



MorayTM

Adaptive Weight Control

Operation Manual

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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, nor authorizes anyone to assume for it, any other obligation or liability in connection with such products.

Revision Level of this Manual

Rev Letter	Effective Date	Contents
A	11/28/07	Initial Release
B	02/08/08	Expanded

Package Contents

A complete *Moray*TM control system contains the following items:

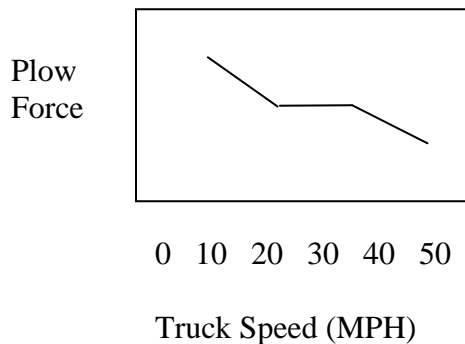
- 1) *MORAY*TM control unit;
- 2) *Mako Trim*TM program for the PC (copy on CD);
- 3) Power cable (MK-1003);
- 4) Speedo cable (TS-2004);
- 5) Hydraulic cable (TS-2505);
- 6) Sensor cable (TS-2101);
- 7) Hydraulic control manifold with pressure sensor;
- 8) This manual;

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

Functional Overview

*MORAY*TM is a plow controller that senses the speed a plow truck is traveling and automatically adjusts the “contact weight” (down force) that the moldboard of a snowplow exerts on a road surface. The system decreases the contact weight of the snowplow as the truck speeds up and increases the weight as the truck slows down.

Additionally, the controller is able to transfer weight from the truck to the plow to increase the plowing capability for packed snow/ice. (This feature requires a snowplow designed for down pressure and the proper size truck).



MORAY™ Control Panel Front View



Switches:

Power: Main system power switch.

Engage: Enables the **MORAY™** to take control of contact weight. With this switch off, the system will be idle and no weight control will take place.

Auto/Manual: Selects between Automatic and Manual modes,

- Automatic mode: uses adjust plow weight in response to speed changes,
- Manual mode: allows the driver to set a specific weight and hold that weight.

Set Point: Used in manual mode to set the contract weight of the implement.

MORAY™ Control Panel Back View



Connections:

PWR/ GND: Provides power and ground to unit. (MK-1003 cable)

SPEEDO: Input for speed signal. (TS-2004 cable)

HYDRAULIC OUT: Control signals out to valve. (TS-2505 cable)

SENSOR IN: Pressure sensor input. (TS-2101 cable)

PC PORT: Used for uploading firmware, and setup changes.

MORAY™ Control Valve

The moray control valve can be mounted either near the implement to be controlled or by the main system control valve. The valve requires lines run for P, T, LS, A, and B. The A and B lines need to tie into the existing lines running for the implement lift cylinder. When the system is engaged the valve will control the pressure in the cylinder by adjusting the pressure in the A or B lines depending on the run mode. If the valve is adjusting the pressure in the A line the system is increasing the down force of the plow beyond the weight of the plow (down force plow required). If the valve is adjusting the pressure in the B line the system is reducing the down force of the plow to be less than the actual weight of the plow.



Connections:

T = Return hose from valve back to tank.

P = Pressure line from power beyond, or directly from pump.

LS = Load sense line used to tell pump to supply more flow when work is required. This unit has an internal LS shuttle, so no need to install an external shuttle.

A = “T” this port into the pressure line going to the lower side of the implement cylinder.

B = “T” this port into the pressure line going to the lift side of the implement cylinder.

GA = Plug this port. Only used when checking pressures.

RP = Pressure transducer is installed in this port, and sends data back to controller through TS-2101 cable.

Pre-Delivery System Setup Checklist

	Description	Completed By/Date
Step 1	Install System and connect cables	
Step 2	Setup system using on board wizard	
Step 3	Run system in Test mode	

Pre-Delivery

Step 1

To install and run the **MORAY™** system, the following steps must be completed.

- 1) Mount the control unit in the truck cab so the driver can reach and see control;
- 2) Mount and plum hydraulic valve that will control implement lift and lower function. All ports on the valve are labeled.
- 3) Connect power cable and signal input and output cables;
- 4) Power up the unit;
- 5) Configure the system using the on board wizard.

Installing the control unit

The **MORAY™** control unit should be mounted in a place where the driver can both see and reach the control unit. If there is room in the Cirus arm unit it can be mounted there.

Connecting the cabling

1. Connect the TS-2505 to the control valve and the back of the **MORAY™** unit.
2. Connect the TS-2101 to the pressure transducer on the valve and the back of the **MORAY™** unit.
3. Connect the Speedo cable (TS-2004) to a good speed signal source.
4. Finally, connect the power cable (MK-1003) to the unit. Check to make sure that the power switch is off before connecting the power leads.

Configuring the MORAY

Mako Config™ is compatible with a Windows 98, 2000 or XP system.

During setup the engage key accepts selections, the auto / man key moves back one menu, and the set point key navigates.

Setup:

1. Start truck, and place the plow on scales capable of handling the weight of the plow. The **MORAY™** cannot be programmed without scales.

2. Turn on *MORAY™* unit with the engage switch off, auto / manual switch off, and the set point switch in the plus position. This will take the unit to the first setup screen where you can select current implement, set contrast, setup system, and access advanced settings.
3. Select System setup, which is option 3.
4. Select the units you would like to use standard or metric.
5. Select the implement you want to setup or adjust. There are 4 available.
6. Select option 1 to set the name of the implement.
7. Select option 2 to setup reducing weight points.
 - a. Select yes or no for reducing plow weight. Selecting no turns this mode off.
 - b. Asks for start speed for reducing weight
 - c. Asks for start weight
 - d. Has you match current weight on scale to your start weight. Adjust weight by increasing or decreasing set point.
 - e. Ask for stop speed
 - f. Ask for stop weight
 - g. Has you match current weight on scale to stop weight.
8. Select option 3 to setup increasing weight points.
 - a. Select yes or no for increasing plow weight (need a down force plow to do this). Selecting no turns this mode off.
 - b. Asks for start speed for increasing weight
 - c. Asks for start weight
 - d. Has you match current weight on scale to your start weight. Adjust weight by increasing or decreasing set point.
 - e. Ask for stop speed
 - f. Ask for stop weight
 - f. Has you match current weight on scale to stop weight.
9. Select option 4 to setup speedo. This is done by driving a constant speed and adjusting the controller to match that speed.
10. Exit and save configuration.

The *MORAY™* is now setup, and will control the plow weight based on truck speed, and settings entered.

Normal Operation:

1. Turn on unit.
2. To activate the system to reduce or increase the contact weight turn the engage switch to “ON”.
3. Select the mode you want to use.
 - a. Automatic adjusts contact weight as the speed of the truck changes.
 - b. Manual lets you set the weight by manually adjusting the speed set point.
4. To turn off the system in order to raise or lower the plow simply turn the engage switch “OFF”.

Trouble Shooting Guide

Complaint	Cause (s)	Correction (s)
Power Isn't On	a) Master Power Off; b) Bad Power or Ground connection;	a) Turn on power; b) Verify power/ground connections.
MORAY cuts out or acts strange;	Low power supply voltage from truck battery/alternator;	Minimum truck voltage must be > 12.0 volts;
System doesn't run as expected;	a) New configuration did not upload correctly;	a) Re-upload configuration file.
MORAY Config won't show green file link bar;	a) Wrong Com port assigned; b) Faulty Serial cable;	a) Re-assign to correct Com port; b) Replace cable;

Appendix A – Part Number List

Moray Control unit	Moray-01
Hydraulic control cable	TS-2505
Pressure sensor cable	TS-2101
Power cable	MK-1003
Speedo cable	TS-2004
Hydraulic valve	HYD10009

Appendix B – Standard System Drawings

MORAY

BACK VIEW

PC PORT


PRESSURE SENSOR

SPEEDO

HYDRAULIC OUT

PWR / GND

TS-2101 PRESSURE TRANSDUCER CABLE



TS-2004 SPEEDO INPUT CABLE



TS-2505 HYDRAULIC CONTROL CABLE



MK-1003 SYSTEM POWER AND GROUND



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

DESIGN: JTM
DRAWN: JTM
AS BUILT: -

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

MORAY CONTROL SYSTEM

CABLE OVERVIEW

PROJECT NUMBER: MORAY-0V	SCALE: NONE	DATE: 4-17-08	REV. -
			SHT 1 OF 1

PLUMBING INSTRUCTIONS:

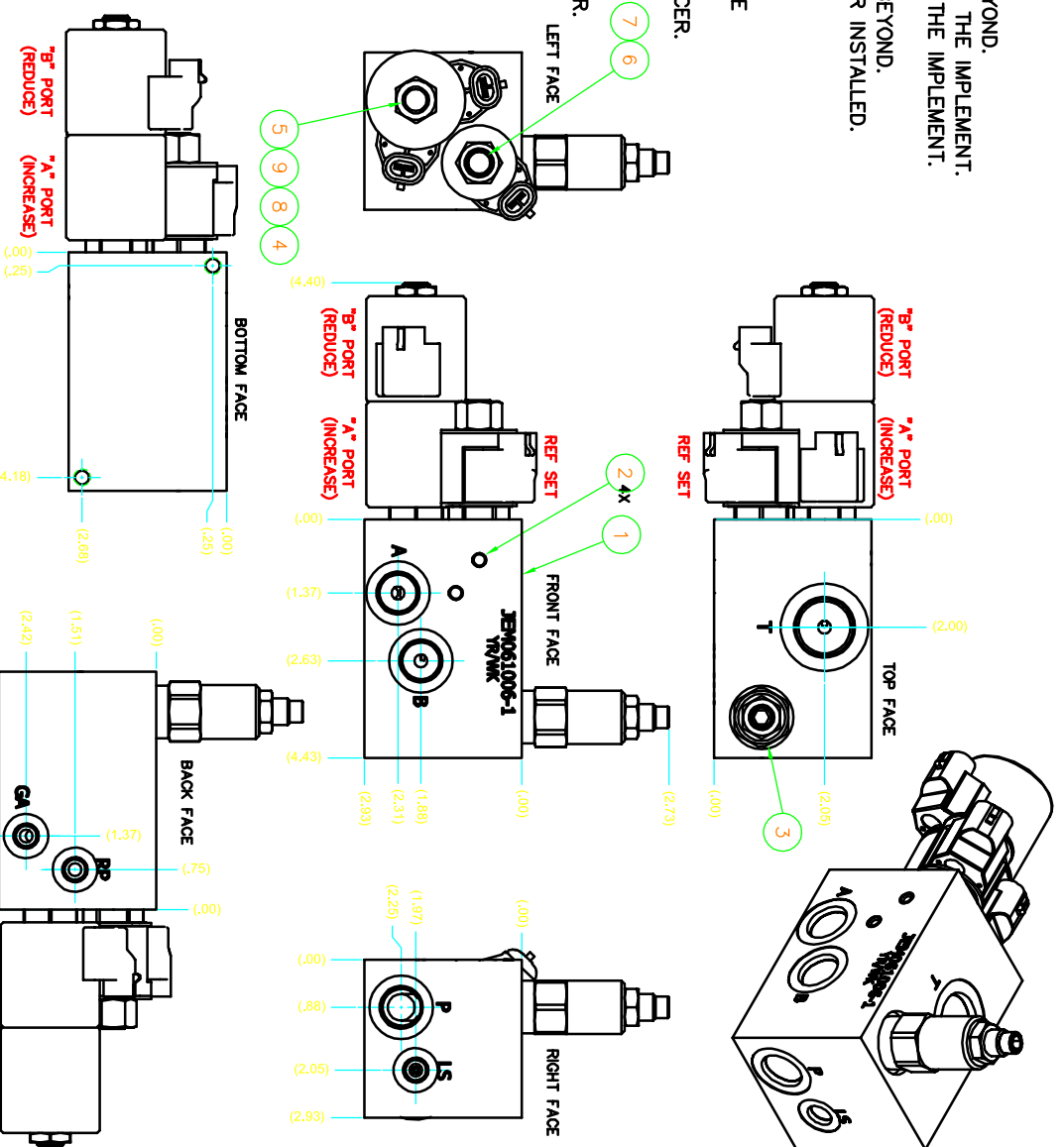
1. PLUMB "T" PORT INTO TANK PORT ON POWER BEYOND.
2. PLUMB "P" PORT INTO PRESSURE PORT ON POWER BEYOND.
3. TEE "A" PORT INTO THE PRESSURE LINE THAT LOWERS THE IMPLEMENT.
4. TEE "B" PORT INTO THE PRESSURE LINE THAT RAISES THE IMPLEMENT.
5. PLUG THE "GA" PORT.
6. PLUMB "LS" INTO THE LOAD SENSE PORT ON POWER BEYOND.
7. THE "RP" PORT WILL COME WITH PRESSURE TRANSDUCER INSTALLED. CHECK FOR TIGHTNESS.

WIRING INSTRUCTIONS FROM THE MORAY:

1. RUN THE TS-2505 CABLE TO THE COILS ON THE VALVE AS THEY ARE LABELED TO THE RIGHT.
1. RUN THE TS-2101 CABLE TO THE PRESSURE TRANSDUCER.

VALVE NOTES:

1. THIS VALVE ONLY WORKS WITH THE MORAY CONTROLLER.
2. PORT SIZES:
 GA, RP, LS..... SAE-4
 A, B, P..... SAE-8
 T..... SAE-12



8	ASSY/VALVE	1	1/2" CON. SPACER	-10	NA	NA	NA	NA
7	KEYWAY	2	1/2" WID. F-226	-10	NA	NA	NA	NA
6	1/8"-3168-Q-N-20	1	PROPORTIONAL VALVE		NA	NA	NA	NA
5	5/16"-316-Q-N-20	1	SOLENOID VALVE		20	FL/AS	3/16"-316-SH-1/4"NA	NA
4	1/4"-20X-0-N-2.5	1	STOP N. SHUTTLE NBS		NA	NA	NA	NA
3	1/10"-20X-0-N-2.5	1	FLOW REGULATOR		20	FL/AS	3/16"-316-SH-1/4"NA	NA
2	1/8"-20X-0-N-2.5	4	SPRINGER PLUG		NA	NA	NA	NA
1	1/8"-20X-0-N-2.5	4	SPRINGER PLUG		NA	NA	NA	NA
0	PART NUMBER	SAE	SAE TOL. DEVIATION		GRADE		SEAL KIT	

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 BROOKLYN PARK, MN 55445

MORAY ELECTRICALLY
 ADJUSTABLE FLOAT BLOCK

EDGE SAVER SERIES

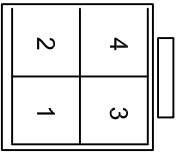
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PROJECT NUMBER:	HND10009	SCALE:	NONE	DATE:	3-4-08
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HYD10009 / JEM061006-1

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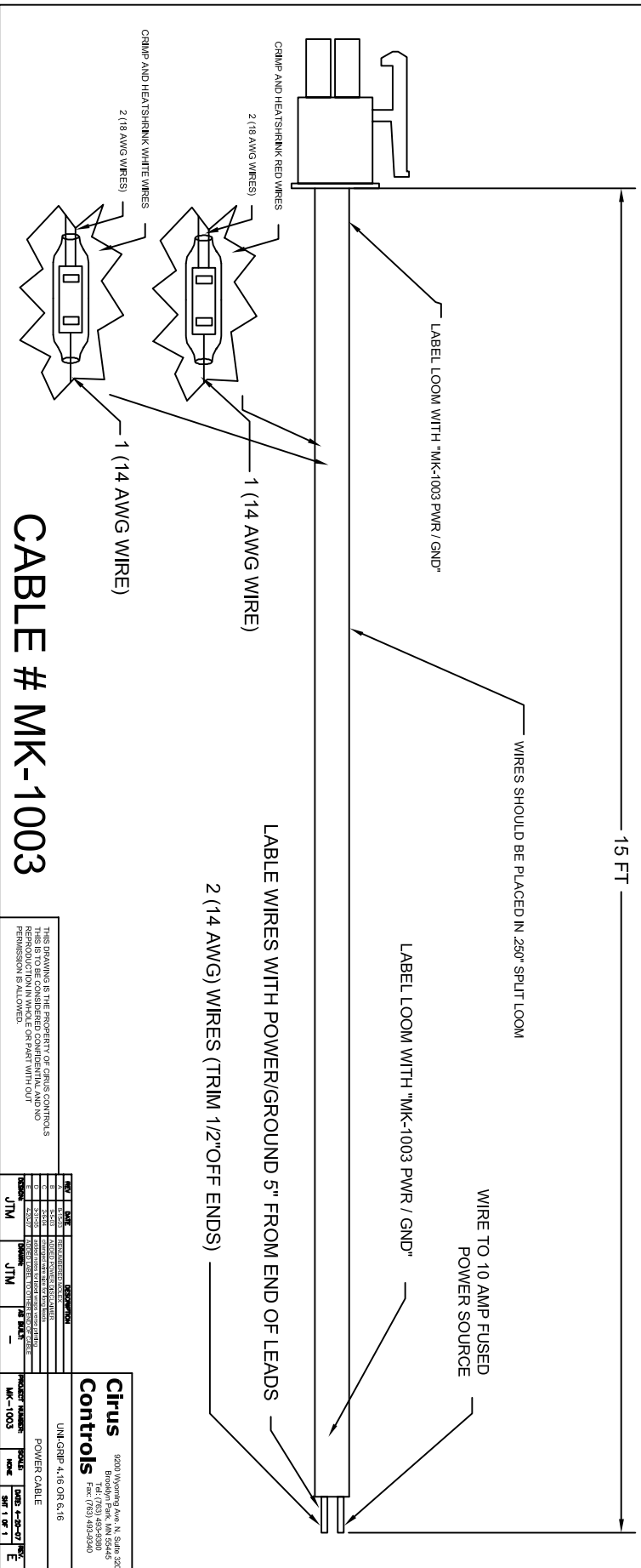


MOLEX PIN#	SIGNAL
1	GROUND : WHITE (18AWG)
2	+12 VDC : RED (18AWG)
3	GROUND : WHITE (18AWG)
4	+12 VDC : RED (18AWG)

QTY	PART NUMBER	DESCRIPTION
1	39-01-2040	MOLEX RECEPTACLE 4 PIN
	(Dig-Key WM3701-ND)	
4	39-00-0039	MOLEX TERMINALS FEMALE 18-24 AWG
	(Dig-Key WM2501-ND)	
14-1/2 FT	LCP-250	.250" SPLIT LOOM

BACK VIEW
(SIDE PINS ARE INSERTED FROM)

- NOTES:
1. LABEL WIRES WITH SIGNAL EVERY 12 INCHES
 2. TAPE SPLIT LOOM EVERY 12 INCHES

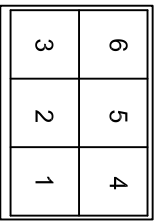


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99	03/15/08	REVISIONS	
100	04/15/08	REVISIONS	

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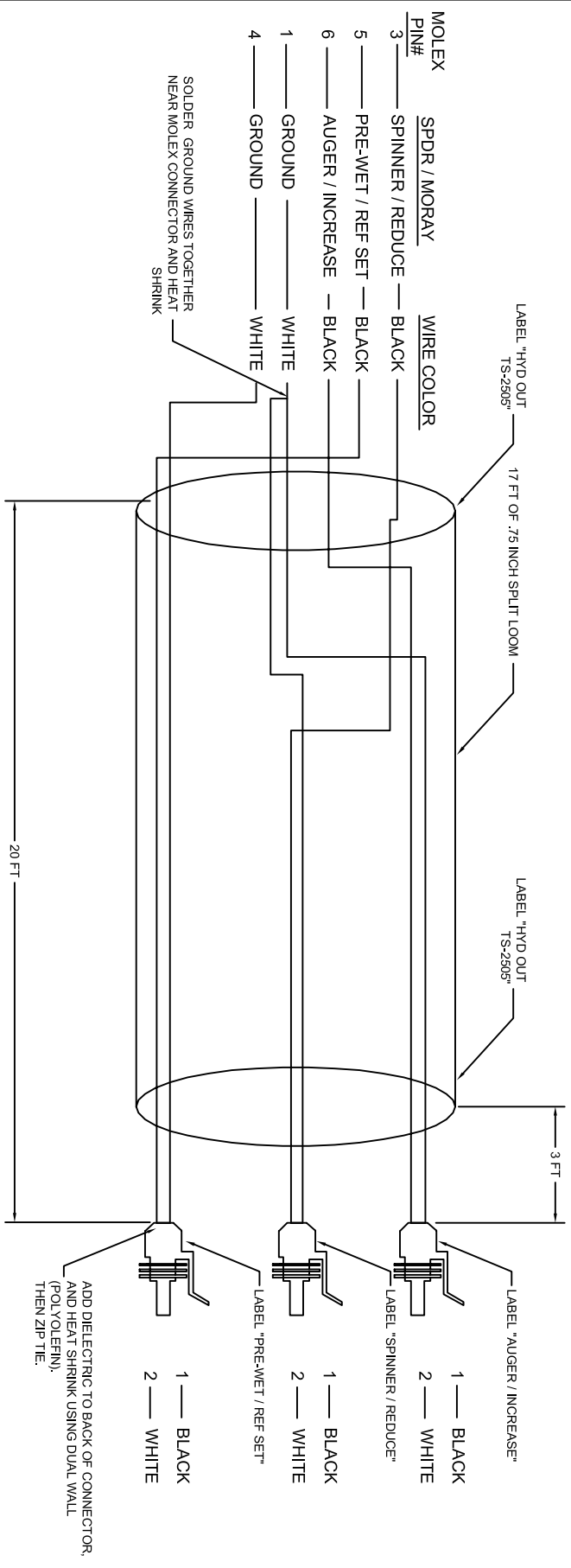
UNICRIP 4, 6 OR 8, 16
 POWER CABLE
 PROJECT NUMBER: MK-1003
 DATE: 12/15/04
 SHEET 1 OF 1

B.O.M.



BACK VIEW
(SIDE PINS ARE INSERTED FROM)

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	39-01-2060 (Digi-Key #WM3702-ND)	MOLEX 6 PIN
2	6	39-00-0039 (Digi-Key #WM2501-ND)	MOLEX TERMINALS 18-24 AWG FEMALE METRI-PACK 150 2 PIN
3	3	38201 (waytek)	FEMALE TERMINALS 16-18 AWG TPA LOCK
4	6	31077 (waytek)	CABLE SEALS
5	3	38202 (waytek)	2 WIRE 18AWG CABLE
6	6	39006 (waytek)	.75 INCH SPLIT LOOM
7	60 FT	SVO	
8	17 FT	??????	



- | | | |
|-------------------|---------------------|-------------------|
| MOLEX PIN# | SPDR / MORAY | WIRE COLOR |
| 3 | SPINNER / REDUCE | BLACK |
| 5 | PRE-WET / REF SET | BLACK |
| 6 | AUGER / INCREASE | BLACK |
| 1 | GROUND | WHITE |
| 4 | GROUND | WHITE |
- SOLDER GROUND WIRES TOGETHER NEAR MOLEX CONNECTOR AND HEAT SHRINK

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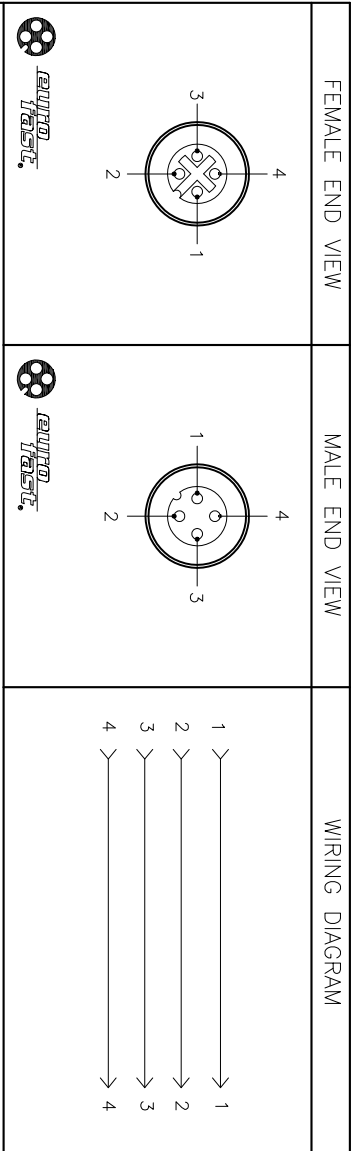
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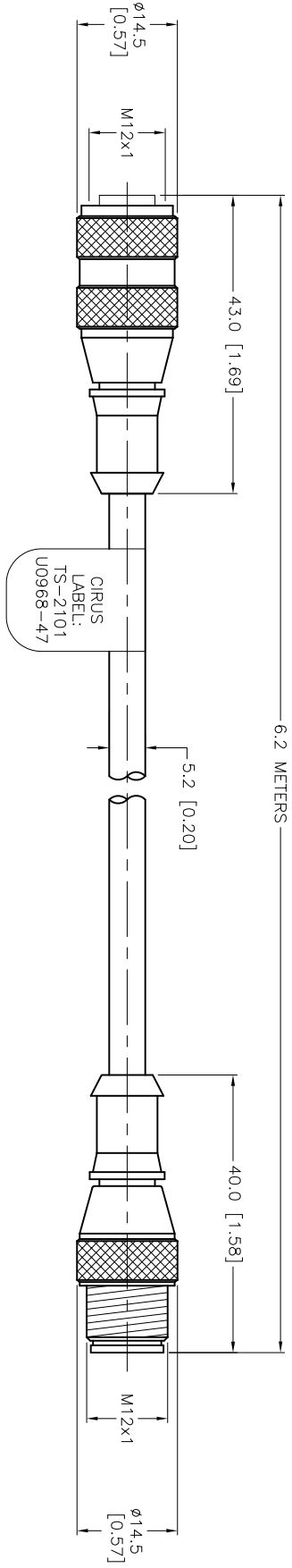
PROJECT NUMBER: TS-2505 SCALE: NONE DATE: 9-21-07 REV: SHT 1 OF 1

CIRUS CONTROLS LLC
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 Fax: (763) 483-9340
 9200 WYOMING AVE, N. SUITE 320
 BROOKLYN PARK, MN 55445

SPREADER CABLE SYSTEM
 HYD OUT TO 3 METRI-PACK 150



SPECIFICATIONS	
CONTACT CARRIER MATERIAL	POLYURETHANE
CONTACT MATERIAL/PLATING	GOLD-PLATED BRASS
COUPLING NUT	NICKEL-PLATED BRASS
RATED CURRENT [A]	4.0 A
RATED VOLTAGE [V]	250 VAC/300 VDC
OUTER JACKET MATERIAL/COLOR	PVC, GRAY
CONDUCTOR INSULATION MATERIAL	PVC
NUMBER OF CONDUCTORS [AWG]	4x22 AWG
DRAIN/SHIELD	22 AWG DRAIN/FOIL SHIELD
TEMPERATURE RATING	-40°C to +105°C (-40°F to +221°F)
PROTECTION CLASS	MEETS NEMA 1,3,4,6,13 AND IEC IP67



CABLE LENGTH	TOLERANCE
ALL LENGTHS	+ 4% (OR 50mm) OF LENGTH - 0% (OR 0mm) OF LENGTH WHICHEVER IS GREATER
STRIP LENGTH	TOLERANCE
0-7mm	±0.5mm
8-29mm	±1.0mm
30-49mm	±2.0mm
50-69mm	±3.0mm
70-100mm	±4.0mm
OVER 100mm	±5.0mm

REV	DESCRIPTION	PU	BY	DATE	ECONO.
A	DRAWING RELEASE			07/14/04	

RELATED DOCUMENTS	3RD ANGLE PROJECTION	THIS DOCUMENT IS PROPERTY OF TURCK INC. USE OF THIS DOCUMENT WITHOUT WRITTEN PERMISSION IS PROHIBITED.	DATE	SCALE	DESCRIPTION	
1. SEE SPECIFICATIONS		<p>TURCK inc High Technology Sensors and Automation Controls</p> <p>3000 CAMPUS DRIVE MINNEAPOLIS, MN 55441 1-800-544-7769 (763) 553-7300 (763) 553-0708 fax turck.com</p>	04/29/04	1=1.0	TS-2101	
2. SEE SPECIFICATIONS						
3. FINISH						
4. SEE SPECIFICATIONS						

UNIT OF MEASUREMENT	IDENTIFICATION NO.	REV
MILLIMETER [INCH]	U0968-47	A

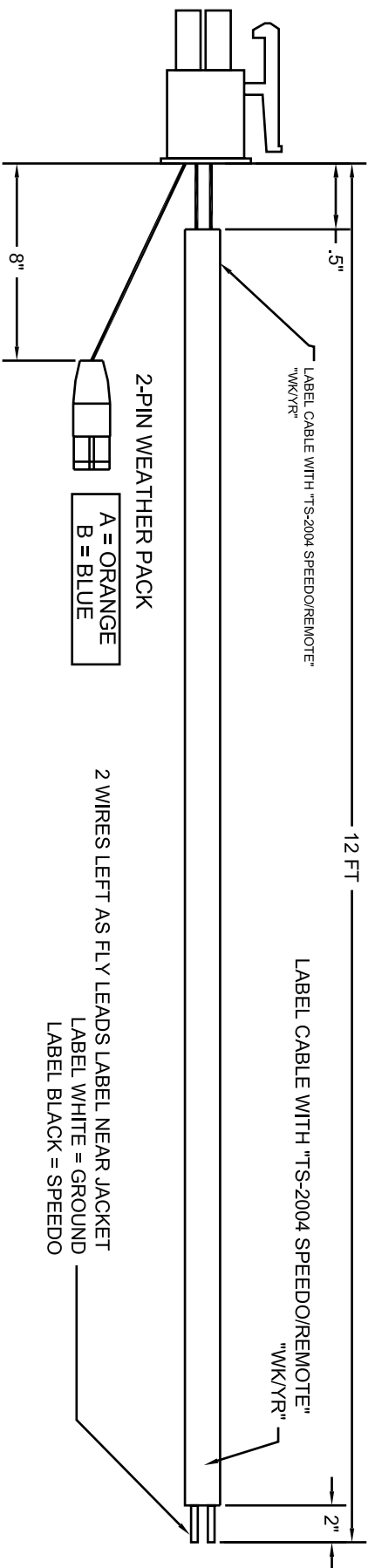
DO NOT SCALE THIS DRAWING	FILE: CIRUS\U0968-47	SHEET 1 OF 1
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SOURCE DRAWING - FOR REFERENCE ONLY

NOTES:

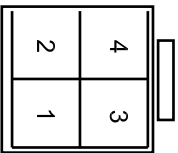
1. CABLE TO BE BAGGED AND THE BAG LABELED WITH "TS-2004"

- | | | |
|-------|------------------|-----------------------------|
| 12 FT | AUTOMOTIVE GRADE | 2 CONDUCTOR 18 AWG CABLE |
| 1 | 12010973 | 2-PIN WEATHER PACK (SHROUD) |
| 2 | 12089040 | PINS FOR WEATHER PACK |
| 2 | 12015323 | SEAL FOR WEATHER PACK |



2 WIRES LEFT AS FLY LEADS LABEL NEAR JACKET
 LABEL WHITE = GROUND
 LABEL BLACK = SPEEDO

- | | |
|---|--|
| 1 | GROUND : WHITE (18AWG) |
| 2 | REMOTE PASS : BLUE |
| 3 | SPEEDO : GREEN OR BLACK |
| 4 | PEMOTE BLAST (MORAY = REMOTE TRIGGER) : ORANGE |



(SIDE PINS ARE INSERTED FROM)