FUTURA®
TOOLS & TECHNOLOGY

EG series
Machine Control System

Instruction Manual

Ver. 2 April 2018

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System Description

The EconoGrade Machine Control Systems were designed to let you achieve maximum control of your grading system, at a very friendly price. The four configurations of the EG Series are versatile and can be installed on a number of machines including box blades, box scrapers, graders, mini-graders and skid steers. The system controls most valve packages, giving the user both LED and a real-time LCD display so you are always in touch with the blade position. The EG Series Receiver can detect any rotating red beam laser within its 173mm (7") capture range, and in turn indicates the blade's position to within a 2mm (5/64") accuracy. The receiver has LED indicator lights that give the same output as the control box LED indicators. So whether you're standing on the field, or driving the machine you'll always know where your blade needs to be. The control box allows the user to configure the display to indicated variances from the on grade position in real time. The receiver is able to attach to a 45mm (1 3/4") standard pipe. The complete system requires 10 - 30vdc to operate.

System Components

Control System

Control Box

Slope Sensor

Receiver

Cable Set

Com. Node Cable

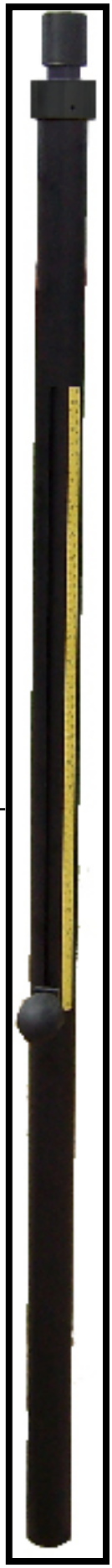
Power Cable

Remote Switch Cable

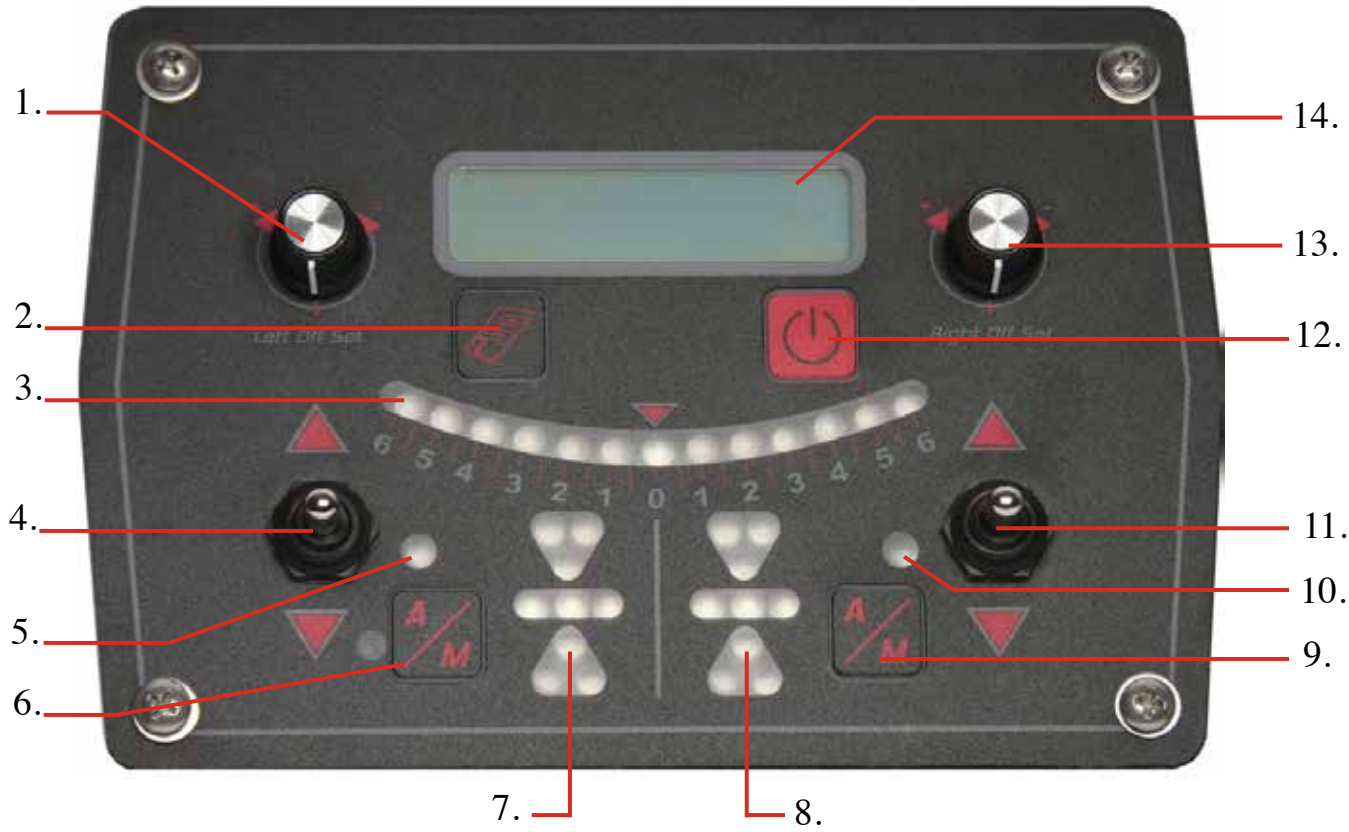
Receiver cable

Valve cable

Optional Telescoping Mechanical Mast



EG Series Control Box
Controls
(fig 1)



1) Left On-grade Offset -
13) Right On-grade Offset - These knobs control the offset of the on-grade of each receiver. They allow the operator to move the on-grade position of each receiver up or down by 54mm (2.13 inches)

2) Menu Button - These keys are used to step through the menus to setup all of the controls in the System. The menu flow is unidirectional and can only cycle through in one direction, if you go past a menu step it can't go back. Pressing either of the A/M keys is a short cut back to the main screen, a quick way to start over.

3. Slope Indicator Display - The slope indicator displays gives the operator realtime slope indication from -6% to +6% in 0.5% steps.

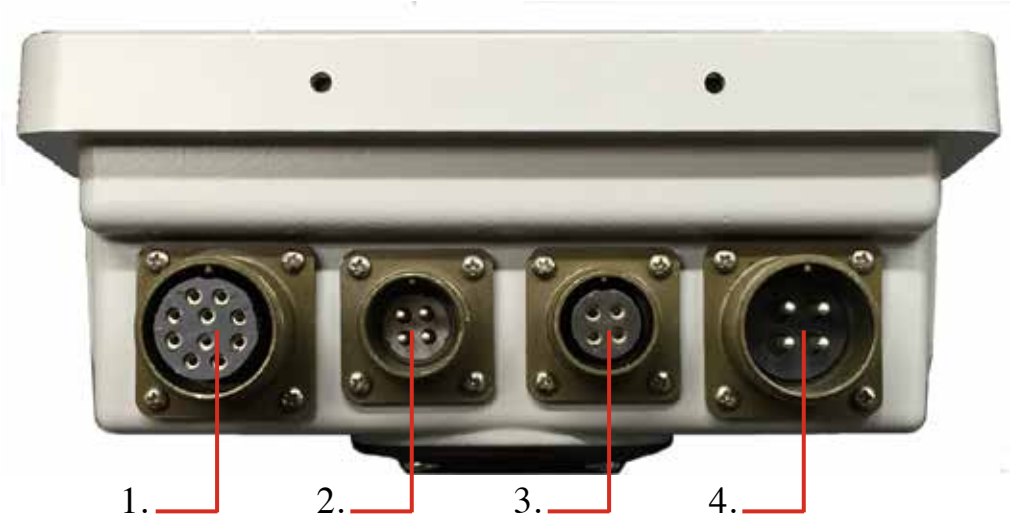
4) Left Valve Raise/Lower Switch -
11) Right Valve Raise/Lower Switch - These toggle switches are used for manual control and allow the operator to raise and lower each hydraulic circuit on the machine. These switches also acts as a control in the menu and are used to change parameters in the menu display.

5) Auto/Manual Indicator -
10) Auto/Manual Indicator - These indicators display when the system is in the automatic mode, if the light is on, the systems control is active.
6) Left Auto/Manual button -
9) Right Auto/Manual button - These buttons switch the EG Series system between automatic and manual control modes. The right switch controls both the left and right sides together and the left switch controls just the left. This configuration allows a way to control both sides together as well as individually.

7) Left LED Grade Display -

8) Right LED Grade Display - These LED's display whether you are above grade, below grade or on grade. The red arrows tell the user which direction the blade must move to achieve grade, while the single up or down red LED will flash when the receiver is within 10mm (0.39") of the desired grade. The green LED's in the middle will flash when you are within your desired 'on grade'.

12. Power On/Off switch - Press the power button briefly to turn it on, and the button must be pushed and held for approximately two seconds to turn the system off. This button is also used as a soft key providing the function indicated in the display directly above it.



1. Valve Cable Connector - This is where the valve cable is connected to the control box.

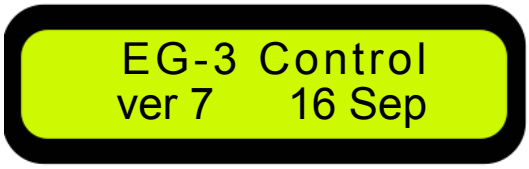
2. Remote Switch Connector - The remote auto/raise/lower toggle switch assembly plugs into the control box via this connector.

3. Communication Connector - Receiver and Sensors plug into the Node Box, their signals are trasfered to the control box via this 4 pin connector.

4. Power Cable Connector - Battery power is routed to the system via this cable connection.

EG Series Control Box

Display Screens and Menus



Splash Screen -The EG Series has many menu screens for setting the system parameters. The first to show up after power up is the Splash screen displaying System Type and Version. The Version and Version Date may change as features and program modifications are implemented.

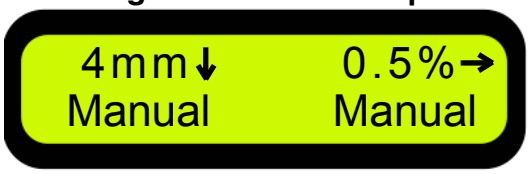
Main Operating Screens

The Main Control Screens: This is the first screen displayed after the 10 second start up routine is complete. The control screens will look different depending on the systems model, as well as how the system setup is configured. The three main configurations of the four EG Series models are shown here.

Single Laser

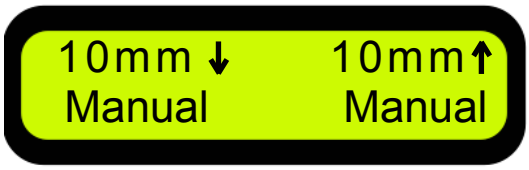
Single Laser Control - The upper left reading is the real time position of the laser beam on the receiver in metric or imperial depending on the units configuration. The upper right is the receiver on-grade offset entered in via the right offset adjust knob.

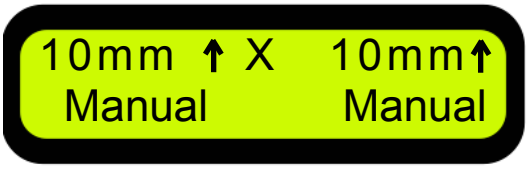
Single Laser with Slope



Single Laser with Slope Control - The upper left shows the receiver on-grade offset, which can be entered by the left offset adjust knob. The upper right displays the desired slope, this value is entered by the right off sett knob.

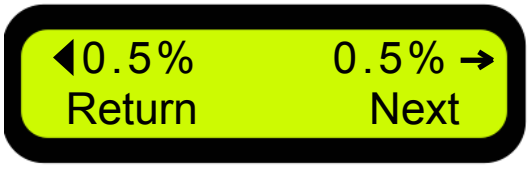
Dual Laser
Dual Laser with Slope Indicate





Dual Laser Control -
Dual Laser Control with Slope Indicate - The upper left and right display are the receiver on-grade offset values, they are adjusted via the adjustment Knobs. The Left Knob adjusts the left offset and Right Knob adjusts the right offset. We can also temporarily link the Left and Right offset together. This is accomplished by pressing the Power button once, an X will be displayed between the two offset values. While the X is present the Right Offset Knob will adjust both the Left and Right offset values together. The X will disappear 5 seconds after the value has been entered.

Slope Indicate / Control



Slope Indicate / Control -
If the system has the slope option and the slope option is enabled, pressing the menu button once will display the slope indicate / control screen. Here the real-time slope in the upper left side of the display and the direction is shown by a thick direction arrow. The desired slope is in the upper right hand side of the display and the direction is shown by a thin direction arrow. The desired slope is enter via the right off set knob while this screen is active. The system will remain in this slope screen until either the return or next key is pressed. The return key returns you to the main control screen and the next key will continue to the menu screens.

System Lockout Screen - When entering the menu screens, if there is a lockout code this screen will appear. You must enter the system password to be able to go any further into the menu screens. If this option is not needed it may be disabled in the installation menu. Password is Factory set to 1000

Filtering - Changing the filtering rate can help to cure any jumpy behavior of the receiver. The best setting is the fastest setting with the least amount of interruptions.

Valve Dead band - Is the amount of allowable on-grade tolerance. The range is 1mm to 30mm at 1mm steps. When the receiver is receiving the laser light in the on-grade position, the valves will not activate until the dead band range is passed. If the on-grade dead band is set to 10mm, the valves will not be activated until the receiver readings are beyond 5mm in either direction.

Horn - Sets the function of the internal beeper. **Off:** disables the internal beeper. **Alert:** sets the beeper to grade alarm mode, when in automatic, if there is no on-grade indication for 6 seconds the alarm will sound. **Indicate:** sets the beeper to indicate mode, the grade lights sounds the beeper like a detector. If the to high you get a double beep, low a single beep and on grade a solid beep.

Height Adjustment - By setting the Height adjustment option to **"ON"**, the off-set knob is enabled and the user has the ability to have an adjustable 'on grade' which is displayed on the LCD. If the Height adjustment is off or **Height set to "0"**, the off-set knob is disabled and the 'Real Time' blade position is displayed on the LCD.

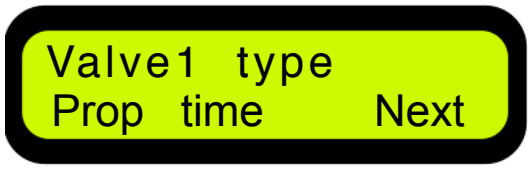
Unit selection - Sets for 3 different units: **Millimeters**, **Inches** (decimal inches) or **Feet** (10th of a foot).

Latec Info Screen - The final screen in the menu displays Latec Info, Name and phone number. Outside of North America, dial +01.519.235.4585.

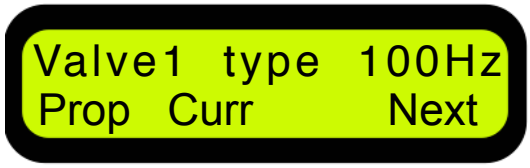
Note:

To access the Installation Menu , press the Menu and Power button in UNISON while the LATEC info screen is displayed.

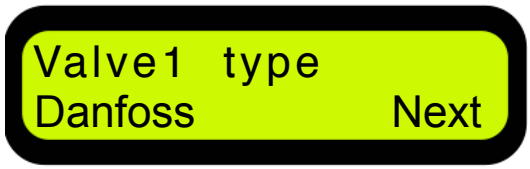
Valve Settings



Valve1 Types (Left Side) - EG Series can control proportional time ('bang-bang') valves, proportional valves with integrated electronics (Danfoss), Selective Control Valve (SCV) and proportional current (variable flow) valves. There are three Proportional current settings: 50 Hz., 100 Hz., and 200 Hz.; Consult the valve manufacturer to find the proper type and dither frequency for your valve.



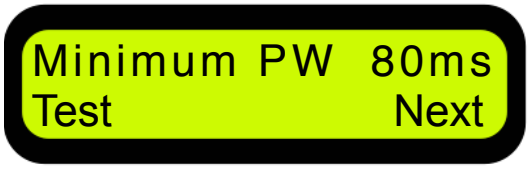
In **Proportional Time** mode, the EG Series valve output is an on/off voltage, high current output; the output voltage will, during the valve on time, be equal to the DC input supply.



In **Proportional Current** mode, the EG Series valve output is a pulse-width-modulated, high current output; the output voltage will, during the valve on time, be equal to the DC input supply.

The **Danfoss** setting, as well as producing the low power analogue control signal for the valve, also drives both of the high current valve outputs. One of those high current outputs can supply power to the Danfoss valve, and the other can operate the hydraulic system loading valve as recommended by the manufacturer.

Valve Control Direction can be changed to alleviate the need to change wiring or hydraulic plumbing. To enter Valve Direction menu, press the **Menu and Power Button in Unison**, then pressing the Menu button will switch between Normal and Inverted



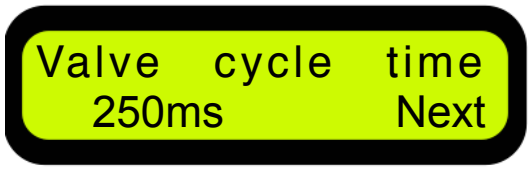
Proportional Time Valve Settings:

CAUTION: THE FOLLOWING ITEMS WILL OPERATE THE HYDRAULIC VALVE. BE CAREFUL WITH THEIR USE! MAKE SURE YOUR AREA IS CLEAR.

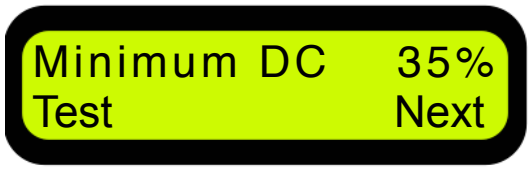
If your valve has been set to either proportional current or Danfoss go to Minimum DC setting on next page. Proportional time continue with below.

Minimum Pulse Width - The EG Series needs information about the hydraulic system on your machine, as all hydraulic systems are not the same. Here we are telling the system the signal needed to move the cylinder at its slowest speed. Pressing the Menu (Test) button will enter you in to this routine. Your hydraulics will begin to move, use the right toggle switch to increase or decrease the signal to the valve until you get a blade movement of approximately 0.5 inches per second. Press the menu button to change the direction, then adjust the cylinder speed for the opposite direction. When the cylinder speed is OK then press the power button (Stop) and these values will be stored. There may be a need to enter different values for Up and Down to balance the over all minimum speed. This is due to gravity helping in the downward direction and the volume differences in the cylinder, from the cap end to rod end.

Note: that either the "Stop" button, or the Power button will turn off the valve drive, and return you to the Minimum PW window. Also, the valve will shut off automatically after 20 seconds without any buttons being pushed.



Valve Cycle Time - This screen will only be displayed as part of the Proportional Time valve setup. This menu function sets how often the valve pulses are sent to the hydraulic valve called, hits per second. The range is 1 - 15 hits per second and unit is in milliseconds, to calculate the hits per second divide 1 by the milliseconds. eg.1 / 0.250 = 4 hits per-second. The lower the number the more hits per-second, for most hydraulic system starting at 100ms or 10 hits per second is a good place to start. The faster you can hit the valve the smoother it will seem to respond, the valve response will differ for valve to valve, playing with this setting will show you your valves limitations.



Proportional Current and Danfoss Valve Settings:

Proportional Time users proceed to the Valve Gain screen.

Minimum DC Pulse Width - This screen changes slightly when the Proportional Current and Danfoss valves are selected. It's functions and procedures are exactly the same as the Proportional Time routine except the units is in percent.

Note that either the "Stop" button, or the Power button will turn off the valve drive, and return you to the Minimum PW window. Also, the valve will shut off automatically after 20 seconds without any buttons being pushed.

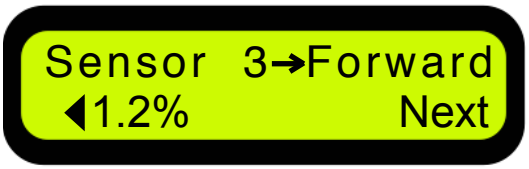
All Valves Types:

Valve Gain - The span of error between the onset of valve operation and the point at which the valve is fully on is determined by the valve gain setting. In this case, the units displayed (percentage) are arbitrary, but higher numbers suggest more vigorous valve action. With the gain set to 100%, the slightest error will fully open the appropriate valve. This setting should be left at 50% until after the Minimum Pulse width has been set and the hydraulics tested to see in which direction you would like to adjust this setting. The higher the number the more aggressive the hydraulic system. Conversely the lower the number the less aggressive the hydraulic system will be.

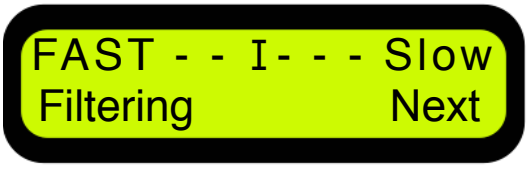
Derivative Gain - To stabilize some machine control applications, it is necessary for the control box to know not only whether the machine is at the desired slope or not, but how fast the slope is changing and in what direction. This is known variously as velocity or derivative (dv/dt) feedback. The control box can vary the amount of velocity feedback added; choose among: “High” “Medium” “Low” or “Off” This setting is to be left at medium for 99% of all installations.

Auto Return - Is the time duration that it takes for the valve to return the blade to the on-grade range after being manually driven away from the laser light using the toggle switch. The options available are in increments of 0.5 seconds with a range from 0 (off) to 7.5 seconds. After the set time is expired, the unit will move toward the last laser hit that it received. To disable this feature set the time to 0.

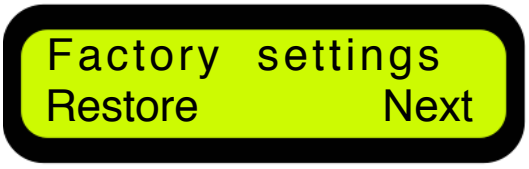
Tilt Sensing On/Off - This is were you turn slope sensing on If your system has the optional slope sensor feature. If Tilt Sensing is set to Off the next menu will be Factory Settings.



Sensor Forward - To add flexibility to the sensor mounting we have added a forward axis selection to orient the sensor after mounting. The label on top of the sensor shows a number for each quadrant, enter the number that is facing the forward direction of travel, this will orient the sensor axis. In the bottom left corner the real-time slope is displayed, this will help in mechanically adjusting the sensor to zero (level) after making sure the control surface is level before calibrating.



Filtering - Changing the filtering rate mathematically changes the sensors viscosity. The slower the filtering setting the thicker the sensor fluid will appear. Depending on the machine and the type of work, there will be a need to speed up or slow down the sensor.



Factory Settings: All of the EG Series variables can be restored to their default values with this window displayed. The defaults are restored by pushing the Restore button. The values saved will be:

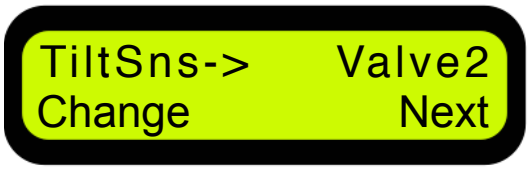
Filtering	--I---
On-grade dead band	10mm
Horn	Off
Height Adjustment	-On-
Units of Measurement	mm
Valve type	P.T.
Minimum PW	100ms
Valve Cycle time	250ms
Valve Gain	50%
Derivative Gain	medium
Auto Return	OFF
Language	English

Laser Receiver - The EG Series has the ability to communicate with other manufactures receivers, due to the communication changes necessary we had to limit the number of receivers to one and our slope sensor can not be implemented. Selections are limited to Apache BullsEye and Topcon LS-B series receivers, each requires an adapter cable to connect to our system.

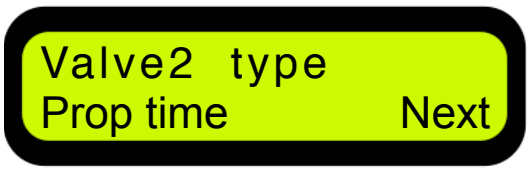
System Lockout Screen - This is the screen where you can enter a new password into the box. The factory default password in every system is “1000”. If user would like this option to be disabled set password to “0000” and all menu options will be available to the user.

Language - Pick your language...English or French only (sorry)

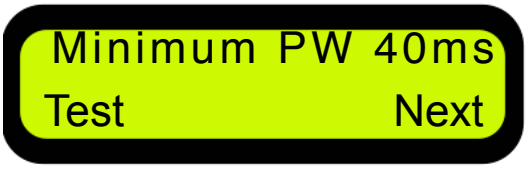
Number of Receivers - The system needs to know the number of receivers being connected, one is the default and two is the maximum. If the system is set to two receiver and the second receiver is not connected, the system will be looking for the receiver. Then an error will be displayed telling you the system cant find it.



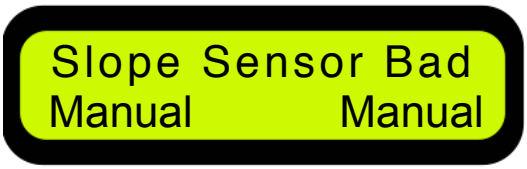
Valve2 Select - This selects the controlling device for Valve 2 (right valve), it can be changed between the Right Receiver and the Slope Sensor. The main control screen will change depending which device has been selected for Valve 2.



Valve 2 Settings - Valve 2 setting procedures are in the same order as Valve 1, follow the procedure as described for Valve 1.



Software Ver. - This screen is also displayed when the box is first powered on. These version numbers and dates will change as new features are added.



Error Screens: EG Series control system has built in diagnostics to keep you system running at its peak performance. If a problem develops with the receiver or slope sensor connection, cable, or the device itself, it will be displayed in the main screen.

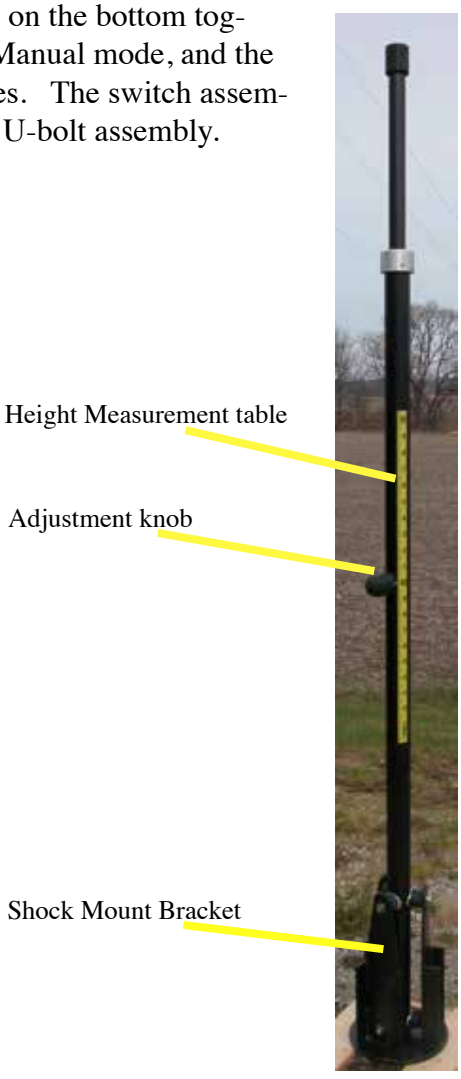
EG Series Options:

EG Series Remote Toggle Switch Assy: You can switch your EG2 from auto to manual mode, or raise and lower the valves right from the lever in your cab. The switch on the bottom toggles the EG Series between Automatic and Manual mode, and the switch on the top raises and lowers the valves. The switch assembly attaches to any lever using the universal U-bolt assembly.

EG Series Manual Mast:

The manual mast is made from 2" aluminum pipe and the slide can be adjusted up to 30" (760mm). Attach the mast to any implement using the optional Shock Mount Bracket (P#: 101789) or by inserting it into the existing laser mount. The receiver fits on the top of the mast, tighten the receiver into place via the two knobs on the base of the receiver.

Once the mast is mounted onto your machine, loosen the adjustment knob by turning it counter clockwise. Then move the knob up or down, until the receiver picks up a laser hit. Once the receiver has an on-grade laser hit, tighten the mast into place by turning the knob clockwise until it is tight.



Control Box mount:

EG Series comes standard with a Ram Mount mounting system that is designed to clamp to a steel rod or to be bolted to a flat surface. This system will allow for great flexibility in control box positioning

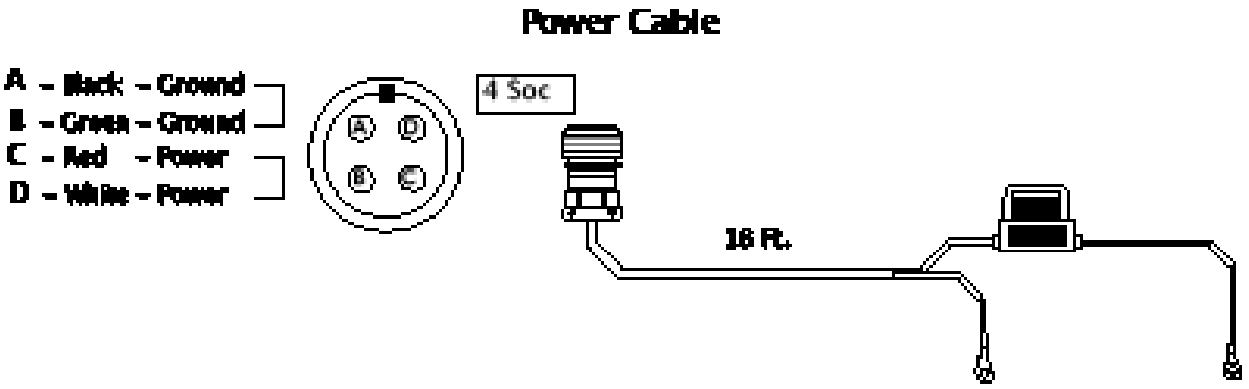
EG Series Installation:

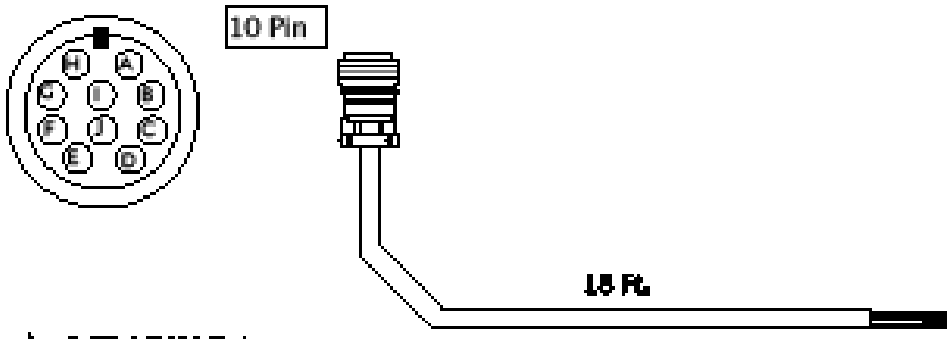
Control Box: To install the control box find an area in the cab which will allow for the control box to be easily viewed and controlled, but also does not interfere with the operators controls and line of sight. To mount the control box use the supplied mount as a template and drill 4 holes in the appropriate place. Then screw the mount into position and attach the control box to the mount. The control box can now be adjusted for your optimum viewing pleasure.

Receiver: The receiver can be mounted with any 1 3/4" pipe or using the optional EG2 Manual Mast as a stand alone or with the optional Shock Mount bracket. It should be mounted so that the receiver can receive a laser hit from 360°. This means the receiver should clear any cab, stack or any other obstacle on the machine.

Cable Assembly Information:

Power Cable -



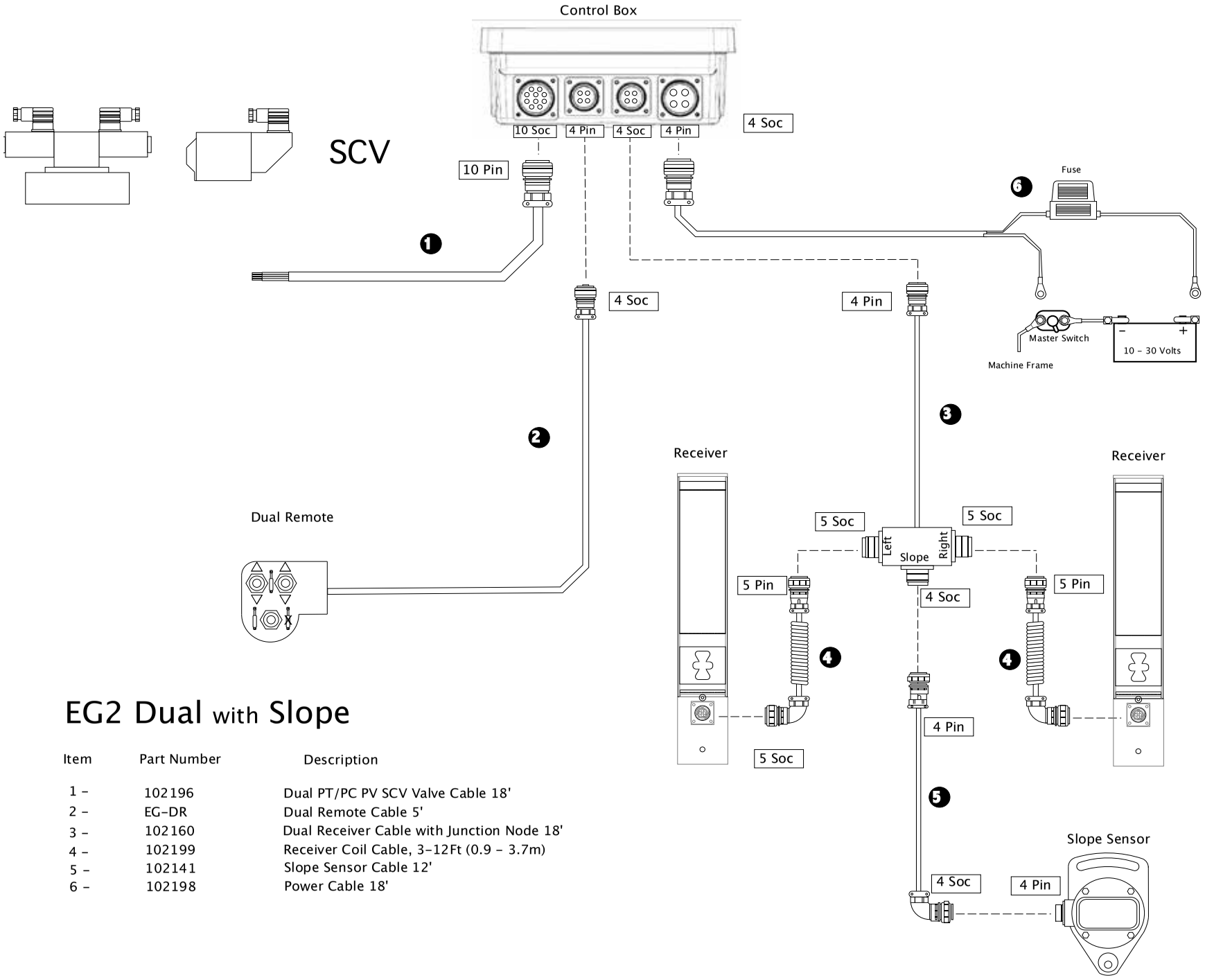


Dual Valve Cable

A - Red/Blk - Right valve 1 FT / PWM Out
B - Brown - Right Valve 2 FT / PWM Out
C - Yellow - Right Danfoss / SCV Out
D - Orange - Right Danfoss / SCV Reference In
E - Blue - Left Valve 1 FT / PWM Out
F - Yel/Blk - Left Valve 2 FT / PWM Out
G - Org/Blk - Left Danfoss / SCV Out
H - Blue/Blk - Left Danfoss / SCV Reference In
I - Black - Ground
J - Red - Ground

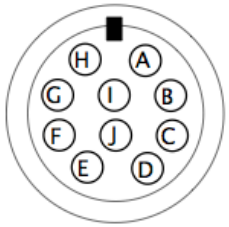
Single Valve Cable

E - White - Left Valve 1 FT / PWM Out
F - Green - Left Valve 2 FT / PWM Out
G - Brown - Left Danfoss / SCV Out
H - Red - Left Danfoss / SCV Reference In
I - Black - Ground



EG2 Dual with Slope

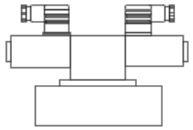
Item	Part Number	Description
1 –	102196	Dual PT/PC PV SCV Valve Cable 18'
2 –	EG-DR	Dual Remote Cable 5'
3 –	102160	Dual Receiver Cable with Junction Node 18'
4 –	102199	Receiver Coil Cable, 3-12Ft (0.9 – 3.7m)
5 –	102141	Slope Sensor Cable 12'
6 –	102198	Power Cable 18'

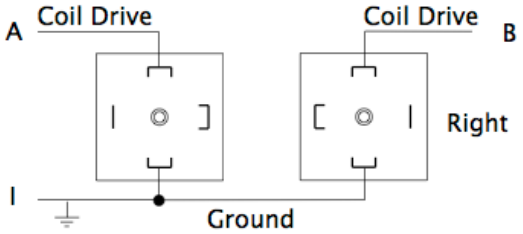


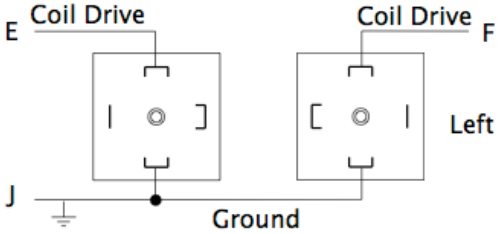
A – Red/Blk – Right valve 1 PT / PWM Out
B – Brown – Right Valve 2 PT / PWM Out
C – Yellow – Right Danfosse / SCV Out
D – Orange – Right Danfosse / SCV Referance In

E – Blue – Left Valve 1 PT / PWM Out
F – Yel/Blk – Left Valve 2 PT / PWM Out
G – Org/Blk – Left Danfosse / SCV Out
H – Blue/Blk – Left Danfosse / SCV Referance In
I – Black – Ground
J – Red – Ground

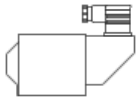
Proportional Time & 200, 100, 50 Hz Proportional Current:

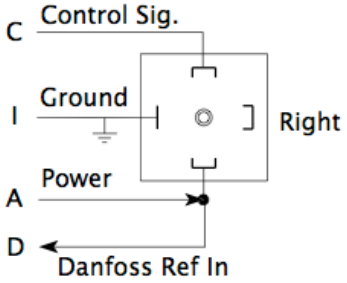


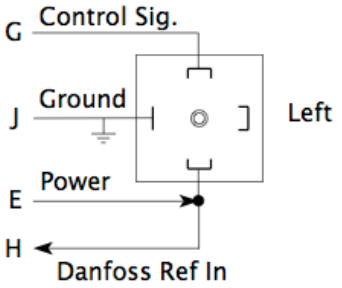




Proportional Voltage PVE: (Danfoss)

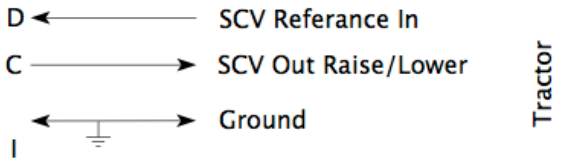


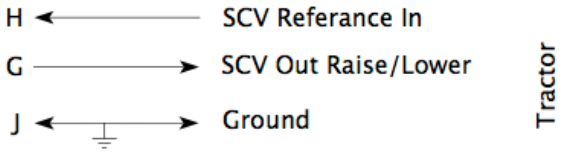




Selective Control Valve:

SCV





Notes

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