING FIX SET 1500 PSI

ITEM	PORT CONNECTIONS
P, ACC, PB, T1, T2	#8 SAE O-RING BOSS
G1, G2	#4 SAE O-RING BOSS
1-1, 1-0, 3-1, 3-0	#6 SAE O-RING BOSS
L-1, L-0, A-1, A-0	#6 SAE O-RING BOSS
B-1, B-0	#6 SAE O-RING BOSS
2-1, 2-0, 4-1, 4-0	#6 SAE O-RING BOSS
R-1, R-0, DB-1, DB-0	#6 SAE O-RING BOSS
DR-1, DR-0	#6 SAE O-RING BOSS

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UNLESS OTHERWISE SPECIFIED, X ± .1 .XXX ± .003
TOLERANCES ARE TO BE: .XX ± .01 ANGLES ± 1°

PROJECT DIGITAL CONTROLLED WATER DISTRIBUTION	
DESC. CANNON CONTROL MANIFOLD HYDRAULIC SCH	
SCALE N.T.S.	PART # N/A
DATE 10/30/2014	APPROVED BY—
DWG NO. DCWD-0567B	DRAWN BY CHAD ROLFE

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Brightness Control

Brightness Control
Button



Brightness Control

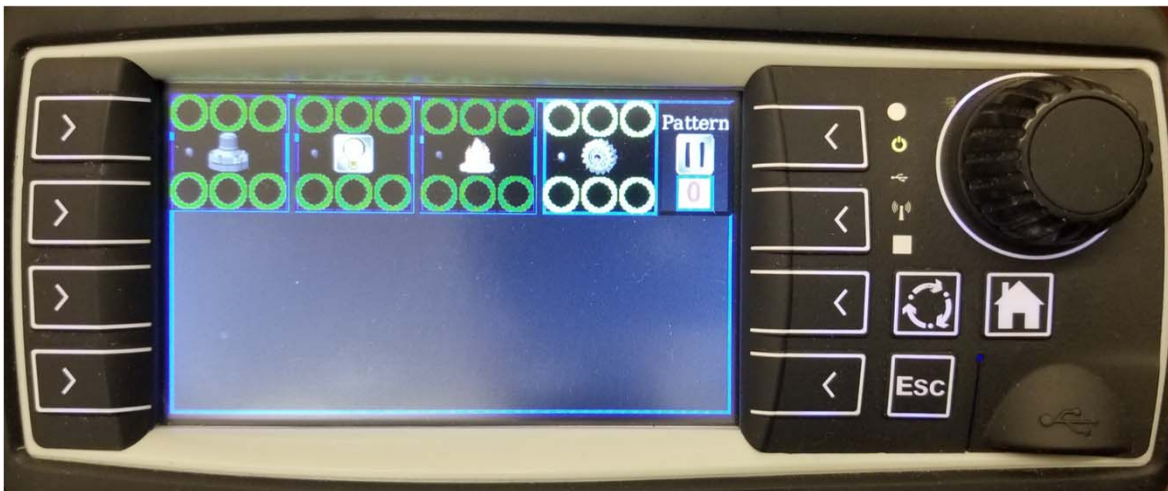


Numeric range for screen brightness is 1-10
Numeric range for Joystick brightness is 0-25

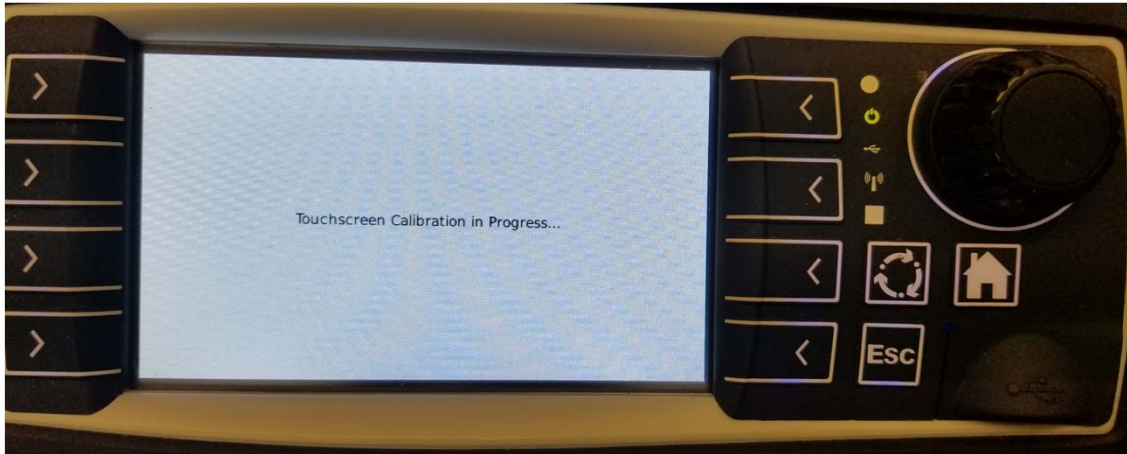
Return to Home Screen by pressing the Brightness Control Button again



From the Home screen, go to the DIAGNOSTIC screen, push the lowest left hard key button.



Next, push the second hard key button from the bottom of the right side to enter the screen calibration mode.



Press each cross-hair with a small pointed object such as a pen or stylus. Be as precise as possible. There will be a total of five cross-hairs.

