CYCLIC ELECTRIC TRIM

The cyclic electric trim is intended to reduce pilot workload by reducing the force required to maintain a given attitude or flight profile. It is not intended to hold the stick or aircraft in place and is by no means intended to replace the pilot's constant attention to the aircraft's flight controls.

The system is comprised of two motor mounts, two motor and pulley assemblies, a relay box, two trim control switches already installed on the cyclic grips, two tension cables with springs on each end, and two wiring harnesses.

Actuating one of the cyclic mounted trim switches activates a relay in the relay box which simultaneously supplies voltage to drive the trim motor and disables inputs from the other switch in the same axis. If the pilot selects to trim the stick forward, the co-pilot cannot trim it aft. The motor rotates a trim drum with several wraps of $^{1}/_{16}$" cable which pulls a tension spring to apply force to the flight controls at the attachment point of the spring. The attachment points are close to the pivot point of the affected controls and exert a force on the sticks. The mechanical advantage provided to the pilot by the length of the stick makes it very easy to overcome this force.

With the trim system installed, long term corrections to maintain attitude should be accompanied by trimming the affected axis. Doing so equalizes spring tension and extension preventing one spring from going slack. Short term corrections are made as usual.

The following picture identifies the parts of the trim system:

a) Pitch motor, drum, and mount

b) Roll motor, drum, and mount

c) Roll springs

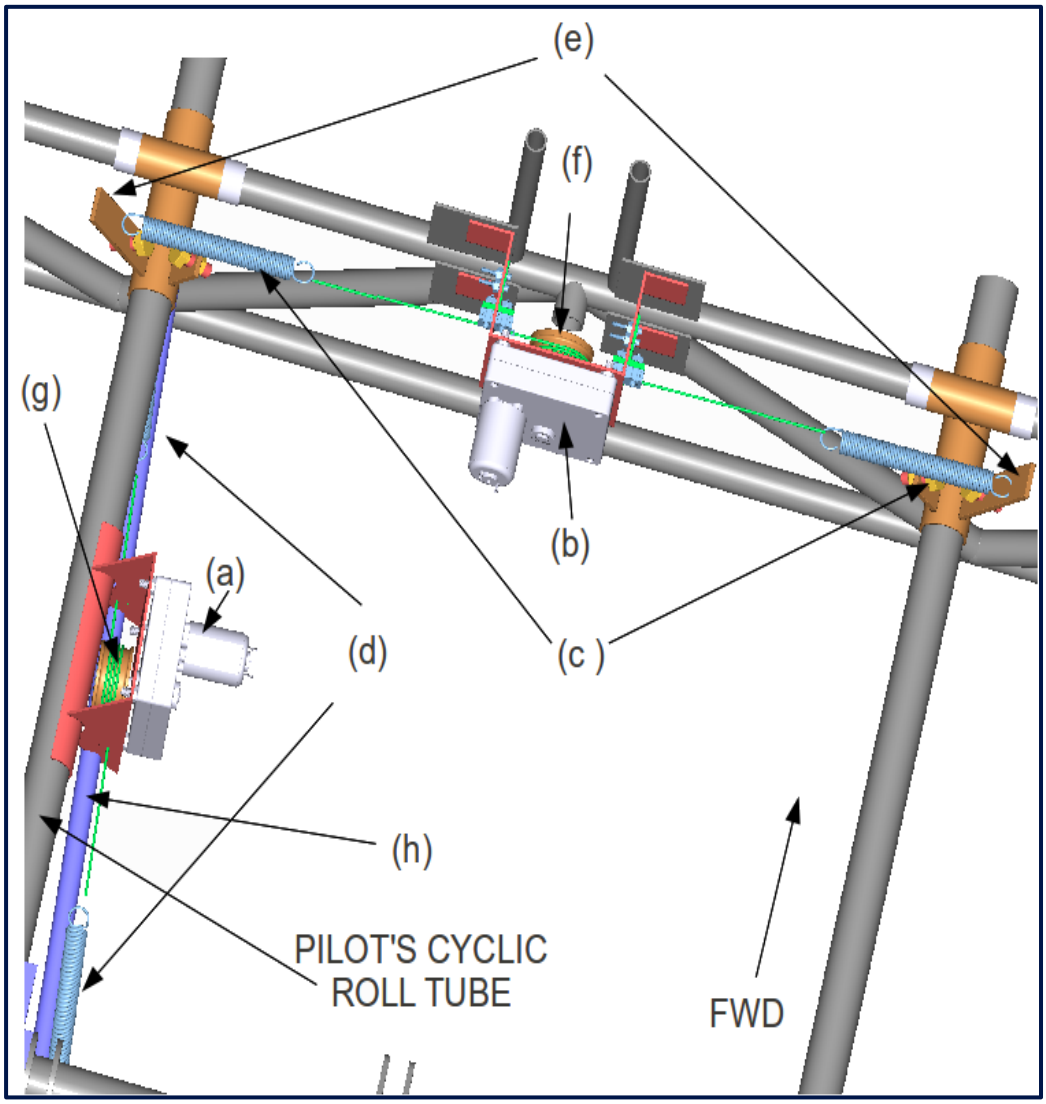
d) Pitch springs

e) Roll spring attachment tabs

f) Roll cable

g) Pitch cable

h) Fore-aft pitch rod with attachment point



The pitch and roll motor assemblies are similar, but the pitch drum is slightly shorter than the roll drum. The motor assembly has three connections – 2 female spade connections for the motor drive and 1 male spade connection for noise suppression.

The relay box has 2 connectors. The male pin connector will contain the power wire and pitch system wiring. The female pin connector will contain the system ground and roll system wiring.

With the power and ground wires split between connectors, the system will not work without both connected.

Before beginning installation of the trim system, be sure that the aircraft battery is disconnected to prevent accidental contact.

INSTALLING THE TRIM MOTORS

ROLL TRIM MOTOR

The roll trim motor is mounted to the cabin frame between the cyclic sticks.

- ☞ Ensure the cyclic sticks are centered and locked.
- ☞ Place a string or 0.020” safety wire between the spring attachment holes in the roll stops.
- ☞ Measure the distance between the pilot’s and copilot’s roll stops.
- ☞ Divide this measurement by 2 to derive the center point between the cyclic sticks.
    - Distance between stops _____
    - Divided by 2 _____
- ☞ Measure half the recorded distance from the pilot’s roll stop and mark the string or safety wire at this location.
- ☞ Measure the same distance from the co-pilot’s roll stop and check that it is within 1/8” of the mark on the string. If not, recheck your measurements and calculations.
- ☞ Place the roll trim motor in its mount, paying attention to the orientation of the mount and motor. The square openings in the sides of the mount and the pre-drilled holes in the mount are upward. The output shaft is not centered on the motor. The larger part of the motor should be above the output shaft. (Drawing above shows the roll motor reversed of the correct position. When looking at the motor and mount as shown in the drawing, the electrical connection will be on the right.) Using the studs installed in the motor, attach the motor to the mount using AN365-1032A locknuts, with an AN960-10L thin washer under the nut.
- ☞ Place the motor and mount assembly so that the mark on the string aligns with top dead center of the trim pulley and the mount is square to the frame.
- ☞ Clamp the motor mount to the four tabs welded to the frame. When the motor mount is positioned correctly, use a 1/4” bit to drill through the existing holes in the mount through the mounting plates welded to the frame. Notice that the bolt through the lower tabs will pass through a narrow space between the frame tubing. Allowing space to install a castle nut and cotter key, drill 1/4" holes through the lower tabs of the mounting bracket and the lower tabs welded to the frame.
- ☞ Secure the motor mount using AN4-5 bolts with AN960-416 washers under the head and under the AN310-4 nut. Cotter key with AN380-2-2.
- ☞ The roll trim cable has eyelets installed on each end to attach the springs. Hold the center of the roll trim cable against the drum, and wrap each end around the drum 3 times. Try to keep the cable centered on the drum. The cable unrolls in both directions from the top of the drum.

☞ Attach the springs to the cable through the eyelet on each end and attach to the roll spring attachment tabs. This is easier to do with help!

PITCH TRIM MOTOR

The pitch trim motor is mounted on the pilot's roll tube.

☞ Ensure the cyclic sticks are centered and locked

☞ Place a string or 0.020" safety wire between the forward tab on the cyclic pitch control rod installed when completing the internal rigging and the pitch bell crank hole.

☞ Measure the distance between the tab and the bell crank hole.

☞ Divide this measurement by 2 to derive the center point.

- Distance _____
- Divided by 2 _____

☞ Measure half the recorded distance from the forward tab along the string or wire.

☞ Measure the same distance from the bell crank hole along the string or wire. The marks should be within 1/8" of each other. If not, recheck your measurements and calculations.

☞ Install the pitch trim motor in its mount using the same hardware used on the roll motor mount, paying attention to the orientation of the mount and motor. The top side of the mount has a small notch in the edge. The output shaft is not centered on the motor. The larger part of the motor should be above the output shaft.

☞ Place the motor and mount assembly on the pilot's cyclic roll tube so that the mark on the string touches the top dead center of the trim pulley and the mount is plumb to the frame.

☞ Clamp the mount to the roll tube. Drill a 1/4" hole through the mount and roll tube on each side of the mount face. Install AN4-14 bolts, with AN960-416 washer under the bolt head and AN310-4 nut. Torque and cotter key with AN380-2-2.

☞ The pitch trim cable has eyelets installed on each end to attach the springs. Hold the center of the roll trim cable against the drum, and wrap each end around the drum 2-1/2 times. Try to keep the cable centered on the drum. The cable unrolls in both directions from the top of the drum.

☞ Attach the springs to each end of the cable. Connect the springs to the forward tab on the cyclic pitch control and pitch bell crank hole. As with the roll trim, this is easier to do with help.

The cable on the pitch and roll drums will adjust to center with movement of the drums.

WIRING INSTALLATION

The cyclic stick trim requires 4-way switches, which are included on the cyclic grips provided in your Kit. The system is designed to make use of two 4-way switches and a relay box is provided to automatically disable the active axis on one switch when the other is activated. For example, if the pilot trims aft, the copilot's entire pitch axis is disabled but roll can still be activated.

RELAY BOX INSTALLATION

The relay box is normally installed in an open area of the solenoid board. Note that the relay box may emit a small amount of magnetic interference, so keep it away from sensitive electronic components if you have opted to install them in your helicopter. You may wish to test the location before making a permanent installation.

- ☞ Mount the relay box using (4) 8-32 x 1/2" screws through the mounting tabs on the box, secured with 8-32 Nylock nuts.
- ☞ Connect the relay box harnesses, being careful to connect them to the proper connectors.
- ☞ Route the wiring to the approximate location of termination. The wires for the pitch control motor should be left with enough slack to allow for rotation of the pilot's roll tube without being pulled tight but short enough to prevent interference with the flight controls. Ensure the wiring is well supported and can be secured.
- ☞ The female connector controls the pitch trim and is wired as follows with 6 connections (in order of length)
    - The shortest 22 gauge wire (white/black stripe) goes to the aircraft ground.
    - Two (2) 22 gauge wires go to the cyclic pitch control (forward/aft)
    - The larger cable goes to the pitch motor. Strip the outer jacketing and unlace the shielding so that it can be twisted and terminated into a female spade connector. This will be connected to the male spade terminal installed on the pitch motor.
    - Blue/white and white wires (within the larger shielded cable) will go to the female spade terminals installed on the pitch motor. They may have to be swapped during testing to get the motor turning in the proper direction.
    - Connect the red power wire to the appropriate circuit breaker.
- ☞ The male connector controls the roll trim and is wired as follows with 6 connections (in order of length)
    - The 20 gauge black wire goes to the aircraft ground.

- The larger cable goes to the roll motor. Strip the outer jacketing and unlace the shielding so that it can be twisted and terminated into a female spade connector. This will be connected to the male spade terminal installed on the roll motor.
- Blue/white and white wires (within the larger shielded cable) will go to the female spade terminals. They may have to swapped during testing to turn the motor in the correct direction.
- The two (2) 22 gauge wires will go to the cyclic roll control (left/right).

CYCLIC STICK WIRING

The cyclic sticks use two different gauges of wiring. The trigger switch for Push To Talk and the trim switches use the 22 gauge wire. The push buttons use the 20 gauge wire.

☞ Separate the following 22 gauge wires from the bundle of wiring exiting the bottom of the cyclic sticks:

- Brown (Forward)
- Blue (Aft)
- Green (Right)
- Red (Left)
- Black (Common Ground)

☞ Use a volt/ohm meter to confirm the wires and their configuration.

☞ Connect the pilot's and co-pilot's cyclic stick wires to the correct relay box wires.

☞ Connect the black wires to the aircraft common ground.

CONTROL MOTOR WIRING

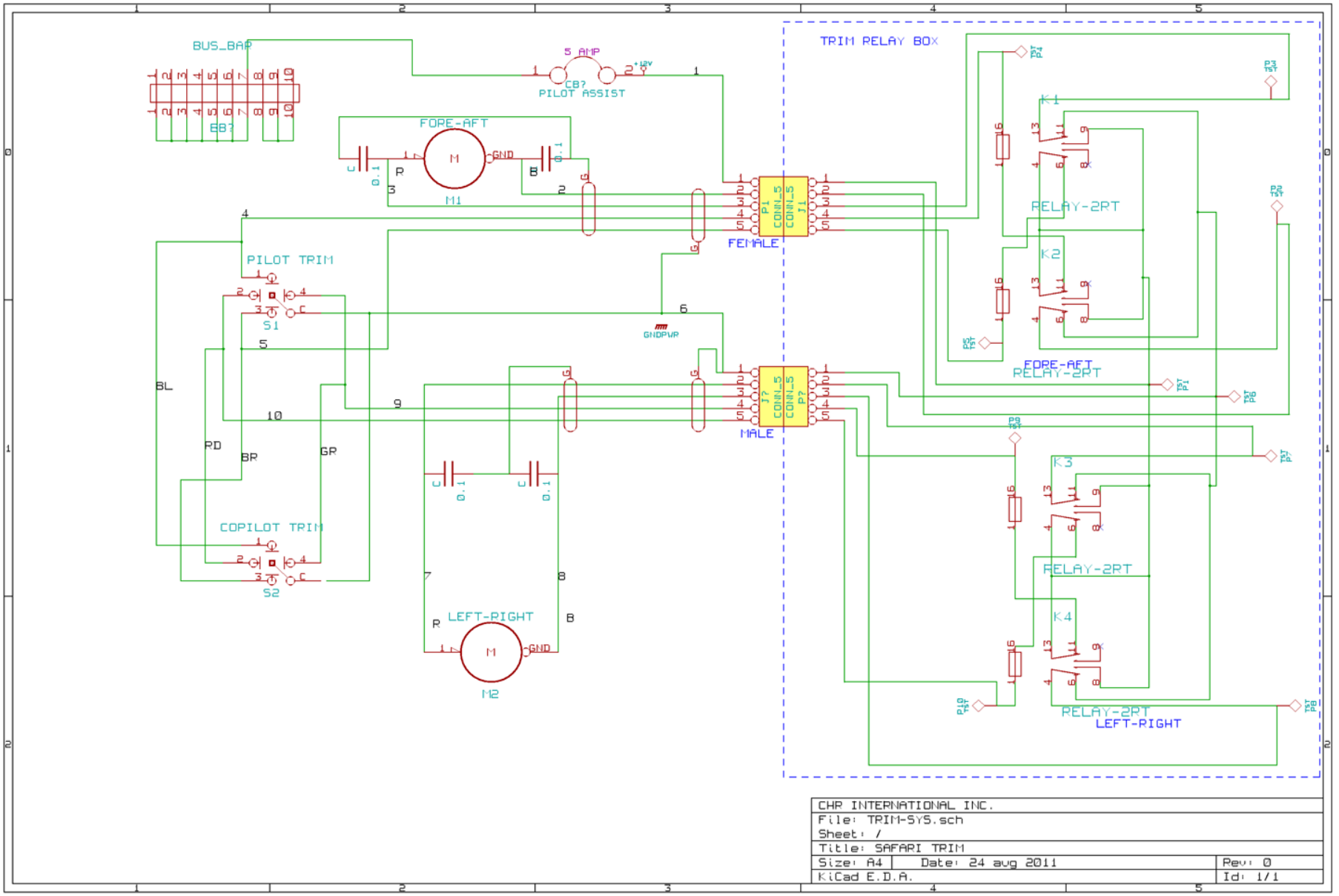
The trim control motors are reversible DC motors. Reversing the polarity of the current reverses the direction of the motor. In most cases, wiring the motors according to the schematic will have the motors going in the proper direction.

☞ Connect the motor wiring to the spade connectors on both motors to confirm the correct polarity and configuration.

☞ Ensure the wires are not touching anything but the motor terminals.

☞ Re-connect the aircraft battery and engage the trim circuit breaker.

- ☞ Momentarily press the trim switch forward and confirm that the trim motor engages and pulls on the forward spring. If the motor pulls on the aft spring, reverse the motor connections and try again.
- ☞ Momentarily press the trim switch aft and confirm that the trim motor engages and pulls on the aft spring.
- ☞ Momentarily press the trim switch to the left and confirm that the trim motor engages and pulls on the right side spring. If the motor pulls on the left side spring, reverse the motor connections and try again.
- ☞ Momentarily press the trim switch to the right and confirm that the trim motor engages and pulls on the left side spring
- ☞ Repeat the above steps for the trim switch on the opposite stick
- ☞ After the polarity of the motors has been confirmed, disengage the trim circuit breaker and confirm that the system is inoperative.
- ☞ Position and secure the wiring and ensure the motor terminals are secure. Apply corrosion preventative to the trim springs. Do not apply corrosion preventative to the trim cables.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BUS_BAR
5 AMP
CB?
PILOT ASSIST
FORE-AFT
M1
FEMALE
MALE
PILOT TRIM
S1
COPILOT TRIM
S2
LEFT-RIGHT
M2
GNDPWR
K1
K2
K3
K4
RELAY-2RT
FORE-AFT
RELAY-2RT
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Rev: 0
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