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THIS MANUAL CONTAINS HELPFUL HINTS ON:

Installation and Operation Guide for DynaFlow 2 System

DynaFlow 2 Rev 2 Control and Management system

Overview of System

The DynaFlow 2™ system is a high end, High Speed GPS based electronic Flow Control and management system specifically designed as a tool for the pilot to automatically control the flow of application of seeds, fertilizer and liquid chemicals for farm and forestry applications. The system can be installed as a standalone system using the DynaFlow 2 HMI Touchscreen with GPS. It also can be interfaced to other GPS Systems to give the flow data to the DynaFlow 2. It has the capability to interface to KZ Flow Valves, Linear Electric Actuators, Electric Pumps and Hydraulic Systems for liquid Flow Control. The DynaFlow 2 HMI also can be used and configured for Electric or Hydraulic Motors for granular Rotary Vane Metering of seeds, etc.

A further feature of the System is that it includes a digital Boom Pressure Sensor to read the Boom pressure directly. Further to this the System can be given a selected pressure you want to output a relay contact for marking the GPS System exactly at the transition of the pressure on the boom. This is an extremely reliable and accurate marking system.

Mounting

Touchscreen Processor Display (Optional for other GPS Manufacturers to Connect to set Flow Rate parameters)

Overview

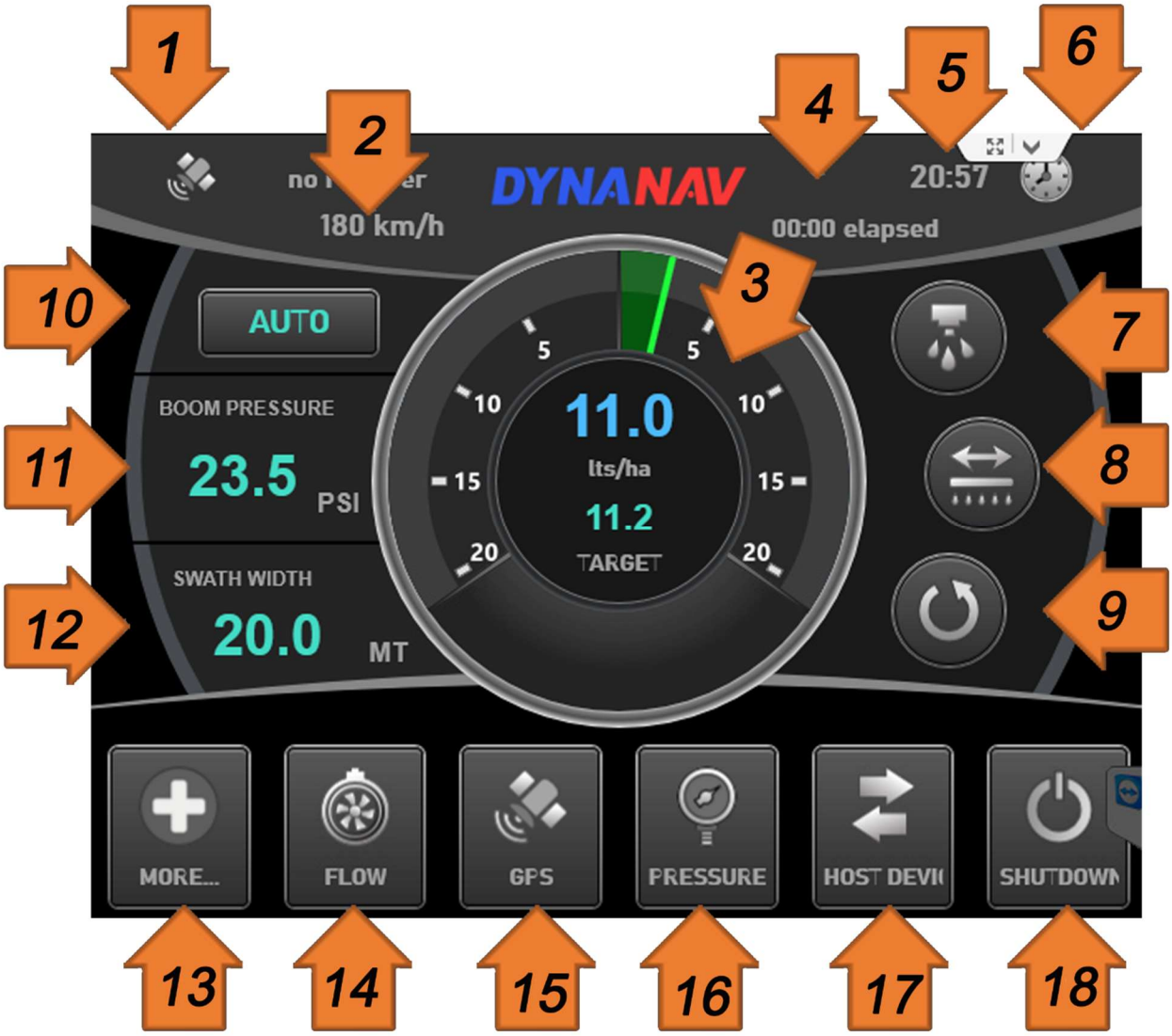
The DynaFlow 2 HMI Touchscreen display has all the electronics and GPS of the system in the touchscreen display including the Flow Controller Electronics. It should be mounted to the aluminum panel using 4 mounting Clips to attach if possible. It also has the NEMA 75 screws on the back if needed to mount that way.

Placement

The Touchscreen should be mounted in a direction that is in direct line of sight for the Pilot to access during flight with ease. If run in HOST mode from other GPS Manufacturers, the required Flow rate is supplied to the DynaFlow system as well as is a secondary acre counter and flow indication of the system

Overview

All settings for the system is done on the DynaFlow HMI Touchscreen.

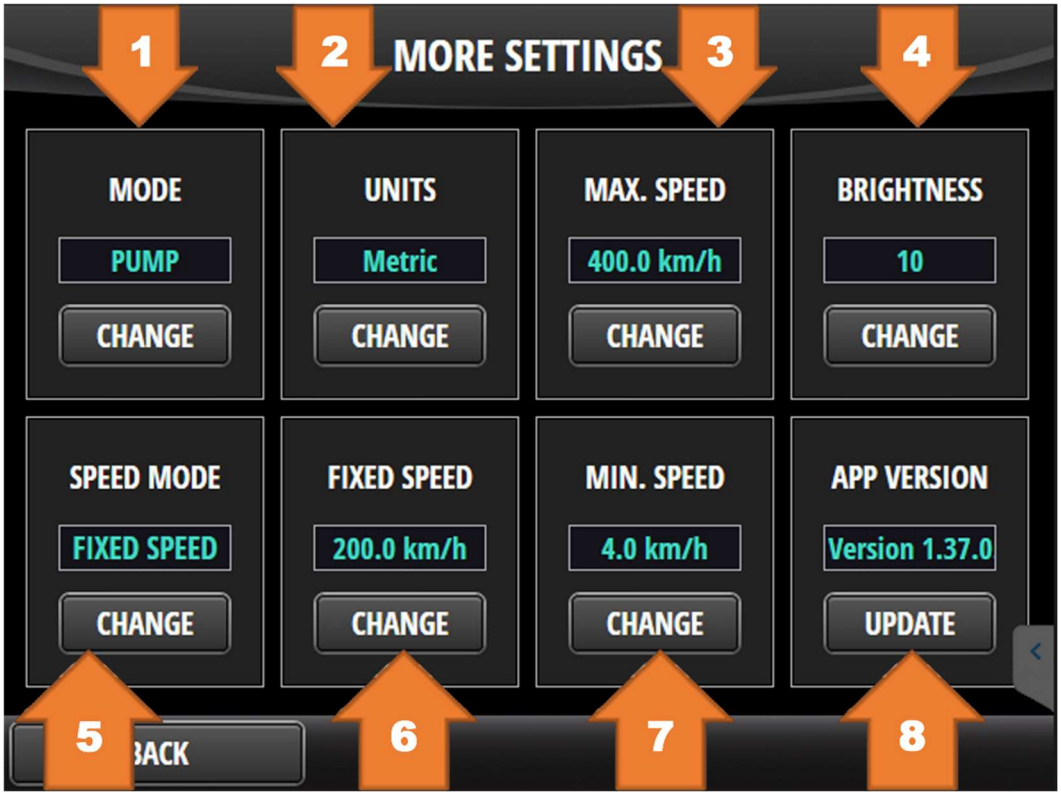


Action Buttons and Display Icons

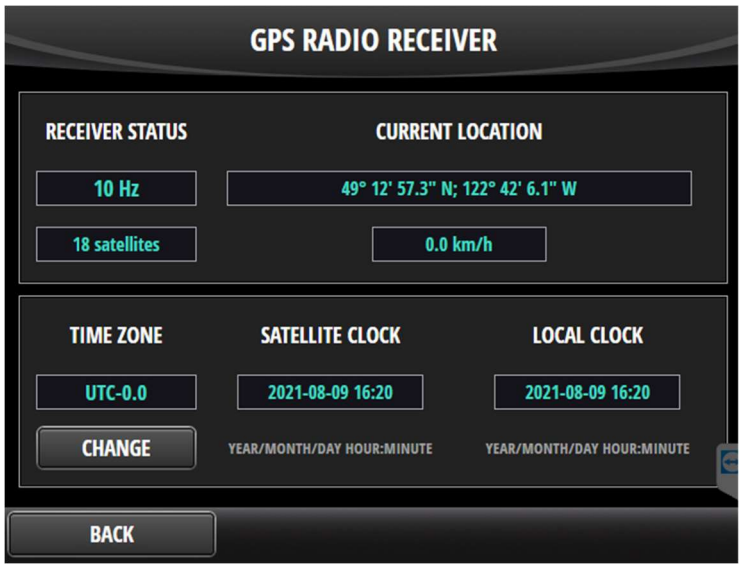
1. GPS indicator - Displays the state of the GNSS signal.
2. Speed – Displays the Ground Speed of the Aircraft
3. Flow Gauge - Indicates the target flow, measured flow and the error percentage.
4. Spray Time - Gives the total time when spraying is on.
5. Time – Displays the local time as per settings for time.
6. Stopwatch – Resets the Spray Time to zero
7. Change Target Rate - Button that allows the pilot to set the target rate.

8. Change Swath Width – Button the allows the pilot to change the Swath Width.
9. Reset or Clear – resets timer and saved application.
10. Working Mode Toggle Button - AUTO = Flow controller will adjust the flow. MANUAL = Valve will remain fully open, and the pilot can adjust manually the flow with the by-pass.
11. Pressure Sensor - Displays the reading of the pressure sensor.
12. Swath Width – Displays the current Swath Width being used.
13. MORE… Button – MORE SETTINGS - Gives options for the system. See Below
14. FLOW Button – FLOW SENSOR AND VALVE page - Gives the Pilot the options for Which Flow System he has installed, such as Electric Flow Valve or Hydraulic Motor driven Pump as well as Calibration entr. Also, the Flow Motor can be tested and the Flow Meter reading can be seen here.
15. GPS Button – GPS RADIO RECEIVER - Gives the Pilot the number of satellites in use. (GPS + GLONASS + WAAS) as well as to set the clock for local time or Universal time.
16. PRESSURE Button – PRESSURE SENSOR AND RELAY - To set the boom pressure required for marking of the GPS System for As Applied Maps. This setting also tells the Flow Valve Motor to stop below this number and to go active for control of the flow above this number.
17. HOST DEVICE Button – COMMUNICATION - For setting the system between DynaFlow Standalone or communications from an External GPS system to set flow parameters. If Host is available, it will automatically update the Swath Width, Speed and Rate.
18. SHUTDOWN – When finished application- be sure to use this button to Shutdown the DynaFlow 2 before turning off the aircraft Master Switch.

MORE Button Options

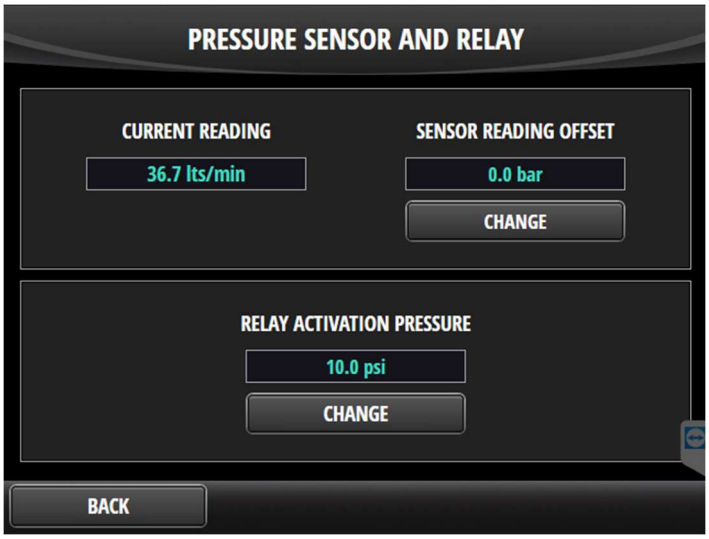


1. **MODE** is to Select the method of control for the DynaFlow such as an Electric Motor Valve **"Firmware"** or an Electric Motor or Hydraulic Motor Driven Pump **"Software".**
2. **UNITS**, is where you can change whether the system is **Metric** or **Imperial.**
3. **MAX. SPEED** is set the flow control for a Maximum Speed in which the flow control will not try to put out more GPM or LPM. For **Software** mode, it is best to make this speed much higher than your maximum operational speed.
4. **BRIGHTNESS** is to control the brightness of the screen, when entered it will bring up a slider control.
5. **SPEED MODE** has either Fixed Speed or GPS speed. Should the GPS signal fail, you can set this to Fixed Speed to operate at for your nominal application speed. Other than that, the GPS signal will adjust the flow to meet you Application Rate.
6. **FIXED SPEED** is the nominal speed for your application.
7. **MIN. SPEED** is particularly useful for helicopters where the flow will not go lower than the Min. Speed. As such the spray nozzles will still be putting out the correct spray pattern and droplet size. It is usually 25 to 40 mph
8. **APP VERSION** is where you can see the version of the application of the unit. You can periodically check our website to see if there is an update that you can load onto a USB Data stick to **UPDATE** using this button.



GPS RADIO RECEIVER gives you the GPS RECEIVER STATUS, CURRENT LOCATION in Degrees, Minutes and Seconds, TIME ZONE (which you can change) and GMT and LOCAL time.

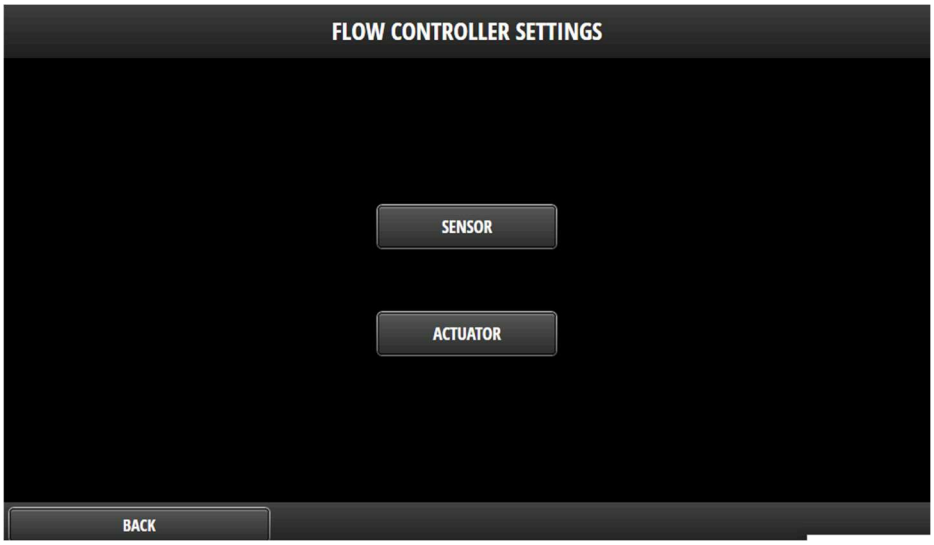
Pressure Sensor



PRESSURE SENSOR AND RELAY displays your current Flow Reading in either Gals/Minute or Liters/Minute. Also, this is where you set the transition point for the Relay to turn on/off the spray marking to your GPS. It is important to make this **RELAY ACTIVATION PRESSURE** is somewhere between the operational Boom Pressure and the Check Valve pressure.

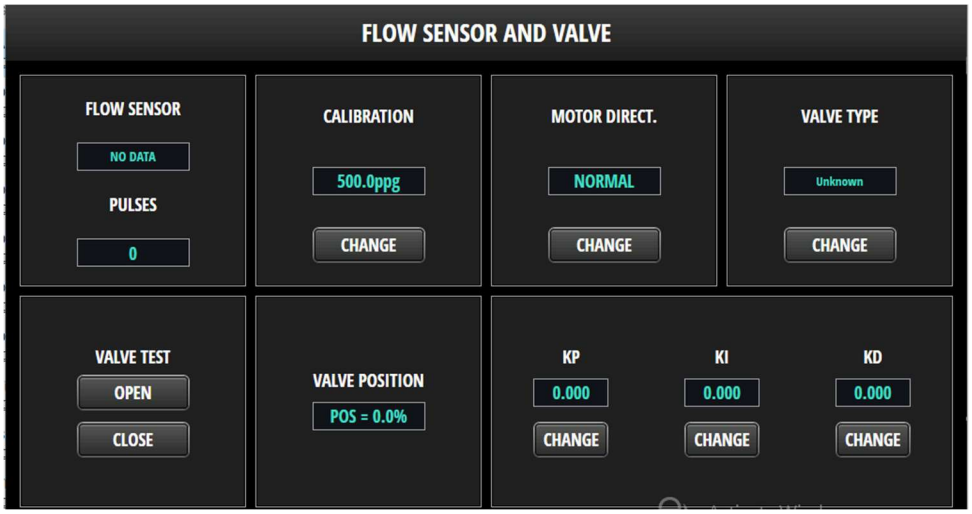
The **SENSOR READING OFFSET** is for calibrating the zero point of the Pressure Transducer. For all the later Transducers, the pressure should show -5PSI during Suck Back.

FLOW CONTROLLER SETTINGS



In SOFTWARE mode, you can select the settings for either the Flow Sensor or the Actuator.

FLOW SENSOR AND VALVE Page for FIRMWARE Mode



When operating, the **FLOW SENSOR** will show flow in LPM or GPM depending on Units selected.

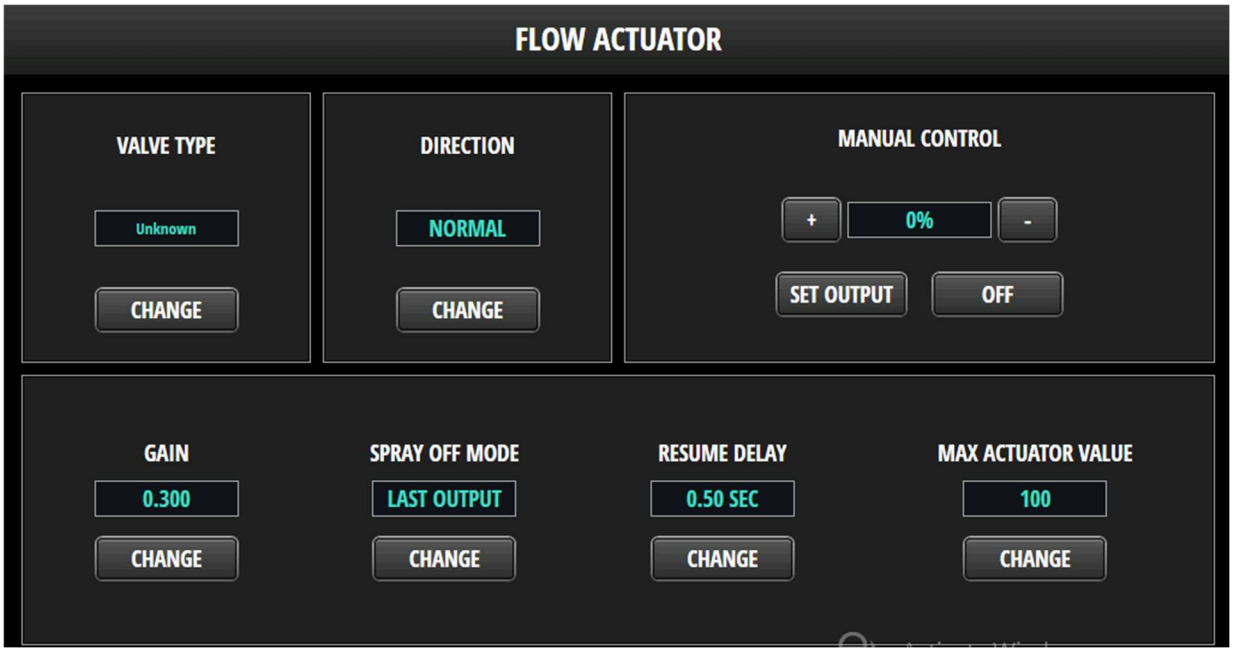
The **CALIBRATION** is either PPG or PPL again depending on Units selected.

If the Valve Motor has been wired reversed, then **MOTOR DIRECT** can be changed her. It is highly recommended to have the wiring changed on the motor for **NORMAL** direction.

You can test the Motor with the **VALVE TEST** Open and Close buttons. When testing you should see the **VALVE POSITION** percentage change.

The normal settings are as follows: **KP** – 1.500, **KI** – 0.100 and **KD** – 15.000.

FLOW ACTUATOR for SOFTWARE Mode



This page is for adjusting settings for the Electric/Hydraulic motor driven pumps.

The **VALVE TYP**E is not used at this time and **DIRECTION** should never need changing if the systems are configured correctly. However, there is a Hydraulic Control Valve Block that can be reversed so ON is OFF. This would be the only exception.

For testing the system on the ground before flying, you can use the **MANUAL CONTROL** to set the percentage of output to see the actual flow.

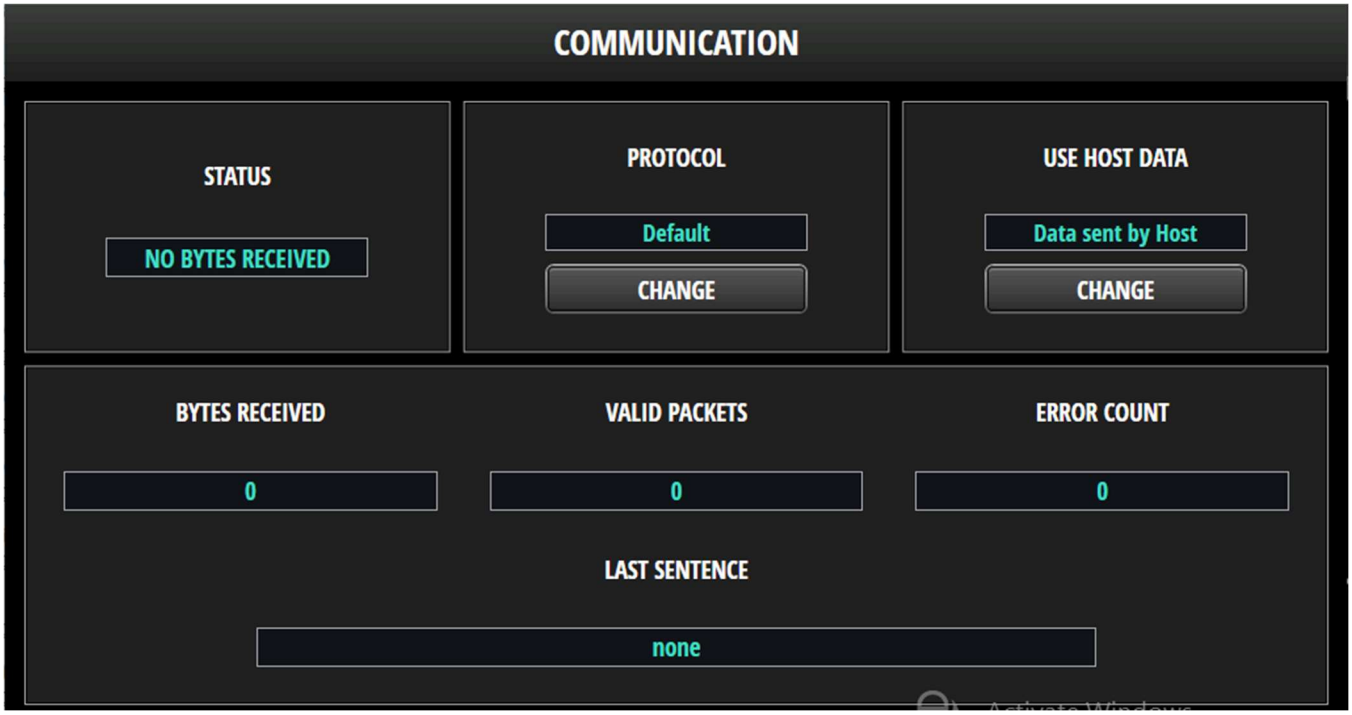
The **GAIN** for Electric/Hydraulic Pumps is usually 0.300 or less. If the pump is oscillating, then reduce this number. The higher the number, the more active the reaction to flow. As such you can try increasing this number to mind the point of hunting, then reduced so it is stable.

The **SPRAY OFF MODE** cn be switched between **MIN OUTPUT** or **LAST OUTPUT**. For **MIN OUTPUT** means that when spray is turned off, it will stop the pump from turning, for **LAST OUTPUT**, it will maintain the same pump setting when spray is turned off for making sure you get recirculation.

The **RESUME DELAY** is for when the spray is being turned on with the ON/OFF Valve, the pump will stay at the same rate for this amount of time before starting to adjust for Flow Meter readings.

MAX ACTUATOR VALUE is something that can be discovered by using the MANUAL CONTROL percentage to keep increasing until the flow no longer increases. This is the Value that can be set in this number. That way the 0 to 100% of flow will be used.

HOST DEVICE



COMMUNICATION Page will show if a Host Device is connected. Displayed is the **COMMUNICATION STATUS** whether it is connected. In the **BYTES RECEIVED** the number will keep increasing as long as messages are coming from the Host Device. **VALID PACKETS** shows the number of valid packets while the **ERROR COUNT** shows the number of Error Packets. If the communication is good, this **ERROR COUNT** should stay at 0. The **LAST SENTENCE** shows the last packet sent by the Host Device.

PROTOCOL can change communications from **Default** to **Satloc** if using a **Satloc** GPS System which should connect as an **Intelliflow** 1. For all other GPS systems, it should be **Default.**

Wiring Harness Diagrams

Overview

The diagrams attached to appendix are for the interconnect wiring of the DynaFlow 2 system. All wires and connectors on the harnesses are supplied and Mil Specification.

Supplied Parts List

Basic DynaFlow 2 Flow Control system contains: (Optional in brackets is for Standalone operation and for other GPS manufacturers to interface to the DynaFlow)

Part Number ..... Description

1) **DynaFlow2+ HMI/ECU ..... DynaFlow 2 Touchscreen and Electronic Control Unit**
2) **DynaFlow2 + Remote ..... DynaFlow 2 Remote Touchscreen and Electronic Control Unit**
3) **DynaFlow 2 Install Harness..... Installation wiring kit (special for each configuration)**
4) **GPS/GLONASS Antenna ..... Antenna with Cable to SMA connector (for standalone)**
5) **TDH33CG-00503B004-100 ..... Pressure Transducer, 0-5 VDC, 24 VDC, -5PSI - 100PSI**
6) **All other Valves and Flow meters are supplied as per the specifications of the Flow System.**

Specifications:

- GPS is a GNSS Engine is less than 0.1 second latency and presented at ten position solutions per second or better.

Specifications Environmental:		Physical:	**DynaFlow 2 Touchscreen**
Operating Temp:	-30 to +50 degrees C.	*Width:*	8.65 ins (17.85 cm)
Storage Temp:	-40 to +70 degrees C.	*Height*:	6.25 ins (13.64 cm)
Humidity:	5 to 95%, non-condensing.	*Depth*:	3.5 ins (76.0 cm)
		Weight:	3.6 lbs (1.2 kg)

Installation kit including antenna weights are dependent on installation, typically less than 3 lbs. (1.2kg)

9 – 32 VDC, negative ground (system requires less than 20 watts nominal and 84 Watts intermittent) Note: Specifications subject to change without notice.

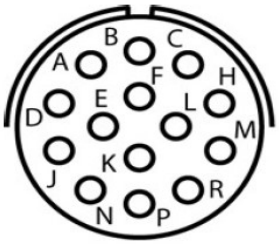
NOTE: All weights and sizes of the Flow Valves, Motors and Flow Meters, etc. Weights and sizes are dependent on the system that is being configured.

Appendix Follows:

DynaFlow HMI Wiring Diagram Connections

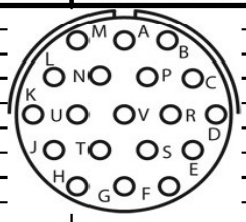
DynaFlow 2 Wiring Harness

	Feet		Vektor LITE Plug			232 Com	RS485
Size	Length	Designation	PT06A12-14S-SR	Color		206060-1	1445534-3
20	5	Aircraft Power	A	RED			
20	5	Aircraft Gnd	B	BLACK			
22		RS232 GND	E	White		3, & 4	
22	1	232 Host RX	C	WH/BLU		2	
22	1	233 Host TX	F	WH/ORN		1	
22	1	RS485 D+	L	White			1
22	1	RS485 D-	M	WH/BLU			2
22	1	RS485 GND	N	Shield			3
22	8	Enter/Advance	P	BLUE			
22	8	Spray ON	R	ORANGE			



Make sure the shieded cable is under the Plug Clamp on JR16WP-7P

					3 Pin Flow Meter	Motor	Motor Pot	Pressure	2Pin Flow Meter
			TTI Souriau		MS 3Pin	Delphi	Delphi	Delphi	MS 2 Pin
Size	Length	Designation	MS3116F14-19P	Color	97-3108B-10SL-3S	12015792	12015793	12065287	97-3108B-10SL-4S
22	10	Flow +	A	WH/ORN	A (ArAg 2)				
22	10	Flow Signal	M	WH/BLU	C (ArAg 3)				
22	10	Flow Gnd	R	White	B (ArAg 1)				
18	10	Valve Motor A	L	White		A			
18	10	Valve Motor B	H	WH/BLU		B			
20	10	Valve Pot 5V	S	WH/ORN			C		
20	10	Valve Pot Wiper	P	WH/BLU			B		
20	10	Valve Pot GND	K	White			A		
22	10	Sensor 1 Pump	F	WH/BLU				C	
22	10	Sensors GND Both	J	White				A	Reversed Layout
22	10	Sensors + For Both	G	WH/ORN				B	For Pinning from Back
22	10	Sensor 2 Boom	E	WH/BLU				C	
22	6	Relay Voltage Out	D	Green					
22	6	Relay Gnd Out	C	Yellow					
20	8	Hyd PWM	B	WH					
22	8	PWM_DC_Out_5V	N	WH					
20	10	Flow A Coil	U	White					A
20	10	Flow B Coil	T	WH/BIU					B
			V						



NOTE:

Enter/Advance Blue wire is for future use and will require being grounded for activation.

Spray ON (Spray Active) Orange wire is normally used in helicopters to tell the Flow System to start controlling for flow when this line goes high (12 to 28 Volts DC). This is just in case the valve gets closed during the helicopter slowing down while spray is on. Normal operation of the Valve requires the boom pressure to go higher than the Boom Pressure setting to go active.

Flow Control Installation Guide

Valve and Flow Meter

Flow Motor and Flow Meter Placement

The Flow Control Valve should generally be placed downstream of the on/off/bypass valve, however, if that is not physically possible then it can be placed before the Bypass On/Off valve. See some configuration diagrams in Appendix.

The Flow Meter ideally should be placed either right before Flow Control Valve or at least 18" downstream from the Flow Control Valve. This is to minimize the flow turbulence on the Flow Meter, as such, if downstream from any valve (On/Off) or pump, it should be kept as far away as possible.

Selecting the right size of Flow Meter and Flow Control Valve

Flow Control valve and Flow Meter size should be selected for the mid-range of your operating flow. If the Flow Control valve is too large, it will try to control the complete flow in a very tiny range of the valve movement. As such, it will not regulate properly.

To calculate your maximum and minimum Flow Rates, you can enter the values into the Flow Calculator on our website on the GPM_Calculator tab of the Flow Control Calculator found here https://dynanav.com/support/calculators/

By calculating your GPM or LPM for the full operating range of the speed, Swath Width and Gallons per Acre or Liters per Hectare, you will determine the correct Flow Valve and Flow Meter to install. The size of the Flow Meter should be selected to fit the range of your calculated GPM or LPM.

Determine Operating Flow of system

Determine the actual operating Gallons per Minute or Liters per Minute (GPM or LPM) of the system by the following:

1. Do your Test Flights while the Flow Control Valve is fully open and with the desired nozzles installed on the boom,
2. Looking at the Flow Control system showing Flow in either GPM or LPM, at maximum speed for the maximum pump pressure (fan operated pump) note the value of the GPM or LPM as Maximum flow. At this point, the Boom Pressure should be above the suggested nozzle operating pressure.
3. Find out the minimum full open Flow of the system by reducing the speed of the aircraft to absolute minimum and again make sure the boom pressure is in the operating range of the spray nozzles.

Boom Pressure

Your Boom Pressure should be operated in the range of the specifications of the nozzles for the correct spray droplet size.
Boom pressure should always be well above the Check Valve pressure so that the Flow control variance will be well within its range. This will require proper selection of Spray Nozzle types and number of nozzles to get in range of your operating speeds and operating flow.
Boom Pressure Sensor (Digital), if installed will give a digital feedback of your boom pressure. If using a DynaNav systems DynaFlow Digital Boom Pressure sensor, you can set the pressure at which the GPS marking will be on/off. This pressure setting should be significantly above the check valve pressure as well as significantly below the operating pressure range of the boom.

Flow Control Methods

Flow Valves

Flow Valves are usually Ball Valves with electrical actuator motors (rotary or linear) or hydraulic actuator. By changing the opening of the valve, the flow of liquid is varied. Note that flow is proportional to boom pressure. Also control of Gas Motor pumps using linear motor actuator.

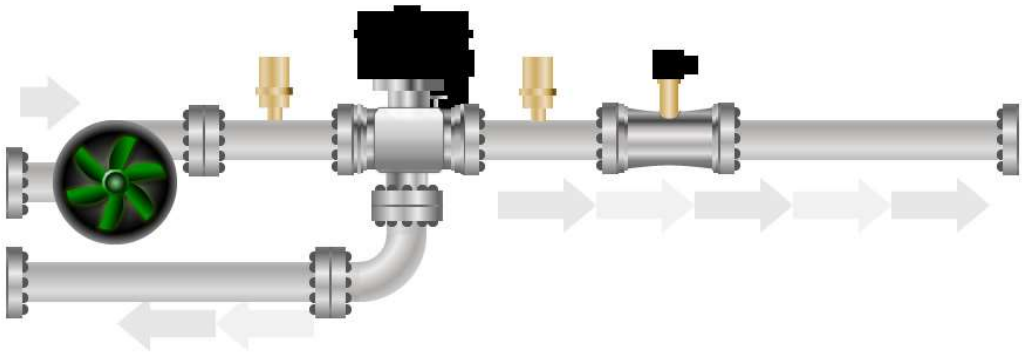
Flow Motors – Electric and Hydraulic

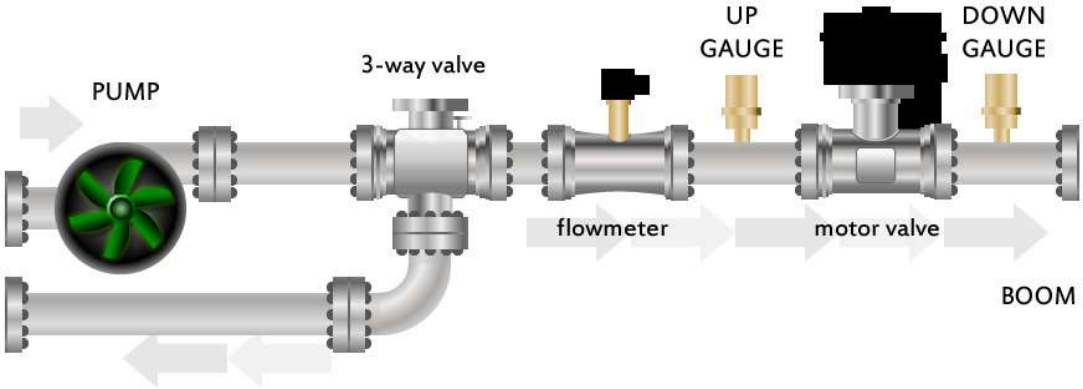
Flow motors will be connected directly to the Pump. By varying the RPM of the pump, the Liquid flow can be controlled directly without the need for a flow valve. These systems can not only control flow, but also control the on/off of flow. If tank mixing is necessary, then a Bypass on/off should also be installed.

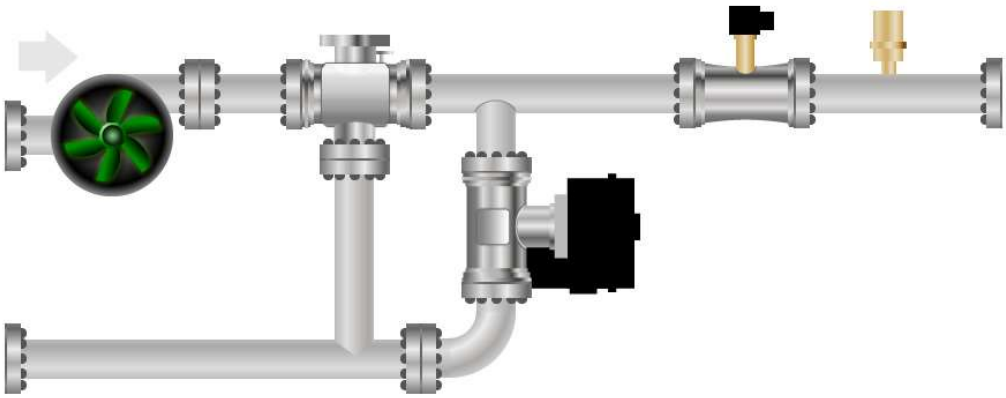
Fan Control

Some Fans have a variable pitch system. These can be set up to have an actuator to control the pitch thus control the flow of the liquid. Usually, these systems have a fan brake for On/Off control.

Configurations – Some Examples



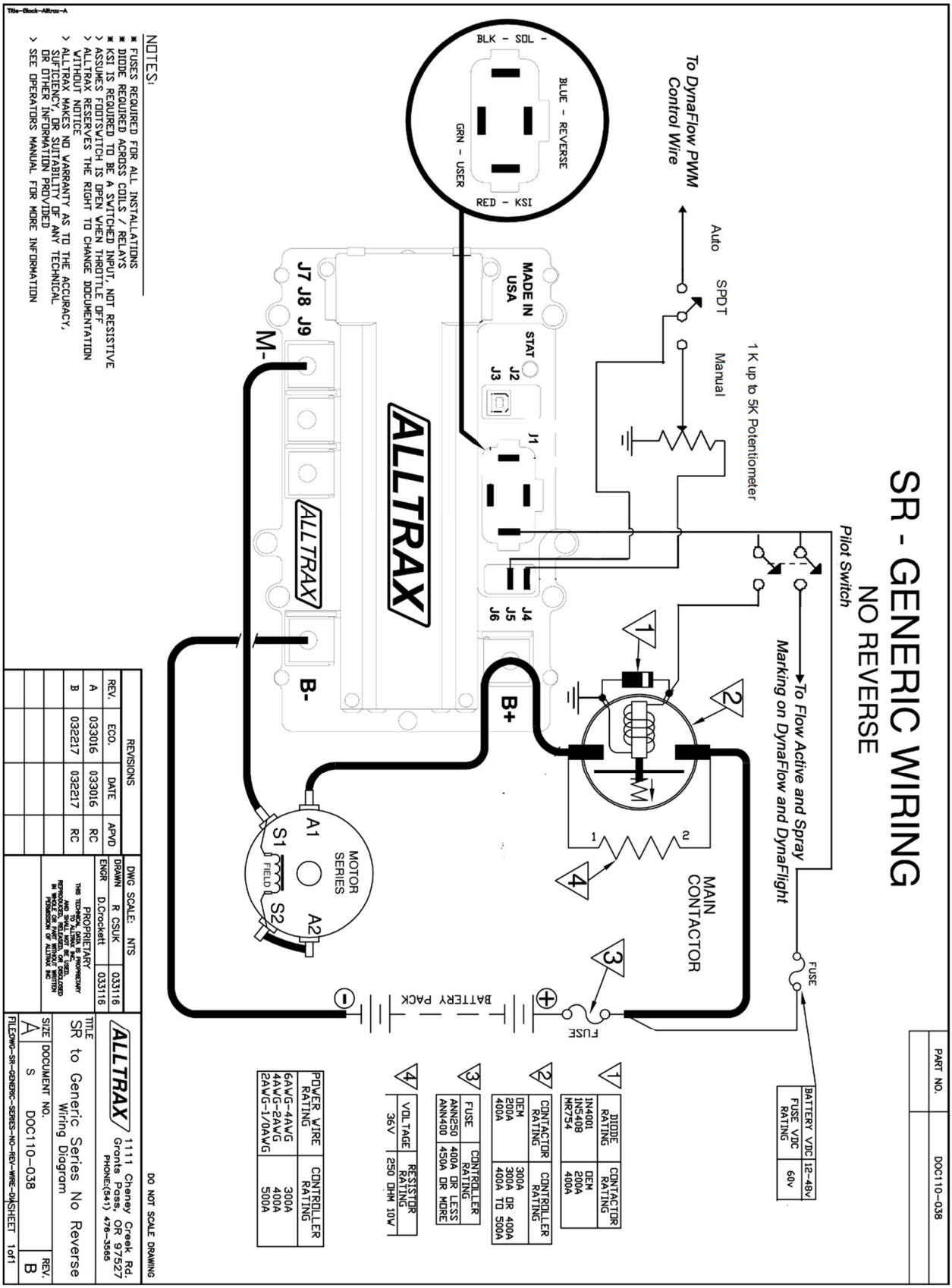




DynaFlow Electric Motor Controller using Alltrax DC Brushed Motor

The Alltrax DC Brushed Motor Controller is rated at 300 AMPS, however for the operation of the DynaFlow for this Controller should be a maximum of 200 Amps continuous operation.

The DynaFlow DC Motor output for the Alltrax controller is a 0 to 5vdc control voltage.


SR - GENERIC WIRING
NO REVERSE
Pilot Switch
To Flow Active and Spray Marking on DynaFlow and DynaFlight
To DynaFlow PWM Control Wire
1 K up to 5K Potentiometer
Auto
SPDT
Manual
BLK - SOL -
BLUE - REVERSE
GRN - USER
RED - KSI
MADE IN USA
STAT
J2
J3
J1
J4
J5
J6
J7 J8 J9
M-
B-
B+
ALLTRAX
MAIN CONTACTOR
BATTERY PACK
FUSE
MOTOR SERIES
A1
A2
S1
S2
FIELD
BATTERY VDC
FUSE VDC RATING
12-48v
60v
DIODE RATING
1N4001
1N5408
MR754
CONTACTOR RATING
DEM 200A 400A
CONTACTOR RATING
DEM 200A 400A
CONTROLLER RATING
300A OR 400A
400A TO 500A
FUSE
ANN250
ANN400
CONTROLLER RATING
400A OR LESS
450A OR MORE
VOLTAGE
36V
RESISTOR RATING
250 OHM 10W
POWER WIRE RATING
6AWG-4AWG
4AWG-2AWG
2AWG-1/0AWG
CONTROLLER RATING
300A
400A
500A
NOTES:
* FUSES REQUIRED FOR ALL INSTALLATIONS
* DIODE REQUIRED ACROSS COILS / RELAYS
* KSI IS REQUIRED TO BE A SWITCHED INPUT, NOT RESISTIVE
> ASSUMES FOOTSWITCH IS OPEN WHEN THROTTLE OFF
> ALLTRAX RESERVES THE RIGHT TO CHANGE DOCUMENTATION WITHOUT NOTICE
> ALLTRAX MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY, OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED
> SEE OPERATORS MANUAL FOR MORE INFORMATION
REVISIONS
REV. ECO. DATE APVD
A 033016 033016 RC
B 032217 032217 RC
DWG SCALE: NTS
DRAWN R CSUK 033116
ENGR D.Crockett 033116
PROPRIETARY
THIS TECHNICAL DATA IS PROPRIETARY AND SHALL NOT BE USED, REPRODUCED, RELEASED, OR DISCLOSED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF ALLTRAX INC
DO NOT SCALE DRAWING
ALLTRAX
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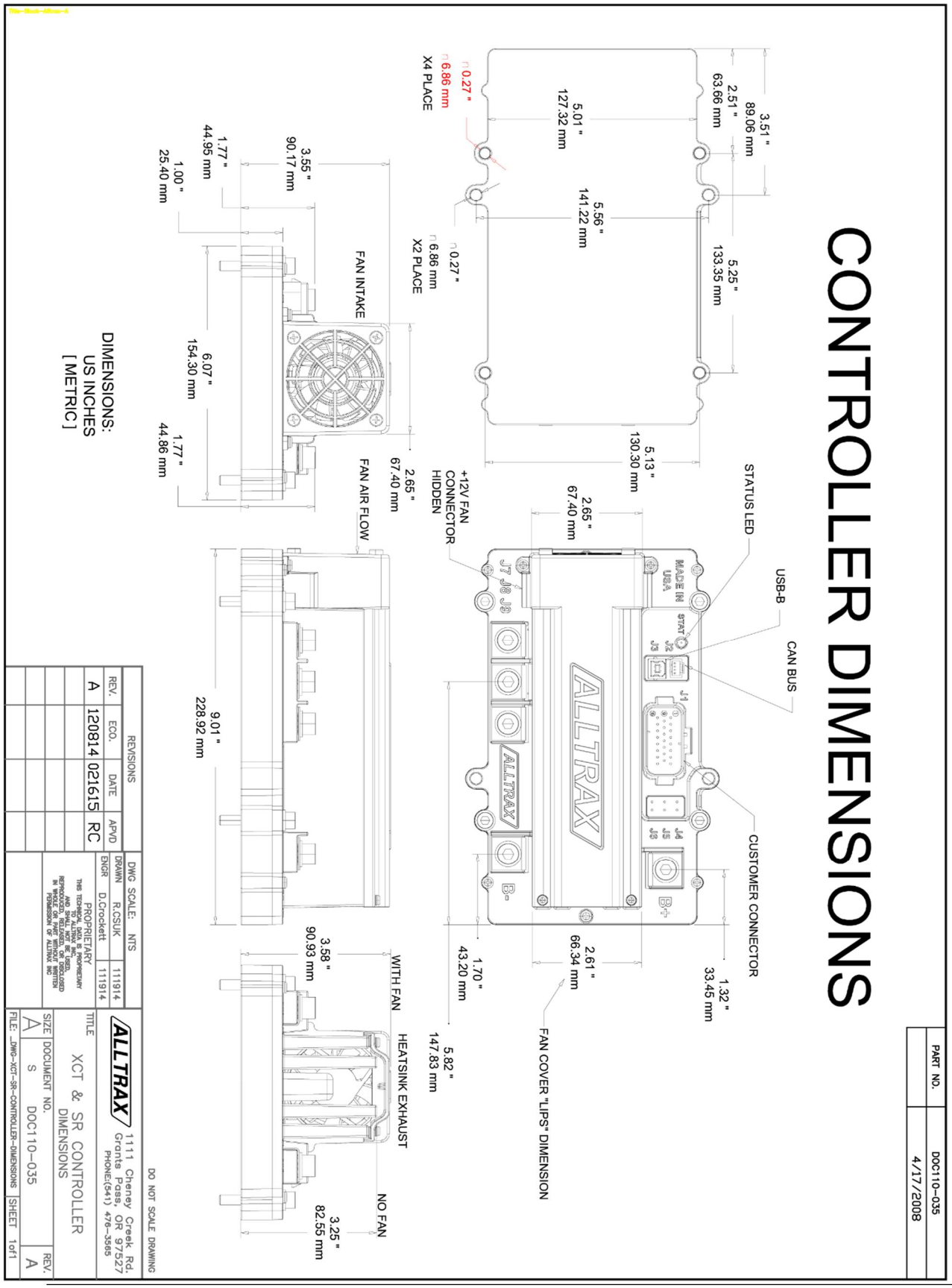
Grants Pass, OR 97527
PHONE:(541) 476-3565
TITLE
SR to Generic Series No Reverse Wiring Diagram
SIZE A
DOCUMENT NO. DOC110-038
REV. B
SCALE S
SHEET 1 of 1
FILENAME: SR-GENERIC-SERIES-NO-REV-WIRE-DW
PART NO.
DOC110-038


CONTROLLER DIMENSIONS
3.51 "
89.06 mm
2.51 "
63.66 mm
5.01 "
127.32 mm
5.56 "
141.22 mm
5.25 "
133.35 mm
0.27 "
6.86 mm
X4 PLACE
0.27 "
6.86 mm
X2 PLACE
5.13 "
130.30 mm
2.65 "
67.40 mm
+12V FAN
CONNECTOR
HIDDEN
STATUS LED
USB-B
CAN BUS
CUSTOMER CONNECTOR
1.32 "
33.45 mm
2.61 "
66.34 mm
FAN COVER "LIPS" DIMENSION
1.70 "
43.20 mm
5.82 "
147.83 mm
MADE IN USA
STAT
J2
J3
J1
J4
J5
J6
J7 J8 J9
ALLTRAX
B+
B-
3.55 "
90.17 mm
1.77 "
44.95 mm
1.00 "
25.40 mm
6.07 "
154.30 mm
1.77 "
44.86 mm
FAN INTAKE
FAN AIR FLOW
2.65 "
67.40 mm
9.01 "
228.92 mm
WITH FAN
HEATSINK EXHAUST
NO FAN
3.58 "
90.93 mm
3.25 "
82.55 mm
DIMENSIONS:
US INCHES
[METRIC]
REVISIONS
REV. ECO. DATE APVD
A 120814 021615 RC
DWG SCALE: NTS
DRAWN R.CSUK 111914
ENGR D.Crockett 111914
PROPRIETARY
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