Servo Technologies, LLC

SVX Reregister + Infeed System
Installation & Operating Manual

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Index

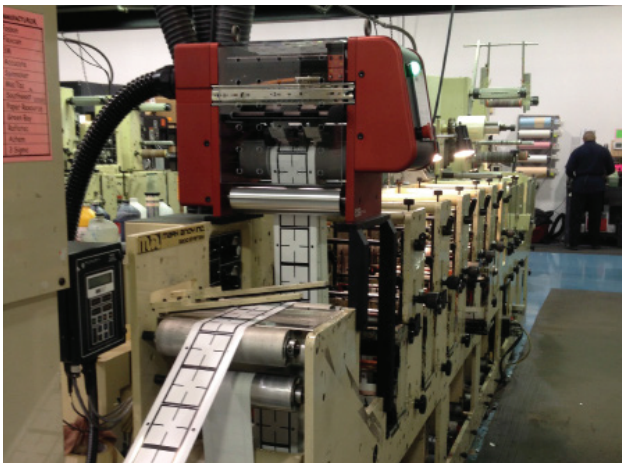
1. System Overviews

Note for setup
Username = sv5 Password = 2569

The SVX Reregister + Infeed System is two machines in one. It is a servo infeed that improves press registration, lowers material waste, and expands the runnable substrate range.

The SVX is also a precision registration system for preprinted rolls. The SVX allows preprinted rolls to be over printed for additional colors, allows digitally printed rolls to be converted on a conventional press, and allows preprinted rolls to be laminated to other printed webs for multi layered products.

The system can operate at full press speed.



Mounting Bracket Examples

2. System Parts

Servo Unit

Encoder

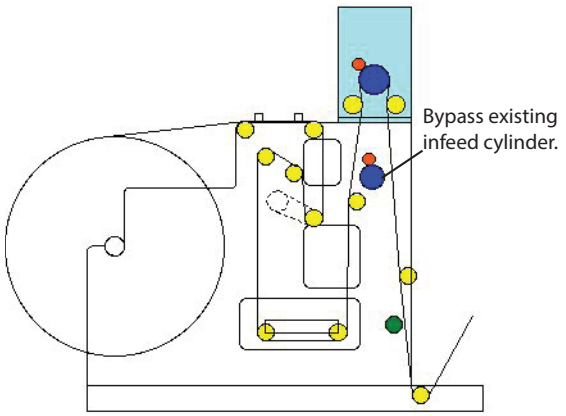
Electrical Cabinet

Backside Web Reader (optional)

3. Mechanical Installation

3.1 Servo Unit: The Servo Unit must be mounted with rigid bracketry. Excessive vibration will degrade performance. See section **13. Mechanical Dimensions,** starting on page 13, for mounting hole locations to make brackets.

The unit must be mounted downstream of the dancer and web guide, and with the web path bypassing the existing infeed cylinder.



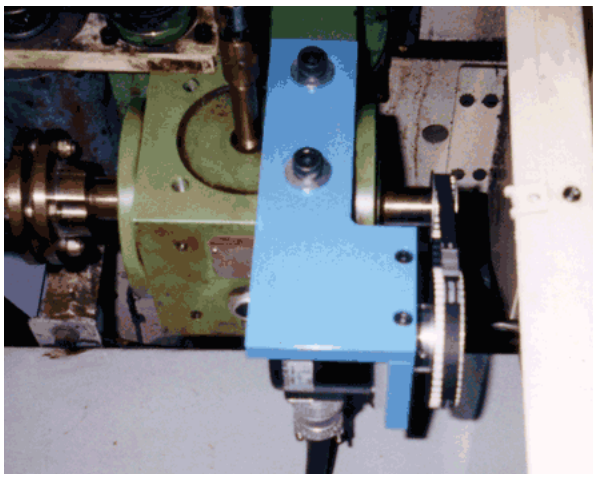
3.2 Encoder: There are three methods of mounting the encoder, 1) timing belt pulleys from the press line shaft, 2) direct couple to the line shaft, and 3) direct geared using a spur gear.

The encoder is a precision instrument and must be mounted with rigid bracketry. Excessive vibration will degrade performance. See page 13 for encoder drawing.

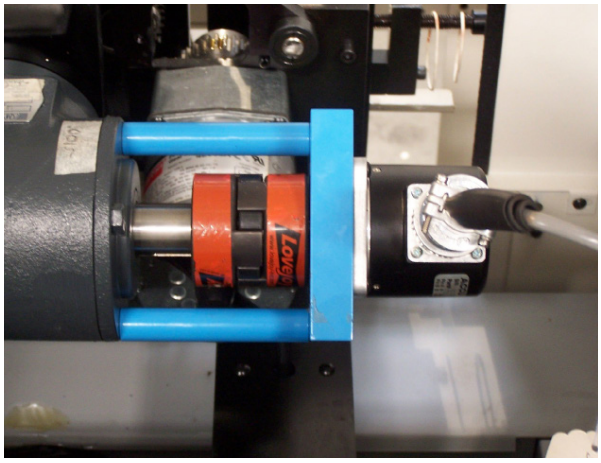
If mounting using a spur gear adjust the mesh so there is a tight fit.

Important. The ratio between the press and encoder is extremely important. Consult Rotary when choosing to mount the encoder using timing belt pulleys or direct couple to the line shaft.

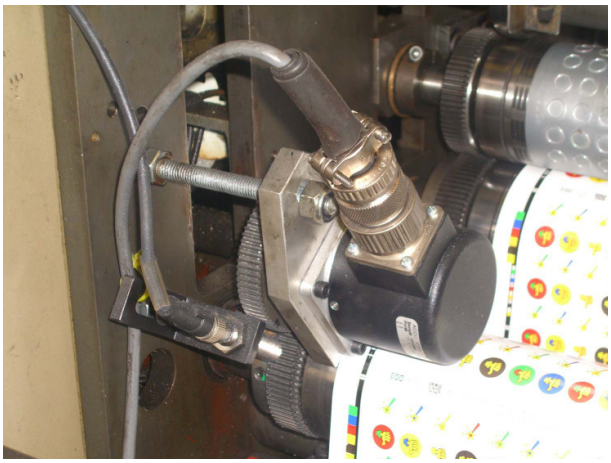
3.3 Electrical Cabinet: The electrical cabinet is delivered already mounted on casters.



Timing belt pulleys mount

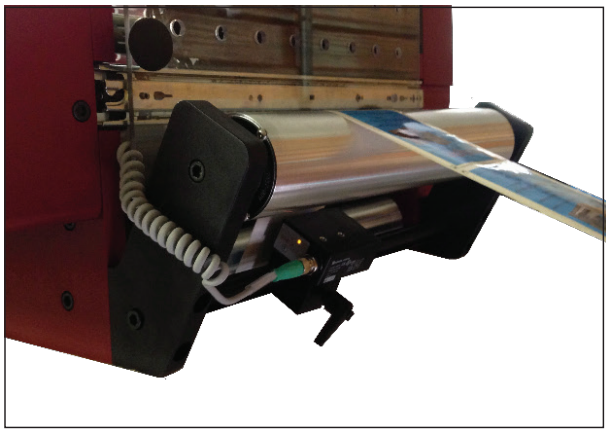


Direct couple mount



Direct gear mount

3.4 Backside Web Reader: This option mounts directly to the Servo Unit with the supplied hardware (4x 3/8-16 x 2" SHCS).



Backside Web Reader

4. Electrical Installation

4.1 Mains: The SVX is designed for universal three phase power.

Voltage	3x 208 - 520 VAC
Cycle	50/60 Hz
Service	20 Amps

The SV5 is portable and it is recommend that a power drop with a female receptacle be provided for ease of connection. A male plug can be wired to the supplied 12' power cord which is terminated inside the electrical cabinet. Observe local electrical requirements when choosing the plug and receptacle.

Mains Power Cord & Encoder Cable

4.2 Encoder: The encoder cable coming from the electrical cabinet has a military style connector. Connect this cable to the encoder before turning the system on. Make sure the encoder cable is clear of moving parts and other high voltage lines.

5. Pneumatic Installation

Located on top of the electrical cabinet is a universal air intake fitting. Connect regular shop air. Adjust the air regulator to 40 - 50 psi. This sets Gripper Wheel pressure.

Air Regulator to set Gripper Wheel Pressure

6. Touchscreen Pages & Operations

Important: The SVX must be programmed for the press it is installed on. Section **6.5 Program Tools Page** on page 8 explains how.

There are three main pages:

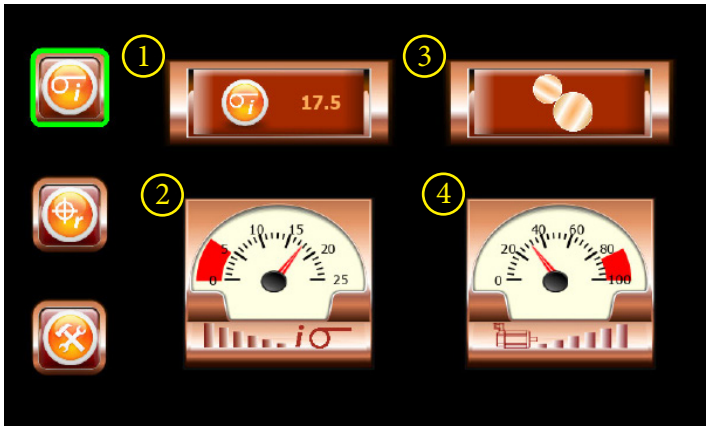
1) Infeed Page
2) Reregister Page
3) Tools Page

Note: Page buttons have rounded corners. Data entry buttons and information displays have square corners.

Initial Splash Page

6.1 Infeed Page

The Infeed Page is used to adjust web tension for first pass printing and converting. The web tension is adjusted by setting the Infeed Value, a number between 0.0 and 25.0, where as the lower the number the more web tension.



Infeed Page

1) Infeed Value. This is the web tension setting. Push this button and a key pad pops up allowing a new value to be set.

2) Infeed Value Scale. This is a graphical representation of the Infeed Value range.

3) Gripper Wheel Status. This display shows if the gripper wheels are on or off. The gripper wheels are automated. They are off when the guards are open to allow easy webbing of the SVX, and they are on when the SVX is in run mode.

4) Motor Torque. This is a graphical representation of the servo motor torque. Presumably the more web tension the higher the motor torque.

6.2 Reregister Page

The Register Page is used to set up a reregister job.

(1) Reregister On/Off. Pressing this button turns reregister on or off.

The number display on the top shows reregister accuracy. This unit of measurement can be in inches or millimeters depending on the Units selected in the Program Tools Page.

The number display on the bottom is the Infeed Value. When reregister is on the Infeed Value automatically adjusts to hold the best possible registration.

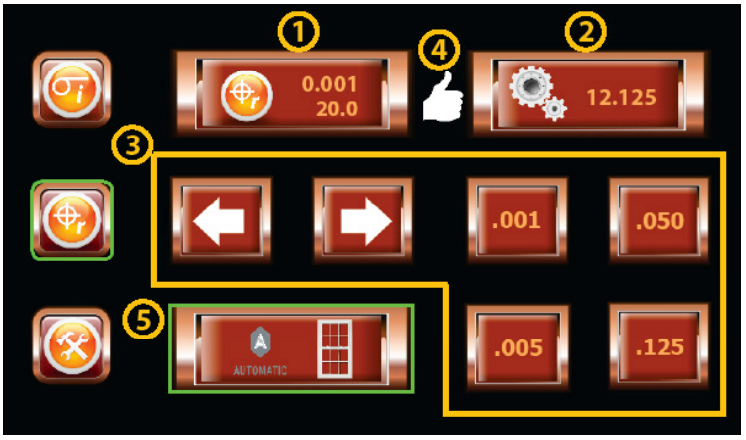
(2) Print Repeat. Push this button and a key pad pops up allowing a new print repeat to be set. The print repeat can be entered in inches or cylinder gear teeth depending on the selected setting for Gear Type in the Program Tools Page.

Note: Print repeat refers to the size of the print cylinder or die cutting tool and not the size of an individual label.

(3) Register Movement. These buttons control the register adjustments between the preprinted material and the press. Press a "unit of distance" button on the right and it will be highlighted in green. Each time the advance or retard arrow buttons are pressed the registration of the preprinted material will move by the selected distance.

The unit of distance can be in inches or millimeters depending on the selected setting in the Program Tools Page.

(4) Print Length Status. The SVX automatically checks print length and determines if the current jobs print length is within specifications. Print length is the most important factor for reregister. See section 11. Print Length for more information.



(5) Mark Window Control. This will display whether the mark window is in manual or automatic mode.
- Automatic mode will automatically set a mark window based on the actual distance from mark to mark.
- Manual mode gives you greater control by allowing you to set the window to your liking.

By pressing the mark window control button this will bring up the Mark Window control Page. See Page 7.

6.2.1 Register Mark

It is recommended that a rectangular register mark be placed in its own margin, and measure 3/16" across the web and 1/8" in the web direction. There only needs to be one mark per print repeat.

Other register mark placements and shapes can be used. Contact Rotary for further details.

6.2.2 Reregister Set Up

The following are steps necessary to set up a reregister job:

1) Enter the print repeat.
2) Start the press and position the mark sensor in the path of the register marks.
3) Configure the mark sensor. (Ensure the sensor is in Dynamic mode for auto calibration and setup)
4) Turn on reregister. The first few marks will be used for sensor calibration and to calculate the auto mark window. If using a manual window this would be the point to enter it. Within a few revolutions the SV5 will be holding a register position between the preprinted material and the press.
5) Adjust registration by using the Register Movement buttons, or make ready the press as normal.

6.2.3 Mark Window Control Page

The Mark Window Control Page is used to set up the mark window. You may choose automatic or manual for the functionality of the mark window.

(1) Pressing this button will toggle between automatic and manual for the mark window.

(2) Pressing this button turns reregister on or off.

-The number display on the top shows reregister accuracy. This unit of measure can be in inches or millimeters depending on the Units selected in the Program Tools Page.

-The number display on the bottom is the Infeed Value. When reregister is on the Infeed Value automatically adjusts to hold the best possible registration.

-Print Length Status. The SVX automatically checks print length and determines if the current jobs print length is within specifications. Print length is the most important factor for reregister. See section 11. Print Length for more information.

(3) - If Automatic is selected this data field will display the current calculated mark window.
- If manual is selected then you may enter your desired window.

*Note * The manual window should only be entered after the reregister is displaying a value. (The number display on the top)

(4) Overdrive Functionality. Pressing this button turns overdrive on or off.

Overdrive is a form of AI for the reregister. This will allow the machine to run a wider range of materials.

6.2.4 Express Reregister Set Up

Prerequisites for express setup

- Machine is set to automatic window.
- Sensor is set on dynamic.

To set up a reregister job:

1) Enter the print repeat.

2) Start the press and position the mark sensor in the path of the register marks.

3) Turn on reregister.

4) Make ready the press as normal

6.3 Tools Page

The Tools Page is used to check system status, clear errors, and navigate to other pages for system set up, view production reports, and see relevant machine running information.

1) Running Tools. Pressing this button will go to the running tools page.

***Note* Username = sv5 Password = 2569**
2) Program Tools. Pressing this button will go to the programming tools page. The programming tools page is where the SVX is set up for the press it is installed on.

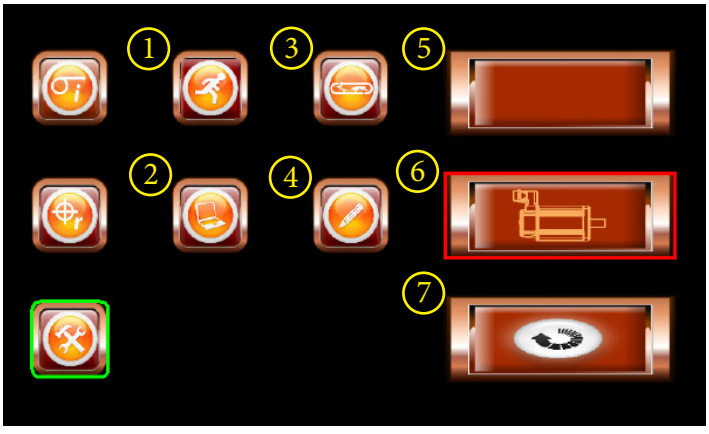
3) Rotary Tools. This is for Rotary technicians only.

4) Report Tools. Pressing this button will go to the report tools page.

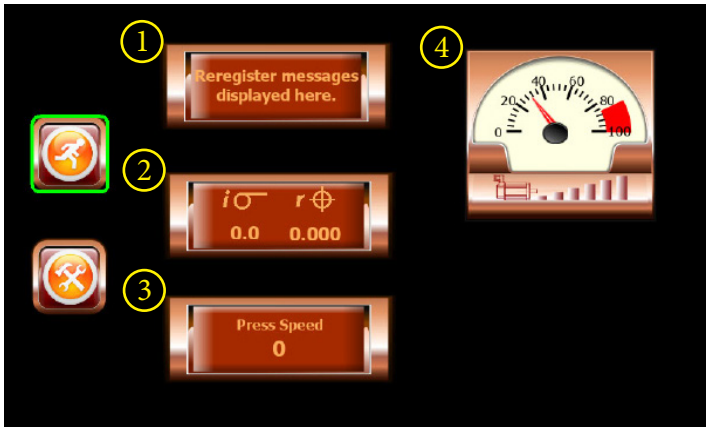
5) System Status. System status and error codes will be displayed here.

6) Motor Engage. Pressing this button will engage and disengage the servo motor.

7) Clear Error. Pressing this button will clear system errors.



Tools Page



Running Tools Page

6.4 Running Tools Page

The Running Tools Page displays current running conditions.

1) System Status. System status and error codes will be displayed here.

2) Reregister Values. The number display on the left is the Infeed Value. When reregister is on the Infeed Value automatically adjusts to hold best possible registration.

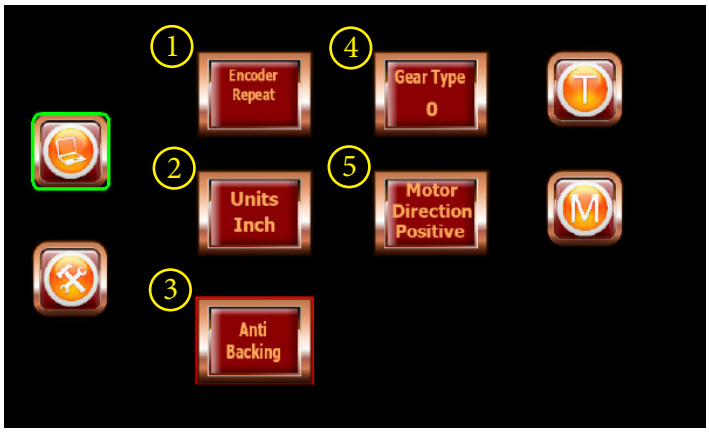
The number display on the right shows reregister accuracy. This unit of measurement can be in inches or millimeters depending on the selected setting in the Program Tools Page.

3) Press Speed. This displays real time press speed.

4) Motor Torque. This is a graphical representation of the servo motor torque. Presumably the more web tension the higher the motor torque.

6.5 Program Tools Page

The Program Tools Page is where the SVX is set up for the press it is installed on.



Program Tools Page

1) Encoder Repeat. Push this button and a key pad pops up allowing for the encoder to be set. The encoder repeat is displayed and entered according to the Gear Type selected. The value is the actual representation of how the encoder is installed and relates to one revolution of the encoder compared to press movement.

Example 1: The encoder is mounted direct geared using a 1/8" pitch spur gear with 73 teeth. Therefore one revolution of the encoder is 9.125" of press movement. The Encoder Repeat would be 9.125 if Gear Type Inches is selected, or 73 if Gear Type 1/8 CP is selected.

Example 2: The encoder is direct coupled to the press line shaft. One revolution of the press line shaft is 8.250". The Encoder value would be 8.250 if Gear Type Inches is selected, or 66 if Gear Type 1/8 CP is selected.

Important: Entering any value other than the correct Encoder Value and the system will not work !

2) Units. Pressing this button will toggle the units of measure between inches and millimeters.

3) Anti Backing. Pressing this button will toggle Anti Backing on and off.

The anti backing feature when enabled prevents backward Encoder movements to be transfered to the Servo Head Unit, causing the infeed cylinder to turn backwards when the press comes to a stop. The cause of backward encoder movements is due to web tension releasing when the press comes to a stop.

4) Gear Type. Push this button and a key pad pops up allowing for the Gear Type to be set.

The selected gear type value will determine how the encoder repeat is entered, but more importantly it is an operator preference since it determines how the Print Repeat is entered on the Reregister Page.

0 = Inch	Enter Print Repeat in Inches
1 = 1/8 CP	Enter Gear Teeth of Print or Die Cylinder
2 = 1/4 CP	Enter Gear Teeth of Print or Die Cylinder
3 = 32 DP	Enter Gear Teeth of Print or Die Cylinder
4 = MOD 1	Enter Gear Teeth of Print or Die Cylinder

5) Motor Direction. Pressing this button will toggle the direction of the servo motor.

The motor direction, positive or negative, determines which direction the infeed cylinder on the Servo Head Unit turns.

To test jog the press and see if the infeed cylinder is turning the same direction as the web direction, if yes it is correct. If the infeed cylinder turns the opposite direction change the motor direction.

6.6 Report Tools Page

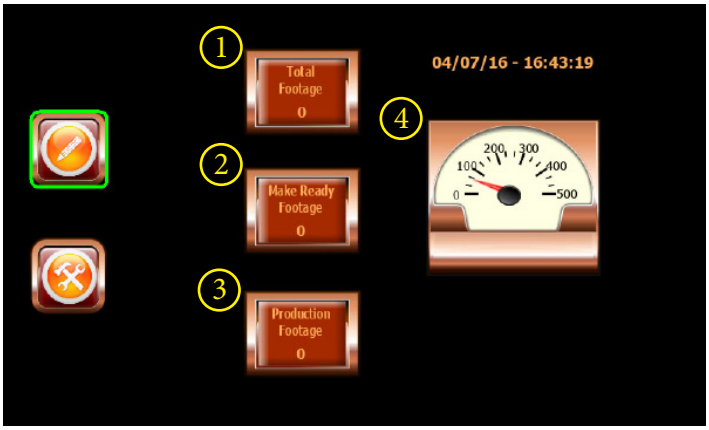
The Report Tools Page is a production report showing material ran through the press. This report resets itself on machine power up.

1) Total Footage. This display is a running count of all material ran through the press.

2) Make Ready Footage. This display is a running count of material ran through the press when the press is running below 50 FPM.

3) Production Footage. This display is a running count of material ran through the press when the press is running above 50 FPM.

4) Press Speed. This display is a graphical representation of real time press speed.



Report Tools Page

7. Status Light

The Status Light has four states:

1) Solid Green. Servo motor engaged and ready to run.

2) Flashing Blue. System ready for servo motor to be engaged.

3) Flashing Green/Red. Mark sensor not reading print marks when reregister is turned on.

4) Solid Red. Guards open or system error.

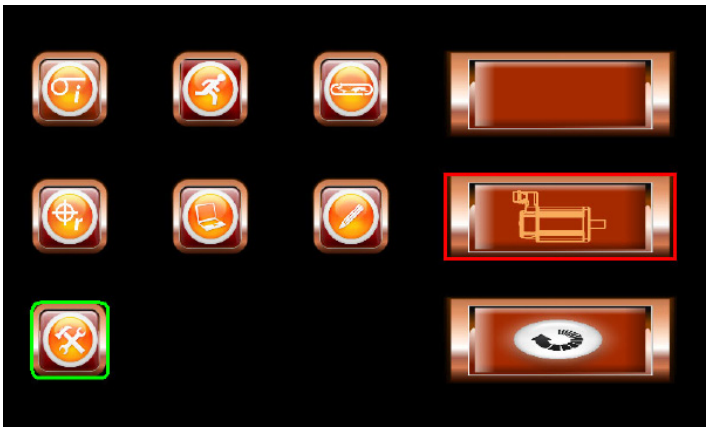
8. Machine Reset/Clear Error

To reset the SVX after opening the guards or to clear a system error, go to the Tools Page and follow this procedure:

1) Press the Clear Error button.

2) Wait for the Status Light to flash orange.

3) Press the Motor Engage button. The Status Light will turn solid green indicating ready to run.



Go to Tools Page to Reset Machine

9. Maintenance

There are three items that require periodic inspection and cleaning:

1) Air filter. The air filter inside the electrical cabinet requires cleaning every three months. Simply blow clean with shop air. Replace when needed.

2) Drive belt. The servo motor drive belt requires inspection every six months for signs of wear. Replace when need.

3) Gripper Wheels. Replace gripper wheels when showing visible signs of wear.

10. Service/Remote Communication

The SVX is equipped with an industrial VPN router designed to offer easy remote access across the Internet.

Simply plug in an Internet connection and a Servo Technologies technician can trouble shoot the SVX.

The SVX uses an outbound connection across the factory LAN (HTTPS port 443 or UDP 1194). No IT/firewall changes are needed to establish communication.

A fully secure SSL-based VPN tunnel is used for all traffic. The information exchanged during the communication is encrypted via SSL (2048-bit key) allowing only authenticated users to connect

Plug in an Internet connection for technical service.

11. Print Length Explanation

Print length is the most important component for running a successful reregister job. Print length is the distance between register marks over multiple print repeats in an approximate 10 foot span.

For example, if the register marks were printed with a 12" cylinder, what is the distance between the first register mark and the tenth? Is it exactly 10 feet? Is it a little shorter or longer than 10 feet?

Print length is expressed as dead on in 10 feet, 1/8" short in 10 feet, 1/16" long in 10 feet, etc.

The reason why this is important is how the SVX works. The SVX works by adjusting the speed of the web in relation to the speed of the press. This is how the SVX times the preprinted web to be in register with the press.

Print length determines the speed of the preprinted web.

Theoretically if the print length is dead on in 10 feet, the web and the press would run at the same speed to be in register.

If the print length was short, the preprinted web would need to run slower than the press to be in register, and faster than the press if the print repeat was long.

If the print length is too far short or long, there will be a mismatch in speed, and the reregister job will not run good, or run at all.

If the print length is too short, the SVX will try to slow down the web speed, this can create a lot of web tension and the web can slip around the drive roll in the SVX.

If the print length is too long, the SVX will speed up the web, this will cause over feeding and the press will lose web tension.

Print length can be controlled by the following:

1) On flexo and offset presses there is usually web tension control at the infeed nip. Generally the more web tension the shorter the print length.

2) On digital presses print length can be determined in the art work or on press settings.

To determine the correct print length for a specific reregister job, print a single color using the material and press for which the job will be ran. Measure the print length. What the print length measures is the correct length.

Print length may be a new concept for those new to the SVX. However it is not a difficult concept. Consult Servo Technologies for more information.

12. Multi Layer Labels

The SVX can be used to laminate in register a top printed web onto a base web.

This is usually done the following way:

1) A lamination tower is used as an unwind for the preprinted roll.

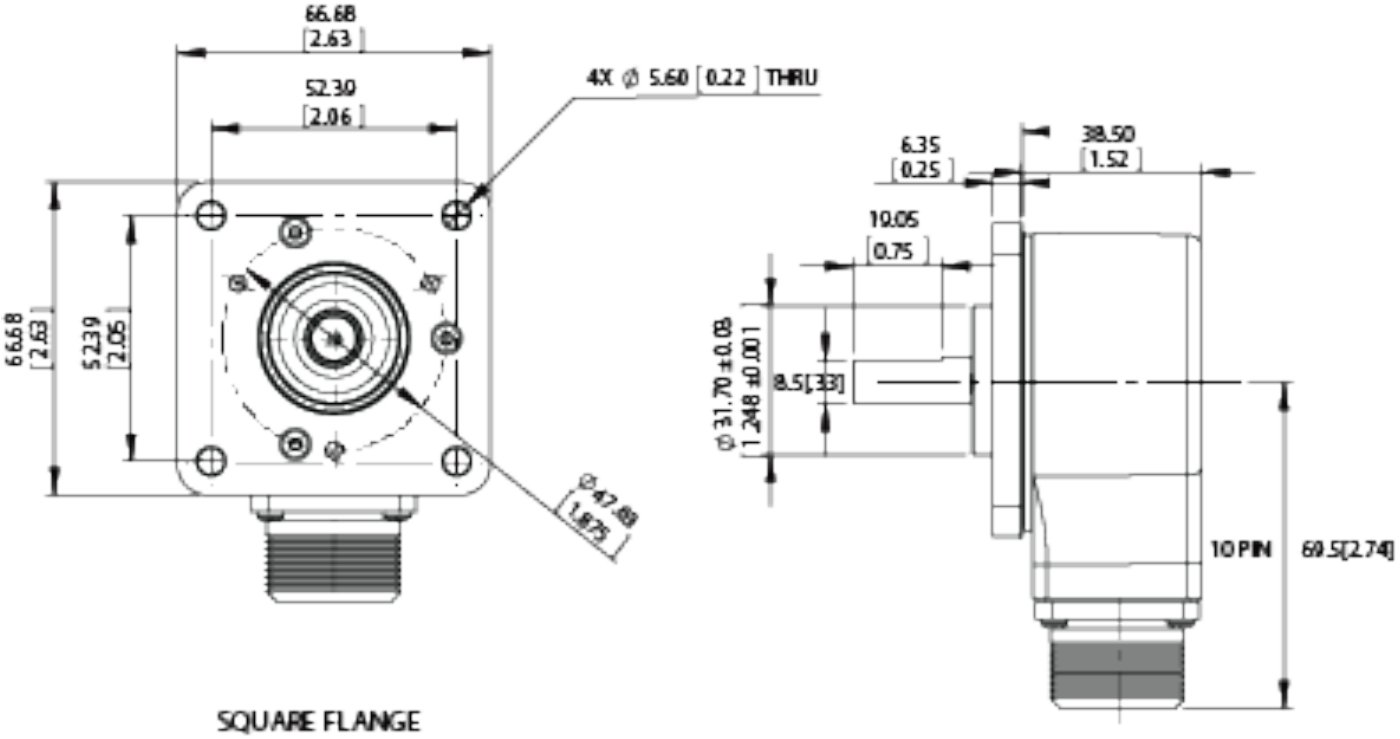
2) The SVX is mounted in a downstream position in the press before the first die station.

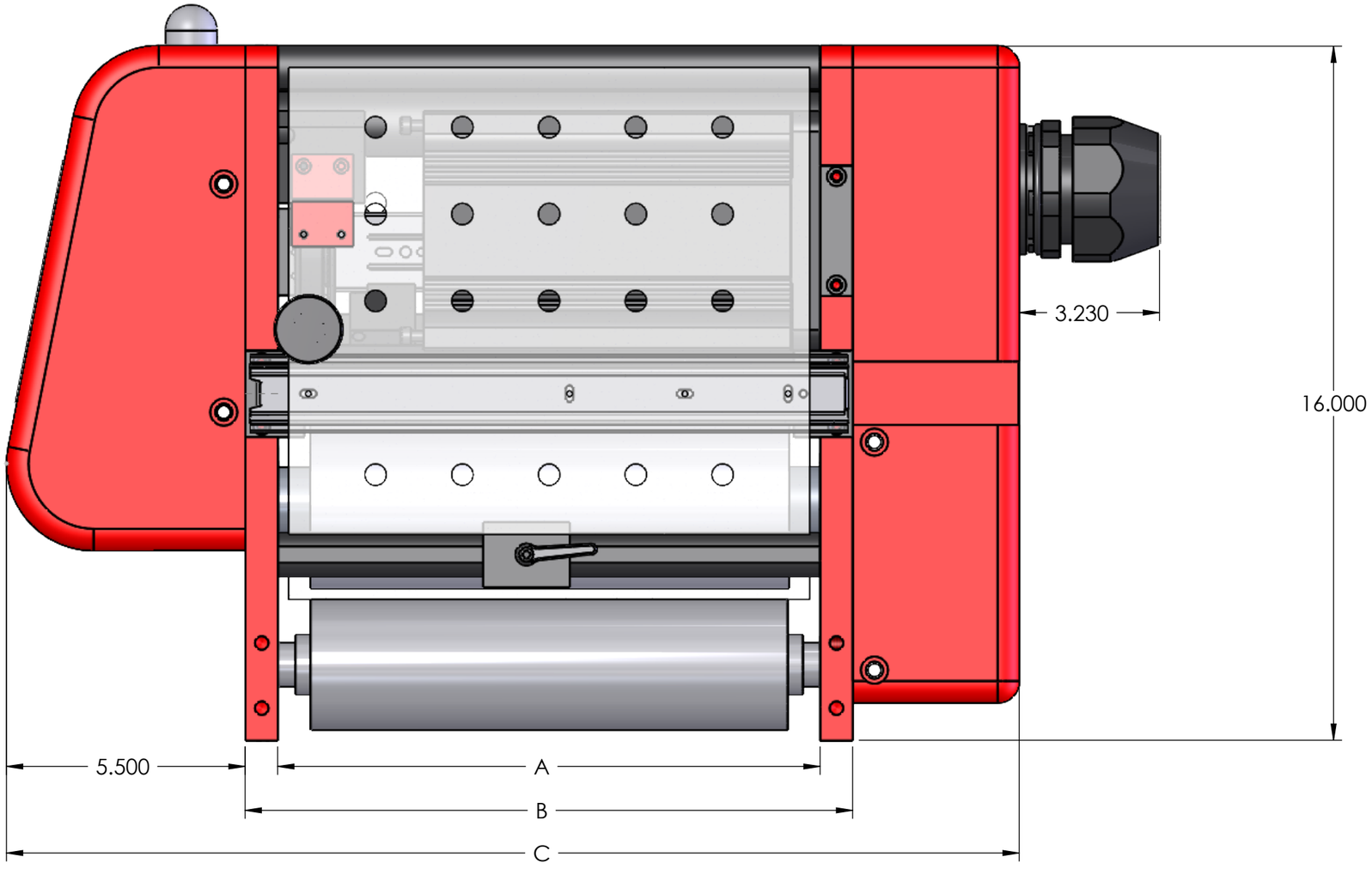
3) At the same time the base web is being printed, the top preprinted web controlled by the SVX is feed into the press and the two webs are laminated together at the first die station.

4) The registration between the two webs is controlled by the SVX. Using the register movement keys on the Reregister Page it is possible to adjust the position of the top web to the base web.

13. Mechanical Dimensions

Encoder





MODEL	A	B	C
10	12.50''	14.00''	23.34''
16	18.50''	20.00''	29.34''
20.5	23.00''	24.50''	33.84''

DRAWN BY	DRM	DATE	11/21/18
APPROVED BY	-	DATE	-
MATERIAL	N/A		
FINISH	N/A		

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGULAR: ± 1°
TWO PLACE DECIMAL ± .015
THREE PLACE DECIMAL ± .005

THIRD ANGLE PROJECTION

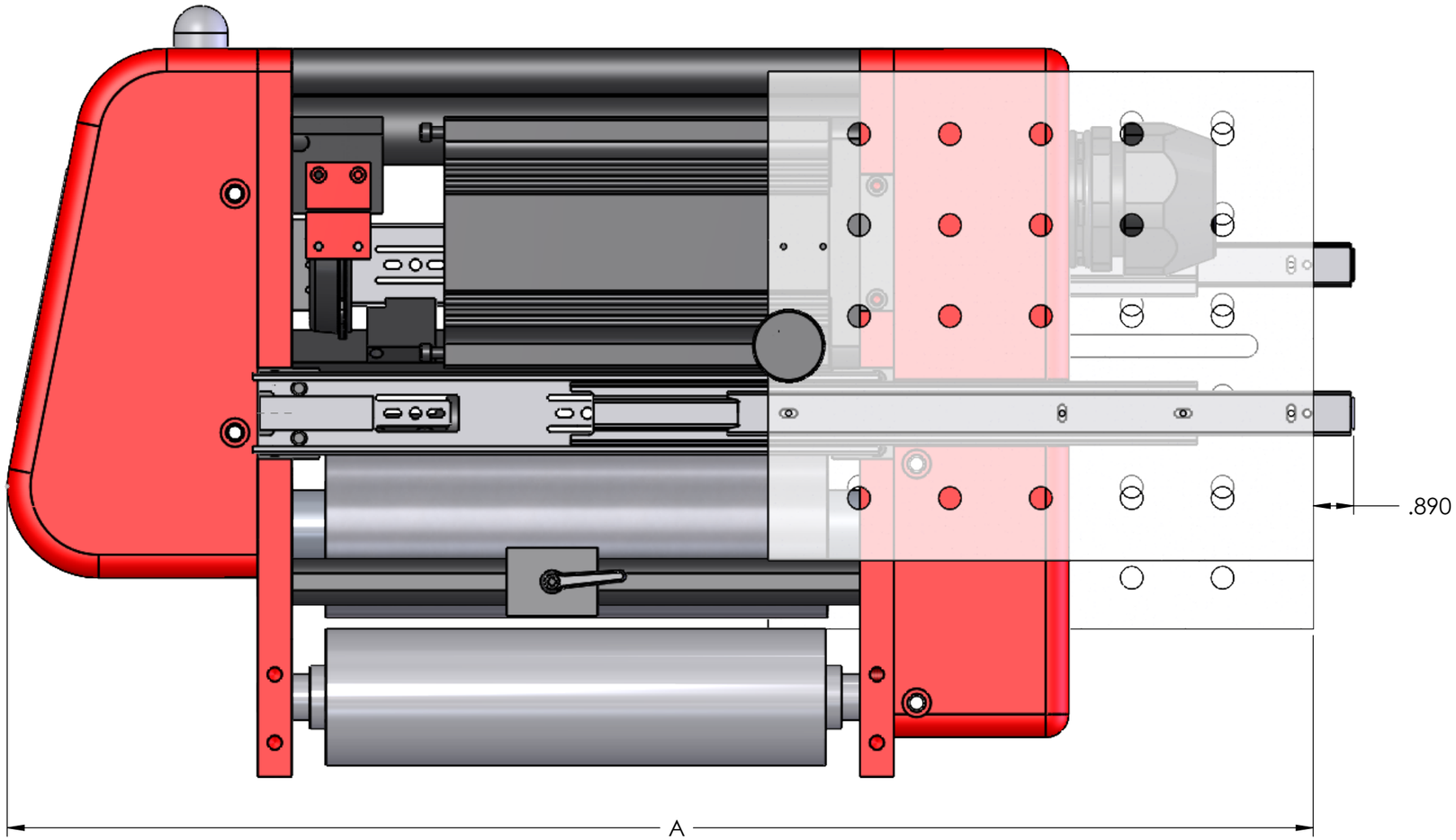
Servo Technologies

TITLE: Reregister

SIZE: B | REV: -

SCALE: 1:3 | DO NOT SCALE DRAWING | SHEET: 1 OF 5

GUARD DOOR OPEN



MODEL	A
10	28.95"
16	40.95"
20.5	49.95"

DRAWN BY	DRM	DATE	11/21/18
APPROVED BY	-	DATE	-
MATERIAL	N/A		
FINISH	N/A		

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGULAR: ± 1°
TWO PLACE DECIMAL ± .015
THREE PLACE DECIMAL ± .005

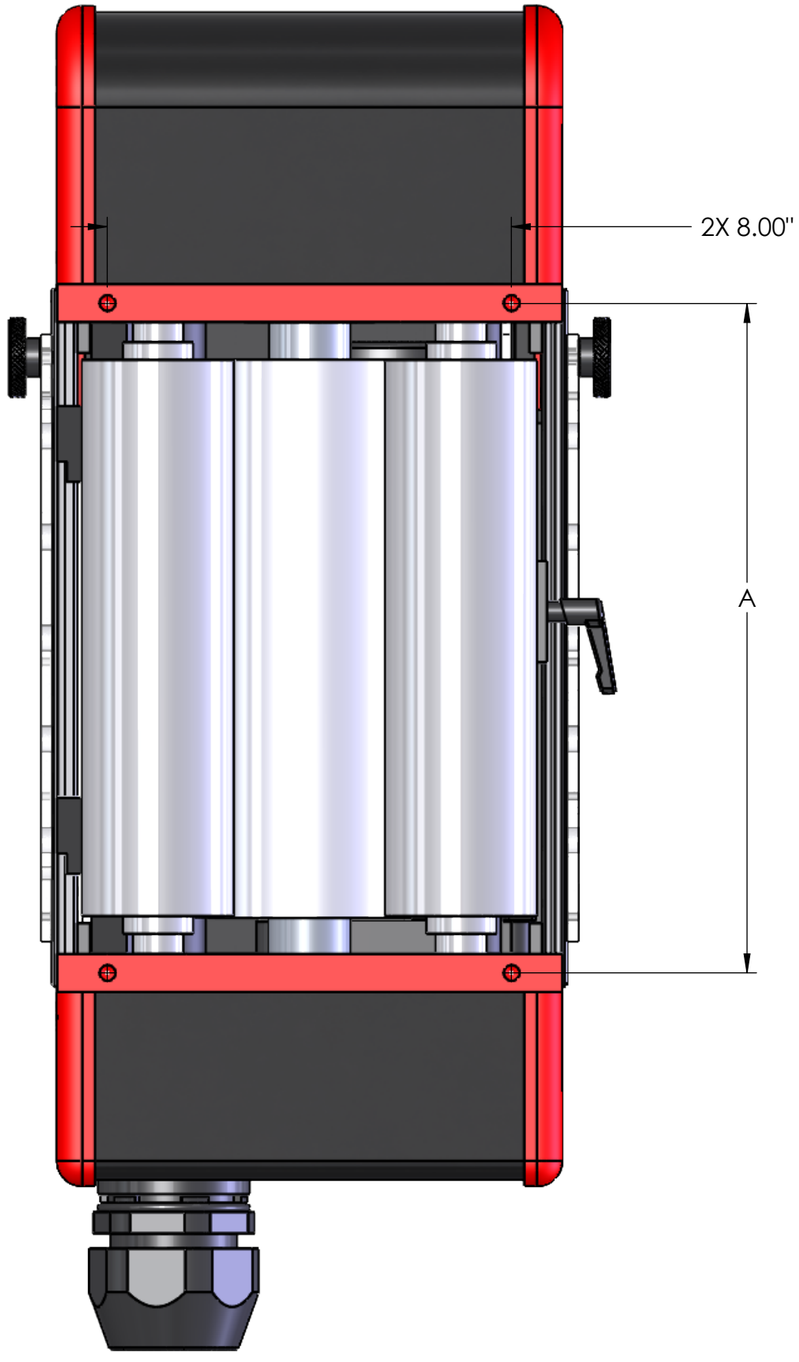
THIRD ANGLE PROJECTION

Servo Technologies

TITLE: Reregister

SIZE: B | REV: -

SCALE: 1:3 | DO NOT SCALE DRAWING | SHEET: 2 OF 5



MOUNTING HOLE PATTERN CONSISTS OF (QTY:4) 3/8-16 HOLES

MODEL	A
10	13.25"
16	19.25
20.5	23.75

DRAWN BY	DRM	DATE	11/21/18
APPROVED BY	-	DATE	-
MATERIAL	N/A		
FINISH	N/A		

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGULAR: ± 1°
TWO PLACE DECIMAL ± .015
THREE PLACE DECIMAL ± .005

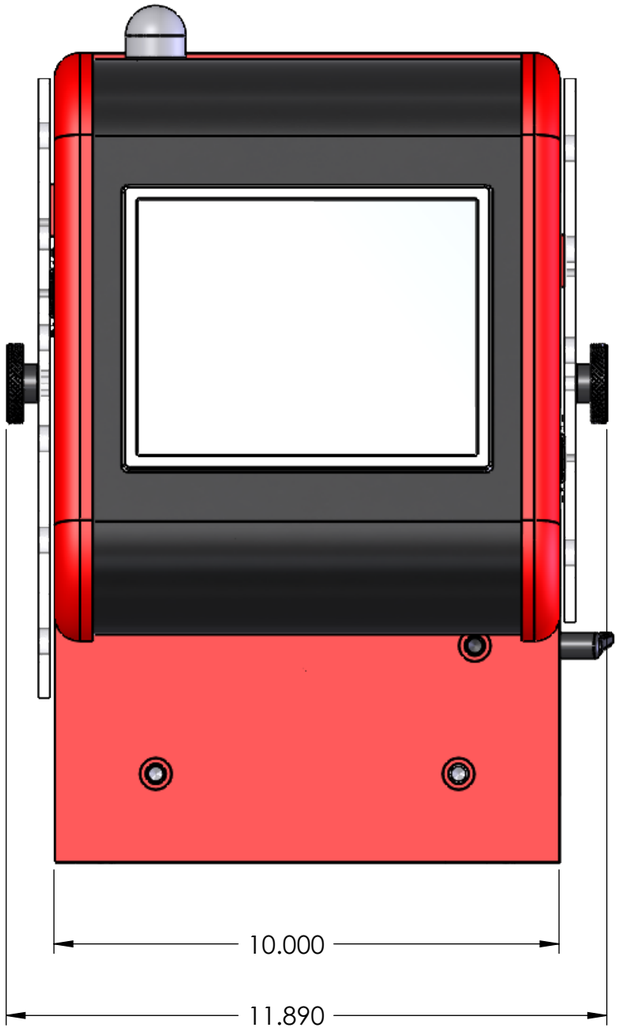
THIRD ANGLE PROJECTION

Servo Technologies

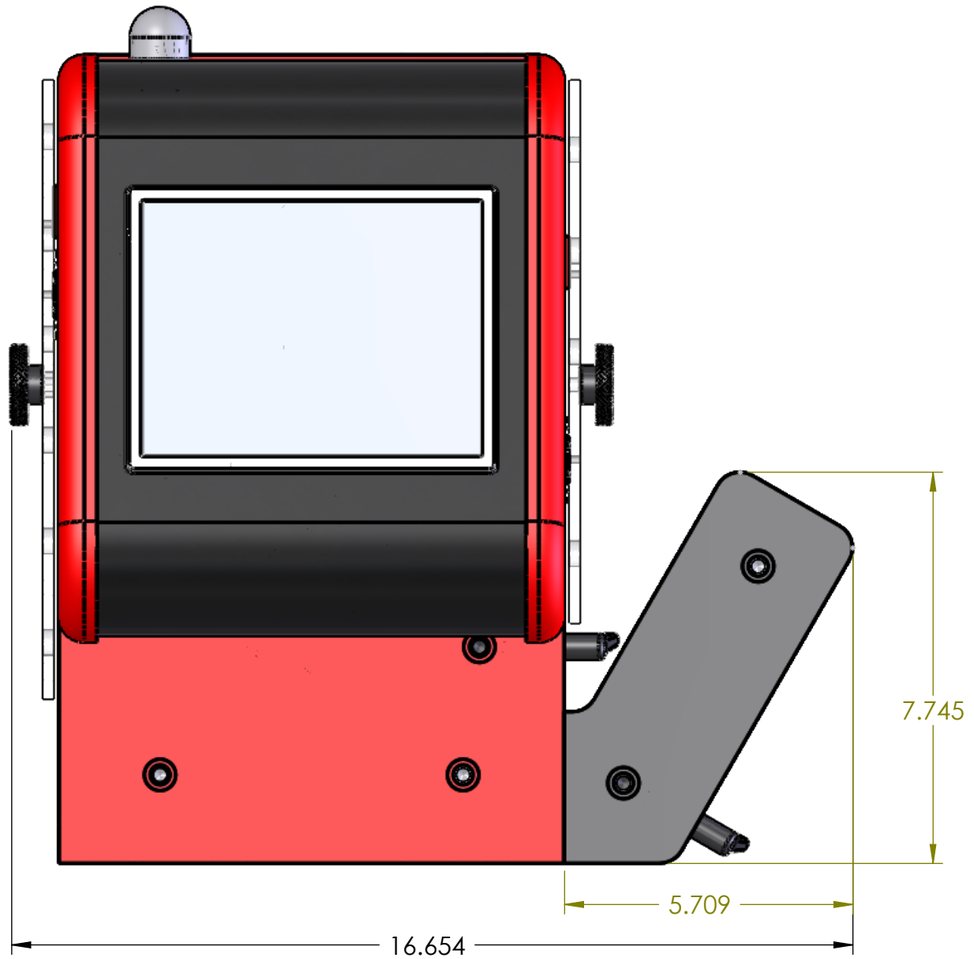
TITLE Reregister

SIZE B | **REV** -

SCALE 1:3 | **DO NOT SCALE DRAWING** | **SHEET** 3 OF 5



UNIT WITH BACKSIDE READER



DRAWN BY	DRM	DATE	11/21/18
APPROVED BY	-	DATE	-
MATERIAL	N/A		
FINISH	N/A		

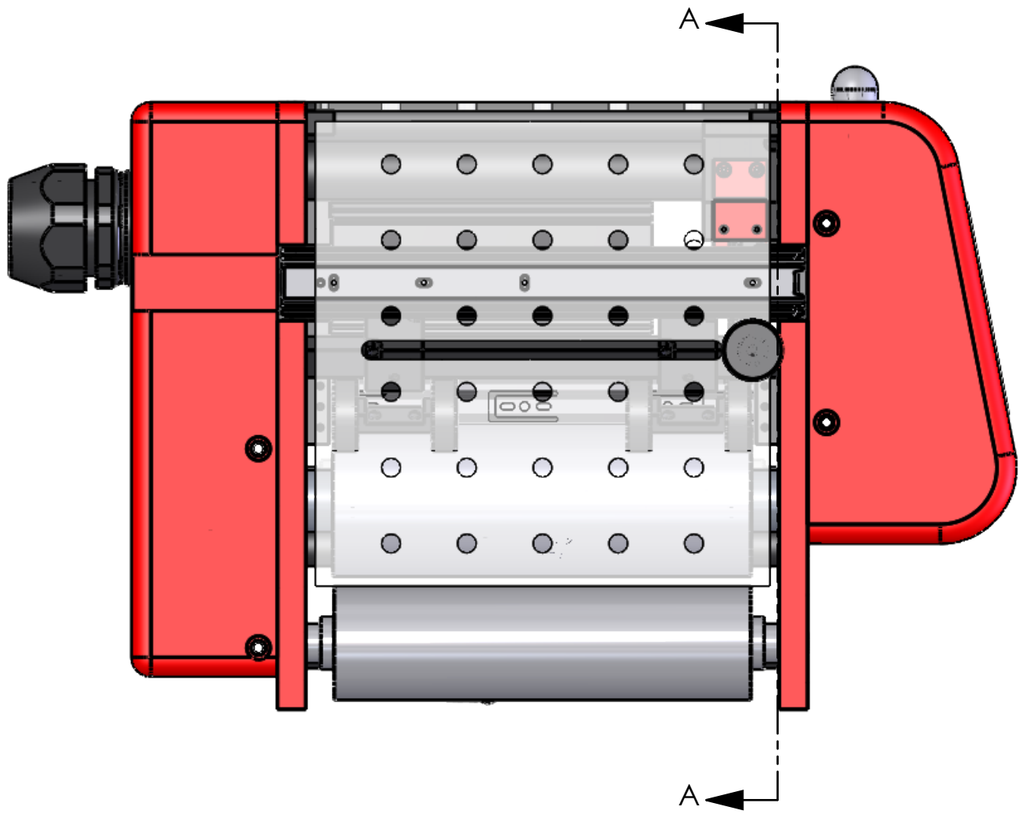
Servo Technologies

TITLE: Reregister

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGULAR: ± 1°
TWO PLACE DECIMAL ± .015
THREE PLACE DECIMAL ± .005

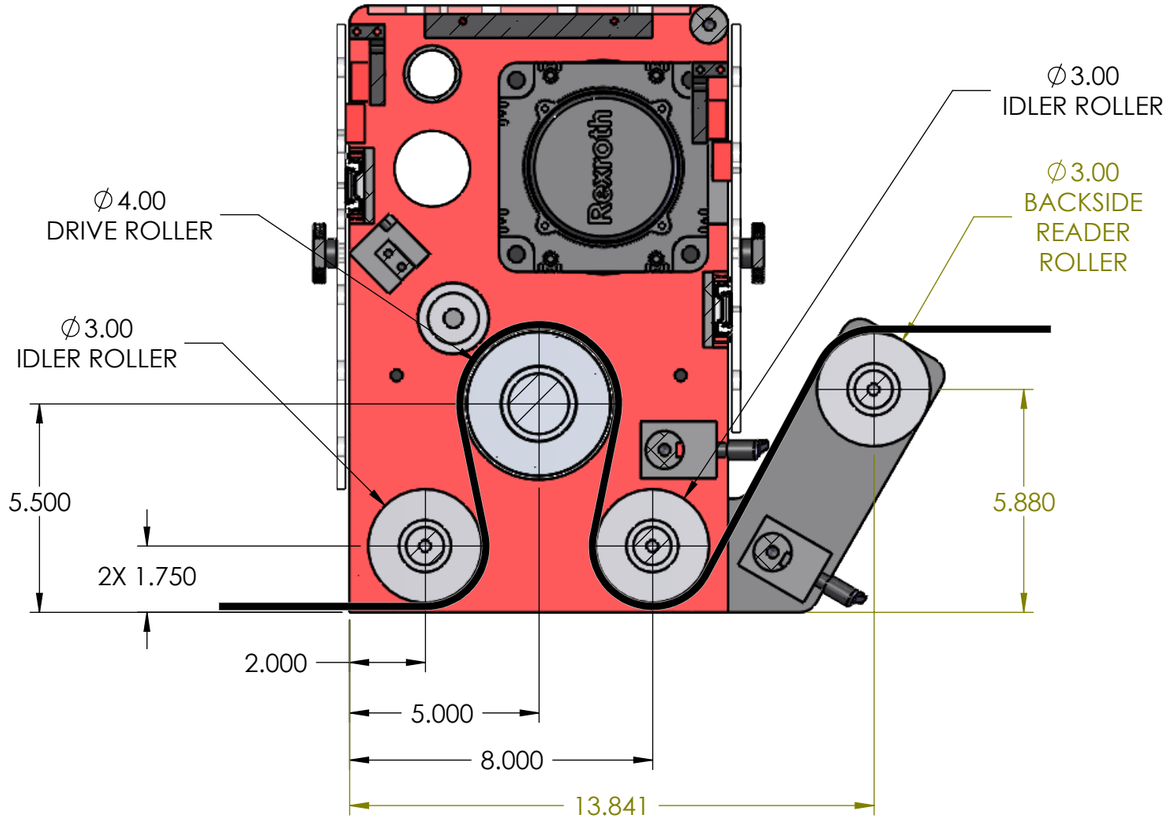
THIRD ANGLE PROJECTION

SIZE			REV
B			-
SCALE 1:3	DO NOT SCALE DRAWING		SHEET 4 OF 5



SECTION A-A

WEBBING DIAGRAM



DRAWN BY	DRM	DATE	11/21/18
APPROVED BY	-	DATE	-
MATERIAL	N/A		
FINISH	N/A		

Servo Technologies

TITLE: Reregister

SIZE: B | REV: -

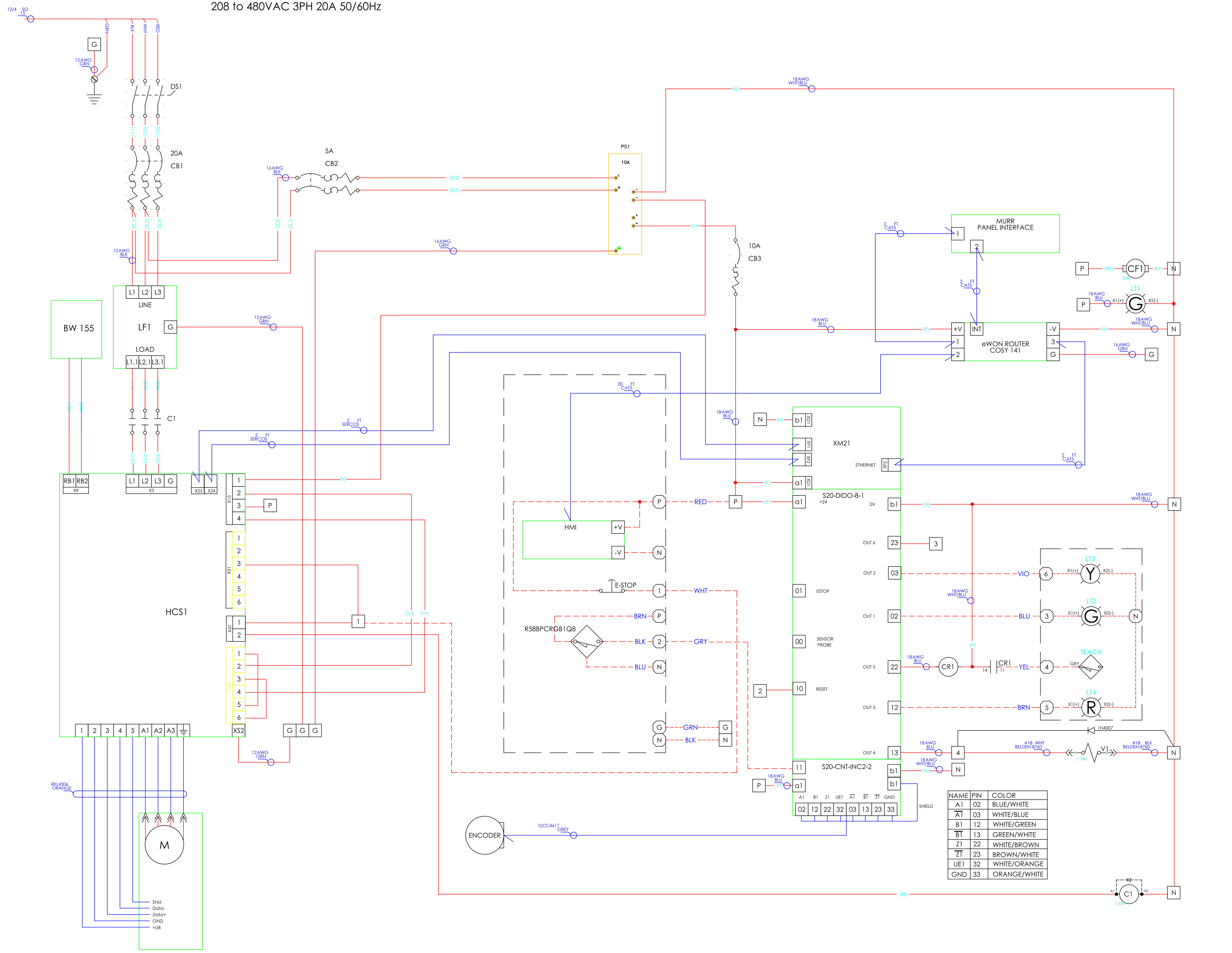
SCALE: 1:3 | SHEET: 5 OF 5

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGULAR: ± 1°
TWO PLACE DECIMAL ± .015
THREE PLACE DECIMAL ± .005

THIRD ANGLE PROJECTION

208 to 480VAC 3PH 20A 50/60Hz



NAME	PIN	COLOR
A1	02	BLUE/WHITE
$\overline{A1}$	03	WHITE/BLUE
B1	12	WHITE/GREEN
$\overline{B1}$	13	GREEN/WHITE
Z1	22	WHITE/BROWN
$\overline{Z1}$	23	BROWN/WHITE
UE1	32	WHITE/ORANGE
GND	33	ORANGE/WHITE

NOTES:

2 TB1 (CONTROL PANEL FIELD WIRING TERMINAL)

LIKE NUMBERED TERMINALS ARE SAME POTENTIAL

ALL WIRING #16AWG EXCEPT AS NOTED

FIELD WIRING TERMINAL = WIRE NUMBER EXCEPT AS SHOWN

(112) WIRE NUMBER

1 TB2 (HMI STATION TERMINAL)

FIELD WIRING #20 AWG MINIMUM

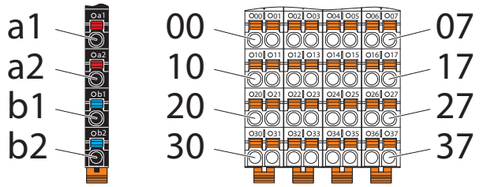
DWG. NO. SPN068161 REV A

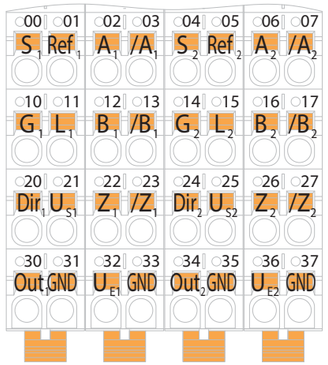
TITLE: SCHEMATIC DRAWING

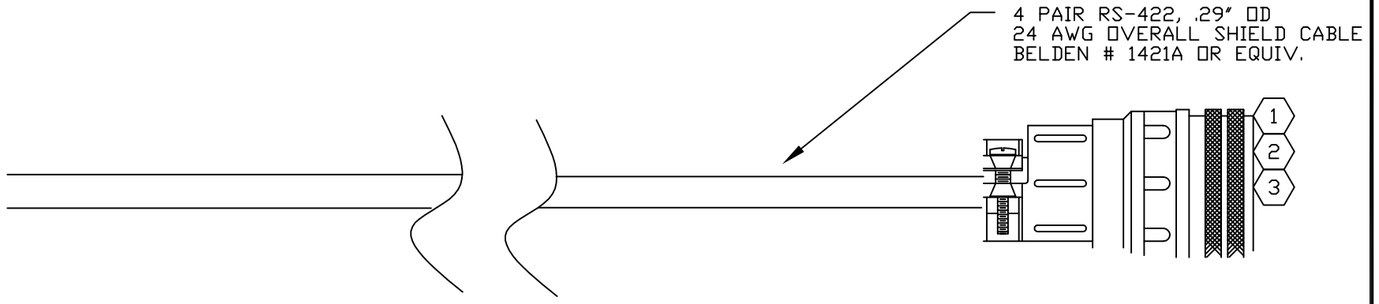
SIZE: D SCALE: NTS SHEET 2 OF 2

APPROVED

Connection to Input card S20-INC

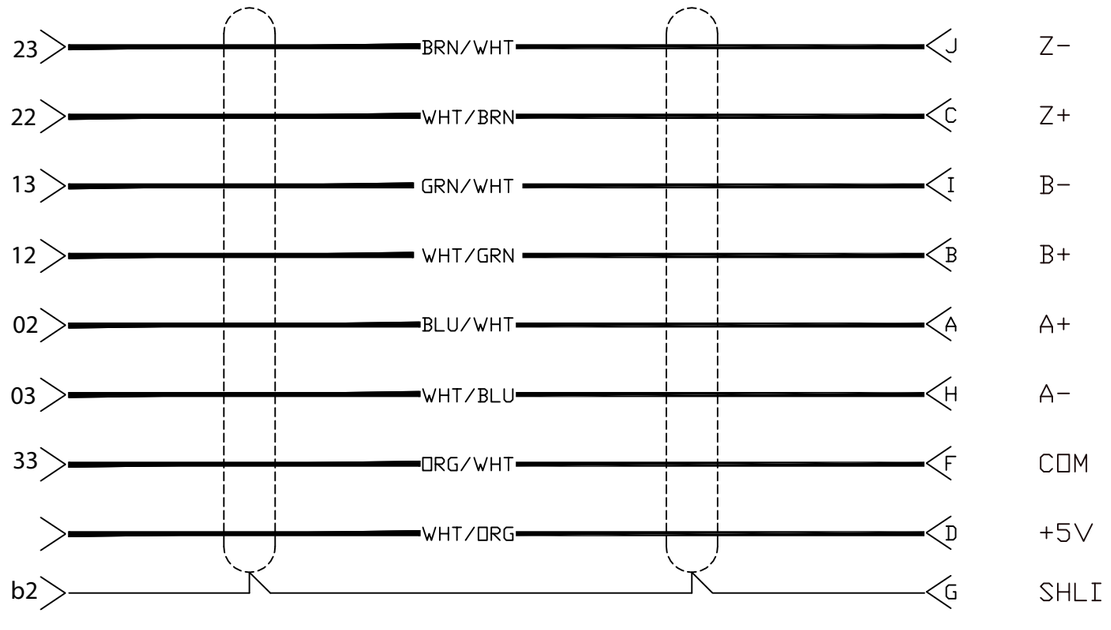






Termi-nal point	Color	Assignment	
02/06	Orange	A1/A2	Track A, incremental encoder 1/2
12/16	Orange	B1/B2	Track B, incremental encoder 1/2
22/26	Orange	Z1/Z2	Track Z, incremental encoder 1/2
32/36	Orange	U_{E1} / U_{E2}	Encoder supply +5 V DC for incremental encoder 1/2
03/07	Orange	/A1 / / A2	Track A inverted, incremental encoder 1/2
13/17	Orange	/B1 / / B2	Track B inverted, incremental encoder 1/2
23/27	Orange	/Z1 / /Z2	Track Z inverted, incremental encoder 1/2
33/37	Orange	GND	Reference potential of the I/O supply

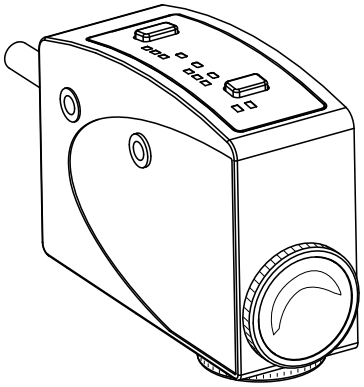
CONNECTION TO MEM (EMULATED SIGNAL)
X10



R58B Series Expert Registration Mark Sensors

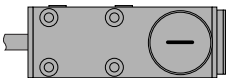
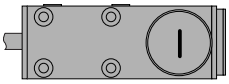
Registration Mark Sensors with Three-Color Light Source and Fast Teach

Features



- Ultra-fast 10 kHZ switching frequency
- Sensor automatically selects red, green, or blue LED during TEACH to optimize application contrast
- Outstanding color contrast sensitivity; detects 16 levels of gray scale
- Smart gain-control algorithm to maximize performance in low-contrast or high-gloss applications
- Fast TEACH via single-clicks on the TEACH push-button or remote input
- Sensor configuration options are easily changed via push-buttons or PLC compatible remote input
- Fixed-convergent sensing at 10 mm ±3 mm (0.39" ±0.12"); rectangular sensing image measure 1.2 mm x 3.8 mm (0.05" x 0.15") at 10 mm (0.39") from the lens
- Models available with either parallel or perpendicular sensing image (see Models)
- Rugged zinc alloy die-cast housing with high-quality acrylic lens suitable for food processing applications; rated IP67
- Models available with integral quick disconnect or Euro-style quick-disconnect pigtail

Models

Models*	Focus Distance	Supply Voltage	Output	Sensing Image Orientation
R58BPCRGB1	10 mm (0.39")	10 - 30 Vdc	PNP	Parallel to sensor length 
R58BNCRGB1			NPN	
R58BPCRGB2			PNP	Perpendicular to sensor length 
R58BNCRGB2			NPN	

* Only Standard 2 m (6.5') cable models are listed.

- For 9 m (30') cable, add suffix "**W/30**" to the model number (e.g., **R58BPCRGB1 W/30**).
- For 150 mm (6") pigtail with a 4-pin Euro-style connector, add suffix "**Q**" to the model number (e.g., **R58BPCRGB1Q**).
- For integral 4-pin Euro-style QD, add suffix "**Q8**" to the model number (e.g., **R58BPCRGB1Q8**).

WARNING: Not To Be Used for Personnel Protection

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

P/N 156477 Rev. A

2/23/2011

Specifications

Supply Voltage and Current
10 to 30V dc (10% maximum ripple within specified limits)
Supply current (exclusive of load current): 75 mA max @ 10V dc 35 mA @ 30V dc

Supply Protection Circuitry
Protected against reverse polarity and transient over voltages

Output Configuration
Single output: one current sourcing (PNP) or one current sinking (NPN) open-collector transistor by model

Output Rating
ON-state load current: 100 mA max
OFF-state leakage current: NPN < 200 microamps; PNP < 10 microamps (see Application Note 1)
NPN Saturation: < 1.6V at 100 mA
PNP Saturation: < 3.0V at 100 mA

Output Protection Circuitry
Protected against false pulse on power up and continue overload or short-circuit of output

Output Response Time
50 microseconds
Note: 1 second delay on power-up; output does not conduct during this time

Repeatability
15 microseconds

Tri-Color LED Sensing Image
Rectangular: 1.2 mm x 3.8 mm (0.05" x 0.15") at 10 mm (0.39") from face of lens; image oriented either parallel or perpendicular to sensor length
Red: 636 nm **Green:** 525 nm **Blue:** 472 nm

Construction:
Housing: Zinc alloy die-cast and steel housing with black painted finish and o-ring sealed lens and lens port cap
Lens: Acrylic
Lens port cap and lens holder: ABS
Push-buttons: Thermoplastic elastomer
Labels: Polycarbonate

Adjustments

MODE Push-button
Selects Operating Mode

TEACH Push-button
Initiate Teach from STATIC or DYNAMIC Mode

Both Push-buttons >2 s
Enter Sensor Set-up (only accessible from RUN Mode)

Remote Input (gray wire)
Input for remote Set-up of the sensor (PLC compatible)

Connections
PVC-jacketed 5 conductor 2 m (6.5') or 9 m (30') cable with internal strain relief
Integral 5-pin Euro-style QD fitting
150 mm (6") pigtail with 5-pin Euro-style QD fitting

Indicators
(LO) **Light Operate:** Red
(⏲) **Off-delay:** Red
(DO) **Dark Operate:** Red
(⊓⊔) **Output:** Yellow
(⏻) **Power:** Green
Mode: Green
(R) Red: Red
(G) Green: Green
(B) Blue: Blue

Operating Conditions
Temperature: -10° to -55° C (+14° to 131° F)
Storage Temperature: -20° to +80° C (-4° to 185° F)
Maximum Relative Humidity: 90% at 50° C (non-condensing)

Environmental Rating
IEC IP67

Vibration and Mechanical Shock
All models meet IEC 68-2-6 and IEC 68-2-27 testing criteria

Application Notes
1. NPN OFF-state leakage current is < 200 µA for load impedances > 3kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current.
2. Do not mount the sensor directly perpendicular to shiny surfaces; position it at approximately a 15° angle in relation to the sensing target (see Installation Notes).
3. Minimize web or product "flutter" whenever possible to maximize sensing reliability.

Overview

R58B Registration Mark Sensors offer maintenance-free, solid-state reliability for typical color contrasts found in product and material registration applications. Fast 50-microsecond sensing response produces excellent registration repeatability, even in ultra-high-speed applications. This fast response, coupled with the small 1.2 x 3.8 mm (0.05" x 0.15") sensing image, allows the detection of small and inconspicuous registration marks.

R58B sensors feature TEACH mode sensitivity adjustment by presenting two sensing conditions to the sensor. TEACH mode has two options: Static TEACH and Dynamic TEACH. Static TEACH is used to position the two sensing conditions individually. Dynamic TEACH provides a means for teaching a series of conditions on-the-fly; the R58B samples the sensing events and automatically sets the switchpoint between the lightest and darkest conditions. The sensor then determines which sensing condition is present for the shortest time and assigns the Output ON condition to that event (therefore, LO/DO selection is automatic). If necessary, the LO/DO setting can be reversed in Set-up mode.

The sensor uses a tri-color LED during either teach process and automatically selects a red, green, or blue sensing beam, based on the contrast between the registration mark and its background. For applications where the user wishes to select the sensing beam color, individual colors may be enabled/disabled in Set-up mode.

The discrete NPN or PNP output can be configured in Set-up mode to include a 30 millisecond OFF-delay if required.

Sensor Set-up configuration may be accomplished either by using the push-buttons on the sensor, or by supplying input pulses via the remote input. The push-buttons may be disabled via the remote input.

The construction of the R58B is extremely robust; with a die-cast metal housing, plastic optics, and IP67 leakproof design for harsh sensing environments.

Sensor Features

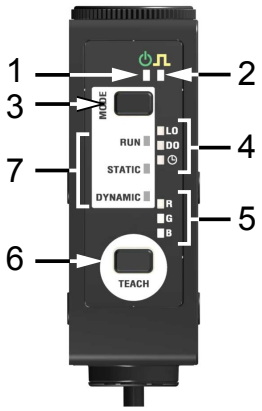


Figure 1. Features
1. Power LED
2. Output LED
3. Mode Selection Push-button
4. Output Configuration LEDs
5. Emitter Color Configuration LEDs
6. TEACH Push-button
7. Mode Configuration LEDs

Sensor Mode Description

The R58B Registration Mark Sensors have 3 user selectable modes of operation: Run Mode, Static Mode, and Dynamic Mode. The"active" Mode is selected by pressing the Mode push-button or via the remote input. For simplicity of operation, only certain features are enabled in each mode as described below.

- **All Modes:** The sensor detects registration marks based on the last taught conditions. Via the remote line the user may configure the operational mode and the output settings, enable/disable emitter color(s), lock/unlock push-buttons, and restore factory defaults.
- **Run Mode:** There is no TEACH button functionality in RUN Mode. Press and hold both push-buttons > 2 seconds to enter Set-up mode to configure the output settings or enable/disable emitter color(s).
- **Static Mode:** Using the TEACH push-button, the sensor can be quickly taught new sense conditions using a simple *Static TEACH Procedure* on page 5.
- **Dynamic Mode:** Using the TEACH push-button, the sensor can be taught on-the-fly using a simple *Dynamic TEACH Procedure* on page 6.

LED	Indicates	
Power	**ON:** Normal sensor operation **OFF:** Set-up Mode **Momentary Flashing:** Push-button lock-out status	
Output	**ON:** Output is conducting **OFF:** Output is not conducting **Slow Flash:** TEACH Static OFF condition or Dynamic TEACH active **Fast Flash:** Re-TEACH Static ON condition (prior static TEACH failed)	
Light Operate	**ON:** Light Operate (LO) operation	
Dark Operate	**OFF:** Dark Operate (DO) operation	
Off Delay	**ON:** 30 ms pulse stretcher (OFF-delay) is active **OFF:** No OFF-delay	
Red, Green, Blue	Normal Operation	**ON:** Active emitter LED color
	Set-up Mode	**ON:** Enabled emitter LED colors **Flashing:** Allow Enabling/ Disabling of emitter LED colors
Run	**ON:** Run Mode is active	
Static	**ON:** Static Mode is active	
Dynamic	**ON:** Dynamic Mode is active	

Sensor Set-up

The R58B will power up in normal operation and begin sensing using the settings from the most recently taught registration mark. The sensitivity of the R58B may be quickly optimized to the application by using one of two available TEACH modes: Static TEACH or Dynamic TEACH.

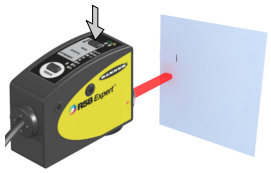
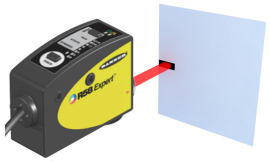
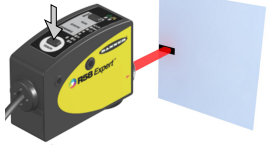
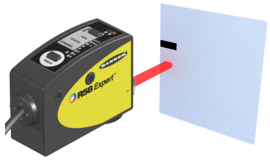
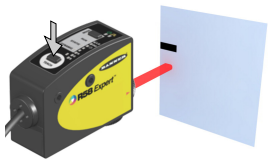
- **Static TEACH:** Both the Output ON and Output OFF conditions are presented to the sensor, and the sensitivity and emitter color are automatically selected to maximize sensing contrast.
- **Dynamic TEACH:** The registration mark and background are presented during actual sensing conditions (i.e. web moving) and the sensitivity and emitter color are automatically selected to maximize sensing contrast.

The sensor's operating parameters may be configured either via its push-buttons or via the remote input (gray wire). While in RUN mode, press and hold both buttons > 2 seconds to enter Set-Up mode. Pressing the Mode Push-button will cycle through the 4 possible output settings. Pressing the TEACH Push-button will cycle through the 7 combinations of emitter LED color. The indicators will update to show the currently selected configuration. Press both buttons for > 2 s or wait 60 s to exit Set-up mode.

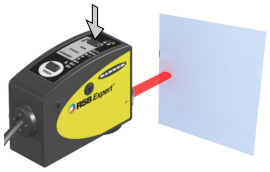
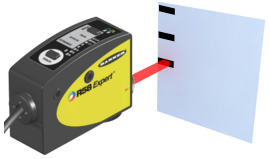
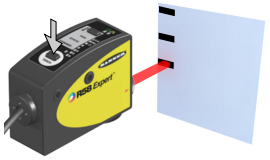
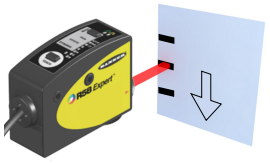
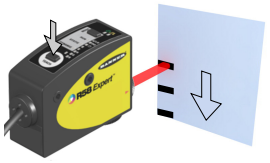
To use the remote input, connect the gray wire to a PLC or a NO (normally open) switch to 0V dc. Set-up using the remote line is accomplished by following a sequence of input pulses (see following procedures). The duration of each pulse, and the period between multiple pulses, is defined as "T".

0.04 seconds ≤ "T" ≤ 0.8 seconds

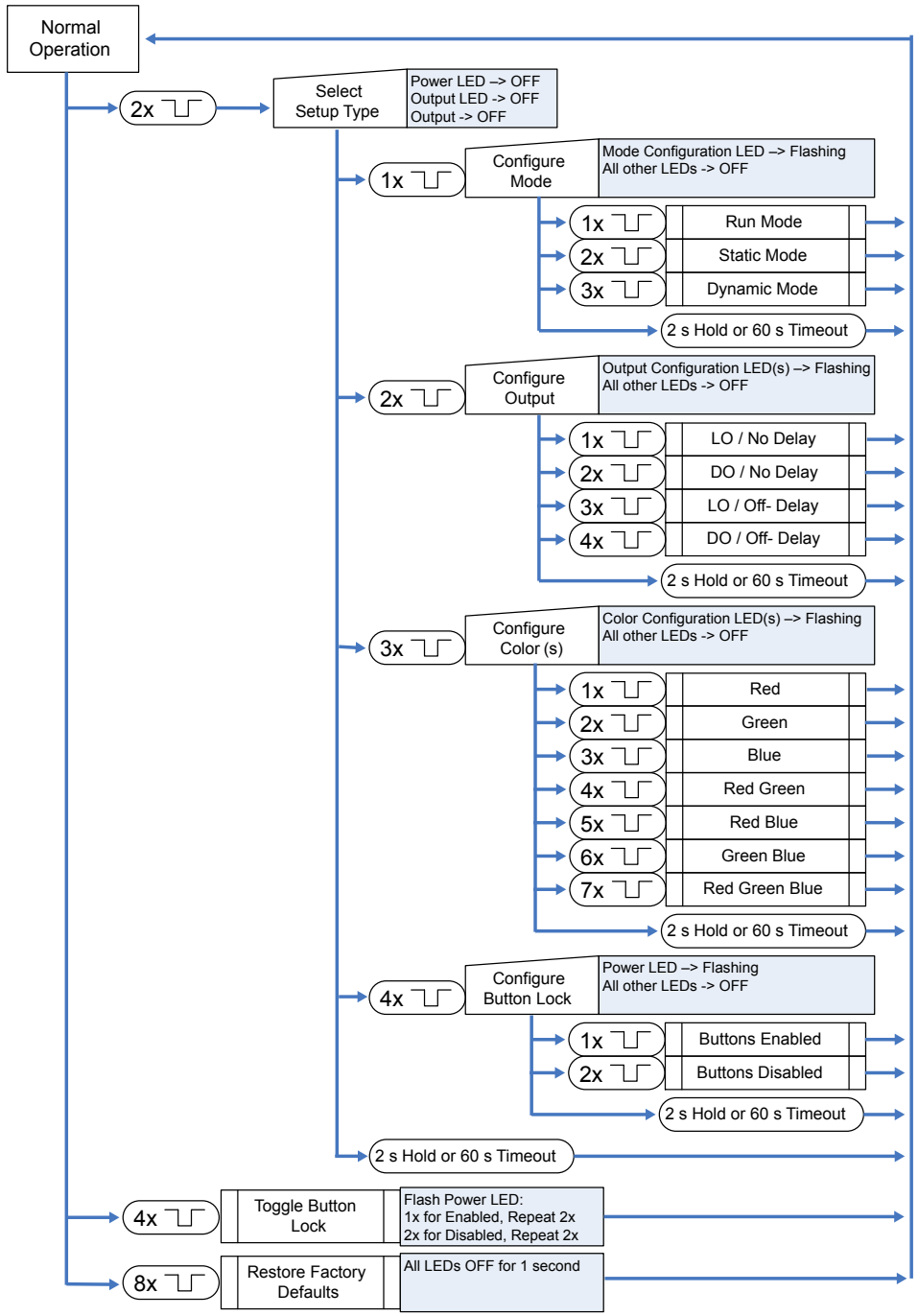
Static TEACH Procedure

	Procedure	Push-button	Remote Input
1.	Enter Static Mode by pressing the Mode select push-button or via the remote input; see *Remote Configuration Flowchart* on page 7.		Select Static Mode; see *Remote Configuration Flowchart* on page 7
2.	Align the light spot to the output ON condition. "Mark Operate" is shown.		
3.	Press the TEACH push-button or single-pulse the remote input to LEARN the output ON condition. **NOTE:** The Output and Emitter LEDs will flash at a 2Hz rate to indicate that a TEACH is in progress.		 1X
4.	Align the light spot to the output OFF condition.		
5.	Press the TEACH push-button or single-pulse the remote input to LEARN the output OFF condition. Sensor evaluates contrast and returns to normal operation. If inadequate contrast, the Output and Emitter LED flash rate will increase to 4Hz to indicate that the TEACH failed. Repeat TEACH starting at Step 2.		 1X

Dynamic TEACH Procedure

	Procedure	Push-button	Remote Input
1.	Enter Dynamic Mode by pressing Mode select push-button or via the remote input; see *Remote Configuration Flowchart* on page 7.		Select Dynamic Mode; see *Remote Configuration Flowchart* on page 7
2.	Align sensor to either mark or background.		
3.	Press the TEACH push-button or single-pulse the remote line to start Dynamic sampling. **NOTE:** The Output LED will flash at a 2Hz rate to indicate that a Dynamic TEACH is in progress.		 1X
4.	Start moving the web past sensor. Present at least 2 marks.		
5.	Press the TEACH push-button or single-pulse the remote line to end Dynamic sampling. Sensor evaluates contrast. If adequate mark to background contrast, the sensor returns to normal operation using the new sense settings. If not, the Output Configuration and Emitter Color Configuration LEDs will alternately flash 4x to indicate that the TEACH failed and the sensor will return to normal operation without changing the sense settings.		 1X

Remote Configuration Flowchart



A click (T T) is defined as 40 ms. < T < 800 ms

Installation Notes

The R58B Registration Mark Sensors includes a total of eight size M5 threaded holes used for mounting (see *Dimensions* on page 9). These threaded holes are positioned to match the mounting hole patterns common to other registration mark sensors. The R58B includes four M5 x 0.8 x 6 mm stainless steel cap screws and a hex key wrench.

The R58B focus is 10 mm (0.39") from the lens surface. The R58B must be mounted within 3 mm (0.12") of this distance from the surface of the material for reliable sensing (Figure 2).

Consider the following when mounting the R58B:

- Whenever possible, it is a good idea to sense a web material at a location where it passes over a tension bar or roller, to minimize the adverse effects of web "flutter" or sag (Figure 3).
- When sensing a registration mark on a reflective (shiny) material, mount the R58B at an angle which places the lens centerline at approximately 15° off perpendicular to the material's surface (Figure 4). This "skew angle" will minimize strong direct reflections (which tend to overwhelm the sensor), and allow the sensor to discern the relatively small optical contrast offered by differences in colors.
- Clear materials are poor reflectors of light. When sensing a mark printed on a clear material (e.g., a clear poly web), position a reflective surface directly behind the clear material to return light to the R58B. The printed mark, regardless of its color, then becomes the dark condition, as it blocks the light from reaching the reflective surface. Most clear materials are also shiny; it is important to include a 15° skew angle when sensing clear materials (Figure 4).

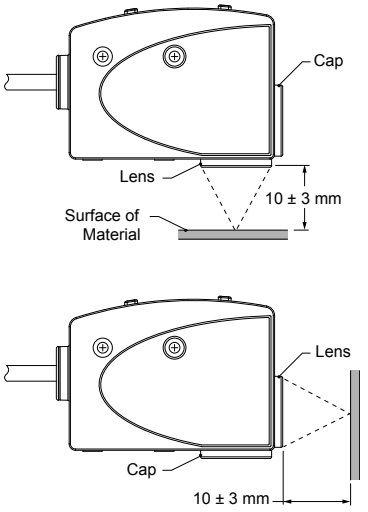


Figure 2

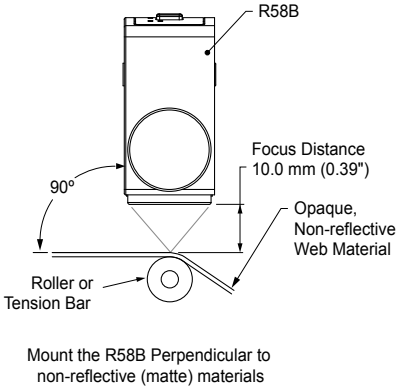


Figure 3

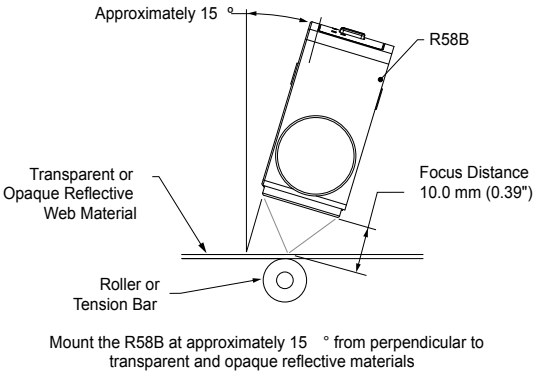


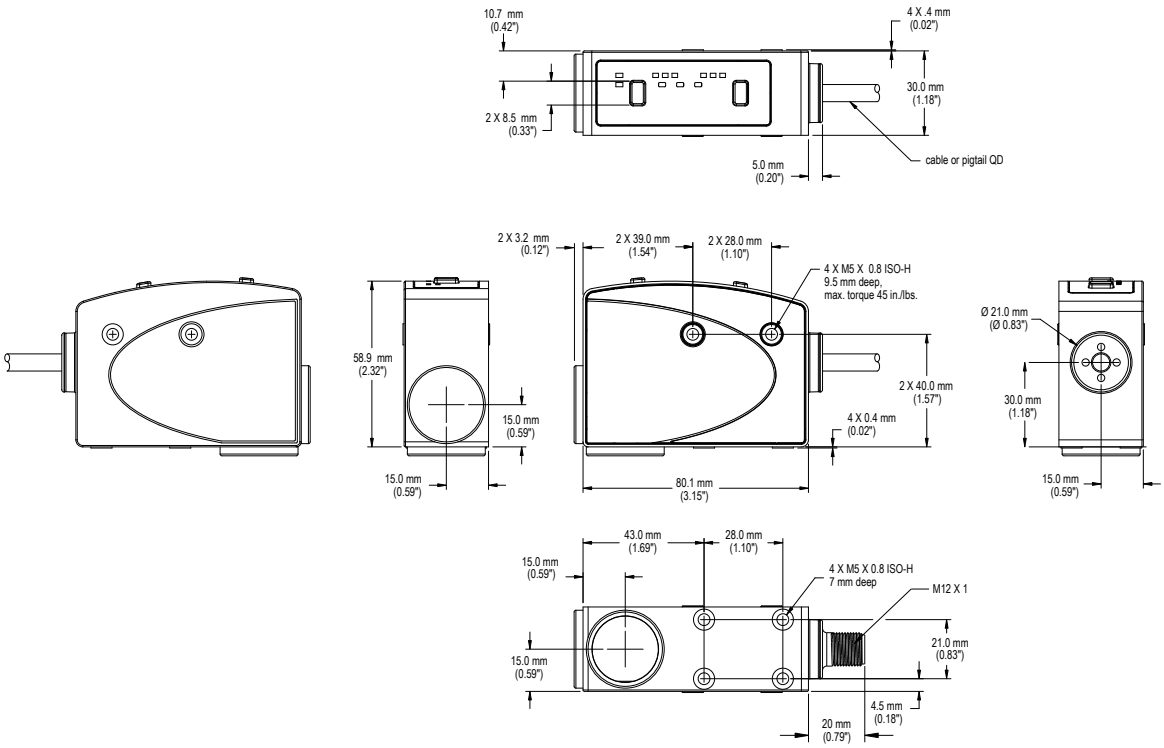
Figure 4

Lens Location

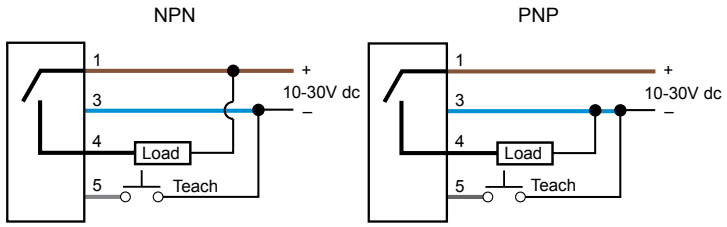
The lens may be installed at either of two lens ports (see Figure 2). The lens and the lens port cap are both threaded and may be exchanged by hand; no tools are required. The lens and cap both include an o-ring seal.

NOTE: The lens port cap must be installed on the unused port for reliable operation. Fully seat the lens cap to ensure a liquid-tight seal.

Dimensions



Hookups



Wiring Key:

1 = Brown

2 = White (No connection)

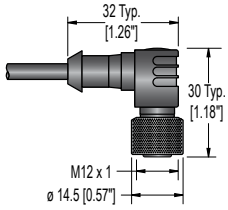
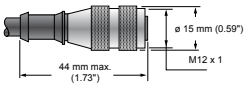
3 = Blue

4 = Black

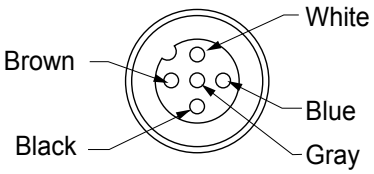
5 = Gray

Accessories

Quick-Disconnect (QD) Cordsets

5-Pin M12/Euro-Style Cables – Single-Ended, with Shield			
Model	**Length**	**Description**	
MQDEC2-506	2 m (6')	5-pin cable, Euro-style straight with shield	
MQDEC2-515	5 m (15')		
MQDEC2-530	9 m (30')		
MQDEC2-506RA	2 m (6')	5-pin cable, Euro-style right-angle with shield	
MQDEC2-515RA	5 m (15')		
MQDEC2-530RA	9 m (30')		

5-Pin M12/Euro Pinout (Female)



Accessory Mounting Brackets

SMB55A • 15° offset bracket • 12-gauge stainless steel		**SMB55F** • Flat-mount bracket • 12-gauge stainless steel	
SMB55RA • Right-angle bracket • 12-gauge stainless steel		**SMB55S** • 15° offset bracket • 12-gauge stainless steel	

Replacement Lens

Model	Description	
UC-R55	Replacement lens for R58A, R58B, and R58E