

OVERVIEW

The TURNTABLE INDEXER unit has been made with simplicity of installation and use in mind. The unit consists of a main unit with panel and printed circuit board attached and an infra-red optical reflective sensor attached to a 4' wire assembly with a 3 prong connector. A fixed 16 volt AC input source is required to power the electronics (Item #690). The TURNTABLE INDEXER provides variable DC to power up to 12 volt DC turntable motors with up to 2 ampere of output and overload protection! The TURNTABLE INDEXER user controls/indicators consists of a GREEN LED for POWER indication, RED LED's for ALIGNMENT and OVERLOAD, an ALIGN on/off and DIRECTION switch with center off as well as a SPEED control for turntable motor speed.

Fabrication of brackets for stop positions is required by the user. Four #6 mounting screws are also required.

Operation of the turntable to the next position merely requires toggling the "ALIGN" switch to "ON" and allowing the motor to pass the present stop. When the next stop location is approaching, merely switch the "ALIGN" toggle switch to the "OFF" position. The turntable will proceed (assuming that power is being applied to the motor) to the next stop. If you desire to continue, leave the "ALIGN" switch in the "ON" position until you approach the desired stop. Then switch the "ALIGN" switch to "OFF".

The TURNTABLE INDEXER is for use with various types of turntable mechanisms. The BOWSER installation is shown here which can be applied to other operations. As an example, the optics could be mounted on top of the turntable and with a solid rotating bed (as some have) you could read small vertical wires. Other operators mount the optics into the rotating bridge and use slip rings to transfer the wire connections.

INSTALLATION INSTRUCTIONS

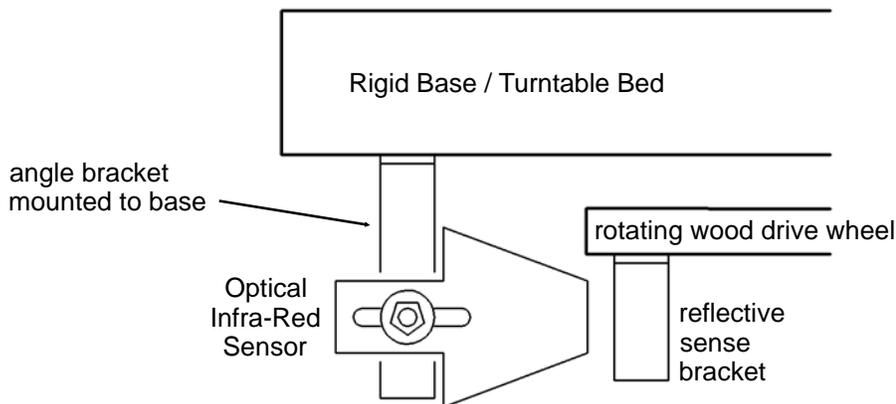
Read all instructions first, then decide on the best method for your installation.

A location has to be made to properly mount the TURNTABLE INDEXER's main panel. Four holes are located on each corner to facilitate #6 screws. A template is provided for cutting out the panel to clear the pc board for mounting. It has to be located close enough to the turntable so that the optical reader's wires will reach. If they do not, they can be extended but care has to be taken to not reverse the wires!

When using this unit with a BOWSER turntable (reference page 3 pictures with this discussion), you will need to bend the motor support bracket (BOWSER #79334) at the spring end so that the spring/tension wire clears the brackets mounted to the underside. You will also need to use a longer nail/screw to extend the tension wire further below the wood drive wheel base. We would also suggest placing two large washers (one on either side of the motor support bracket) so that the motor is held closer to parallel of the lower wood drive wheel. You may find it necessary to add a few washers to bring the motor drive's "O" ring drive drum closer to centered with the wood drive wheel.

Since the optical alignment is controlled from the lower wood drive wheel it is necessary to secure the drive wheel to the vertical shaft and the vertical shaft to the upper table. This can be done by either gluing or driving a pin through holes drilled in the upper and lower parts. If you elect to pin the upper and lower parts to the drive shaft, first drill a small hole for accuracy followed by the size hole appropriate for the pin used. It is suggested to always leave the outer collar hole a slight bit undersized. As a side note, if you are concerned about warpage of the lower wood drive wheel, you might want to seal it before use. You may also want to make angle bracket guides to keep it into a fixed vertical position (bend an angle onto the flat metal to help guide the wood). It is imperative that this piece does not wander up and down as it moves!

The TURNTABLE INDEXER and optics need to be secured near the main turntable. The edge of the wood drive wheel on the turntable base is a typical location for the optical sensor. The optical sensor can be mounted by using a standard angle bracket or with a wood block. The point of focus from the optical end to the sensed object ranges from an 1/8" to 1/4". Mount the optics so that the focal point is at least 1/4" below the wood drive wheel and a slight bit back from the edge of the drive wheel (see diagram below) so that nothing interferes with it. Although the optics are shown to be mounted perpendicular, they can also be mounted horizontally.



Exploded side view of bottom rotating wood drive wheel, showing optics aligned to stop bracket.

Stop indicators can be fabricated from shim stock, thin paper clips (easiest for O gauge & larger type operators), laser printed stripe, or just about any other reflective surface. The accuracy of stopping in either direction is directly related to the thickness of material (when using the edge of a fabricated bracket / paper clip thickness) or line on the indicator. When using a 300 dot per inch printer, the smallest useable resolution has been found to be 0.015" (at 300 dpi = 0.0033"/dot, 600 dpi = 0.001667, the included stripes are printed higher than 600 dpi. To use these simply cut out and press the self stick label or glue (with 3M "Glue Stick") to the flat face of any type of support (a picture is shown on page 4). If using this type of sense, the sense brackets would be rotated 90 degrees from shown in all edge sense diagrams and the stop position would be the white line (perpendicular to the drive wheel). As the drive wheel turns to stop position the sensor will first see black. The black is sensed the same as not

being there. When the white stripe appears, the sensor detects the reflection and stops the motor (assuming that all is aligned correctly). In all of the following text, whatever you are using to sense position will be referred to as a "target". The accuracy of the stop from a clockwise rotation versus a counter-clockwise rotation is shown on page 3.

ELECTRICAL CONNECTIONS

All wires to be connected to the barrier strips should be stranded, not solid, and stripped approximately 1/4" for placement in the barrier strip. Place the wires into the appropriate rectangular opening, and when all wires necessary are in the opening turn the appropriate screw clockwise until the wires are securely clamped. DO NOT overtighten. There is NO SOLDERING required.

Without power on, connect an appropriate 16 volt AC source (this can be the fixed AC output from a power transformer or from item #690, 38 watts is necessary to obtain full power) to the AC input terminals on the printed circuit board (as shown and labeled #3 & #4). Connect the motor wires to the terminal strip marked for the turntable motor (labeled #1 & #2 on the PC board picture shown below). If the turntable rotates opposite of what you would like from the "DIRECTION" switch, merely reverse these two wires.

The reflective infra-red optical reader is supplied with 4' of extra wire connected to a 3 pin female connector. The 3 pin female connector connects to the 3 pin male connector on the main pc board. The connector is polarized. Align the two and press the entire body onto the pins until it bottoms out. If your requiring a lot of force, you do not have it rotated correctly for alignment to the male connector!

ALIGNMENT:

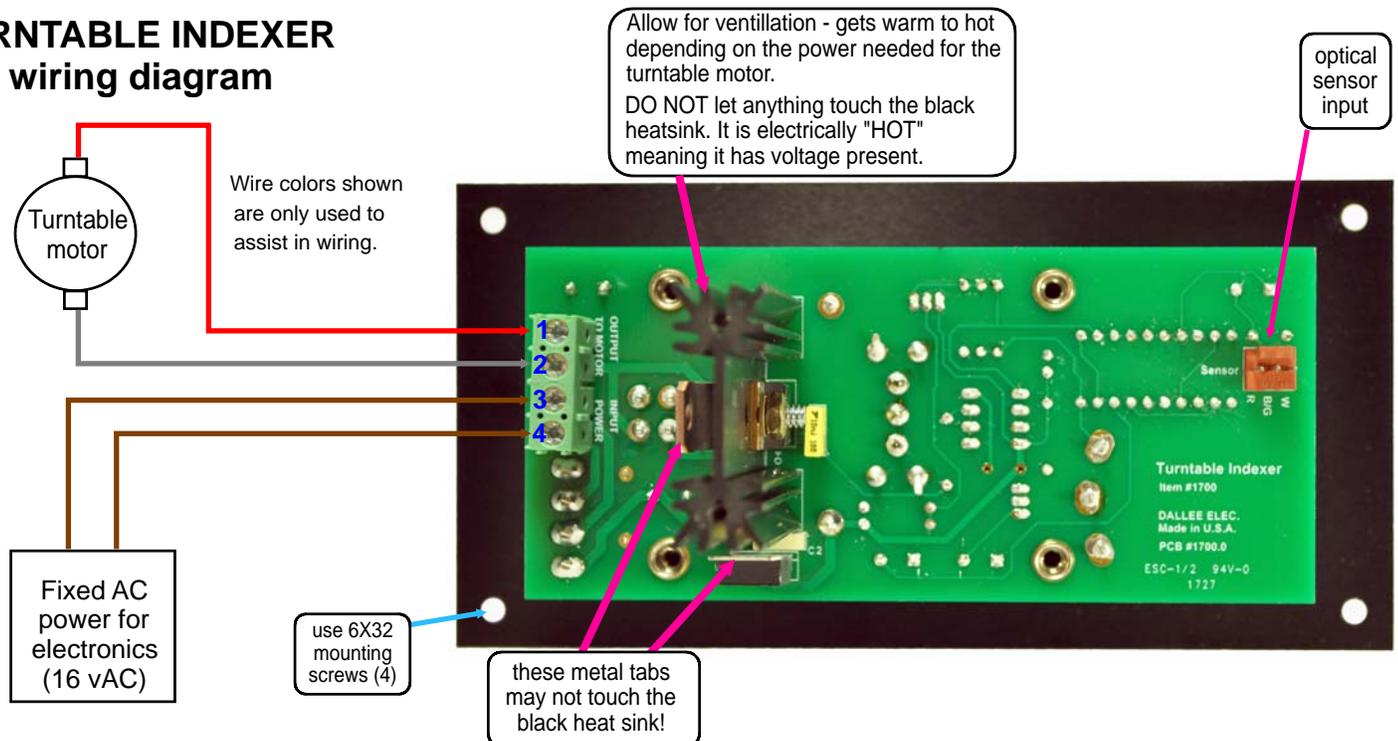
For alignment, you will need to see the front "ALIGNMENT" LED's. The RED LED to the left will be illuminated fully when there is no reflection. As an object starts to reflect the infrared light from the sensor, this LED will begin to dim. When alignment is achieved, the RED LED to the right will illuminate and turn off the motor power. The left LED may not be fully off. This is normal.

To facilitate easier placement of the optical target, first move the turntable to the desired stop location by switching the "ALIGN" switch to the "ON" position. When at the desired position, switch the "DIRECTION" switch to the center "OFF" position. This will stop the turntable motor. If you need to fine tune your alignment, merely reduce the "SPEED" to "SLOW" and re-apply power to the turntable motor via the "DIRECTION" toggle switch.

To properly perform alignment, you MUST NOT have any external light entering the front of the optical sensor. Bright light entering the sensor will disable it from properly reading the infra-red light emitted from it's own source. Some light, of course, is necessary to see what you are doing! You can really see how ambient light is affecting the optical reader just by how the left red LED responds.

Next, take your alignment bracket and place it at that spot, in front of the optics (they have to be permanently mounted at this time in order to place the targets). Then loosely secure the target so that you can slightly move it about. You will see the left "ALIGNMENT" LED gradually diminish in intensity as you approach the reflecting target. When the exact position is obtained, the right "ALIGNMENT" LED will illuminate. That is where you want to secure your bracket. If you want to check your alignment and target location, turn the "ALIGN" switch to "ON" and the apply turntable motor power with the "DIRECTION" switch (in either direction). The turntable should move from that position. Then, when no longer aligned turn the turntable motor "OFF" by setting the "DIRECTION" switch to the center off position. Then, set the "ALIGN" switch to "OFF" and set the "DIRECTION" switch to the opposite direction. The turntable will then proceed back to the target you just placed. If it is placed correctly the turntable will stop at the exact same position (make sure you are not running fast or you can run right through the stop positions!). When your satisfied with your placement, proceed to the next one. As you progress you will find how easy it is to do these. When all are placed, you should now be ready for full operation.

TURNTABLE INDEXER wiring diagram



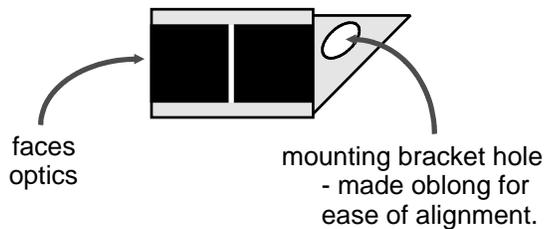
The optics do not sense black or the lack of focus, they do however sense any reflection of light striking the optical pickup. This light is generally the infra-red light generated by the internal infra-red led. It will however also sense some ambient light striking the sensor, since that also contains infra-red light as well. So care must be taken when alignment is done so that ambient light does not strike the sensor.

LASER PRINTED STRIPE SENSOR

Fabrication of this type of sensor can be done by placing patterns included on the preprinted labels on the front of angle brackets. The pattern can be copied with a laser printer type copier utilizing toner, inkjet printers and paint will generally not work. A sheet is also available from our web site to download and print more on your own laser printer. Each pre-printed label consists of 3 patterns on each and must be cut from each other. The brackets can be either commercial brackets since the thickness is not important in this application or they can be fabricated from 3/8" (or larger) Plastruct molded plastic right angle extrusions which are available from most hobby stores. Cut the strip into small lengths, make an oblong hole for mounting, and with a clean surface to place the pattern on, remove the backing from the labels and place the optical patterns on the face. If more glue is necessary, use 3M "Glue Stick" for reattachment. Other glues may seep into the toner and close the gap so that the optics cannot read it properly. The optics should read the center pass of the printed line. It is not important to have an exact amount of black on either side of the center white stripe. What is important is to have the bracket covered on either side of the center white stripe. Otherwise the optics will read the exposed bracket and stop on those spots as well. The black area is equivalent to having nothing in front of the optics.

"O" gauge and larger operators will find small paper clips, bent and cut to position, will work just fine.

The bracket must be made to clear any other obstacles on the lower side of the turntable.



PAINTED STRIPE SENSOR

The optics do not sense black or the lack of focus. A painted sensor can be made two different ways.

The first method is done by placing a fine line on the bracket, painting brackets flat black, after the paint has dried peel open the reflective stripe. The shiny metal will reflect just fine.

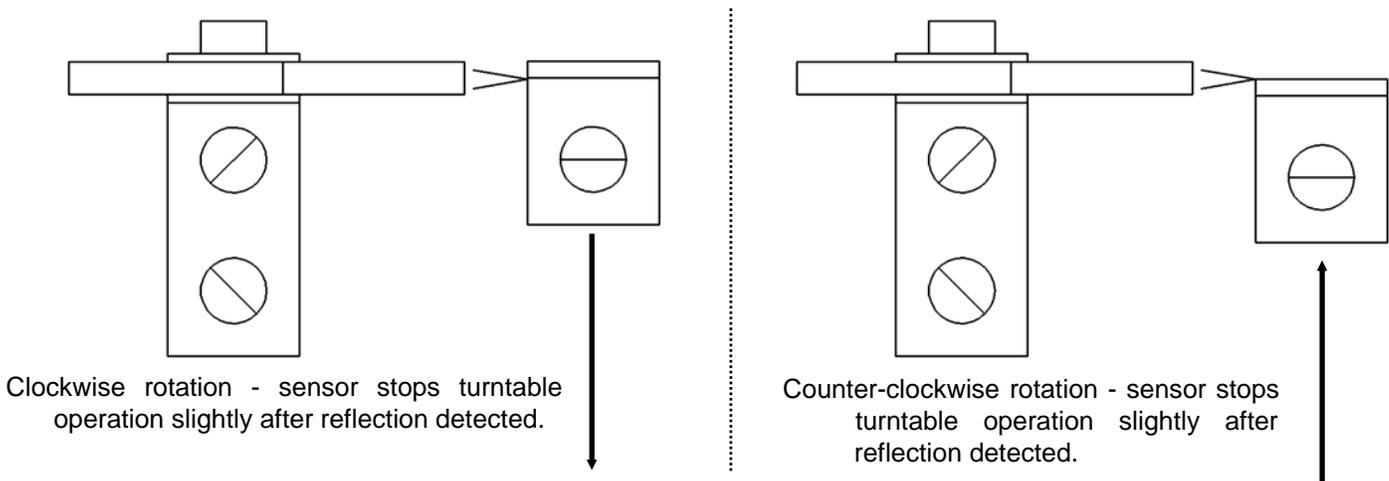
The other method is to again paint the face of the bracket flat black. Then place a fine white line, or use chrome racing stripe tape, on the face of the bracket.

The main problem with painting the bracket flat black is that some types of paint still reflect infra-red light. To be sure that yours does not, simply paint a bracket. After it dries hold it in front of the optical pickup (at a proper focal distance - the optics will detect your finger nail). If the ALIGNMENT LED's do not activate to show any reflection, then the paint is OK to use. Sometimes roughing up the surface will also work.

ANGLE BRACKET/WIRE SENSOR

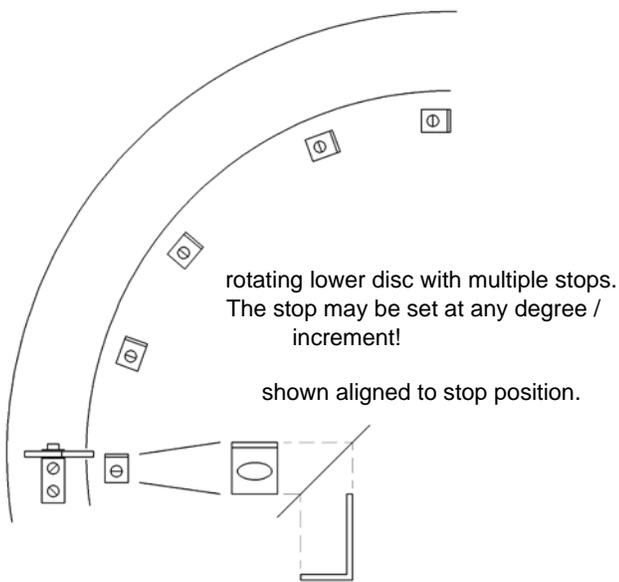
The side of a narrow angle bracket or paper clip can be used to operate the indexer. The thickness of the bracket or paper clip will affect the accuracy of clockwise and counter-clockwise operation (see drawing below). Small paper clips are typically 0.033" thick, which is OK to use in larger gauge trains. Angle brackets can be made with very thin metal and can be easily read. Thin piano wire can also be used. Sensor accuracy is determined by thickness of the sense bracket / wire. If the bracket is located closer to center of the turntable bed, the error of stop position for clockwise versus counter-clockwise becomes greater. The thinner the bracket material / stripe, the better the accuracy but it is also harder to align.

Sensor Accuracy



Underside of turntable showing multiple stops of rotating lower disc. The lower disc directly correlates to the upper transit.

Note the ease of stop placement. An undersized wood screw with a washer works best for bracket securement.



Side view of fabricated angle bracket. Note the oblong hole made for ease of adjustment. The bracket needs only to be high enough for optical sensing.



Shown reading a paper clip or other rigid fine wire. Remember, the clockwise and counter clockwise stop resolution depends on the thickness of this metal.



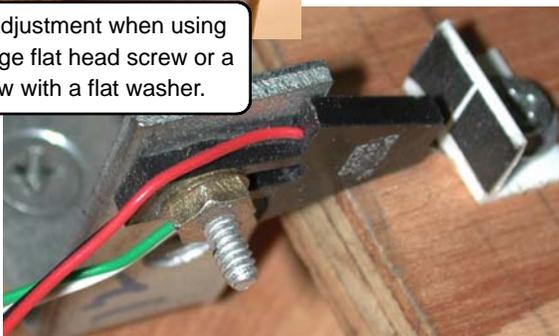
Shown reading an angle bracket. Remember, the clockwise and counter clockwise stop resolution depends on the thickness of this metal.

Paper Target mounted on angle bracket

If you choose to use the laser printed stripes, the brackets would be mounted as shown below. In this picture plastruct plastic angle brackets used. First they were cut to size. Then large, or oval, mounting holes were drilled. Last, the laser printed stops were placed on the brackets face.



Easy adjustment when using a large flat head screw or a screw with a flat washer.

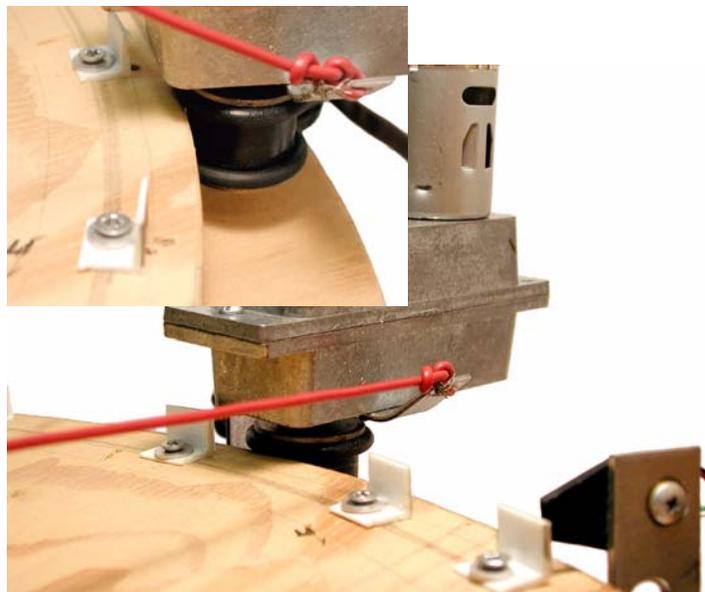


Motor Drive & Optics

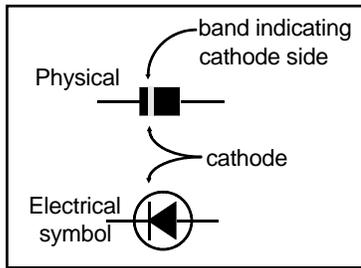
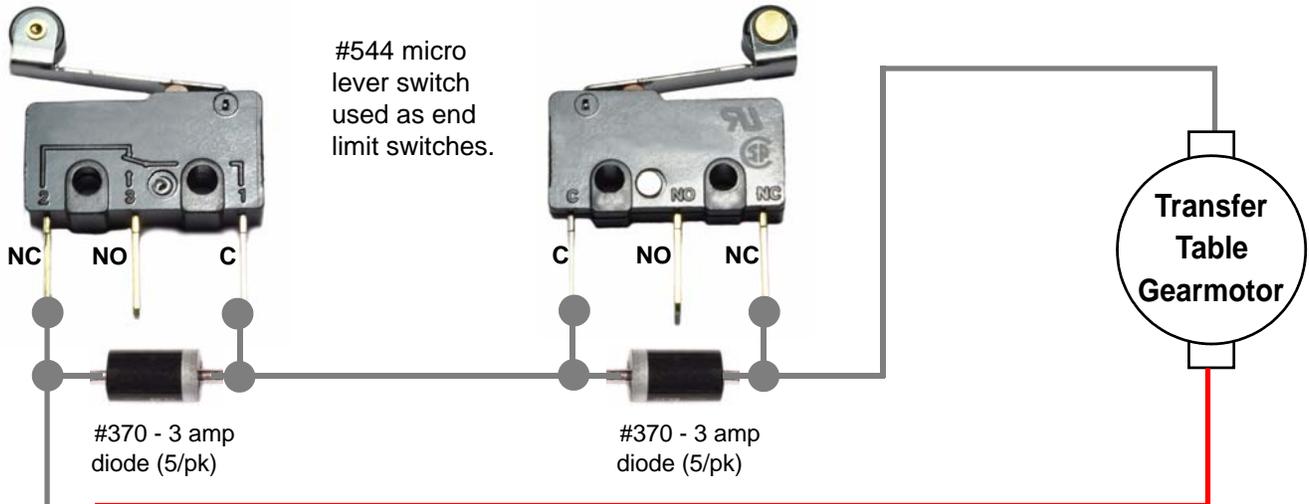
By applying drive O rings top and bottom of the drive wheel the turntable bottom maintains a proper elevation for the optics to read. A wandering disc prevents the optics from proper reading.

Another method to hold the lower disc is to use angle brackets to trap the rotating disc or captive roller balls.

In this picture, tubing was added to the BOWSER drive wheel before the O rings were placed. This assists in drive traction although not required.

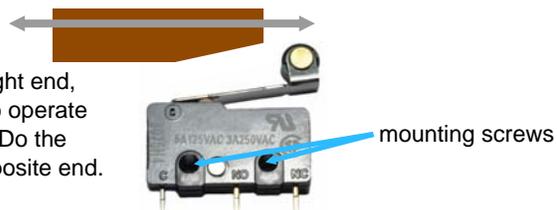


TURNTABLE INDEXER, #1700 wiring diagram for use with a transfer table.



Position micro lever switches at each end of the transfer table. The switch needs to activate before the travel ends so that it can turn off the "Transfer Table Gearmotor". Upon activating the reverse switch on the Turntable Indexer, the transfer table will proceed in the opposite direction. The second micro lever switch needs to be located on that end as well to prevent overrunning.

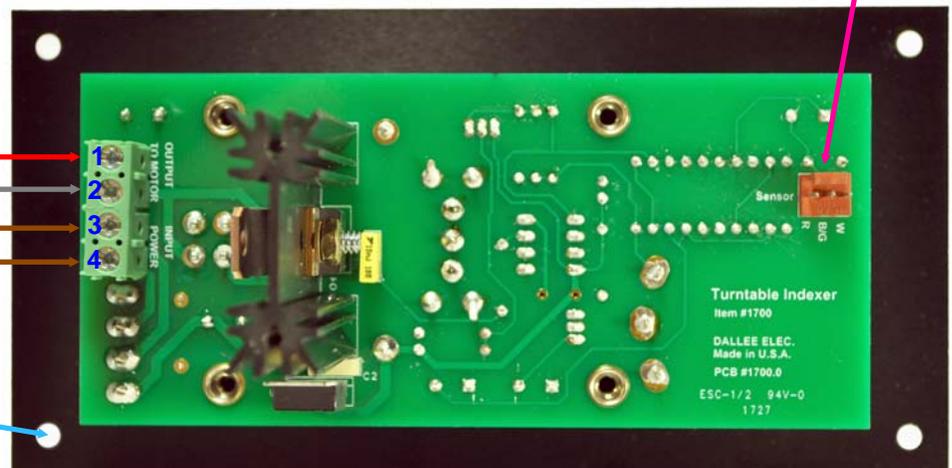
Transfer table right end, bevel for roller to operate without binding. Do the same on the opposite end.



Wire colors shown are only used to assist in wiring.

Fixed AC power for electronics (16 vAC)

use 6X32 mounting screws (4)



Optics



Item #1701, Infra-Red Optical detector assembly with 3 pin female connector. (included with #1700 indexer)

Mounting Template

Dimensions given are that of the pc board and #6 mounting hole locations. To clear the PC board when panel mounting, cut out the outer green opening as shown. This is a 1:1 drawing, so it can either be cut out of the instructions and taped to your panel or you can put it in a copier to duplicate and use.

A center punch used on the corners of the outer green area and mounting screw center locations is an easy way to transfer the information from the page to your panel.

