



Dual Spread M (Mini)™

Operation Manual

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Configuration Log Page

Dual Spread Mini TM System

Today's Date: _____ Information logged by: _____

Truck ID: _____

Dual Spread Mini TM Serial # _____

Hydraulic Valve Type _____

Coil Frequency (Hz) _____

Granular System Capacities

Auger/conveyor Material Capacities

Material	Gate Height	Pulses/Lb. (kg) -or- Max Lb(kg)/Minute

Pre-Wet System Capacities

Pre-Wet Tank Volume (gallons or liters) _____

Pre-Wet Pump Max Volume Rating (gpm or lpm) _____

Flow Meter Rating (pulses/gal or liter) _____

Note: Raven flow meter calibration value is per 10 gallons and needs to be divided by 10 to record in the *Dual Spread*. (i.e. 3460/10 = 346)

Speedometer Calibration

Speedometer pulses/mile (km) _____

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

<u>Rev Letter</u>	<u>Effective Date</u>	<u>Contents</u>
K	1/26/10	Frequency Update
L	11/30/10	Spinner Trim
M	3/8/11	General update

Cirus Controls reserves the right to make revisions and alterations to this manual from time to time without notice.

Package Contents

A complete *Dual Spread Mini*TM spreader control system contains the following items:

- 1) *Dual Spread Mini*TM control unit (may be stand alone or arm mount);
- 2) This manual;
- 3) *Power and Speedometer cable(s)
- 4) *Main trunk sensor cable(s) – Closed loop systems only
- 5) *Hydraulic control cable (s)

*These cables may be replaced by a translation cable in a retrofit system.

Functional Overview

The *Dual Spread Mini*TM spreader control system is a two material (four channel), ground speed oriented, open or closed loop system. It is designed to accurately control application rates based on ground speed and sensor feedback. The system is also capable of controlling a closed loop spinner.

The system is designed to be a “set it and forget it” type system where the operator sets the application rates and the system does the rest, starting and stopping dry and pre-wet application as the vehicle starts and stops, and varying the auger/conveyor speed and pre-wet pump rates as the vehicle speeds up and slows down to deliver consistent material per mile traveled regardless of truck speed. Optionally, the operator can enter manual mode where he/she controls the rates manually. In this mode material application starts and stops with the vehicle, but the auger/conveyor, spinner, & pre-wet delivery rate in % is constant regardless of vehicle speed, unless changed by the operator.

Open or Closed Loop Spreading

*Dual Spread Mini*TM is designed to spread granular and /or liquid material with feedback sensors: “Closed Loop operation” or without feedback sensors: “Open Loop operation.” Use of feedback sensors allows measured output compared to signal output to make real-time adjustments. Closed loop operation is more consistent throughout the range of conditions.

Selecting Closed Loop Operation: During setup for each device (auger/conveyor, spinner, pre-wet), the choice of **Sensor Present= yes** results in closed loop operation for the system selected. A choice must be made for each device (auger, spinner, prewet).

Selecting Open Loop Operation: During setup for each device (auger/conveyor, spinner, pre-wet), the choice of **Sensor Present= no** results in open loop operation for the system selected. A choice must be made for each device (auger, spinner, prewet).

NOTE: Cirus Controls does not recommend that open loop operation be used as the normal operating mode for pre-wet systems since that choice over-rides the pump protection that would prevent a pump from running dry which could result in pump damage.

Distance or Area Spreading of Granular Materials

When setting up the auger/conveyor section of your system, select the method that causes the controller to manage the amount of material spread by:

Selecting Distance Spreading: Distance spreading is selected by setting the auger/conveyor setting to **Pounds Per: MILE (kg per: km)**. In this mode the material output from the auger/conveyor is the same regardless of spinner (lane width) setting. Material dispensed will correlate to ground speed and distance traveled, but will not be increased as the spinner setting is increased to cover more lanes.

Selecting Area Spreading: Area spreading is selected by setting the auger/conveyor setting to **Pounds Per: LN-MI (kg per: LN-km)**. In this mode the material output from the auger/conveyor is increased proportionally as the spinner (lane width) setting is increased. For example, if the output rate is set to 500 pounds/lane mile, the spreader will dispense 500 pounds per vehicle mile traveled if the spinner is set to 1.0 lanes, and the spreader will dispense 1000 pounds per vehicle mile traveled if the spinner is set to 2.0 lanes.

“Fixed Rate Spreading” and/or “Operator Control” Spreading

For users want to follow defined spreading methods, *Dual Spread Mini™* allows definable spreading prescriptions to allow users to precisely manage their spreading parameters. Detailed instructions are included in “managing materials.” Options for using material settings to manage spreading include:

- a) Invoice by assigning different spreading prescriptions for different jurisdictions. Define your spreading prescriptions/categories so you’ll always know how much material was dropped on federal roads, state roads, county roads, municipal roads and private roads. You will be able to track total material spread as well as each individual category of materials spread.
- b) Unique calibration settings named for wet or dry material: Since wet material weighs more than dry material, spread amounts per revolution of the auger/conveyor will vary if material is wet or dry. This problem is correctable if the calibration values take actual material weight into account. Naming each granular material calibration to correlate to the conditions under which granular material is stored improves the accuracy of data collected during spreading.

High Current Electric Pre-Wet Systems

The pre-wet channel on *SpreadSmart Rx™* is rated for a maximum current capacity of 6 amps. If you are using an electric pre-wet pump that is rated for higher source current levels, contact Cirus Controls for the Electric Pre-Wet Driver accessory module.

Multi-Level Security for Console Access

The system password can be re-defined using the password utility and single use access to protected files is offered in Dual Spread M 2006. Using the Cirus Controls’ password software utility, the administrator can achieve a higher level of security for settings control on each system.

Auger Reverse Functionality

For the system that has the hydraulic valves and plumbing, *Dual Spread Mini™* allows the operator running in Automatic Mode to briefly reverse the direction of the auger to clear a jam. To reverse the direction, hold the **AUGER** paddle down until the display shows **REV**. Auger will run in reverse as long as the paddle is held in that position. To stop motion, release paddle and display will return to “0”. Auger reverse works in a stopped or moving truck, but only in automatic mode.



Basic Operation Controls

POWER switch: in the upper left corner controls the power to the unit and all electrical connections.

MENU switch: toggles between “run mode” and “menu mode” for setup, material selection, etc.

AUGER/CNVYR +/- paddle: controls the granular material output rates in various run modes.

SPINNER +/- paddle: controls spinner rate and lane width and is also used to navigate menu functions.

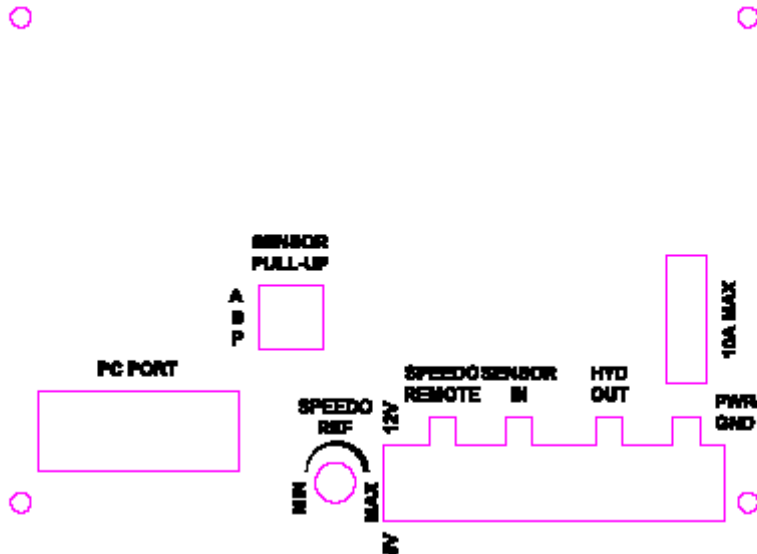
PREWET ON/OFF switch: turns the pre-wet function on and off.

PREWET +/- paddle: controls the liquid application rate in various run modes.

BLAST/PASS paddle: controls the “blast” and “pass” functions and is also used to navigate menus.

AUTO switch: changes between manual and automatic run modes.

Dual Spread Mini™ Back Panel



Operating Functions Matrix

Operating Mode	Desired Function Control
Automatic Mode	Normal operation, with data collection and ground speed orientation. For safety, pass is enabled when auto mode is engaged. Select PASS to begin spreading.
Manual Mode	Manual operation, rates in % of output with ground speed trigger. No data collected.
No Speedo Mode	Same as Automatic Mode, except ground speed is simulated. Data is collected.
Unload Mode	Unload granular material while truck is stationary.
Test Mode	Manual override with feedback from sensors. Used for troubleshooting.
Fill Tank	Operator input to update tank level indicator when liquid tank is replenished.
Materials Screen	Change to a different named material.
Contrast Screen	Change contrast settings on LCD.
Setup	Truck Setup, Hydraulic Trim, Material Definitions & Calibrations.
Storm/Season Totals	Operator accessible and storm and season totals.
Password Control	Key functions are password protected and using the Password utility can be set by the administrator or can be controlled using a two-level security function.

Initial Startup with Pre/Post Delivery Checklist

To install and complete all delivery requirements for the *Dual Spread Mini™* system, the following steps must be completed and are described in detail in the following pages.

Pre-Delivery Steps:

Step	Task	Completed by:
1	Installation – Mount the control unit in the truck cab and connect hydraulic control cable, sensor cable, power and speedometer cable to the appropriate valve coils and feedback sensors.	
2	Pre-Trim Testing – Power up the unit, and check functionality of spreader outputs and sensor inputs.	
3	System Configuration / Setup - Perform system setup to teach the spreader what equipment and sensors will need to be operated and monitored.	
4	Hydraulic System Trimming - Perform system setup to teach the spreader what electrical current / PWM is required for full range operation of the hydraulic valves.	
5	Calibrate Pre-Wet – Input the flow meter calibration values.	
6	Spinner Set Up – Assign spinner settings.	
7	Calibrate Speedo - Verify speedometer signal input to the spreader and calibrate the spreader to match the truck speedometer.	
8	“Un-calibrated” automatic mode - Verify system will go into “un-calibrated” automatic mode and displays pounds/lane mile for granular and gal/ton for pre-wet. Note: If unable to get into “un-calibrated” automatic mode steps 3 –5 need to be verified and or repeated.	
9	Pre-Delivery Functional Test – In No-Speedo Mode, test and verify ground speed operation, off rate indications, and alarms.	

Post Delivery Steps:

A	Material Setup & Calibration - Program up to (6) granular & pre-wet material names to establish operational parameters for granular calibration and perform drop test calibration (closed or open loop) for each granular material customer defined.	
B	Spinner Calibration - Load truck with granular material and trim spinner (closed or open loop) for normal and blast operation.	
C	Post Delivery Functional Test - In No-Speedo Mode, verify system function is stable at the ground speed and delivery rates the customer expects.	

Pre Delivery Steps:

STEP 1 – Installation


Installation - Mount the control unit in the truck cab and connect hydraulic control cable, sensor cable, power and speedometer cable to the appropriate valve coils and feedback sensors.

Installation steps and considerations:

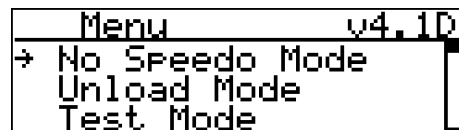
- The control unit should be mounted in a position where the display is easily seen and the controls of the unit can be easily reached. It should not, however, be mounted in a position such that it interferes with the drivers line of sight of the roadway or safe operation of the vehicle.
- Guard against radio frequency interference - Even properly guarded sources of radio frequency (RF) noise can “leak” and interfere with in-cab electronics. When installing radios and antennae cable to keep at least 12” spacing between them and any cabling for the *Dual Spread Mini™*.
- **To maximize cable life, follow cable installation guidelines in the appendix of this manual.**
- Connect the hydraulic cable to the **Hyd Out** connector at the back of the unit, route the cable to the hydraulic valve and plug in the auger/conveyor, the spinner, and the pre-wet valves.
- Connect the main sensor trunk cable to the **Sensor In** connector at the back of the unit, route the cable to the back of the truck. The sensor voltage is set to 12v at the factory. If 5v sensor operation is desired, move the sensor voltage jumper to 5v.. Sensor pull up jumpers are factory pre-set, but can be moved if a non-standard sensor is in use. Note that the location of the pull up jumpers is specific to the *Dual Spread™* model (“M” or “Mini”). See drawings on pages 6 & 7 of this manual.
- Connect the chosen sensor pigtail(s) to the M23 connector socket at the back of the truck, and plug the ends of the pigtails into the appropriate devices.
- Connect the speedometer cable to the back of the unit, then connect the speedometer sensor to the cable (note: speedometer sensor hookup is truck brand specific).
- Connect the power cable. Check to make sure that the power switch is off before connecting the power leads. **The power cable (12 V DC) is normally connected to a 12v “ignition hot” source** or can be connected either directly to the battery*, as the unit is fused, or to a power circuit capable of delivering a minimum of 10 amps. ***NOTE:** This provides no protection for the battery to unit wire.

STEP 2 – Pre-Trim Testing

Power up the unit, and check functionality of spreader outputs and sensor inputs.

WARNING		<p>Potential for injury due to unexpected startup or movement of mechanical equipment.</p> <p>Unexpected startup or movement of mechanical equipment may cause injury to eyes and extremities.</p> <p>During initial startup and testing, the spreader components may start without warning. Stay clear of the auger, spinner, and liquid nozzles until initial power up and programming are complete.</p>
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Turn the **MENU** switch on and then turn the **POWER** switch on. The unit should start up, light the display, display the *Dual Spread™* logo, and after a couple seconds, display the menu. Using the **SPINNER +/-** control, move the arrow to the **Test Mode** position and press **PASS**.



The unit will ask for a password, enter _____, using the **SPINNER +/-** control to change the digits, and **BLAST/PASS** to move back and forth. Move the cursor off the end of the password using the **PASS** switch to enter test mode.

Verify that the auger/conveyor, spinner and pre-wet pump are clear of obstructions and starting the system cannot injure any personnel. Add appropriate fluid to the pre-wet tank. Ramp the auger /conveyor speed up slowly using the **AUGER/CNVYR +/-** switch. Observe the hydraulic function of the auger/conveyor. (Most systems will not function below a low percentage level. This is normal.) Return the auger/conveyor to zero percent output, either by pressing **PASS** or holding the **AUGER/CNVYR +/-** switch down. Next, increase the spinner output, and observe spinner motion. (Like the auger/conveyor, the spinner will not spin below a certain percentage level. This is normal). Zero the spinner output, using pass or spinner. Finally, raise the pre-wet output level slowly, and observe the output of pre-wet fluid. Reset the pre-wet output level to zero and verify proper system response to these controller settings.

Note: The *Dual Spread Mini™* system must be “trimmed” before it can be run in automatic mode (**the auto switch will not function until the unit is trimmed**). The controller will operate in Manual Mode without trimming if necessary, however, in Manual Mode operation consistency will not be achieved and spreading data is not recorded. It is recommended that trimming be completed on all systems before use in any operating mode.

STEP 3 – System Configuration / Setup

Prior to initial operation, the system administrator must enter the system setup in the setup menu and set the operating parameters for your *Dual Spread Mini™*. The settings chosen in this step are not changed during routine operation, but do affect all aspects of system performance.

Follow these steps to enter the system setup:

- 1) Power up the unit, turn on the **MENU** switch and the **Menu** screen is displayed.

- 2) Using the **SPINNER +/-** toggle, scroll down to **Setup** and hit **PASS** to enter the setup menu. You will be asked for a password, enter _____ using the **SPINNER +/-** control to change the digits, and the **BLAST/PASS** controls to change cursor positions.

```

      Setup
-----
Enter Password:
  [0000]
  
```

Run the cursor past the end of the password to enter setup menu.

- 3) Leave the arrow on **System Setup** and select **PASS** to enter system setup.

```

      System Setup
-----
Units:      Standard
→PWM Freq:  180
Allow Dry Run: No
  
```

Parameters – modify or leave at factory defaults as desired.

- **Units (of measure):** Displays settings and rates in **Standard** (English) or **Metric** units. Use **SPINNER** to toggle between the choices. Changing this setting will switch the unit to the preferred measurement system. Standard mode uses miles, pounds, gallons, and tons, while metric mode uses kilometers, kilograms, liters, and tons.
- **PWM Frequency:** This value is set to match the frequency of the hydraulic valve coils in use. After initial installation, normal operation does not include changing this value. The factory default is 180Hz. Consult the specification for coils in use to determine the correct frequency.
- **Allow Dry Run:** The *Dual Spread Mini™* has “dry run protection” when used in conjunction with a flow meter on the pre-wet circuit. When the sensor detects no liquid flow with the pump running (such as when the tank is empty), the pump is shut off after a short period of time to prevent pump failure as a result of running dry. At the default setting of **No**, the output cannot be turned back on until the power of the controller is cycled. If the setting is “**Yes**”, simultaneously pressing and holding **PASS** while pressing the **PREWET +** key turns pump output back on.
- **Password Test:** This feature allows the supervisor to set a password for the Test Mode to prevent unauthorized entry to that mode. Default is **Yes**.
- **Password Manual:** This feature allows the supervisor to set a password for the Manual Mode to prevent unauthorized operators from entering that mode. Default is set to **No** since manual mode is a common operating mode.
- **Password NoSpeedo:** This feature allows the supervisor to set a password for the No Ground Speed Mode to prevent unauthorized operators from entering that mode. Default is set to **No** (used in the case of a field failure of a speedo sensor).
- **Manual GS Trigger:** Default is set to **YES** to allow system to run normally. Change to **NO** to turn off the ground speed trigger in manual (to dispense material while truck is still).
- **Tank Volume:** Use the **AUGER/CONVEYOR** switch to scroll up or down to set the total volume of the tank used for pre-wet application. The units of measure (gallons or liters) are automatically chosen based upon your choice in **Units** of measure.
- **Blast Seconds:** Settable to the number of seconds (1-60) that the timed blast functions. When timed blast is enabled and operated, a countdown timer is displayed to indicate time remaining in blast mode. Pressing **BLAST** again increases the blast time by this setting.
- **Blast Mode:** Blast mode can be set to **Toggle** on or off, operate as a **Momentary** function or run in a **Timed** blast mode. Use the **AUGER/CONVEYOR** switch to make the selection.
- **Blast when stopped:** chose yes to allow blast to function with truck standing still;

- **Blast resume after stop:** choose yes to allow blast to start while stopped and continue once the truck is in motion.
- **Offrate Flash Percentage:** This setting allows you to set the minimum amount of off rate error that will trigger a flashing warning. The default is 50%.
- **Offrate Minimum Speed:** This setting determines the minimum speed above which the off rate alarm may function. At low speeds (below 10 mph) this alarm is not useful as auger overspeed conditions are normal. Default is set at 10 mph/kph.
- **Display Deadband:** This setting determines the amount of variation in output that is displayed on the LCD. A lower value will cause the displayed value to rise and fall often because the full accuracy of the sensors is displayed. A larger value will make the display show less fluctuation. Material output is not affected by this setting. Default is set to 25% rate change.
- **Auto Min. Speed:** This setting causes the *Dual Spread Mini*TM to respond to truck motion as if it was instantaneously at the minimum speed shown here (mph). Default is 2mph. This setting is useful for applications with “start and stop” spreading (intersections etc) to spread more material since the truck speed is low in an intersection. Speedometer display is not affected.
- **Maximum Speed:** This is an alarm setting to warn the operator when he is driving too fast. Default setting is 0, which means the alarm is disabled. Details in “Alarms” section.
- **Truck Name:** The administrator may identify the truck in which this *Dual Spread Mini*TM is installed. This ID will be displayed on all truck specific data output by the *Dual Spread Mini*TM. Up to 17 alpha and/or numeric characters may be entered. Press **PASS** to enter or modify the name. Use the **SPINNER +/-** switch to scroll through letters and numbers, and use the **BLAST/PASS** switch to move the cursor left and right. Any number of characters may be used for the ID. When your ID characters are entered, use **PASS** to scroll to the end to complete the ID entry.
- **Log Interval:** adjustable setting that determines how often *Dual Spread*TM records data. Log interval is adjusted in the following increments using the “pass” switch: 5, 10, 30, 60, 120, 300 sec. The longer the interval, the less often data is recorded and the faster data can be transferred; the shorter the interval, the more often data is recorded and the slower data can be transferred.
- **Driver ID Required:** answer yes to require the driver to enter his ID # to enable the system.

STEP 4 – Auger / Conveyor Trimming

In order for *Dual Spread Mini*TM to accurately gauge the amount of material being dispensed, it must be trimmed and calibrated. The first step is to trim the unit, which tells the *Dual Spread Mini*TM how much current to apply to the hydraulic coils for the minimum amount of hydraulic flow resulting in movement of the attached device and how much current to apply for the maximum amount of flow. In the case of the spinner, the trim settings tell the *Dual Spread Mini*TM how much current to apply for a one lane wide pattern up to a three lane wide pattern. Normally you trim the auger/conveyor first and then trim the pre-wet pump. The spinner must be trimmed using granular material to get an accurate spread pattern and as such, is normally trimmed by a person who has granular material available to them.

Auger/Conveyor setup

To configure the auger/conveyor, power up the unit with the **MENU** switch on. Move to the arrow to the **Setup** choice using the **SPINNER** control, and select the setup choice using **PASS**. You will be asked for a password: enter _____ using the **SPINNER** controls to change the digits, and the **BLAST/PASS** controls to change cursor positions. Run the cursor past the end of the password to enter setup mode.


Setup	Trim/Calibration
System Setup → Trim/Cal Materials	→ Auger Prewet Spinner Speedo

Using the **SPINNER** switch, select **Trim/Cal**, then select **Auger** (or **Cnvyr**).

Parameters – modify or leave at factory defaults as desired.

- **Device Present:** The default is **Yes**.
- **Has Sensor:** Answer **Yes** for closed loop system and **No** for open loop (no sensor).
 - a) **For open loop systems, trimming should be done using a tachometer to determine auger max speed for best accuracy.**
- **Pounds Per:** The default is **MILE**, which can be changed to **LN-MI** for area spreading.
- **Minimum Trim:** Do not adjust yet.
- **Maximum Trim:** Do not adjust yet.
- **Show Cnvyr:** The default is **No**, changing to **Yes** changes display text to **Cnvyr** for trucks with a conveyor in place of an auger.
- **Reversible:** The default is **No**. Can be changed to **Yes** if the truck is plumbed with an extra hydraulic section to allow the auger to be run in reverse to clear a jam.

Auger/conveyor trimming

WARNING		<p>Potential for injury due to unexpected operation of auger.</p> <p>Entanglement in the auger will cause severe injury to extremities, with possible loss of extremities.</p> <p>During initial startup and testing, the auger may start without warning. Stay clear of the auger during all startup, programming, and operation procedures.</p> <p>Do not attempt to clear a jammed auger with the hydraulic or control system active.</p>
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- 1) To begin the trimming process, use the **SPINNER** switch to select the **Minimum Trim** setting.
- 2) Press **PASS** to enter trim calibration. If you chose **Yes** to **Has Sensor** then choose either automatic or manual trimming. If you chose **No** only manual trimming is available.
- 3) The unit can automatically calibrate the trim settings using the sensor as feedback. (see “automatic trimming” to continue). Automatic trimming is recommended for most trucks. If you wish to manually trim the auger/conveyor (faster and more accurate for more experienced users), select manual trim (see manual calibration for rest of instructions).

Manual auger/conveyor trimming (closed or open loop systems)

If you selected **Manual Calibration** (or the system does not have a feedback sensor), you must manually raise the hydraulic level using the **AUGER/CONVEYOR** switch, and either observe the pulse count returning from the sensor, if equipped, or visually observe the auger/conveyor motion. The


SPINNER control is functional during auger/conveyor trimming, to prevent material piling up on the spinner.

After reading the instructions, and using **PASS** to proceed, follow these steps to manually trim the auger/conveyor:

- 1) Raise the hydraulic level (**AUGER/CONVEYOR** switch) until it is barely moving.
- 2) Press **PASS** to accept this speed as the minimum trim level.
- 3) Increase the hydraulic level until maximum auger/conveyor speed is achieved.
 - a) **For open loop systems, a tachometer is best to measure max rpm of the auger;**
 - b) Press **PASS** again to accept the maximum trim levels.
- 4) Once the maximum trim level is accepted, the user is asked to **Accept Trim Values**. Select **Y** using the **SPINNER** control, and then press **PASS**.
- 5) The auger/conveyor trim is now set, select **BLAST** to return to the previous menu.

Automatic auger/conveyor trimming (only available for closed loop systems with sensors)

If you selected automatic trim calibration, the unit automatically selects the trim levels using the sensor as feedback. The spinner control is functional calibration, to prevent material piling.

WARNING		<p>Potential for injury due to unexpected operation of auger.</p> <p>Entanglement in the auger will cause severe injury to extremities, with possible loss of extremities.</p> <p>During initial startup and testing, the auger may start without warning. Stay clear of the auger during all startup, programming, and operation procedures.</p> <p>Do not attempt to clear a jammed auger with the hydraulic or control system active.</p>
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After reading the instructions, and using **PASS** to proceed, follow these steps to automatically trim the auger/conveyor:

- 1) Press the **PASS** switch to begin trim calibration.
- 2) Once auto trimming is initiated, you have 10 seconds to raise the engine RPM.
- 3) Hold RPM constant while unit is calibrating. This may take as much as two minutes. (You may cancel the trim test at any time using the **BLAST** key.)
- 4) Once the maximum trim level is accepted, the user is asked to **Accept Trim Values**. Select **Y** using the **SPINNER** control, and then press **PASS**.
- 5) The auger/conveyor trim is now set, select **BLAST** to return to the previous menu.

STEP 5 – Trim and Calibrate Pre-Wet System

To configure the pre-wet system, power up the unit with the **MENU** switch on. Move to the arrow to the **Setup** choice using the **SPINNER** control, and select the setup choice using **PASS**. You will be asked for a password: enter _____ using the **SPINNER** controls to change the digits, and the **BLAST/PASS** controls to change cursor positions. Run the cursor past the end of the password to enter setup mode.

Using the **SPINNER** switch, select **Trim/Cal**, then select **Prewet**.


NOTE: For accurate dispensing, the flow meter pulses per gallon, if equipped, must be matched to the flow meter. If the vehicle does not have a pre-wet flow meter, open loop operation is used. In this case, the maximum pump flow for the pump installed (gallons or liters /minute) must be set, and the *Dual Spread Mini*TM unit will use this value to calculate the amount of pre-wet material dispensed. **In an open loop system, the recorded amount of material dispensed by the system is based on a calculated output rate, and therefore is not a certifiable value.**

Parameters – modify or leave at factory defaults as desired.

- **Device Present:** Answer **Yes** if you are using a pre-wet system.
- **Has Sensor:** Answer **Yes** if the system has a flowmeter, and **No** for open loop (no sensor) operation.
- **Pump GAL/min:** This is the maximum pump flow in gallons (or liters) per minute, and is used when the system has no flowmeter.
- **Minimum Trim:** Do not adjust yet.
- **Maximum Trim:** Do not adjust yet.
- **Pulses per Gallon:** enter the pulses per gallon rating of your flow meter. Refer to flow meter manufacturer to determine the signal pulses sent by the flow meter for each gallon (or liter if set in metric mode).
 - 1) Micro Trak FM500 – flow meter used by Cirus Controls
 - a) **Gallons: Pulses per gallon = Flow cal number / 2**
 - b) **Liters: Pulses per gallon = Flow cal number / 7.58**
 - 2) Raven brand flow meters are listed in pulses per 10 gallons.
 - a) **divide the flow meter rating by 10 and input that value.**

Note: units of measure here must match units of measure in master set up. **If you are changing from English to Metric units, you must start at the first setup step and be consistent or calibration errors will occur;**

Pre-wet pump trimming


WARNING		<p>Potential for injury due to unexpected operation of liquid spray system.</p> <p>High-pressure liquid spray will cause severe eye injury, with possible permanent loss of vision.</p> <p>During initial startup and testing, the liquid system may start without warning.</p> <p>Wear face and eye protection when working with active high-pressure spray systems.</p>
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VERIFY THAT FLUID IS PRESENT IN PREWET TANKS BEFORE BEGINNING OPERATION.

- 1) To begin the trimming process, use the **SPINNER** switch to select the **Minimum Trim** setting.
- 2) Press **PASS** to enter trim calibration. If you chose **Yes** to **Has Sensor** then choose either automatic or manual trimming. If you chose **No** only manual trimming is available.
- 3) The unit can automatically calibrate the trim settings using the sensor as feedback. (see “automatic trimming” to continue). Automatic trimming is recommended for most trucks. If you wish to manually trim the prewet system (faster and more accurate for more experienced users), select manual trim (see manual calibration for rest of instructions).

Automatic pre-wet pump trimming

If you selected auto trimming, the unit automatically selects the trim levels using the flow meter (sensor) as feedback.

WARNING		<p>Potential for injury due to unexpected operation of liquid spray system.</p> <p>High-pressure liquid spray will cause severe eye injury, with possible permanent loss of vision.</p> <p>During initial startup and testing, the liquid system may start without warning.</p> <p>Wear face and eye protection when working with active high-pressure spray systems.</p>
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After reading the instructions, and using **PASS** to proceed, follow these steps to automatically trim the pre-wet system:

- 1) Press the **PASS** switch to begin trim calibration.
- 2) Once auto trimming is initiated, you have 10 seconds to raise the engine RPM.
- 3) Hold RPM constant while unit is calibrating. This may take as much as two minutes. (You may cancel the trim test at any time using the **BLAST** key.)
- 4) Once the maximum trim level is accepted, the user is asked to **Accept Trim Values**. Select **Y** using the **SPINNER** control, and then press **PASS**.
- 5) The pre-wet trim is now set, select **BLAST** to return to the previous menu.

Manual pre-wet pump trimming

If you selected **Manual Calibration** (or the system does not have a feedback sensor), you must manually raise the hydraulic level using the **AUGER/CONVEYOR** switch, and either observe the pulse count returning from the sensor, if equipped, or visually observe the auger/conveyor motion. The **SPINNER** control is functional during auger/conveyor trimming, to prevent material piling up on the spinner.

After reading the instructions, and using **PASS** to proceed, follow these steps to manually trim the auger/conveyor:

- 1) Raise the hydraulic level (**PREWET +/-** switch) until it is barely pumping.
- 2) Press **PASS** to accept this speed as the minimum trim level.
- 3) Increase the hydraulic level until maximum pre-wet flow is achieved.
- 4) Press **PASS** again to accept the maximum trim levels.
- 5) Once the maximum trim level is accepted, the user is asked to **Accept Trim Values**. Select **Y** using the **SPINNER** control, and then press **PASS**.
- 6) The pre-wet trim is now set, select **BLAST** to return to the previous menu.

STEP 6 – Spinner and Zero Velocity Spread Set Up and Baseline Trimming

Standard Spinner Configuration

To configure the spinner, power up the unit with the **MENU** switch on. Move to the arrow to the **Setup** choice using the **SPINNER** control, and select the setup choice using **PASS**. You will be asked for a password: enter _____ using the **SPINNER** controls to change the digits, and the **BLAST/PASS** controls to change cursor positions. Run the cursor past the end of the password to enter setup mode.

Using the **SPINNER** switch, select **Trim/Cal**, then select **Spinner**.

Parameters – modify or leave at factory defaults as desired.

- **Device Present:** Answer **Yes** if the system has a spinner..
- **Has Sensor:** The default is **No** since most spinners do not employ a sensor. If closed loop spinner operation is desired, a special sensor pigtail is required.
- **Zero Velocity Spreader:** If the spinner is a Monroe Zero Velocity Spreader, select **Yes** and proceed to the Zero Velocity Spreader configuration section.
- **Show Spinner %:** The default is **No**. Changing to **Yes** will switch the spinner control over to % of trim in automatic mode instead of lanes.
- **1 Lane Speed:** Do not adjust yet.
- **3 Lane Speed:** Do not adjust yet.
- **1 Lane Blast:** Do not adjust yet.
- **3 Lane Blast:** Do not adjust yet.
- **SpinStop 0 MPH:** The default is **No**. This setting stops the spinner when the truck is stopped. Changing to **Yes** forces the spinner to keep moving while the truck is stopped. This aids in keeping the hydraulic fluid circulating and warm.

Pre-Delivery Spinner Trims:

NOTE: This step is done without material in the truck, for the purpose of estimating final spinner trim settings and to allow the truck to enter un-calibrated automatic mode.

Set the Trim for the Rotational Speed of the “One Lane Setting” (minimum)

- 1) Select **1 Lane Speed**, press **PASS** and follow the on screen instructions.
- 2) Increase the auger/conveyor setting until a “normal” speed is reached.
- 3) Increase the spinner setting until a “one-lane wide” spinner speed is reached (note: this rotational speed is your estimate based on observation of the spinner speed. Accurate calibration will be done later)
- 4) **Press PASS to accept the one lane speed setting.**

Set the Trim for the Rotational Speed of the “Three Lane” Setting (maximum):

- 1) Select **3 Lane Speed**, press **PASS** and follow the on screen instructions.
- 2) Increase the auger/conveyor setting until a “normal” speed is reached.
- 3) Increase the spinner setting until a “three-lane wide” spinner speed is reached (note: this rotational speed is your estimate based on observation of the spinner speed. Accurate calibration will be done later)
- 4) **Press PASS to accept the three lane speed setting.**

****NOTE: Verify that the minimum setting and the maximum settings that you saved are not the same value. If they are, the spinner will not operate.**

At this stage, the trims for 1 and 3 lane blast settings are the same as those chosen here. Final settings for blast will be completed during the final trimming with material loaded.

Zero Velocity Spreader (spinner) configuration

Enter the configuration menu and select **Trim/Cal**, then select **Spinner**, as before.

Parameters – modify or leave at factory defaults as desired.

- **Device Present:** Answer **Yes** if the system has a spinner.
- **Has Sensor:** Set to **Yes**. Zero Velocity Spreader spinners require a sensor for correct operation.
- **Zero Velocity Spreader:** Select **Yes** for an Zero Velocity Spreader spinner.
- **Minimum Trim:** Do not adjust yet.
- **Maximum Trim:** Do not adjust yet.
- **Pulses/Rev.:** Enter the rated pulses per revolution of the Zero Velocity Spreader sensor.
- **Overdrive:** Leave at default value.
- **Diameter (in):** This parameter sets the diameter of the paddle wheel. (cm for metric mode).
- **Hotkey Mode:** Select **Yes** if you want single key switching to manual Zero Velocity Spreader speed control.

Zero Velocity Spreader trimming

- 1) To begin the trimming process, use the **SPINNER** switch to select the **Minimum Trim** setting.
- 2) Press **PASS** to enter trim calibration.
- 3) The unit can automatically calibrate the trim settings using the sensor as feedback. (see “automatic trimming” to continue). Manual trimming is recommended for most trucks. If you wish to manually trim the Zero Velocity Spreader (faster and more accurate for more experienced users), select manual trim (see manual calibration for rest of instructions).

Manual Zero Velocity Spreader (spinner) trimming – recommended


If you selected **Manual Calibration**, you must manually raise the hydraulic level using the **SPINNER** switch, and either observe the pulse count returning from the sensor, or visually observe the auger/conveyor motion.

After reading the instructions, and using **PASS** to proceed, follow these steps to manually trim the Zero Velocity Spreader:

- Raise the hydraulic level (**SPINNER** switch) until it is barely moving.
- Press **PASS** to accept this speed as the minimum trim level.
- Increase the hydraulic level until maximum Zero Velocity Spreader speed is achieved.
- Press **PASS** again to accept the maximum trim levels.
- Once the maximum trim level is accepted, the user is asked to **Accept Trim Values**. Select **Y** using the **SPINNER** control, and then press **PASS**.
- The Zero Velocity Spreader trim is now set, select **BLAST** to return to the previous menu

Automatic Zero Velocity Spreader trimming

If you selected auto trimming, the unit automatically selects the trim levels using the sensor as feedback.

WARNING		<p>Potential for injury due to unexpected operation of spinner.</p> <p>Granular material thrown off the spinner will cause severe eye injury, with possible permanent loss of vision. Contact with a moving spinner will cause injury to extremities and other body parts.</p> <p>During initial startup and testing, the spinner may start without warning. Stay clear of the spinner during all startup, programming, and operation procedures.</p> <p>Do not attempt to clear a jammed spinner with the hydraulic or control system active.</p>
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After reading the instructions, and using **PASS** to proceed, follow these steps to automatically trim the pre-wet system:

- 1) Press the **PASS** switch to begin trim calibration.
- 2) Once auto trimming is initiated, you have 10 seconds to raise the engine RPM.
- 3) Hold RPM constant while unit is calibrating. This may take as much as two minutes. (You may cancel the trim test at any time using the **BLAST** key.)
- 4) Once the maximum trim level is accepted, the user is asked to **Accept Trim Values**. Select **Y** using the **SPINNER** control, and then press **PASS**.
- 5) The Zero Velocity Spreader trim is now set, select **BLAST** to return to the previous menu.

STEP 7 – Speedometer Calibration

The speedometer sensor emits a stream of pulses, which increase as the speed increases. The *Dual Spread Mini*TM uses this information to determine speed, using a pulses per mile setting. This setting can be entered using any of the following three methods: by driving the truck at 30 MPH and using **steady speed calibration**, by driving the truck over a fixed mile and using **fixed distance calibration**, or by **match speedo calibration**, which as the name implies involves matching the shown speed on the display to that on the trucks' speedometer. Fixed distance calibration is more accurate, however, steady speed calibration or matching speedometer calibration are quite a bit faster.

From the **Trim/Cal** menu, select **Speedo** and then choose your calibration method:

```

pulses/mi: 37000
→steady speed cal
fixed distance cal
match speedo cal

```

Steady speed calibration

- 1) Select **steady speed cal**.
- 2) Bring the truck to 30 miles per hour and remain at that speed.
- 3) Press **PASS** to start calibration.
- 4) Calibration will complete after several seconds.

The unit will take several samples of the speed sensor output, average, and determine the number of pulses per mile. The whole process takes about 10 seconds.

Fixed distance calibration

If using fixed distance calibration, the best method is to drive a mile using mile markers. Although driving a mile in stop and go traffic would work, more accurate results are achieved if driving a steady speed on a highway.

- 1) Select **fixed distance cal.**
- 2) Follow on-screen info, drive until the vehicle meets the first mile marker and press **PASS**.
- 3) Drive to the next mile marker, and press **PASS** again as the vehicle passes the marker.
- 4) The speedometer is now calibrated.

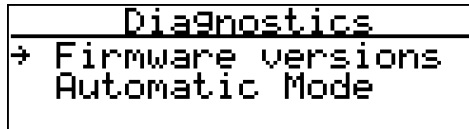
Match truck speedometer calibration

- 1) Select **match speedo cal.**
- 2) Bring the truck to a steady, maintainable speed (within 10-30 mph range).
- 3) Using the **SPINNER** switch, adjust the pulses per mile (or km) until the resulting mph/kph matches the value displayed on the truck speedometer.
- 4) Press **PASS** to accept setting and return to **Trim/Cal** menu.

STEP 8 – Un-calibrated Automatic Mode

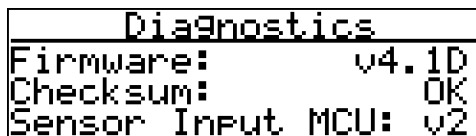
Verify system will go into un-calibrated Automatic Mode and displays pounds/lane mile for granular and gal/ton for pre-wet.

NOTE: If unable to get into Automatic Mode choose **Automatic Mode** from the **Diagnostics** section in the **Menu** screen.



Diagnostics

Firmware versions: Select this to identify the firmware installed in your system.



Automatic Mode: Select this to help trouble shoot functionality in Automatic Mode.

STEP 9 – Pre-Delivery Functional Test

In No Speedo Mode, test and verify ground speed operation, off rate indications, and alarms.

Post Delivery Steps:

STEP A – Material Setup & Calibration

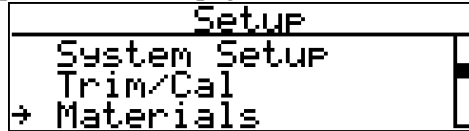
Material Setup

Configure up to six (6) granular and six (6) pre-wet material names to establish operational parameters operation. See Managing Materials section.

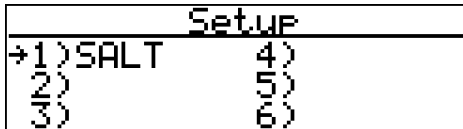
Granular Drop Test for Closed Loop Systems (with auger/conveyor sensor enabled)

With the auger/conveyor, spinner, and pre-wet system trimmed, the *Dual Spread Mini*TM unit can now be operated in Automatic Mode. Doing a drop test for a granular material will tell the *Dual Spread Mini*TM exactly how much material is being dispensed. The settings can be found in the **Materials** setup page.

- 1) Enter **Materials** setup on the **Setup** page.

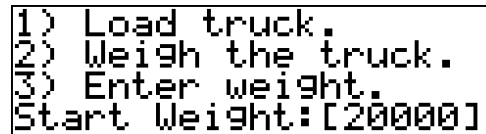


- 2) Press **PASS** to select **Granular** material.
- 3) Press **PASS** to select the default material type, which is **SALT**, scroll down to **Pulses/LB**.



- 4) Press **PASS** to put the unit into **Weight Calibration** mode.
- 5) Select from two drop test calibration methods available.
 - a. **Truck weight** method requires the use of a truck scale;
 - b. **Material dropped** method simply requires weighing the material dropped during the test, using a bucket and a scale, for example.
- 6) Read the instructions and page through them using the **PASS** switch.

Using a truck scale



- Weigh the truck and enter the weight.
- Dispense at least one yard of material using the auger/conveyor and spinner.
- Weigh the truck again and enter the weight.
- Accept the new calibration by changing the **N** to **Y** by using the **SPINNER** control.

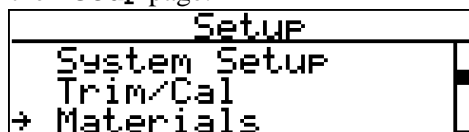
Using material dropped weight

- Following the on-screen instructions, set the auger at 50% and the spinner at 0% and dispense a manageable amount of material (typically 300-500 pounds).
- Weigh the material dispensed using the bucket and scale or any other appropriate method.
- Enter the weight dispensed into the unit.
- Accept the new calibration by selecting “pass”.

Granular Drop Test for Open Loop Systems (no auger sensor)

With the auger/conveyor, spinner, and pre-wet system trimmed, the *Dual Spread Mini*TM unit can now be operated in Automatic Mode. **Doing a drop test for a granular material will improve the accuracy of *Dual Spread Mini*TM, but cannot achieve the accuracy of a closed loop sensor system (above).**

- 1) Enter **Materials** setup on the **Setup** page.



- 2) Press **PASS** to select **Granular** material.
- 3) Press **PASS** to select the default material type, which is **SALT** and
- 4) **Scroll down to: Max LB/min**

Setup		Granular Material	
→1) SALT	4)	Pulses/LB:	20.0
2)	5)	→Max LB/min:	2000
3)	6)		

- 5) Press **PASS** to put the unit into **Weight Calibration** mode.
- 6) Select from two drop test calibration methods available.
 - a. **Truck weight** method requires the use of a truck scale;
 - b. **Material dropped** method simply requires weighing the material dropped during the test, using a bucket and a scale, for example.
- 7) Read the instructions and page through them using the **PASS** switch.

Using a truck scale

Weigh the truck and enter the weight.

Dispense at least one yard of material using the auger/conveyor and spinner.

Weigh the truck again and enter the weight.

Accept the new calibration by changing the **N** to **Y** by using the **SPINNER** control.

Using material dropped weight


Following the on-screen instructions, set the auger at 50% and the spinner at 0% and dispense a manageable amount of material (typically 300-500 pounds).

Weigh the material dispensed using the bucket and scale or any other appropriate method.

Enter the weight dispensed into the unit.

Accept the new calibration by selecting “pass” and then push blast to return to main menu.

STEP B – Spinner Calibration for Area and Linear Spreading

WARNING		<p>Potential for injury due to unexpected operation of spinner.</p> <p>Granular material thrown off the spinner will cause severe eye injury, with possible permanent loss of vision. Contact with a moving spinner will cause injury to extremities and other body parts.</p> <p>During initial startup and testing, the spinner may start without warning. Stay clear of the spinner during all startup, programming, and operation procedures.</p> <p>Do not attempt to clear a jammed spinner with the hydraulic or control system active.</p>
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The controller can be operated in linear spreading mode (pounds per mile) or area spreading mode (pounds per lane mile). To accurately spread material over an area, spinner speed must be calibrated to spread material in a pattern of a particular width. The four settings are a one and three lane wide pattern for normal dispensing rates as well as one and three lane wide settings for blast dispensing rates. To trim these, the unit must be filled with material to set widths.

Set the One Lane Spinner speed

To configure the spinner, power up the unit with the **MENU** switch on. Move to the arrow to the **Setup** choice using the **SPINNER** control, and select the setup choice using **PASS**. You will be asked for a password: enter _____ using the **SPINNER** controls to change the digits, and the **BLAST/PASS** controls to change cursor positions. Run the cursor past the end of the password to enter setup mode.

Using the **SPINNER** switch, select **Trim/Cal**, then select **Spinner**.

Trim/Calibration	
Auger	Prewet
→ Spinner	Speedo

- 1) Press **PASS** to select the **1 Lane Speed** trim setting and follow the instructions.

Spinner Setup	
Show Spinner %:	No
→ 1 Lane Speed:	10
3 Lane Speed:	20

- 2) Increase the auger/conveyor setting until a normal amount of material is being dispensed.
- 3) Increase the spinner until a one lane wide (12 feet wide) pattern is being thrown.
- 4) Press **PASS** to accept the one lane speed setting.

Set the Three Lane Spinner speed

- 1) Press **PASS** to select the **3 Lane Speed** trim setting and follow the instructions.
- 2) Increase the auger/conveyor setting until a normal amount of material is being dispensed.
- 3) Increase the spinner until a three lane wide (36 feet wide) pattern is being thrown.
- 4) Press **PASS** to accept the three lane speed setting.

Set the One Lane Blast Spinner speed

- 1) Press **PASS** to select the **1 Lane Blast** trim setting and follow the instructions.
- 2) Increase the auger/conveyor to dispense the amount of material that would be dispensed while in blast mode.
- 3) Increase the spinner until a one lane wide (12 feet wide) pattern is being thrown.
- 4) Press **PASS** to accept the one lane blast speed setting.

Set the Three Lane Blast Spinner speed

- 1) Press **PASS** to select the **3 Lane Blast** trim setting and follow the instructions.
- 2) Increase the auger/conveyor to dispense the amount of material that would be dispensed while in blast mode.
- 3) Increase the spinner until a three lane wide (36 feet wide) pattern is being thrown.
- 4) Press **PASS** to accept the three lane blast speed setting.

Once the one and three lane trim for both normal and blast amounts have been set, the spinner is calibrated.

NOTE: The blast settings for spinner speed compensate for the extra material dropped in blast mode dragging down the spinner motor.

STEP C – Post Delivery Functional Test

In No Speedo Mode, verify system functions and is stable at speed and delivery rates expected.

NOTE: It is recommended that you save all settings after completion of all system setup and calibration to a PC for safekeeping. In the event of loss of this setting information, it can be uploaded from the stored file in a matter of minutes. Storing this information is described in the “Other Downloads” section of the manual.

Managing Materials – Granular and Pre-Wet

Setting material parameters

To allow maximum flexibility of operation, *Dual Spread Mini™* allows you to define operating programs by using the name of a material to designate either a different material (salt/sand, brine/KCl, etc), or designate a different material distribution rate (salt 500, salt 1000, etc). The word material is used for consistency even though you are allowed to name either a unique material (salt or sand) or a unique set of distribution conditions for the same actual material (salt, salt 500, salt abc, etc).

NOTE: These settings apply to Automatic Mode only. In Manual Mode or any other mode, the operator has full control over the auger/conveyor speed and prewet pump flow.

To enter the **Material Setup** screen, power up the unit with the **MENU** switch on. Move to the arrow to the **Setup** choice using the **SPINNER** control, and select the setup choice using **PASS**. You will be asked for a password: enter _____ using the **SPINNER** controls to change the digits, and the **BLAST/PASS** controls to change cursor positions. Run the cursor past the end of the password to enter setup mode.

Using the **SPINNER** switch, select **Materials**, then press **PASS** to enter **Material Setup**.

Material Setup	
→ Granular	
Prewet	

Setup	
→ 1) SALT	4)
2)	5)
3)	6)

Choose the material type you wish to program (granular or pre-wet) by using the **SPINNER** switch, and press **PASS** to continue. Select which of the 6 materials you wish to configure (to add a new material, select the first empty slot), and press **PASS** to configure the material.

Granular Material	
→ Name: [SALT]	
Min. Rate:	0
Max. Rate:	900

- **Name:** Up to 6 granular and 6 pre-wet programs can be defined, uniquely identified with up to 8 characters. In normal operation, the operator selects his material from those defined on this list. For example: **SALT** is often used generically and doesn't have a pre-programmed distribution rate. The operator is then free to adjust his distribution rate using the **AUGER/CONVEYOR** switch. **SALT 500** is an example of a pre-programmed setting that would deliver a fixed 500 lbs / mile of salt. In that case, the operator cannot change the rate without changing material type he is distributing. These operating principals also apply for pre-wet operation.
- **Min. Rate** and **Max. Rate** settings: These are the lowest and highest settings the operator can select while in Automatic Mode, in pounds per mile. (**NOTE:** To pre-program a specific fixed rate, set the minimum rate and maximum rate at the same value, thereby locking the rate at that value for that material).
- **Blast Rate** (granular only): Set the number of pounds per mile that is dispensed when the truck is in blast mode.
- **Small Inc:** This adjusts the amount the dispensed rate changes when a switch is pressed.

- **Large Inc:** This setting adjusts the amount the dispensed rate changes when a switch is pressed and held in the up or down position.
- **Pulses/LB** (granular only): This setting calibrates the material type to the feedback sensor. It allows accurate dispensing of a material by monitoring the sensor. When materials are added, this setting is copied from the first material. While this setting is close, with varying densities in material such as salt and sand, a new drop test should be performed when the material type is different. To start a drop test, select this setting and press **PASS**.
- **Max LB/Min** (granular only): This setting is used when no feedback sensor is employed. The maximum material flow rate per minute is used to calculate auger/conveyor speed for any desired output rate.

Changing material programs during normal operation

Once material setup is complete, an operator can select any programmed choice by selecting **Material** from the main **Menu** screen (use the **MENU** switch to access the **Menu** screen). From there, the operator can choose any of the named material types designated.

Recording spreading data for each named material

Data recording for each named material occurs whenever that material name has been selected and material is spread in Automatic Mode. No action is necessary to begin the recording of spreading data for each named material.

<u>Operating Mode</u>	<u>Spreading Data Recorded</u>
Automatic Mode	yes
No Speedo Mode	yes
Manual Mode	no
Test Mode	no

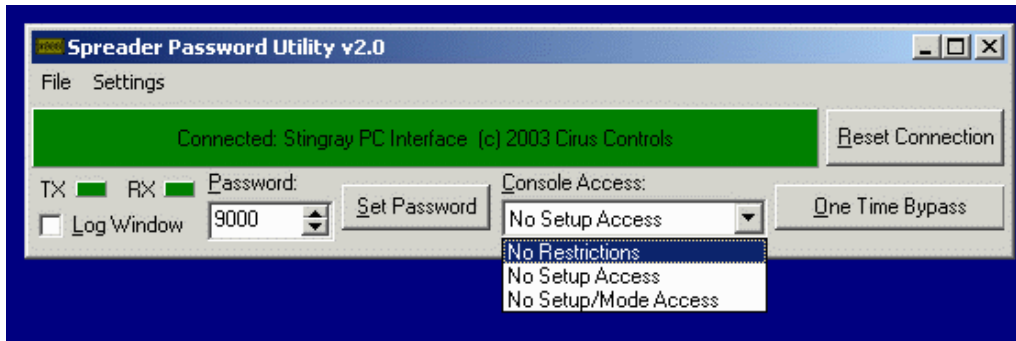
Managing Information on *Dual Spread Mini*TM

Multi-Level Security for Console Access Control

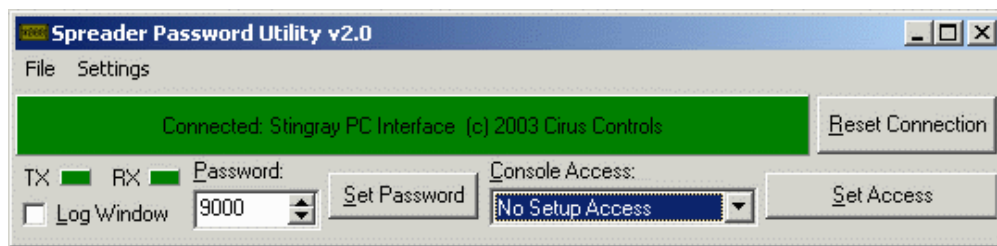
*Dual Spread Mini*TM offers multiple layers of access control: a) “factory standard” password protected access to operating functions and setup files; b) supervisor re-set capability for each password and c) laptop computer access control for higher security.

To re-set passwords or to implement laptop access,

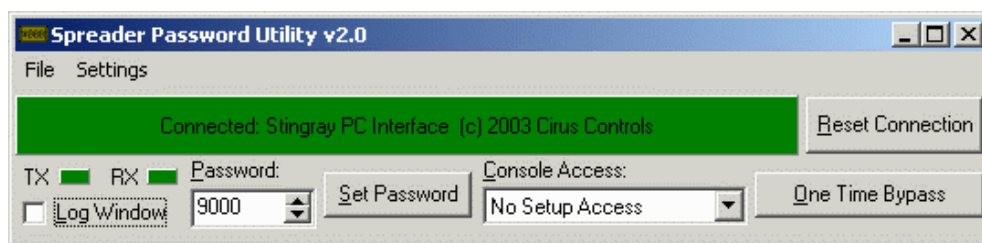
- 1) Power the *Dual Spread Mini*TM off.
- 2) Connect the PC to *Dual Spread Mini*TM using the serial cable or USB adapter.
- 3) Open the Password.exe Utility on the PC.
- 4) The utility will report **waiting for connection** in the red bar. If the serial port fails to open, the utility will report the error in the red bar. To correct error, check the COM port number setting in the utility and make sure that no device on your PC is using that same COM port (such as a Palm Pilot etc). Turn off any device using the COM port. Restart the password utility and verify that PC is **waiting for connection**.
- 5) Power the *Dual Spread Mini*TM on and verify that the red bar turns to green.



- 6) Select from the drop down menu which type of “console access” you desire:
 - a. **No Restrictions:** standard passwords apply and anyone who has those passwords can make changes to set up files and operate password restricted modes;
 - b. **No Setup Access:** select this choice to make the standard passwords non-functional for “setup files.” Access to setup files is not possible from the console while this choice is enabled.
 - c. **No Setup / Mode Access:** select this choice to make the standard passwords non-functional for setup modes and for password protected operating modes; Access to setup files and to password protected operating modes is not possible from the console while this choice is enabled.



- 7) Click on the “set access” tab (right) when you have chosen your level of security. Upload to the controller is immediate; Power cycle the *Dual Spread Mini™* and the change happens.
- 8) Follow the same procedure if you wish to change the numerical password and using the “set password” tab.
- 9) Once the file is uploaded for either restricted setting, the “set access” tab is re-named to “one time bypass;” To allow a mechanic one time access to setup files, click the “one time bypass” tab and verify that the file uploaded to the *Dual Spread Mini™*. Click on “reset connection” to release the *Dual Spread Mini™* to use the numerical password to access the set up files.



- 10) Complete your changes to the setup file, save file changes and power off the *Dual Spread Mini™*. See details on setup files elsewhere in this manual.

- 11) Turn on the *Dual Spread Mini™* and the setup file changes will be effective, and the selected access control feature is enabled automatically. System operation is then allowed as specified.

Data stored by the Dual Spread Mini™

Three groups of information are stored or recorded by *Dual Spread Mini™*

- **Trims and Calibration of Spreader Hardware:** These settings are chosen after installation in a truck and are the coordinated result of the interaction between the *Dual Spread Mini™* and the hydraulics system with which it is paired. This data is stored by the *Dual Spread Mini™* CPU and is downloadable and uploadable using the *Dual Spread Mini™* serial port connected to a laptop PC.
- **Operating Parameters (Material Programs):** These settings are selected by the installer, the site supervisor or (in some cases) by the operator and determine the manner in which the *Dual Spread Mini™* operates. This data is stored by the *Dual Spread Mini™* CPU and is downloadable and uploadable using the *Dual Spread Mini™* serial port connected to a laptop PC.
- **Storm and Season Totals:** This function records the amount of material distributed for each named material. This data is recorded on the CPU and is downloadable.

NOTE: The **Trims and Calibration** settings and the **Operating Parameters** are stored, uploaded, and downloaded as a single file.

The table below indicates types of data stored and used by *Dual Spread Mini™* and the method by which it can be used or moved for use.

Information	Description	Information Movement Direction	Dual Spread Mini			Common Usage	
Trims, Calibration	Hydraulic Settings	Upload..... Download.....	Laptop	PC	Serial	Same settings for multiple trucks	
Operating Parameters	Material Programs	Upload..... Download.....	Laptop	PC	Serial	Re-install settings after repair	
Storm/Season Totals	Spreading totals stored by storm or season only	Upload..... Download.....	None	Laptop	PC	Serial	Normal log for recording spreading results

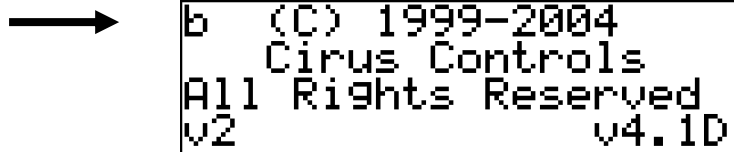
Battery backup for RAM data

Dual Spread Mini™ includes a 3 volt battery to store data in RAM when the truck power is off. Backup batteries are designed to last up to 5 years in normal usage, but may wear out before that time. Data in RAM storage includes:

- Last used rate settings: *Dual Spread Mini™* stores the last settings in use before the truck was turned off and restores those settings using the backup battery when the truck is restarted. These settings include auger/conveyor rate, spinner width, and pre-wet rate in Automatic Mode.
- LCD contrast setting: If the contrast has been changed from the factory default, the backup battery stores the current setting.
- Storm and season totals: Spreading data only.
- Liquid tank level: The graphical display only.

Indication that the battery needs to be replaced

A lowercase “b” will show up on the startup screen (first screen displayed after power up) when the battery is exhausted. Alternatively, if the data above is resetting after power down, the battery needs to be replaced.



Battery replacement

The battery is inside the *Dual Spread Mini™* case. Disconnect the power, open the case and battery can be physically removed. This operation should be performed by someone comfortable with working on electronics, as care should be taken to avoid static discharge. The battery is most easily removed using a pair of small pliers. The new battery can be slid into the socket without the use of tools, but confirm that the battery clip holds the new battery tight.

Part availability

Any battery which cross references to the CR2450 number can be used as a suitable alternative. Please verify the physical dimensions and the 3V rating before inserting the new battery into the spreader. Batteries can be found at most battery stores, and various electronic stores (such as Radio Shack).

Downloading storm & season totals (SST) from *Dual Spread Mini™*

From time to time in the course of normal operation, the administrator will download the spreading data collected by the *Dual Spread Mini™*. This downloading process is accomplished using standard equipment or optional equipment (described in optional equipment section). The method for standard equipment is as follows:

Hardware required

- Laptop computer with Windows 2000 or XP operating system
- Cirrus Controls “Storm and Season Totals (SST) Utility” for Windows (CDROM)
- Standard serial PC interface cable (DB-9 male to female). **NOTE:** If your laptop has a USB port instead of a serial port, you will also need to connect a “USB to Serial” conversion cable (Belkin F5U109, IO Gear GUC232A, or equivalent) between the laptop and *Dual Spread Mini™*.

Download steps

- 1) Power the *Dual Spread Mini™* off.
- 2) Connect the PC to *Dual Spread Mini™* using the serial cable or USB adapter.
- 3) Open the SST Utility on the PC.
- 4) The SST Utility will report **Waiting for connection** in the red bar. If the serial port fails to open, the SST Utility will report the error in the red bar. To correct error, check the COM port number setting in the SST Utility and make sure that no device on your PC is using that same COM port (such as a Palm Pilot etc). Turn off any device using the COM port. Restart the SST Utility and verify that PC is **Waiting for connection**.
- 5) Power the *Dual Spread Mini™* on to automatically initiate download of Storm and Season totals.
- 6) The download will complete quickly and when it does, the SST Utility will display the resulting data. Print or save the data by selecting **Print** or **Save** on the SST utility.
- 7) If you choose to save the data, it is stored on your PC as a standard comma delimited text file (xxx.csv) that can be opened later by various PC applications.

Resetting storm & season totals (SST) on *Dual Spread Mini*TM

Typical use of these recording functions is to use one to record short time duration spreading data (shift, day, or storm totals) and the other to record longer time duration events (season totals). Storm totals can be reset by the operator in the truck, season totals are only resettable by an administrator with a password.

NOTE: Once either or both of the totals are reset in *Dual Spread Mini*TM, they are no longer retained in memory. Be sure to complete your data download before resetting either or both of these totals.

Resetting storm totals

- 1) Return to **Menu** screen by turning on the **MENU** switch and use **SPINNER** switch to move arrow to **Storm/Season T1**. Select by pressing **PASS**.
- 2) Press **PASS** to select storm totals.
- 3) Use the **SPINNER** switch to scroll to last page that displays **Press <PASS> to clear storm totals** and press **PASS**.
- 4) *Dual Spread Mini*TM will ask you to confirm that you wish to delete totals. Use the **SPINNER** switch to select **Y** and press **PASS** to complete resetting of storm totals.
- 5) Resetting is complete and *Dual Spread Mini*TM automatically returns you to the **Menu** screen and normal operation.

Resetting season totals

- 1) Return to **Menu** screen by turning on the **MENU** switch and use **SPINNER** switch to move arrow to **Storm/Season T1**. Select by pressing **PASS**.
- 2) Use the **SPINNER** switch to move down and press **PASS** to select **Season Totals**.
- 3) Use the **SPINNER** switch to scroll to last page that displays **Press <PASS> to clear season totals** and press **PASS**.
- 4) *Dual Spread Mini*TM will ask you to confirm that you wish to delete totals. Use the **SPINNER** switch to select **Y** and press **PASS** to enter a password for final approval.
- 5) Enter _____ and press **PASS** to complete reset of season totals.
- 6) Resetting is complete and *Dual Spread Mini*TM automatically returns you to the **Menu** screen and normal operation.

Other downloads – trims, calibration, and operation settings data

These settings discussed here are described in the system setup section of the manual. Some users choose to store those settings by downloading them to a PC to use them in multiple trucks or to allow a fast restore of a controller that has been repaired. Use the following instructions for uploading and downloading calibration data to the spreader:

Hardware required

- Laptop computer with Windows 2000 or XP operating system
- Cirrus Controls “Storm and Season Totals (SST) Utility” for Windows (CDROM)
- Standard serial PC interface cable (DB-9 male to female). **NOTE:** If your laptop has a USB port instead of a serial port, you will also need to connect a “USB to Serial” conversion cable (Belkin F5U109, IO Gear GUC232A, or equivalent) between the laptop and *Dual Spread Mini*TM.

Download steps

- 1) Power the *Dual Spread Mini*TM off.
- 2) Connect the PC to *Dual Spread Mini*TM using the serial cable or USB adapter.
- 3) Open the SPRDUTIL.EXE utility on the PC.

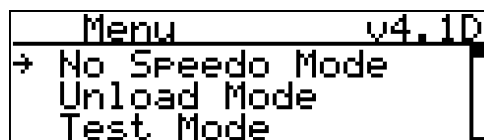
- 4) The SPRDUTIL.EXE utility will report **Waiting for connection** in the red bar. If the serial port fails to open, the SPRDUTIL.EXE utility will report the error in the red bar. To correct error, check the COM port number setting in the SPRDUTIL.EXE utility and make sure that no device on your PC is using that same COM port (such as a Palm Pilot etc). Turn off any device using the COM port. Restart the utility.
- 5) Power the *Dual Spread Mini*TM on to automatically initiate the data connection between the PC and the spreader control. The success of establishing the data connection will be shown by the connection bar turning green.
- 6) Press the **Retrieve Calibration** button on the SPRDUTIL.EXE utility.
- 7) When the **Save As** dialog box appears, name the file and choose the location where you wish to save the calibration data file on your PC.
- 8) Press the **Save** button. Verify that the file has been saved in the location you chose.
- 9) Close the SPRDUTIL.EXE utility by clicking on the **X** in the corner, or selecting **File|Exit** from the menu.

Upload (restore) steps

- 1) Establish connection between the PC and *Dual Spread Mini*TM by following steps 1-5 above.
- 2) Press the **Send Calibration** button on the SPRDUTIL.EXE utility.
- 3) When the **Open** dialog box appears, select the calibration file stored on your PC that you wish to upload to the spreader control.
- 4) Press the **Open** button to initiate the transfer to the spreader control.
- 5) Successful upload will be confirmed by a **Calibration data upload successful** confirmation.
- 6) Close the SPRDUTIL.EXE utility by clicking on the “**X**” in the corner, or selecting **File|Exit** from the menu.
- 7) Cycle the power on the *Dual Spread Mini*TM to restart the spreader with the new settings.

Operational Modes – Description

Accessing the Menu screen



The primary choice screen is called the **Menu** screen. From this screen, the operator can access all normal operating modes, all testing modes, all system setup screens, and all material change screens. The menu screen appears as the second screen (after the logo/copyright screen) after powering the system up when the **MENU** switch is selected. The menu screen can be accessed during normal operation by selecting the **MENU** switch. Turning off the **MENU** switch returns you to the normal operating mode.

Open loop or closed loop operation

*Dual Spread Mini*TM is designed to spread granular and /or liquid material with feedback sensors – closed loop operation – or without feedback sensors – open loop operation. Use of feedback sensors allows *Dual Spread Mini*TM to actually measure output and compare it to signal output to make real-time adjustments. Closed loop operation is more consistent throughout the range of operating conditions than open loop operation.

Selecting closed loop operation

During **Trim/Cal** setup for each device (auger/conveyor, spinner, and pre-wet), the choice of **Sensor Present: Yes** results in closed loop operation for the system selected. A choice must be made for each device.

Selecting open loop operation

During **Trim/Cal** setup for each device (auger/conveyor, spinner, and pre-wet), the choice of **Sensor Present: No** results in open loop operation for the system selected. A choice must be made for each device.

Automatic Mode – ground speed oriented

Automatic mode is the normal operating mode of *Dual Spread MiniTM*. The controller tracks ground speed and then adjusts the output rates based on that speed so the amount of pounds per mile of material dispensed is constant regardless of speed. To enter Automatic Mode, turn the **AUTO** switch on, and turn the **MENU** switch off. **To dispense material, the truck must be moving.**



In Automatic Mode, the granular amount dispensed is displayed in pounds per mile. Pressing the **AUGER/CONVEYOR +/-** switch once will show the set rate, pressing it again will change the set rate. After three seconds, the measured dispensed rate will be displayed again.

The spinner control is shown in number of lanes wide. If the **PREWET ON/OFF** switch is set to on, the pre-wet pump is turned on and dispensed rate is shown in gallons per ton. The bar graph on the right side of the screen shows the liquid tank level.

Auger Reverse

For the system that has the hydraulic valves and plumbing, *Dual Spread MiniTM* allows the operator running in Automatic Mode to briefly reverse the direction of the auger to clear a jam. To reverse the direction, hold the **AUGER/CONVEYOR** paddle down until the display shows **REV**.

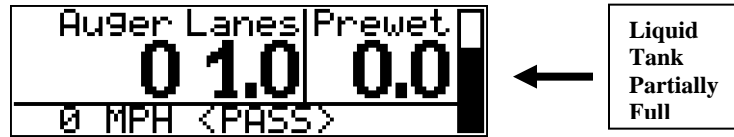
The auger will run in reverse as long as the paddle is held in that position. To stop motion, release paddle and display will return to 0. Reverse functionality works in a stopped or moving truck, but only in automatic mode.



Prewet tank level indicator

Dual Spread MiniTM includes a liquid tank level indicator which functions in closed and open loop systems. This bar graph on the right side of the display (automatic mode only) is intended to give the operator an indication of liquid level, but the accuracy of this indicator is dependant upon the accuracy with which it is reset when the tank is refilled and since it works in both open and closed loop systems, is

not linked to automatic pump shut off. As a result, it is not offered as a failsafe method of tracking volume of liquid remaining.



Automatic pump shut off – closed loop systems only

*Dual Spread Mini*TM systems configured with a pre-wet flow sensor feedback (closed loop), *Dual Spread Mini*TM recognizes when the liquid tank is empty since no liquid flows by the sensor and automatically shuts off the pump to protect it. This system is not active in open loop systems since no flow sensor is present in that case.

Automatic mode alarms

In automatic mode, the input sensors are used to determine how much material is being dispensed. Without these inputs, the *Dual Spread Mini*TM can't accurately measure the amount being dispensed. The *Dual Spread Mini*TM system uses the auger/conveyor sensor to measure granular material dispensed, and the pre-wet flow meter to measure liquid dispensed.

Auger/conveyor sensor fail

If the system detects an auger/conveyor sensor failure, it indicates either a stopped auger/conveyor or a bad sensor signal. The system will beep and display **AUGER/CNVYR SENSOR FAIL** in a flashing sequence on the screen. Pressing the **AUGER/CONVEYOR** - switch silences the alarm and the unit will drop into open loop mode and continue running. This allows the operator to verify his operation and if only the sensor has failed, continue to distribute granular material until repairs can be made.

Pre-wet sensor fail

This failure occurs when the sensor fails or when the pumps can no longer function safely because the tank is empty. To prevent pump damage, *Dual Spread Mini*TM automatically shuts the pre-wet pump off and sounds an alarm. **This warning works for closed loop systems with a flow sensor only!**

To silence the alarm, simply press the **PREWET** - switch or shut off the prewet system by turning the **PREWET** switch to **OFF**. If the system has been set up to allow flow sensor alarm overrides (see **Allow Dry Run** in **System Setup**), press and hold **PASS** then press the **PREWET +** switch, to allow the system to function in open loop pre-wet mode.

Off rate alarm

In the case of closed loop systems, *Dual Spread Mini*TM can detect, by measuring sensor feedback, how accurately it is achieving the programmed output rate of granular or pre-wet material. If factors (jamming, lack of hydraulic power, other) prevent the planned output from occurring, the off rate alarm will be displayed by flashing the measured rate for the system not meeting its programmed rate (granular, pre-wet).

Maximum speed alarm

As part of the system setup, an alarm can be set when the vehicle exceeds a chosen speed. The system will beep and flash the speed reading on the screen. The alarm will stop when vehicle speed is reduced below the programmed speed alarm. The Maximum speed alarm only functions when the spreader is turned on and "pass" is off. It is designed for speed warnings during active spreading only.

Manual Mode – ground speed triggered

Manual mode is the default operating mode for untrimmed systems. It allows manual dispensing with a minimum amount of system set up. It allows spreading to occur without the accuracy and flexibility features of Automatic Mode. Select Manual Mode by shutting off the **AUTO** switch and shutting off the **MENU** switch.

Auger Spin	Prewet
25%	12% 22%
STOPPED	<PASS> MA

In Manual Mode, output rates are set as a percentage of full-scale output and are ground speed triggered (meaning they turn on to the set rate when the truck starts moving, and stop with the truck). Manual Mode is indicated on the screen by the letters **MA** in the lower right corner of the screen. A proper ground speed signal is necessary to allow operation in Manual Mode. If no ground speed signal can be established, convert to No Speedo Mode.

NOTE: No data logging occurs in manual mode operation.

No Speedometer Mode – ground speed simulation

This mode is the backup operating mode for *Dual Spread Mini*TM in the event that the speedometer sensor fails and the driver wishes to continue to dispense without repair.

Auger Spin	Prewet
16%	16% 21%
STOPPED	<PASS> NS

No Speedo Mode is indicated by the letters **NS** in the lower right corner of the screen.

In a trimmed truck with the **AUTO** switch on, the output rates will be displayed in pounds per mile and gallons per ton, as in Automatic Mode. If the unit is not trimmed, or the **AUTO** switch is off, rates will be displayed in percent of full scale and operation will be open loop, as in Manual Mode. Refer to the following table for details about No Speedo Mode:

	Truck trimmed and Auto mode selected	Truck not trimmed or auto mode not selected
Granular Material Units	Pounds per mile	Percent of full scale
Spinner Units	Lanes	Percent of full scale
Pre-wet Units	Gallons per ton	Percent of full scale
Operating Mode	Closed loop, ground speed oriented	Open loop, ground speed triggered
Speed	MPH, adjusted while in pass mode using the AUGER/CONVEYOR +/- switches ¹	Moving or stopped, using the PASS switch ²

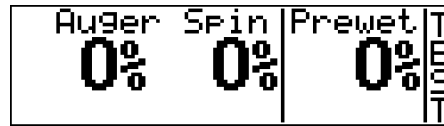
¹ Driver can set desired simulated speed. Press **PASS** and use the **AUGER/CONVEYOR +/-** switch to change the speed do this. Once the desired speed is set, the **PASS** switch must be pressed again to start dispensing.

² Driver tells the unit whether the truck is moving or stopped using the **PASS** switch.

Test Mode – no ground speed triggering

The technician, when verifying hydraulic valve outputs and sensor inputs, normally uses this mode. All output rates are displayed in percent of full scale and sensor inputs are displayed in pulses per minute.

With the **PREWET** switch on, the pre-wet output level and pre-wet sensor are displayed; with the **PREWET** switch off, the speedometer sensor signal is displayed.

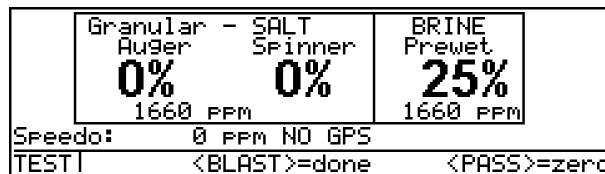


Test mode may be used as an operating mode when no ground speed triggering is desired.

Test Mode – use to validate calibration numbers on flow meter:

Confirm your Calibration: to validate that you are delivering the planned amount of fluid from your liquid system regardless of which flow meter is in use, use the following method:

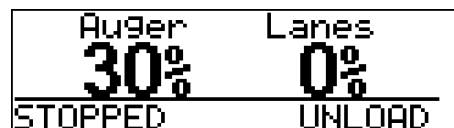
- Plumb your liquid system to allow you to catch and measure an amount of fluid from a single port (2-3 gallons or 8-12 liters). Add enough fluid to do the calibration;
- From the menu screen, select Test mode, enter the password;
- Ramp up the output on the liquid system in use until the pulses coming back are equal to the flow cal number (such as 1500). Liquid will be flowing at this point:



- Collect fluid for exactly one minute. The volume of fluid collected is equal to the volume flowing in one minute. Because the test mode allows you to see pulses expressed in ppm (pulses per minute), the amount of fluid you collect will tell you if your pulses per gallon (or liter) rating on the flow meter is correct for the spreader control.
- If the test gives you more or less fluid than you expected (off by more than 3%), adjust the pulses per gallon (liter) in the spreader setup to compensate for the variation you experience.
- The variation is most likely due to the fact that different flow meters are calibrated using different methods, not because of any problem with the flow meter or the spreader control.
- Flow meters supplied by Cirus Controls will have the correct pulses/gallon conversion shown on the actual flow meter for use during the set up step.

Unload Mode – granular material only

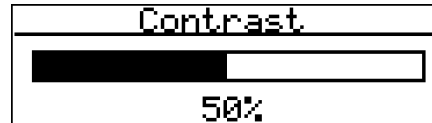
This mode is used for unloading the truck. All rates are displayed as a percentage of full scale. The truck must be stopped in order to drop material. Dispensing will stop when the truck is moved, and will automatically resume when the truck stops again (to prevent all the granular material from piling up). Pressing **PASS** in unload mode turns off all dispensing.



Both granular and pre-wet media (if equipped) are displayed on the Unload Mode screen, however, no pre-wet dispensing can occur unless the **PREWET ON/OFF** switch is on. Material can be unloaded

individually or simultaneously if you choose. Pre-wet material is normally not unloaded using the *Dual Spread Mini™* controller. Most systems are plumbed with a manual unload valve/spigot.

LCD Screen Contrast



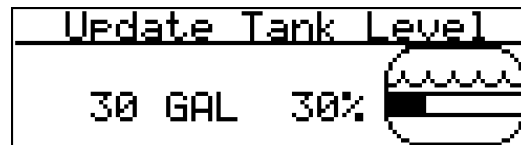
The contrast for the display is set at the factory for average brightness. Contrast can be adjusted for personal preference and individual lighting. To adjust, simply select **Contrast** from the menu screen, use the **SPINNER +/-** switch to adjust the contrast to a readable level, and press **PASS** to accept. This setting will be remembered between power downs until the next time contrast is set.

Material

If more than one material has been pre-defined in the material calibration setting section, the material can be changed here. This allows for multiple weight calibrations, minimum and maximum dispense settings, and varying blast rates.

Fill Tank

On a pre-wet equipped system, the *Dual Spread Mini™* reports the tank level by calculating the amount dispensed. When the tank is filled, the level in the *Dual Spread Mini™* unit must be updated to reflect this. By simply pressing **PREWET +**, the tank level is reset to full. Should you choose to partially fill the tank, you can estimate the displayed percentage by pressing the **PREWET +/-** switch up or down to change the tank level to estimate a partial fill. Correctly setting this feature enables low level indication, but does not affect the automatic pump protection system, since automatic pump protection is controlled by flow sensor readings only.



Other Setup Sections

Advanced calibration

This category of settings is the closed loop control settings for the hydraulics. These settings are set at the factory and rarely need to be changed. Please contact Cirrus Controls with any questions about these settings.

Reset All

This selection will clear all calibration data and reset the unit to factory defaults. You will be asked to confirm your selection before the unit is reset, to prevent accidental erasure of calibration settings.

Trouble Shooting Guide

Symptom	Cause (s)	Correction (s)
Set Up Issues		
Power isn't on	a) Master power off b) Fuse is blown c) Bad power or ground connection	a) Turn on panel power b) Replace fuse (s) c) Verify power/ground connections.
Dual Spread Mini cuts out or acts strange	Low power supply voltage from truck battery/alternator	Truck voltage must be at least 12.0 volts
No speedometer signal appears during test mode	a) Speedometer cable failure b) Signal offset needs adjustment (VRM speedometer only)	a) Repair speedometer cable b) Adjust trim pot for VRM signal
Auger/conveyor or spinner doesn't move	a) PTO not engaged b) Hydraulics not functioning c) Electrical connection failure	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 connections
Cannot operate password protected modes (Test, Manual etc). Cannot access "set up" files. Passwords don't seem to work.	a) Restricted access modes have been selected during system set up.	a) See system administrator to change access restrictions.
Auger/conveyor/spinner move, but output rates not indicated;	a) Auger/conveyor sensor failure b) Sensor flashes, but signal not displayed in Test mode	a) Check sensor wiring and sensor function b) Check sensor signal cable verify that spreader setup shows "sensor present"
Spinner won't operate in auto or no-speedo after completing trim steps.	Minimum and maximum settings are the same value. Controller requires minimum to be less than maximum.	Re-trim spinner and verify that minimum is lower than maximum values. Press pass to save the values after completing trim step.
Operating Modes		
Automatic mode is unavailable (Auto/manual switch doesn't put controller into automatic mode – stays in manual mode no matter where auto/manual switch is set)	a) Installed systems are not set up and trimmed properly – see diagnostics in menu screen b) System(s) are not installed in truck, but are enabled in controller setup and not trimmed.	a) Follow setup and trim procedure from diagnostics; b) Follow setup procedure and turn off any systems not installed in truck (reference diagnostics);
Pre-wet will not display when panel switch is turned on	Pre-wet not enabled during system set up	Follow setup and trim procedure to enable functions
Settings on display are shown in % (not in lbs/mile)	a) Automatic mode is not set up and trimmed properly; b) Manual mode is selected	a) Follow setup and trim procedure; b) Select Automatic Mode
Spinner runs continuously	Spinner set not to stop with truck	Follow spinner setup procedure
Unable to maintain steady application at set rate (low speed)	a) Auger/conveyor is not trimmed properly for low speed operation b) Advanced settings need adjustment (sticky valves)	a) Re-trim hydraulic system to improve low speed performance b) Adjust parameters – qualified technician only

Alarm Conditions		
Off rate alarm flashes	Actual material dispensed does not match rate setting	a) Clear auger/conveyor or spinner jam b) Re-trim system
Auger/conveyor alarm sounds	a) Auger/conveyor stopped b) Auger/conveyor sensor failure c) Minimum trim too low d) Stuck or sticky valve	a) Clear auger/conveyor jam b) Repair sensor and/or cable c) Adjust minimum trim d) Adjust coil unseat settings; repair valve coil
Pre-wet alarm sounds/flashes	a) Pre-wet pump stopped b) Pre-wet sensor failure c) Minimum trim too low d) Stuck or sticky valve	a) Repair pump/clear obstruction b) Repair sensor and/or cable c) Adjust minimum trim d) Adjust coil unseat settings; repair valve coil
Alarm keeps sounding (applies to all alarms)	System needs to be reset; Alarm display will remain until root condition is corrected	Turn off main power and then restart
Speedometer reads zero	a) Speedometer signal lost b) Speedometer not calibrated	a) Verify cable connections b) Follow speedo setup procedure
Display		
LCD too dark or too light	Contrast setting needs to be changed	Change contrast from the menu
LCD display changes brightness	Some variation is normal	Reset contrast as needed
Data Logging		
Storm and/or season totals don't match material dispensed	a) Inaccurate calibration during drop test b) Operating sometimes in manual and sometimes in automatic during dispensing	a) Re-run granular drop test and validate calibration for automatic mode b) No dispensing data is recorded in manual mode. If accurate data is required, run in automatic mode
Cannot download calibration data from Dual Spread Mini to PC	a) Bad connection between PC and Dual Spread Mini b) PC operating system must be Windows 98 or newer	a) Validate cable connections between systems b) Use PC with compatible operating system
Cannot upload calibration data from PC to Dual Spread Mini	a) Bad connection between PC and Dual Spread Mini b) Data file not selected (highlighted) when initiating upload.	a) Validate cable connections between systems b) Select the data file you wish to upload before pressing, "send calibration" on "sprdutil.exe".

Appendix A – Parts List

N4DSM00SAN	Dual Spread Mini Style Controller in stand alone sheet metal
TS-2503	15' Hydraulic cable - Molex (Hyd Out) to (3) C2 connectors (IP 67)
TS-2504	15' Hydraulic cable - Molex (Hyd Out) to (3) DIN connectors (IP 68)
TS-2000	Sensor Main Trunk Cable (mates w/ TS-2001, TS-2002 or TS-2202)
TS-2202	Direct Gran & Pre-Wet Sensor Cable w/ 2 WeatherPak
SCS-1010	WeatherPak to M12 w/ integrated LED Pigtail
CR2450	3V Back up battery (available Radio Shack and many battery stores)

Appendix B – Setup Parameters

System Setup

Units: Select the units that the system uses, either **Standard** or **Metric**.

PWM Frequency: Setting for frequency of PWM signal (in Hz).

Allow Dry Run: Select **Yes** to allow operator override of pre-wet pump safety shutoff.

Password Test Mode: Choose to select password protection for Test Mode

Password Manual Mode: Choose to select password protection for Manual Mode.

Password No Speedo Mode: Choose to select password protection for No Speedo Mode

Tank Volume: Setting for the size of the pre-wet tank.

Blast Seconds: Amount of time the timed blast runs (1-60 seconds).

Blast Mode: Select between **Toggle** (on/off), **Timed** or **Momentary** blast operation.

Offrate Flash Percent: Percentage of “off rate” error allowed prior to triggering warning.

Offrate Minimum Speed: Sets the minimum speed (mph) above which the offrate warning will function.

Display Deadband: Determines the percent of variation in output displayed on the LCD.

Auto Minimum Speed: Controller will behave as if the truck is going at least this speed when moving.

Maximum Speed: Overspeed alarm. Set to zero to disable overspeed alarm.

Truck ID: Name of the truck in which the system is installed

Trim/Cal –Auger/Conveyor Settings

Device Present: Select **Yes** or **No** to tell the controller that an auger/conveyor is present.

Has Sensor: Select **Yes** or **No** to tell the controller that the auger/conveyor has a sensor.

Pounds Per: Select granular rate in pounds/mile (distance spreading) or pounds/lane-mile (area spreading).

Minimum Trim PWM: PWM value at which the auger/conveyor starts moving. Value determined during trim.

Maximum Trim PWM: PWM value when auger/conveyor hits maximum speed. Value determined during trim.

Show Cnvyr: Select **Yes** to change auger nomenclature to conveyor (**Cnvyr**) on screen.

Reversible: Select **Yes** if vehicle has a reversing auger.

Trim/Cal –Spinner Settings

Device Present: Select **Yes** or **No** to tell the controller that a spinner is present.

Has Sensor: Select **Yes** or **No** to tell the controller that the spinner has a sensor.

Zero Velocity Spreader: Select **Yes** to tell the controller the spinner is a Monroe Zero Velocity Spreader.

Show Spinner Percent: Selecting **Yes** shows spinner rate in percent instead of lanes. (Trim values shown as

Minimum Trim and **Maximum Trim** values instead of 1 lane and 3 lane).

1 Lane Speed: PWM value when spinner delivers 1 lane wide pattern, normally a 12 ft. Value determined during trim. Actual 1 lane width can be adjusted to end-user preference.

3 Lane Speed: PWM value when spinner delivers 3 lane wide pattern, normally a 36 ft. Value determined during trim. Actual 3 lane width can be adjusted to end-user preference.

1 Lane Blast: PWM value when spinner delivers 1 lane wide pattern under heavy material load. Value determined during trim.

3 Lane Blast: PWM value when spinner delivers 3 lane wide pattern under heavy material load. Value determined during trim.

SpinStop 0 MPH: Optional selection to allow spinner to run when truck stopped.

The following settings are used when an Zero Velocity Spreader is selected only.

Minimum Trim PWM: PWM value at which the spinner starts moving. Value determined during trim.

Maximum Trim PWM: PWM value when spinner hits maximum speed. Value determined during trim.

Pulses Per Revolution: Sensor signal pulses/revolution. Default is 10.

Overdrive Percent: Allows Zero Velocity Spreader to run slightly slower (neg.) or faster (pos) than truck speed.

Impeller Diameter: Diameter of the Zero Velocity Spreader impeller (inches).

Hotkey Mode: Allows rapid switching between manual and automatic Zero Velocity Spreader control.

Trim/Cal – Pre-wet Settings

Device Present: Select **Yes** or **No** to tell the controller that a pre-wet system is present.

Has Sensor: Select **Yes** or **No** to tell the controller that the pre-wet system has a sensor.

Pump Gallon/Minute: Pre-wet maximum pump flow rating. Used for open loop output.

Minimum Trim PWM: PWM value at which the pre-wet pump starts pumping. Value determined during trim.

Maximum Trim PWM: PWM value when pre-wet hits maximum flow. Value determined during trim.

Pulses Per Gallon: Flow meter calibration rating. Used for closed loop output.

Trim/Cal – Speedometer Setting

Pulses Per Mile: Speed sensor rating. Value determined during speedometer calibration.

Materials – Granular Settings

Name: Unique identifier for each material program.

Minimum Rate: Lowest rate available in Automatic Mode (in pounds per mile).

Maximum Rate: Highest rate available in Automatic Mode (in pounds per mile).

Blast Rate: Rate of output (in pounds per mile) during blast mode. Can be higher than maximum rate.

Small Increment: Change of set rate when the **AUGER/CONVEYOR** switch is pressed up or down.

Large Increment: Change of set rate when the **AUGER/CONVEYOR** switch is held up or down.

Pulses Per Pound: Closed loop granular sensor calibration. Value determined during drop test.

Maximum Pounds Per Minute: Open loop granular calibration. Value determined during drop test.

Materials – Prewet Settings

Name: Unique identifier for each material program.

Minimum Rate: Lowest rate available in Automatic Mode (in gallons per ton).

Maximum Rate: Highest rate available in Automatic Mode (in gallons per ton).

Small Increment: Change of set rate when the **PREWET +/-** switch is pressed up or down.

Large Increment: Change of set rate when the **PREWET +/-** switch is held up or down.

Appendix C – Typical Frequency Settings by Valve Mfg

Brand Valve (prewet systems)	100 Hz
Husco – Section Valves –	100 Hz
HydraForce (Cirus manifold)-	220 Hz
Parker -	60 Hz
Rexroth (MP18)	180 Hz
Sauer Dan Foss PVG32	80 Hz

MUST ORDER CABLES FROM THIS BOX TO SENSOR (UP TO 4):
TS-2005 : M12 TO M12 (BRAD HARRISON) (TYPICAL WHITE MOTOR CONNECTOR)
TS-2006 : M12 TO CONXALL (TYPICAL RAVEN FLOW METER CONNECTOR)
TS-2007 : M12 TO WEATHER PACK (TYPICAL GEMS FLOW METER CONNECTOR)

SENSORS ON TRUCK	CABLES REQUIRED
AUGER (PREWET)	MK-1003 TS-2004 TS-2000 TS-2202 SENSOR PIGTAILS (SCS-1010, SCS-1011) TS-2503 OR TS-2504 OR TS-2018 TS-2018 PIGTAILS (TS-2012, TS-2013, TS-2014)
AUGER PRE-WET SPINNER	MK-1003 TS-2004 TS-2000 TS-2001 SENSOR PIGTAILS (TS-2005, TS-2006, TS-2007) TS-2503 OR TS-2504 OR TS-2018 TS-2018 PIGTAILS (TS-2012, TS-2013, TS-2014)

SENSOR IN
TS-2000 (MAIN SENSOR TRUNK)

BULK HEAD AT BACK OF TRUCK

TS-2001 (SENSOR BOX FOR GRANULAR, PRE-WET, AND SPINNER)

TS-2202 (SENSOR CABLE FOR GRANULAR AND PRE-WET)

MUST ORDER CABLES IF DIFFERENT FROM WEATHER PACK:
SCS-1010 : WEATHER PACK TO M12 (BRAD HARRISON) (TYPICAL WHITE MOTOR CONNECTOR)
SCS-1011 : WEATHER PACK TO CONXALL (TYPICAL RAVEN FLOW METER CONNECTOR)

DUAL SPREAD 05 MOUNTED IN CAB

POWER

MK-1003 (POWER)

SPEEDO/REMOTE

TS-2004 (SPEEDO,REMOTE BLAST/PASS)

MAIN HYDRAULIC TRUNK (3 OPTIONS):

HYD OUT

TS-2503 (NON-IP68) (AUGER, SPINNER, PRE-WET)

TS-2503 TERMINATED WITH ITT CANNON (C2 CONNECTOR) (TYPICAL MP18/REXROTH CONNECTOR)

HYD OUT

TS-2504 (NON-IP68) (AUGER, SPINNER, PRE-WET)

TS-2504 TERMINATED WITH DIN (HIRSHMAN CONNECTOR) (TYPICAL MHV CONNECTOR)

HYD OUT

TS-2018 (IP68) (AUGER, SPINNER, PRE-WET)

MUST ORDER CABLES FROM THIS BOX TO VALVE (UP TO 4):
 CABLES FOR TS-2018

TS-2010 : M12 TO WEATHERPACK (2PIN)
TS-2011 : M12 TO AMP TIMER JR (2PIN)
TS-2012 : M12 TO AMP (2PIN) (TYPICAL HUSCO CONNECTOR)
TS-2013 : M12 TO C2 (ITT CANNON PLUG) (TYPICAL MP18 CONNECTOR)
TS-2014 : M12 TO DIN (HIRSHMAN CONNECTOR) (TYPICAL MHV CONNECTOR)

EXTENSION CABLES:

- TS-2100** : M12 TO M12 (10 FT) (FROM TS-2001 TO SENSOR CABLE)
- TS-2101** : M12 TO M12 (20 FT) (FROM TS-2001 TO SENSOR CABLE)
- TS-2102** : M23 TO M23 (10 FT) (FROM TS-2003A TO TS-2003B)
- TS-2103** : M23 TO M23 (20 FT) (FROM TS-2003A TO TS-2003B)

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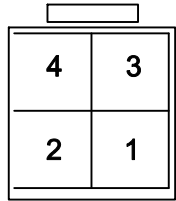
REV	DATE	DESCRIPTION					
A	01-14-05	Added molex connectors on hydraulic cable					
B	-	-					
C	-	-					
D	-	-					
E	-	-					
DESIGN: MVM		DRAWN: MVM		AS BUILT: -		PROJECT NUMBER: DS05-OV	
				SCALE: NONE		DATE: 01-14-05 REV: A	
						SHT 1 OF 1	

CIRUS CONTROLS LLC
 9200 WYOMING AVE. N. SUITE 320
 BROOKLYN PARK, MN 55445
 Phone: (763) 493-9380
 Fax: (763) 493-9340

DUAL SPREAD 05

CABLE OVERVIEW

B.O.M.



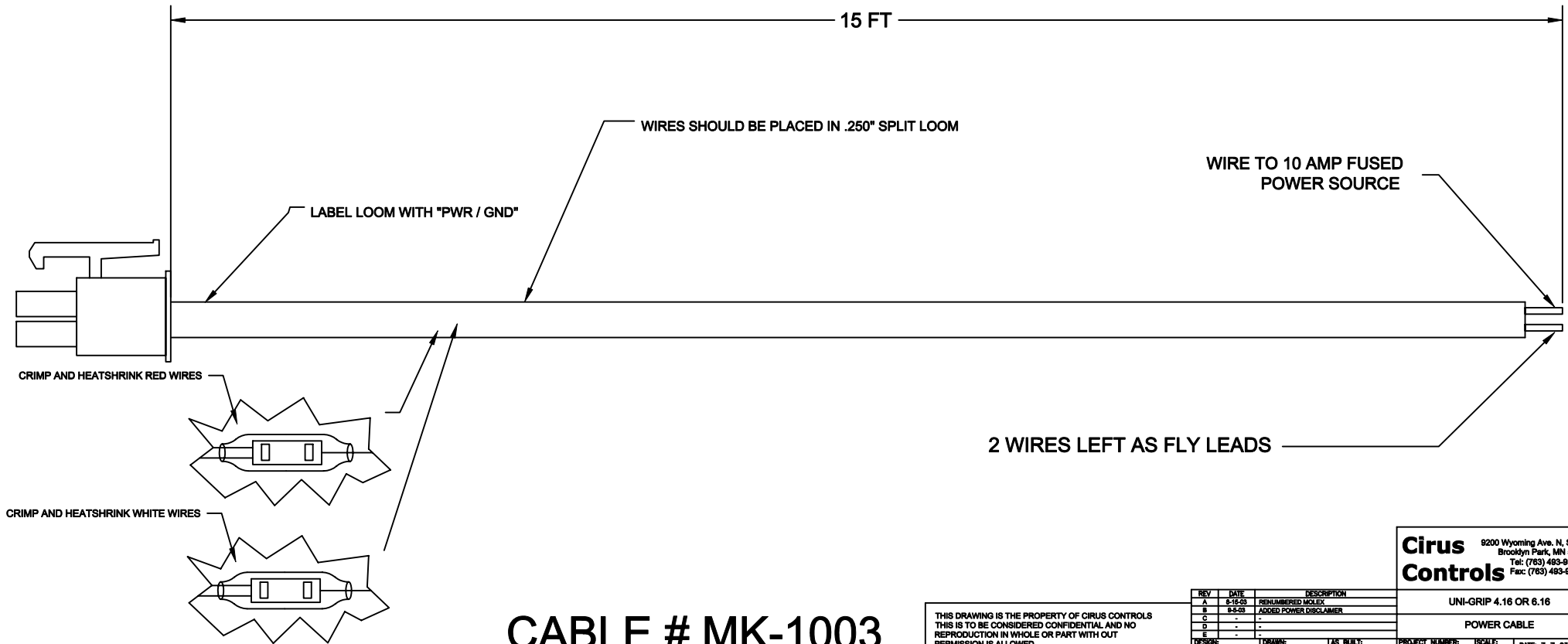
**BACK VIEW
(SIDE PINS ARE INSERTED FROM)**

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 (Digi-Key WM3701-ND)	MOLEX RECEPTACLE 4 PIN
4	39-00-0039 (Digi-Key WM2501-ND)	MOLEX TERMINALS FEMALE 18-24 AWG
15 FT	LCP-250	.250" SPLIT LOOM

NOTES:

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



CABLE # MK-1003

Cirus Controls
 8200 Wyoming Ave. N. Suite 320
 Brooklyn Park, MN 55445
 Tel: (763) 483-8380
 Fax: (763) 483-8340

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REV	DATE	DESCRIPTION	PROJECT NUMBER	SCALE	DATE	REV.
A	8-16-03	RENUMBERED MOLEX	MK-1003	NONE	7-7-03	B
B	8-5-03	ADDED POWER DISCLAIMER				
C	-	-				
D	-	-				
E	-	-				

UNI-GRIP 4.16 OR 6.16

POWER CABLE

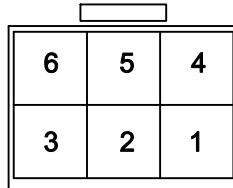
SHT 1 OF 1

B.O.M.

NOTES:

1. PLUGS FOR UNUSED PORTS:
PN# VZ-3
2. TIE GROUND AND COMMON TOGETHER AT LEAST
2 INCHES FROM CONNECTOR

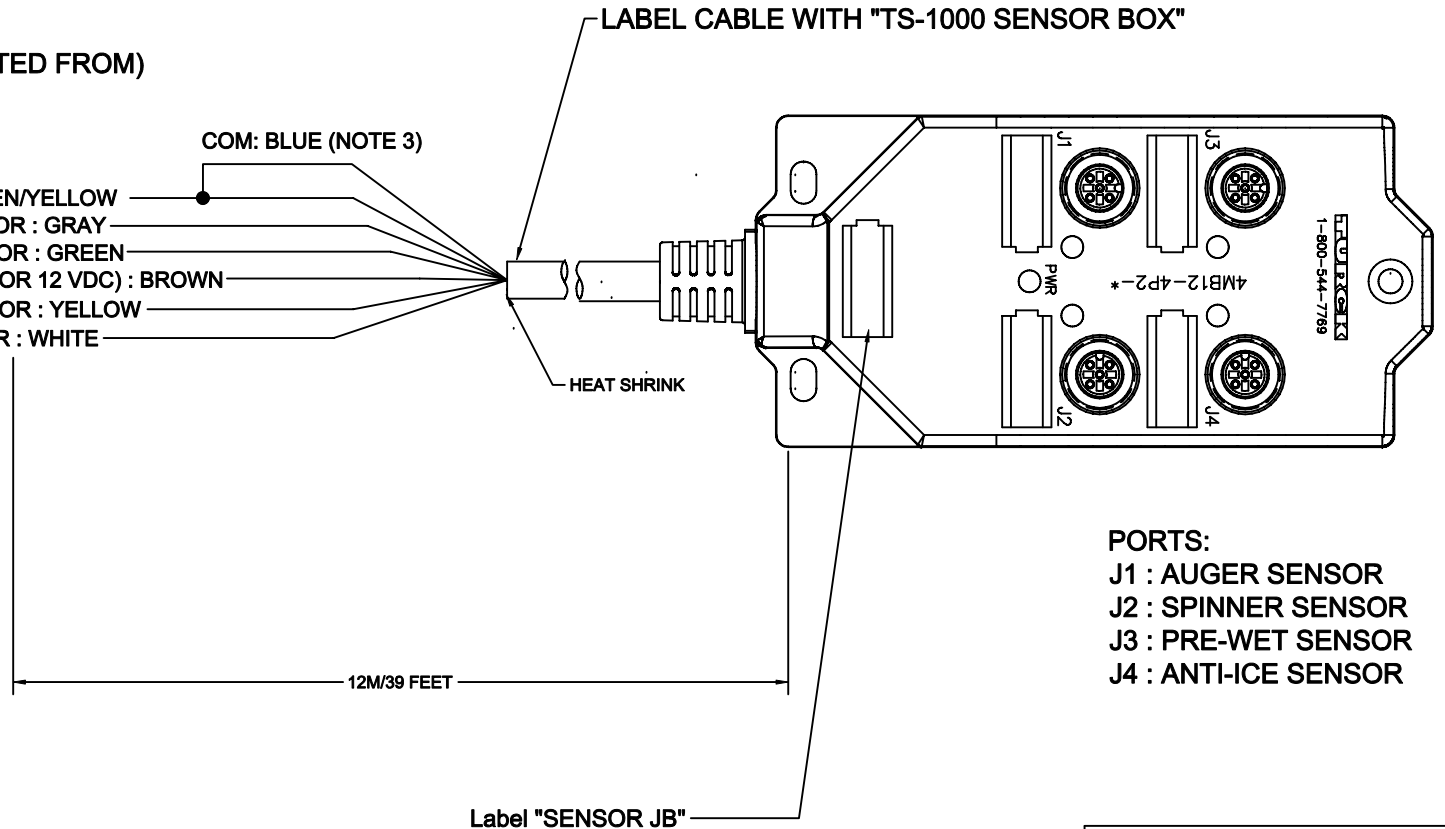
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	4MB12-4P2-12	VALVE BOX W/ CABLE (TURCK)
2	1	39-01-2060	MOLEX 6 PIN
3	6	39-00-0039	MOLEX TERMINALS 18-24 AWG



BACK VIEW
(SIDE PINS ARE INSERTED FROM)

MOLEX PIN#	SIGNAL
1	GROUND : GREEN/YELLOW
2	ANTI-ICE SENSOR : GRAY
3	SPINNER SENSOR : GREEN
4	POWER (5 VDC OR 12 VDC) : BROWN
5	PRE-WET SENSOR : YELLOW
6	AUGER SENSOR : WHITE

COM: BLUE (NOTE 3)



- PORTS:**
 J1 : AUGER SENSOR
 J2 : SPINNER SENSOR
 J3 : PRE-WET SENSOR
 J4 : ANTI-ICE SENSOR

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

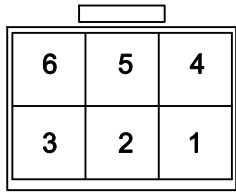
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REV	DATE	DESCRIPTION
A	-	-
B	-	-
C	-	-
D	-	-
E	-	-

DESIGN: MVM DRAWN: MVM AS BUILT: -

SPREADER CABLE SYSTEM			
SENSOR BOX			
PROJECT NUMBER:	SCALE:	DATE:	REV.
TS-1000	NONE	7-29-08	-
		SHT 1 OF 1	

B.O.M.

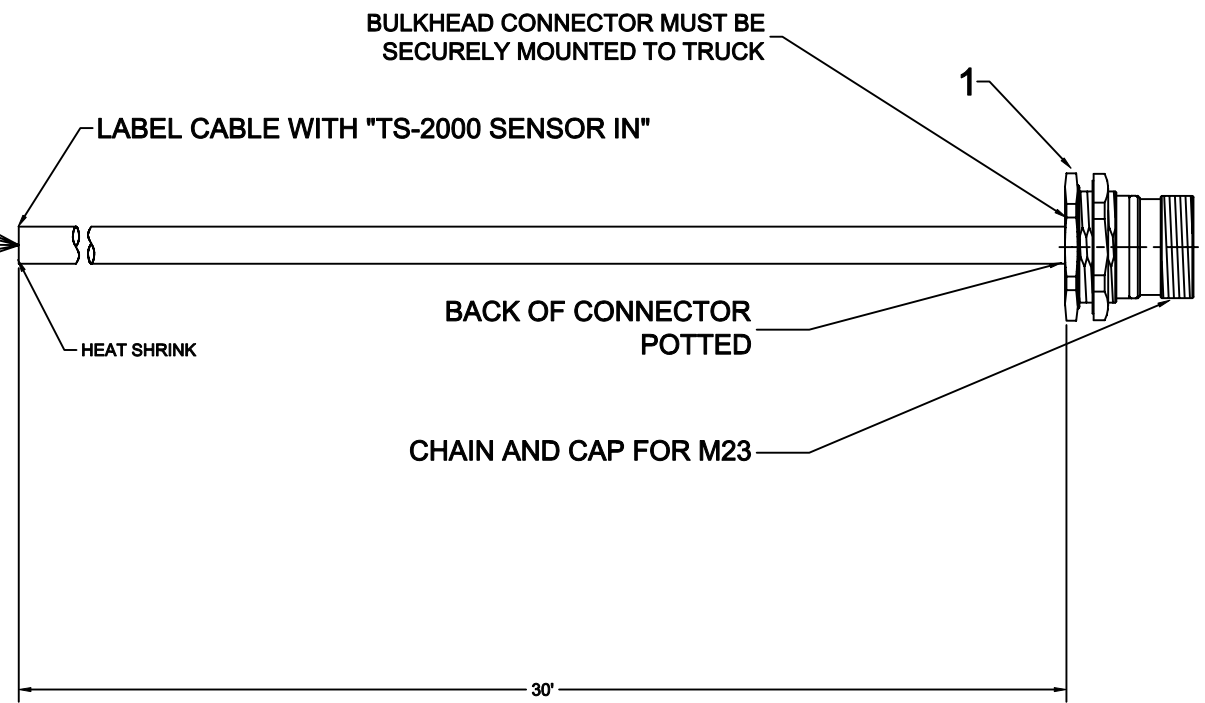


BACK VIEW
(SIDE PINS ARE INSERTED FROM)

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	CKFD 12-7-10/S717	MAIN SENSOR TRUNK (TURCK)
2	1	CK-CC	CAP FOR MAIN TRUNK
3	1	39-01-2060 (Digi-Key #WM3702-ND)	MOLEX 6 PIN
4	6	39-00-0039 (Digi-Key # WM2501-ND)	MOLEX TERMINALS 18-24 AWG

MOLEX PIN# SIGNAL

- 1 GROUND : GREEN/YELLOW
- 2 ANTI-ICE SENSOR : GRAY
- 3 SPINNER SENSOR : GREEN
- 4 POWER (5 VDC OR 12 VDC) : BROWN
- 5 PRE-WET SENSOR : YELLOW
- 6 AUGER SENSOR : WHITE



BULKHEAD CONNECTOR MUST BE SECURELY MOUNTED TO TRUCK

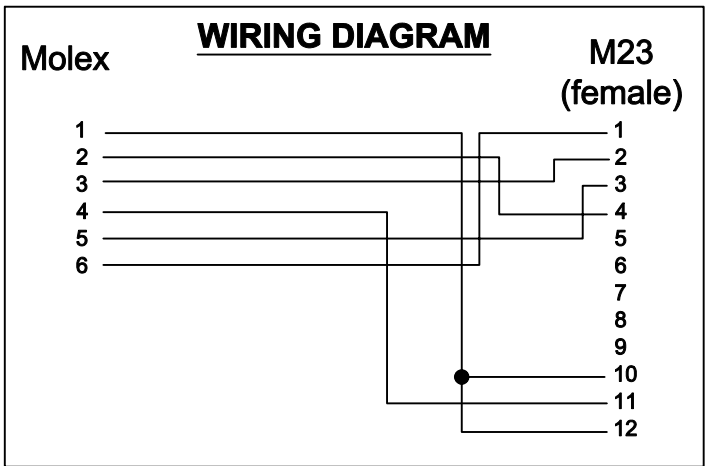
LABEL CABLE WITH "TS-2000 SENSOR IN"

HEAT SHRINK

BACK OF CONNECTOR POTTED

CHAIN AND CAP FOR M23

30'



NOTE: THIS CABLE MATES TO TS-2001 OR TS-2002

#TS-2000

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REV	DATE	DESCRIPTION
A	3-16-05	ADDED MORE BUILD NOTES
B	2-23-06	ADDED NOTE FOR BULKHEAD MOUNTING
C	-	-
D	-	-
E	-	-

DESIGN: JTM DRAWN: JTM AS BUILT: -

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 9200 WYOMING AVE. N. SUITE 320
 BROOKLYN PARK, MN 55445
 Phone: (763) 493-9380
 Fax: (763) 493-9340

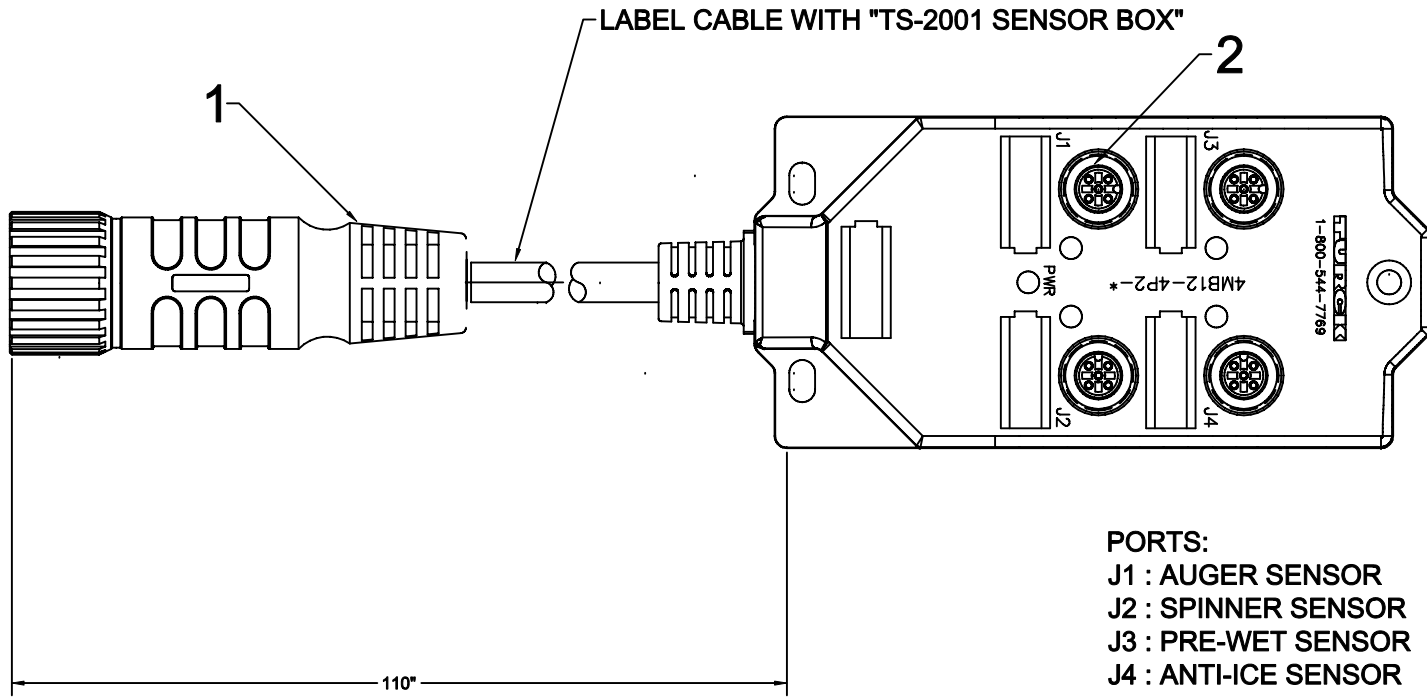
SPREADER CABLE SYSTEM			
SENSOR CABLE			
PROJECT NUMBER:	SCALE:	DATE:	REV:
TS-2000	NONE	2-23-06	B
		SHT 1 OF 1	

B.O.M.

NOTES:

1. NEEDS CABLE TS-2000 TO BE COMPLETE
2. AVAILABLE JUMPER CABLES FOR SENSORS (ORDERED INDIVIDUALLY):
PN# WK 4.5-1.3-WS 4.5T/S653 (WHITE MOTOR)
3. PLUGS FOR UNUSED PORTS:
PN# VZ-3

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	4MB12-4P2-2-CS12	VALVE BOX W/ CABLE (TURCK)
2	1 TO 3	VARIES	JUMPER CABLE TO SENSOR
3	1	CS-CC	CAP FOR CABLE TO BODY



PORTS:
 J1 : AUGER SENSOR
 J2 : SPINNER SENSOR
 J3 : PRE-WET SENSOR
 J4 : ANTI-ICE SENSOR

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

DESIGN: JTM DRAWN: JTM AS BUILT: -

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CONTROLS LLC Fax: (763) 493-9340
 9200 WYOMING AVE. N. SUITE 320
 BROOKLYN PARK, MN 55445

SPREADER CABLE SYSTEM

SENSOR BOX

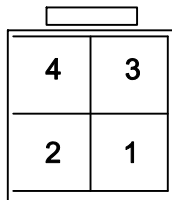
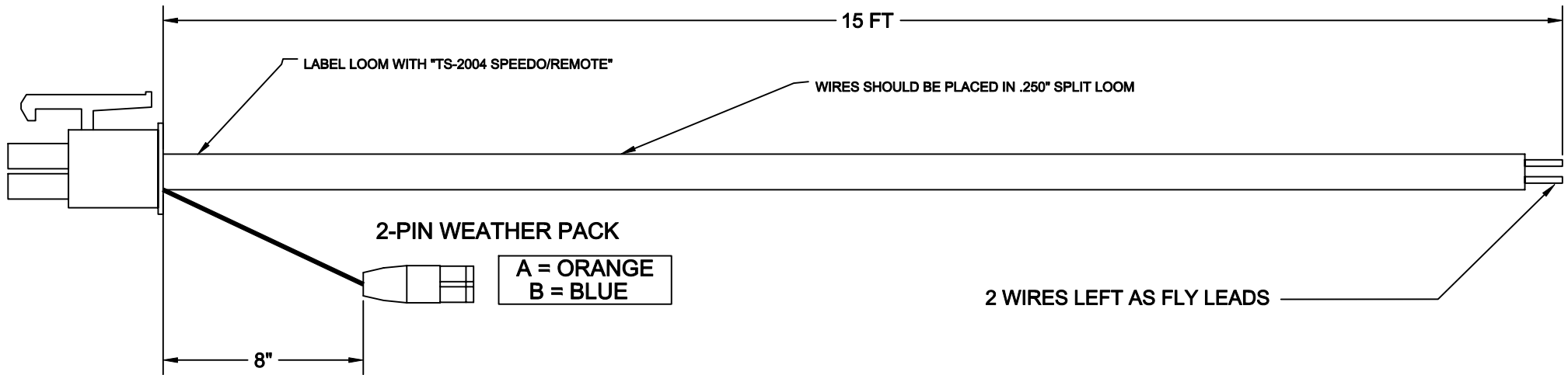
PROJECT NUMBER: TS-2001	SCALE: NONE	DATE: 1-12-04	REV: -
		SHT 1 OF 1	

B.O.M.

NOTES:

1. LABEL WIRES WITH SIGNAL EVERY 12 INCHES
2. TAPE SPLIT LOOM EVERY 12 INCHES
3. CABLE TO BE BAGGED AND THE BAG LABELED WITH "TS-2004"

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
15 FT	LCP-250	.250" SPLIT LOOM
1	12010973	2-PIN WEATHER PACK (SHROUD)
2	12089040	PINS FOR WEATHER PACK
2	12015323	SEAL FOR WEATHER PACK



MOLEX PIN#	SIGNAL
1	GROUND : WHITE (18AWG)
2	REMOTE PASS : BLUE
3	SPEEDO : GREEN
4	REMOTE BLAST : ORANGE

BACK VIEW
(SIDE PINS ARE INSERTED FROM)

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Brooklyn Park, MN 55445
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Fax: (763) 493-9340

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REV	DATE	DESCRIPTION	SPREADER CABLE SYSTEM		
A	-	-	SPEEDO AND REMOTE BLAST/PASS		
B	-	-			
C	-	-			
D	-	-			
E	-	-			
DESIGN	JTM	AS BUILT:	PROJECT NUMBER:	SCALE:	DATE: 1-12-04
DRAWN	JTM	---	TS-2004	NONE	REV. 1
			SHT 1 OF 1		

EuroFast
Female Pins,
Female Threads
or Coupling Nut

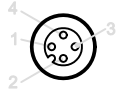


4-pin

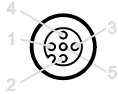


5-pin

EuroFast
Male Pins,
Male Threads
or Coupling Nut



4-pin



5-pin

B.O.M.

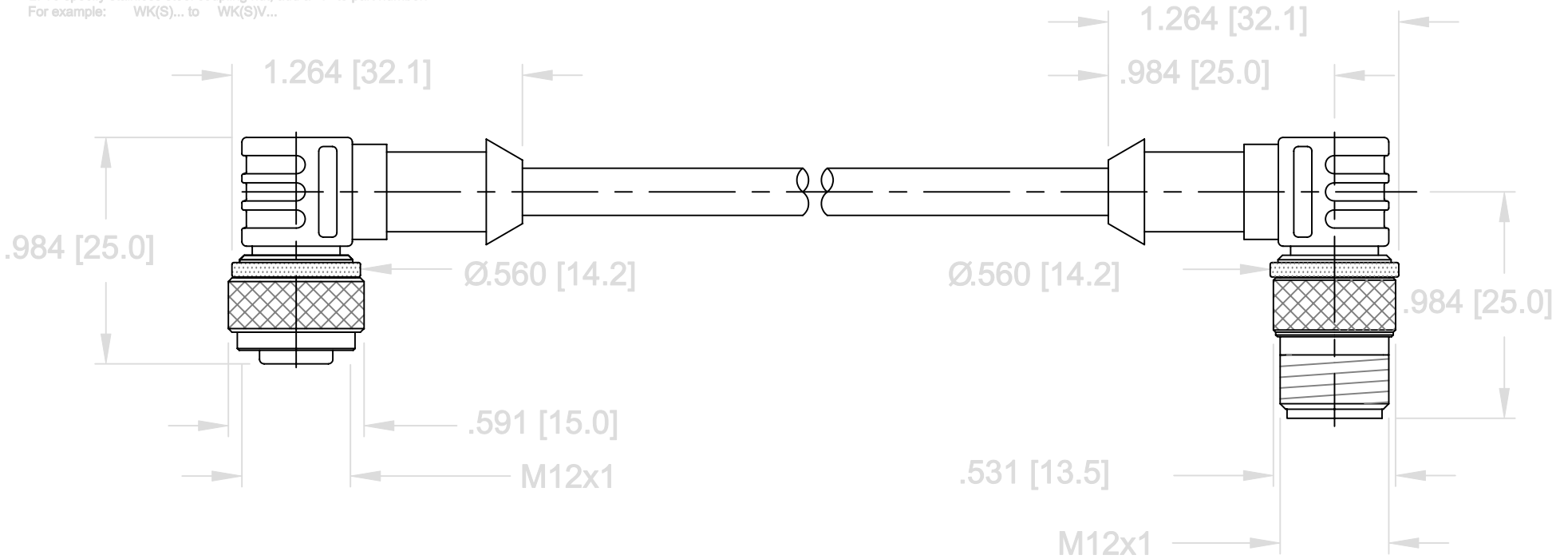
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	WK 4.5T-1.3-WS 4.5T/S653	M12 90 DEGREE TO M12 90 DEGREE

NOTES:

1. To specify nylon coupling nut, add "K" to part number.
For example: WK(S)...to WK(S)K...

2. To specify stainless steel coupling nut, add a "V" to part number.
For example: WK(S)... to WK(S)V...

CABLE (Ø5.2 mm)



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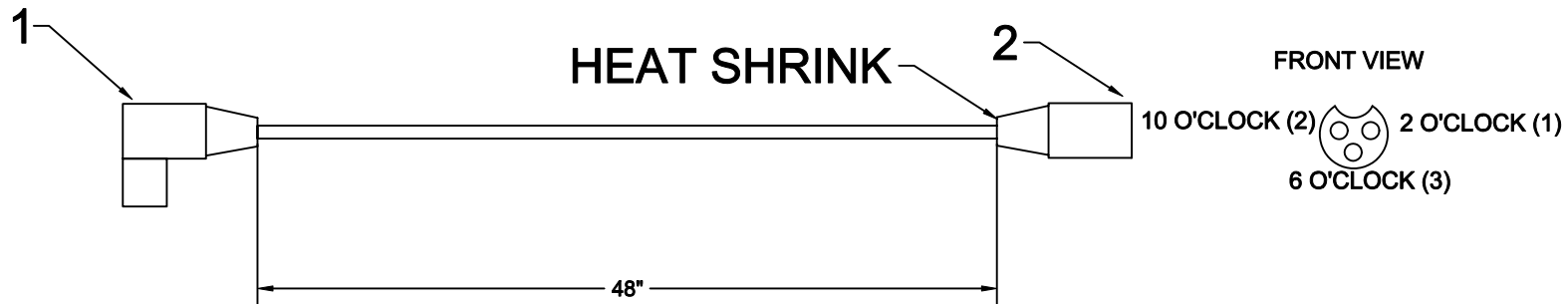
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REV	DATE	DESCRIPTION			
A	9-9-03	-	SPREADER CABLE SYSTEM		
B	-	-			
C	-	-			
D	-	-			
E	-	-			
DESIGN: JTM			DRAWN: JTM		AS BUILT: -
PROJECT NUMBER: TS-2005			SCALE: NONE	DATE: 3-30-04	REV: -
			SHT 1 OF 1		

B.O.M.

ITEM	QTY	PART NUMBER	CIRUS PN	DESCRIPTION
1	1	????	????	M12 90 degree connector and cable
2	1	3182-3SG-3DC	000624	CONXALL CONNECTOR - 3 SOCKET FEMALE (SHELL & TERMINALS)

M12	GAUGE	LENGTH	SIGNAL	WIRE COLOR	CRIMP END	J3
4	20 AWG	48"	SENSOR SIGNAL	BLACK	INCLUDED	6 O'CLOCK (3)
1	20 AWG	48"	+5 VOLTS FOR SENSOR	BROWN	INCLUDED	10 O'CLOCK (2)
3	20 AWG	48"	GROUND / SHIELD FOR SENSOR	BLUE & CABLE SHIELD	INCLUDED	2 O'CLOCK (1)



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REV	DATE	DESCRIPTION	SPREADER CABLE SYSTEM			
A	9-9-03	-	M12 TO CONXALL			
B	-	-				
C	-	-				
D	-	-				
E	-	-				
DESIGN:	DRAWN:	AS BUILT:	PROJECT NUMBER:	SCALE:	DATE:	REV.
JTM	JTM	-	TS-2006	NONE	3-11-04	-
			SHT 1 OF 1			

EuroFast
Female Pins,
Female Threads
or Coupling Nut



4-pin



5-pin

EuroFast
Male Pins,
Male Threads
or Coupling Nut



4-pin



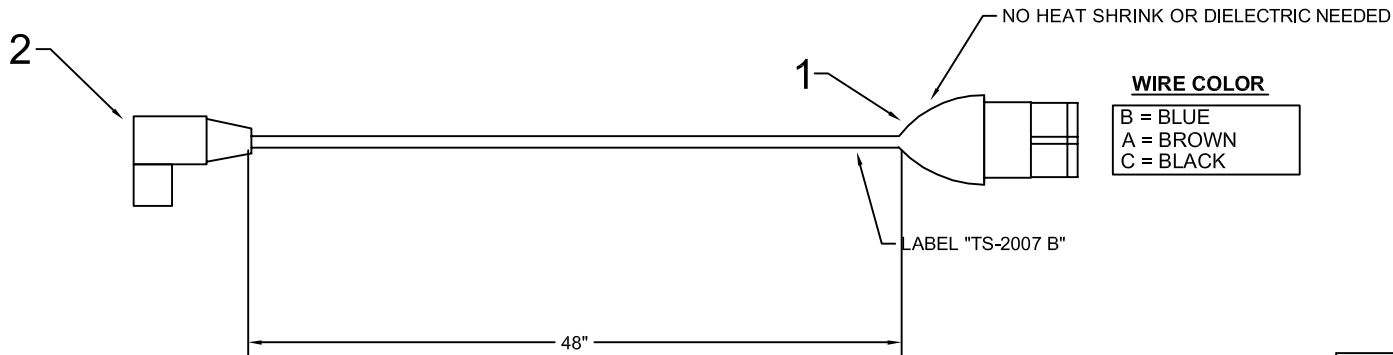
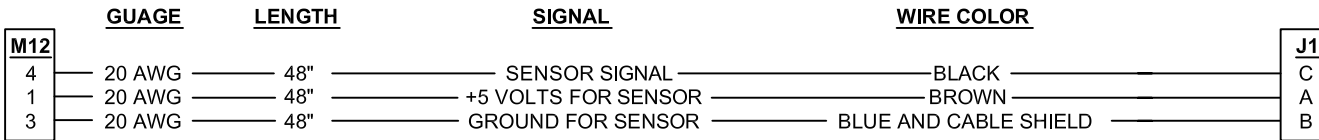
5-pin

B.O.M.

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	WAYTEK 38044	3 PIN WEATHERPACK (SHROUD HALF)
2	1	WS 4.4T-2/S653	M12 90 DEGREE AND CABLE
3	3	WAYTEK 30034	PINS WEATHER PACK
4	3	WAYTEK 39000	SEAL FOR WEATHER PACK

NOTES:

1. To specify nylon coupling nut, add "K" to part number.
For example: WK(S)...to WK(S)K...
2. To specify stainless steel coupling nut, add a "V" to part number.
For example: WK(S)... to WK(S)V...



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CONTROLS LLC
9200 WYOMING AVE. N. SUITE 320
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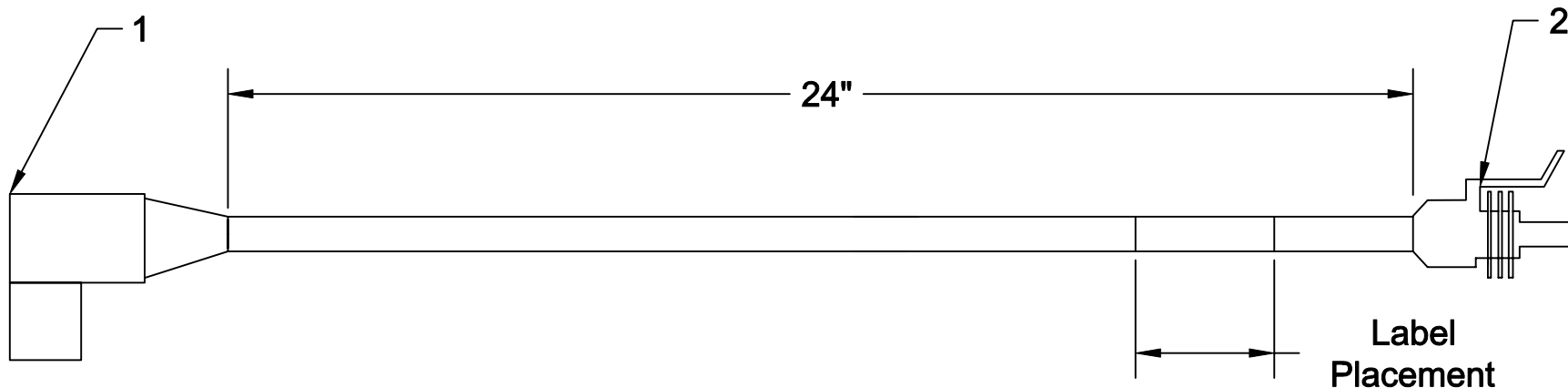
REV	DATE	DESCRIPTION			
A	3-16-05	CHANGED HEAT SHRINK NOTE	SPREADER CABLE SYSTEM		
B	1-23-07	CHANGED PINOUT OF WEATHER PACK			
C	-	-			
D	-	-			
E	-	-			
DESIGN: JTM			DRAWN: JTM		
AS BUILT: -			PROJECT NUMBER: TS-2007B		SCALE: NONE
			DATE: 1-23-07		REV: B
			SHT 1 OF 1		

WIRING DIAGRAM

M12	WP
1	
2	
3	1
4	2

B.O.M.

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	WS 4T - .5	M12 90 degree connector and cable
2	1	38043 (waytek)	weatherpack 2 pin (tower half)
3	2	30035 (waytek)	tower terminals 20- 18 awg
4	2	39000 (waytek)	weatherpack seals



Notes:

- 18 AWG, 2 Conductor cable
- Label to be white w/ black printing and located on cable per drawing. (mylar w/ clear cover, all caps, 15pt font)
- M12 MATES TO SENSOR BOX 4MB12-4P2

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

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 REPRODUCTION IN WHOLE OR PART WITH OUT
 PERMISSION IS ALLOWED.

REV	DATE	DESCRIPTION				
A	2-28-05	changed amp to WP				
B	-	-				
C	-	-				
D	-	-				
E	-	-				
DESIGN: JTM			DRAWN: JTM		AS BUILT: -	PROJECT NUMBER: TS-2010
					SCALE: NONE	DATE: 2-28-05
					SHT 1 OF 1	
						REV: A

SPREADER CABLE SYSTEM

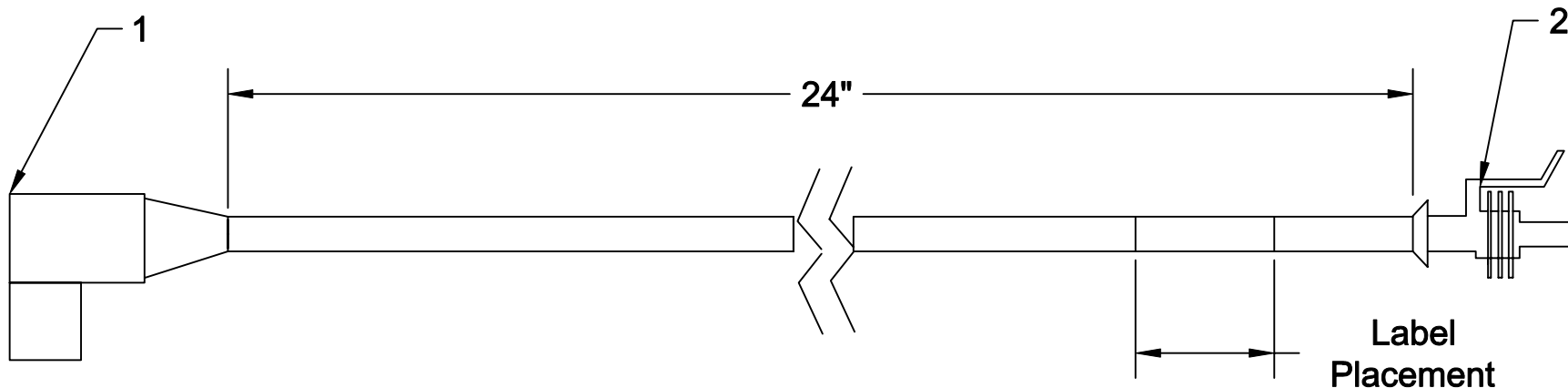
M12 TO WEATHERPACK

WIRING DIAGRAM

M12	AMP
1	
2	
3	1
4	2

B.O.M.

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	????	M12 90 degree connector and cable
2	1	282189 - 1	AMP Junior Timer RECEPTACLE
3	2	929930 - 3	FEMALE TERMINAL for AMP Junior Timer
4	2	828905 - 1	18 AWG SEAL for AMP Junior Timer



Notes:

- 18 AWG, 2 Conductor cable
- Label to be white w/ black printing and located on cable per drawing. (mylar w/ clear cover, all caps, 15pt font)
- M12 MATES TO SENSOR BOX 4MB12-4P2

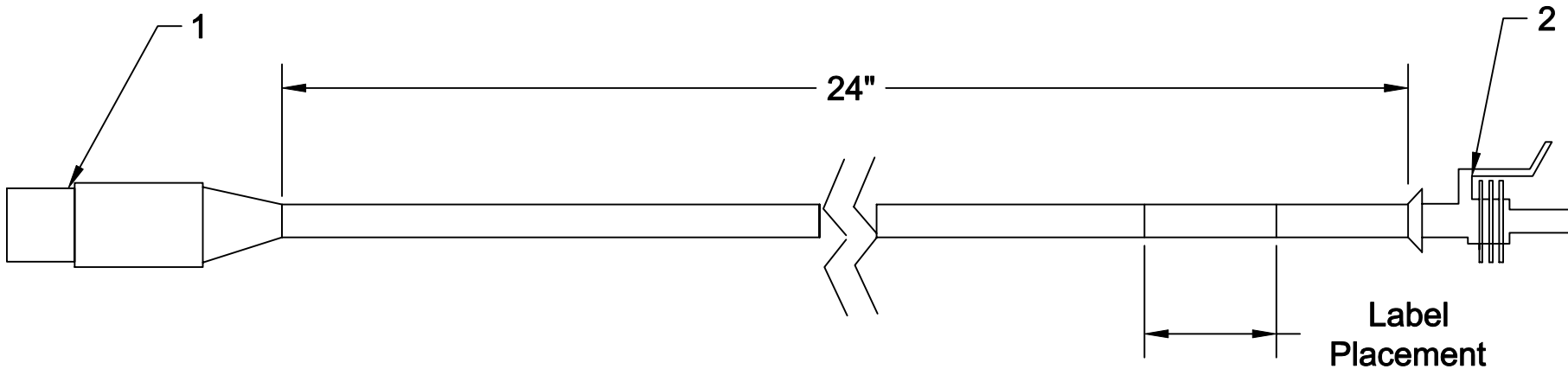
Cirus Controls 9200 Wyoming Ave. N, Suite 320
 Brooklyn Park, MN 55445
 Tel: (763) 493-9380
 Fax: (763) 493-9340

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 REPRODUCTION IN WHOLE OR PART WITH OUT
 PERMISSION IS ALLOWED.

REV	DATE	DESCRIPTION				
A	-	-	SPREADER CABLE SYSTEM			
B	-	-	M12 TO AMP JR Timer			
C	-	-				
D	-	-				
E	-	-				
DESIGN:	DRAWN:	AS BUILT:	PROJECT NUMBER:	SCALE:	DATE:	REV.
JTM	JTM	-	TS-2011	NONE	9-27-04	-
					SHT 1 OF 1	

B.O.M.

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	????	M12 connector and cable
2	1	282080-1	AMP Superseal 1.5 RECEPTACLE
3	2	183025-1	FEMALE TERMINAL for Superseal 1.5
4	2	281934-2	18 AWG SEAL for Superseal 1.5



Notes:

- 18 AWG, 2 Conductor cable
- Label to be white w/ black printing and located on cable per drawing. (mylar w/ clear cover, all caps, 15pt font)
- M12 MATES TO SENSOR BOX 4MB12-4P2

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

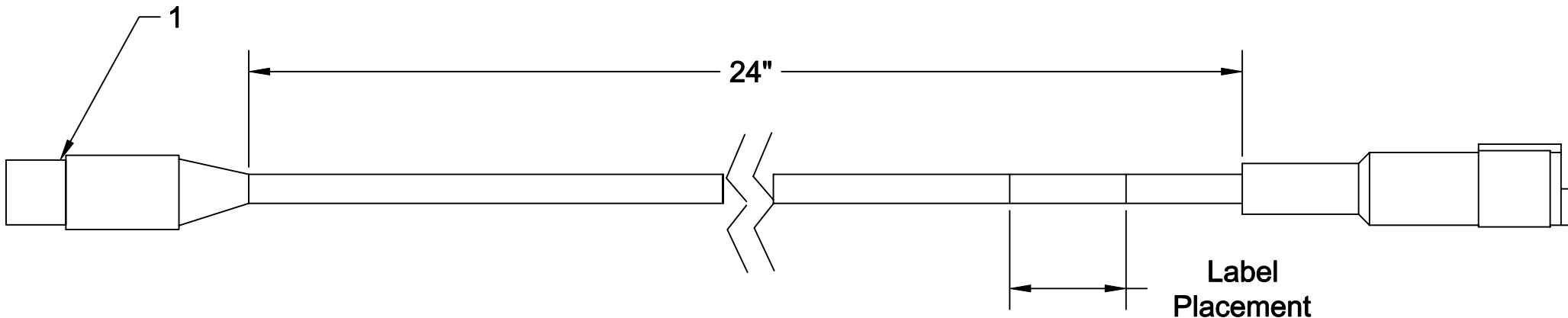
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 REPRODUCTION IN WHOLE OR PART WITH OUT
 PERMISSION IS ALLOWED.

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

DESIGN: JTM		DRAWN: JTM		AS BUILT: -		PROJECT NUMBER: TS-2012		SCALE: NONE		DATE: 3-29-04		REV: -	
SPREADER CABLE SYSTEM													
M12 TO AMP PLUG													
SHT 1 OF 1													

B.O.M.

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	????	M12 connector and cable
2	1	317-1398-000	SURESEAL BOOT
3	1	120-1804-000	SURESEAL RECEPTACLE
4	1	031-1267-001	SURESEAL TIN SOCKET
5	1	030-2196-001	SURESEAL TIN PIN



Notes:

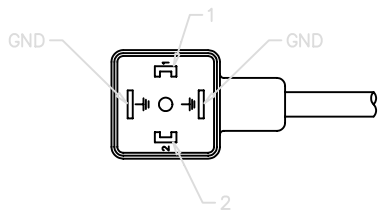
- 18 AWG, 2 Conductor cable
- Label to be white w/ black printing and located on cable per drawing. (mylar w/ clear cover, all caps, 15pt font)
- M12 MATES TO SENSOR BOX 4MB12-4P2

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

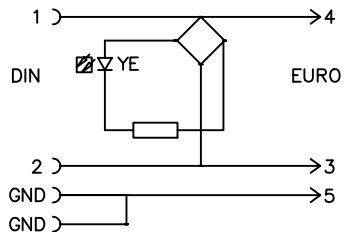
THIS DRAWING IS THE PROPERTY OF CIRUS CONTROLS
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 PERMISSION IS ALLOWED.

REV	DATE	DESCRIPTION											
A	-	-	SPREADER CABLE SYSTEM										
B	-	-											
C	-	-											
D	-	-											
E	-	-											
M12 TO ITT CANNON PLUG													
DESIGN:	JTM	DRAWN:	JTM	AS BUILT:	-	PROJECT NUMBER:	TS-2013	SCALE:	NONE	DATE:	3-29-04	REV.	-
											SHT 1 OF 1		

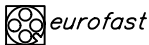
DIN 43650 (FEMALE)



WIRING DIAGRAM

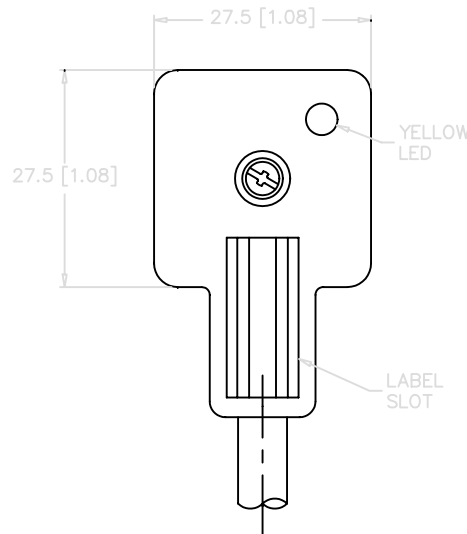
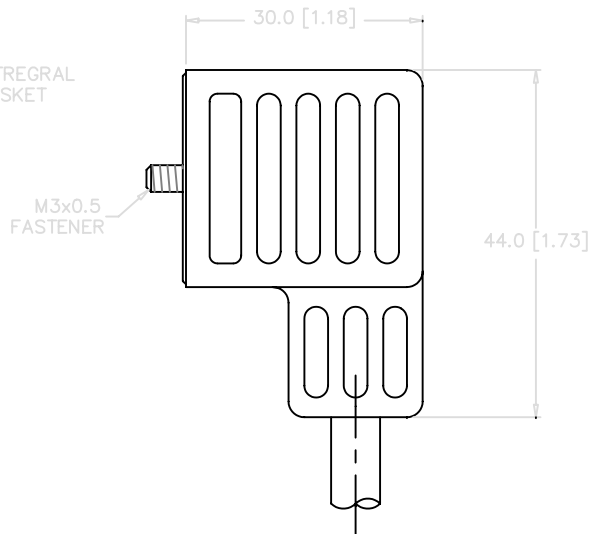
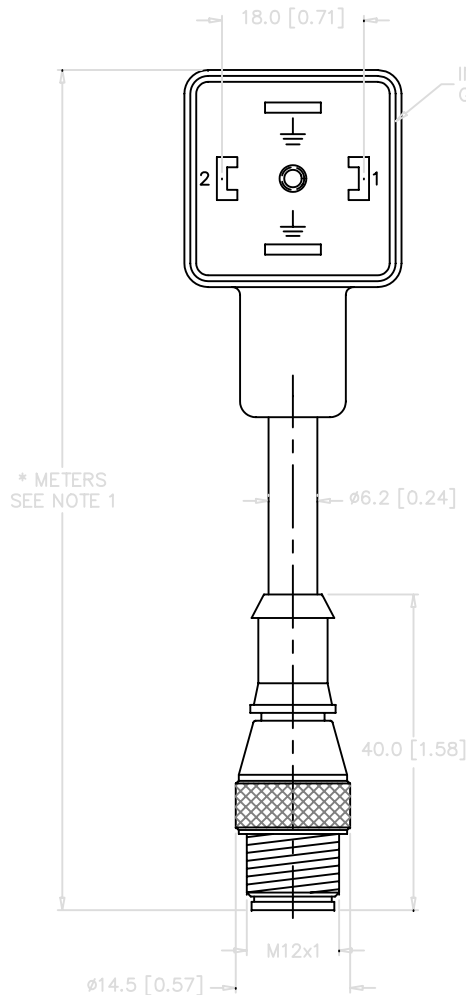


MALE END VIEW



SPECIFICATIONS

CONTACT CARRIER MATERIAL	NYLON OR PUR
CONTACT MATERIAL/PLATING (VALVE)	SILVER-PLATED BRASS
CONTACT MATERIAL/PLATING (EUROFAST)	GOLD-PLATED BRASS
MOLDED HEAD MATERIAL	POLYURETHANE
COUPLING NUT MATERIAL	NICKEL-PLATED BRASS
RATED CURRENT	4.0 A
RATED VOLTAGE	24-48 VAC/DC
OUTER JACKET MATERIAL/COLOR	PUR/GREY
NUMBER OF CONDUCTORS	3x18 AWG
CONDUCTOR INSULATION	PVC
TEMPERATURE RATING	-40°C to +105°C (-40°F to +221°F)
PROTECTION CLASS	MEETS NEMA 1,3,4,6P AND IEC IP67



SKETCH ONLY
NOT "OFFICIAL" TURCK DRAWING

CIRUS CABLE # TS-2014

SOURCE DRAWING - FOR REFERENCE ONLY

NOTES:
1. "*" INDICATES CABLE LENGTH IN METERS. CONTACT TURCK TO ORDER SPECIFIC LENGTHS.

RELATED DOCUMENTS		3RD ANGLE PROJECTION			
1. 2. 3. 4.					
MATERIAL		TOLERANCES UNLESS OTHERWISE SPECIFIED		DRFT	DATE
				DSGN	SCALE
FINISH				UNIT OF MEASUREMENT	
				DESCRIPTION	
				VAS 22-B653-0.6M-RS 5.3T	
				IDENTIFICATION NO.	
				TS-2014	
				REV	
				DO NOT SCALE THIS DRAWING	
				FILE:	
				SHEET OF	

REV	DESCRIPTION	BY	DATE	ECO NO.
A	DRAWING RELEASE	JB	02/11/03	

B.O.M.

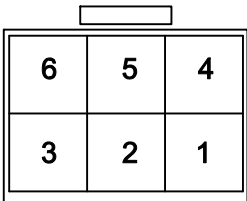
NOTES:

- AVAILABLE CABLES FOR DIFFERENT VALVE TYPES (ORDER INDIVIDUALLY):
 PN# VAS 22-B653-6M-WS 5.3T (DIN VALVE)
- PLUG FOR PORTS NOT USED:
 PN# VZ-3

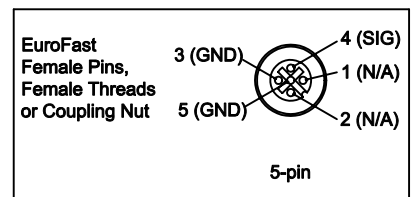
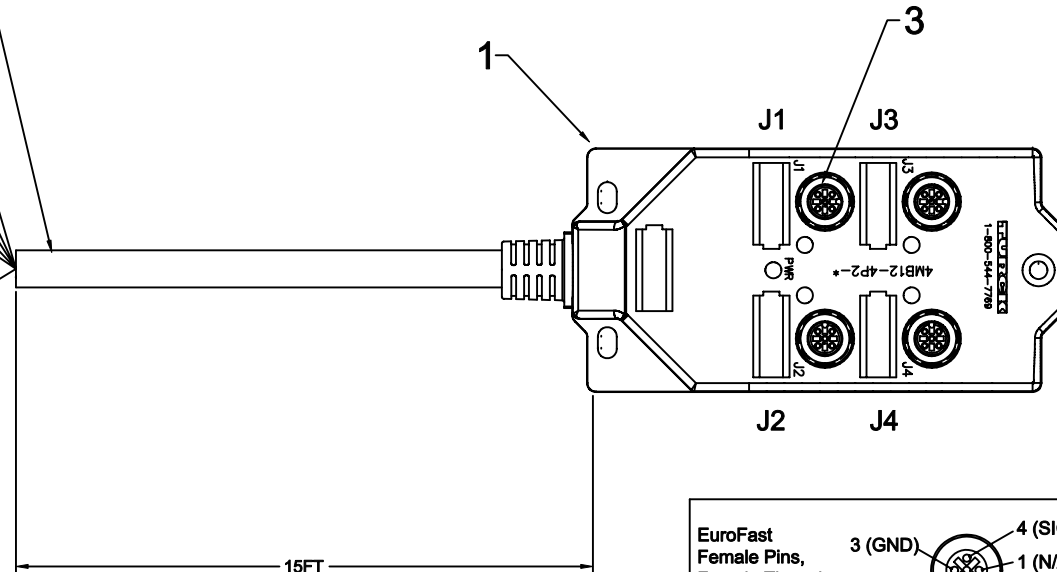
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	4MB12 - 4P2	HYDRAULIC TRUNK AND BOX (TURCK)
2	1	39-01-2060 (Digi-Key #WM3702-ND)	MOLEX 6 PIN
3	6	39-00-0039 (Digi-Key #WM2501-ND)	MOLEX TERMINALS 18-24 AWG
4	1	WAYTEK 30513	.250 FEMALE SPADE
5	1	WAYTEK 30512	.250 MALE SPADE

LABEL CABLE WITH "TS-2018 HYD OUT"

MOLEX PIN#	HYD C	SPDR	SIGNAL
1	GROUND	GROUND	BLUE
2	BLADE LEFT	ANTI-ICE	GRAY (J4)
3	BLADE UP	SPINNER	GREEN (J2)
4	GROUND	GROUND	GREEN/YELLOW
5	BLADE RIGHT	PRE-WET	YELLOW (J3)
6	BLADE DOWN	AUGER	WHITE (J1)



**BACK VIEW
(SIDE PINS ARE INSERTED FROM)**



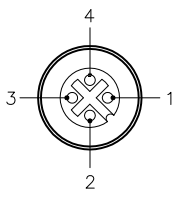
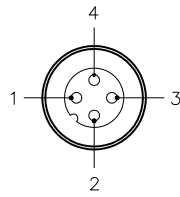
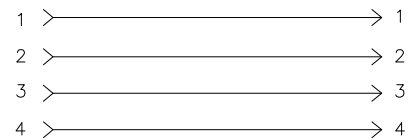
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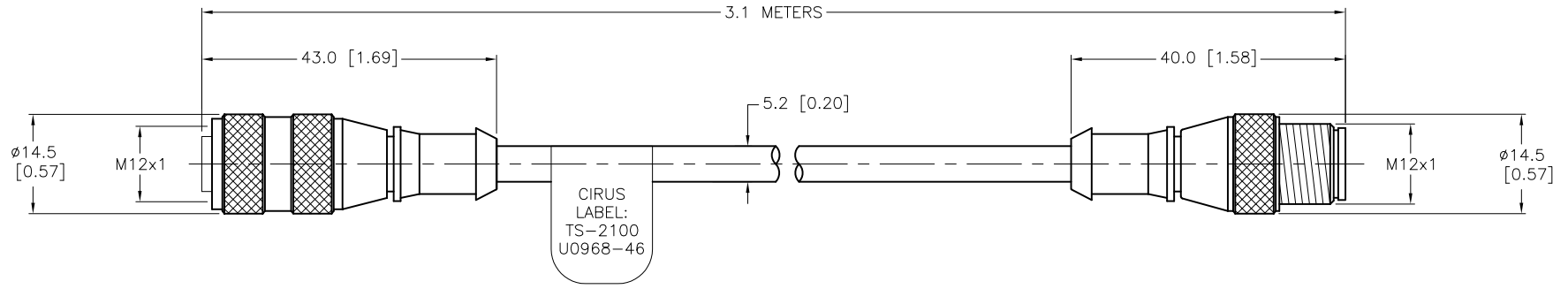
REV	DATE	DESCRIPTION
A	11-18-04	ADDED HYD C FUNCTIONS
B	-	-
C	-	-
D	-	-
E	-	-

DESIGN: JTM DRAWN: JTM AS BUILT: -

CIRUS CONTROLS LLC
 9200 WYOMING AVE. N. SUITE 320
 BROOKLYN PARK, MN 55445
 Phone: (763) 493-9380
 Fax: (763) 493-9340

SPREADER CABLE SYSTEM			
HYDRAULIC CABLE			
PROJECT NUMBER:	SCALE:	DATE:	REV:
TS-2018	NONE	11-18-04	A
SHT 1 OF 1			

FEMALE END VIEW	MALE END VIEW	WIRING DIAGRAM	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



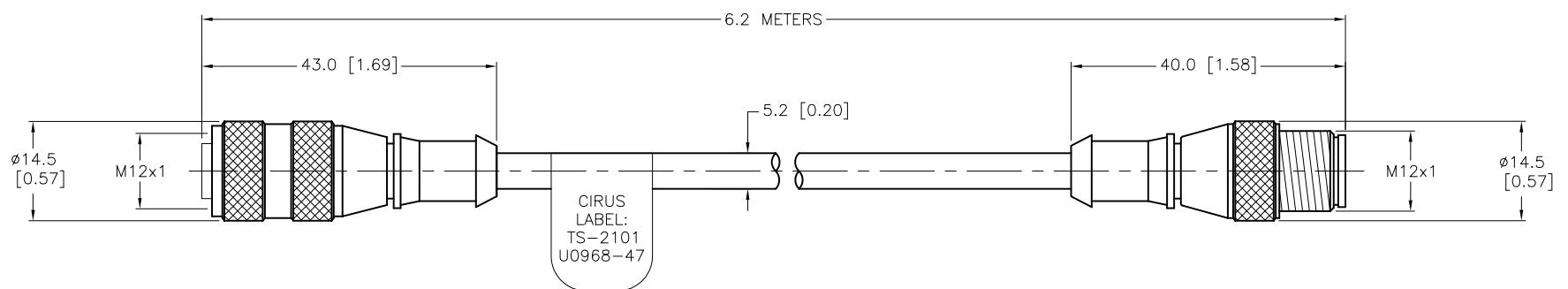
CABLE LENGTH	TOLERANCE
ALL LENGTHS	+ 4% (OR 50mm) OF LENGTH - 0% (OR 0mm) OF LENGTH WHICHEVER IS GREATER
STRIP LENGTH	TOLERANCE
0-7mm	±0.5mm
8-29mm	±1.0mm
30-49mm	±2.0mm
50-69mm	±3.0mm
70-100mm	±4.0mm
OVER 100mm	±5.0mm

SOURCE DRAWING - FOR REFERENCE ONLY

RELATED DOCUMENTS	3RD ANGLE PROJECTION	THIS DOCUMENT IS PROPERTY OF TURCK INC. USE OF THIS DOCUMENT WITHOUT WRITTEN PERMISSION IS PROHIBITED.		TURCK INC High Technology Sensors and Automation Controls 3000 CAMPUS DRIVE MINNEAPOLIS, MN 55441 1-800-544-7769 (763) 553-7300 (763) 553-0708 fax turck.com	
1.		DRFT	JB	DATE	04/29/04
2.		DSGN	JB	SCALE	1=1.0
3.	TOLERANCES UNLESS OTHERWISE SPECIFIED	UNIT OF MEASUREMENT		DESCRIPTION	
4.	0.5 TO 6 ±0.1 6 TO 30 ±0.2 30 TO 200 ±0.3 OVER 200 ±0.4 ANGLES ±1° ALL INCH DIMENSIONS ARE REFERENCE ONLY	MILLIMETER [INCH]		TS-2100	
MATERIAL	SEE SPECIFICATIONS	DO NOT SCALE THIS DRAWING		IDENTIFICATION NO.	
FINISH	SEE SPECIFICATIONS			O0968-46	
				REV	
				A	
				FILE: CIRUS\U0968-46	
				SHEET 1 OF 1	

A	DRAWING RELEASE	PJ	07/14/04	
REV	DESCRIPTION	BY	DATE	ECO NO.

FEMALE END VIEW	MALE END VIEW	WIRING DIAGRAM	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

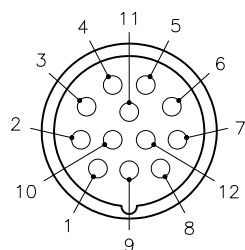
SOURCE DRAWING - FOR REFERENCE ONLY

RELATED DOCUMENTS	3RD ANGLE PROJECTION	THIS DOCUMENT IS PROPERTY OF TURCK INC. USE OF THIS DOCUMENT WITHOUT WRITTEN PERMISSION IS PROHIBITED.		TURCK INC High Technology Sensors and Automation Controls 3000 CAMPUS DRIVE MINNEAPOLIS, MN 55441 1-800-544-7769 (763) 553-7300 (763) 553-0708 fax turck.com	
1.		DRFT	JB	DATE	04/29/04
2.		DSGN	JB	SCALE	1=1.0
3.	TOLERANCES UNLESS OTHERWISE SPECIFIED	UNIT OF MEASUREMENT		DESCRIPTION	
4.	0.5 TO 6 ±0.1 6 TO 30 ±0.2 30 TO 200 ±0.3 OVER 200 ±0.4 ANGLES ±1° ALL INCH DIMENSIONS ARE REFERENCE ONLY	MILLIMETER [INCH]		TS-2101	
MATERIAL	SEE SPECIFICATIONS	DO NOT SCALE THIS DRAWING		IDENTIFICATION NO.	
FINISH	SEE SPECIFICATIONS			O0968-47	
				REV	
				A	
				FILE: CIRUS\U0968-47	
				SHEET 1 OF 1	

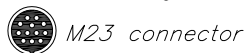
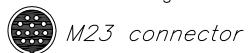
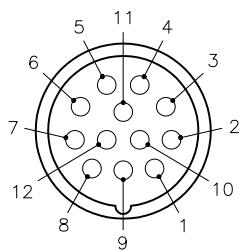
A	DRAWING RELEASE	PJ	07/14/04	
REV	DESCRIPTION	BY	DATE	ECO NO.

MALE END VIEW

FEMALE END VIEW

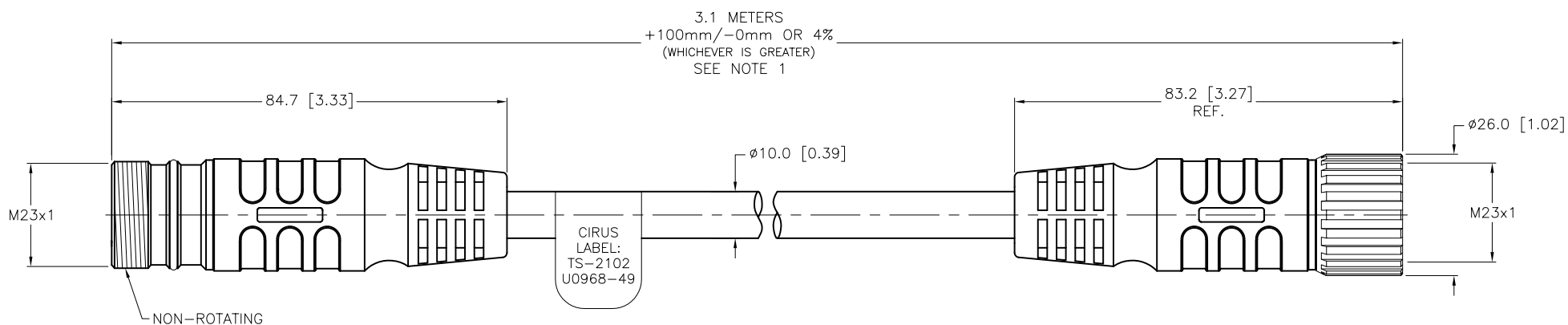


- 1 = BROWN
- 2 = BLUE
- 3 = WHITE
- 4 = GREEN/YELLOW
- 5 = ORANGE
- 6 = YELLOW
- 7 = GREY
- 8 = PINK
- 9 = RED
- 10 = BROWN/WHITE
- 11 = BLUE/WHITE
- 12 = GREEN/WHITE



SPECIFICATIONS

CONTACT CARRIER MATERIAL	NYLON or PBT
MOLDED HEAD MATERIAL/COLOR	THERMOPLASTIC PUR/BLACK
CONTACT MATERIAL/PLATING	GOLD-PLATED BRASS
COUPLING NUT MATERIAL/PLATING	NICKEL-PLATED BRASS
RATED CURRENT [A]	8.0 A MAX, (TOTAL CURRENT NOT TO EXCEED 82 AMPS)
RATED VOLTAGE [V]	300 V
OUTER JACKET MATERIAL/COLOR	PVC/YELLOW
CONDUCTOR INSULATION MATERIAL	PVC
NUMBER OF CONDUCTORS [AWG]	12x18 AWG
DRAIN/SHIELD	20 AWG DRAIN/POLYESTER FOIL SHIELD
TEMPERATURE RANGE	-40°C to +105°C (-40°F to +221°F)
PROTECTION CLASS	IEC IP67



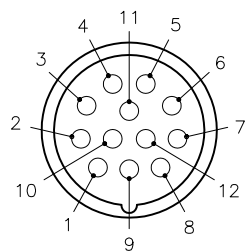
SOURCE DRAWING - FOR REFERENCE ONLY

RELATED DOCUMENTS 1. 2. 3. 4.	3RD ANGLE PROJECTION 	THIS DOCUMENT IS PROPERTY OF TURCK INC. USE OF THIS DOCUMENT WITHOUT WRITTEN PERMISSION IS PROHIBITED.		3000 CAMPUS DRIVE MINNEAPOLIS, MN 55441 1-800-544-7769 (763) 553-7300 (763) 553-0708 fax turck.com	
	MATERIAL SEE SPECIFICATIONS	TOLERANCES UNLESS OTHERWISE SPECIFIED	DRFT JBJ	DATE 04/29/04	DESCRIPTION TS-2102
		0.5 TO 6 ±0.1 6 TO 30 ±0.2 30 TO 200 ±0.3 OVER 200 ±0.4 ANGLES ±1°	DSGN	SCALE NONE	
	FINISH SEE SPECIFICATIONS	UNIT OF MEASUREMENT MILLIMETER [INCH]	IDENTIFICATION NO. U0968-49		REV A
	ALL INCH DIMENSIONS ARE REFERENCE ONLY	DO NOT SCALE THIS DRAWING		FILE: CIRUS\U0968-49	SHEET 1 OF 1

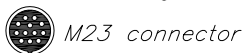
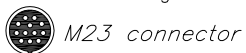
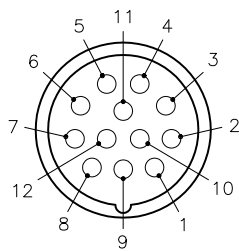
A	DRAWING RELEASE	PJ	07/14/04	
REV	DESCRIPTION	BY	DATE	ECO NO.

MALE END VIEW

FEMALE END VIEW

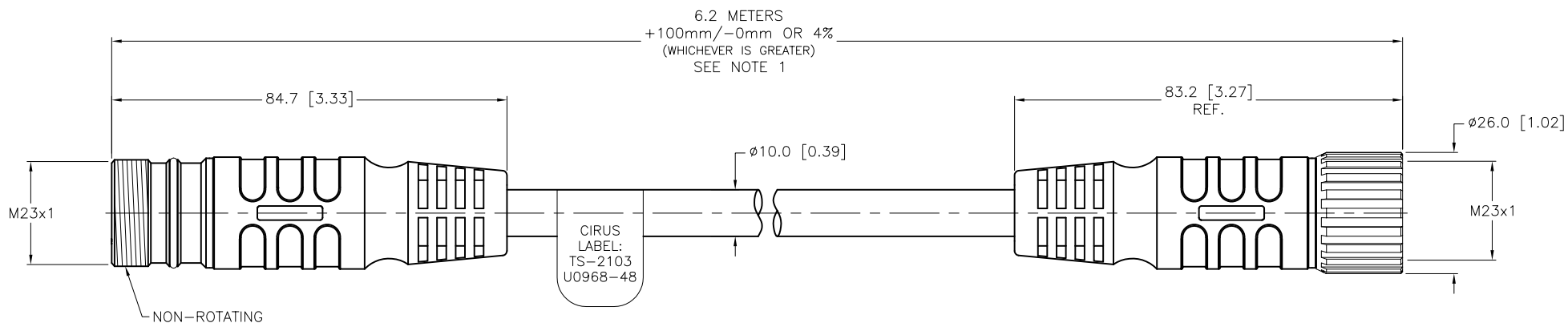


- 1 = BROWN
- 2 = BLUE
- 3 = WHITE
- 4 = GREEN/YELLOW
- 5 = ORANGE
- 6 = YELLOW
- 7 = GREY
- 8 = PINK
- 9 = RED
- 10 = BROWN/WHITE
- 11 = BLUE/WHITE
- 12 = GREEN/WHITE



SPECIFICATIONS

CONTACT CARRIER MATERIAL	NYLON or PBT
MOLDED HEAD MATERIAL/COLOR	THERMOPLASTIC PUR/BLACK
CONTACT MATERIAL/PLATING	GOLD-PLATED BRASS
COUPLING NUT MATERIAL/PLATING	NICKEL-PLATED BRASS
RATED CURRENT [A]	8.0 A MAX, (TOTAL CURRENT NOT TO EXCEED 82 AMPS)
RATED VOLTAGE [V]	300 V
OUTER JACKET MATERIAL/COLOR	PVC/YELLOW
CONDUCTOR INSULATION MATERIAL	PVC
NUMBER OF CONDUCTORS [AWG]	12x18 AWG
DRAIN/SHIELD	20 AWG DRAIN/POLYESTER FOIL SHIELD
TEMPERATURE RANGE	-40°C to +105°C (-40°F to +221°F)
PROTECTION CLASS	IEC IP67



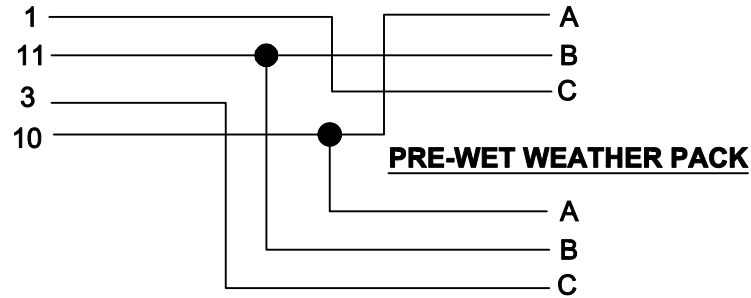
SOURCE DRAWING - FOR REFERENCE ONLY

RELATED DOCUMENTS 1. 2. 3. 4.	3RD ANGLE PROJECTION 	THIS DOCUMENT IS PROPERTY OF TURCK INC. USE OF THIS DOCUMENT WITHOUT WRITTEN PERMISSION IS PROHIBITED.		3000 CAMPUS DRIVE MINNEAPOLIS, MN 55441 1-800-544-7769 (763) 553-7300 (763) 553-0708 fax turck.com	
	MATERIAL SEE SPECIFICATIONS	TOLERANCES UNLESS OTHERWISE SPECIFIED 0.5 TO 6 ±0.1 6 TO 30 ±0.2 30 TO 200 ±0.3 OVER 200 ±0.4 ANGLES ±1° ALL INCH DIMENSIONS ARE REFERENCE ONLY	DRFT JBJ DATE 04/29/04	DESCRIPTION TS-2103	
FINISH SEE SPECIFICATIONS		DSGN	SCALE NONE	IDENTIFICATION NO. U0968-48	REV A
		UNIT OF MEASUREMENT MILLIMETER [INCH]			
A DRAWING RELEASE	PJ 07/14/04	DO NOT SCALE THIS DRAWING		FILE: CIRUS\U0968-48	SHEET 1 OF 1

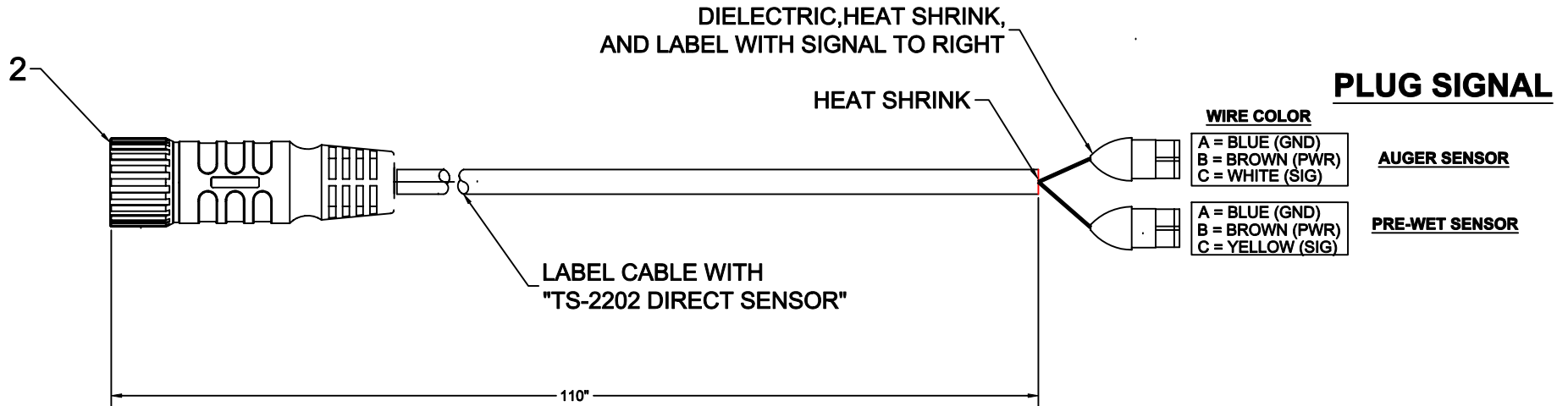
B.O.M.

M23 (FEMALE CONTACTS)

AUGER WEATHER PACK



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	CK-CC	CAP FOR CABLE TO BODY
2	1	CSM 12-7-3.3	DIRECT SENSOR CABLE FROM TRUCK
3	2	12010717 / WAYTEK 38044	3-PIN WEATHER PACK (SHROUD)
4	6	12124582 / WAYTEK 30034	PINS WEATHER PACK
5	6	12015289 / WAYTEK 39000	SEAL FOR WEATHER PACK



NOTES:

- AVAILABLE JUMPER CABLES FROM THE WEATHERPACK TO THE SENSOR (ORDERED INDIVIDUALLY):
 PN: SCS-1010 WEATHERPACK TO BRAD HARRISON
 PN: SCS-1011 WEATHERPACK TO CONEXALL
- NEEDS CABLE TS-2000 TO BE COMPLETE

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 WITH OUT PERMISSION IS ALLOWED.

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

DESIGN: JTM DRAWN: JTM AS BUILT: -

CIRUS Phone: (763) 493-9380
CONTROLS LLC Fax: (763) 493-9340
 9200 WYOMING AVE. N. SUITE 320
 BROOKLYN PARK, MN 55445

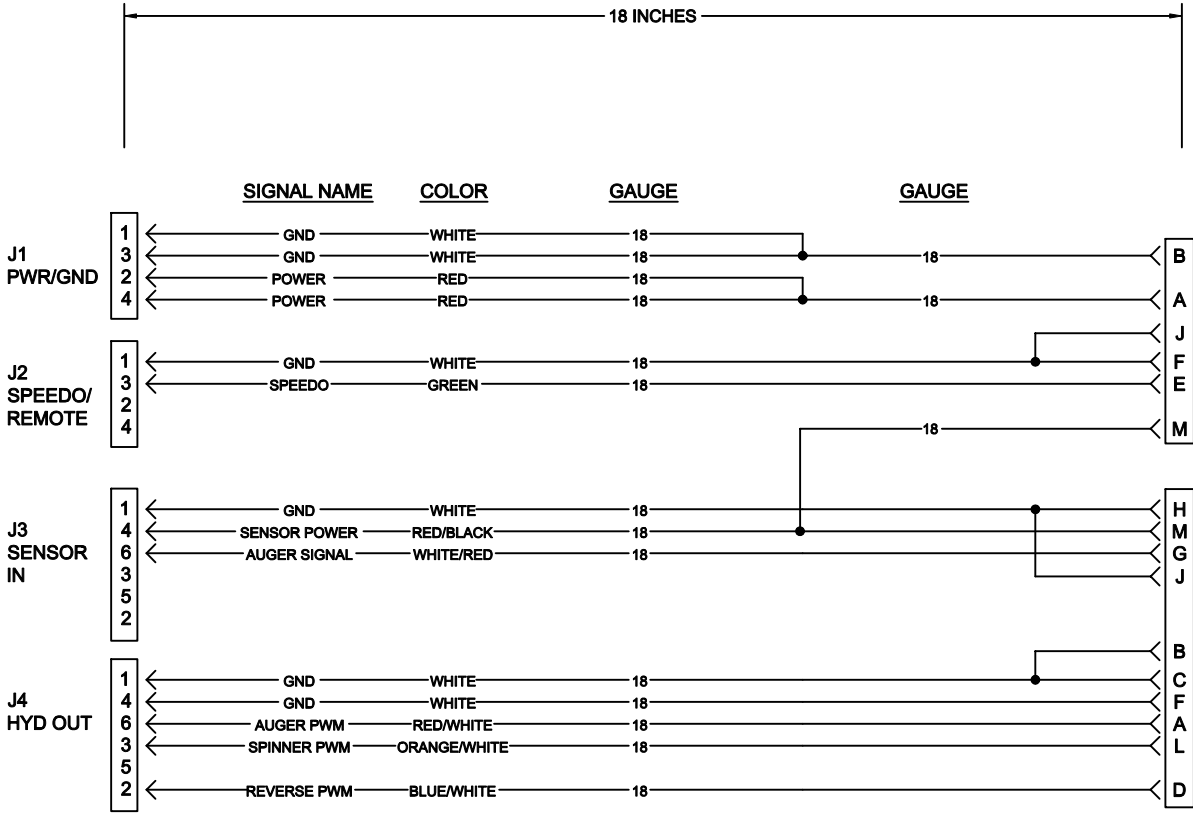
SPREADER CABLE SYSTEM

DIRECT AUGER/PREWET CABLE

PROJECT NUMBER: TS-2202	SCALE: NONE	DATE: 12-17-04	REV. -
		SHT 1 OF 1	

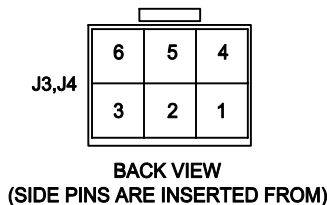
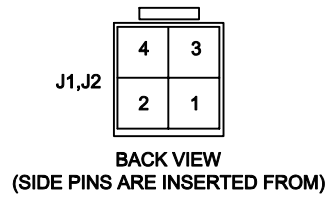
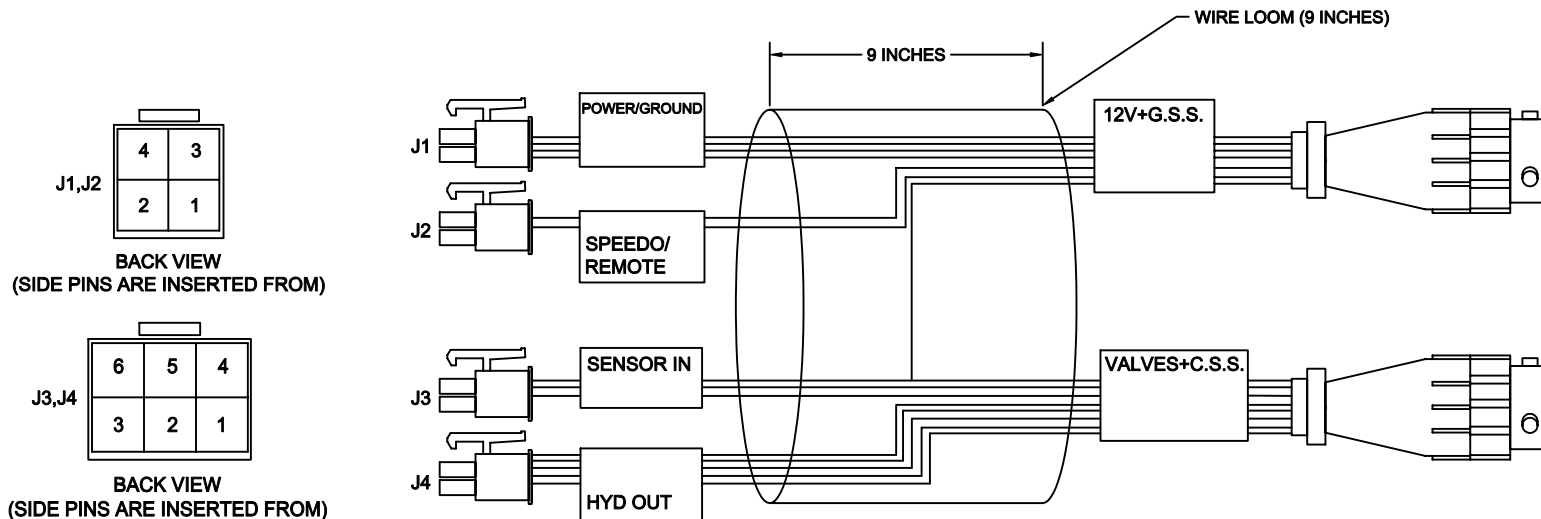
B.O.M.

CONN	QTY	PART NUMBER	DESCRIPTION
J1,J2	2	39-01-2040 (Digi-Key WM3701-ND)	MOLEX RECEPTACLE 4 PIN
J3,J4	2	39-01-2060 (Digi-Key WM3702-ND)	MOLEX RECEPTACLE 6 PIN
J1-J4	14	39-00-0039 (Digi-Key WM2501-ND)	MOLEX TERMINALS FEMALE 18-24 AWG
J5,J6	2	UTG014-12S	SOURIAU TRIM TRIO SOCKET SHELL
J5,J6	2	UTG14AC	SOURIAU TRIM TRIO BACKSHELL
J5,J6	16	SC16ML1TK6	SOCKET CONTACTS FOR TRIM TRIO



NOTES:

- 1) MARK WIRES WITH FLAG LABELS AS INDICATED
- 2) WIRE LOOM HARNESS IN CENTER



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REV	DATE	DESCRIPTION
A	11/10/05	Switched power/ground
B	12-23-05	ADDED HEATSHRINK
C	01/24/06	CHANGED HEAT SHRINK TO WIRE LOOM
D	-	-
E	-	-

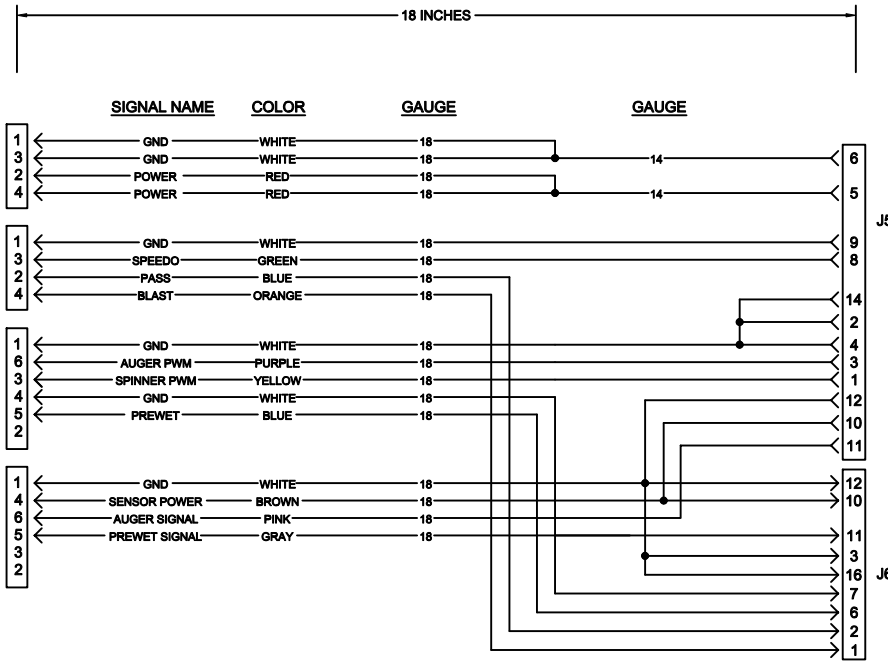
DESIGN: MVM DRAWN: MVM AS BUILT: -

CIRUS CONTROLS LLC
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 BROOKLYN PARK, MN 55445
 Phone: (763) 493-9380
 Fax: (763) 493-9340

SPREADER CABLE SYSTEM			
CS230 TO CIRUS CONSOLE ADAPTER			
PROJECT NUMBER: TS-4008	SCALE: NONE	DATE: 01-24-06	REV. C
		SHT 1 OF 1	

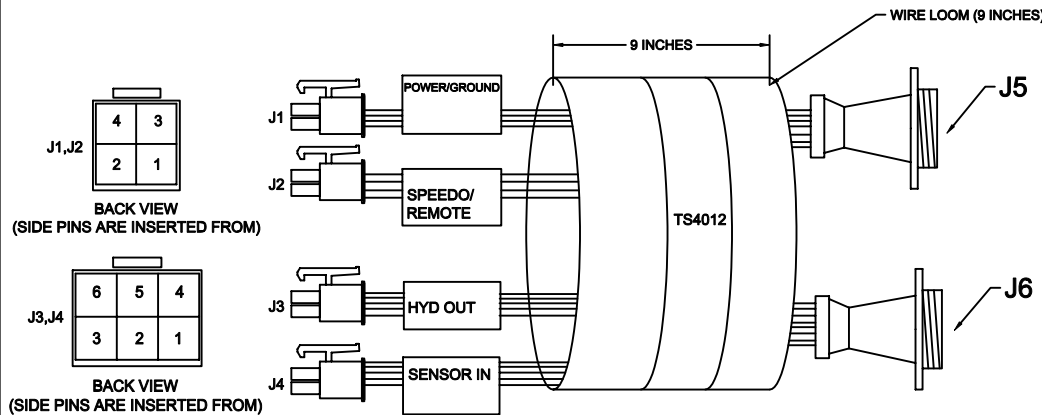
B.O.M.

CONN	QTY	PART NUMBER	DESCRIPTION
J1,J2	2	39-01-2040 (Digi-Key WM3701-ND)	MOLEX RECEPTACLE 4 PIN
J3,J4	2	39-01-2060 (Digi-Key WM3702-ND)	MOLEX RECEPTACLE 6 PIN
J1-J4	17	39-00-0039 (Digi-Key WM2501-ND)	MOLEX TERMINALS FEMALE 18-24 AWG
J5	1	206043-1	AMP CONNECTOR RECEPTACLE
J6	1	206036-1	AMP CONNECTOR RECEPTACLE
J5,J6	2	206070-1	SOCKET CONTACTS FOR TRIM TRIO
J5	12	66360-2	AMP SOCKET 14-18 AWG TIN-LEAD
J6	9	66361-2	AMP PIN 14-18 AWG TIN-LEAD
-	1	LCP-750	CORRUGATED LOOM, .750x9 INCHES



NOTES:

- 1) MARK WIRES WITH FLAG LABELS AS INDICATED
- 2) WIRE LOOM HARNESS IN CENTER
- 3) IMPRINT SIGNAL NAME ON WIRE
- 4) LABEL ENTIRE HARNESS WITH "TS-4012" ON CENTER OF WIRE LOOM
- 5) BAG CABLE ASSEMBLY



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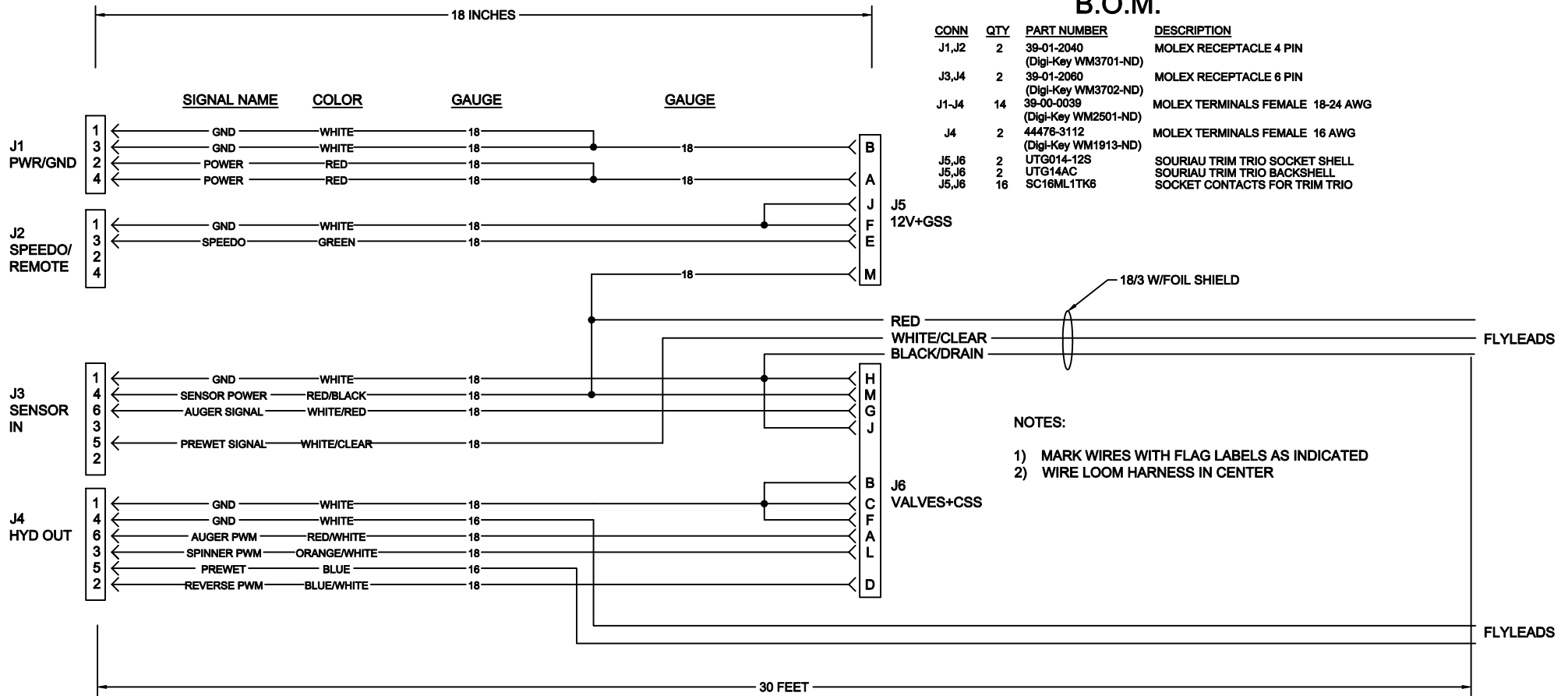
REV	DATE	DESCRIPTION
A	07/31/06	Changed colors to solid only/label wire
B	10/30/06	Added bag and label instructions
C	-	-
D	-	-
E	-	-

DESIGN: MVM	DRAWN: MVM	AS BUILT: -	PROJECT NUMBER: TS-4012	SCALE: NONE	DATE: 10-30-06	REV: B
						SHT 1 OF 1

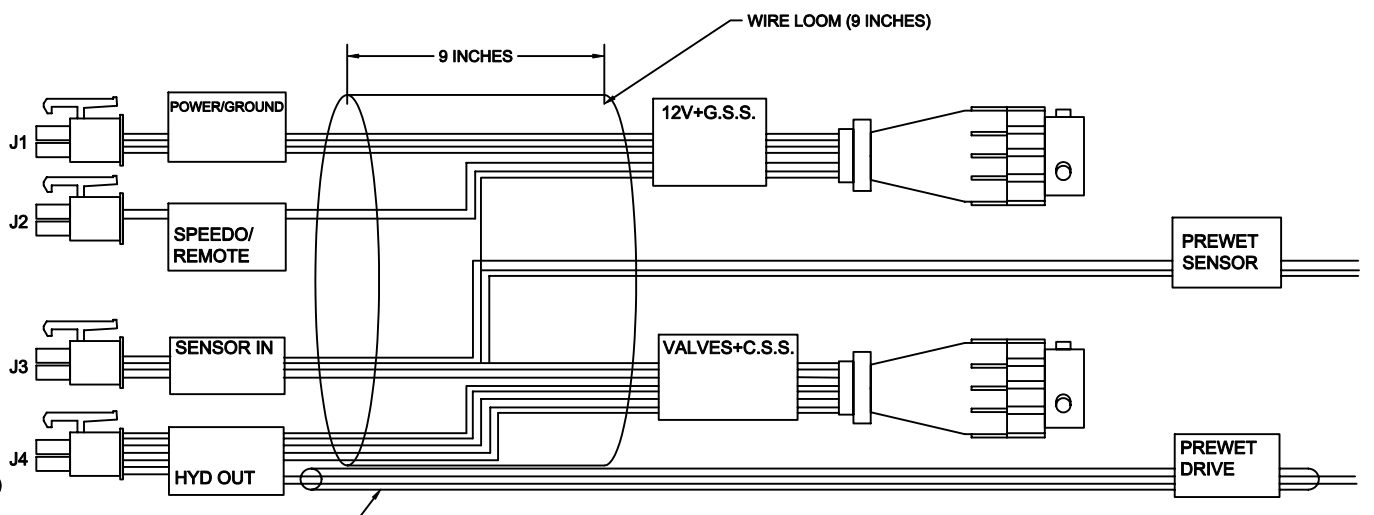
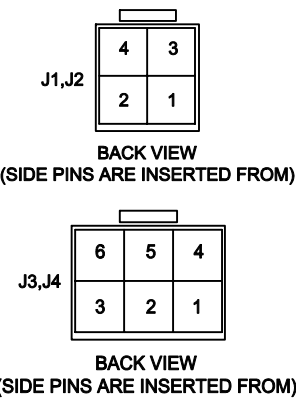
SPREADER CABLE SYSTEM
 GRS31 TO CIRUS CONSOLE ADAPTER

B.O.M.

CONN	QTY	PART NUMBER	DESCRIPTION
J1,J2	2	39-01-2040 (Digi-Key WM3701-ND)	MOLEX RECEPTACLE 4 PIN
J3,J4	2	39-01-2060 (Digi-Key WM3702-ND)	MOLEX RECEPTACLE 6 PIN
J1-J4	14	39-00-0039 (Digi-Key WM2501-ND)	MOLEX TERMINALS FEMALE 18-24 AWG
J4	2	44476-3112 (Digi-Key WM1913-ND)	MOLEX TERMINALS FEMALE 16 AWG
J5,J6	2	UTG014-12S	SOURIAU TRIM TRIO SOCKET SHELL
J5,J6	2	UTG14AC	SOURIAU TRIM TRIO BACKSHELL
J5,J6	16	SC16ML1TK6	SOCKET CONTACTS FOR TRIM TRIO



- NOTES:**
- 1) MARK WIRES WITH FLAG LABELS AS INDICATED
 - 2) WIRE LOOM HARNESS IN CENTER



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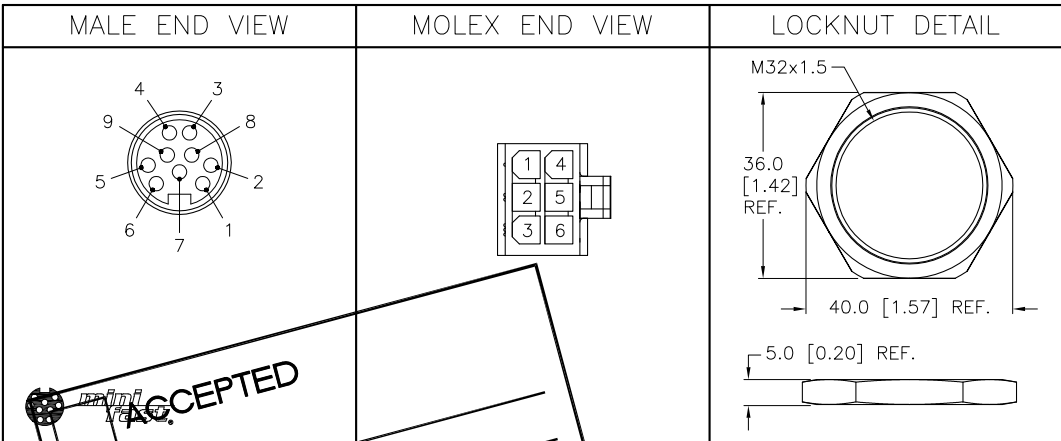
REV	DATE	DESCRIPTION
A	-	-
B	-	-
C	-	-
D	-	-
E	-	-

DESIGN: MVM	DRAWN: MVM	AS BUILT: -	PROJECT NUMBER: TS-4011	SCALE: NONE	DATE: 07-05-06	REV: -
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SPREADER CABLE SYSTEM

CS230 TO CIRUS CONSOLE ADAPTER

SHT 1 OF 1



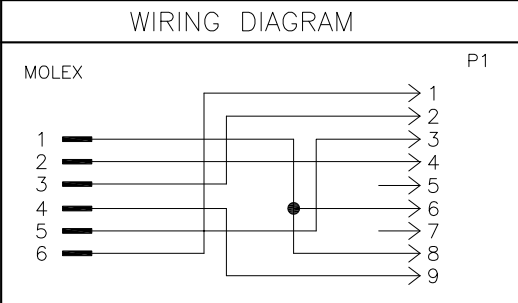
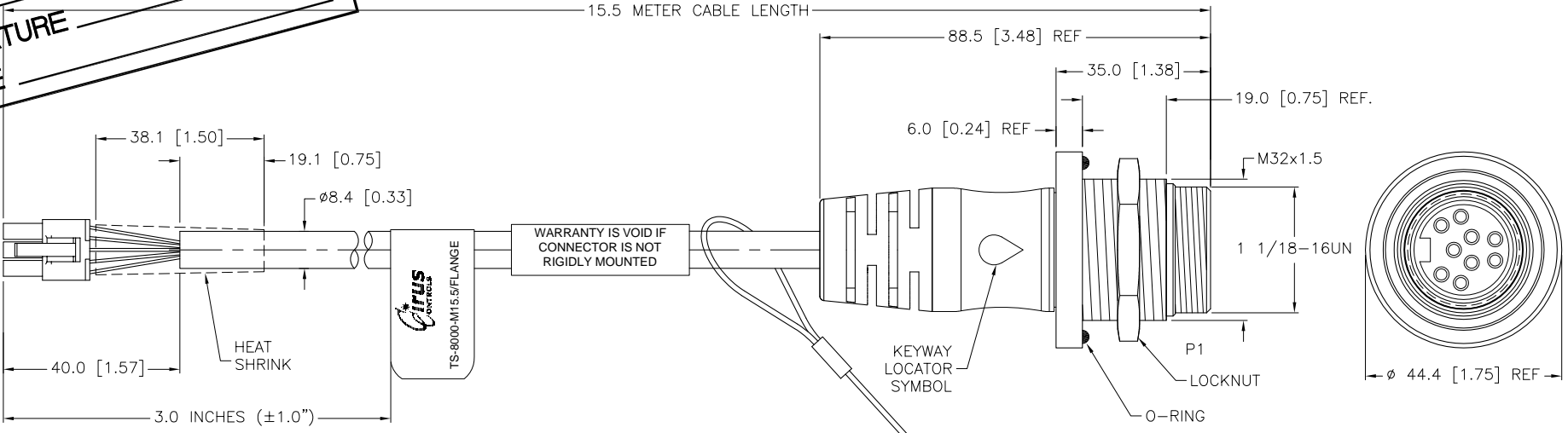
SPECIFICATIONS	
CONTACT CARRIER MATERIAL/COLOR	THERMOPLASTIC PUR/YELLOW
MOLDED HEAD MATERIAL/COLOR	THERMOPLASTIC PUR/YELLOW
CONTACT MATERIAL/PLATING	BRASS/GOLD
COUPLING NUT MATERIAL/PLATING	BRASS/NICKEL
RATED CURRENT [A]	7.0 A
RATED VOLTAGE [V]	300 V
OUTER JACKET MATERIAL/COLOR	PVC/YELLOW
CONDUCTOR INSULATION MATERIAL	PVC
NUMBER OF CONDUCTORS [AWG]	7x18 AWG
DRAIN/SHIELD	20 AWG DRAIN/POLYESTER FOIL SHIELD
TEMPERATURE RANGE	-40°C to +105°C (-40°F to +221°F)
PROTECTION CLASS	MEETS NEMA 1,3,4,6P AND IEC IP67

ACCEPTED

NAME _____

SIGNATURE _____

DATE _____



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

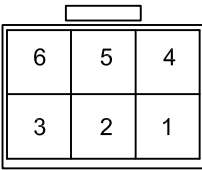
SOURCE DRAWING - FOR REFERENCE ONLY

- NOTES:
- TURCK EQUIVALENT: RSPM 90-15.5M/CS...
 - CABLE ASSEMBLY FOR MINIFAST ARE RATED AS STAND ALONE. OVERALL CABLE ASSEMBLY RATING IS THE RESPONSIBILITY OF THE CUSTOMER.

RELATED DOCUMENTS 1. NOTE 2. PRELIMINARY SPECIFICATIONS 3. 4.	3RD ANGLE PROJECTION 	THIS DRAWING IS PROPERTY OF TURCK INC. USE OF THIS DOCUMENT WITHOUT WRITTEN PERMISSION IS PROHIBITED.		TURCK INC High Technology Sensors and Automation Controls 3000 CAMPUS DRIVE MINNEAPOLIS, MN 55441 1-800-544-7769 (763) 553-7300 (763) 553-0708 fax turck.com	
	MATERIAL SEE SPECIFICATIONS	TOLERANCES UNLESS OTHERWISE SPECIFIED 0.5 TO 6 ±0.1 6 TO 30 ±0.2 30 TO 200 ±0.3 OVER 200 ±0.4 ANGLES ±1° ALL INCH DIMENSIONS ARE REFERENCE ONLY	DRFT RWC DSGN	DATE 04/09/09 SCALE 1=1.5	DESCRIPTION TS-8000-M15.5
FINISH SEE SPECIFICATIONS	UNIT OF MEASUREMENT MILLIMETER [INCH]	DO NOT SCALE THIS DRAWING		IDENTIFICATION NO.	REV P2
P2 CHANGE MOUNTING THREAD TO M32X1.5 REV DESCRIPTION	RDS 05/08/09 BY DATE ECO NO.	FILE: TS-8000-M15.5_FLANGE		SHEET 1 OF 1	

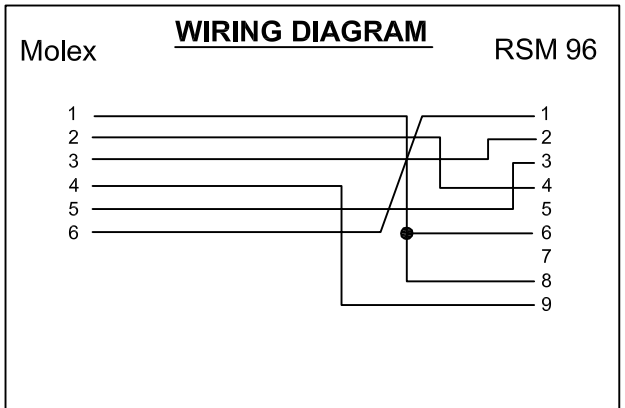
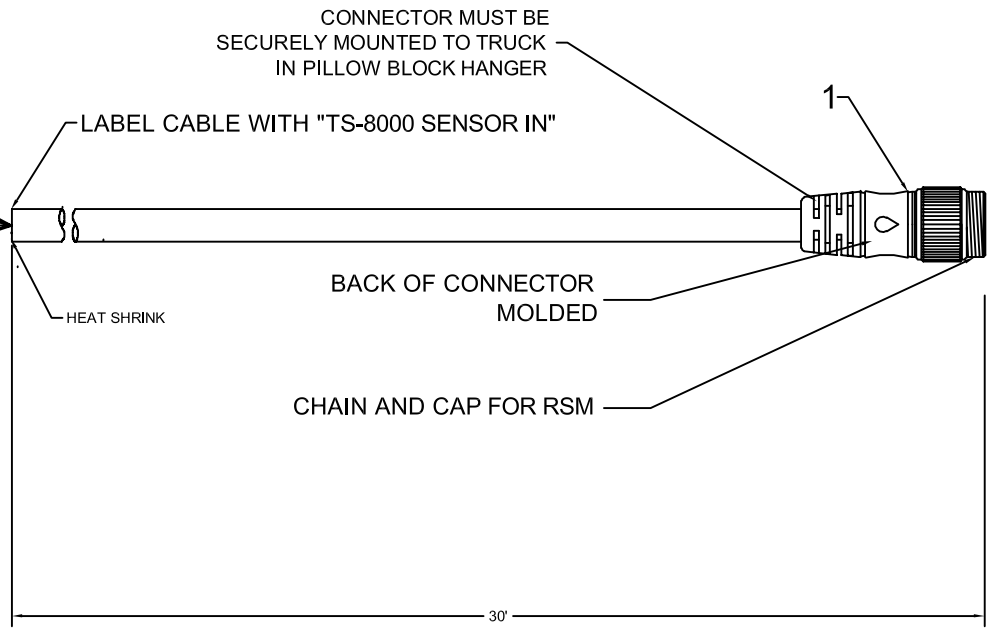
B.O.M.

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	RSM 96-10M/S90	MAIN SENSOR TRUNK (TURCK)
2	1	RKMC-CC	CAP FOR MAIN TRUNK
3	1	39-01-2060 (Digi-Key #WM3702-ND)	MOLEX 6 PIN
4	6	39-00-0039 (Digi-Key # WM2501-ND)	MOLEX TERMINALS 18-24 AWG



BACK VIEW
(SIDE PINS ARE INSERTED FROM)

MOLEX PIN#	SIGNAL
1	GROUND :GREEN/YELLOW
2	ANTI-ICE SENSOR : GRAY
3	SPINNER SENSOR : GREEN
4	POWER (5 VDC OR 12 VDC) : BROWN
5	PRE-WET SENSOR : YELLOW
6	AUGER SENSOR : WHITE



#TS-8000

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NOTE: THIS CABLE MATES TO TS-8001

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	-	-

DESIGN: JTM		AS BUILT: -	PROJECT NUMBER: TS-8000	SCALE: NONE	DATE: 9-5-08	REV: -
					SHT 1 OF 1	

SPREADER CABLE SYSTEM

SENSOR CABLE

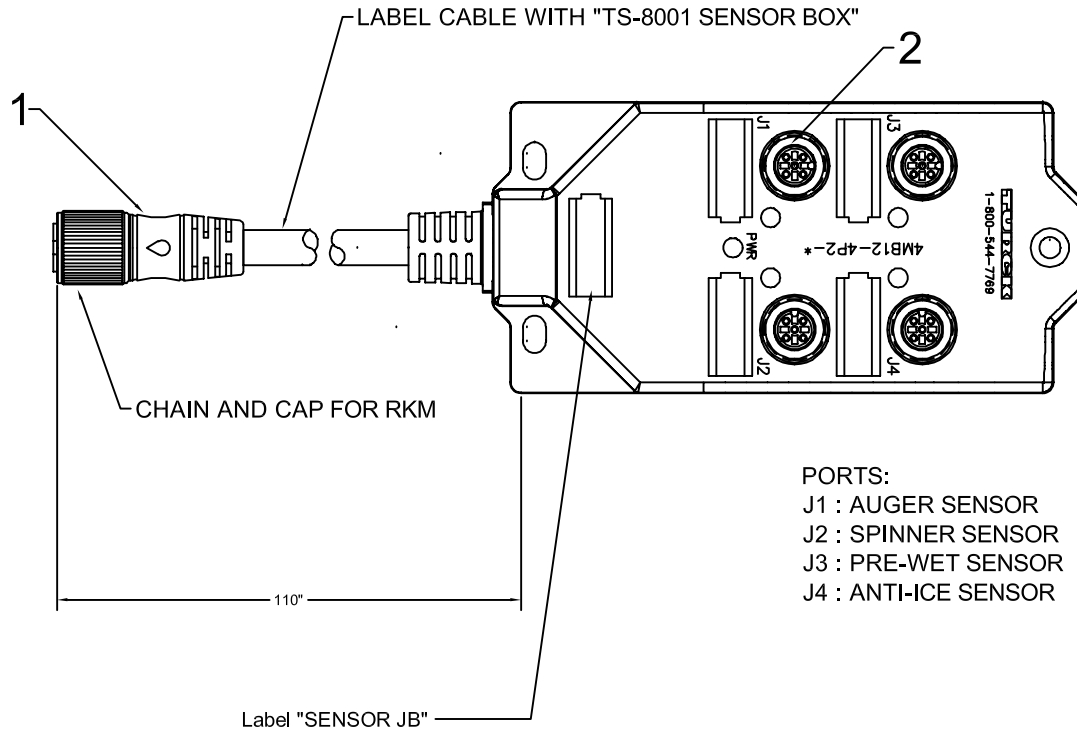
B.O.M.

NOTES:

1. NEEDS CABLE TS-8000 TO BE COMPLETE
2. AVAILABLE JUMPER CABLES FOR SENSORS (ORDERED INDIVIDUALLY):
PN# WK 4.5-1.3-WS 4.5T/S653 (WHITE MOTOR)
3. PLUGS FOR UNUSED PORTS:
PN# VZ-3

<u>ITEM</u>	<u>QTY</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
1	1	4MB12-4P2-2-RKM 96	VALVE BOX W/ CABLE (TURCK)
2	1 TO 3	VARIES	JUMPER CABLE TO SENSOR
3	1	RSMC-CC	CAP FOR CABLE TO BODY

<u>PIN</u>	<u>SIGNAL</u>
1	AUGER SIGNAL
2	SPINNER SIGNAL
3	PREWET SIGNAL
4	ANTI-ICE SIGNAL
6,8	GROUND
9	POWER



PORTS:
 J1 : AUGER SENSOR
 J2 : SPINNER SENSOR
 J3 : PRE-WET SENSOR
 J4 : ANTI-ICE SENSOR

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CONTROLS LLC
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REV	DATE	DESCRIPTION	PROJECT NUMBER	SCALE	DATE	REV.
A	-	-	TS-8001	NONE	9-5-08	-
B	-	-				
C	-	-				
D	-	-				
E	-	-				
DESIGN:	JTM	DRAWN:	JTM	AS BUILT:	-	SHT 1 OF 1

SPREADER CABLE SYSTEM

SENSOR BOX