Lamprey II ™

(LP106)

Operation Manual

Limited Warranty

Cirus Controls, LLC.

What and who is covered?

This warranty covers all defects in materials or workmanship in your Cirus Controls system under normal use, maintenance and service. This warranty coverage applies only to the original owner and is not transferable.

How long is the warranty period?

This warranty coverage runs for a period of 1 year from the date of initial installation (or 13 months from date of shipment from Cirus Controls), whichever occurs first. Replacement parts are warranted for the remaining portion of the original warranty period or thirty (30) days from date of shipment from our factory (whichever is greater).

How can you get service?

Cirus Controls' obligation under this warranty is limited to repairing and/or replacing, at Cirus Controls' option, any part or parts that are determined, by Cirus Controls, to be defective. To be eligible for any claim under this warranty, the owner (or Cirus authorized dealer) must return any defective part(s) to the factory, within the applicable warranty period (as set out above).

What will we do?

Cirus Controls' may, at its option, elect to grant adjustments in the field through an authorized representative and may thereby elect to waive the requirement that parts be returned to Cirus Controls' factory. The repair or replacement of defective parts under this warranty will be made without charge to the owner except for transportation of the part to our authorized repair location.

What is not covered under this warranty?

Cirus Controls will not assume any expense or liability for repairs made outside our plant without our prior written consent. We are not responsible for damage to any associated equipment or product and will not be liable for loss of profit or other special damages.

The provisions of this warranty do not apply to any product or parts which have been subject to misuse, negligence or accident, or which have been repaired or altered outside of Cirus Controls' factory in any way (in the judgment of Cirus Controls) so as to affect adversely its performance or reliability. Neither does this warranty apply to normal maintenance service and parts or to normal deterioration due to wear and exposure.

This warranty is expressly in lieu of other warranties, expressed or implied, in fact or by law, including any implied warranty of merchantability of fitness for a particular purpose. The remedies of repair or replacement as set forth are the only remedies under this warranty; Cirus Controls' disclaims any obligations or liability for loss of time, inconvenience, commercial loss or direct consequential, special or incidental damages. This warranty is in lieu of any other obligation or liability of Cirus Controls' of any nature whatsoever by reason of the manufacture, sale, lease or use of such products and Cirus Controls neither assumes, not authorizes anyone to assume for it, any other obligation or liability in connection with such products.

Revision level of this manual

Rev Letter	Date	Detail
A	11/19/09	Initial Release
B	8/23/12	Setup update

Cirus Controls reserves the right to make revisions to this manual without notice.

Package Contents

A complete ***Lamprey II*** ***TM*** control system contains the following items:

1) ***Lamprey II*** ***TM*** control unit;
2) ***Mako Trim*** ***TM*** program for the PC on a CD;
3) This manual;
4) Power cable;
5) Hydraulic control cables ordered;
6) Joystick pendant;

If any of these items are missing, please contact your distributor for replacement parts.

Functional Overview

The ***Lamprey II*** ***TM*** control system is a 6 channel proportional hydraulic controller. It translates movements from a joystick(s) to movements of truck implements such as plows, hoists and hook lifts. The closer the joystick is to center (neutral) the slower the implement will move; the further from center the faster the implement will move. The ***Lamprey II*** ***TM*** system is field-configurable using a PC connection. This allows the end user to tailor the speed of each individual function or to turn on and off certain functions. For example, set the speed of the "plow down" different from the "plow up" speed.

Lamprey II ***TM*** **Top View and cable connections**

Connections:

Pendant: 10-pin Molex used for plugging in the joystick pendant for the unit.
PC Port: standard PC serial connection used for field setting trims and other configuration options. (Optional cable)
PWR / GND: 4-pin Molex used for connecting power and ground to system (Standard cable);
HYD OUT: 10-pin Molex used for connecting hydraulic coils to system (Standard cable);

Pre-Delivery System Setup Checklist

	Description	Completed By/Date
Step 1	Install System and connect cables	
Step 2	Test the Signal Outputs	
Step 3	Configure the Joystick	
Step 4	Trim hydraulics for all axes of motion	

Step 1- Installing the control unit

The ***Lamprey II ™*** control unit may be mounted anywhere in the cab as long as the pendant cable is long enough to reach the operator location.

Connecting the cabling

1) Verify that power switch is off. Connect the hydraulic cables to the labeled ports. Cable is labeled on the sheeting with TS -2031.
2) Connect the Pendant to the control module in the "Joystick" port.
3) Finally, connect the power cable (MK-1003) to the unit. Check to make sure that the power switch on the pendant is off before connecting the power leads and then connect power and ground to the cable. The power cable should be connected to a power circuit capable of delivering a maximum of 10 amps and should be fused. **A chassis ground is not adequate; the ground source must be connected to the battery.**

Step 2 - Testing the signal outputs

WARNING: KEEP ALL PERSONNEL CLEAR OF MOVING PARTS!
With the truck off, turn on the system and wait 5 seconds for self-test to complete. Move the joystick on the ***Lamprey II ™***. Move the joystick up and check for the correct LED lighting up on the valve junction box out by the valve body. Repeat this for every function on the truck. Once that is complete, start the truck, and repeat. The implements should now move when each function is selected. The speeds of the functions can be tailored using the ***Mako Trim ™*** configuration tool, which is described in the Trimming step.

Step 3 – Configure the Joystick

Joystick Protection and Failure Diagnosis

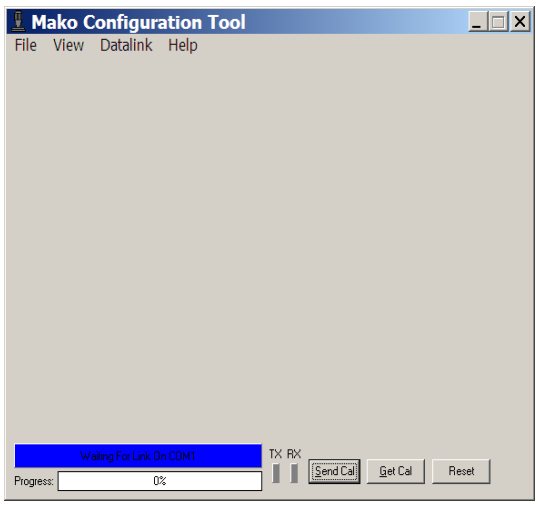
All ***Lamprey II ™*** joysticks are true "Hall Effect" magnetic joysticks. When handled properly, these joysticks will give long service since there are no "contact parts" inside.

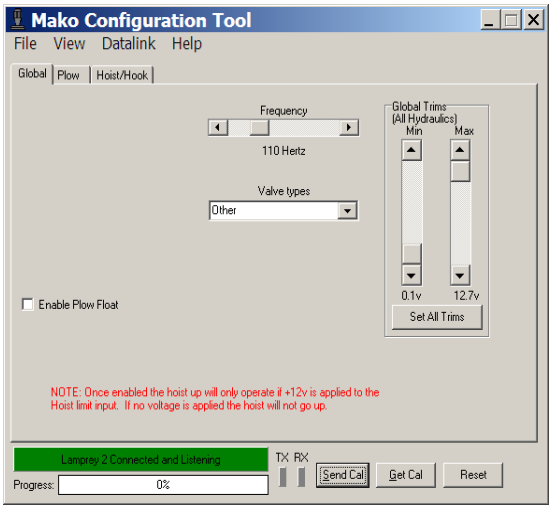
Joystick Damage Prevention

HFX joystick's can by damaged by connecting them into the wrong ports/pins. Joysticks are installed, wired and tested at the factory and should not be removed in the field by anyone other than a qualified technician.

System Configuration

1) To adjust trims, or system parameters plug a standard serial cable into the PC port on the ***Lamprey II ™*** plow control. Use the latest version of ***Mako 2 Trim ™***. Current versions are posted on Cirus Controls' website. Verify that the COM port on the PC is available. Open the ***Mako 2 Trim ™*** configuration utility.





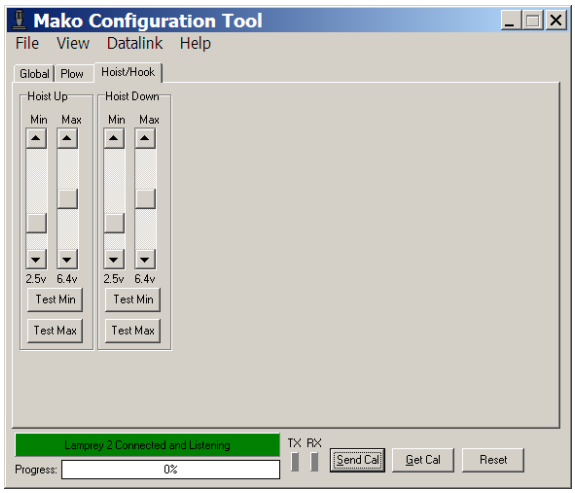
2.) After the ***Mako 2 Trim*** ™ program is opened, turn on the ***Lamprey II*** ™ plow controller. The blue bar that says waiting for link will turn green, this indicates that the system has uploaded the current configuration in the ***Lamprey II*** ™ and now controls the ***Lamprey II*** ™ plow control.

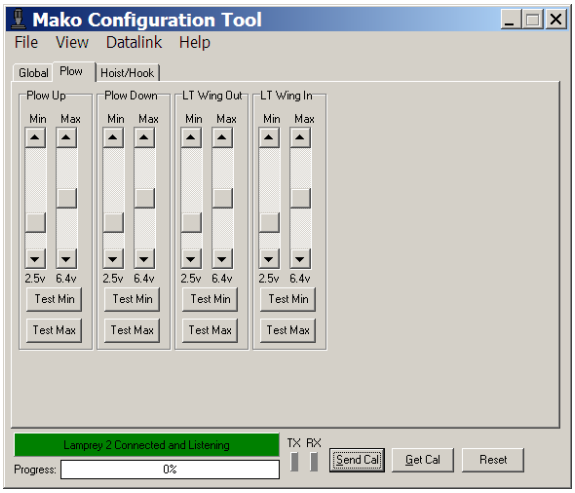
Note: the joystick's current setup changes to display the current configuration of the ***Lamprey II*** ™ and should not be changed unless the joystick you are using changes. Refer to the Joystick Setup table for types of joysticks and what they should be set to in the ***Mako 2 Trim*** ™.

Joystick Setups

Type of Joystick Purchased	Joystick Selection needed in Mako 2 Trim	Safety Jumper Over-ride needed?	What is the Safety Over-ride do?	Total PWM Outputs
PENDANT JOYSTICK	PENDANT	N/A	N/A	6
1-SINGLE HFX & 1-DUAL HFX	DUAL HFX	NOT UNLESS CUSTOMER REQUIRES	BYPASSES TOP BUTTON	6
1-DUAL AXIS HFX JOYSTICK	SINGLE HFX	NO	ALLOWS FOR J5 & J6	6
SINGLE AXIS HFX	HOIST ONLY HFX	NOT UNLESS CUSTOMER NEEDS	BYPASSES TOP BUTTON	2
DUAL AXIS HFX	PLOW ONLY HFX	NOT UNLESS CUSTOMER NEEDS	BYPASSES TOP BUTTON WHICH IS NEEDED TO MOVE J1-J4 OUTPUTS	4
3-AXIS HFX	WING 3-AXIS	NOT UNLESS CUSTOMER NEEDS	BYPASSES SAFETY FOR J1-J6 OUTPUTS	6
PENDANT JOYSTICK	V-PLOW PENDANT	NA	NA	6

3) From the system mode menu, use the check boxes to assign top switches as desired and trim each output with the hydraulic "Test Min/Max" tabs (trimming section). Note: the trucks hydraulics must be running when doing this, make sure all personal stay clear.





4) Once the joystick and trims are set to your liking, send the calibration by pressing "send cal"

5) Save the file by clicking "file/save as", name the file to your liking to have for future use.

Step 4 Set Up for Operation – Trimming

Overview of Trims for Proportional Control of Motion (Feathering)

Setting trims is the process of setting minimum and maximum signal voltages for the valve coil that result in a fine-tuning of the range of proportional control available to the operator. Proportional control of motion allows the operator to move the control joystick a small amount to control low-speed movement and a large amount to control high-speed movement. When properly set, the operator can "feather" the control joystick and move the implement (plow, dump body) at the rate of speed that is appropriate to the task at hand for best safety and efficiency.

Trims can be set at the outer limits of the electro-hydraulic system's capability for proportional control of motion or they can be narrowed to a tighter range of control. The larger the difference in voltage between the minimum and maximum settings, the larger the range of movement of the control joystick and the finer degree of proportional control of motion is available to the operator.

Minimum Trim: the minimum signal voltage delivered to the coil necessary to result in enough flow of hydraulic fluid to begin to move the implement selected. This voltage value will vary based on the valve coil in use, the size of the hydraulic system, the size of the hydraulic cylinder and the weight of the implement (dump body, plow, wing etc). Minimum settings can only be determined at operating engine rpm's with hydraulic fluid warmed to its operating temperature.

Maximum Trim: the maximum signal voltage delivered to the coil necessary to result in enough flow of hydraulic fluid to reach the maximum speed of motion of the implement intended. This voltage value will vary based on the valve coil in use, the size of the hydraulic system, the size of the hydraulic cylinder and the weight of the implement in use (dump body, plow, wing etc) and is normally pre-set at the factory.

Typical Settings (largest difference between min and max settings): choosing these settings results in the largest amount of proportional control available for that hydraulic system. The operator will be able to make large and small adjustments to speed of motion by moving the control joystick a corresponding amount.

Bang /Bang Control (On/Off): Set the minimum and maximum trim voltage levels at 12V. Zero proportional control of speed is available at this setting.

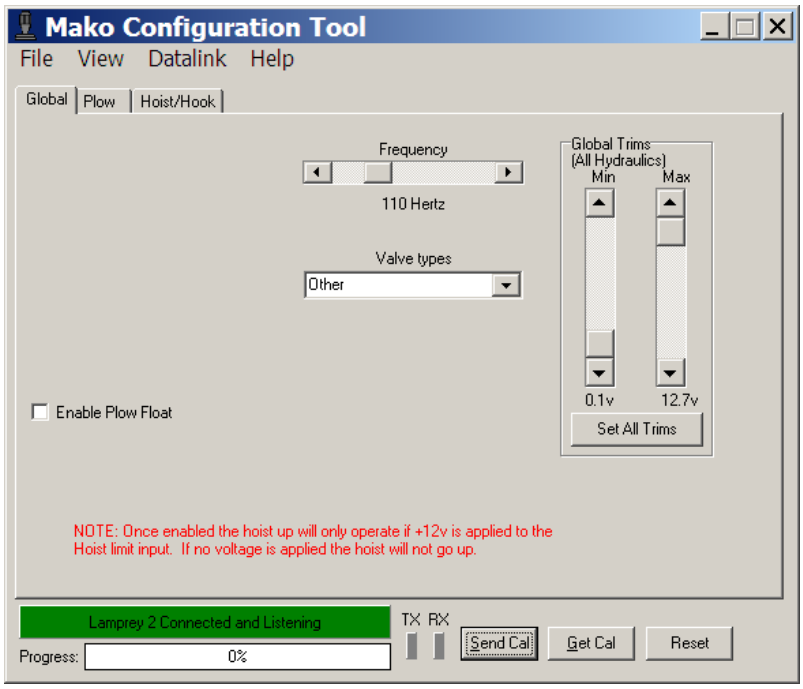
Other Setting Combinations: because each implement has performance characteristics, setting trims uniquely for each one will create the best sense of control for both safety and efficiency.

Instructions for Setting Trims

In order for a ***Lamprey II*** ™ plow control system to proportionally move implements the system may have to be trimmed. The unit comes factory set for a variety of different coils, which allows the unit to run without changes. However if some of the implements don't move as desired, they can be adjusted by setting new min and max trim settings via the ***Mako Trim*** ™ configuration program which can be found on the CD accompanying the system user manual. ***Mako Trim*** ™ is compatible with personal computers (PC) or laptops running Windows 2000, XP or Vista operating system.

1) To adjust trims, or system parameters plug a standard serial cable into the PC port on the ***Lamprey II*** ™ plow control. Validate that you are using the latest version of ***Mako Trim*** ™. Current versions are posted on Cirus Controls' website. Verify that the COM port on the PC is available. Open the ***Mako Trim*** ™ configuration utility.

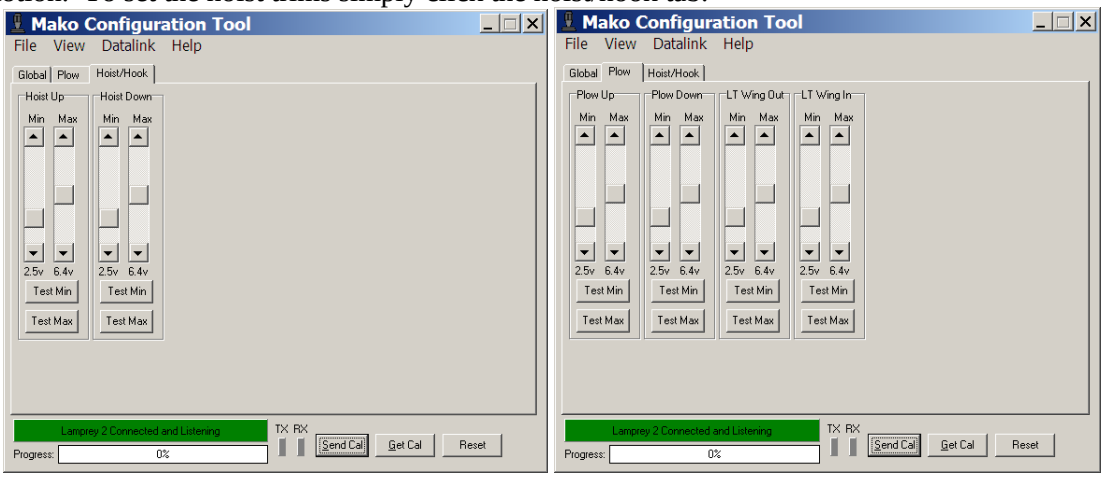
2) After the ***Mako Trim*** ™ program is opened, turn on the blue ***Lamprey II*** ™ plow control. The blue bar that says waiting for link will turn green. At this point the PC has uploaded the current configuration in the ***Lamprey II*** ™ and now controls the ***Lamprey II*** ™ plow control. Global Trims Tab



This screen is used for setting the coil type, coil frequency, and setting all the trims to be the same with the global trim sliders. Use the slider to select the voltage desired and then selects "set all trims" to apply those values to all channels on the system.

Test and Set Trims for Each Channel

If wish to set trims individually for each implement, use the next 2 tabs to do so for all the axes of motion. To set the hoist trims simply click the hoist/hook tab.



Using the PC to Identify the Minimum Voltage:

Caution, the hoist will move, keep all personnel clear before beginning.

1) With the truck running, move the hoist up slider up in 0.1 volt increments. Each mouse click will move the value up 0.1V and the displayed value will change.
2) After each increase press and hold the "TEST MIN" button. This will tell the ***Lamprey II*** ™ box to move the hoist at the set level. It is not necessary to move the joystick.
3) If the hoist doesn't move, move the slider and repeat the process until the hoist <u>just starts to move</u>. "Ideal" min. voltage is the point at which the hoist barely moves with "test min."
4) To set the next channel independently, select the tab for the next implement and repeat.

Maximum Trim Voltage

The maximum voltage setting is pre-set at the factory to match the valve coil in use on this system. The max trim can be reduced below the pre-set level to (from full on to barely moving) by moving the max slider downward. This type of "lowered maximum" is used to balance the speed of a "lighter" implement to keep it from banging when run at top speed.
Increasing the maximum voltage will only increase speed of motion up to the maximum capacity of the hydraulic system, increasing max voltage above that point will not increase the speed.

Using the PC to Set the Maximum Voltage:

Caution, the hoist will move, keep all personnel clear before beginning.

1) With the truck running, move the "hoist up max slider" down in 0.1 volt increments. Each mouse click will move the value down 0.1V and the displayed value will change.
2) After each increase press and hold the "TEST MAX" button. This will tell the ***Lamprey II*** ™ to move the hoist at the set level. Do not move the joystick.
3) Final setting will depend on the desired maximum speed you seek. Observe the speed at several Max settings and choose the speed that meets your needs.

4) To set the next channel independently, select the tab for the next implement and repeat.

Upload and Store the Trim and Settings

Once all the trims are set to the users liking, they must be uploaded to the ***Lamprey II ™*** box by clicking the "Send Cal" button.
NOTE: TRIMS ARE NOT UPDATED OR SAVED IN THE SYSTEM UNTIL THE SEND CAL BUTTON IS PRESSED.
This file can also be saved on the PC by clicking the file menu and saving the configuration. When the PC is connected to a printer, the numerical values can be printed for your records.

Downloading Trim and Settings – Backup Copy

In the event you wish to download the trim setting from a ***Lamprey II ™*** box. Connect the PC as before, and simply press the "Get Cal" button. Save the new file on your PC.

Using Stored Trims and Settings – Restore Settings

You may use a settings file on your PC to upload an existing configuration to ***Lamprey II ™***. Connect the PC to the ***Lamprey II ™*** plow control as before and click on "Send Cal." The ***Lamprey II ™*** plow control now is configured with the settings from the stored file.

System Self-Diagnostics and Troubleshooting

Joystick Check during Startup

During each system power up, the ***Lamprey II ™*** tests each joystick for proper electrical function. This test takes approximately 5 seconds after power is turned on. Should the ***Lamprey II ™*** identify a bad joystick during power up, it will automatically cancel all of the joystick outputs to protect the hydraulic system until the joystick problem is corrected.

When a joystick failure is identified, the Red power light will blink slowly.

Joystick failure during operation (*SafeStik*™) – Blinks Slow

In the event that a joystick axis fails during operation, the ***Lamprey II ™*** system automatically recognizes the failure and disables the failed axis. In this event (single axis failure), all other joystick axis will function properly. To confirm the diagnosis, shut off the system power for 5 seconds and then re-start the system. Upon power up, the system self test will recognize the failed axis and cause the "POWER LED" to blink slowly confirming the failure and then you can replace the joystick or return the unit for service.

Shorted or Open Circuit on Output channels – Blinks Fast

The ***Lamprey II ™*** system is designed to recognize when an output channel is connected to a shorted or open circuit. This protection ensures that the system stops sending an output signal to the affected device until the problem is resolved. The failure indication is a fast flashing POWER LED. The LED will flash fast while the operator attempts to actuate the damaged circuit by moving the joystick toward the damaged function. If only one output channel (controlled by one direction of joystick motion) is damaged, only that output channel is shut off by the ***Lamprey II ™*** system until repairs can be made.

Trouble Shooting Guide

Complaint	Cause (s)	Correction (s)
Power Isn't On	a) Master Power Off; b) Fuse is blown; c) Bad Power or Ground connection;	a) Turn on power; b) Replace Fuse c) Verify power/ground connections.
Lamprey II cuts out or acts strange;	Low power supply voltage from truck battery/alternator;	Minimum truck voltage must be > 12.0 volts;
Plow or Hoist Doesn't Move	a) PTO not engaged; b) Hydraulics not functioning; c) Electrical connection failure; d) Lamprey II power off; e) Joystick malfunction; f) Hoist limit is enabled;	a) Engage PTO; b) Verify Hydraulics: actuate plow or hoist; manually operate using manual over-ride on valve; c) Check LED at coil connection and at valve junction box; Repair cable; d) Check wiring and switch; e) "Power up" joystick self test; Repair/replace indicated joystick. f) Correct hoist limit conditions;
System doesn't respond to joystick (initial setup)	a) Lamprey II not configured to match the joystick system in truck; b) One or more joysticks have failed and Lamprey II has canceled the output signal to protect the hydraulic system;	a) Use Lamprey II Trim to configure the system to match the joystick installed in the truck. b) See Joystick Safety section in this manual to diagnose which joystick has failed;
Implement (plow or hoist) moves without actuating joystick;	a) Output signal on at all times;	a) Verify joystick cable is plugged in properly on both ends; b) Verify that individual joysticks are plugged into joystick PCB in arm unit. c) Joystick was damaged by incorrect wiring and must be replaced.
"Power LED" Flashes (fast or slow).	a) Flashes slowly – joystick failed; b) Flashes rapidly (only when joystick is moved in a particular direction), stops flashing when stick returns to neutral;	a) Replace joystick; b) Shorted or open circuit external to the Lamprey II. Investigate the wiring and coil in the device controlled by the axis of motion that causes the flashing LED. (I.e. LED flashes when moving joystick for "hoist up." Troubleshoot wiring and Hydraulic coil for "hoist up" function.).

Appendix A: Spare parts list

Lamprey II 106

000861	Lamprey Pendant and cable
030195	Lamprey control module
MK-1003	Lamprey II Power Cable
0009821.2	Lamprey hanger

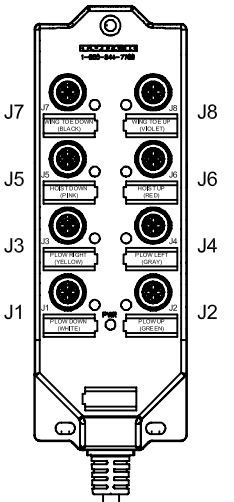
IP 68 Valve Junction Box Parts

TS-2031	8 (active) Port Junction Box
TS-2011	24" Pigtail with Weatherpak termination (2 pin, tower half)
TS-2017	24"pigtail w Metripak terminations
TS-2020	24" pigtail w Deutsch terminations

Appendix B – Glossary of Plow Control Terms

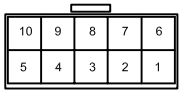
Lamprey II ^{TM}: Proportional joystick system for controlling plowing systems.
Mako Trim ^{TM}: Windows compatible software for configuration of plow control system.
Proportional Control: the ability to control motion of a plow in a smooth, feathering manner from slowest to fastest speed of motion possible for a given hydraulic set up. The closer the joystick is to center (neutral) the slower the implement will move; the further from center the faster the implement will move.
Bang-Bang Control: the ability to control motion of a plow as either fully on or fully off resulting in a single speed of motion determined by the hydraulic system (no operator control).
Minimum Trim: the minimum signal voltage delivered to the coil necessary to result in enough flow of hydraulic fluid to begin to move the implement selected.
Maximum Trim: the maximum signal voltage delivered to the coil necessary to result in enough flow of hydraulic fluid to reach the maximum speed of motion of the implement intended.

Appendix C – Standard and Optional System Drawings



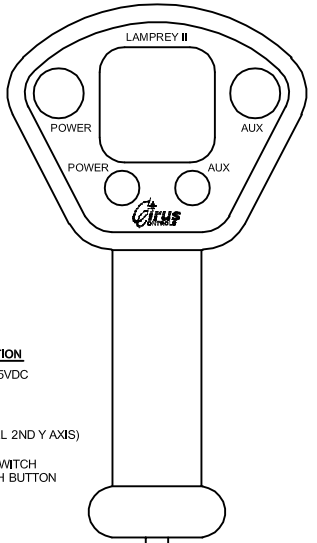
VALVE PIGTAIL OPTIONS

TS-2010 M12 TO WEATHERPACK
TS-2011 M12 TO AMP JUNIOR TIMER
TS-2012 M12 TO AMP
TS-2013 M12 TO ITT CANNON
TS-2014 M12 TO DIN
TS-2017 M12 TO METRI-PACK 150
TS-2020 M12 TO DEUTSCH
TS-2016 DUAL M12 TO DIN



BACK VIEW
(SIDE PINS ARE INSERTED FROM)

MOLEX MINI FIT JR	WIRE COLOR	CONNECTION
10	RED	POWER +5VDC
9	ORANGE	TRIGGER
8	WHITE	X- AXIS
7	BLUE	Y-AXIS
6	N/A	(OPTIONAL 2ND Y AXIS)
5	BLACK	GROUND
4	YELLOW	POWER SWITCH
3	PURPLE	AUX PUSH BUTTON
2	GREEN	LED 1
1	BROWN	LED 2



TS-2031 HYD OUT

JOYSTICK PENDANT

MK-1003 SYSTEM POWER AND GROUND

PC PORT

LAMPREY II MODULE

CIRUS CONTROLS LLC
9210 WYOMING AVE. N. SUITE 200
BROOKLYN PARK, MN 55445
Phone: (763) 493-9380
Fax: (763) 493-9340

REV	DATE	DESCRIPTION
A	-	-
B	-	-
C	-	-
D	-	-
E	-	-

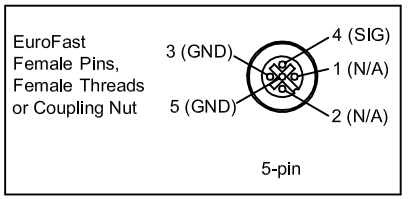
LAMPREY II SERIES

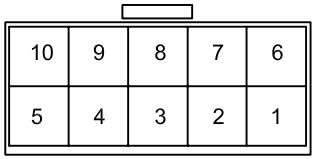
CABLE OVERVIEW

DESIGN:	DRAWN:	AS BUILT:	PROJECT NUMBER:	SCALE:	DATE:	REV.
JTM	JTM	—	OVERVIEW	NONE	11-30-09	—
					SHT 1 OF 1	

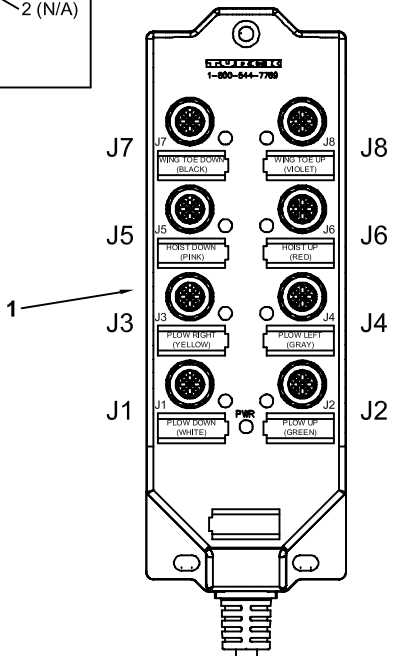
B.O.M.

QTY	PART NUMBER	DESCRIPTION
1	M48MB12Z-4P-4P2-5	8 TERMINAL TURCK BOX 15' CABLE
1	39-01-2100 (Digi-Key WM3704-ND)	MOLEX RECEPTACLE 10 PIN
10	39-00-0039 (Digi-Key WM2501-ND)	MOLEX TERMINALS FEMALE 18-24 AWG





BACK VIEW
(SIDE PINS ARE INSERTED FROM)



MOLEX PIN#	BT HYD	MAKO II HYD A	MAKO II HYD B	COLOR (PORT#)
10	PLOW DOWN	PLOW DOWN	HEEL DOWN	WHITE (J1)
9	PLOW RIGHT	PLOW RIGHT	SLIDE OUT	YELLOW (J3)
8	HOIST DOWN	HOIST DOWN	BLADE DOWN	PINK (J5)
7	GND	GND	GND	BLUE
6	SPINNER	TOE DOWN	BLADE RIGHT	BLACK (J7)
5	PLOW UP	PLOW UP	HEEL UP	GREEN (J2)
4	PLOW LEFT	PLOW LEFT	SLIDE IN	GRAY (J4)
3	HOIST UP	HOIST UP	BLADE UP	RED (J6)
2	GND	GND	GND	GREEN / YELLOW
1	AUGER	TOE UP	BLADE LEFT	VIOLET (J8)

WIRES NOT USED SHOULD BE TRIMED BACK AND HEAT SHRUNK TO MAIN CABLE

LABEL CABLE TS-2031

CABLE # TS-2031

REV	DATE	DESCRIPTION
A	4-16-08	ADDED MAKO II OUTPUTS
B	-	-
C	-	-
D	-	-
E	-	-

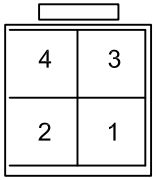
DESIGN:	DRAWN:	AS BUILT:	PROJECT NUMBER:	SCALE:	DATE: 4-16-08	REV.
JTM	JTM	–	TS-2031	NONE	SHT 1 OF 1	A

Cirus Controls
9200 Wyoming Ave. N, Suite 320
Brooklyn Park, MN 55445
Tel: (763) 493-9380
Fax: (763) 493-9340

BLACK TIP CABLES

VALVE JUNCTION BOX 8 PORT

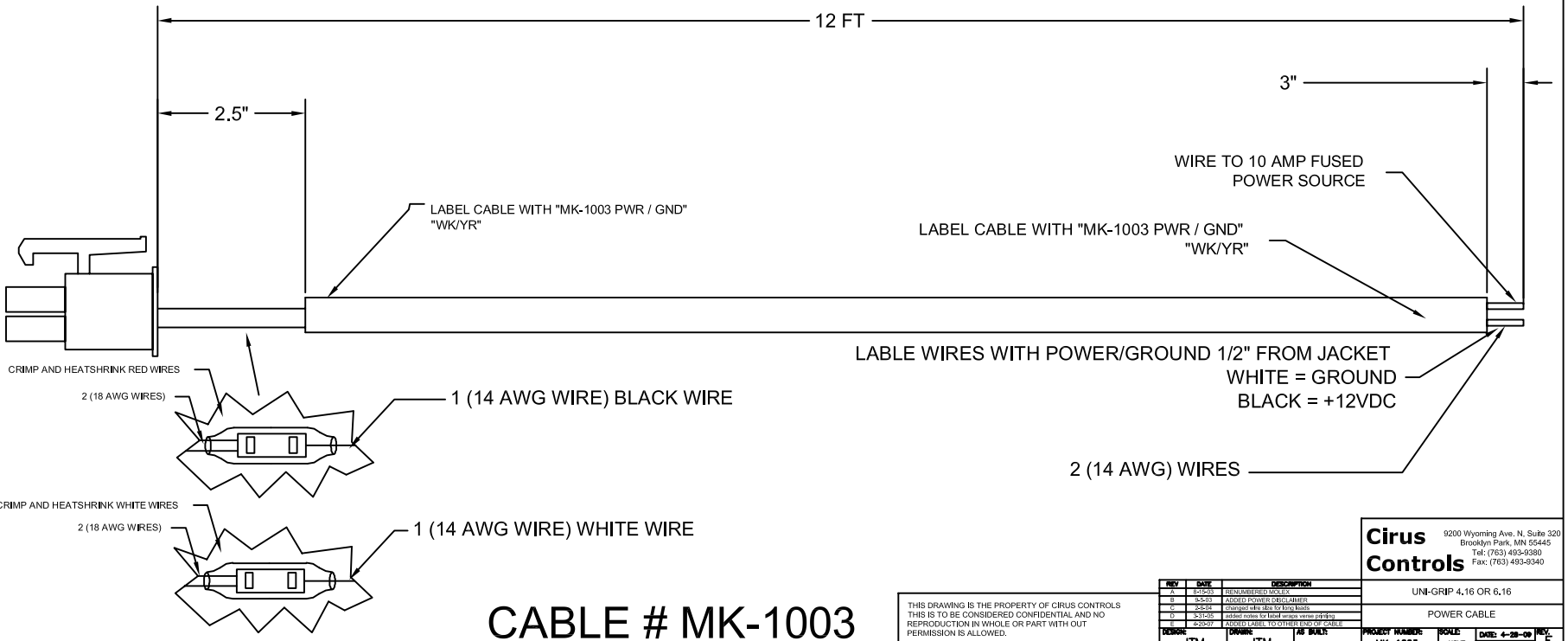
B.O.M.



BACK VIEW
(SIDE PINS ARE INSERTED FROM)

MOLEX PIN#	SIGNAL
1	GROUND : WHITE (18AWG)
2	+12 VDC : RED - BLACK (18AWG)
3	GROUND : WHITE (18AWG)
4	+12 VDC : RED - BLACK (18AWG)

QTY	PART NUMBER	DESCRIPTION
1	39-01-2040 (Digi-Key WM3701-ND)	MOLEX RECEPTACLE 4 PIN
4	39-00-0039 (Digi-Key WM2501-ND)	MOLEX TERMINALS FEMALE 18-24 AWG
12'	AUTOMOTIVE GRADE	2 CONDUCTOR 14 AWG CABLE



CABLE # MK-1003

REV	DATE	DESCRIPTION
A	8-15-03	RENUMBERED MOLEX
B	8-5-03	ADDED POWER DISCLAIMER
C	3-5-04	changed wire size for long leads
D	5-31-05	added notes for label wraps verse printing
E	4-20-07	ADDED LABEL TO OTHER END OF CABLE

DESIGN:	DRAWN:	AS BUILT:
JTM	JTM	—

Cirus Controls
9200 Wyoming Ave. N, Suite 320
Brooklyn Park, MN 55445
Tel: (763) 493-9380
Fax: (763) 493-9340

UNI-GRIP 4.16 OR 6.16

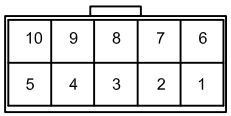
POWER CABLE

PROJECT NUMBER:	SCALE:	DATE: 4-20-09	REV.
MK-1003	NONE	SHT 1 OF 1	F

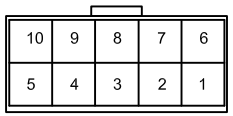
NOTE:
ALL WIRES TO BE 18 AWG WHITE

B.O.M.

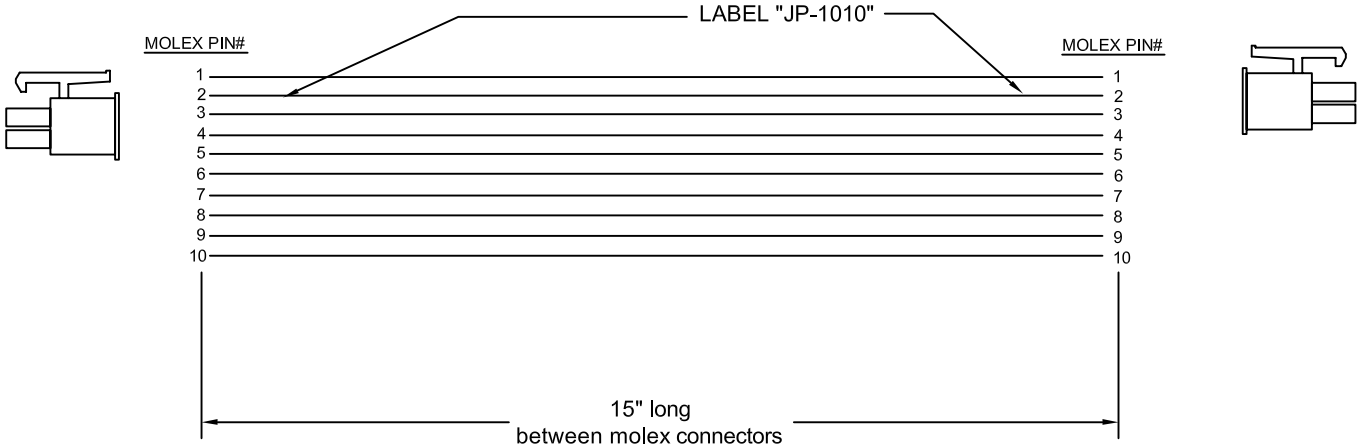
#	QTY	PART NUMBER	DESCRIPTION
2	2	39-01-2100 OR WM3704-ND	10 PIN MOLEX PLUG WITH LOCK
3	20	39-00-0039 OR WM2501-ND	MOLEX SOCKETS FOR PLUGS



BACK VIEW
(SIDE PINS ARE INSERTED FROM)



BACK VIEW
(SIDE PINS ARE INSERTED FROM)



CABLE # JP-1010

REV	DATE	DESCRIPTION
A	-	-
B	-	-
C	-	-
D	-	-
E	-	-

DESIGN:	DRAWING:	AS BUILT:
JTM	JTM	–

Cirus Controls
9210 Wyoming Ave. N, Suite 200
Brooklyn Park, MN 55445
Tel: (763) 493-9380
Fax: (763) 493-9340

JUMPER CABLE SERIES

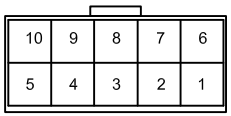
10 PIN PLUG TO 10 PIN PLUG

PROJECT NUMBER:	SCALE:	DATE: 12-9-08	REV.
JP-1010	NONE	SHT 1 OF 1	–

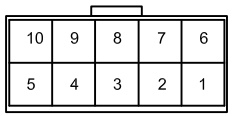
NOTE:
ALL WIRES TO BE 18 AWG WHITE

B.O.M.

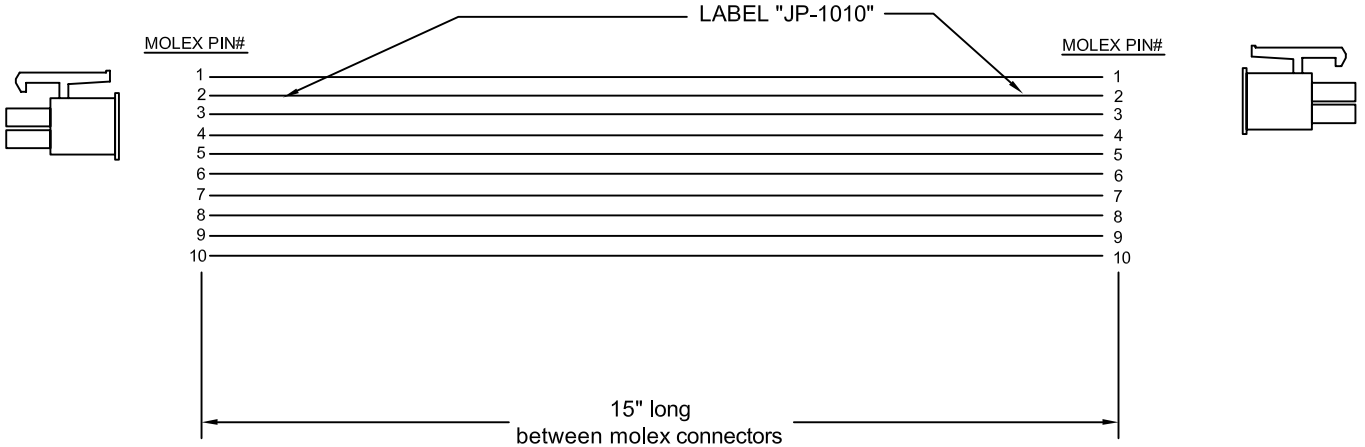
#	QTY	PART NUMBER	DESCRIPTION
2	2	39-01-2100 OR WM3704-ND	10 PIN MOLEX PLUG WITH LOCK
3	20	39-00-0039 OR WM2501-ND	MOLEX SOCKETS FOR PLUGS



BACK VIEW
(SIDE PINS ARE INSERTED FROM)



BACK VIEW
(SIDE PINS ARE INSERTED FROM)



CABLE # JP-1010

REV	DATE	DESCRIPTION
A	-	-
B	-	-
C	-	-
D	-	-
E	-	-

DESIGN:	DRAWING:	AS BUILT:
JTM	JTM	–

Cirus Controls
9210 Wyoming Ave. N, Suite 200
Brooklyn Park, MN 55445
Tel: (763) 493-9380
Fax: (763) 493-9340

JUMPER CABLE SERIES

10 PIN PLUG TO 10 PIN PLUG

PROJECT NUMBER:	SCALE:	DATE: 12-9-08	REV.
JP-1010	NONE	SHT 1 OF 1	–