

TF20 Tray Feeder

for JEDEC and IEC Standard Trays



Instruction Manual

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Definitions of Warning, Caution and Note Messages Used in This Manual



Warning

The Warning symbol indicates a hazard. It calls attention to a procedure, practice or condition which, if not followed or performed correctly, could result in injury to personnel.



Caution

The Caution symbol also indicates a hazard. It calls attention to an operating procedure or practice which, if not followed or performed correctly, could result in damage to the machine.



Note

The Note symbol indicates important information. It calls attention to an important procedure, practice, or condition.

TF20 Tray Feeder

Introduction

The TF20 Tray Feeder is a compact, high-speed tray exchanger. It is designed to integrate easily with existing assembly equipment. The TF20 unit delivers thin and thick JEDEC and IEC standard trays to pick or place positions with a high degree of accuracy and repeatability.

Specifications

Height	23 ¹ / ₄ "	587 mm
Width	6 ³ / ₈ "	162 mm
Length - base section	17 ⁷ / ₁₆ "	355 mm
Length - conveyor short	25"	635 mm OR
Length - conveyor long	30"	762 mm
Weight	50 lbs	22.7 Kg
Power*	24 V DC ±10% 2 Amp (peak) 0.3 Amp (rest) 0.7 Amp (during tray exchange)	
Communication signal	5 VDC, 12VDC or 24VDC sink or source	
Pneumatic	60 to 80 psi < 1.0 SCFM filtered and dried	4.1 to 5.5 bar < 28.3 Nliters/minute
Temperature Range	50 to 95° F	10 to 35° C
Humidity Range	10 to 95% R.H. non-condensing	
Operating Sound Level	60 db	
Listings	The TF20 meets appropriate safety specifications for international shipments. The unit complies with SEMI S2, CE and NFPA 70 and 79. The ergonomics comply with SEMI S8.	

* Host machine to provide input power circuit protection.

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Safety Notes



Warning

Before servicing the feeder, ensure that power is removed from the assembly equipment, or that the feeder is removed from the assembly equipment. Disconnect the power to the feeder by unplugging the power cable from the assembly machine.



Warning

Before removing the feeder from the assembly equipment, ensure that the assembly equipment is in a safe or e-stop condition. Remove all trays from the feeder.



Note

Do not use the manual index feature to index another tray if there is a tray being processed in the assembly equipment.



Note

When removing trays -

If the blue LED is **not** flashing, this indicates that the upper output stack has room for more trays. Before removing the trays, press the Inhibit button and wait to see the yellow LED. The inhibit mode will prevent the feeder from cycling a tray while you are removing the trays.



Note

If the Thick/Thin switch (Fig. 4) is set incorrectly, the feed mechanism will jam, triggering an error condition.



Note

Whenever the machine detects an error, the operator should press the Stop button immediately.

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Controls and Features

Figures 1 through 3 show the most important controls and features on this unit. For more detailed operating instructions, see the next section of the manual.

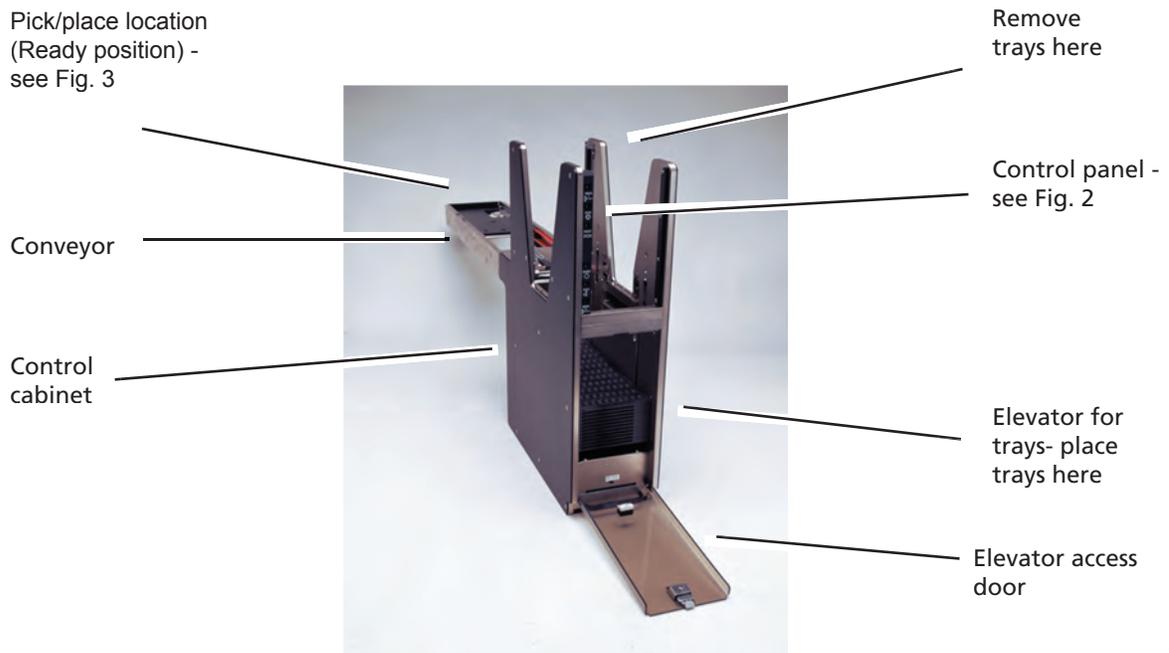


Fig 1 -
Rear View

TF20 Tray Feeder

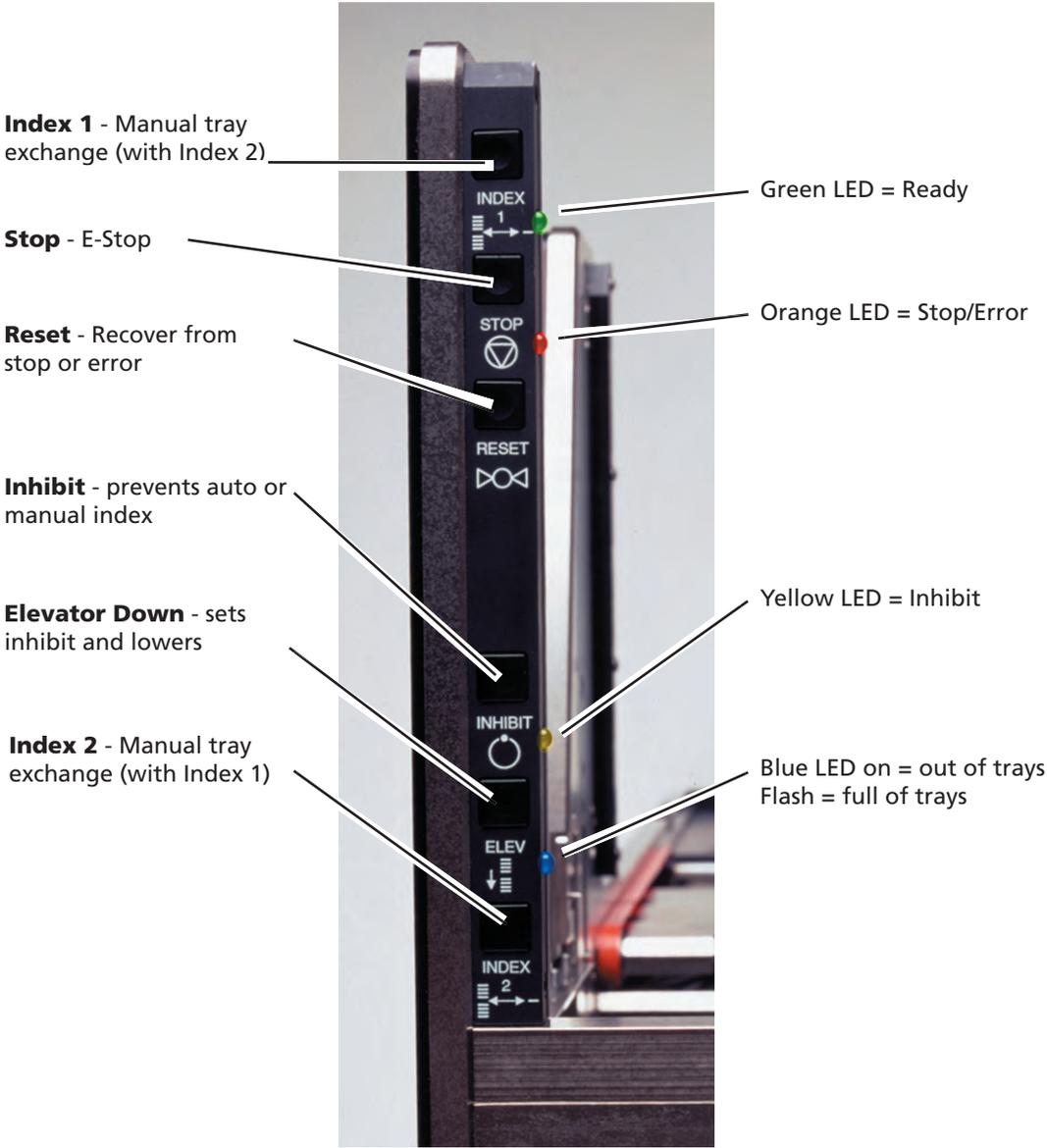


Fig 2 -
Control Panel

TF20 Tray Feeder

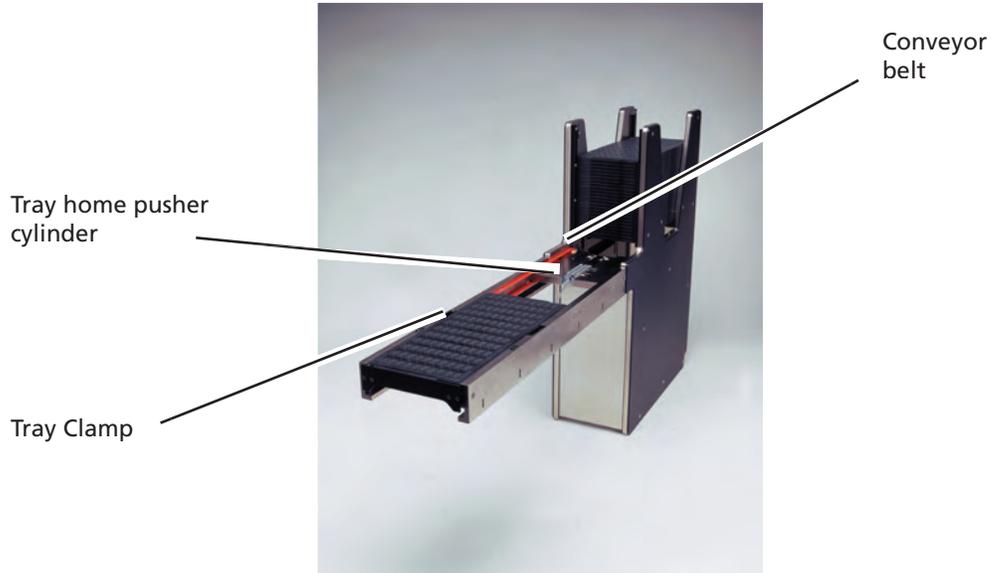


Fig 3 -
View of Feed End

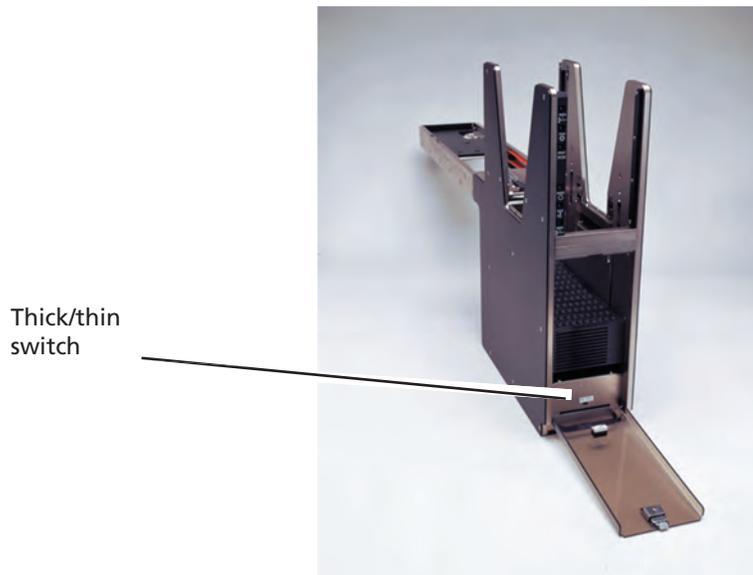


Fig 4 -
Thick/Thin Switch

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Initialization



ATTENTION!

In order to feed highly sensitive components, a slow (speed) mode is available. Depending on the host machine communication, the feeder may require a manual initialization. If after power up the four LEDs on the operator interface light up, the feeder must be manually initialized.

Initializing the feeder enables a choice between normal (Fast) mode and slow mode. To enable slow mode, momentarily press the “INDEX 1” and “INDEX 2” buttons simultaneously. To enable normal mode, momentarily press the “ELEV” button. Once the speed is set in this way, the LEDs will turn off and the run mode will be maintained until the power to the feeder has been removed.

Control Functions

Figure 2 shows the manual controls on the feeder. These controls have the following functions:

Index 1 and Index 2

These buttons do not trigger any machine action unless both are pressed at the same time. If the machine is **not** in inhibit mode, when both buttons are pressed, the feeder will begin one tray exchange cycle.



Note

Do not use the manual index feature to index another tray if there is a tray being processed in the assembly equipment.

Stop

This button works as an E-Stop. Pressing this button will disable the pneumatics, the elevator and the conveyor motor. (The orange LED will light continuously.)

If a tray is clamped at the pick/place position when the Stop button is pressed, it will be pulled away from the pick/place position and the Ready signal to the assembly machine will turn off. (More information about the signals to the assembly machine is presented in the Troubleshooting section of this manual.)

To recover from a stop condition, press the Reset button. If a tray was clamped at the pick/place position when the Stop button was pushed and the tray was not removed, the feeder will relocate the tray at the pick/place position and clamp it in place.

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Reset

This button is used to recover from either a stop or an error condition (orange LED on or flashing).

- When the Reset button is pushed while the machine is in a stop condition (orange LED on continuously), power is restored to both motors and to the pneumatic mechanisms.
- To recover from an error condition (orange LED flashing), first identify the cause of the problem and correct it. Once the cause of the error has been corrected, press the Reset button. Power will be restored to both motors and to the pneumatic mechanisms.

Inhibit

When this button is pressed, the feeder will not process automatic index signals (from the assembly machine) or manual index signals (from the Index 1 and Index 2 buttons). The yellow LED indicates an inhibit condition. The machine will remain in an inhibit condition until the Inhibit button is pressed again.

Elevator Down

This button causes two things to happen:

- The feeder will go to an inhibit condition (see above).
- The elevator will drive down to its lower limit.

There are two ways to return the elevator to a normal run position:

- Press the Inhibit button.
- Open and close the elevator access door.

The feeder will automatically leave the inhibit condition once the elevator has finished moving up to a normal run position.

Elevator Access Door

This door has a switch that provides a safety interlock. For details, see the section on "Operating Instructions."

Thick/Thin Switch

This switch prepares the machine to operate with either thin or thick JEDEC trays.



Caution

If the switch is set incorrectly, the feed mechanism may jam, triggering an error condition.

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Operator Indicators

See Fig. 2.

Green LED - Ready

- When this LED is on, it means that the feeder has successfully completed a tray exchange and there is a tray clamped at the pick/place position. This LED also means that the Ready signal is sent to the assembly machine.
- This LED will turn off when a tray leaves the pick/place position.

Orange LED - Stop/Error

- When this LED is on and not flashing, it means that the feeder is in a stop condition.
- When this LED is on and flashing, it means that an error has occurred during tray exchange.



Note

Whenever the machine detects an error, the operator should press the Stop button immediately.

- This LED will be off when the machine is in a normal run condition.

Yellow LED - Inhibit

- When this LED is on and not flashing, it means that the feeder is in an inhibit condition.
- When this LED is on and flashing, it means that the feeder is in an inhibit condition and the elevator is moving up to a normal run position.
- This LED will be off when the machine is in a normal run condition.

Blue LED - Full/Empty

- When this LED is on and not flashing, it means that the lower input stack of trays is empty.
- When this LED is on and flashing, it means that the upper output stack is full of trays.



Note

If both the full and empty conditions occur at the same time, the LED indicates the full condition.

- This LED will be off when the machine is in a normal run condition.

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Operating Instructions

Starting the Feeder

1. Supply power to the feeder by plugging the power cable into the assembly machine.
2. The feeder will automatically initialize. If the feeder detects a tray on the conveyor, it will move the tray to the pick/place position and clamp it in place. Otherwise there will be no conveyor motion.
3. Choose either Normal mode or Slow mode (see Initialization, Page 6) depending on the sensitivity of components being conveyed.
4. Look at the operator indicators.
 - a. Check the Thick/Thin switch. See Fig. 4. This switch prepares the unit to operate with JEDEC trays of the correct thickness.



Note

If the Thick/Thin switch is set incorrectly, the feeding mechanism will jam and cause an error condition (orange LED on and flashing).

- b. If the blue LED (indicating Full/Empty) is on and **not** flashing, the lower input elevator is out of trays. Open the tray access door and place one or more trays in the lower input stack. Close the door. The elevator should automatically begin to move up to a normal run position.
- c. If the blue LED is on and flashing, the machine is full of trays. Remove the trays from the upper output stack.
- d. If the yellow LED is on and **not** flashing (indicating an inhibit condition), close the elevator access door.

Loading Trays

The feeder can be reloaded with trays at any time, with little or no interruption to the operation of the assembly machine. When the last tray is moved to the pick/place position, the lower input stack will be empty. This causes the feeder to go to an empty condition and causes the blue LED to turn on without flashing. The elevator will drive down to its lower limit. It is best if the operator can reload the feeder at this point or sooner.

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If the operator does not reload the feeder and the machine continues to operate, the last tray will be returned to the upper output stack. At this point the feeder will automatically go to an inhibit condition.

To reload the feeder:

1. If the feeder is not empty, press the Elevator Down button. The feeder will automatically go to an inhibit mode, and the elevator will begin driving down toward its lower limit.
2. Open the elevator access door and insert one or more trays.
3. Close the elevator door and the elevator will begin moving up to a normal run position. Once the elevator has reached the normal run position, the unit will automatically leave the inhibit mode.

Unloading Trays

The feeder can be unloaded at any time with little or no interruption to the operation of the assembly machine. When the upper output stack reaches its maximum capacity, the feeder will automatically go to an inhibit condition and signal that it is full (blue LED on and flashing). It is best if the operator can unload the feeder at this point or sooner.

If the operator does not unload the feeder and the machine continues to operate, the unit will not accept any further manual or automatic tray exchange requests and will idle.

To unload the feeder:

1. If the blue LED is not flashing -
The upper output stack has room to accept more trays. Before you remove the trays, press the Inhibit button. Remove the trays.



Note

Before removing the trays, press the Inhibit button and wait to see the yellow LED. The inhibit mode will prevent the feeder from cycling a tray while you are removing the trays.

If the blue LED is flashing -

Remove the trays.

2. Once the trays have been removed, press the Inhibit button to resume normal operation.

Recovering from Tray Exchange Errors

The software that controls the feeder has a built in watch-dog timer. This allows a pre-determined amount of time for a tray to move from one sensor location to the next during

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a tray exchange. If this timer expires, the feeder goes to an error condition. If the machine detects an error condition (flashing orange LED), the operator should press the Stop button immediately.

To recover from a tray exchange error:

1. Press the Stop button immediately.
2. Identify the cause of the error. (The tables included in the Troubleshooting section may be helpful.)
3. Correct the problem (In most cases this means removing the tray from the conveyor).
4. Press the Reset button.
5. The orange LED should stop flashing. If it does not, repeat steps 2-4. If the error persists, contact the factory.
6. When the orange LED stops flashing, the feeder is ready to resume normal operation.

Maintenance

General

All bearings used in the machine are sealed, and do not require lubrication. The feeder uses dry-run chains, and these should not be lubricated.



Note

Any lubrication applied to these or other mechanical parts in the feeder could potentially migrate and/or outgas, which could contaminate the components being fed.

Weekly Maintenance

- Check the feeder for damaged or broken parts.
- Check the orange conveyor belts for dirt, nicks, or other signs of damage.

Monthly Maintenance

- Clean the orange conveyor belts and the tray platform. Wipe down the belts and platform with isopropyl alcohol. (See Figure 3.)

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- Check the urethane pinch roller attached to the tray clamping mechanism for signs of wear or damage. Replace it if necessary.

Installation

The mounting arrangements may vary from one installation to another. We will just state some general principles here. For detailed instructions, see the material supplied with the mounting kit.

1. The end of the conveyor must be level and square in relation to the assembly machine. Once the conveyor end has been brought into this position, it should be firmly attached to the assembly machine. Sometimes this is accomplished using a mounting block that sits below the end of the conveyor. (The arrangement on your feeder may be different.)
2. The other end of the feeder must be firmly supported. The support device must be set so that the conveyor is level. On some units, this end of the feeder is supported on one or two adjustable legs. (The arrangement on your feeder may be different.)
3. Make the electrical connection to the feeder using the low-voltage connector provided. Be careful not to pinch any electrical wiring during the installation.
4. Make the pneumatic connection at the point provided on the assembly machine. The air supply used in this machine must be clean and dry. See the pneumatic specifications in the beginning of this manual. Be careful not to pinch any pneumatic tubing during the installation.

Theory of Operation

The feeder is controlled by a board-mounted CPU. The CPU supervises the operation of the feeder, and also handles the communications with the assembly machine. All of the inputs and outputs pass through the CPU board, and are indicated by LED's. These inputs and outputs are also indicated on the schematic diagrams included at the end of this manual.

The feeder includes two motors: one for the conveyor and one for the elevator. Both motors can be reversed by the control system. The pneumatic system includes a small on-board air pressure regulator, three double-acting air cylinders, and one single-acting cylinder.

A stack of trays is maintained in the upper section of the feeder. The bottom of this stack is supported by four retractable pawls. Most of the time, the pawls support the bottom tray in the stack. When the machine is loading one of the trays into the output stack, the pawls retract to allow the bottom tray to move upward. One of the air cylinders is used to control the action of the pawls.

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When the machine is loading a tray, one cylinder acts as a “pusher” to move each tray onto the conveyor. Another cylinder controls a tray clamp mechanism that locks each tray into the pick or place position at the end of the conveyor. When the machine is removing a tray, the tray home pusher pushes each tray into the stack elevator.

Operating Sequence

At the beginning of the operating sequence, we will assume that there is a tray at the end of the conveyor, there are some trays in the lower elevator, and there are some trays in the upper output stack of the feeder. The lifting mechanism is in the resting position (down).

In normal operation, the cycle begins when the feeder receives an Index command from the assembly machine.



Note

The operator can also index a tray by pressing both Index buttons at the same time.

The lift mechanism stays down, while the tray clamping arm extends and pushes the tray onto the conveyor, which has begun to drive towards the base of the feeder.

The tray will then pass a sensor location before it enters the base of the machine. This will cause the conveyor to shift to a slower speed. (A variable time delay is set by one of two potentiometers on the control board. See Fig. 6.) When the tray clears the sensor location, the tray home pusher will fire to push the tray farther into the base. If the feeder determines that this has happened within a specific amount of time, the lift mechanism will start to move up. Otherwise the feeder will go to an error condition.

At this point, the tray is being stacked in the bottom of the upper output stack, while the next tray is being singulated from the top of the input stack inside the elevator.

Next, the lift mechanism must move down to complete the stacking of the returning tray. This also locates the newly singulated tray in position so that it can be fed onto the conveyor.

When the lift mechanism has reached the bottom of its stroke, the tray feed pusher advances the leading edge of the tray so that it contacts the conveyor belts. Once the tray touches the belts, the belts accelerate the tray, and it begins to move out onto the conveyor.

The machine is designed to prevent a tray from stopping abruptly when it arrives at the end of the conveyor. A sensor, called the "forward slow down" sensor, is positioned a fixed distance from the end of the conveyor. As the leading edge of the tray passes the

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sensor, the conveyor shifts to slow speed operation. (This slow speed is different from the one previously mentioned, and is set by the second of two potentiometers on the control board. This is also shown in Fig. 6.) When the tray reaches the end of the conveyor, it triggers another sensor that turns off the conveyor motor. When this sensor location is reached, the tray clamp retracts, locking the tray into position. The feeder then generates a Ready signal which lets the assembly machine know that it may begin a pick or place operation.

Control of Upper Output Stack

The feeder includes a sensor that monitors the stack of trays in the top of the feeder. When the feeder moves the last tray into the stack in the upper part of the feeder, this triggers a sensor that tells the microprocessor controller that the upper stack is full. The assembly machine is allowed to continue to process a tray at the end of the conveyor, so the green LED (Ready) remains on. The blue LED (Full/ Empty) turns on and flashes to show that the feeder needs operator attention, and specifically that the upper output stack has reached its capacity of trays. The operator can remove some or all of the trays from the upper output stack without disturbing the operating cycle. Refer to the section on Operating Instructions for the steps required to unload the upper output stack.

Control of Lower Input Stack

The feeder includes another sensor that monitors the stack of trays in the elevator. As the elevator loads each tray, it moves up by a small amount. This function is controlled by one of two sensors, depending on how the Thick/Thin switch is set. Each sensor has a horizontal beam. As the feeder operates, the elevator moves higher to properly position the next tray relative to the separation mechanism. A sensor is positioned near the top of the elevator travel to give a warning of an empty condition. When this occurs, the blue LED (Full/Empty) turns on and does not flash. This indicates that the feeder needs operator attention, and specifically that the elevator is empty.

The elevator compartment is protected behind the tray access door, which includes an interlock switch. When the door is open, both of the motors are turned off, and most pneumatic functions are stopped. (The exception is the tray clamp mechanism at the end of the conveyor. This remains active, so that any tray at the end of the conveyor will remain locked in place.) The door switch also provides some extra protection by preventing the feeder from indexing. The operator should open the door, insert the trays, and close the door again. Once the door is closed, the elevator will automatically drive up to a normal run position, and the machine will automatically recover from the empty and inhibit conditions.

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Troubleshooting Guide

The following pages list some troubleshooting suggestions. Please refer to the Theory of Operation and the following prints:

- Control Circuit Diagram 4036229C
- System Schematic 4037154C
- Interface Circuit 4036236

To reach the control board inside the unit, loosen the two screws recessed into the bottom panel.



Note

Do not work with the parts inside the machine unless you are a trained technician.

The LEDs on the controller board indicate most of the important signals passing through the unit. See Figure 5 and the following table.

For additional service help, please contact your vendor.

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Mechanical Malfunction

Error	Possible Cause	Remedy
The feeder will not operate.	The feeder may not be getting power.	<ol style="list-style-type: none"> 1. Make sure that the feeder is plugged into the assembly machine. 2. Make sure that the assembly machine is on and not in an E-Stop condition. 3. The stop button on the feeder may have been pressed. Press the Reset button.
	The feeder may not be getting compressed air.	<ol style="list-style-type: none"> 1. Make sure that the air feed line is connected to the assembly machine. 2. Make sure that the assembly machine air supply is on. 3. Make sure that the assembly machine is supplying between 60 and 80 psi.
The elevator does not move.	The elevator may be out of trays (blue LED not flashing).	Add more trays and close the elevator access door.
	The elevator access door may be open.	Close the elevator access door.
	Weight Limit Exceeded	Check weight of stack. If weight exceeds 6.8 Kg (15 lbs), remove some of the trays. If weight is within limit, call the vendor for proper adjustment procedure.
The conveyor does not move.	The feeder may be in an inhibit condition (yellow LED).	Press the Inhibit button again to cancel the condition.
	The elevator access door may be open.	Close the elevator access door.
	Error or Stop condition	Press the reset button
One or more pneumatic functions seem slow or sluggish.	The feeder may not be getting enough compressed air.	<ol style="list-style-type: none"> 1. Make sure that the assembly machine is supplying between 60 and 80 psi. 2. Make sure that the air feed line is not pinched.
One pneumatic function is slow or sluggish.	The mechanism may be blocked or jammed.	Check the feeder for a mechanical problem.

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Error Conditions

Error	Possible Cause	Remedy
The feeding mechanism has jammed.	The Thick/Thin switch may be set for the wrong type of tray.	Set the Thick/Thin switch correctly. (See Fig. 4.)
A tray exchange was started with a tray underneath the separation mechanism.	A tray was improperly located in the feeder.	Remove the tray and push the Reset button.
When resetting from an error condition, a tray on the conveyor was not successfully conveyed to the pick/place position and clamped.	A tray was improperly located in the feeder.	Remove the tray and press the Reset button.
	Something is obstructing the free motion of the tray on the conveyor.	Remove the tray and obstruction, and then push the Reset button.
During tray exchange, the lift cylinder did not make it to the top of its stroke in time.	The mechanism may have jammed.	Check for a mechanical problem and push the Reset button.
	The flow controls may be out of adjustment.	Call the vendor for the proper adjustment procedure.
During tray exchange, the returning loaded tray did not reach the "stack slow down" sensor in time.	There may be an obstruction on the conveyor.	Remove the obstruction and press the Reset button.
	The tray clamp cylinder may not have retracted properly.	Call the vendor for the proper adjustment procedure.

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Error	Possible Cause	Remedy
During tray exchange, the returning tray did not reach the “stop at stack” sensor in time.	There may be an obstruction on the conveyor.	Remove the obstruction and press the Reset button.
	The tray home pusher cylinder may not have operated properly.	Call the vendor for the proper adjustment procedure.
During tray exchange, the tray home pusher did not successfully push a tray into the feeder base.	There may be an obstruction on the conveyor.	Remove the obstruction and press the Reset button.
	The flow controls may be out of adjustment.	Call the vendor for the proper adjustment procedure.
During tray exchange, the separated tray did not reach the “conveyor slow down” sensor in time.	The tray feed pusher may not have extended properly.	Call the vendor for the proper adjustment procedure.
During tray exchange, the separated tray did not reach the “stop at end” sensor in time.	There may be an obstruction on the conveyor.	Remove the obstruction and press the Reset button.
During tray exchange, the lift cylinder did not make it to the bottom of its stroke in time.	The mechanism may have jammed.	Check for a mechanical problem and press the Reset button.
	The flow controls may be out of adjustment.	Call the vendor for the proper adjustment procedure.

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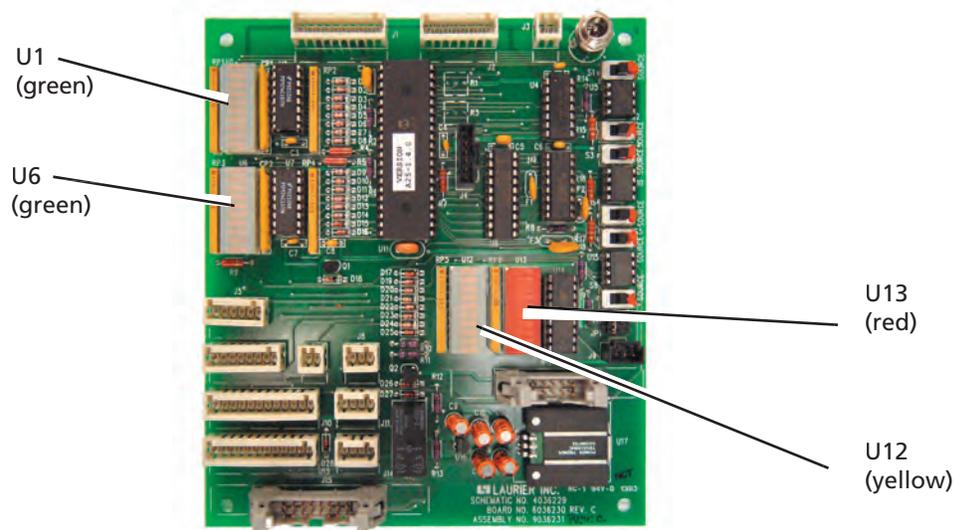


Fig 5 -
LEDs on CPU Controller Board
(See the list of functions indicated by the LEDs on the next page.)

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LED Indications - Controller Board for TF20

LED #	Sensor/Function	Indicates
U1-1	Lift Cylinder Up	The lift is at its upper limit.
U1-2	Lift Cylinder Down	The lift is at its lower limit.
U1-3	Forward Slow	A tray is approaching the end of the conveyor.
U1-4	Stop @ End	A tray is at the pick/place position.
U1-5	Tray Position	Indicates the next tray in the input stack is ready to be exchanged.
U1-6	Reset Switch	The Reset button is pressed.
U1-7	Stop Switch	The Stop button is pressed.
U6-1	Inhibit Switch	The Inhibit button is pressed.
U6-2	Elevator Down	The Elevator button is pressed.
U6-3	Stack Full	The upper output stack is full of trays.
U6-4	Stop @ Stack	A tray has reached the base of the feeder.
U6-5	Reverse/ Slow	A tray is approaching the base of the feeder.
U6-6	Elevator High	The elevator is at its upper limit.
U6-7	Elevator Low	The elevator is at its lower limit.
U6-8	Door	The elevator access door is open.
U12-4	Full/Empty LED (blue)	Constant on = Input stack is empty Flashing on = Output stack is full
U12-5	Inhibit LED (yellow)	Constant on = Inhibit condition Flashing on = Inhibit condition and elevator moving up
U12-6	Stop/Error LED (orange)	Constant on = Feeder stopped Flashing on = Error condition
U13-1	Move - Lift Down	If off, and U13-2 is on, then the solenoid is switched to move the lift down.
U13-2	Move - Lift Up	If off, and U13-1 is on, then the solenoid is switched to move the lift up.
U13-3	Tray Feed Pusher	If off, the tray feed pusher is extending.
U13-4	Tray Clamp	If off, the tray clamp is holding a tray at the pick/place position.
U13-5	Tray Home Pusher	If off, the tray home pusher is pushing a tray back into the base.

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Conveyor Speed Adjustments

The feeder is designed to keep a tray from stopping too abruptly when it reaches the end of the conveyor. (An abrupt stop can cause the components to pop out of the tray.) The "conveyor slow down" sensor is located near the end of the conveyor. When the leading edge of the tray passes this sensor, the conveyor shifts to slow speed operation. This can be adjusted using the potentiometer shown in Fig. 6. As the tray returns back into to the feeder, it passes a second sensor. This slows the tray before it reaches the base. The amount of time the feeder waits before switching to slow speed after passing this sensor can be adjusted as well using a potentiometer.

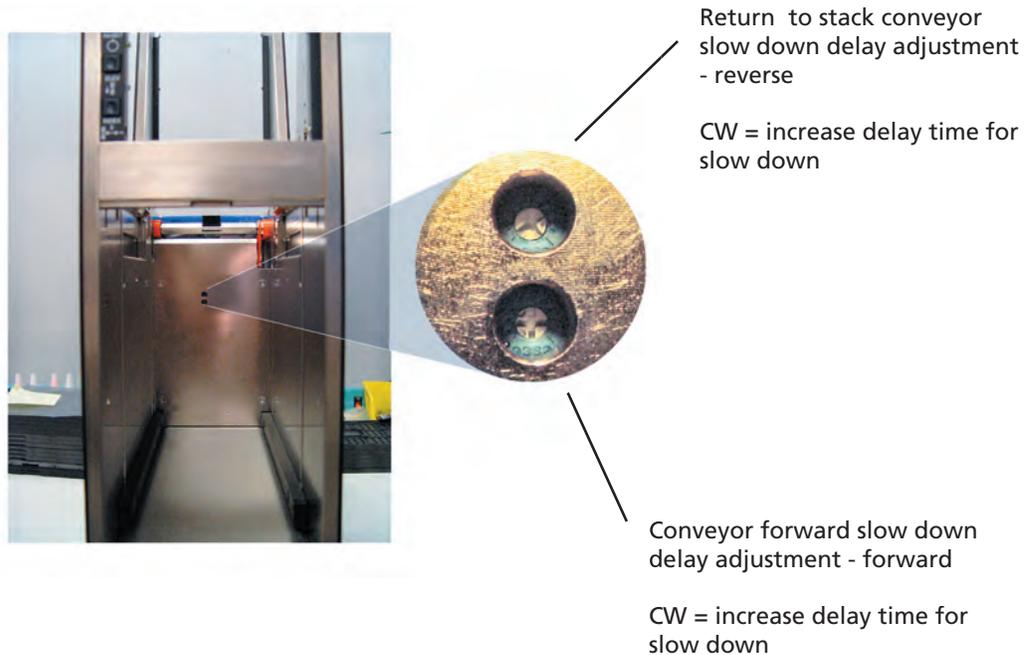


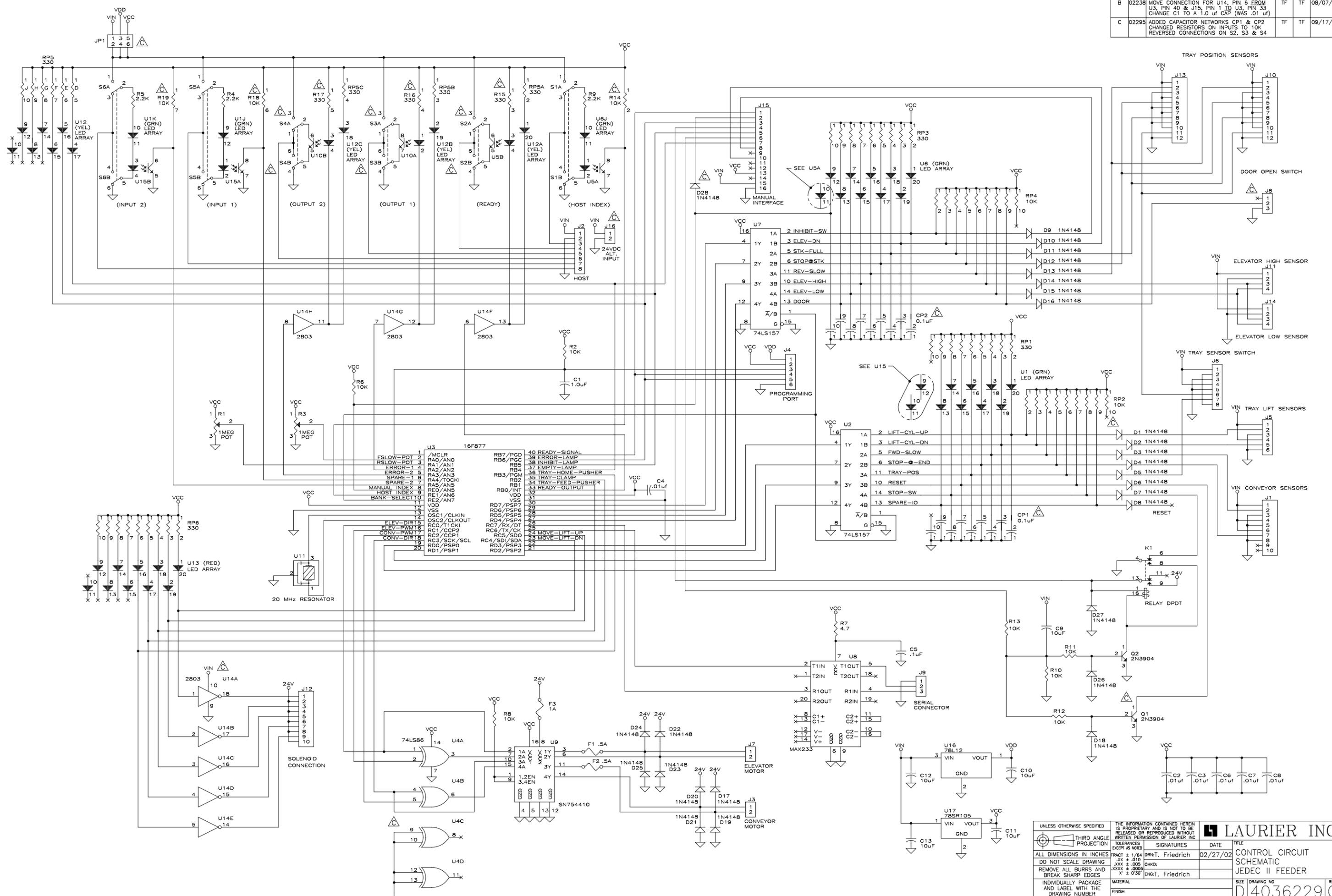
Fig. 6
Conveyor and Stack Slow Down Adjustments



Caution

Be careful not to strip the potentiometer by overturning.

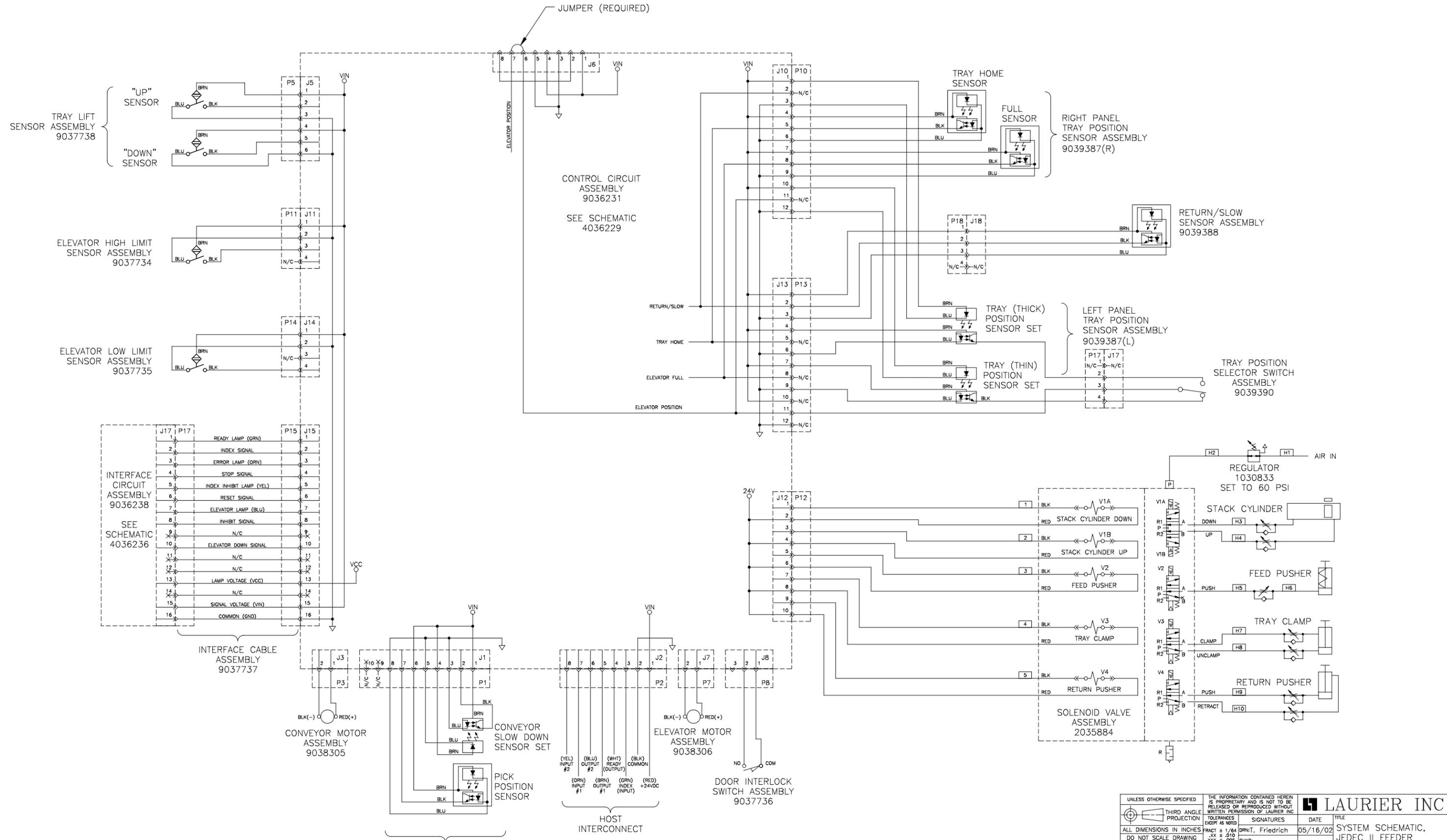
REV	ECCO	DESCRIPTION	DRN	AUTH	DATE
B	02238	MOVE CONNECTION FOR U14, PIN 6 FROM U3, PIN 40 & U15, PIN 1 TO U3, PIN 33 CHANGE C1 TO A 1.0 uf CAP (WAS .01 uf)	TF	TF	08/07/02
C	02295	ADDED CAPACITOR NETWORKS CP1 & CP2 CHANGED RESISTORS ON INPUTS TO 10K REVERSED CONNECTIONS ON S2, S3 & S4	TF	TF	09/17/02



UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER INC		LAURIER INC	
THIRD ANGLE PROJECTION	FRACT ± 1/64	DRN: T. Friedrich	DATE: 02/27/02	TITLE: CONTROL CIRCUIT SCHEMATIC	REV: JEDEC II FEEDER
DO NOT SCALE DRAWING	.XXX ± .010	CHKD: ENG: T. Friedrich		SIZE: DRAWING NO	REV: D14036229C
REMOVE ALL BURRS AND BREAK SHARP EDGES	.XXXX ± .0005			SCALE: N/A	SHEET 1 OF 1
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER	FINISH				
SURFACE FINISH					

SIMILAR PARTS:

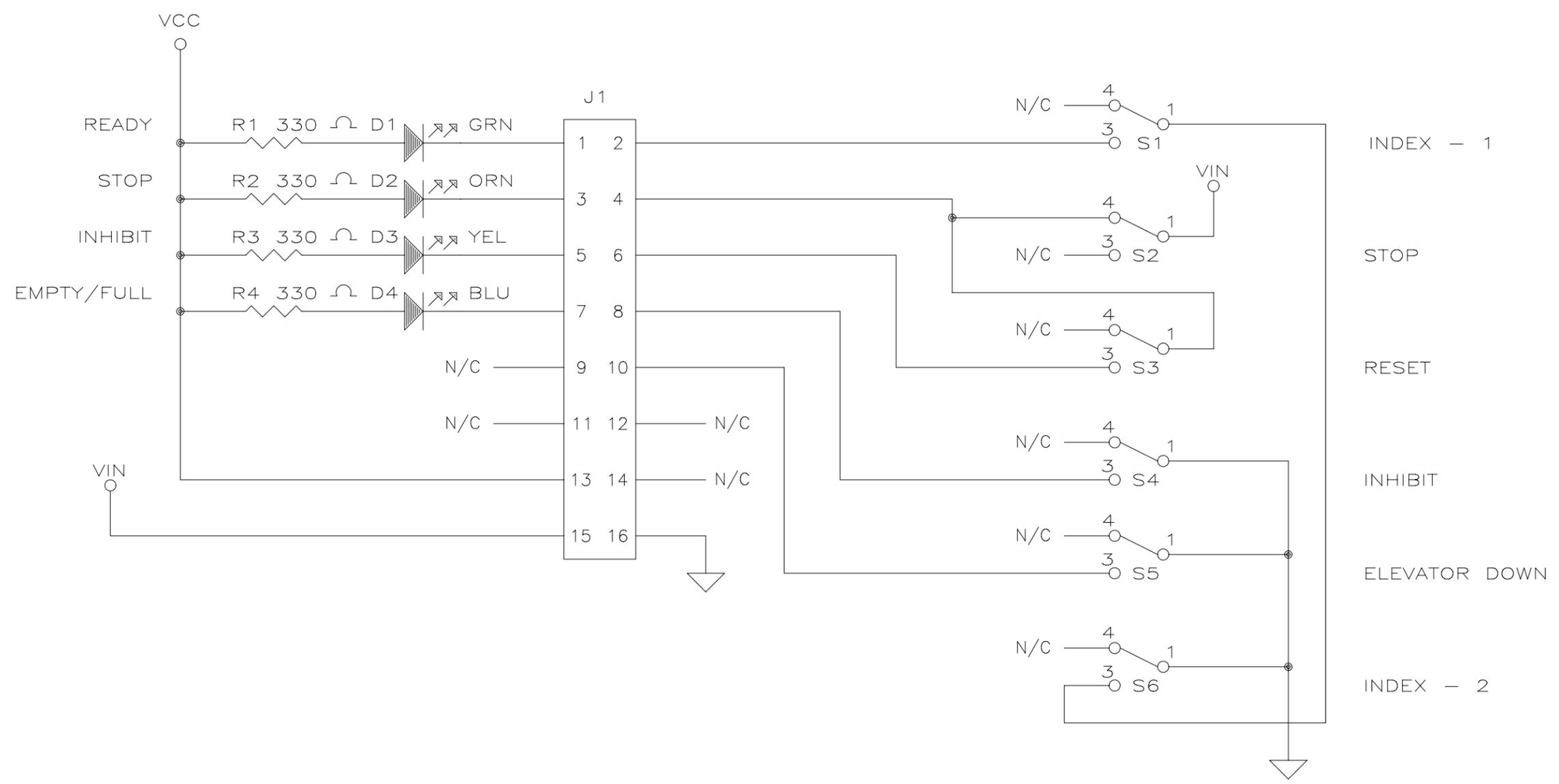
REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	-	CORRECTED DESIGNATORS A&B ON VALVE V1	TF	TF	10/31/02
B	-	ADDED CABLE ASSEMBLY PART NUMBERS	TF	TF	03/14/03
C	03246	REPLACED 9037732 & 9037733 W/ 9039387(L); REPLACED 9038739 W/9039390 ADDED 9039388 & JUMPER ON J6	TF	TF	10/17/03



UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER, INC.		LAURIER INC	
THIRD ANGLE PROJECTION	FRACT ± 1/64	DRN: T. Friedrich	DATE: 05/16/02	TITLE: SYSTEM SCHEMATIC, JEDEC II FEEDER PROGRAMMABLE	REV: D
ALL DIMENSIONS IN INCHES	.XXX ± .010	CHKD:		SIZE: DRAWING NO. D4037154C	REV: 1
DO NOT SCALE DRAWING	.XXXX ± .0005	ENG:		SCALE: N/A	SHEET 1 OF 1
REMOVE ALL BURRS AND BREAK SHARP EDGES	" ± 0.50"				
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER	MATERIAL FINISH				
SURFACE FINISH 128					

SIMILAR PARTS:

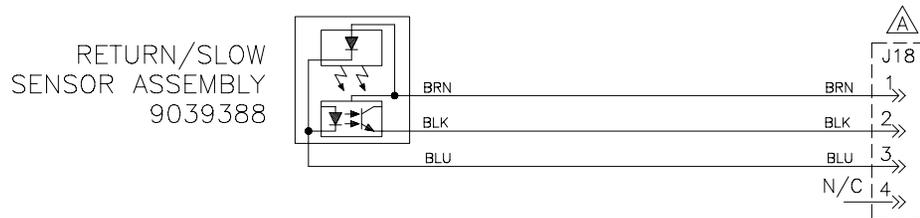
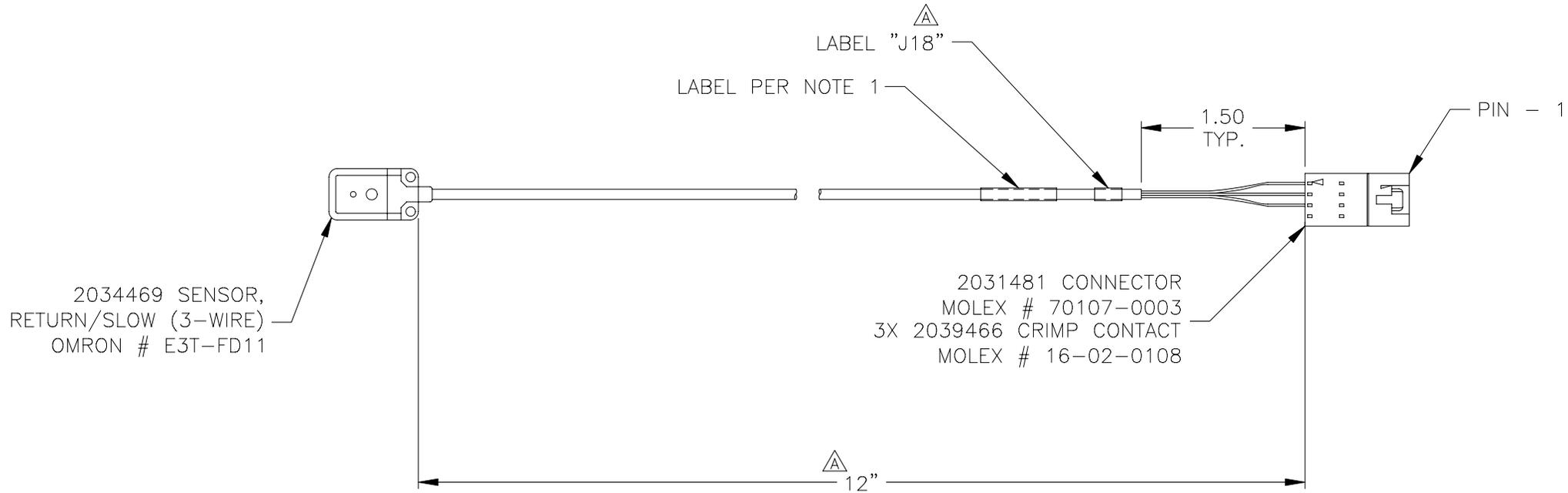
REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	02167	R1 THRU R4 WERE 2.2K TO VIN ADDED VCC ON PIN 13 TO RESISTORS	TF	TF	05/13/02



UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER INC			
		TOLERANCES EXCEPT AS NOTED			
ALL DIMENSIONS IN INCHES		FRACT ± 1/64		DATE	
DO NOT SCALE DRAWING		.XX ± .010		DRN:T. Friedrich 11/09/01	
REMOVE ALL BURRS AND BREAK SHARP EDGES		.XXX ± .005		CHKD:	
		.XXXX ± .0005		ENG:T. Friedrich	
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER		MATERIAL		TITLE	
		FINISH		SCHEMATIC, INTERFACE PCB	
SURFACE FINISH 128/				JEDEC FEEDER	
				SIZE DRAWING NO REV	
				A 4036236 A	
				SCALE 1:1 SHEET 1 OF 1	

SIMILAR PARTS;

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	03247	LABEL J18 WAS J17, 12" LENGTH WAS 24"	TF	TF	12/01/03



NOTE:

1. LABEL FINISHED ASSEMBLY W/ PART NUMBER; INCLUDE VENDOR INFORMATION AS REQUIRED, CONNECTOR END ONLY.

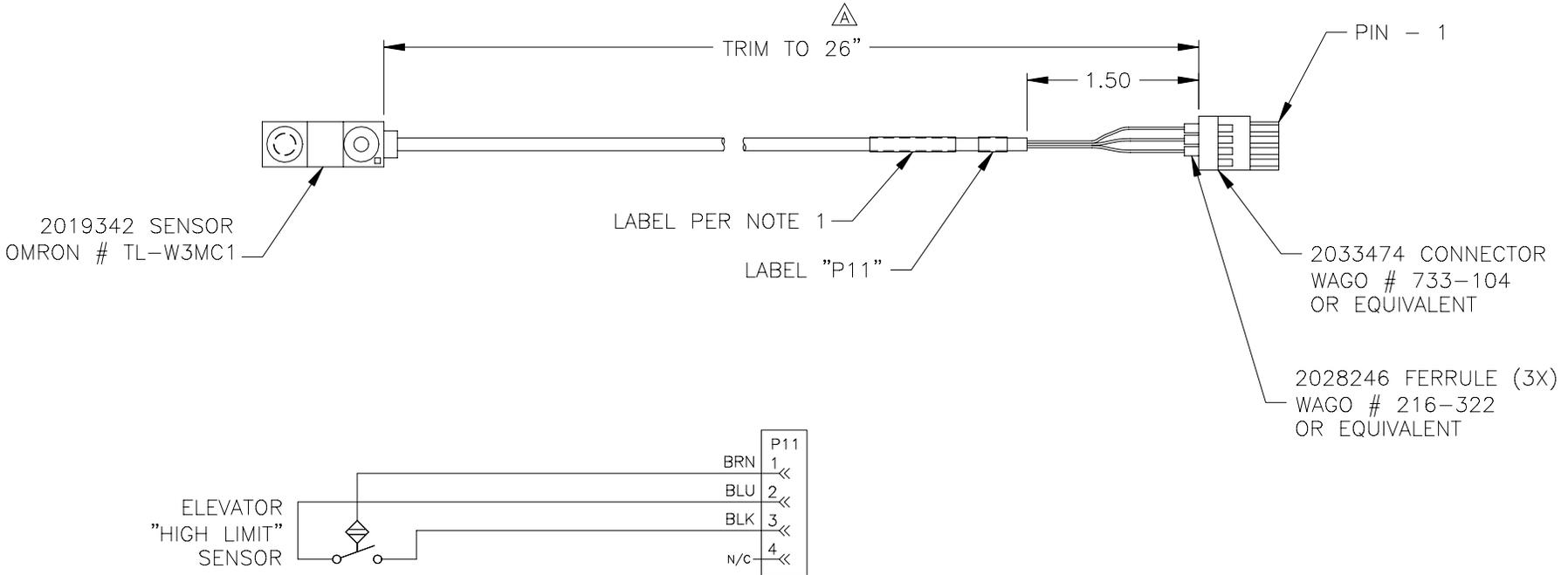
UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER INC		LAURIER INC	
 THIRD ANGLE PROJECTION	TOLERANCES EXCEPT AS NOTED	SIGNATURES	DATE	TITLE	
	FRACT ± 1/64 .XX ± .010 .XXX ± .005 .XXXX ± .0005 ° ± 0°30'	DRN:T. Friedrich	10/17/03	RETURN/SLOW SENSOR ASSEMBLY JEDEC II	
ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING REMOVE ALL BURRS AND BREAK SHARP EDGES	MATERIAL SEE DETAILS	ENG:T. Friedrich	10/17/03	SIZE	DRAWING NO
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER	FINISH			B	9039388
SURFACE FINISH 128/			SCALE	1:1	SHEET 1 OF 1

9039387
SIMILAR PARTS; 9037733

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	03085	26" LENGTH WAS 24"	TF	TF	04/02/03
B	04126	REMOVED SHRINK TUBING; REVISED NOTE 1, ADDED NOTE 2	TF	TF	03/02/04

NOTE:

1. LABEL FINISHED ASSEMBLY W/ PART NUMBER; INCLUDE VENDOR INFORMATION AS REQUIRED, CONNECTOR END ONLY.
2. DISPOSE OF ALL UNUSED SENSOR HARDWARE AND DOCUMENTATION.



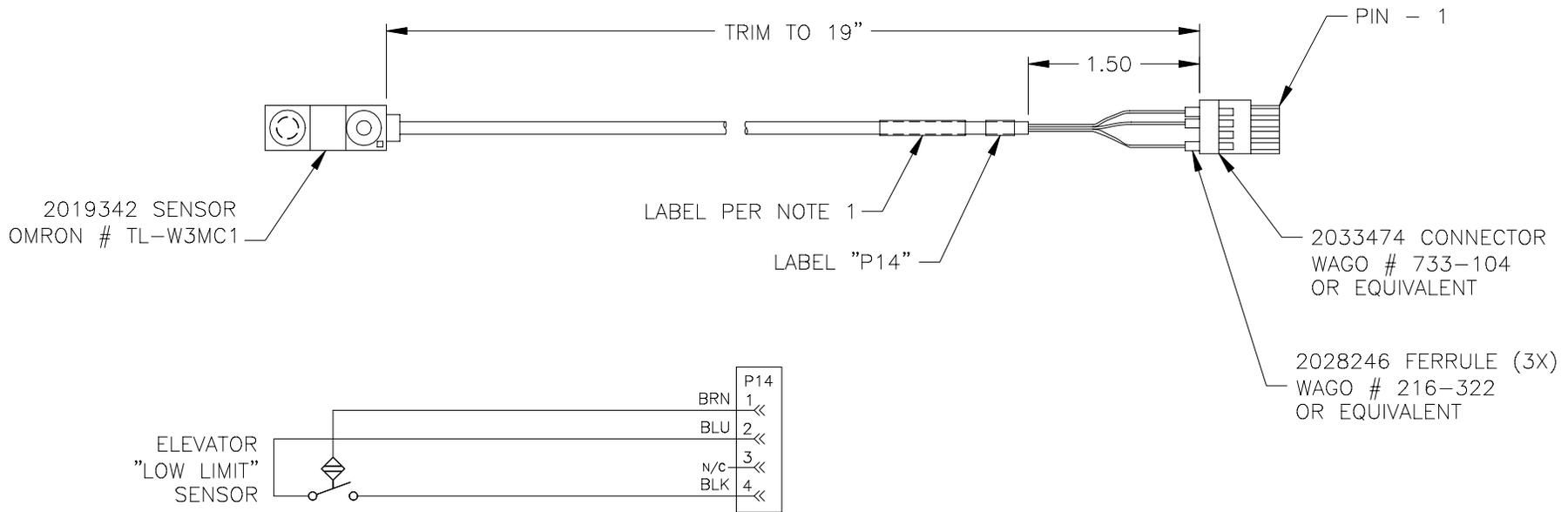
9037738
SIMILAR PARTS; 9037735

UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF BDH		Besi Die Handling	
	THIRD ANGLE PROJECTION	SIGNATURES		DATE	TITLE
ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING REMOVE ALL BURRS AND BREAK SHARP EDGES		DRN: T. Friedrich		10/16/02	ELEVATOR HIGH LIMIT SENSOR ASSEMBLY JTF 2
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER		MATERIAL SEE DETAILS		10/16/02	CHKD:
SURFACE FINISH 128/		FINISH		ENG: T. Friedrich	REV B
				SIZE	DRAWING NO
				SCALE 1:1	B9037734
				SHEET 1 OF 1	

NOTE:

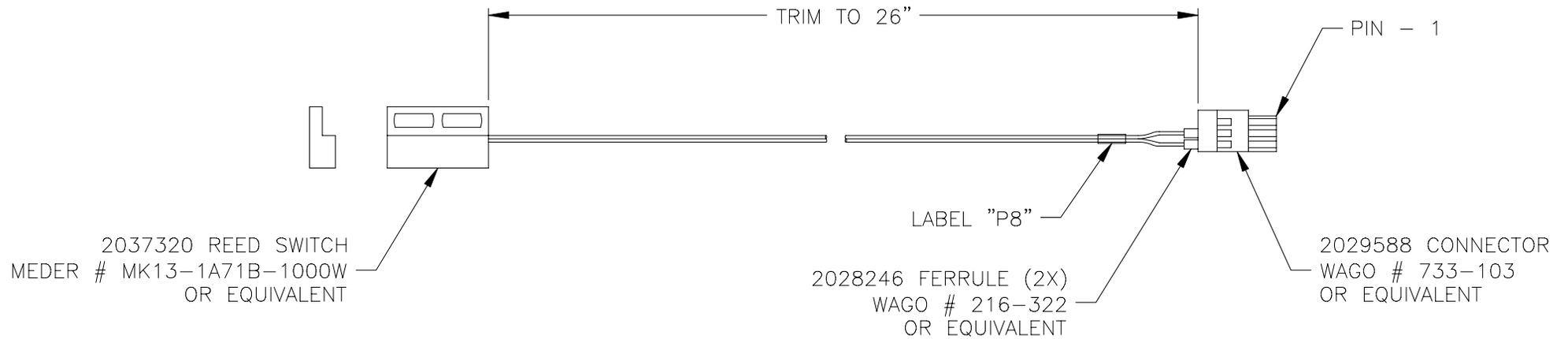
1. LABEL FINISHED ASSEMBLY W/ PART NUMBER; INCLUDE VENDOR INFORMATION AS REQUIRED, CONNECTOR END ONLY.
2. DISPOSE OF ALL UNUSED SENSOR HARDWARE AND DOCUMENTATION.

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	04126	REMOVED SHRINK TUBING; REVISED NOTE 1, ADDED NOTE 2	TF	TF	03/02/04



UNLESS OTHERWISE SPECIFIED	THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF BDH		Besi Die Handling	
THIRD ANGLE PROJECTION	TOLERANCES EXCEPT AS NOTED	SIGNATURES	DATE	TITLE
ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING	FRACT ± 1/64 .XX ± .010 .XXX ± .005 .XXXX ± .0005 X' ± 0'30"	DRN: T. Friedrich CHKD: ENG: T. Friedrich	10/16/02	ELEVATOR LOW LIMIT SENSOR ASSEMBLY JTF 2
REMOVE ALL BURRS AND BREAK SHARP EDGES	MATERIAL SEE DETAILS	INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER		SIZE DRAWING NO
SURFACE FINISH 128/	FINISH	B9037735		REV A
9037738 SIMILAR PARTS; 9037734		SCALE 1:1		SHEET 1 OF 1

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
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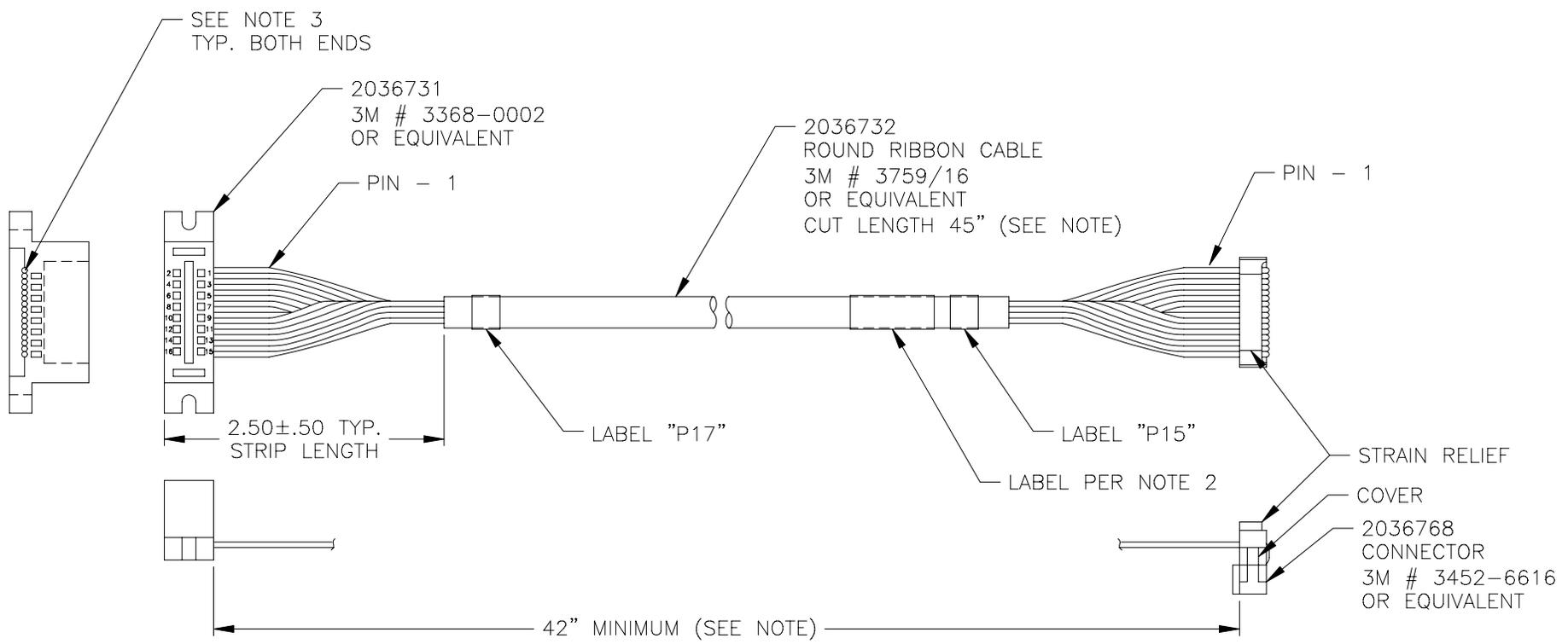


NOTE:
LABEL FINISHED ASSEMBLY W/ PART NUMBER.

SIMILAR PARTS;

UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER INC		LAURIER INC	
 THIRD ANGLE PROJECTION ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING REMOVE ALL BURRS AND BREAK SHARP EDGES	TOLERANCES EXCEPT AS NOTED	SIGNATURES	DATE	TITLE	
	FRACT ± 1/64 .XX ± .010 .XXX ± .005 .XXXX ± .0005 ° ± 0'30"	DRN:T. Friedrich	10/17/02	DOOR INTERLOCK SWITCH ASSEMBLY JEDEC II	
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER	MATERIAL SEE DETAILS	ENG:T. Friedrich	10/17/02	SIZE	DRAWING NO
SURFACE FINISH 128/	FINISH			B	9037736
				SCALE 1:1	SHEET 1 OF 1

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	04126	REVISED NOTE 2, ADDED NOTE 3	TF	TF	03/02/04



NOTE:

1. FINISHED LENGTH DETERMINED BY BONDED SECTIONS OF CABLE. ACTUAL LENGTH MUST FALL BETWEEN 45" & 42".
2. LABEL FINISHED ASSEMBLY W/ PART NUMBER; INCLUDE VENDOR INFORMATION AS REQUIRED WHERE SHOWN.
3. RIBBON CABLE ENDS MUST BE TRIMMED NEATLY AND MUST NOT EXTEND OUTSIDE OF CONNECTOR.

SIMILAR PARTS;

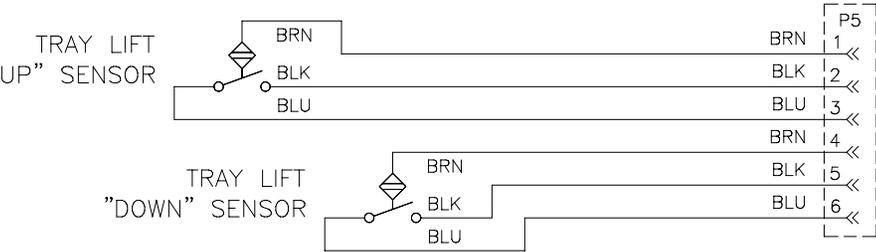
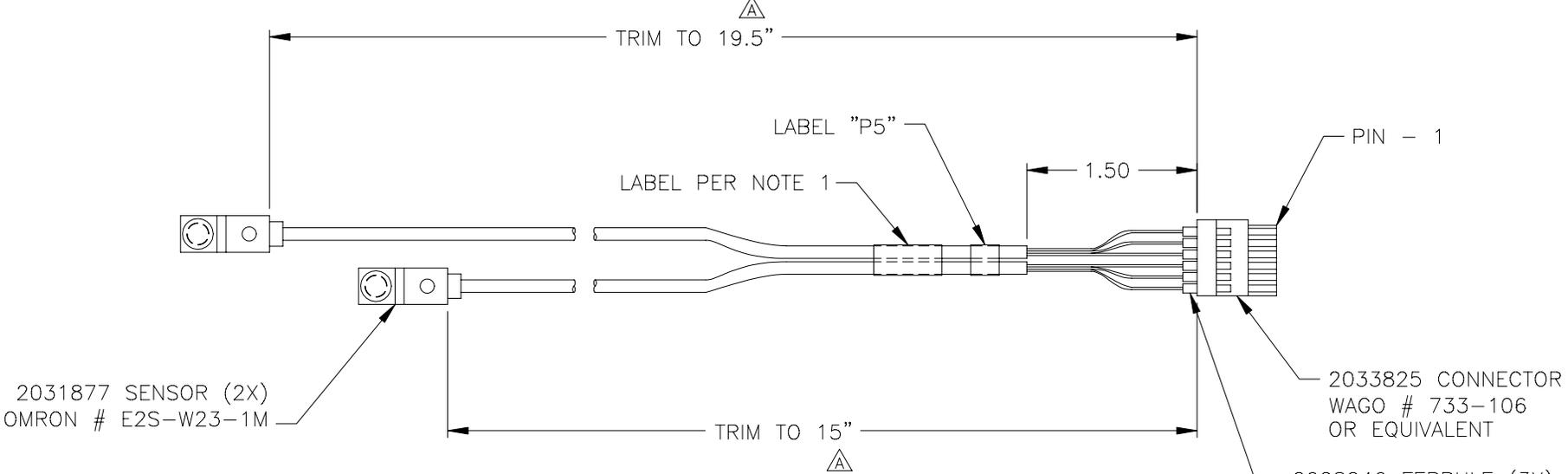
UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF BDH			
THIRD ANGLE PROJECTION		SIGNATURES			
ALL DIMENSIONS IN INCHES		FRACT ± 1/64		DRN: T. Friedrich	10/16/02
DO NOT SCALE DRAWING		.XX ± .010		CHKD:	
REMOVE ALL BURRS AND BREAK SHARP EDGES		.XXX ± .005		ENG: T. Friedrich	10/16/02
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER		" ± 0'30"		MATERIAL SEE DETAILS	
SURFACE FINISH 128/√		FINISH		SIZE	DRAWING NO
				B9037737	
				SCALE	1:1
				SHEET	1 OF 1
				REV	A

TITLE
INTERFACE CABLE ASSEMBLY
JTF 2

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	03085	19.5" LENGTH WAS 22.5", 15" WAS 17"	TF	TF	04/02/03
B	04126	REMOVED SHRINK TUBING; REVISED NOTE 1, ADDED NOTE 2	TF	TF	03/02/04

NOTE:

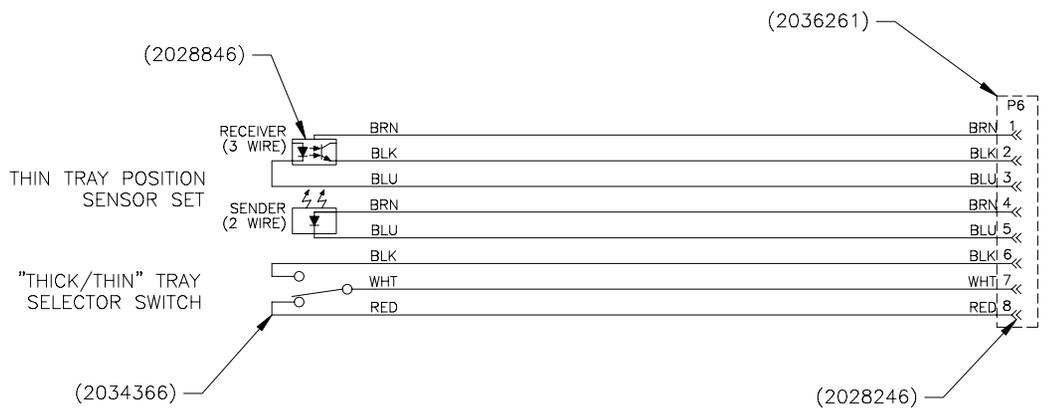
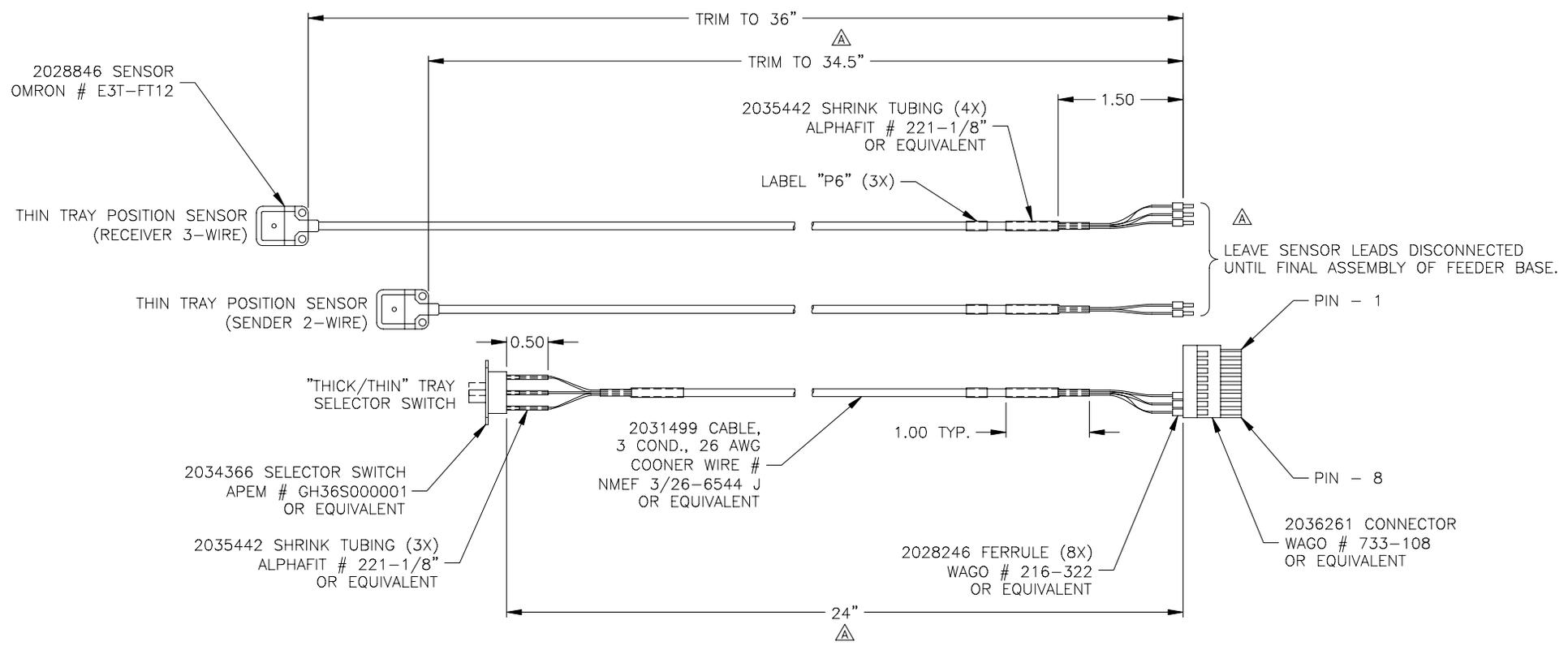
1. LABEL FINISHED ASSEMBLY W/ PART NUMBER; INCLUDE VENDOR INFORMATION AS REQUIRED, CONNECTOR END ONLY.
2. DISPOSE OF ALL UNUSED SENSOR HARDWARE AND DOCUMENTATION.



UNLESS OTHERWISE SPECIFIED THIRD ANGLE PROJECTION ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING REMOVE ALL BURRS AND BREAK SHARP EDGES	THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF BDH		SIGNATURES DRN: T. Friedrich CHKD: ENG: T. Friedrich	DATE 10/16/02	TITLE TRAY LIFT SENSOR ASSEMBLY JTF 2
	TOLERANCES EXCEPT AS NOTED FRACT ± 1/64 .XX ± .010 .XXX ± .005 .XXXX ± .0005 X' ± 0'30"	MATERIAL SEE DETAILS			
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER	FINISH		SIZE DRAWING NO B9037738		REV B
SURFACE FINISH 128/√	SCALE 1:1		SHEET 1 OF 1		

9037735
SIMILAR PARTS; 9037734

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	03085	36" LENGTH WAS 37.5", 34.5" WAS 36", 24" LENGTH WAS 27", SEPERATED SENSOR LEADS	TF	TF	04/02/03

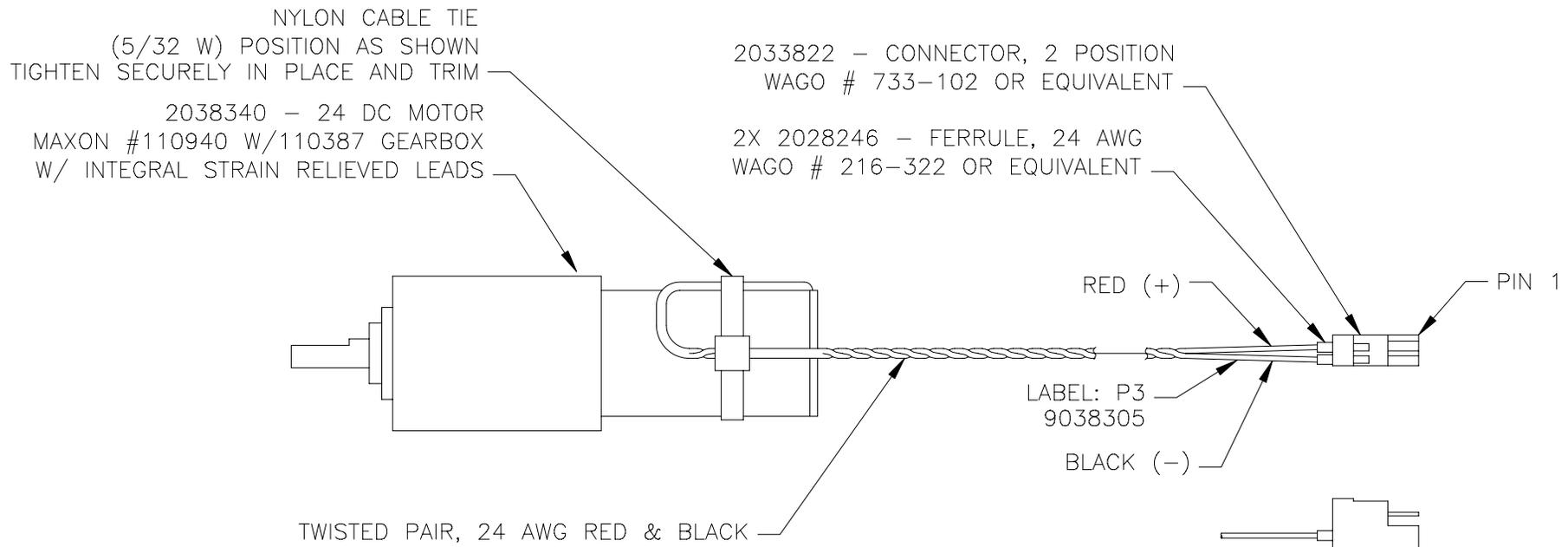


NOTE:
LABEL FINISHED ASSEMBLY W/ PART NUMBER.

UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER INC		LAURIER INC	
THIRD ANGLE PROJECTION	TOLERANCES EXCEPT AS NOTED	SIGNATURES	DATE	TITLE	
ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING	FRACT ± 1/64 .XX ± .010 .XXX ± .005 XXXX ± .0005 X' ± 0'30"	DRN: T. Friedrich	10/17/02	TRAY POSITION SELECTOR SWITCH ASSY	
REMOVE ALL BURRS AND BREAK SHARP EDGES	CHKD:	ENG: T. Friedrich	10/17/02	JEDEC II - BOTTOM UP	
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER	MATERIAL SEE DETAILS			SIZE	DRAWING NO
SURFACE FINISH 128	FINISH			C	9037739
				REV	A
				SCALE	1:1
				SHEET	1 OF 1

SIMILAR PARTS:

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	03095	MOTOR P/N WAS 2031997	TF	TF	09/15/03



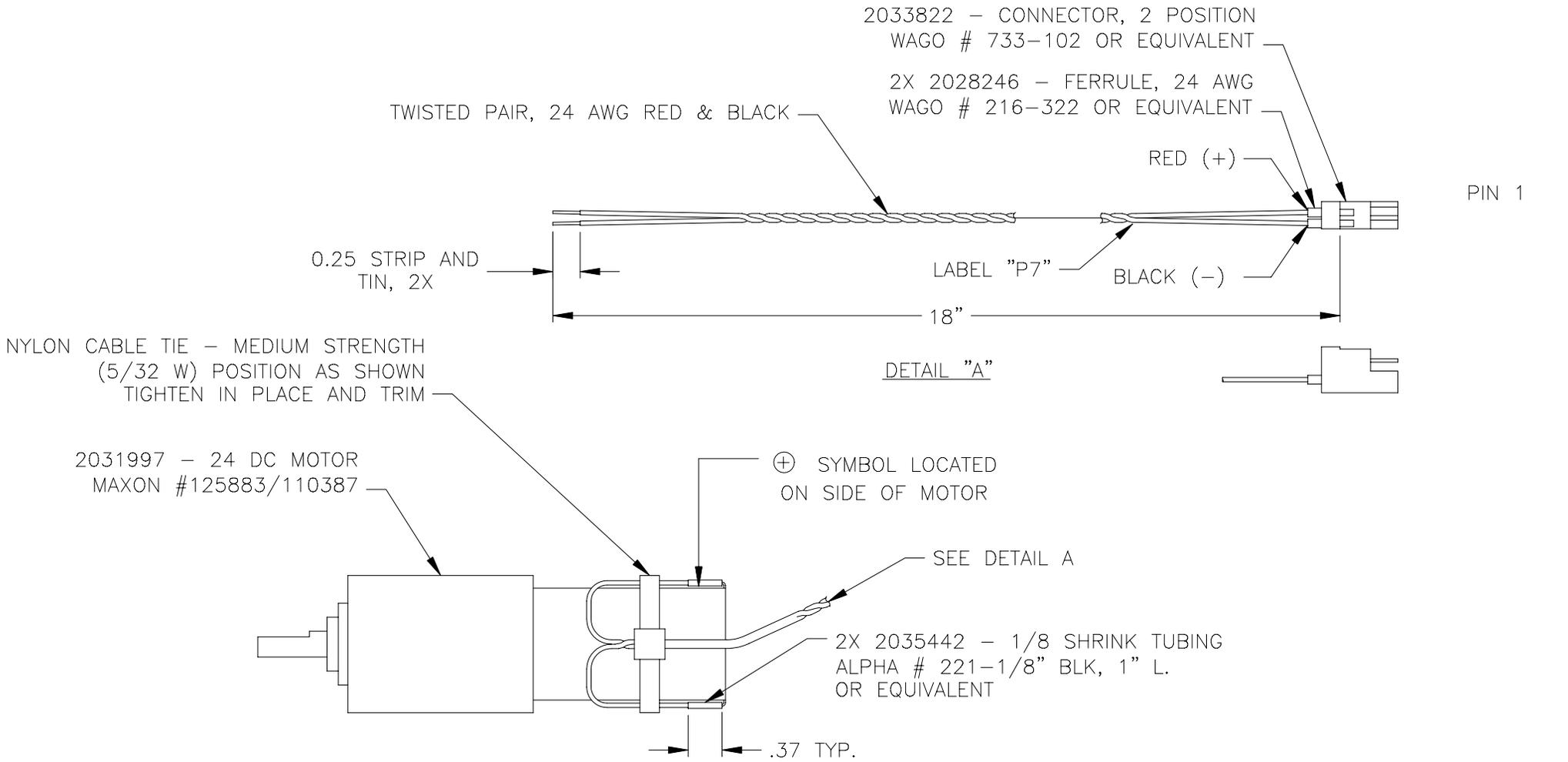
NOTES:

1. TWIST LEADS TOGETHER AND TRIM TO A LENGTH OF 7".
2. TIGHTLY STRAIN RELIEVE LEADS WITH NYLON CABLE TIE AS SHOWN.

SIMILAR PARTS; 9038306

UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER INC		LAURIER INC	
THIRD ANGLE PROJECTION		SIGNATURES		DATE	
ALL DIMENSIONS IN INCHES		DRN: T. Friedrich		02/10/03	
DO NOT SCALE DRAWING		CHKD:			
REMOVE ALL BURRS AND BREAK SHARP EDGES		ENG: T. Friedrich		02/26/03	
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER		MATERIAL SEE DETAILS		SIZE DRAWING NO	
SURFACE FINISH 128/		FINISH		B 9038305 A	
				SCALE 1:1 SHEET 1 OF 1	

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
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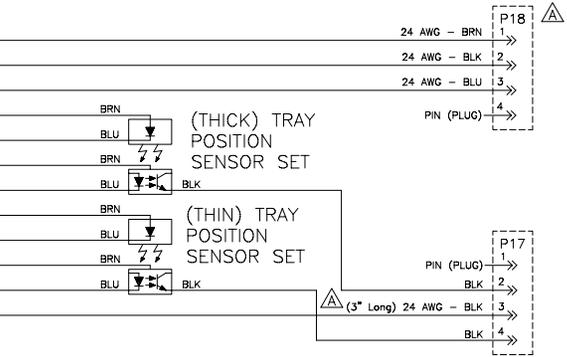
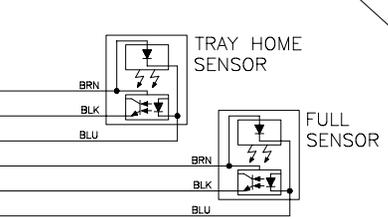
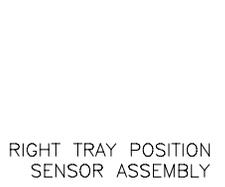
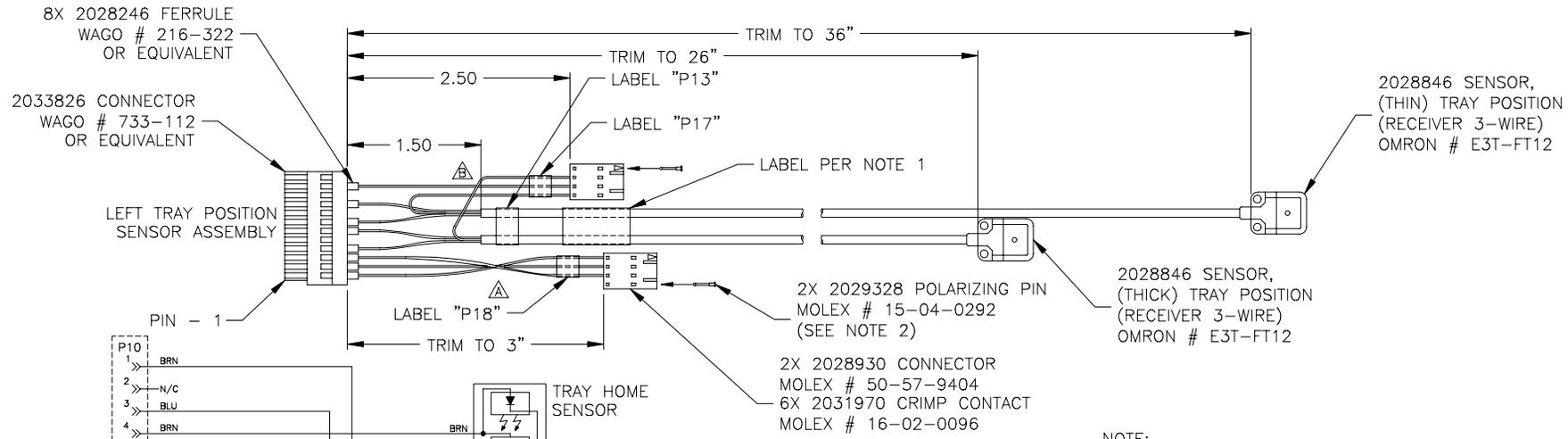
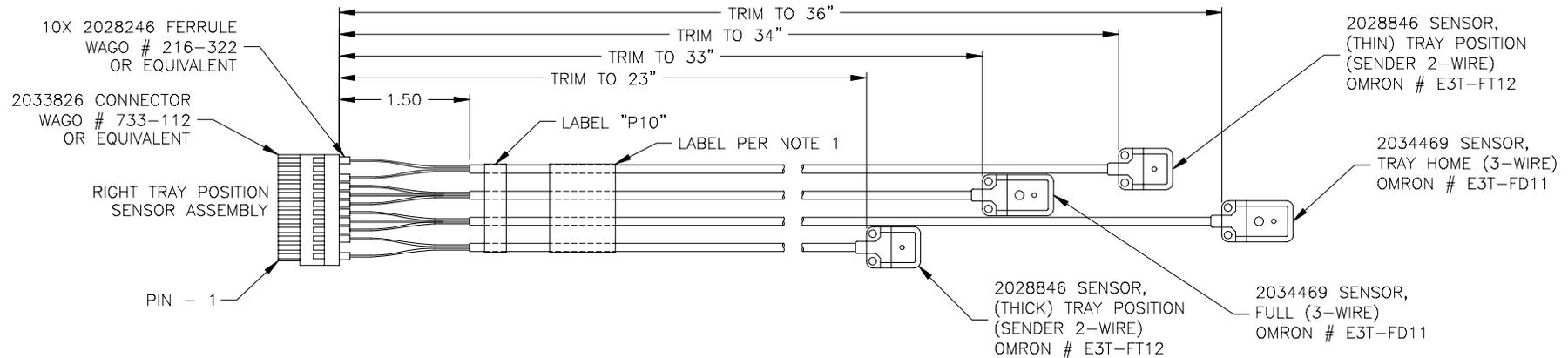
NOTES:

1. SOLDER LEADS TO MOTOR (RED WIRE TO + SIDE).
2. COVER SOLDER JOINTS WITH SHRINK TUBING.
3. CAREFULLY BEND LEADS TO LAY FLAT AGAINST MOTOR HOUSING.
4. STRAIN RELIEVE WITH TIE-WRAP AS SHOWN.

SIMILAR PARTS; 9038306

UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER INC		LAURIER INC	
 THIRD ANGLE PROJECTION	TOLERANCES EXCEPT AS NOTED	SIGNATURES	DATE	TITLE	
	FRACT ± 1/64 .XX ± .010 .XXX ± .005 .XXXX ± .0005 ° ± 0'30"	DRN: T. Friedrich	02/10/03	MOTOR ASSEMBLY, ELEVATOR JEDEC II	
ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING REMOVE ALL BURRS AND BREAK SHARP EDGES	MATERIAL SEE DETAILS	ENG: T. Friedrich	02/26/03	SIZE	DRAWING NO
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER	FINISH			B	9038306
SURFACE FINISH 128/			SCALE 1:1	SHEET 1 OF 1	

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	03246	P18 WAS ORIGINALLY LABELED P16 SWAPPED SIGNAL WIRES ON P17	TF	TF	12/01/03
B	04126	SWAPPED SIGNAL WIRES ON P17 (SCHEMATIC OK) ADDED NOTE 4	TF	TF	03/02/04



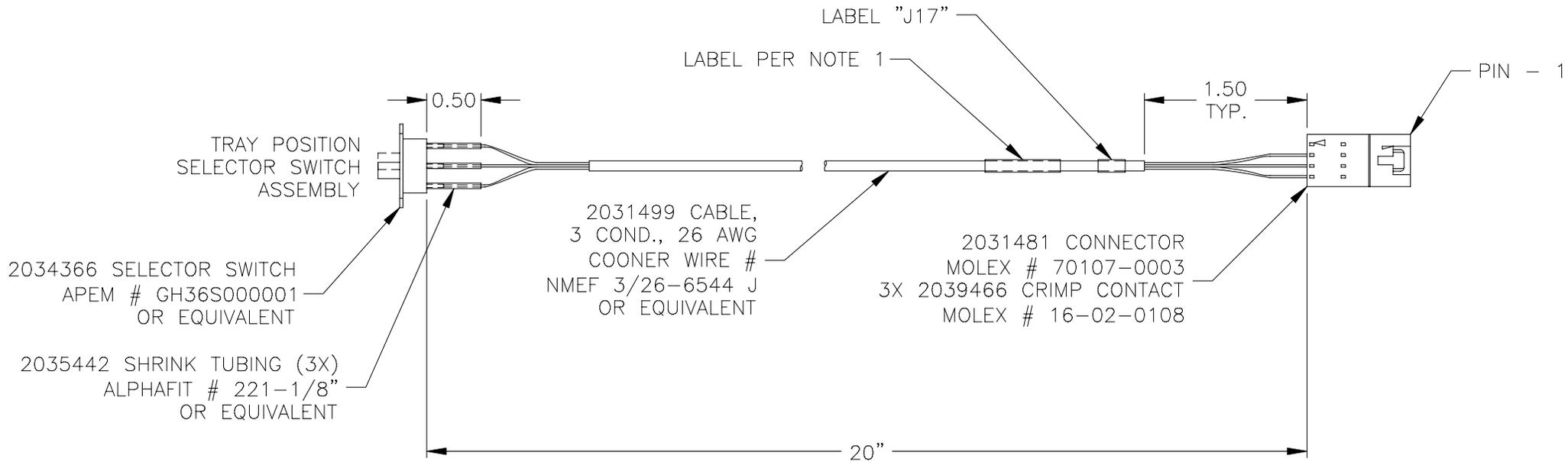
NOTE:

1. LABEL FINISHED ASSEMBLY W/ PART NUMBER; INCLUDE VENDOR INFORMATION AS REQUIRED, CONNECTOR END ONLY; IDENTIFY LEFT AND RIGHT ASSEMBLIES BY FOLLOWING THE PART NUMBER WITH THE DESIGNATOR (L) OR (R).
2. INSTALL POLARIZING PIN 2029328 2 PLACES AS SHOWN.
3. PLEASE NOTE THAT, ALTHOUGH P/N - 2028846 (THRU-BEAM SENSOR) COMES AS A SET (SENDER/RECEIVER), THE TWO SENDERS ARE USED ON THE LEFT ASSEMBLY AND THE TWO RECEIVERS ARE USED ON THE RIGHT ASSEMBLY.
4. DISPOSE OF ALL UNUSED SENSOR HARDWARE AND DOCUMENTATION.

UNLESS OTHERWISE SPECIFIED THIRD ANGLE PROJECTION	THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF BSH		Besi Die	
	TOLERANCES EXCEPT AS NOTED	SIGNATURES	DATE	TITLE
ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING REMOVE ALL BURRS AND BREAK SHARP EDGES	FRACT ± 1/64 .XX ± .010 .XXX ± .005 XXXX ± .0005 X" ± 0'30"	DRN:T. Friedrich	10/16/03	SENSOR ASSEMBLY, TRAY POSITION, LEFT/RIGHT, JTF 2
INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER	MATERIAL SEE DETAILS	CHKD:	ENG:T. Friedrich	10/16/03
SURFACE FINISH 128	FINISH	SIZE DRAWING NO C9039387		REV B
SCALE 1:1				SHEET 1 OF 1

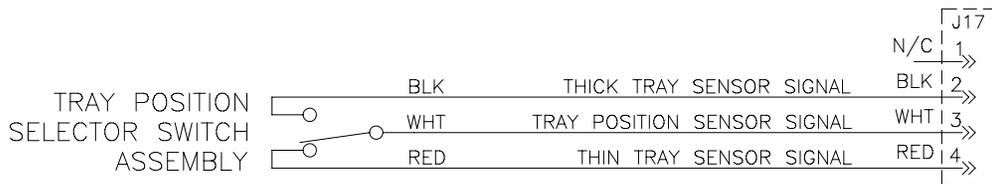
9037733
SIMILAR PARTS; 9037732

REV	ECO	DESCRIPTION	DRN	AUTH	DATE
A	03246	LABEL J17 WAS J16, 20" LENGTH WAS 24"	TF	TF	12/01/03



NOTE:

1. LABEL FINISHED ASSEMBLY W/ PART NUMBER; INCLUDE VENDOR INFORMATION AS REQUIRED, CONNECTOR END ONLY.



SIMILAR PARTS; 9037739

UNLESS OTHERWISE SPECIFIED		THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND IS NOT TO BE RELEASED OR REPRODUCED WITHOUT WRITTEN PERMISSION OF LAURIER INC		LAURIER INC	
 THIRD ANGLE PROJECTION ALL DIMENSIONS IN INCHES DO NOT SCALE DRAWING REMOVE ALL BURRS AND BREAK SHARP EDGES INDIVIDUALLY PACKAGE AND LABEL WITH THE DRAWING NUMBER SURFACE FINISH 128/	TOLERANCES EXCEPT AS NOTED	SIGNATURES	DATE	TITLE	
	FRACT ± 1/64 .XX ± .010 .XXX ± .005 .XXXX ± .0005 ° ± 0'30"	DRN: T. Friedrich CHKD: ENG: T. Friedrich	10/17/03	10/17/03	TRAY POSITION SELECTOR SWITCH ASSY JEDEC II
	MATERIAL SEE DETAILS			SIZE	DRAWING NO
	FINISH			B	9039390
				REV	A
				SCALE	1:1 SHEET 1 OF 1