

SC-12 Road Marking Control System Installation and Operation Manual



Skip-Line®

Road Marking & Monitoring Equipment

Leading the industry since 1972.

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PRELIMINARY DRAFT

Last modified: 12/15/19

After calibration of your system, use the following table to note your truck specific settings.

MENU	Value
Vehicle ID (Not a menu item)	
Footage Cal #	
Yellow Pump Cal #	
White Pump Cal #	
Left Air Offset	
Left Yellow Offset	
Left White Offset	
Left Bead Offset	
Right Air Offset	
Right Yellow Offset	
Right White Offset	
Right Bead Offset	

i. Warnings, Warranty, and Disclaimer

WARRANTY

Each unit of the SC-12 system is covered by a 30-day money-back guarantee. Buyer is responsible for determining suitability of this product for intended application prior to engaging in any contract that would rely on product functionality.

This product is also covered by a limited one year warranty. Products with defects in workmanship will be repaired or replaced at the sole discretion of Skip-Line, Inc. without charge for up to one year from date of invoice.

DISCLAIMER

All electronic equipment is subject to failure due to: Unanticipated use, non-compatibility of accessories, stress by mechanical vibration, electrical spikes, exposure to intermittent, poorly regulated, highly inductive, or noisy power sources, overload, temperature extremes, induced load-dump and welding currents, insulation chafing, improper wiring, poor cable routing, or stressed mounting. Indiscriminate high-pressure washing can cause moisture intrusion and corrosion.

All computerized systems can fail. Skip-Line, Inc. will not be held responsible or liable for any loss as a result of the use of this device, including but not limited to loss of time, money, opportunity, or personal injury. In no case shall Skip-Line, Inc. be responsible beyond the purchase price of this product.

IMPORTANT NOTE

Not all SC-12 units have exactly the same appearance, functionality, or graphical style. Some graphics contained in this manual may show patterns, functions, or features that are not installed on every unit and should not be relied upon for operational decisions. This system depends on the proper operation, calibration, and functionality of other devices in the Skip-Line product line. Full functionality may require purchase of further devices.

**Contents of this manual are subject
to change without notice.**

If your system lacks a feature found in this manual that you would like to have added, contact Skip-Line to see if it is possible.

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1. Overview

The Skip-Line SC-12 Road Marking Vehicle Control System is a comprehensive, networked control system for road marking vehicles. In addition to controlling road marking application and glass bead guns, the SC-12 can control most aspects of the entire vehicle, including hydraulic and pneumatic pressures, temperature controls, material application rates, lights, actuators, and more.

Some features covered in this manual may or may not have been included in your system. See your system-specific documentation. **If your system lacks a feature in this manual and you would like to have it added, contact Skip-Line to see if it is possible.**

The SC-12 system is comprised of a network of core devices. At a minimum, the devices required for this core system are:

- Core Skipper*
- Front Hub and Rear Hub*
- At least one Master Control Box*

Many optional devices are available also, and development on this system is on-going with new features added frequently. Currently, the following optional features are available:

- | | |
|--|---|
| <i>Additional Master Control Boxes</i> | <i>Thermocouple Input Box</i> |
| <i>Video Guidance & Overlay</i> | <i>Bi-Directional Motor Outputs</i> |
| <i>Switch Panel Boxes</i> | <i>Camera Controls</i> |
| <i>SC-12 Glass Cockpit</i> | <i>Light Controls</i> |
| <i>RPM Inputs</i> | <i>Arrow & Variable Message Board</i> |
| <i>Pulse Counter Inputs</i> | <i>Controls</i> |
| <i>Proportional (Analog) Inputs</i> | |
| <i>Proportional (Analog) Outputs</i> | |

There are several items that require attention before the first use of the system. **Before connecting to road marking equipment, read all warnings in the preface of this manual. Ensure the system will be installed in a manner that will not expose it to parameters outside those described in the specifications.**

Before applying power for the first time, double check connections. Mis-wiring can cause damage.

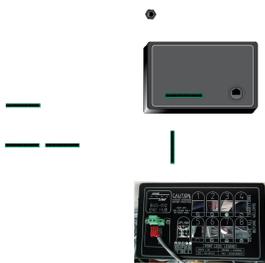
1.1 Unit Descriptions

SC-12 units work together to provide both operator interface and output control of the vehicle hardware. The following are descriptions for each of the basic units.

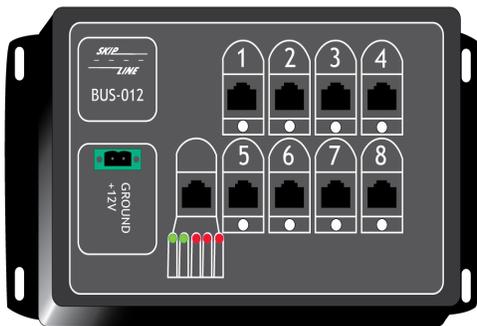


The **Master Control Box** provides the primary interface for the operators. It includes a full-color character LCD display menu along with toggle switches that together define the striping patterns and operation.

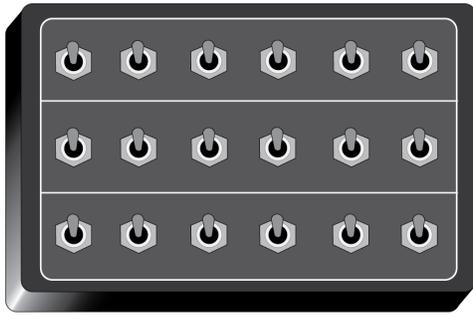
A truck must have one Master Control Box at minimum, but may have several depending on the configuration of the vehicle.



The **Core Skipper** is the central computer for skip patterns. Most system inputs and outputs also occur here. The Core Skipper can have up to 8 pulse input channels.



The **HUB** distributes both control signals and filtered, clean +12V power to devices on the system. Diagnostic LEDs assist in troubleshooting wiring and device problems. A system must have at least one front and one rear hub. If necessary, mid-hubs are available for system expansion or wiring convenience.



*A **Switch Box** is an optional device that can be custom ordered to provide auxiliary functions (such as lights, actuators, etc.) and custom features to the system. If your system has a Switch Box, see the additional documentation provided with your order for further information.*

1.2 Optional Units

The SC-12 system can be easily expanded, usually by simply adding a device to any unused port on a Hub. Your system may or may not have devices from the following list—if it does, further information is provided in separate reference documents.

SC-12 Glass Cockpit: Provides a touchscreen interface to monitor various sensor inputs and control certain setup items. This device can also provide video guidance and cross hair generation for the vehicle driver.

CDRV-HI and CDRV-LO: These driver boxes drive loads on the system. A CDRV-HI sources +12V, while a CDRV-LO provides grounded outputs to loads. An LED shows the activated state of the output at all times.

CANLG-OUT: Sources a proportional (analog) 4-20mA output signal to proportional loads, such as valves or regulators.

CANLG-OPTO: Provides digital signal, counter, or RPM inputs to the SC-12 system, which can be displayed on a Glass Cockpit.

CANLG-IN: Provides inputs from any proportional (analog) 4-20mA sensor, such as temperature, pressure, or level, to the SC-12 system. This information can be displayed on a Glass Cockpit and used as part of a control system.

CANLG-TC: Directly senses Type-J, ungrounded thermocouple sensors into the SC-12 system. This temperature information can be displayed on a Glass Cockpit and used as part of a thermostat control.

2. Specifications

Please observe the following operational and storage specifications for each of the basic SC-12 devices. Operation or storage outside of these specifications may reduce the life of the device and, in some cases, void the warranty.

	Minimum	Maximum
Operating Temperature	33°F	140°F
Storage Temperature	10°F	160°F
Humidity (non-condensing)	10 %RH	90 %RH
Voltage	10V	16V
Current	--	1A/device

Each hub device internally fuses each port to 1A, so no individual fuses are necessary. The hubs also clamp total current output (i.e., the sum of the current drawn from all ports) at 10A. A 10A to 15A fuse is recommended in line before the hub.

For optional SC-12 devices, see separate reference documentation.

3. Installation

Installation of the SC-12 system requires both physical installation of the boxes and communications cabling.

3.1 Preparing the installation

Check that the following are ready before getting started:

- *Select mounting locations for each SC-12 component.*
- *Plan routes for communications cables from each box to closest hub box.*
- *Plan routes for +12V power to each of the hubs and driver output boxes.*

Follow these precautions during installation:

- *Do not connect power to the any of the hubs or other system devices until all other connections have been made.*
- *If a partial installation is made, some devices may be inoperable or may not operate as expected.*

Cable lengths are important in order to maintain the specifications of the CAN communications bus used by the SC-12 system. Intermittent communications problems may arise if the following specifications are exceeded:

- *Maximum length between a Hub and any device: 5 meters.*
- *Maximum length between Front Hub and Rear Hub: 20 meters.*

Select mounting locations and cable routes so that the above cabling specifications can be met.

3.2 Physical Installation

Mounting mechanisms for most devices are one of the following:

- *1/4" bolt mount (typically used with Master Control boxes and Switch Boxes)*
- *Flange mount*
- *DIN rail mount.*

Other custom mount requests can also be arranged at time of order.

Bolt mounts should use only 3/4" long 1/4-20 bolts, which are provided with the boxes. Deeper bolts may contact internal electronics and cause permanent damage.

DIN rails use the industry standard EN 50022 - Top Hat Rail 35 × 15 type.

Once the mounting locations have been selected, physically mount the boxes to their mounting locations on the truck.

- *Make the appropriate connections to the Core Skipper box using the wiring diagram*

included with your system.

3.3 Cabling

Cabling should use 26AWG (or larger) Cat5 cable and RJ-45 connectors. The Hubs accept only standard RJ-45 plugs. Some of the devices have sealed RJ-45 jacks, available from Skip-Line, which will accept either standard or strain-relieved IP-67 rated plugs. See Appendix B for instructions on RJ-45 connector wiring.

Cable protection devices should be used to prevent vibration-induced chaffing from occurring against sharp edges. Avoid pinch points where the cable may be damaged from moving parts.

- *Run cable between each of the devices and the Hub each device will connect to.*
- *Run a cable between the Rear Hub and Front Hub.*
- *Plug all the boxes into the nearest Hub. Any available port (except for UPLINK ports) can be used.*
- *Plug the Front Hub into the Rear Hub using a connection cable from the UPLINK on one Hub to the UPLINK port on the second Hub.*
- *Double check each connection, and then supply the Hub(s) with +12V power. Make sure that each Hub lights up and does not show power faults or short circuits. If any fault lights occur, remove power from the system immediately and correct the faulty device.*

Refer to the BUS-012 insert for more information on HUB wiring and diagnostic LED information.



**Important
Note!**

Do not leave dangling cables connected to hubs. Improperly terminated cables can cause communications issues.

The SC-12 system is now ready to be configured.

4. Menu System

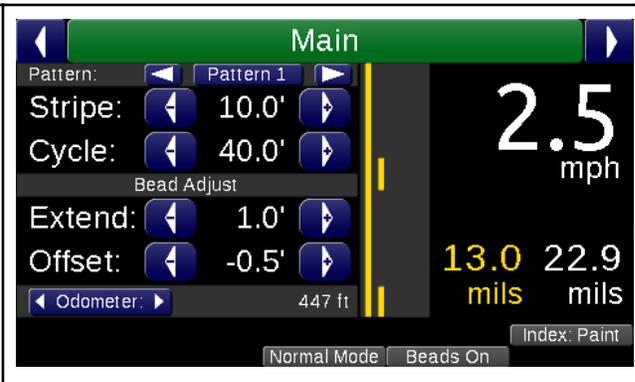
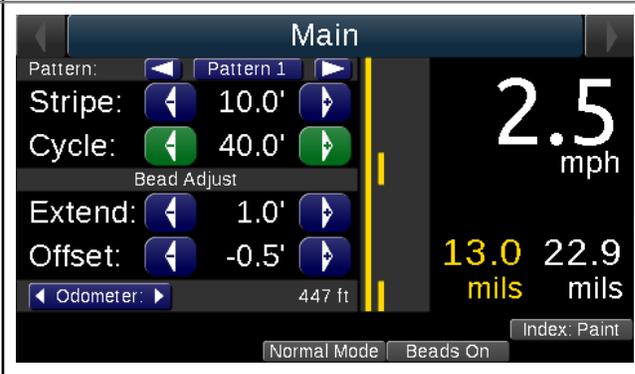
The Skip-Line color LCD menu system is simple and intuitive, yet more capable than older skip timer menu systems.

There are two navigation options—joystick and pushbutton. Either input type is equivalent, and will be referenced with the same functions throughout this section.

4.1 General Navigation

There are four navigational buttons (or directions, in the case of menus with the joystick navigation option), which behave differently between two different contexts—**Menu Bar** and **Action Screen**.

The “**cursor**” indicates the current navigation location.

<p><i>In this screenshot, the Cursor is on the top-level menu Main.</i></p>	
<p><i>In this screenshot, the Cursor is on the Action Screen parameter Cycle.</i></p>	

<p>Begin Button Test in this screenshot is an example of a Command Button. The cursor is currently on it here.</p>	
<p>When there are multiple pages of information available on a screen it is indicated in the lower right hand corner. Pg 1/2 means that there are two pages available and you are currently viewing page one. To access the next page simply scroll your cursor down through all the menu items on the screen.</p>	

4.1.1

4.1.2 Menu Bar Navigation

The **menu bar** is visible on almost every screen, making it easy to know your current location within the menu. The uppermost menu bar is called the **Top-Level Menu**. Some menus have sub-menus, while others do not. **Navigation buttons** have the following behaviors when the cursor is on the menu bar:

- : Navigate to the next menu to the right.
- : Navigate to the previous menu to the left.
- : Navigate up a menu level.
- : Navigate down into a sub-menu, or into an action screen.

If a menu does not have a sub-menu, pressing down will enter an **Action Screen**. Pressing and holding  returns the Cursor to the menu bar on all Action Screens.

4.1.3 Action Screen Navigation

Pressing  from a menu enters the **Action Screen** associated with the menu. While the Cursor is on an Action Screen, the navigation buttons have the following behaviors:

: Increase the value of the currently selected parameter. If the Cursor is on a command button, that will “**click**” the command button.

: Decrease the value of the currently selected parameter.

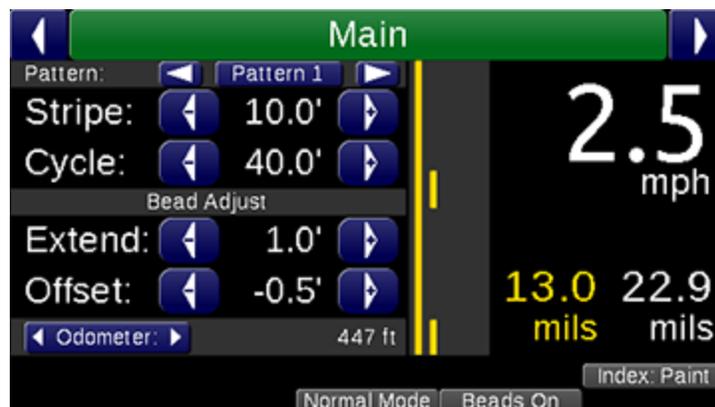
: Navigate up. If the Cursor is on the uppermost parameter, navigating up will exit the current Action Screen. Pressing and holding this will also exit the current Action Screen, regardless of where the Cursor is.

: Navigate down to the next parameter on the current Action Screen.

Note: Most parameters are immediately affected when altered on an Action Screen. There is no need to do anything further to “**save**” the new value.

4.2 Main Screen

The **main screen** is the first of the top-level menus, which provide fast access to the most important day-to-day parameters of operation.



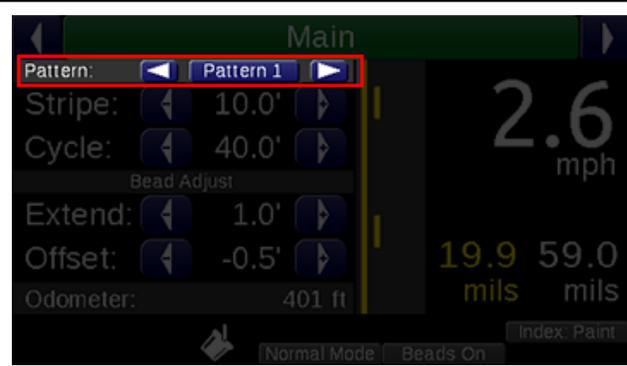
The Main Screen is the recommended screen to use during striping operations. It is organized into several sections.

4.2.1 Main Screen Parameters

There are four parameters that can be changed from the main screen.

Pattern Selector

The **Pattern Selector** allows you to select between three (or more) saved patterns. When **Pattern 1** is selected, any changes to **Stripe** and **Cycle** will be memorized to **Pattern 1**. When **Pattern 2** is selected, the previously entered settings for **Pattern 2** will be restored. This can be changed on-the-fly in the gap during striping operations. The pattern will change at the beginning of the next cycle.



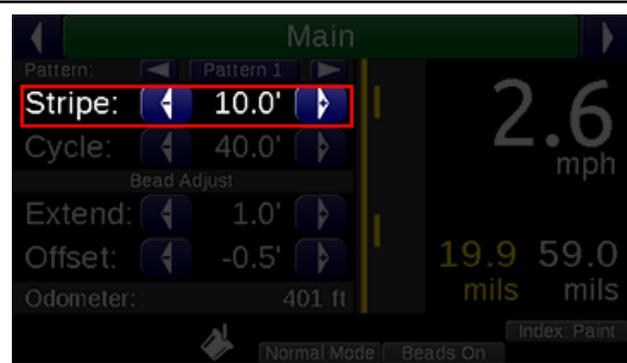
Info

The **Pattern Selector** feature was previously called **ALT CYCLE** and was controlled with a switch on older skip timers. The functionality described here is roughly the same.

Stripe

Stripe sets the length of the skip pattern on the road. This is calculated from two numbers: the distance calibration number, and the Gun Delays.

If your stripe length on the road does not match the entered **Stripe** length, correct this error with **Gun Delays**. **Do not** change the stripe from the desired length as a corrective measure.



(See section 4.5.2, **Gun Delays** for more information on **Gun Delays**.)

Cycle

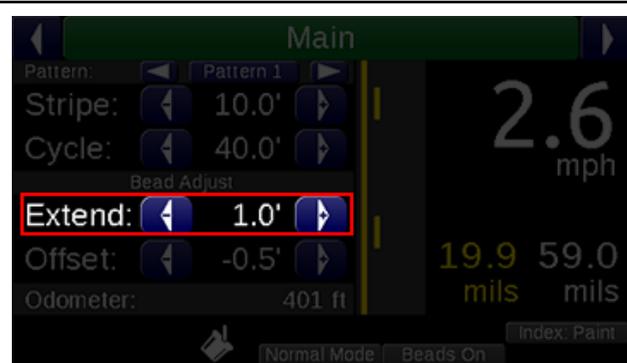
Cycle is the distance from the start of one stripe to the start of the next stripe.

If the cycle is not correct, check your distance calibration number or check the troubleshooting guide. Do not adjust this number as a corrective measure from the actual distance desired.



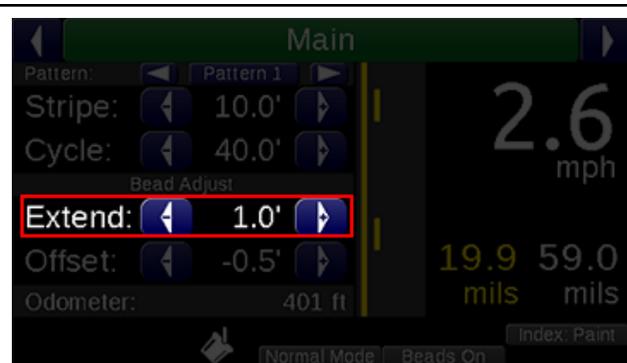
Bead Extend

To help ensure complete bead coverage, the **Bead Extend** adds a user specified amount of bead coverage distance to the end of the stripe length.

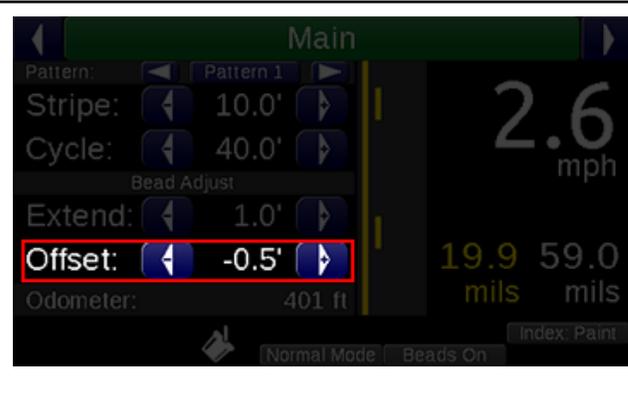


Bead Offset

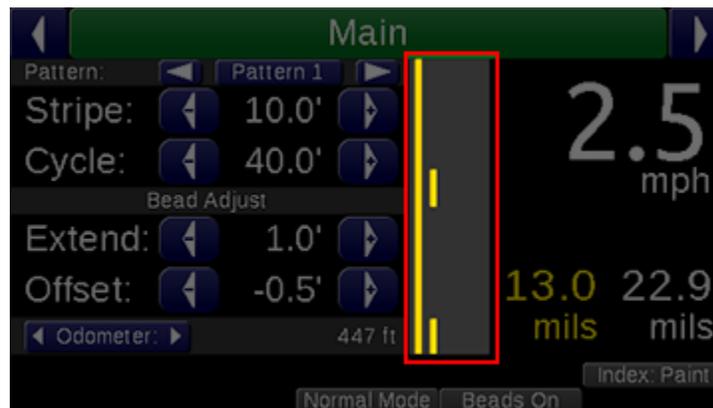
When using **Bead Extend**, **Bead Offset** is also used to center the additional length. For example, if 0.5' of bead coverage is desired on the beginning and end of the stripe, set **Bead Extend** to 1.0', and **Bead Offset** to -0.5'. Then, during operations, only the **Bead Offset** will need to be shifted in order to adjust for truck speed and wind variables.



Bead Offset shifts the entire length of the **bead stripe**, to assist with bead coverage. This is particularly useful for dealing with shifting head and tail winds.



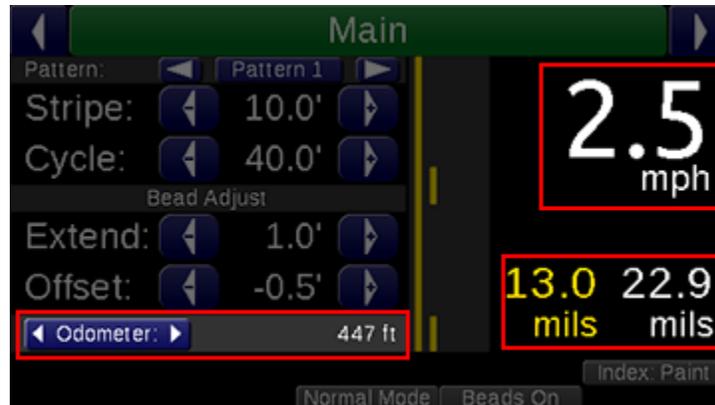
4.2.2 Pattern Preview



The innovative **Pattern Preview** screen provides a preview of the current pattern that will be emitted from guns. While not every pattern-altering feature can be accounted for, the Pattern Preview is the skip timer's best guess as to the pattern that will be painted when striping begins.

Gun colors are shown on the preview, which helps the operator clearly see which guns will be counting towards application rates.

4.2.3 Rate Indicators



Speed is shown in large, high contrast digits for easy operator viewing.

Average wet thickness calculations are shown just below the speed. These rates are calculated with the current counter channel values. For accuracy, ensure the gun colors and widths are set correctly in the setup menu (see 4.5.2, **Gun Setup**).

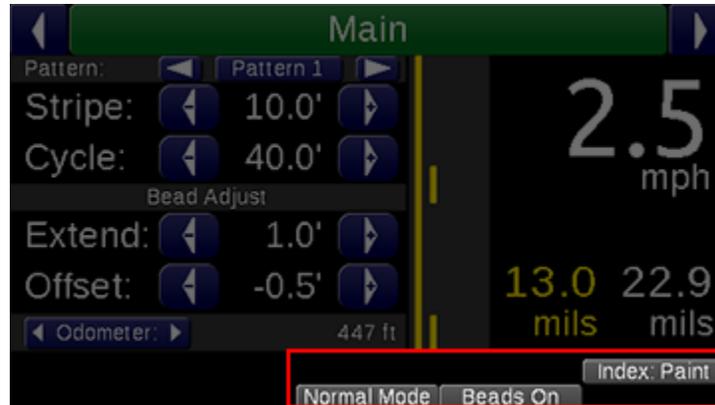
The *odometer* shows the total distance traveled with the **START** switch on, regardless of material switch positions, since the last counter channel clear.



Info

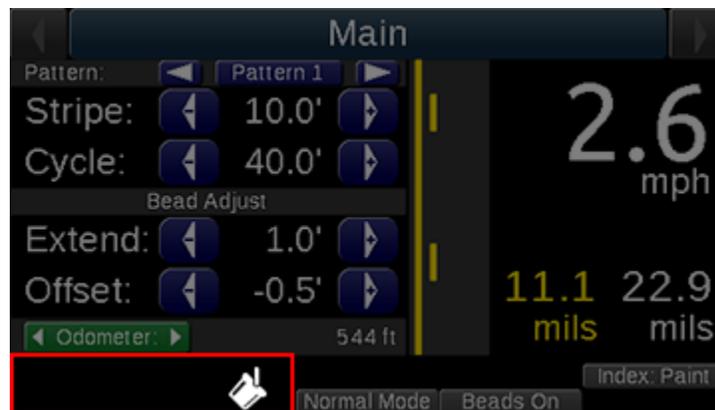
Note that wet thickness will not match dry thickness measurements, due to material shrinkage. Refer to your road marking material vendor for more information.

4.2.4 Feature Status Indicators



Many features can change the painted pattern. To help avoid confusion, when a setting causes a pattern change and is not indicated on the Pattern Preview, it is accounted for in the **Feature Status Indicators**. Refer to the manual section for each feature to understand these messages.

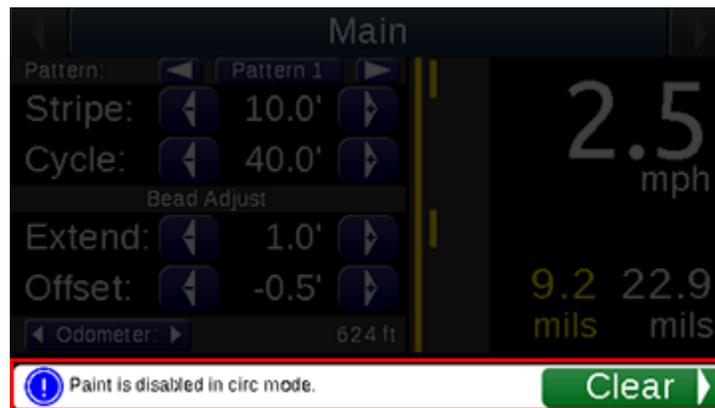
4.2.5 Status Indicators



There are several **system status indicators** that help show what is currently detected by or occurring on the skip timer.

Icon	Description
	Start Switch On: The start switch is on. Solid guns may be on, but skip guns are not.
	Skip-Watch: The start switch is on, and the paint guns are in the skip portion of the pattern (as opposed to the gap).
	USB Drive Attached: A USB drive is attached to the skip timer. Typically, USB drives should not be left attached after the counter channel export process is complete.
	USB Error: A USB device is attached, but it is either not a USB drive or it is not compatible.

4.2.6 Information System



The menu provides a **descriptive alert system** to assist with understanding current activity, warnings, and critical errors that need attention. The **Information System** messages cover the status indicator area.

To view status and feature indicators again, clear the message. These messages can be cleared by scrolling the Cursor down to the **Clear** command button on the message. Most messages will disappear if the related error condition is no longer detected.

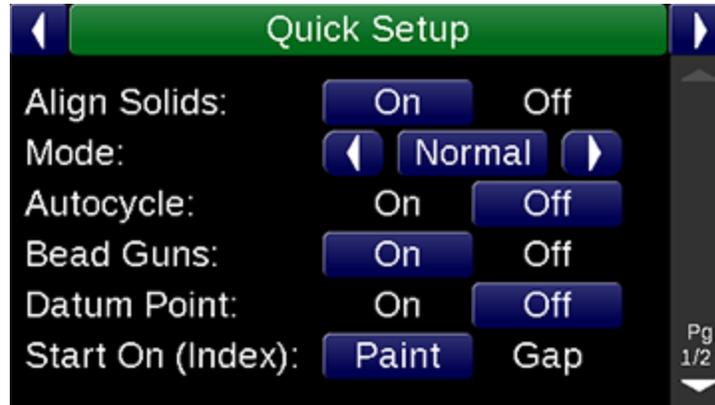
Information messages assist the operator in understanding certain behaviors or conditions that may be intentional, but could be confusing or interpreted as incorrect behavior due to setting configurations (the three levels of Information Messages are *info*, *warning*, *error*).

Warning and **Error Messages** will automatically disappear after the problem is

no longer detected.

Information Messages will not reappear for the same event when cleared by the operator. However, Warning and Critical Error messages will, if the problem is still detected by the system, reappear two minutes after being cleared by the operator. Refer to the section titled **Menu Messages** for more information.

4.3 Quick Setup



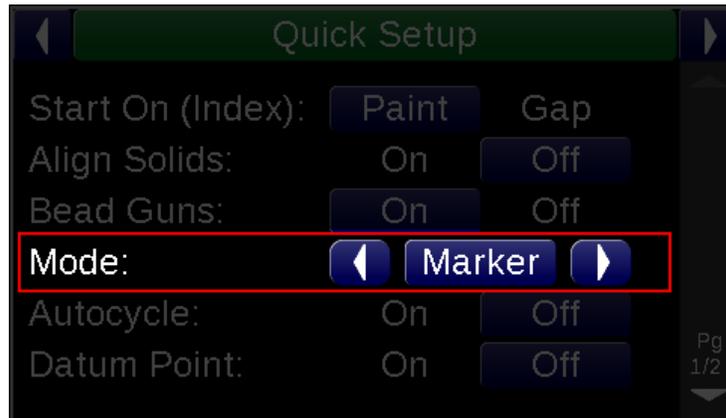
The **Quick Setup** menu provides quick access to enable or disable many features that may be used during day-to-day operations.

Some of the basic setup items are covered here, but your particular Quick Setup menu may not have all features mentioned here. For features that may appear on your particular skip timer system, refer to supplemental documentation. If your system lacks a feature found in this manual that you would like to have added, contact Skip-Line to see if it is possible.

4.3.1 Mode

The **Mode** determines how the skip timer will behave:

- **Normal:** Normal skip-timing behavior.
- **Test:** Guns will come on immediately. This allows operators to test guns, regardless of datum offsets or other settings.
- **Black:** Black patterns are enabled, per the configuration in the Setup menu.
- **Marker:** Marker layout patterns are enabled, per the configuration in the Setup menu.



Note that not all modes are available on all systems.

4.3.2 Bead Guns

The **Bead Guns** option enables and disables bead guns from engaging during striping operation.

4.3.3 AutoCycle

AutoCycle causes the cycle to change +/- 0.1' after the Advance/Retard switch has been pressed in the same direction three times. This assists with correcting the cycle to match previous markings during rework operations.

4.3.4 Midspot

Midspot adds a dot in the middle between the end of one stripe and the start of the next. Midspot can occur every cycle, or every other cycle with a $\frac{1}{2}$ midspot setting. The $\frac{1}{2}$ **Odd** setting adds the midspot on odd cycles (1st, 3rd, etc.) while the $\frac{1}{2}$ **Even** settings adds the midspot on even cycles (2nd, 4th, etc.).

Midspot length is determined by the Dot Length parameter in the Marker Layout menu.

4.3.5 Index

This setting allows the skip timer to start the pattern on either the stripe or the gap when the START switch is engaged.

4.4 Counter Channel Menu

The **Counter Channel** menu provides access to distance and volume usage counters. Clearing the counter channels is common at the beginning of a new job.

The counter channels allow the user to record width and/or color changes individually for each gun, providing enhanced records and job tracking. Counter Channels fill in dynamically during operation. Guns only appear in the counter channels once they have a footage associated with them.

<p><i>Distance counters are separated between solid and skip distances. Gun colors are indicated by text color. (Black is a faded gray, for visibility). Sums for skip and solid appear at the bottom.</i></p>	 <table border="1"> <thead> <tr> <th colspan="3">Counter Channels</th> </tr> <tr> <th>Left Guns</th> <th>Right Guns</th> <th>Left Trip</th> </tr> <tr> <th></th> <th>Solid</th> <th>Skip</th> </tr> </thead> <tbody> <tr> <td>#1 (4.0"):</td> <td>68'</td> <td>0'</td> </tr> <tr> <td>#2 (4.0"):</td> <td>0'</td> <td>20'</td> </tr> <tr> <td>#3 (4.0"):</td> <td>68'</td> <td>0'</td> </tr> <tr> <td>#4 (4.0"):</td> <td>0'</td> <td>20'</td> </tr> </tbody> </table>	Counter Channels			Left Guns	Right Guns	Left Trip		Solid	Skip	#1 (4.0"):	68'	0'	#2 (4.0"):	0'	20'	#3 (4.0"):	68'	0'	#4 (4.0"):	0'	20'			
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	Solid	Skip																							
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#3 (4.0"):	68'	0'																							
#4 (4.0"):	0'	20'																							
<p><i>Left Guns, Right Guns, Left Trip, Right Trip, Pumps, Totals, and Options are all sub-menu options in the Counter Channels.</i></p>																									
<p><i>Stripe width and pattern (solid or skip) are tracked respectively under Left Guns and Right Guns.</i></p>	 <table border="1"> <thead> <tr> <th colspan="3">Counter Channels</th> </tr> <tr> <th>Left Guns</th> <th>Right Guns</th> <th>Left Trip</th> </tr> <tr> <th></th> <th>Solid</th> <th>Skip</th> </tr> </thead> <tbody> <tr> <td>#1 (4.0"):</td> <td>68'</td> <td>0'</td> </tr> <tr> <td>#1 (8.0"):</td> <td>659'</td> <td>230'</td> </tr> <tr> <td>#2 (4.0"):</td> <td>915'</td> <td>20'</td> </tr> <tr> <td>#3 (4.0"):</td> <td>1223'</td> <td>0'</td> </tr> <tr> <td>#4 (4.0"):</td> <td>0'</td> <td>300'</td> </tr> </tbody> </table>	Counter Channels			Left Guns	Right Guns	Left Trip		Solid	Skip	#1 (4.0"):	68'	0'	#1 (8.0"):	659'	230'	#2 (4.0"):	915'	20'	#3 (4.0"):	1223'	0'	#4 (4.0"):	0'	300'
Counter Channels																									
Left Guns	Right Guns	Left Trip																							
	Solid	Skip																							
#1 (4.0"):	68'	0'																							
#1 (8.0"):	659'	230'																							
#2 (4.0"):	915'	20'																							
#3 (4.0"):	1223'	0'																							
#4 (4.0"):	0'	300'																							

When the width or color of a gun is changed, it records as a new entry.



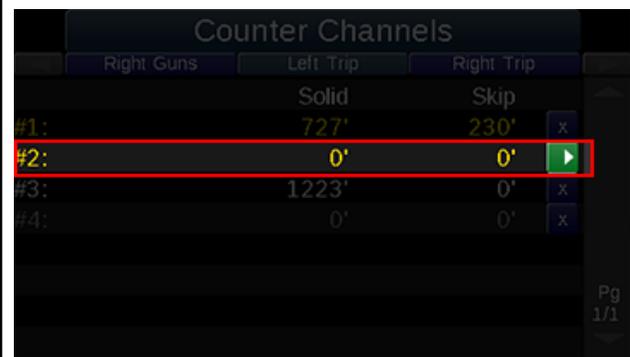
	Left Guns	Right Guns	Left Trip
	Solid		Skip
#1 (4.0"):	68'		0'
#1 (8.0"):	659'		230'
#2 (4.0"):	915'		20'
#3 (4.0"):	1223'		0'
#4 (4.0"):	0'		300'

The **Trip Counter** feature is found under **Left Trip** or **Right Trip**. This acts like the trip odometer on vehicles. Any trip counter can be cleared individually, but the regular counters will remain intact, preserving job footages and application rates.



	Right Guns	Left Trip	Right Trip
	Solid		Skip
#1:	727'	230'	x
#2:	915'	20'	x
#3:	1223'	0'	x
#4:	0'	0'	x

To clear an individual **Trip Counter**, simply scroll the cursor down to the appropriate selection and  navigate right to clear the channel.



	Right Guns	Left Trip	Right Trip
	Solid		Skip
#1:	727'	230'	x
#2:	0'	0'	
#3:	1223'	0'	x
#4:	0'	0'	x

Paint usage by pump is tracked under **Pumps**.



	Right Trip	Pumps	Totals
Pump 1:		7.0 gals	
Pump 2:		3.8 gals	
Pump 3:		0.2 gals	

<p><i>Each side is tallied up and displayed under Totals.</i></p>	 <p>The screenshot shows the 'Counter Channels' screen with the 'Totals' tab selected. It displays a table with columns for 'Solid' and 'Skip' and rows for 'Subtotal (L)', 'Subtotal (R)', 'Total', and 'Odometer'. The values are: Subtotal (L): 4399', Skip: 817'; Subtotal (R): 197', Skip: 50'; Total: 4596', Skip: 867'; Odometer: 3681'. A 'Pg 1/1' indicator is visible at the bottom right.</p>
<p><i>Counter Channels can be cleared or, if you have a paper tape printer, printed under Options. Guns and Trip can be printed separately.</i></p>	 <p>The screenshot shows the 'Counter Channels' screen with the 'Options' tab selected. It features a 'Clear' button at the top, a 'Print:' section with a left arrow and a 'Guns' button, and a 'Print Counters' button at the bottom.</p>

4.4.1 Pattern Counter Channels

In addition to standard counter channels, each system can be customized to track specific patterns by total distance. These channels are in addition to the standard counters, and may better match the billing and reporting requirements in a given locale.

Standard counter channels and pattern counter channels both count at the same time, and should not be combined. For example, an advanced **Double Solid** counter counts distance traveled when Material #1 and Material #2 are turned on in solid. The standard #1 and #2 counter channels will each individually count distance as well. You cannot combine the standard #1 channel and the advanced Double Solid counter channels, since that would be double-counting.

Some pattern counter examples:

- *When Gun 1 and Gun 2 are in solid, count into Double Solid.*
- *When Gun 1 or Gun 2 are in skip, but not both, count into Single Skip.*
- *When Gun 1 is solid and Gun 2 is skip, count into Skip-Solid.*
- *When the width of Gun 4 is 8", count into White 8".*

- When Right Gun 1 and Right Gun 2 are both on, count into White 12".

Pattern Counter Channels may be custom ordered for your specific needs—please contact your preferred OEM or Skip-Line for availability and compatibility.

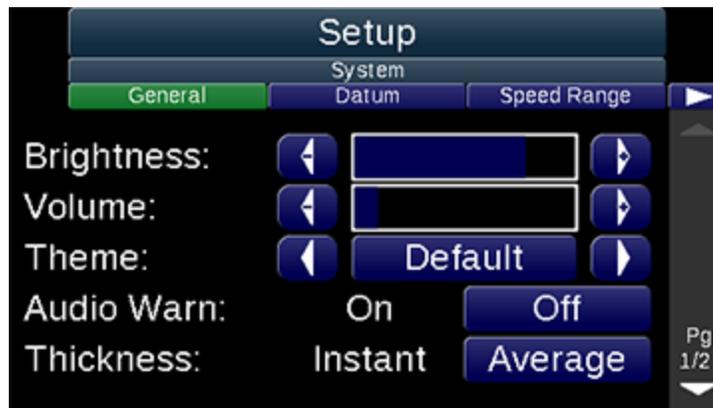
<p><i>Pattern Counter Channels</i> are located in the Counter Channels menu under Left Pattern and/or Right Pattern.</p>	 <p>The screenshot shows the 'Counter Channels' menu with sub-tabs: Right Trip, Left Pattern (selected), and Pumps. The list includes: Skip-Solid: 338', Solid-Skip: 738', Solid-Solid: 2608', Single Skip: 564', Single Solid: 47', and Other: 153'. A 'Pg 1/1' indicator is visible at the bottom right.</p>
---	--

4.5 Setup

The **Setup menu** is split up into several sub-sections for fast and easy navigation of advanced system configurations.

4.5.1 System

General



- **Brightness:** Screen brightness
- **Theme:** The color theme for the menus. Dimmer themes reduce eye strain at night, while more colorful themes are easier to see during the day.
- **Thickness:** Instant displays the estimated thickness over the last few strokes. Average will calculate over the whole job and is the default way to track the thickness.

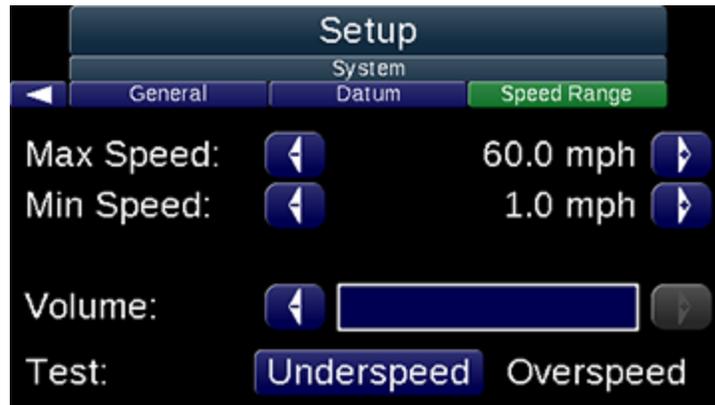
Note that other general items may be added to this list for various future system functions.

Datum



Datum Length: The **delay** distance in front of the first gun, the point where the pattern will actually begin. Refer to section 5.2, **Datum Point** for more information.

Speed Range



These alarms will trigger when the START switch is on.

- **Max Speed:** The maximum acceptable speed. If the speed rises above this value, the Overspeed alarm will be triggered.
- **Min Speed:** The minimum acceptable speed. If the speed falls below this value, the Underspeed alarm will be triggered.
- **Volume:** The volume of the speed alarm. If set to zero, the visible alarm flashing of the speed on the Main Screen will still occur. In systems without a speaker, this setting will not change the functionality.
- **Test:** When selected, the alarm volume is tested. Use  and  to sample the Overspeed and Underspeed alarms for familiarity. In systems without a speaker there will be no audio cue. However, in the main screen the speed will be displayed in red

when over or under speed.

Life Totals



Life totals provide a total number of painted distance and gallons pumped. This number survives counter channel resets. The primary purpose of Life Totals is to assist the operator in knowing when to service pumps and other equipment.

The Life Totals are often reset at the time of equipment maintenance or rebuilds. To reset the Life Totals, select **Reset**.

4.5.2 Gun Setup

Gun Colors



Gun Colors sets the color for each gun. Note that proper color setting is important for accuracy in mil thickness calculations, pump control features, data logging, and report printouts.

Scroll down using , and note that for systems with more than five material guns, you may need to scroll down to further pages.

Gun Widths



Gun Widths sets the gun widths to match the actual application width of the material on the road.

Note that setting proper gun widths is important for accuracy in mil thickness calculations, data logging, pump control features, and report printouts.

Gun Offsets



Set **Gun Offsets** for all items in the gun line, including *Paint, Beads, Tandem Beads, or Blow Air*. Only available guns will appear in the **Gun Setup** menu.

- *Gun Offsets are the distance from the front-most gun rank to the current gun. The front-most gun rank should be set to 0.0'.*
- *Gun Offsets account for distance delays when marking the pattern. When the pattern starts, all guns will attempt to turn on at the same longitudinal position as the front gun on the road as they move past that position.*
- **IMPORTANT:** *Do not correct time factors with distance. Only distance factors should be corrected with distance, otherwise, the skip timer will not be as accurate in placing*

paint and bead materials on top of each other at different vehicle speeds.

Gun Delays

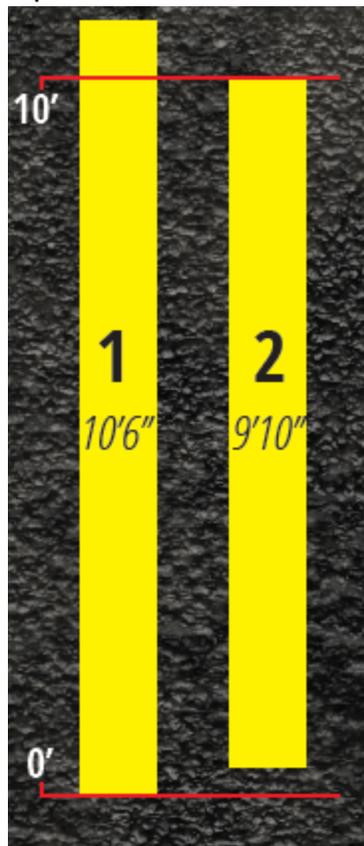
Paint Gun Delays correct the mechanical response delay of the gun. Most material applicators experience a time delay between the time the electrical signal is applied from the skip timer, until the gun actually opens and material can flow.

Most applicators take longer to turn off (pushing against high pressure) than to turn on (pushing with high pressure). This causes a 10.0' stripe, for example, to be longer, i.e. 10.5' to 11.0'.

Gun delays account for this delay with TIME. With the gun offsets already set correctly, adjust the gun delays to correct the line length:

- *If the stripes on the road are too long, use a negative Off Delay*
- *If the stripes on the road are too short, use a negative On Delay*

IMPORTANT: Do not correct distance factors (where the material falls) with time (on and off delays), or time (how long it takes material to hit the ground) with distance factors (offsets). The system will not correctly respond to variations in speed.



If the desired line length is ten feet, then in the above example the line marked 1 is

10'6"—six inches too long (ending late)—and the line marked as 2 is 9'10"— two inches too short (starting late). To solve the delay, use the following equation:

$$\left(\frac{56.8}{MPH} \right) \times \text{distance (in inches)}$$

Take 56.8, divided by the speed at which you were striping, and multiply it by the number of inches that you were off by. Use a positive number. The result will be time in *ms*. In our above examples, line 1 is off by 34.08 *ms*, and line 2 is off by 11.36 *ms*. Round to the nearest whole (down if the decimal value is below four, up if the value is above five).

To fix line 1, we would set the gun's **off delay** to -34 *ms*. This would essentially remove 6 inches worth of active striping time from the gun, ensuring future lines are 10 feet in length. This means it will shut off 34 *ms* earlier than without the delay. (*If it were a positive value it would shut off later instead*).

To fix line 2, we would set the gun's **on delay** to -11 *ms*. This would essentially add 2 inches worth of striping time to the start of the cycle. This means it will activate 11 *ms* earlier than without the delay. (*If it were a positive value, it would activate later instead*).

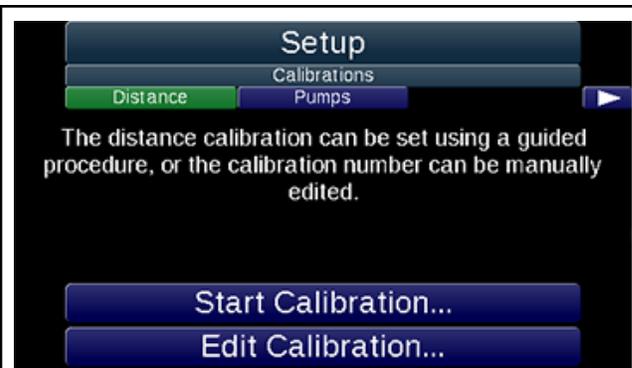
4.5.3 Guided Calibrations

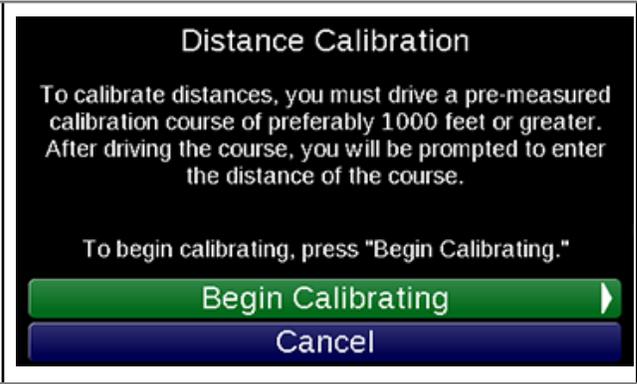
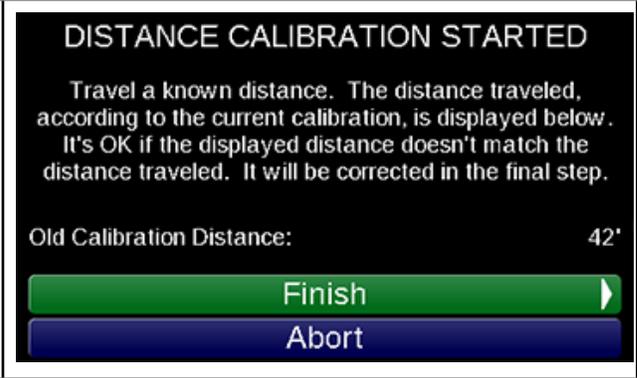
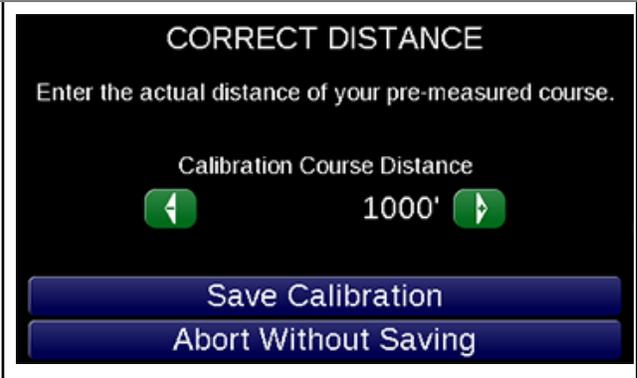
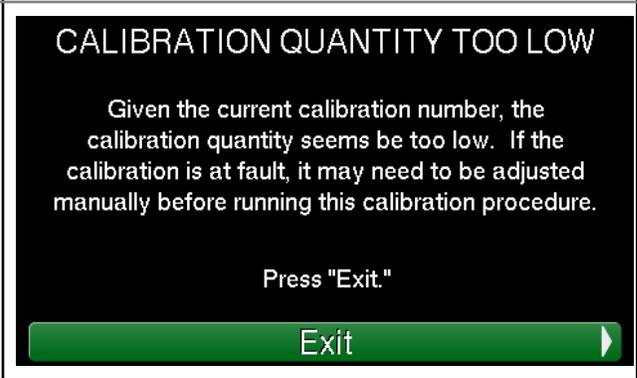
The skip timer must be properly calibrated before use.

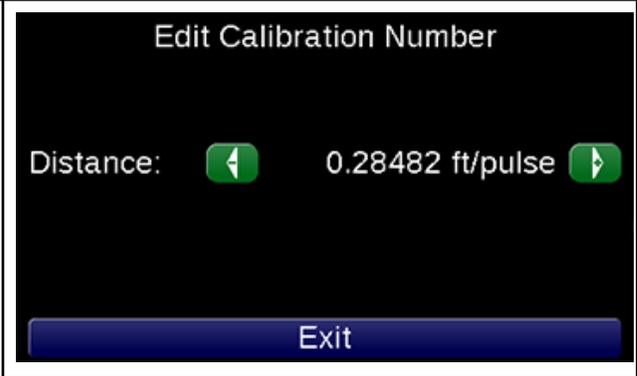
Distance

Select **Start Calibration...** to begin the guided calibration process. This is the recommended process for calibration.

Alternately, select **Edit Calibration...** to view or directly modify the calibration number.

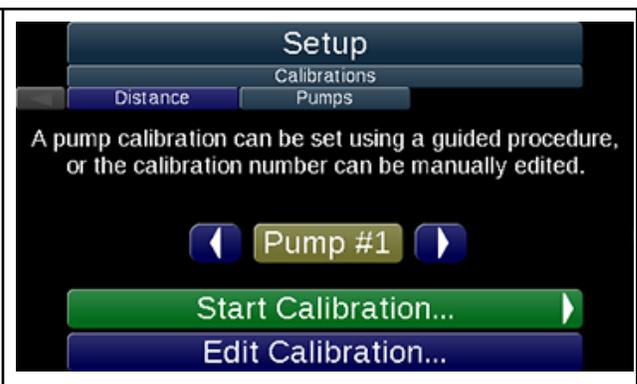


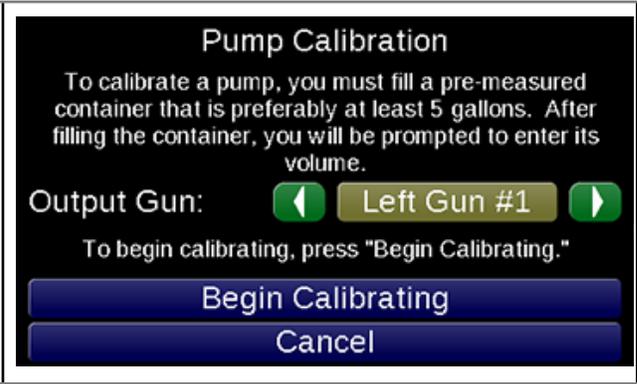
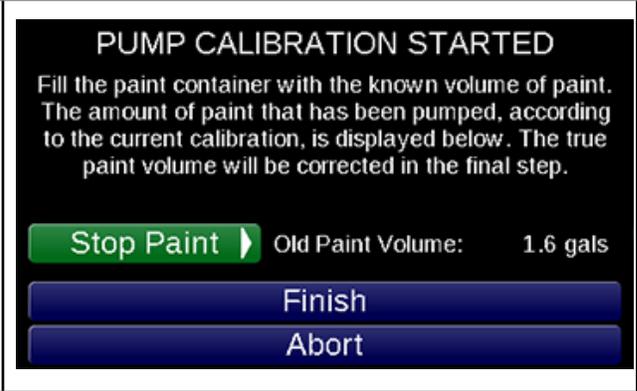
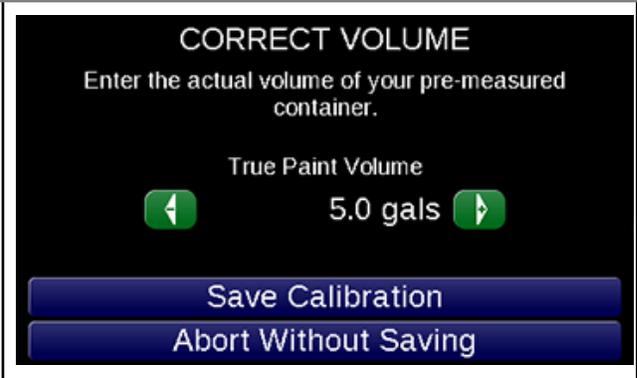
<p>To begin a Distance Calibration, align the vehicle with the start of a calibration course and then select Begin Calibrating.</p> <p>A calibration course is a pre-measured distance for the vehicle to drive. Make your own easily by measuring out a distance of 1,000 feet or greater.</p>	 <p>Distance Calibration</p> <p>To calibrate distances, you must drive a pre-measured calibration course of preferably 1000 feet or greater. After driving the course, you will be prompted to enter the distance of the course.</p> <p>To begin calibrating, press "Begin Calibrating."</p> <p>Begin Calibrating (green button with right arrow)</p> <p>Cancel (blue button)</p>
<p>Drive the distance of the course. Note that the Old Calibration Distance number is likely incorrect. It is useful to see to ensure that motion pulses are being received, but is not the actual distance traveled.</p>	 <p>DISTANCE CALIBRATION STARTED</p> <p>Travel a known distance. The distance traveled, according to the current calibration, is displayed below. It's OK if the displayed distance doesn't match the distance traveled. It will be corrected in the final step.</p> <p>Old Calibration Distance: 42'</p> <p>Finish (green button with right arrow)</p> <p>Abort (blue button)</p>
<p>Correct the distance measured, to the actual distance traveled.</p> <p>For example, if your course was 1000', and the measured distance was 932', you would change 932' to be 1000'.</p> <p>Save Calibration to complete this process.</p>	 <p>CORRECT DISTANCE</p> <p>Enter the actual distance of your pre-measured course.</p> <p>Calibration Course Distance</p> <p>← 1000' → (with left and right arrow buttons)</p> <p>Save Calibration (blue button)</p> <p>Abort Without Saving (blue button)</p>
<p>If there was an error, verify the motion sensor is installed correctly. The motion pulse source should provide between 2 pulses per foot and 20 pulses per foot.</p>	 <p>CALIBRATION QUANTITY TOO LOW</p> <p>Given the current calibration number, the calibration quantity seems to be too low. If the calibration is at fault, it may need to be adjusted manually before running this calibration procedure.</p> <p>Press "Exit."</p> <p>Exit (green button with right arrow)</p>

<p>Once you have finished calibrating select  Exit to return to the Setup menu.</p>	 <p>CALIBRATION COMPLETED</p> <p>The calibration process has been completed.</p> <p>Press the "Exit" button.</p> <p>Exit</p>
<p>From the Distance screen, Edit Calibration Number allows you to manually edit the calibration number (in feet per pulse).</p>	 <p>Edit Calibration Number</p> <p>Distance:  0.28482 ft/pulse </p> <p>Exit</p>

Pump

If the system was purchased without pump inputs (i.e. for material application that does not have a positive displacement pump), these menus may not be present.

<p>Start by selecting a Pump to calibrate. The pump system color is indicated by the background color of the pump.</p> <p>Select Start Calibration... to begin the guided calibration process. This is the recommended process for calibration.</p> <p>Alternately, select Edit Calibration... to view or directly modify the calibration number.</p>	 <p>Setup</p> <p>Calibrations</p> <p>Distance Pumps</p> <p>A pump calibration can be set using a guided procedure, or the calibration number can be manually edited.</p> <p> Pump #1 </p> <p>Start Calibration...</p> <p>Edit Calibration...</p>
---	--

<p>Select a gun to use for the calibration. Only select a gun that is plumbed to the pump you are calibrating.</p> <p>Place a container with known volume under this gun. Lower pump pressure and disable any atomizers to minimize overspray. Select  Begin Calibrating to enter the start screen.</p>	 <p>Pump Calibration</p> <p>To calibrate a pump, you must fill a pre-measured container that is preferably at least 5 gallons. After filling the container, you will be prompted to enter its volume.</p> <p>Output Gun:  Left Gun #1 </p> <p>To begin calibrating, press "Begin Calibrating."</p> <p>Begin Calibrating</p> <p>Cancel</p>
<p>Once the pre-measured container is under the selected gun, press Start Paint to begin the calibration. The button will change to Stop Paint.</p> <p>Once the container has been filled to its pre-measured capacity, press Stop Paint. If not yet filled, use Start Paint/Stop Paint until paint level is at the correct height.</p> <p>Press Finish when done.</p>	 <p>PUMP CALIBRATION STARTED</p> <p>Fill the paint container with the known volume of paint. The amount of paint that has been pumped, according to the current calibration, is displayed below. The true paint volume will be corrected in the final step.</p> <p>Stop Paint  Old Paint Volume: 1.6 gals</p> <p>Finish</p> <p>Abort</p>
<p>Adjust the number displayed to match the volume of the pre-measured container.</p>	 <p>CORRECT VOLUME</p> <p>Enter the actual volume of your pre-measured container.</p> <p>True Paint Volume</p> <p> 5.0 gals </p> <p>Save Calibration</p> <p>Abort Without Saving</p>

If an error occurs, verify the pump stroke sensor is installed and connected correctly.

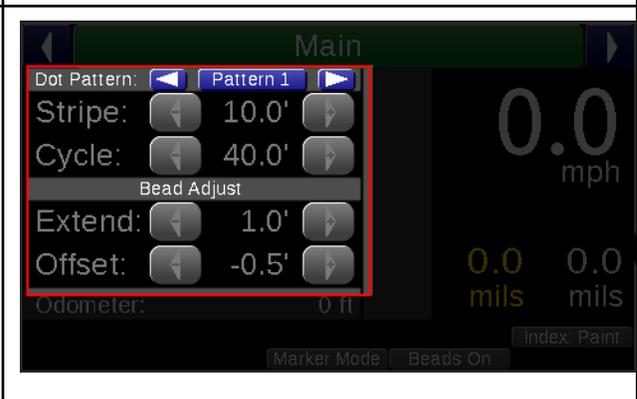
4.5.4 Extras

Some features are not part of the standard package, and are organized under other menus when purchased with the system.

Marker Layout



Marker layout mode can be enabled on the **Quick Setup** menu (see 4.3.1, **Mode**). When enabled, the main screen Stripe and Cycle parameters are disabled.

<p><i>Enter Marker Layout Mode</i></p>	
<p><i>Main Screen Options Disabled</i></p>	

Each Marker Layout pattern consists of distinct settings for *Skip* and *Solid*. In the example below, Dot Pattern 1 contains the separate settings for *Skip* and *Solid*. Gun 1 is on SOLID, and Gun 3 is on SKIP. Gun 1 has been set to dot at 5' intervals, while Gun 3 is set to do a 10' Stripe of dots at 2.5' spacing.



Create the desired pattern by setting the distance between markers in the Skip and Solid pattern sub-menus.

- Use  and  to scroll between function buttons and the marker positions.
- When highlighting a marker position, use  or  to increase or decrease the distance between the last marker and this marker.
- The pattern will end on the first 0.0' marker position after Indent.
- **Clear All:** Clears all marker positions. Only the first marker will be present.
- **Equidistant:** Allows you to set the distance of the Stripe or Cycle, and the number of dots desired in that distance. The dots will be separated equally across the entered distance.

Under either **Skip** or **Solid**, depending on what pattern you would like to edit, select a **Dot Pattern** and then select **Options** for more settings on that specific pattern.



Clear All: Clears all marker positions. Only the first marker will be present.

Equidistant: Allows you to set the distance of the Stripe or Cycle, and the number of dots desired in that distance. The dots will be separated equally across the entered distance.



Dot Length controls the length of the dot, in inches. Set it to the desired dot length. If the dot is small or if the gun does not have enough time to turn on, you may need to adjust **Paint Gun Delays**.

Midspot length is also determined by the Dot Length parameter.

Black Patterns



Black patterns cause the special Black Gun to have specific behavior. On some skip timers, this is configurable. On others, the special Black Gun behavior is fixed to Gun #4. Physical mounting of the black material gun is important when using this special mode. Refer to the **Pattern Preview** area on the **Main screen** to see the expected pattern.

The Black Pattern setup is engaged when the **Black** mode is enabled on the **Quick Setup** menu (see 4.3.1, **Mode**).

*If your system is equipped with **Carriage Layout** your **Black Patterns** screen will look slightly different.*



This screenshot shows the 'Setup' menu with 'Black Patterns' selected. The settings are as follows:

Setting	Value
Black Mode:	Shadow
Fore Shadow:	3.0'
Aft Shadow:	3.0'
Fore Gap:	0.0'
Aft Gap:	0.0'

There are two Black Pattern modes that can be selected in the setup:

- **Shadow:** Shadow mode applies paint before and/or after the stripe. When the black gun is in *Skip*, the fore shadow/aft shadow lengths will be applied as entered. When the black gun is in *Solid*, it will *Gap Fill* (i.e., black paint will be on for the entire gap between the end of the last stripe and the start of the next).
 - **Fore Shadow:** The length of black paint to be applied before the beginning of the stripe.
 - **Aft Shadow:** The length of black paint to be applied after the end of the stripe.

- **Fore Gap:** The indent/gap between Fore Shadow and a stripe.
- **Aft Gap:** The indent/gap between a stripe and an Aft Shadow.
- **Contrast:** *Contrast* mode applies paint between two adjacent guns.
 - Refer to the *Pattern Preview* area on the *Main Screen* to see the expected patterns.

Note: Black paint is often desired to not overlap with other paint colors and beads. Proper Gun Delays and Gun Offsets values will ensure accurate cross-color positional registration between color gun, black gun, and bead guns.

Carriage Layout

Carriage Layout is an optional feature and will not be included in every system.

The ***Carriage Layout*** screen allows the operator to specify the locations of paint guns on the carriage. The various painting modes use the layout to determine which guns are in front of, next to, or behind others. The pattern preview will place guns in the preview based on the carriage layout settings.

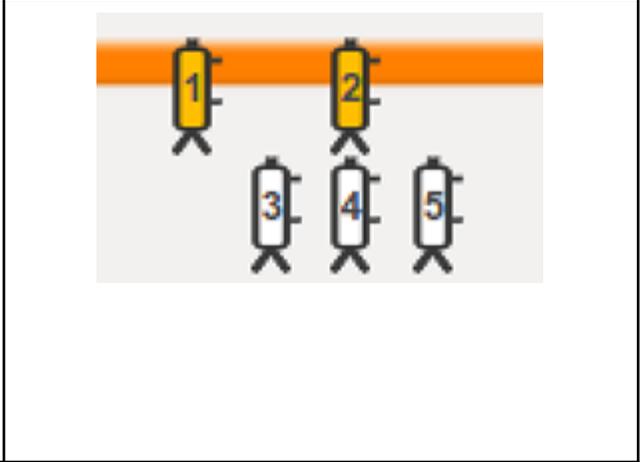


*This screen is only for specifying the location of paint guns. **Do not** place bead guns or air guns in the layout. Tandem paint guns are connected to their parent paint gun and also should not be placed in the layout.*

**Important
Note!**

The ***Carriage Layout*** menu is located under the ***Gun Setup*** menu.

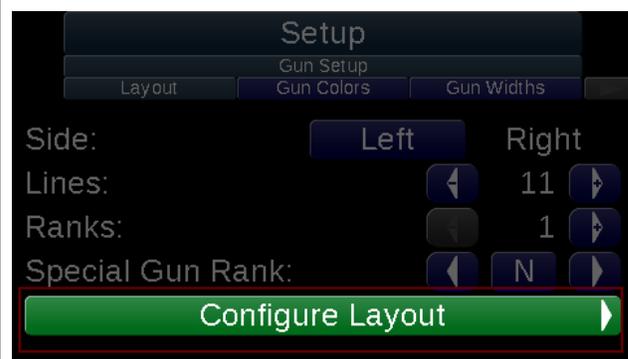


<p>The Side toggle determines if the operator is editing the layout for the left or right side of the truck. This value is not displayed on systems with only one side.</p>	
<p>The Lines spinner specifies the number of lines, or columns, in the carriage layout for the selected side. Guns next to each other are in different lines.</p>	
<p>The Ranks spinner specifies the number of ranks in the carriage layout for the selected side. Guns in front of or behind each other are in different ranks.</p>	
<p>On this example carriage:</p> <ul style="list-style-type: none"> Line 1: Gun 1 Line 2: Gun 3 Line 3: Gun 2, Gun 4 Line 4: Gun 5 Rank 1: Yellow Guns (Gun 1, Gun 2) Rank 2: White Guns (Gun 3, Gun 4, Gun 5) 	

The **Special Gun Rank** specifies the rank where guns used in special patterns are placed. It is only displayed on systems with the black patterns and/or zipper features.

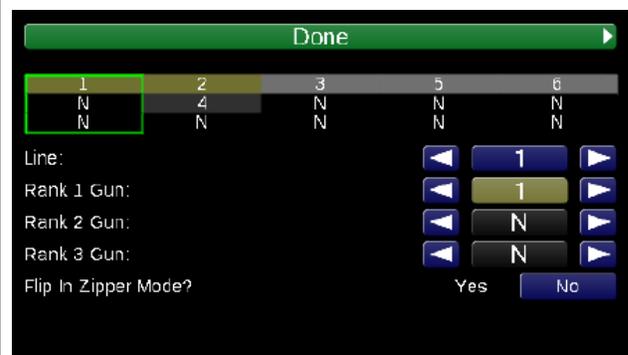


Press the **Configure Layout** button to enter the screen for specifying the paint gun positions.



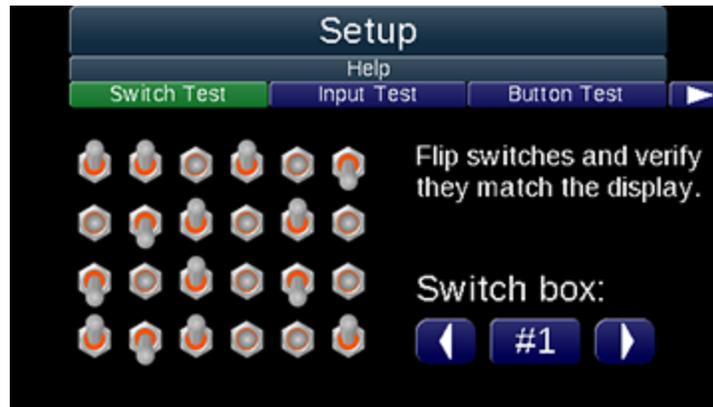
Once you have selected **Configure Layout** you will be on the layout subscreen.

More information on **Carriage Layout** can be found in the **Carriage Layout Manual Insert**.



4.5.5 Help

Switch Test



Switch failures are a common cause of difficult-to-identify operational issues. Use the Switch Test to detect malfunctioning switches.

To test the switches, flip each switch on the system. If the switches exhibit erratic behavior or do not switch cleanly on the on-screen graphic, contact Skip-Line for service.

To view the status of switches from other units on the skip timer system, which may or may not have a display (including custom switch boxes, remote push buttons, etc.), select a different number under the **Switch box:** label.

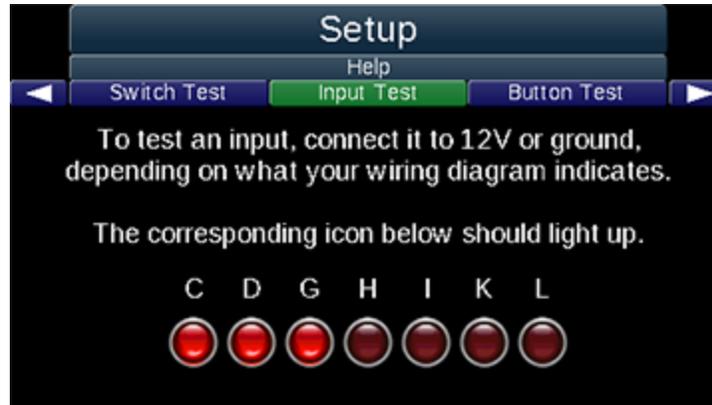


Important Note!

Switches will still function during this test!

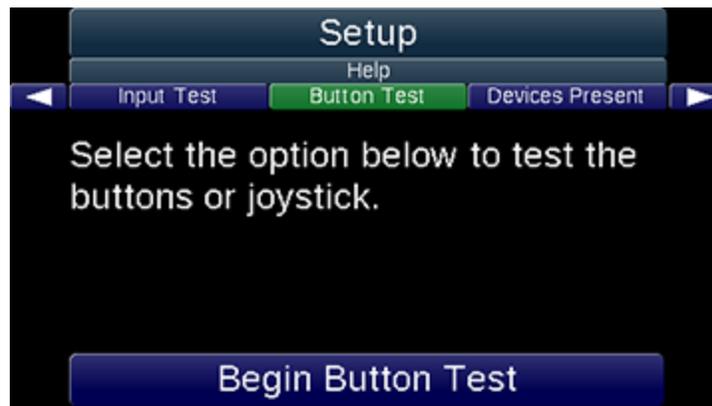
Remove load power and/or disconnect any equipment that would cause a safety hazard or undesired effects if a switch engaged that equipment.

Input Test



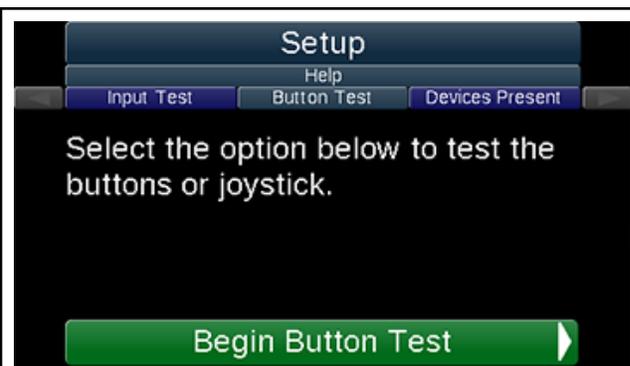
To test an input connection, connect it to 12V or ground, depending on what your wiring diagram indicates. The corresponding icon on the screen will light up. If the icon does not light up there may be a problem with the connection or the device.

Button Test



To troubleshoot issues with buttons, a **Button Test** is included in the Help options of the box's Setup menu (it also tests the Joystick if there is one). This is a quick and responsive way to check if there is an issue with the buttons.

Scroll your cursor to the **Begin Button Test** option and navigate right  to begin.



Once the **Button Test** begins, a countdown of 10 seconds will be displayed at the bottom of the screen. At the end of the count down, the **exit** button will appear and you will be able to exit the Button Test.

Press buttons or move joystick to test. Received inputs will light up.



The exit button will appear in 10 seconds.

Press the navigation buttons and watch the graphic displayed on the screen. When a button is pressed, the corresponding arrow should turn green for the duration of the press and return to gray when it is released.



Press buttons or move joystick to test. Received inputs will light up.



Exit Button Test

After the 10 second countdown completes the **Exit Button Test** button will appear. To exit the button text, scroll down to the **Exit Button Test** button and navigate to the right . You will be returned to the **Help** menu.

Press buttons or move joystick to test. Received inputs will light up.



Exit Button Test 

About

The About screen provides information that is useful for troubleshooting your particular system when technical support is required. Refer to this page to find your particular system's revision number. This information, along with the model and serial numbers of your device, speeds troubleshooting efforts.

4.6 Other Menus

Other menus may arise at various times in operation, due to an event or external action that is detected by the system.

Splash Screen

The Splash Screen appears as the device boots up. This screen appears for approximately three seconds.

USB Menu

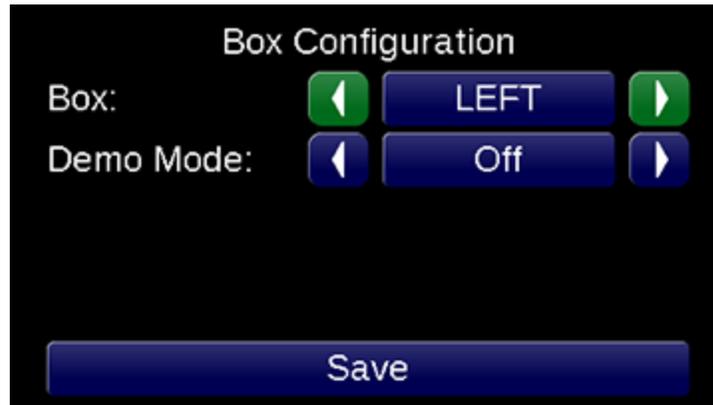


The USB menu appears when a USB drive is inserted. It is primarily used to export Counter Channel data, although future USB functionality may be here as well.

Side Configuration

The **Box Side Configuration** menu allows a Master Box to be selected as the left or right master. Being able to easily swap left and right master boxes gives flexibility when a box fails or troubleshooting is required.

- *Start with power removed from your skip timer.*
- *Press and hold the right navigation button, or hold the joystick to the right, then apply power to the skip timer.*
- *This will enter the **Box Configuration** menu.*



Select the box configuration desired, then press **Save**. The box will restart now and the new configuration will be in use.

Demo Mode

Demo Mode can be enabled and disabled to simulate speed on the skip timer. This is useful for office demonstrations as well as for testing skip timer functionality in the shop.

Demo Mode simulates motion and/or pump inputs, but the system is still fully operational. Demo Mode effectively tricks the system into thinking inputs are present when they may not be. Outputs will still come on (gun solenoids will fire).



Important Note!

DO NOT USE DEMO MODE DURING NORMAL OPERATIONS

Make sure you disable demo mode before engaging equipment during actual striping operations. Speed will not be accurate, causing incorrect patterns to be emitted from material applicators.

Enter the box configuration menu and set **Demo Mode** to your desired Demo Mode.

- **OFF:** Demo Mode will not be activated when you finish starting your system.
- **MOTION:** This will simulate speed on the skip timer.
- **PUMPS:** This will simulate pump strokes.
- **BOTH:** This mode will simulate both pump strokes and speed.

When your box is in a Demo Mode the word DEMO will steadily flash on the screen.



While you are in the **Motion Demo Mode**, the Odometer will record distance when you switch on the START switch. You can toggle patterns on and off to change the preview display. This will provide a simulation of data as if the pattern had been painted.



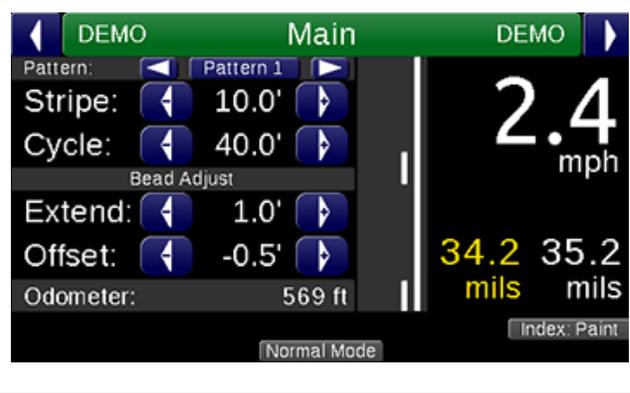
While in the Motion Demo Mode you will be able to view a simulation of the truck in motion. This includes **Counter Channels**. Motion mode will not track simulated pumpstrokes.



In the **Pumps Demo Mode** you will be able to view a simulation of pump strokes. These are reflected in the Counter Channels.



The **Both Demo Mode** will simulate both motion and pump strokes.



5. Additional Features

5.1 Paper-Tape Printing

Skip-Line provides an optional paper-tape printer. It prints current counter channel information.

Under **Counter Channels, Options**, select **Print Counters** to print. The following is an printout example, showing the information contained in a standard printout.

```

-----
Current Activity
-----
JOB _____
CREW _____
HWY _____
MILEPOST _____

Start Switch On Dist:
                1880 ft

      SOLID FT      SKIP FT
Gun 1 (Yellow 4.00")
      1254          626
Gun 2 (Yellow 4.00")
      915           0
Yellow Subtotal:
      2169          626
Yellow Usage:      9.4 gal
Yellow App Rate:   16.1 mils*
Yellow Cal Number: 0.2560

      SOLID FT      SKIP FT
Gun 3 (White 4.00")
      1751          0
White Subtotal:
      1751          0
White Usage:       5.3 gal
White App Rate:    15.2 mils*
White Cal Number: 0.2537
  
```

FOOTAGE TOTALS:	
SOLID FT	SKIP FT
3920	626
FOOTAGE CAL NUMBER:	
0.09780	
* Mil calculation based on line widths shown	
All report items based on calibration numbers.	
Verify calibration frequently to ensure correct reports.	

5.2 Datum Point

Datum point allows the skip timer to create a point in front of the guns that is the target point for material.

This can be advantageous or even necessary in several situations:

- *When bead coverage is critical when paint first turns on.*
- *For single-operator setups, where the operator is also the driver and/or cannot see the guns.*
- *For high precision applications, so the vehicle can align with the target from the front of the vehicle, allowing the vehicle to reach a reasonable application speed before material is emitted from the guns.*

5.2.1 The Bead Registration Concept

Beads are gravity fed and are relatively slow to reach the pavement (around 100 to 500 milliseconds depending on bead gun type and installation variables). In comparison, high pressure paint reaches the road nearly instantaneously in around five milliseconds.

Therefore, a properly operating skip timer will need to turn on the bead guns before the paint guns. At 15MPH, a bead gun with 250ms total time delay turned on electrically at the same time as a paint gun will have the beads arrive on the ground ~5.5 feet AFTER the paint reaches the pavement. This is obviously unacceptable in most situations.

This difference **should only be corrected with time**, and not with distance. If 5.5' is entered as a bead distance offset, and the vehicle subsequently is operating at 10MPH, the beads will arrive 2.3' before the paint. This is obviously

not the intended result either.

By correcting the combination of bead gun mechanical delay time plus bead drop time with a time factor, the vehicle speed is no longer part of the equation, and bead registration will be much more reliable at varying vehicle speeds. Typically at this point, the only remaining variable* is wind speed, which can be corrected for using the Bead Offset parameter on the main screen during striping operations.

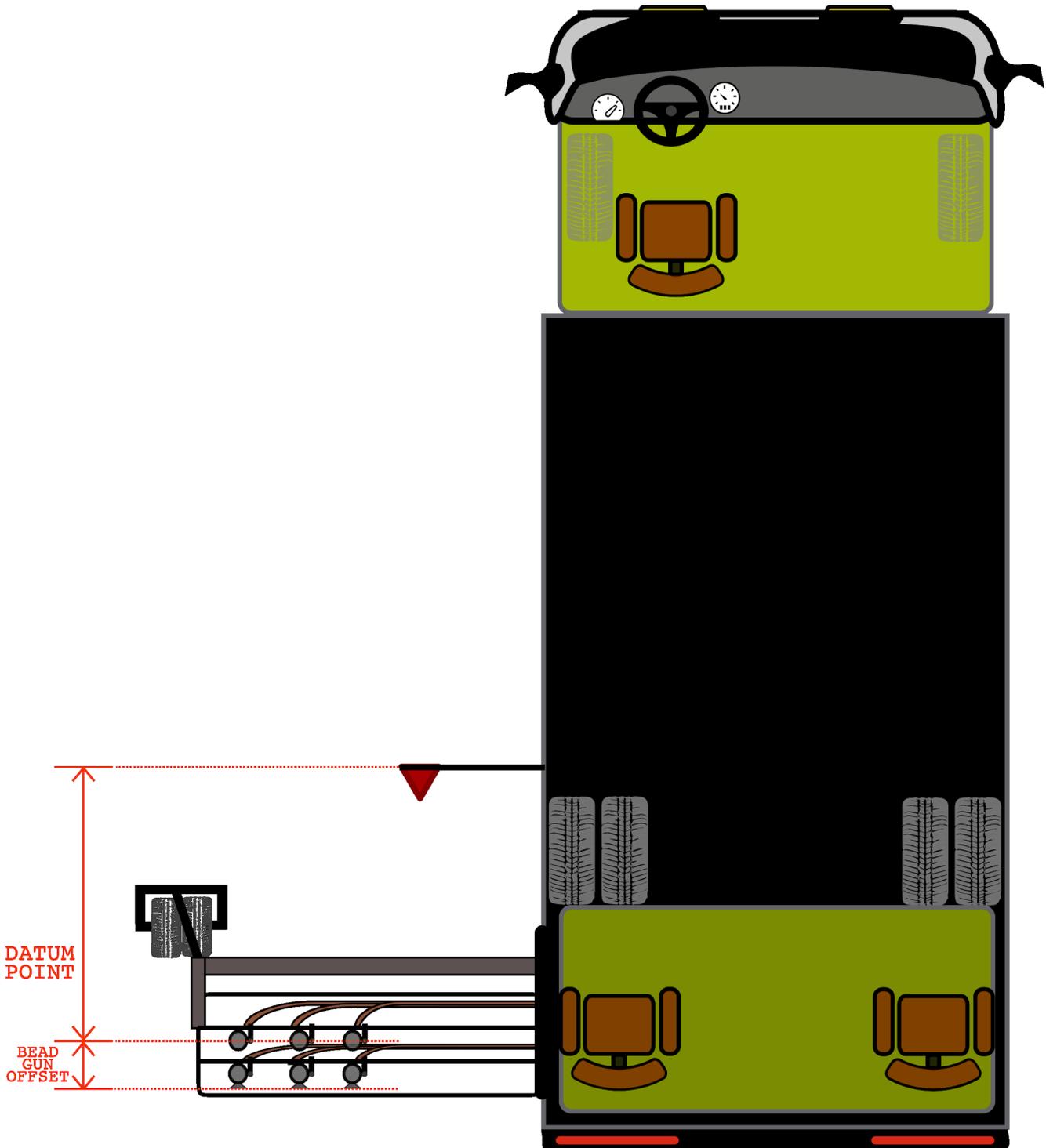
** Some bead gun styles may also be affected by variations in pneumatic air pressure systems.*

5.2.2 Datum Point Correction

When striping first starts, there is no time for the skip timer to turn on the bead guns before the paint guns to ensure proper registration. This means that the first few feet of markings are not covered with beads.

By enabling Datum Point and setting the Datum Offset to some distance in front of the guns, this provides the skip timer with enough time to accurately account for required paint and bead timings.

It is recommended to attach a flag or identifier to the vehicle at the desired datum point. Then, measure from the datum point to the front material gun, as shown in the illustration below:



Enter the measured Datum Length distance (see 4.5.1, "Datum") and then enable Datum Point usage in the Quick Setup menu to engage this feature.

5.3 Tandem Beads

Tandem beads (also called **double-drop** bead systems) allow two different types of bead materials to be applied from two aligned bead guns in the same pass, including standard bead mixes, premium bead mixes, high-friction grit, high retroreflectivity materials (3M Element), or curing agents (Potter's VisiLok).

This function can be provided either using a toggle switch, or through the Quick Setup menu.

The Quick Setup function that enables this feature is labeled **Tandem Beads** and has the options of **Tandem/Front/Rear**. This function selects between both bead guns (double-drop), the front gun, or the rear gun (respectively) to be active during striping operations.

5.4 In-Field Software Updates

Software updates can be applied to Skip-Line skip timers in the field using a file, delivered via email or web download, placed on a USB flash drive.

This provides a quick and easy way to provide new features, functionality, or bug fixes remotely without vehicle down time.

There may be one or more files. Follow this procedure to accomplish the update on the skip timer:

1. *From a PC, download all email attachments or Internet links to files.*
2. *Place all files in a folder called **updates** on the root of the USB drive from a computer.*
3. *Close all file explorer windows. Properly eject the USB drive.*
4. *With the skip timer system powered off, insert the USB drive.*
5. *Power on the skip timer. The skip timer should detect the USB drive, find the files, and commence with the update.*
6. *Once the update is complete, remove USB drive and power cycle the device.*
7. *Verify the new functionality is in place.*

The new software should now be installed on the skip timer system. Note that updates for other devices (with the exception of CVO-312 devices) will have received their updates through the communications network at the same time.



**USB
Update
Note**

*Update files are created on a serial number basis. Attempting installation of an update file created for a different serial number will fail.
Make sure your OEM and/or Skip-Line has the correct serial numbers prior to requesting an update.*

6. Menu Messages

There are many information, warning, and error messages that can appear on the SC-12. Review the following sections for information about what these messages mean, and what (if any) corrective actions should be taken.

6.1 Message Icons

There are three levels of messages.

Icon	Importance	Description
	<p>Information</p>	<p><i>Informational messages typically do not mean that anything is necessarily wrong, but provide additional information that will help the operator understand what is happening.</i></p> <ul style="list-style-type: none"> ➤ <i>If cleared, the information will not reappear for the same instance.</i>
	<p>Warning</p>	<p><i>Warning messages indicate that at some level, something is not functioning as expected. It may not cause the system to fail completely, but may limit functionality until the error is corrected.</i></p> <ul style="list-style-type: none"> ➤ <i>If the message is cleared, the warning will reappear in two minutes if the error still exists.</i>
	<p>Critical Error</p>	<p><i>Critical messages indicate the system may not be able to function without correcting the error.</i></p>

		➤ If the message is cleared, the critical error message will reappear in two minutes if the problem still exists.
--	--	---

6.2 Message Descriptions

Icon	Message Text	Description
	Core Skipper is initializing...	This appears on startup to indicate that the system is not quite ready for operations yet. It will disappear once the system is ready.
	Gun #X Disabled - Change color from 'None' to fix.	Guns can be disabled by setting the color to None . If the color is set to none, but the switch is not in the OFF position, this message reminds the operator of the gun's current status. <ul style="list-style-type: none"> ➤ If the gun is intended to be used, change the gun color from None to the correct color in the Gun Setup menu. ➤ If the gun is not intended to be in use, move the pattern switch to OFF.
	Attached USB device has an error.	The system has detected a USB device is plugged in, but can't determine what kind of device it is. <ul style="list-style-type: none"> ➤ Remove the device from the USB port. ➤ If the device was a USB flash drive, it is not compatible – try a different USB drive.
	Attached USB device is not a flash drive.	The system has detected a USB device is plugged in, but that device is not a flash drive. <ul style="list-style-type: none"> ➤ Only USB flash drives are compatible with this USB port – unplug any other devices. ➤ If the device was a USB flash drive, it is not compatible – try a different USB drive.

	<p>Output #X is shorted.</p>	<p>A short circuit has been detected on an output pin. Remove the short circuit, and clear the error to resume use of this pin.</p>
	<p>Turn Run switch to Hold to continue.</p>	<p>On systems with a RUN-HOLD switch, the switch must be in the HOLD position before operations can begin after system power-on. This prevents inadvertently engaging material at power-on.</p>
	<p>Turn off Start switch to continue.</p>	<p>On systems with a START-STOP switch, the switch must be in the STOP position before operations can begin after system power-on. This prevents inadvertently engaging material at power-on.</p>
	<p>Flash image mismatch: update image via USB.</p>	<p>Images and audio files for the program do not match the main program installed on the system.</p> <ul style="list-style-type: none"> ➤ Insert a USB drive with the correct update file. ➤ Contact Skip-Line for support.
	<p>Flash memory unreadable.</p>	<p>The flash memory that contains graphics, audio files, and logged counter channel records is not communicating.</p> <ul style="list-style-type: none"> ➤ Contact Skip-Line for support.
	<p>Duplicate switch detected. Fix and cycle power.</p>	<p>A switch with the same function is connected via the CAN expansion port, or devices with incompatible programs are both on the same system.</p> <ul style="list-style-type: none"> ➤ Remove other devices from the CAN bus. ➤ A full system power cycle is required to clear this error. ➤ Contact Skip-Line for support.
	<p>No communication with Core Skipper.</p>	<p>The SC-12 master boxes must be able to communicate with the Core Skipper device in order to operate, since the Core Skipper is the central computer for the system.</p>

		<p><i>Check for communications issues, including cables</i></p> <p><i>Check connectors for corrosion, dirt, or damage.</i></p> <p><i>Contact Skip-Line or your OEM.</i></p>
	<p><i>The memory in the Core Skipper isn't responding.</i></p>	<p><i>A memory circuit has failed internally. Contact Skip-Line for service.</i></p>
	<p><i>Switch communication error. Check cables.</i></p>	<p><i>The SC-12 master box has had an internal failure. Contact Skip-Line for service.</i></p>

7. Master Box Switches

Functions used during normal striping operations are most often assigned to toggle switches on a master box. This provides functionality that is easy to access quickly, has tactile feedback, and simplifies operation.

Switch functionality is described in an appendix insert that you should have received with this manual. If you did not receive a Switch appendix, please contact your OEM or Skip-Line.

Some switches may not work in all striping modes or under certain settings. Refer to each switch definition for conditions that may alter switch behavior.

If you suspect that a switch is malfunctioning due to damage or wear, use the Switch Test menu to verify the switch status.



Important Note!

SC-12 systems are custom built to order. Your unit may have fewer or additional switches and possibly with slightly different labels than those listed.



Glass Cockpit Note

An SC-12 Glass Cockpit has automated calibration routines and other functionality that can override Master Box controls.

Ensure that while testing and troubleshooting switch behavior, the Glass Cockpit is not in calibration mode and does not have functionality activated that would impede the Master Box behavior.

Refer to the Glass Cockpit manual for more information.

Appendix A: Glossary

Hub: A hub provides clean, filtered power and communications to the other units in the SC-12 system. It also shows diagnostics for each port, as well as general fault conditions.

Core Skipper: This is the same as the **Slave Box** on Legacy devices. This unit makes centralized command decisions for the entire system.

Master Box: This is a switch box with a display. It allows the operator to control the striping pattern and other striping actions. Most Master Boxes are dedicated to control specific carriage outputs on either the right or left side of the truck.

Switch Box: This is a simple switch box that has toggle switches to be controlled from a different section of the truck than normal. Example: a Cab Box could allow a driver to open or close a door with the switch. These can also contain LEDs to turn on under certain conditions as warning lights.

Speedometer: A small box with a large digit LCD display that shows the speed of the vehicle. It can also display counter channels and material usage information.

Menu Button: The push button on Master box labeled **MENU**. This switch cycles between menu screens on the display.

Stripe: The **skip** length, i.e. the length of the paint on the road for a skip.

Cycle: The cycle is the distance from the start of one skip to the start of the next skip.

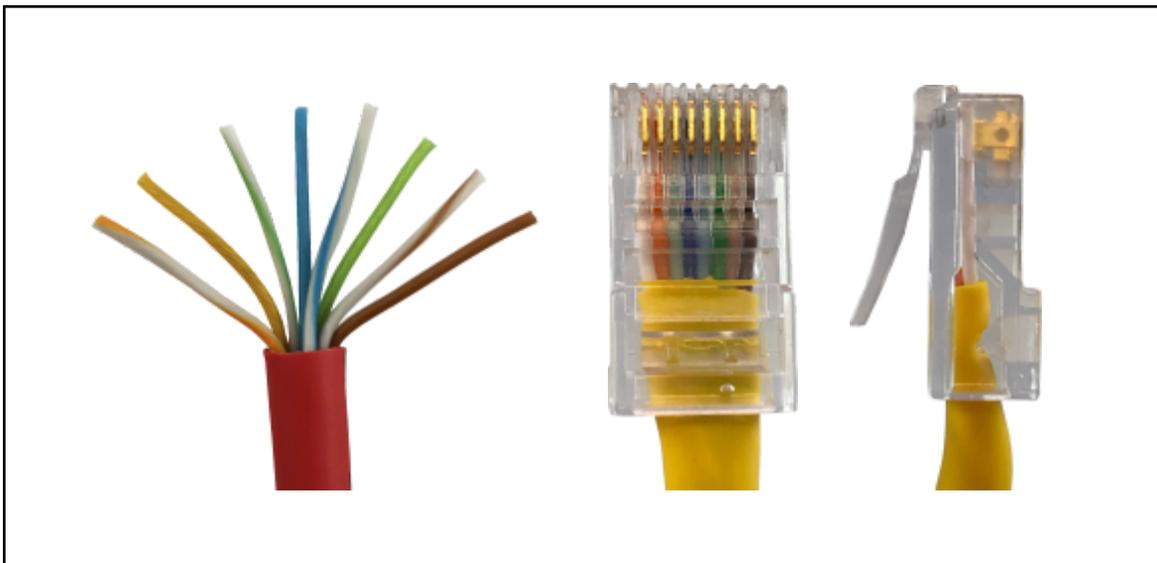
Gap: This is the portion of the Cycle between skips where paint is not applied.

Appendix B: Making a Communications Cable

Communications cables for the SC-12 system follow the EIA/TIA 568-B cable wiring standard. These are commonly referred to as Cat5, RJ45, or simply as a network patch cable.

A communications cable should be constructed using the following pin assignments on both ends of the cable.

- Pin 1 - white / orange stripe
- Pin 2 - orange
- Pin 3 - white / green stripe
- Pin 4 - blue
- Pin 5 - white / blue stripe
- Pin 6 - green
- Pin 7 - white / brown stripe
- Pin 8 - brown



TIA/EIA 568-B

These cables can also be purchased pre-assembled from your local computer store or big box retailer in varying lengths.

A sealed waterproof RJ-45 connector with strain relief is available from your OEM or Skip-Line.

Appendix C: Repairs Form

The SC-12 Control System is field-updateable and many issues may be fixed using the **USB Remote Update** process (See section 5.4 **In-Field Software Updates** for more information on the USB Remote Update process). If an issue has been isolated to a hardware malfunction and needs to be sent in for repairs, there is a form that can be filled out to help streamline the process. The most up to date version of the form can be found on www.skipline.com and is also included in every Skip-Time newsletter. A copy of the repairs form is included on the following page in this manual. You may reproduce this form via photocopy, scanning, etc.

If for any reason you are unable to reproduce or print the form, please include a note with the following information in the box with your Skip-Line device(s):

Contact name

Phone number where contact can be reached during business hours

Return shipping address (no PO Boxes)

Return shipping method (Next day, 2nd day, 3rd day, or ground)

Billing address (if different from return address)

A description of the problem

PO number (if required by your organization's accounts payable department)

Boxes containing a note with the above information can be sent to us at:

Skip Line, Inc.

10514 N. McAlister Rd

La Grande, OR 97850

Should any information above be missing, we cannot guarantee the repaired unit will be returned in the manner expected.

UPS is the preferred shipping provider as our local UPS delivers earlier in the morning and picks up later in the evening than any other local courier. The unit(s) being sent in should be relatively clean. Units should be wrapped in large bubble wrap (3/4" to 1" bubbles) and surrounded by newspaper or packing filler. Particular care should be taken for units with LCD displays by ensuring there are no other objects with sharp corners packed in such a way that they could damage the screen while the shipment is in transit. There should be two inches of filler between the unit and the edge of the shipping box.

If you have any questions about the process, please call (541) 963-0111.



Inspection or Repair Information Form

Company: _____

Contact Name: _____

Phone Number: _____

Email: _____

P/O Number: _____

Date Sent: _____

Model(s): _____

Serial Number(s): _____

Return Method:

- Ground Next Day Air 2 Day 3 Day
 Saturday Delivery

Return Address (No PO Box):

This is an: Inspection Repair Update Other: _____

Please provide a detailed description of the problems/issues you are experiencing below.

Affix your business card here (optional)

Billing Address (Required if different from above):

Thank You!

Ship this form with your equipment to:

Skip-Line Repairs
10514 N. McAlister Road
La Grande OR 97850

Contact Us:

Hours: 8am-4:30pm Pacific Time
Monday-Friday
repairs@skipline.com
541-963-0111