

# Roadranger®

Eaton® Fuller® Automated Transmission

CE 18-Speed



One Great Drivetrain from Two Great Companies

Installation Guide TRIG-0011 May 1992



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- Voltmeter - Eaton P/N 5505027
- Troubleshooting Guide - Eaton TBSG-011
- Driver's Instructions - Eaton DR-122
- Service Manual - Eaton Form 220
- Optional - Hydraulic/Pneumatic Troubleshooting Tool Kit - Eaton P/N 5505030
- Optional C.E. 18-Speed Transmission Jack Cradle - Eaton P/N 5505032 and Adaptor Plate 5505033

The checklist, found on the last page of the book, was developed as an installation tool for line personnel to insure the correct operation of each vehicle and to assist the vehicle O.E.M. to identify transmission quality related issues, as well as O.E.M. line quality issues. Used correctly, this checklist identifies transmission issues and aids in tracking the problem until corrected.

The recommended use of the checklist is as follows:

1. A separate checklist should be filled out for each vehicle built with a C.E. 18-Speed.
2. The section, identified as PRE-START CHECKS should be performed prior to the initial start-up of the vehicle. This section insures the ECU has the correct power supplies and the transmission has the correct air supply, sufficient oil, and can be operated safely when the engine is started. You will find instructions on Page 6.
3. The section POST-START CHECKS should be performed after the engine is first started to insure proper operation of the interface systems prior to actually driving the vehicle. You will find instructions on Page 6.
4. At this point, the checklist should be reviewed and, if necessary, corrective action taken prior to the dyno or road test.
5. The DYNO/ROAD TEST section is used to verify that all transmission system are functional, the driver information is supplied in the cab. You will find instructions on Page 7.
6. The O.E.M. now has a record of transmission related information and repairs made to each unit and is able to track and reduce repeated quality issues.
7. A copy of the checklist should be supplied to Eaton Automated Products Application department for installation history. O.E.M. line personnel should become familiar with the checklist and the C.E. 18-Speed hand-held diagnostic tool operation prior to a scheduled build. Eaton Automated Products Applications department can coordinate training and information to expedite this process.

**NOTE:** This checklist represents a generic system which can be tailored to the individual O.E.M. to achieve the best possible method of C.E. 18-Speed installation. Eaton recommends the use of this system to maintain the utmost in satisfactory operation and long service life.

Each C.E. 18-Speed installed at the O.E.M. must pass the on-line checklist requirements per Eaton C.E. 18-Speed Inspection Form, Appendix IV, prior to shipment from the O.E.M. plant.

Refer to the C.E. 18-Speed Line Inspection form in Appendix IV while performing the following procedure:

### **Pre-Start Checks**

1. Power Supply - Using a standard Volt/Ohm meter disconnect ECU main 30 pin harness connector and touch black lead to pin A3 and red lead to pin G1, meter reading should be within .6 volts of battery voltage **(with the key on only)**. Now touch black lead to pin B3 and red lead to pin G2, meter reading should be within .6 volts of battery voltage **(with key on or off)**.
2. Visually verify that the ECU power supplies are protected by Automatic resetting circuit breakers, 15 AMP for 12 volt systems.
3. Oil Fill - Verify that a minimum of 7 gallons of approved oil has been added to the transmission **before** attempting to start the engine. Failure to add sufficient oil could damage the transmission.
4. Vehicle Interface Test -
  - A. Verify that the Interrupt clutch is operating by depressing the clutch pedal far enough to activate the first switch and listening for an audible click at the valve body located on the torque converter.
  - B. Verify the Inertia brake is functioning by depressing the clutch pedal far enough to activate the Inertia brake solenoid located at the rear of the transmission.
  - C. Verify that the relay sub-assembly is operating by turning on the ignition switch and listening for an audible click from the relay located in the cap under the dash.
5. Verify converter open light operation - Turn on ignition switch and visually check that the light is on.

### **Post-Start Checks**

6. Oil Fill - As soon as possible, following initial vehicle start-up, the transmission should be filled with the remaining oil required to arrive at the correct operating level. This process must be done with the engine running at idle and the transmission in neutral. Slowly add oil to obtain the proper oil level at the appropriate temperature band on the dipstick. Reference Drivers Instructions DR-122 for additional information.

**Dyno/Road Test**

7. With the engine not running, place the shift lever in gear, depress the clutch and attempt to start the engine to verify the engine will not start in gear. Repeat the test by placing the transmission in neutral, do not depress the clutch and attempt to start the engine to verify the engine will not start with the clutch pedal out. The engine should only start with the transmission in neutral **and** the clutch pedal depressed.
8. Verify lockup clutch operation - Transmission should lockup at engine RPM of around 1500 and the converter open light should turn off.
9. Verify through normal operation that the transmission temperature gauge is functional.
10. Check transmission oil level to verify the correct level at the proper temperature band.
11. Visually check for oil drips or residue on the transmission and related cooler lines.
12. Make sure that the transmission dash label is present and that a driver's instruction booklet is included with other vehicle information.
13. Verify that a remote throttle label is in the cab.
14. Verify that a remote label is located at the remote location.

Two types of flywheel designs are used depending on the specific engine application:

- a) One piece flywheel with integral drive ring (See Figure 1).
- b) Separate bolt on drive ring and pilot adaptor (See Figure 2).  
For additional information contact Eaton Engineering or Engine O.E.M.

The flywheel and drive ring must be an Eaton Approved design and must be installed per the appropriate Eaton or Engine O.E.M. specifications.

1. Check the engine crankshaft seal to insure it is an approved double lip design (See “Starter and Engine Crankshaft Sealing Requirements”).
2. Check the starter to insure it is a sealed configuration (See “Starter and Engine Crankshaft Sealing Requirements”).
3. Handle the flywheel and drive ring carefully to avoid damage to the mating surfaces.
4. The installed flywheel must meet the engine O.E.M. specifications for concentricity. Refer to engine specifications for runout limits.
5. Install the flywheel onto the engine crankshaft, using the hardware and mounting specifications specified by the engine manufacturer.
6. **Pilot Adapter:** When using the bolt-on drive ring adapter, a center pilot adapter must also be used. Care should be used to insure the adapter is completely seated into the flywheel (See Figure 2 for dimensional information).
7. Install the bolt-on drive ring (See Figure 2) using the following hardware:

Inch Design - (12) capscrew and washer assembly 7/16-14 X 1 ¼ SAE grade 5 with adhesive, torque 37-50 lbs<sub>f</sub> · ft.

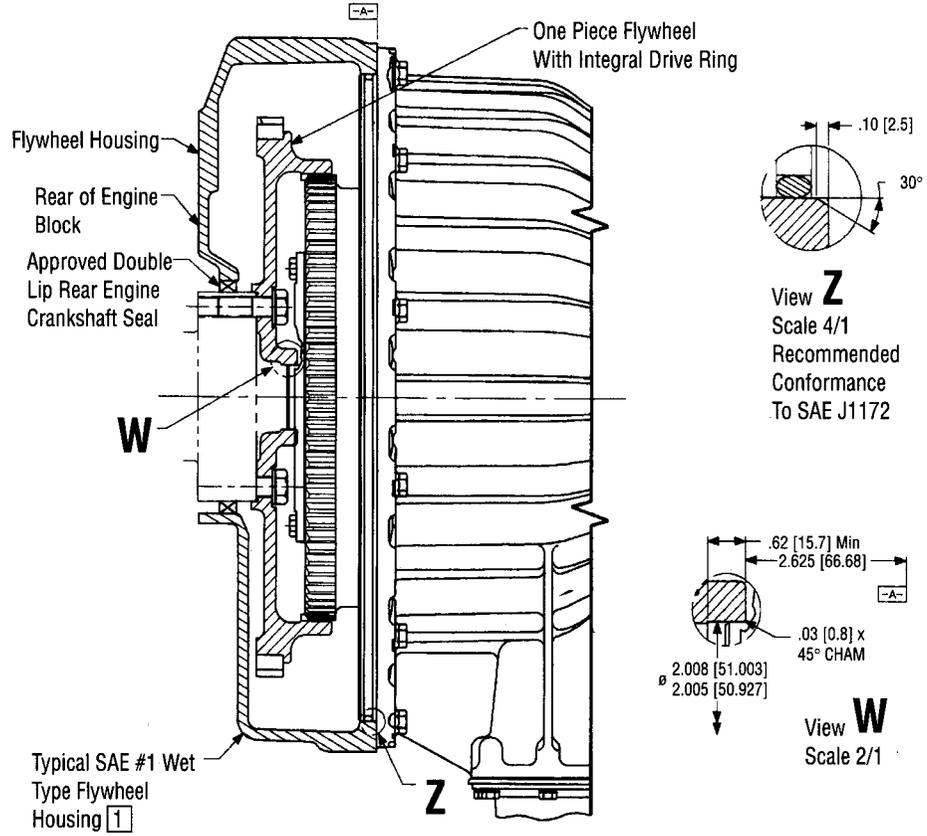
Metric Design - (12) flanged shouldered capscrew M10 X 1.5 X 35 ISO class 12.9 zinc chromate with sealant, torque 50-55 lbs<sub>f</sub> · ft. use with hardened steel flat washer.

**Note:** Do not tighten any flywheel capscrews until all of the capscrews have been installed and finger tightened.

# Flywheel Installation

## Single Piece Flywheel Assembly

Figure 1

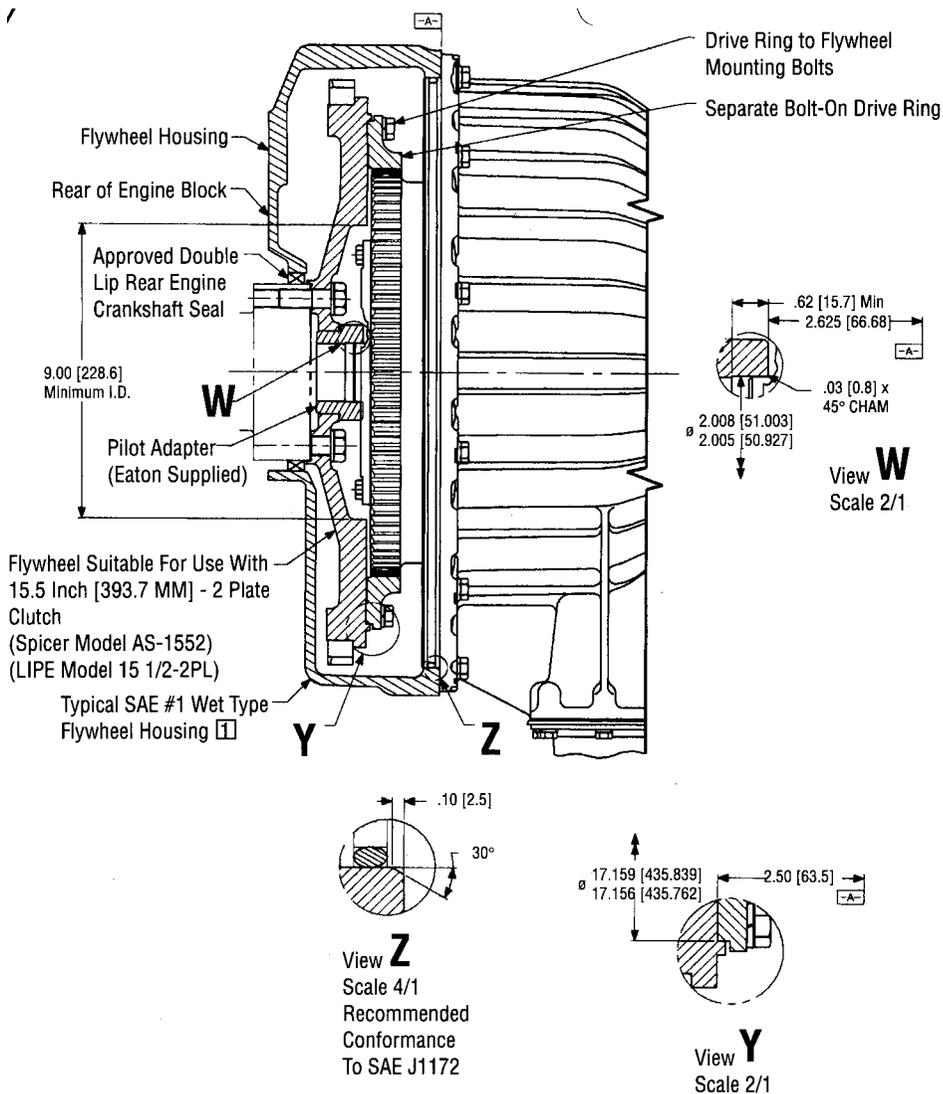


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**WARNING** Failure to use proper parts or failure to follow installation instructions could lead to personal injury or property damage.

## Bolt-On Drive Ring With Pilot Adaptor

Figure 2



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**WARNING**

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## Flywheel Housing Sealing Requirements

1. The engine flywheel housing must be approved for “wet” applications, including a double lip rear engine crankshaft seal. The housing must provide a completely sealed environment for the torque converter area.
2. The vehicle O.E.M. is responsible for sealing all holes in the flywheel housing/ converter housing area, including starter, mounting pads, transmission mounting, speed pickups, etc. (See Figures 3 and 4).
3. Speed Sensors mounted in the flywheel housing must use a sealing jam nut, O-ring, or equivalent sealing method.

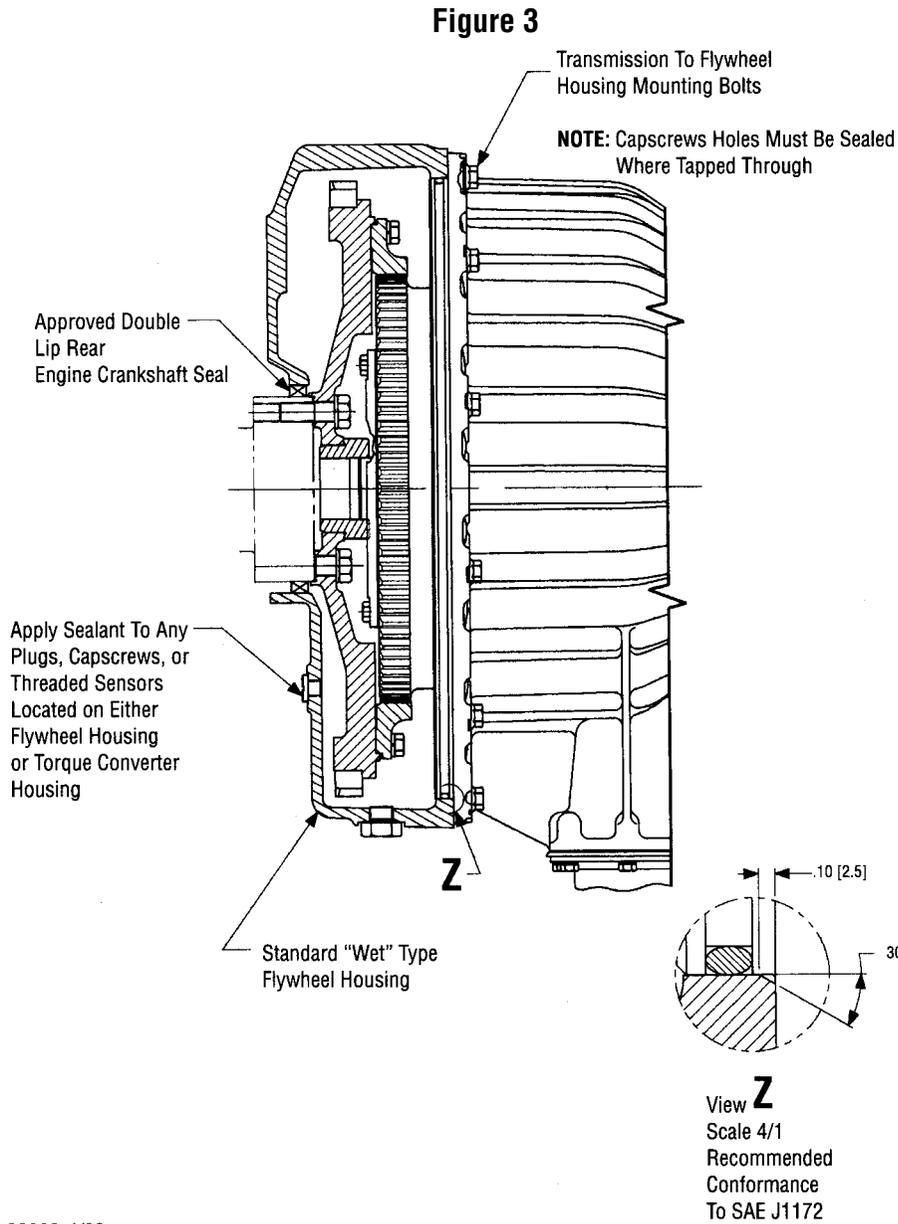
**NOTE:** The installation sketches shown in this section represent typical sealing locations only. Other sealing requirements may be needed in each unique application. Special care should be taken to insure a sealed design.

### Starter and Engine Crankshaft Sealing Requirements

1. Approved starters must effectively contain the oil in the flywheel housing.
2. Gasket, seal ring, or equivalent sealing method along with sealed fasteners must be used when mounting the starter to the flywheel housing.

Approved engine crankshaft seals must not allow the transfer of oil between the engine and the transmission. The flywheel and torque converter housing will not build internal pressure if sealed correctly.

Flywheel Housing Sealing Requirements



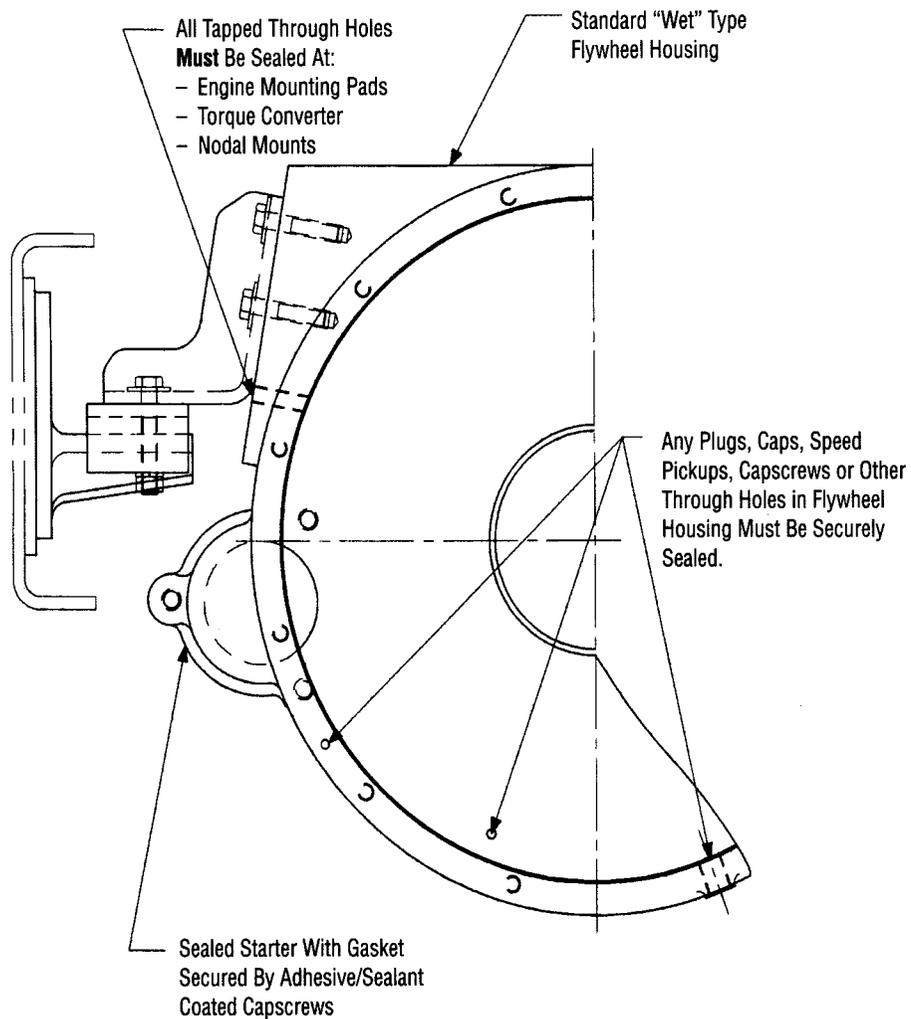
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Failure to use proper parts or failure to follow installation instructions could lead to personal injury or property damage.

Flywheel Housing Sealing Requirements

Figure 4



**WARNING** Failure to use proper parts or failure to follow installation instructions could lead to personal injury or property damage.

### Handling

1. Handle the transmission carefully to avoid damage to the transmission components and to surrounding vehicle components.
2. Never set the transmission directly on the oil pan, if the pan is damaged or bent inward, the internal suction screen should be inspected for damage.
3. Use a hoist or transmission jack that permits precise control of transmission movement during installation (See Figure 5).

**NOTE:** A special transmission Jack Cradle (with adaptor for 9109 series) is available from Eaton - P/N 5505032 cradle and 5505033 adaptor.

### Mounting To Engine

1. Use the transmission lifting eyes provided (See Figure 5).
2. Use a three point lift chain with a minimum capacity of 1 TON (See Figure 5).
3. Adjust lift chain or transmission jack to obtain the same relative angle as the engine.
4. Lubricate the transmission torque converter center pilot and the transmission O-ring seal with soluble grease or equivalent (See Figure 6).
5. Align the converter splines and the flywheel splines to mesh and push the transmission into the flywheel ring and housing. Pushing by hand should be the only force required to seat the transmission O-ring into the housing. If interference is encountered, move the transmission away from the engine to investigate the cause (See Figure 6).
6. Align the converter housing bolt holes with the engine flywheel housing bolt holes and install all the capscrews finger tight.

**NOTE:** The converter housing must be flush against the engine flywheel housing before tightening any capscrews. DO NOT USE THE CAPSCREWS TO SEAT THE HOUSING.

7. Tighten four mounting capscrews at 90° intervals around the converter housing, then tighten the remaining transmission mounting capscrews using the recommended torque specifications.

**NOTE:** Do not tighten any mounting capscrews until all capscrews have been installed and finger tightened.

8. Recommended hardware for mounting the transmission to the engine flywheel housing as follows (See Figure 6):

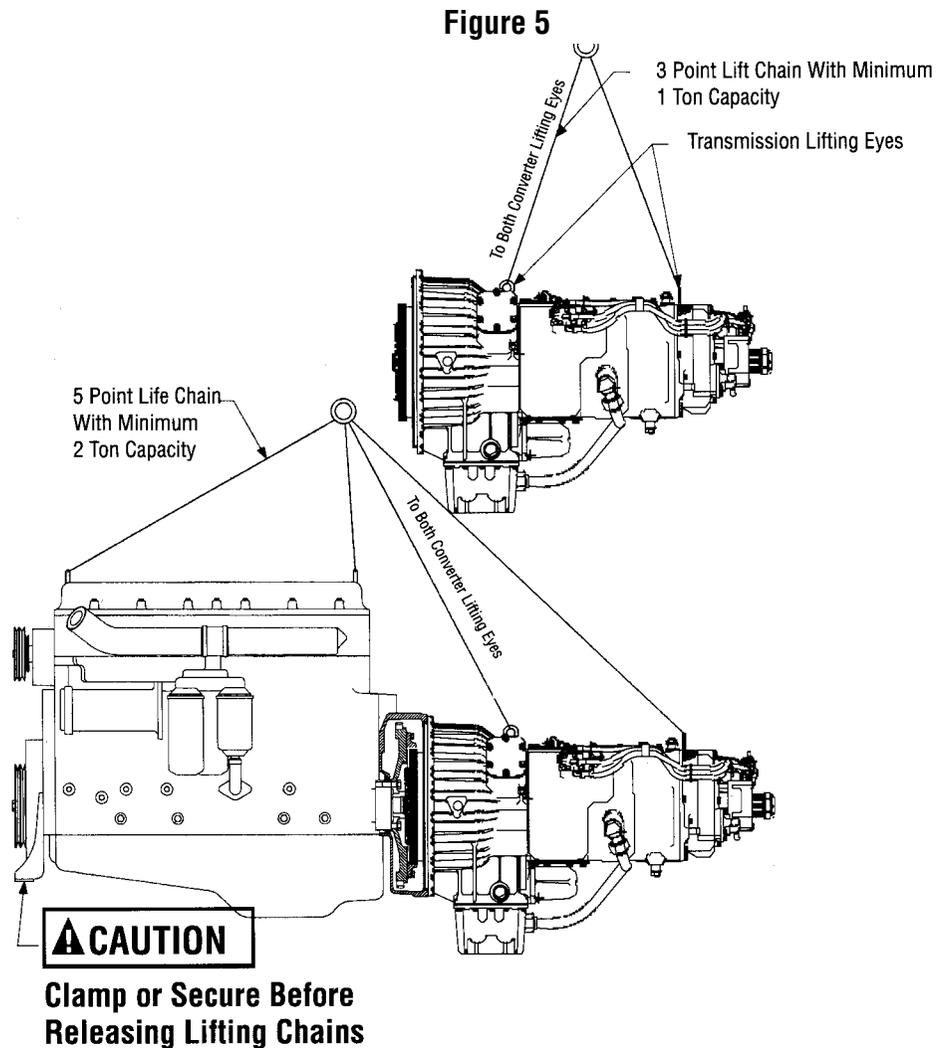
## Transmission Mounting

Inch Design - (12) Hex head flanged capscrews 7/16-14 X 1 ¼ SAE grade 5 minimum zinc chromate with sealant, torque 37-50 lbs<sub>f</sub> · ft.

(12) Hex head flanged capscrews 3/8-16 X 1 ¼ SAE grade 5 minimum zinc chromate with sealant, torque to 26-32 lbs<sub>f</sub> · ft. use with hardened steel flat washers (12)

Metric Design - (12) 12 point flanged shoulder capscrews M10 X 1.5 X 35 ISO class 12.9 zinc chromate with sealant, torque 26-35 lbs<sub>f</sub> · ft. use with hardened steel flatwashers (12)

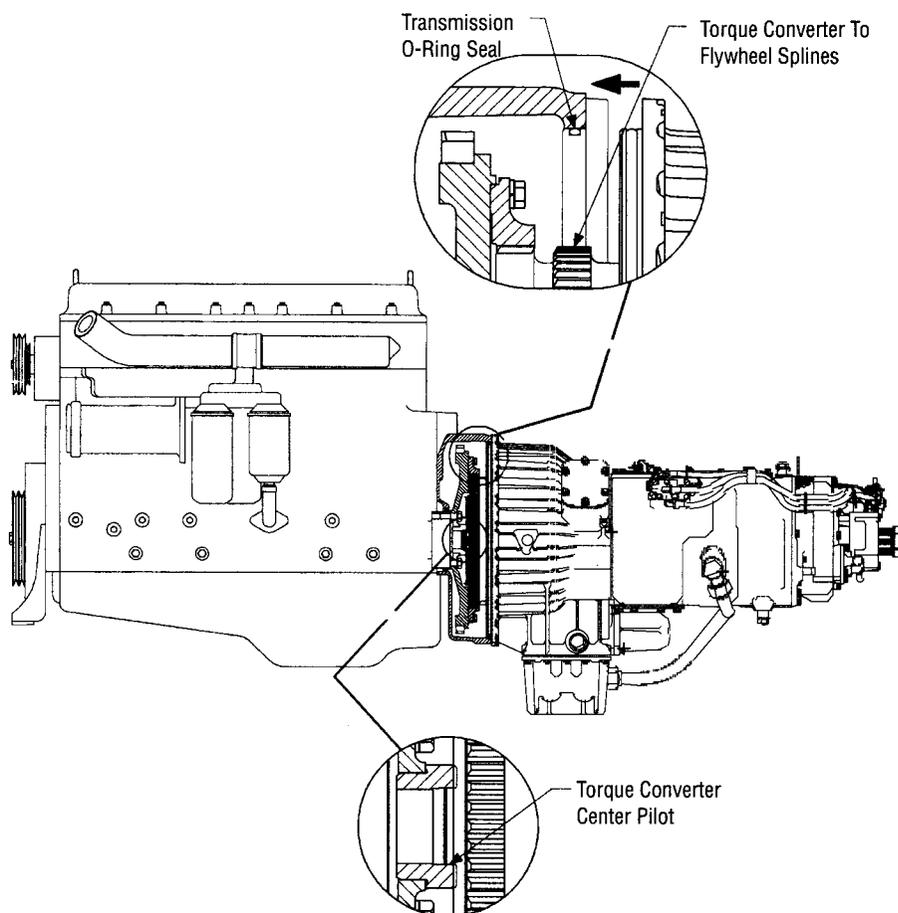
### Transmission Mounting Typical Lift Points



**WARNING** Failure to use proper parts or failure to follow installation instructions could lead to personal injury or property damage.

## Transmission To Flywheel Assembly

Figure 6



**WARNING**

Failure to use proper parts or failure to follow installation instructions could lead to personal injury or property damage.

### Using Rear Supports

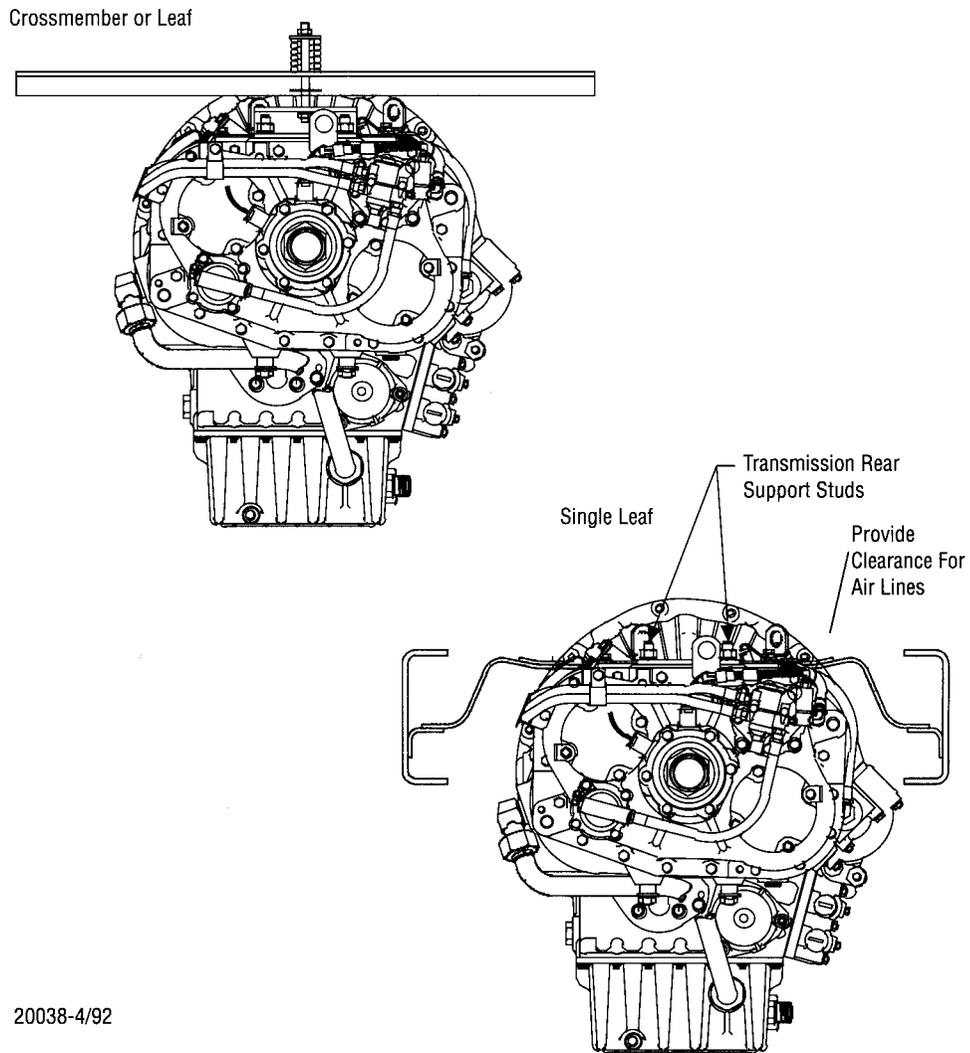
1. A rear transmission support is required for all installations where the nodal mount supports are not used. The O.E.M. is responsible for this design.
2. Many O.E.M. rear support designs are already being used for standard Eaton Roadranger transmissions, these same rear supports can be used with the C.E. 18-Speed system. Eaton recommends the vehicle O.E.M. follow SAE Guidelines for rear support design (Reference SAE SP-479). (See Figure 7 for typical rear support designs.)
3. Optional long or short rear support studs are available when ordering the C.E. 18-Speed (See Figure 7).

### Using Transmission Nodal Mounts

1. The transmission nodal mounting pads are approved to be used as a rear engine support location. Using these support pads requires special sealing requirements when installing the mounting capscrews (See Figure 8).
2. The nodal mount tapped holes must be sealed, if used. The C.E. 18-Speed comes equipped with sealed capscrews at the required location along with warning labels to remind the technician that these locations require capscrews with thread sealant if replaced (See Figure 8).
3. The O.E.M. is responsible for the nodal mount design and sealing the required capscrews at the nodal mount locations (See Figure 8).
4. See Figure 9 for nodal mount dimensions for SAE NO.1 and SAE NO.2 C.E. 18-Speed Torque Converter housings.
5. Torque transmission nodal mount capscrews ( $\frac{3}{4}$ -10 UNC) to 180-190 lbs<sub>f</sub> · ft of torque.

## Typical Rear Support Designs

Figure 7

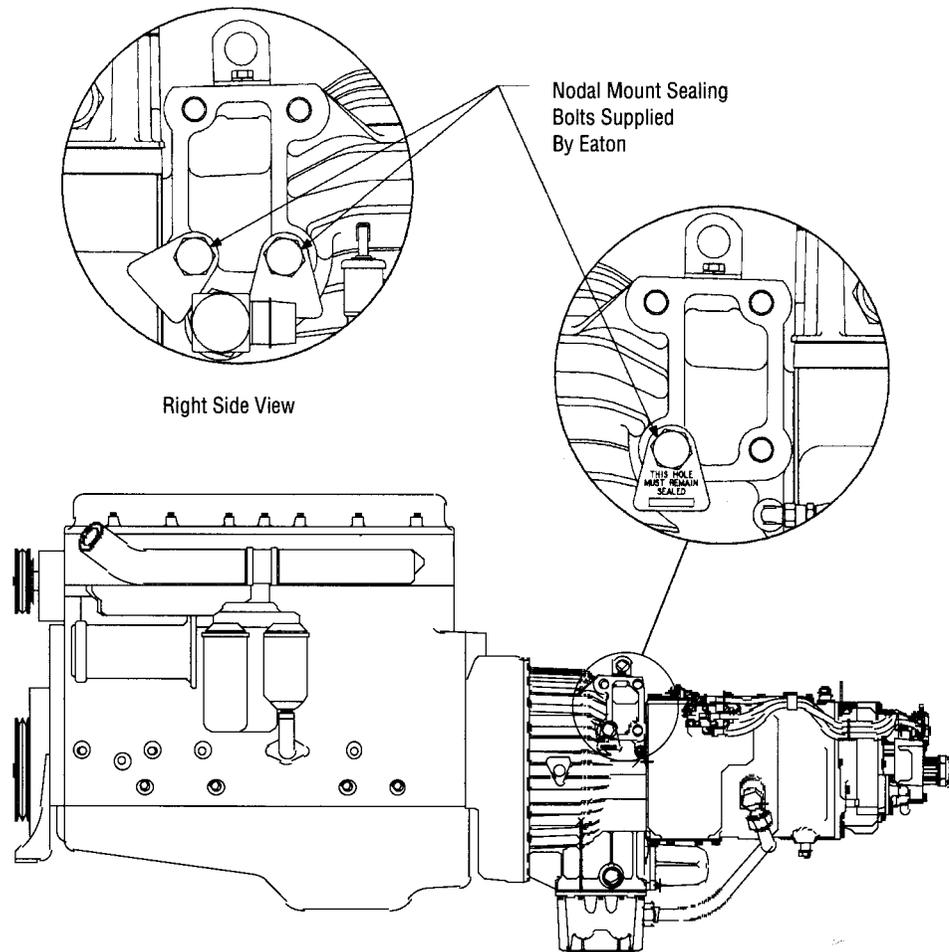


**WARNING**

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Using Transmission Nodal Mounts

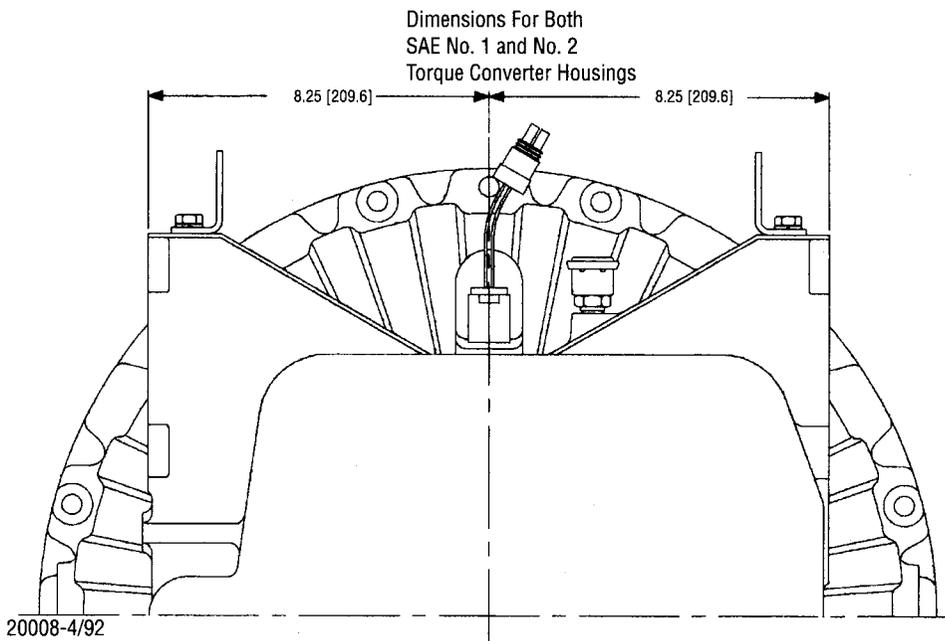
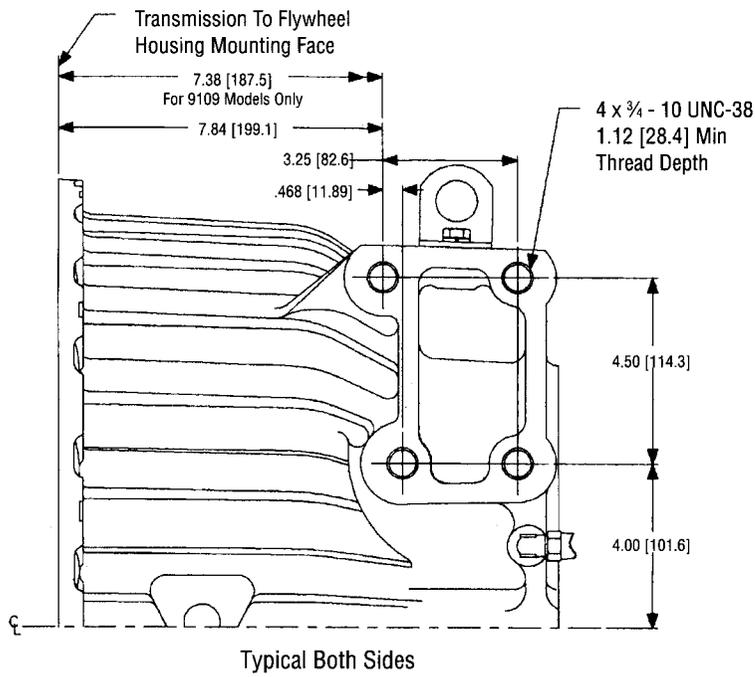
Figure 8



**WARNING** Failure to use proper parts or failure to follow installation instructions could lead to personal injury or property damage.

Nodal Mount Dimensions

Figure 9



**WARNING**

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## Cooler Requirements

1. An external transmission cooler must be used with the C.E. 18-Speed transmission. The cooler sizing must meet application approval requirements specified in FUL-219.
2. A minimum pressure drop through the transmission of 10 PSI @ 1500 to 1800 RPM is required (converter lube apply pressure - converter lube outlet pressure) reference cooler verification this section.
3. The cooler return line must be routed into the Eaton supplied back-pressure valve (Eaton P/N A-5754). This valve can be located on either side of the C.E. 18-Speed.
4. Either Air-To-Oil or Water-To-Oil coolers are acceptable. Sizing must meet Eaton application guidelines.
5. A minimum SAE #12 cooler hose or comparable tube should be used for the C.E. 18-Speed cooler circuit (See Figures 10 and 11).
6. The oil cooler and cooler connecting lines should be free of debris, dirt, grease, etc. before being attached to the transmission. If these conditions exist cooler and lines must be flushed or cleaned.
7. Cooler connecting lines should be routed in such a way as to prevent kinks or leaks from rubbing on other components. Use high temperature protection as required to protect against heat deterioration.
8. The C.E. 18-Speed transmission uses an internal high pressure oil filter system, an external in-line oil filter is not required but may be used.
9. A transmission cooler bypass circuit is not recommended for the C.E. 18-Speed transmission.

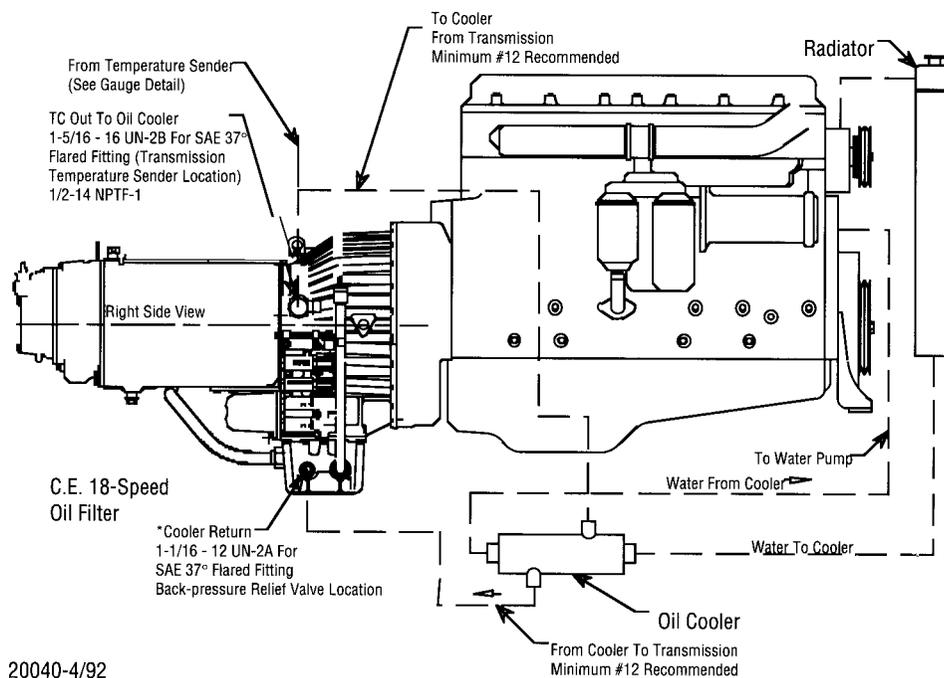
**NOTE:** Figures 10 and 11 show typical Water-To-Oil and Air-To-Oil systems only, the actual configuration may vary depending on the application.

### Transmission Temperature Gauge/Sender

1. A transmission temperature gauge with sender mounted in the torque converter outlet port is required (See Figures 10, 11 and 12).
2. A temperature gauge in combination with an over temperature alarm is the Eaton recommended installation.
3. A temperature gauge with a maximum range to 140°F to 325°F maximum and an over temperature alarm set between 250°F and 300°F is required. Normal operating temperature, when sensed from the torque converter outlet port, should be below 250°F; however, intermittent operating temperature to 300°F does not harm the transmission (See Figure 12).

## Cooling Requirements Oil To Water

**Figure 10**



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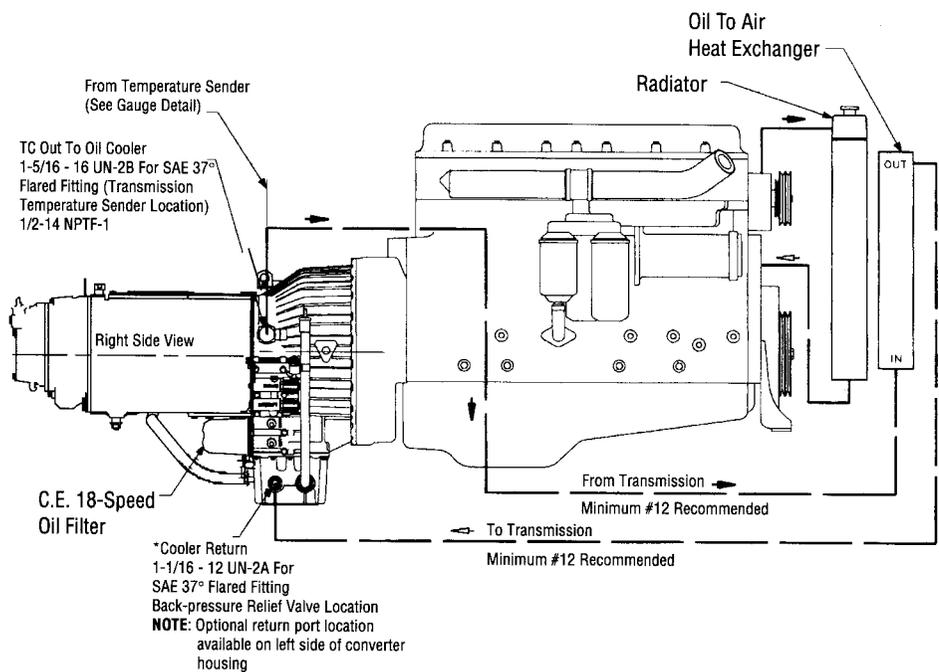
**\*NOTE:** Optional cooler return located on left side of torque converter housing. Back-pressure relief valve must be located at cooler return location.

### **WARNING**

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## Cooling Requirements Oil To Air

Figure 11

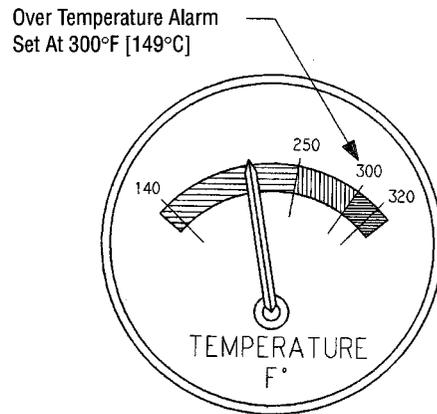


**\*NOTE:** Optional cooler return located on left side of torque converter housing. Back-pressure relief valve must be located at cooler return location.

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**Temperature Gauge**

**Figure 12**



**NOTE:** A temperature gauge in combination with an over temperature alarm is required by Eaton.

140 - 250	Green	Normal Operating Range
*250 - 300	Yellow	Intermittent Range
*Above 300	Red	Unacceptable Operating Range

\*Consult Driver's Instruction "Special Features" For Increased Cooling

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## Cooler Requirements

### Cooler Verification

The C.E. 18-Speed transmission supplies a minimum of 12 GPM oil flow to the transmission cooler @ 1500 RPM if cooler restriction falls within Eaton limits. For new cooler installations, the following test is used to check cooling system restriction.

### Test Tools Required

0-100 PSI pressure gauge on LUBE circuit

0-100 PSI pressure gauge on CONVERTER OUTLET circuit

### Test Conditions

70-120°F Transmission Oil Temperature

Transmission shift control in Neutral

Engine RPM	Lube Press	Conv Out Press	Delta Press
800			
1000			
1200			
1500			
1600			
1800			
Gov. RPM			

### Acceptance Criteria

Calculate Delta Pressure: (Lube Press - Conv Out Press = Delta Press)

Minimum Delta pressure @ 1800 RPM of 10 PSI

If Delta pressure is less than 10 PSI cold, warm transmission in drive at stall (< 1500 RPM) until transmission temperature warms to 180°F. Minimum Delta pressure should be 10 PSI at 1500 to 1800 RPM (in neutral).

1. New dipstick and tube designs are required to be approved and/or validated by Eaton engineering if supplied by the O.E.M.
2. A supporting bracket to eliminate vibration is required at the upper end of the dipstick tube. The bracket must be attached to the transmission or engine and not to the frame or body (See Figure 13).

**NOTE:** Support bracket hardware is provided on all C.E. 18-Speed's as shown in Figure 13. Alternate designs/hardware may be required to provide adequate tube support.

3. A minimum 6.0" vertical leg must be maintained above the dipstick tube connection point at the oil pan for accurate oil level readings.
4. A minimum of 12.0" total vertical rise must be maintained from the dipstick tube connection point to aid in oil filling.
5. Torque dipstick tube fitting (1 5/8-12) to 60-70 lbs.<sub>f</sub> · ft. (See Figure 13).
6. Torque dipstick tube nut (1 5/16-12 JIC 37°) to 50-60 lbs.<sub>f</sub> · ft. (See Figure 13).
7. Actual oil level is required to be within 1/8" of Eaton specifications according to the dipstick readings.

**NOTE:** The reference drawing in this section shows typical dipstick and tube installation. Bracket hardware shown is standard on all C.E. 18-Speed models, but may be omitted if alternate support design is used.

**NOTE:** For more information on Dipstick/Dipstick Tubes available from Eaton reference Eaton drawing 5500500, 5500503, 5501000.

### Dipstick and Tube Validation

Test Equipment: (Available from Eaton Application Group)

- Oil
- "See-through" Tubing 1 inch I.D. = 8 Inch Long
- Hose Clamp - Adjustable up to 1¼ inch Diameter
- SAE 070202 Male Elbow (JIC 37 Degree)
- Dipstick Sample
- Tube Sample
- Scale
- Reference Figure 14

## Dipstick and Tube Mounting

### Procedure:

1. Securely clamp the “see through” tubing to the  $\frac{3}{4}$  - 18 pipe male end of the elbow.
2. Mark the dimension on the “see through” tube per Figure 14 using the proper transmission model requirements.
3. Affix the elbow/tube assembly in a suitable vice or other clamp orienting the axis of the  $1 \frac{5}{16}$  JIC 37 degree male flare horizontally. The “see through” tube must be oriented vertically.
4. Attach the dipstick tube to the elbow orienting the dipstick tube to the elbow per the proper O.E.M. installation drawing or instructions, then tighten adequately to seal and retain this orientation (See Figure 14).
5. Pour oil into the open “see through” tubing until the level reaches the appropriate mark determined in Step 2 above.
6. Insert the dipstick into the tube fully.

6a. Did the oil level raise in the “see through” tube as the stick was inserted?

Yes \_\_\_\_ >1/8 inch      No \_\_\_\_\_ <1/8 inch

If Yes - A means must be provided to vent the stick.

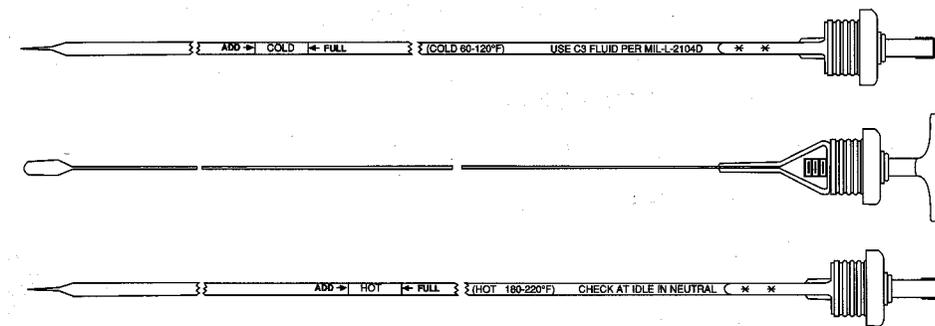
If No - Proceed to Step 6b.

6b. Remove the dipstick from the tube and observe the oil witness mark.

The oil witness should be at the “FULL” line of the dipstick “HOT” range. If the witness is within 1/8 inch from this line, the dipstick is considered validated. If the oil witness is greater than 1/8 inch from the “FULL” line of the dipstick “HOT” band the parts and/or drawings must be changed.

7. The corresponding “LOW” line of the dipstick “HOT” range should be 1 inch below the oil witness.
8. The “FULL” line of the dipstick “COLD” range should be  $1 \frac{5}{8}$  inch below the oil witness.
9. The corresponding “LOW” line of the dipstick “COLD” range should be  $2 \frac{5}{8}$  inch below the oil witness.

## Required Dipstick Markings



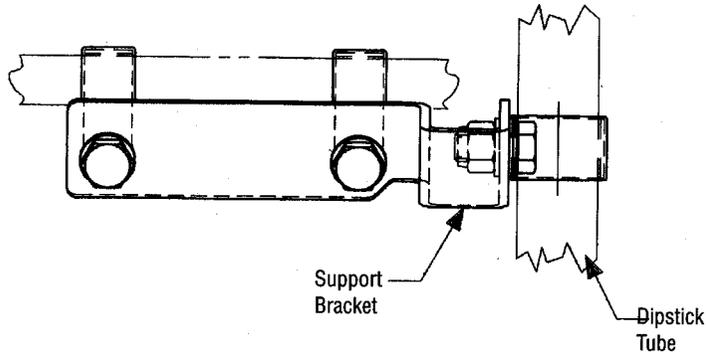
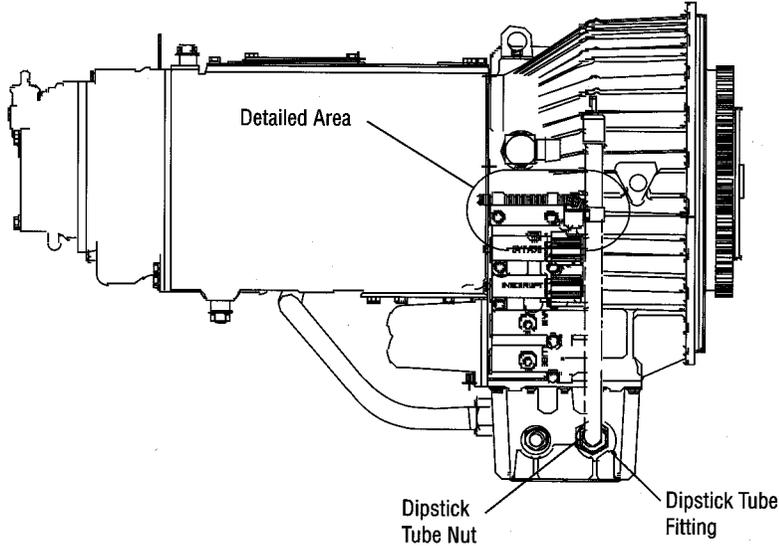
## Different Views of the Oil Dipstick

Make sure oil is within dipstick marks for the corresponding oil temperature. Oil should be checked at idle speed in the neutral position using the corresponding temperature band. Cold checks can be performed when the oil temperature is 60-120°F. The oil level should be within the dipstick “COLD” band. Additional checks can be made with the transmission at operating temperature by using the “HOT” band on the opposite side of the dipstick. The “hot” band temperature range is 180-220°F.

Dipstick and Tube Mounting

Figure 13

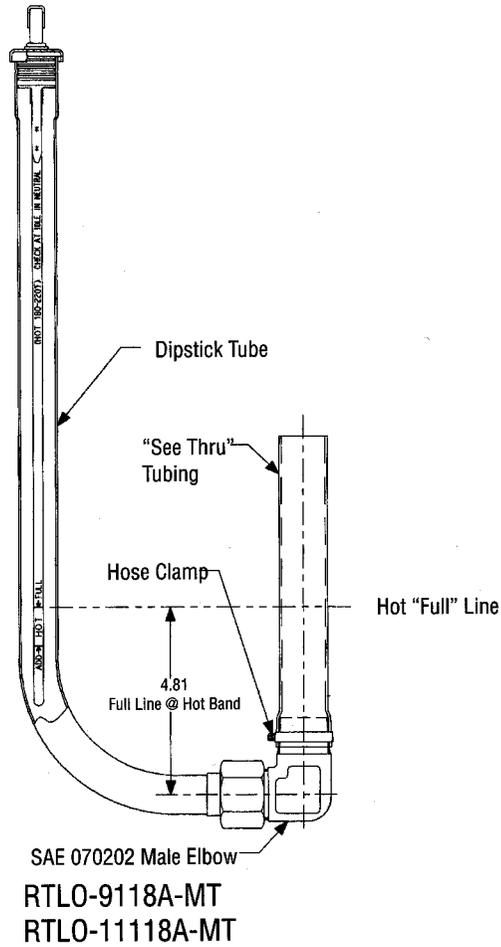
NOTE: Eaton Dipstick Mounting Bracket Design Shown.



**WARNING** Failure to use proper parts or failure to follow installation instructions could lead to personal injury or property damage.

Dipstick and Tube Validation

Figure 14



**WARNING** Failure to use proper parts or failure to follow installation instructions could lead to personal injury or property damage.

**WARNING** Before working on a vehicle, place the transmission in neutral, set the parking brakes, and block the wheels.

1. Make sure oil is within dipstick marks for the corresponding oil temperature.

**NOTE:** Oil should be checked at idle in neutral using the corresponding temperature band.

2. Cold checks can be performed when the oil temperature is 60-120°F. The oil level should be within the dipstick “COLD” band.
3. When the vehicle is at operating temperature 180-220°F. The oil level should be within the dipstick “HOT” band located on the opposite side of the dipstick.
4. The operational level should always be within the appropriate temperature bands on the dipstick. The exact amount of oil depends on the transmission inclination and model.
5. Insufficient oil damages the pump and other components and can affect the function and reduce the life of the transmission.
6. **DO NOT OVERFILL.** This causes overheating and loss of fuel economy.
7. When adding oil, types and brands of oil should not be mixed because of possible incompatibility.
8. When changing oil viscosity to Arctic oil or alternate viscosity ranges, follow the recommended transmission oil flush procedure outlined in the C.E. 18-Speed service manual.
9. Use clean oil and clean containers when filling the transmission. Containers that have been used for anti-freeze or water should not be used for transmission oil.
10. Oil must meet MIL-L-2104E Specification or Dexron®II. Oil must be filled to the proper oil level prior to O.E.M. shipment.

### Oil Fill Procedure

1. Remove the dipstick and add a minimum of seven (7) gallons (27 liters) of the prescribed oil through the fill tube (dipstick tube).
2. Place the transmission in neutral position and apply the parking brakes. Start the engine and let idle for five (5) minutes, (this allows the oil to circulate and fill the torque converter, main case, and cooling system).

3. Add oil as needed to obtain the correct level at the proper temperature range.

**NOTE:** Approximately total oil quantity needed is 44 quarts (42 liters), this varies depending on cooling system capacity.

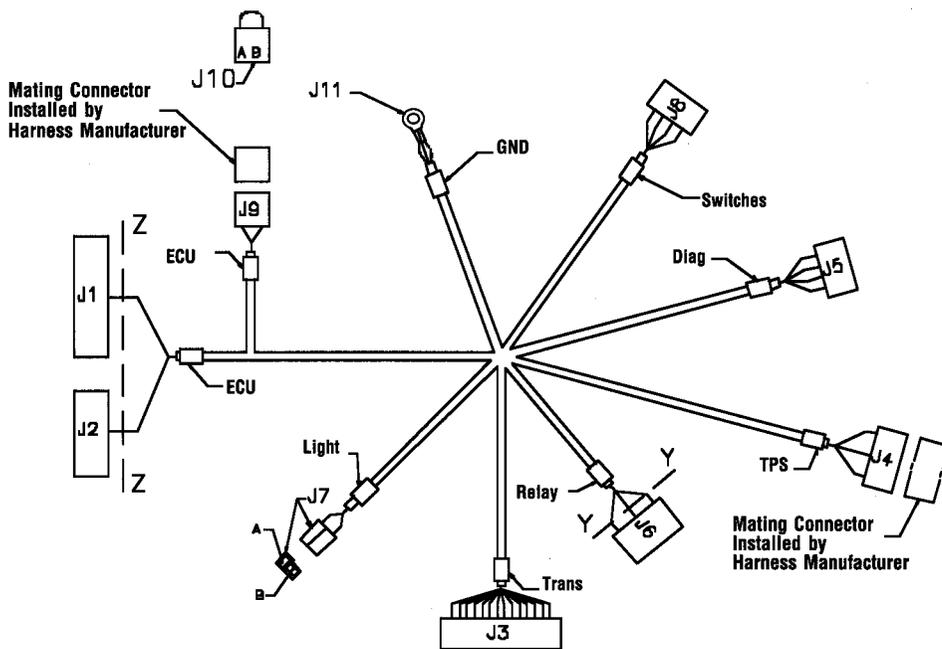
4. Increase the engine idle slowly to 1500 RPM for two (2) minutes. Now check the oil level at normal idle speed in neutral, add or drain oil to obtain a level at the proper temperature range on the dipstick.

5. Replace the dipstick and tighten securely.

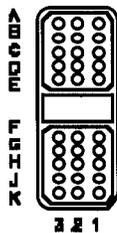
NOTES:

# Electrical Requirements

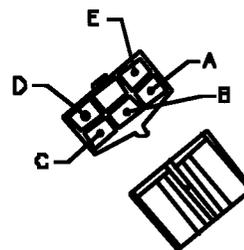
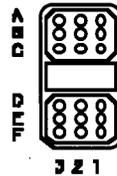
## Vehicle Interface Harness



**CONNECTOR J1**



**CONNECTOR J2**

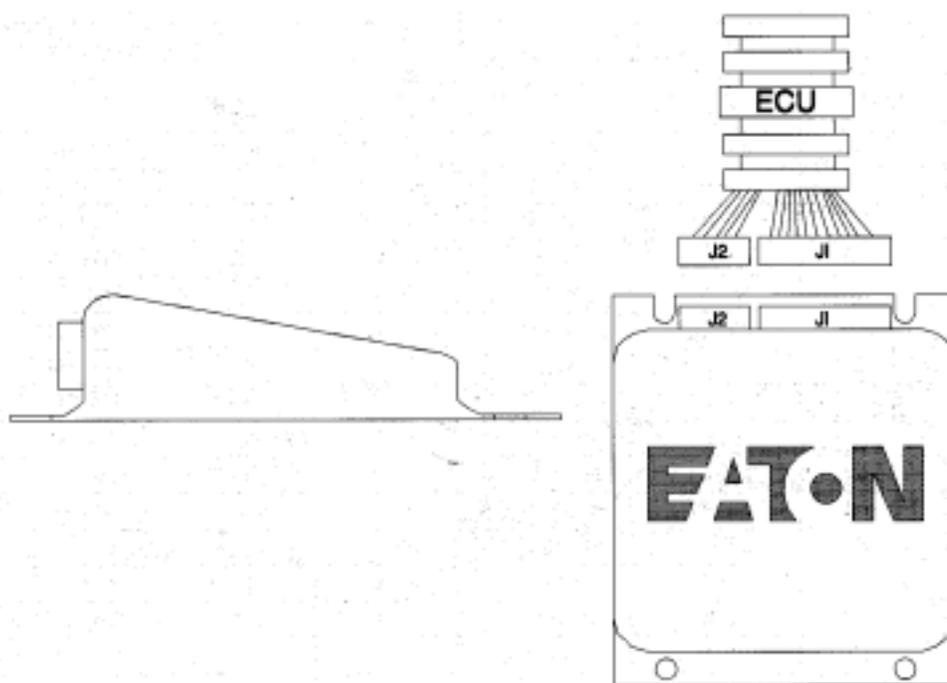


**VIEW Z-Z**  
Scale None

20043-4/92

From Connector Location	To Connector Location or Termination	Wire Description	From Connector	To Connector - Location or Termination	Wire Description
J1-A1	J3-E	OUT SPD +	J2-D1	J4-C	TPS PW
J1-A3	J11	GND 1	J2-D3	J3-L	TEMP SW
J1-B1	J3-F	OUT SPD -	J2-F3	J8-C	INER BRK
J1-B3	J11	GND 2	J3-D	J11	INER GND
J1-C1	J3-B	LOCK GND 1	J3-A	J6-C	LOCK PW
J1-C2	J7-A	LAMP GND	J3-M	J11	TEMP GND
J1-C3	J11	GND 3	J3-G	J6-C	INTR PW
J1-D3	J5-A	ATA +	J5-C	J6-D	ATA PW
J1-E1	J6-C	IGN 1	J5-E	J11	ATA GND
J1-E3	J5-B	ATA -	J7-B	J6-C	LAMP +
J1-F1	J6-B	RELA GND	J8-A	J3-C	INER PW
J1-G1	J6-E	IGN BUS	J8-B	J6-A	INTR +
J1-G2	J6-D	BAT BUS	J8-D	J11	INTR -
J1-G3	J3-K	IN SPD -	J9-A	J11	CONFIG GND
J1-H1	J3-H	INTR GND			
J1-H3	J3-J	IN SPD +			
J1-J2	J9-B	CONFIG			
J1-J3	J3-N	ENG SPD +			
J1-K2	J3-B	LOCK GND 2			
J1-K3	J3-P	ENG SPD -			
J2-A3	J6-C	IGN 2			
J2-C1	J4-A	TPS GND			
J2-C3	J4-B	TPS SIG			

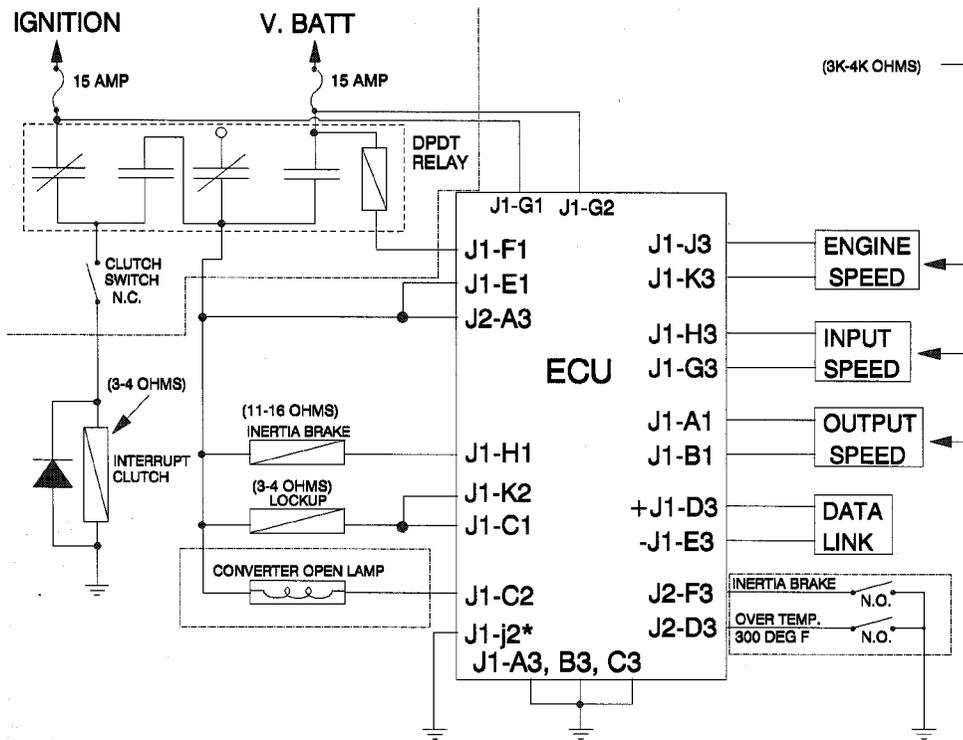
## ECU Optional



ECU can be mounted at any orientation and must be mounted in the cab. Maximum temperature not to exceed 85°C.

**CAUTION** Power supply and ground must be disconnected from ECU prior to any welding on the vehicle.

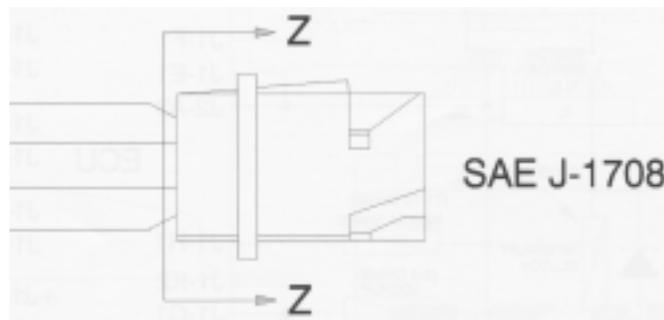
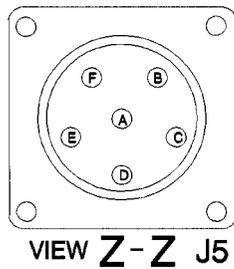
## Electrical Schematic



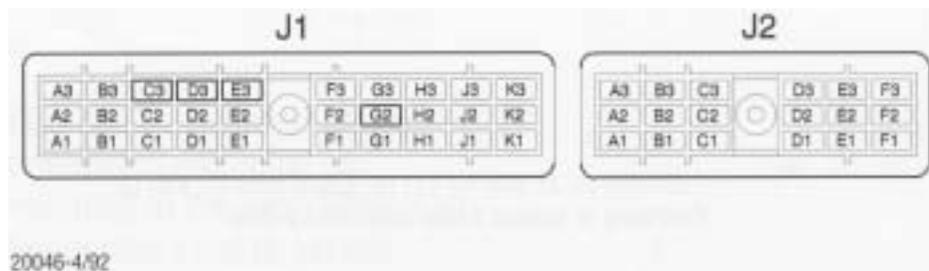
\* Ground pin J2 only for 11118. Leave open for a 9118.  
**Everything in dashed boxes supplied by O.E.M.**

## Diagnostic Connections

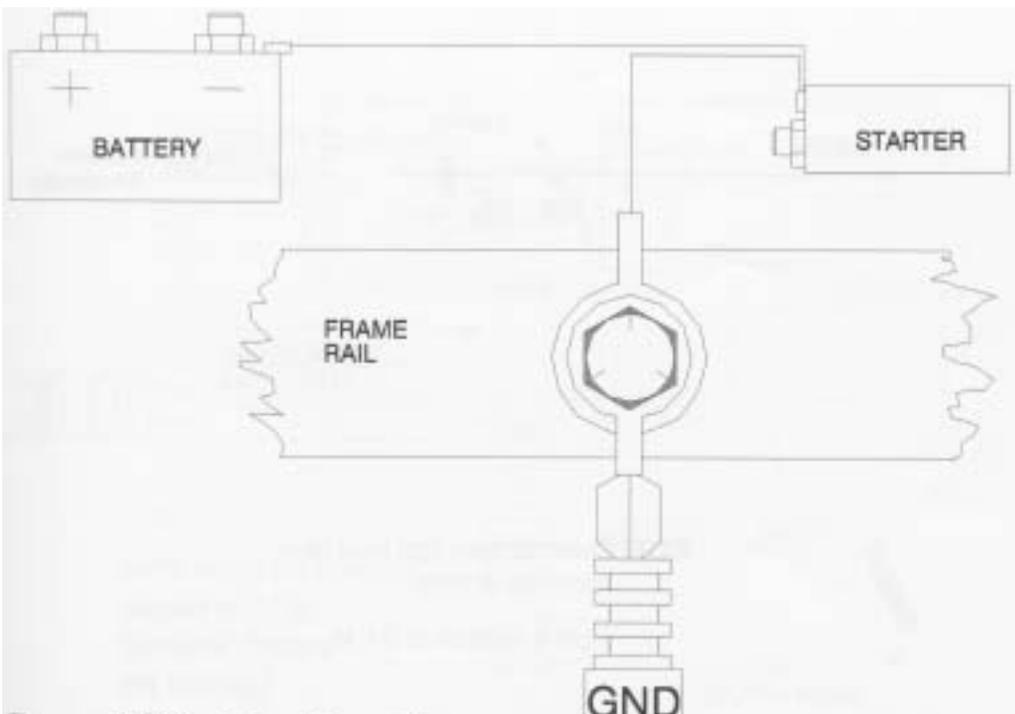
WIRE TABLE			
ECU PIN	WIRE CODE	WIRE DESCRIPTION	PIN LOCATION
J1-D3	W15	A.T.A. (+)	J5-A
J1-E3	W16	A.T.A. (-)	J5-B
J1-G2	W20A	DIAG (+)	J5-C
J1-C3	W10A	DIAG GND	J5-E



Connector must be accessible. Mount on left side of dash or leave under dash.



## Ground Connections

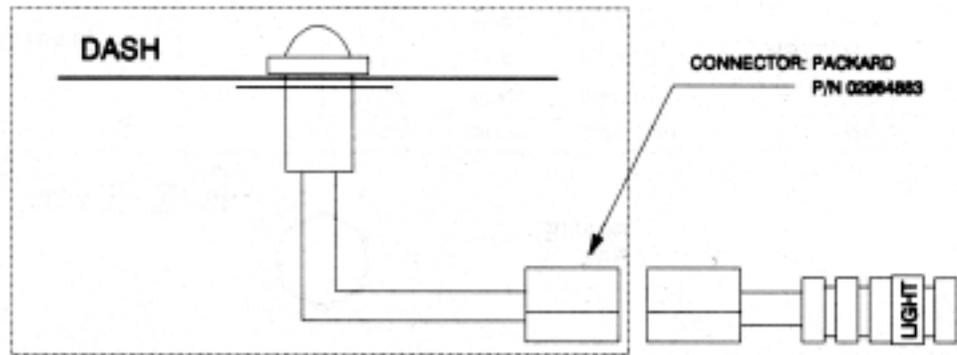


The ground (GND) ring terminal must be connected to the first place battery Negative is connected to the frame rail or chassis.

Check the resistance from pin A3, B3, and C3 or J1 to the negative post on the battery. Resistance must be less than .4 ohms.



## Converter Open Light

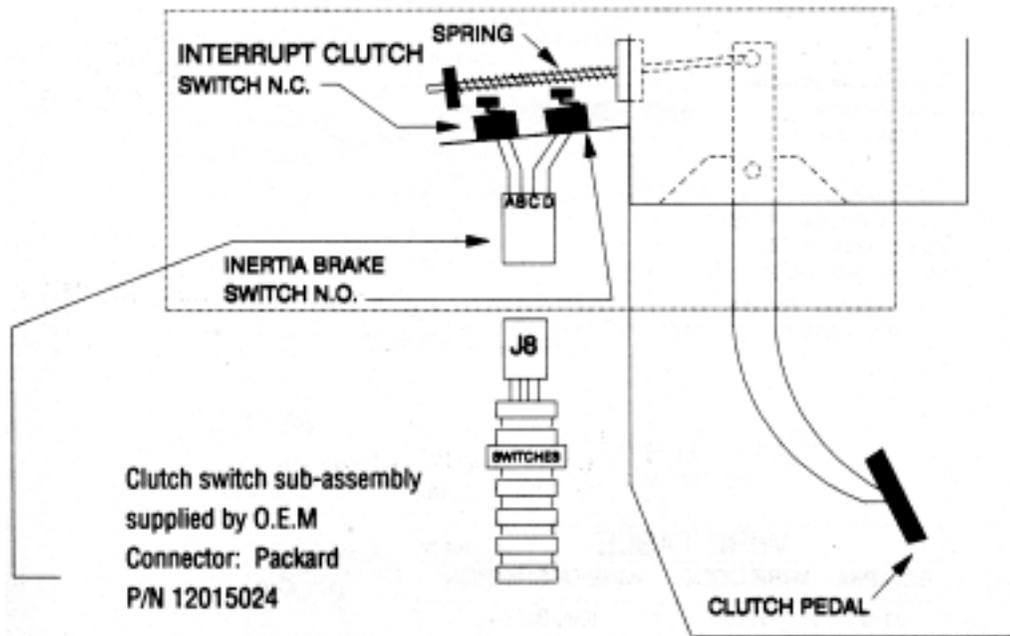


**Note:** Converter open light must be in plain view of driver.

Light is supplied by O.E.M.

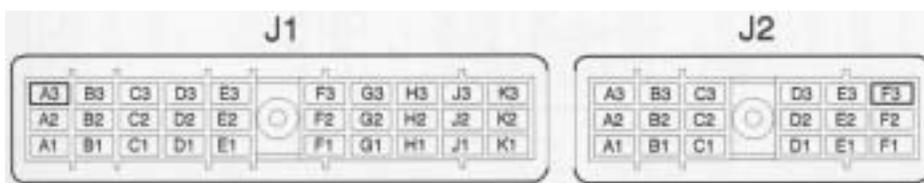


Clutch Switch Sub-Assembly Electrical

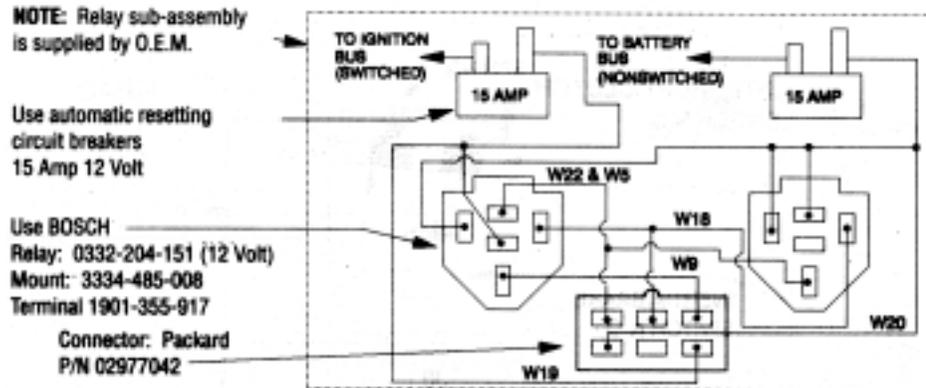


Clutch switch sub-assembly supplied by O.E.M. Connector: Packard P/N 12015024.

WIRE TABLE			
J3-C	W1	INTR PW	J8-A
J6	W9	INTR +	J8-B
J2-F3	W17	INER BRK	J8-C
J1-A3	W2B	INER-	J8-D



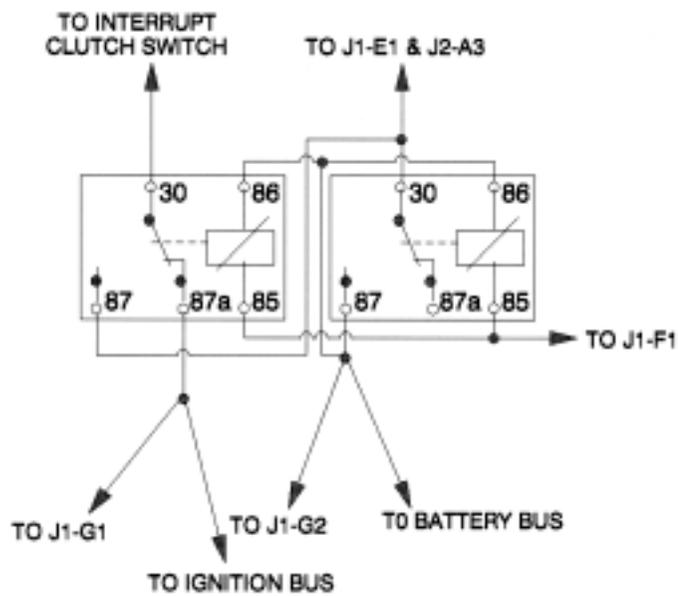
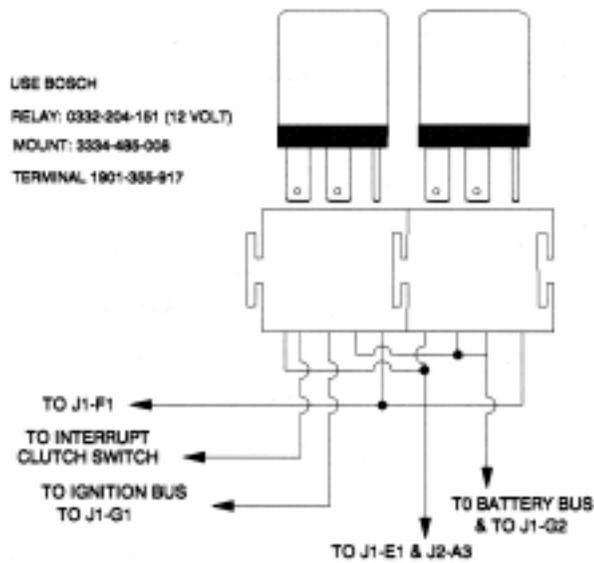
## Relay Sub-Assembly



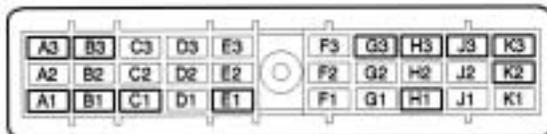
WIRE TABLE		
ECU PIN	WIRE CODE	WIRE DESCRIPTION
J1-G1	W19	IGN BUS
J1-G2	W20	BAT BUS
-----	W9	INTER +
J1-F1	W18	RELA GND
J2-A3	W22	IGN 2
J1-E1	W5	IGN 1



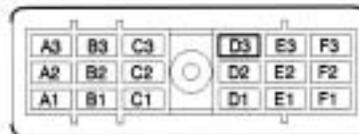
## Reference Relay Sub-Assembly Electrical



J1

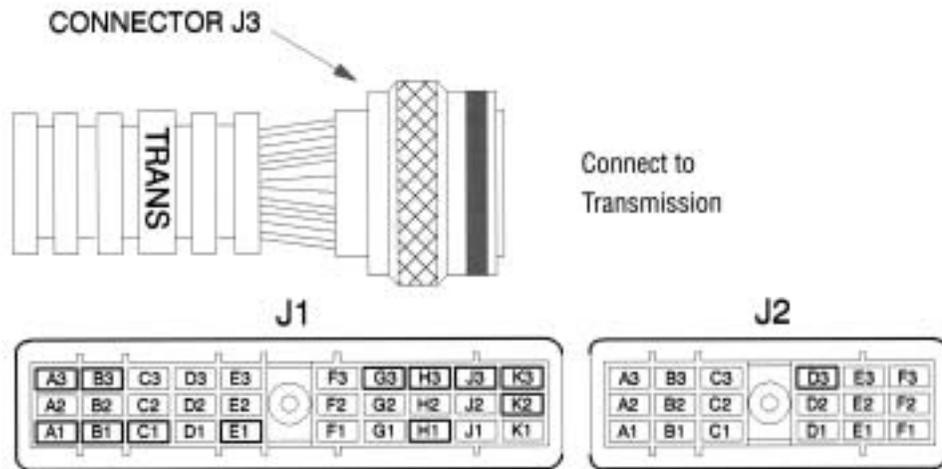


J2



## Transmission Harness Connector

WIRE TABLE			
ECU PIN	WIRE CODE	WIRE DESCRIPTION	PIN LOCATION
J1-E1	W5A	LOCK PW	J3-A
J1-C1	W13	LOCK GND 1	J3-B
J1-K2	W13A	LOCK GND 2	J3-B
-----	W1	INTR PW	J3-C
J1-A3	W2A	INTR GND	J3-D
J1-A1	W3	OUT SPD +	J3-E
J1-B1	W4	OUT SPD -	J3-F
J1-E1	W5B	INER PW	J3-G
J1-H1	W21	INER GND	J3-H
J1-H3	W7	IN SPD +	J3-J
J1-G3	W8	IN SPD -	J3-K
J2-D3	W26	TEMP SW	J3-L
J1-B3	W14A	TEMP GND	J3-M
J1-J3	W11	ENG SPD +	J3-N
J1-K3	W12	ENG SPD -	J3-P



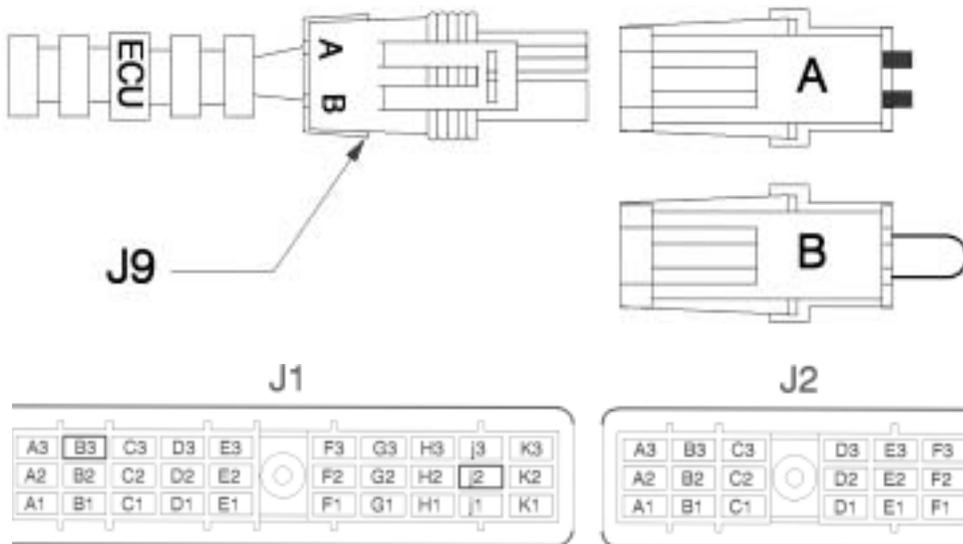
Configuration Connector

WIRE TABLE			
ECU PIN	WIRE CODE	WIRE DESCRIPTION	PIN LOCATION
J1-B3	W14B	CONFIG GND	J9-A
J1-J2	W27	CONFIG	J9-B

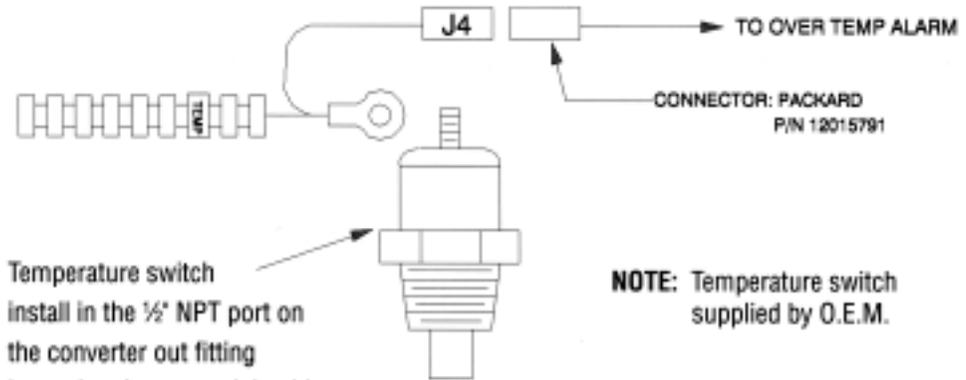
Place Cap “A” (OPEN) on J9 for RTLO-9118A-MT

Place Cap “B” (SHORTED) on J9 for RTLO-11118A-MT

Caps “A” & “B” supplied with harness



## Over Temperature Switch



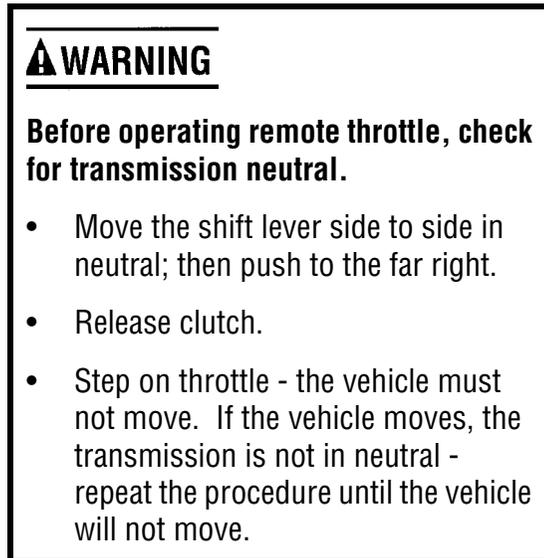
WIRE TABLE				
ECU PIN	WIRE CODE	WIRE DESCRIPTION	PIN LOCATION	Tran Connector
J2-D3	W26	TEMP SW	J3-L	J1-L



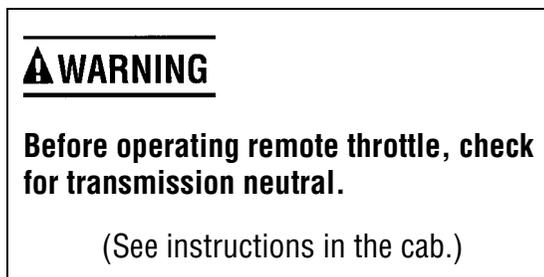
## **Remote Throttle Installations**

**If remote throttle is used, the following warning labels must be installed:**

In the cab, the following label is required:



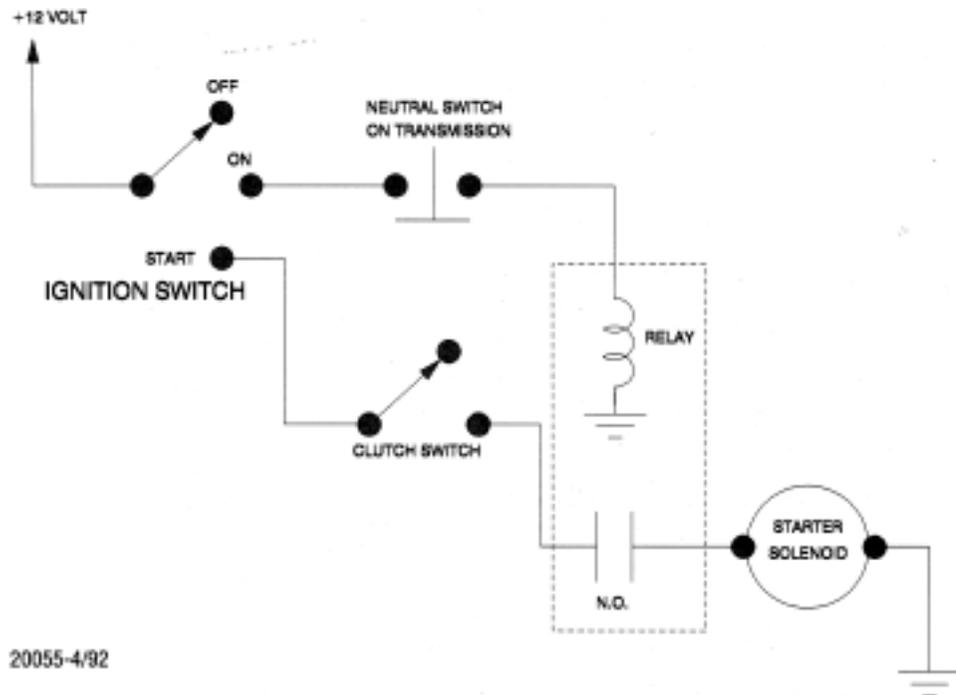
At the remote throttle location, the following warning label is required:



## Neutral Start System

The neutral start switch must be located on the clutch pedal and be activated when the transmission interrupt clutch switch is in the open state (clutch disengaged).

## Neutral Safety



Clutch switch must activate when interrupt clutch switch is open.

The neutral safety circuit is supplied by the O.E.M.

## Installation Requirements

**All C.E. 18-Speed transmissions installed at O.E.M. facilities must meet the application requirements specified in Transmission Application Approval Form FUL-219.**

### Line Inspection

1. Each C.E. 18-Speed installed at the O.E.M. must pass the on-line checklist requirements per Eaton C.E. 18-Speed Line Inspection Form, Appendix III, prior to shipment from the O.E.M. plant.

### Flywheel Installation

1. The flywheel and drive ring must be an Eaton approved design and must be installed per the appropriate Eaton or Engine O.E.M. specifications.
2. Pilot Adapter: When using the bolt-on drive ring adapter, a center pilot adapter must also be used. Care should be used to insure the adapter is completely seated into the flywheel (See Figure 2 for dimensional information).

### Flywheel Housing Sealing Requirements

1. The engine flywheel housing must be approved for “wet” applications, including a double lip rear engine crankshaft seal. The housing must provide a completely sealed environment for the torque converter area.
2. The vehicle O.E.M. is responsible for sealing all holes in the flywheel housing/ converter housing area including starter, mounting pads, transmission mounting, speed pickups, etc.
3. Gasket, seal ring, or equivalent sealing method along with sealed fasteners must be used when mounting the starter to the flywheel housing.

### Transmission Support Requirements

1. A rear transmission support is required for all installations where the transmission nodal mount supports are **NOT** used.

**Cooler Requirements**

1. An external transmission cooler must be used with the C.E. 18-Speed transmission. The cooler sizing must meet application approval requirements specified in FUL-219.
2. A minimum pressure drop through the transmission of 10 PSI @ 1500 to 1800 RPM is required (converter lube apply pressure - converter lube outlet pressure) (See reference cooler verification in this section).
3. The cooler return line must be routed into the Eaton supplied back-pressure valve (Eaton P/N A-5754). This valve can be located on either side of the C.E. 18-Speed.
4. The oil cooler and cooler connecting lines should be free of debris, dirt, grease, etc. before being attached to the transmission. If these conditions exist, cooler and lines MUST be flushed or cleaned.
5. A transmission temperature gauge with sender mounted in the torque converter outlet port is required.
6. A temperature gauge with a maximum range to 325°F and an over temperature alarm set at 300°F is required.

**Dipstick and Tube Mounting**

1. New dipstick and tube designs are required to be approved and/or validated by Eaton engineering if supplied by the O.E.M.
2. A supporting bracket to eliminate vibration is required at the upper end of the dipstick tube. The bracket must be attached to the transmission or engine and not the frame or body.

**Lubrication Requirements**

1. Oil must meet MIL-L-2104E specifications or Dexron®II. Oil must be filled to the proper oil level prior to O.E.M. shipment.

**Electrical Requirements**

1. 15 Amp 12 Volt automatic resetting circuit breakers must be used.
2. The ground ring terminal must be connected to the first place battery negative is connected to the frame rail or chassis.
3. Converter open light must be in plain view of driver.
4. Configuration connector must be open for RTLO-9118A-MT and shorted for RTLO-11118A-MT.
5. Mount ECU in cap. ECU can be mounted at any orientation.
6. Remote throttle label must be located in cab and at the remote throttle location.

## Installation Quick Reference

### Engine Section

#### A. Double Lip Engine Rear Crankshaft Seal Required

Source approved seal per the engine O.E.M. recommendations.

#### B. Engine Flywheel Housing Sealing Required

Engine flywheel runout to conform to engine O.E.M. specs.

Ordered per appropriate engine O.E.M. option number.

- Sealing at: Flywheel housing mounting face, threaded fasteners, covers, sensors, engine support mounts and transmission SAE O-Ring pilot.

#### C. Sealed Engine Starter Required

Ordered per appropriate engine O.E.M. option number.

- Sealing at: Mounting face, starter motor, threaded fasteners.

#### D. Flywheel and Torque Converter Pilot

**Note:** Spline drive feature with no direct coupling! Ordered per appropriate engine OEM option number or Eaton number.

- See appropriate Eaton installation drawing for flywheel threaded fastener installation.
- See appropriate Eaton engine installation drawing for integral or separate converter pilot.

#### E. Transmission O-Ring and Sealed Threaded Mounting Fasteners Required

Use only 3 point lifting chain for transmission. O-Ring supplied with transmission per SAE sealed flywheel housing size.

- Sealing at: Threaded mounting fasteners (when through tapped holes encountered at the flywheel housing).

#### F. Transmission Mounting - Nodal & Rear Supports

- Sealed threaded fasteners required at the transmission nodal pads identified with tags.
- Rear support required when nodal mounts not used. Support to conform to SAE SP-479 specification.

## Chassis Section

### G. Transmission Cooler, Circuit, and Sensors Required

- Cooler Sized per Application Approval.
- Sensors installed per Eaton approval.
- Gauge per Eaton approval.

### H. Transmission Dipstick and Tube Required

Stick & Tube set must comply with Eaton Drawing requirements.

- Oil per MIL-L-2104E SAE 10 Wt.
- Oil fill - Must be checked in neutral engine at idle.

to 250°F	250°F-300°F	above 300°F
Green Band	Yellow Band	Red Band

- Warning device per Eaton approval actuated at 300°F.
- Circuit pressure drop per Eaton approval (5/8 inch line minimum)

### I. Transmission Lubrication Requirements

#### Electrical Section

### J. Electrical Dual Power Required

- 12 V power from 15 amp auto-rest circuit breaker - ignition  
Ignition connection to harness terminal
- 12 V power from 15 amp auto-rest circuit breaker - battery  
Battery connection to harness terminal

### K. Electrical Grounds Required

Dual independent terminals at battery ground to frame.

### L. “Service Transmission” Light & Diagnostic Connector Required

- Service light 2.5 amps maximum per Eaton approval. Diagnostic SAE J-1708 connector with easy in cab access
- Terminated at harness W13a, W4, W3, and W2a.

#### Cab Section

### M. Neutral Start & Reverse Back Up Switches

- Switches incorporated into the shift bar housing.
- Neutral start and clutch switch supplied by O.E.M.

### N. Remote Throttle

- Label in cab.
- Label in remote throttle location.

### O. Splitter and Range Valve

## Torque Specifications

1. Flywheel Adaptor Ring bolts:
  - Inch design (7/16-14) - 37-50 lbs<sub>f</sub>.ft.
  - Metric design (M10-35) - 50-55 lbs<sub>f</sub>.ft.
2. Flywheel bolts (with integrated drive ring):
  - Follow engine manufacturers specifications
3. Transmission-to-engine bolts:
  - \*\* Inch design (7/16-14) - 37-50 lbs<sub>f</sub>.ft.
  - \*\* Inch design (3/8-16) - 25-32 lbs<sub>f</sub>.ft.
  - \*\* Metric design (M10-35) - 26-35 lbs<sub>f</sub>.ft.
4. Transmission nodal mount bolts: 180-190 lbs<sub>f</sub>.ft.  
  
(Thread sealant at through hole locations required)
5. Output yoke nut - 450-500 lbs<sub>f</sub>.ft.
6. PTO mounting bolts:
  - 6-bolt opening - 20-25 lbs<sub>f</sub>.ft.
  - 8-bolt opening - 50-65 lbs<sub>f</sub>.ft.
7. Torque converter outlet fitting (1 5/8-12) - 60-70 lbs<sub>f</sub>.ft.
8. Oil cooler line fittings (1 1/16-12) 50-60 lbs<sub>f</sub>.ft.
9. Oil cooler line nut (1 1/16-12 JIC 37°) - 45-55 lbs<sub>f</sub>.ft.
10. Dipstick tube fitting (1 5/8-12) - 60-70 lbs<sub>f</sub>.ft.
11. Dipstick tube nut (1 5/8-12 JIC 37°) - 50-60 lbs<sub>f</sub>.ft.
12. Speedometer body in rear cover - 35-50 lbs<sub>f</sub>.ft.
13. Speedometer electronic sensor (3/4-16) - 10-15 lbs<sub>f</sub>.ft.
14. Oil drain plugs:

## Appendix II

- converter pan ( $\frac{1}{2}$ -20 std. thread with washer) - 15-20 lbs<sub>f</sub>.ft.
- converter pan ( $\frac{3}{8}$  NPT) - 20-25 lbs<sub>f</sub>.ft.
- main case ( $\frac{3}{4}$  NPT) - 45-55 lbs<sub>f</sub>.ft.

15. Oil temperature sensor ( $\frac{3}{8}$ -16) - 16-20 lbs<sub>f</sub>.ft.

16. Lifting bracket bolts ( $\frac{3}{8}$ -16) -25-32 lbs<sub>f</sub>.ft.

17. Rear support nuts ( $\frac{5}{8}$ -18) - 170-185 lbs<sub>f</sub>.ft.

\*\* THREAD ADHESIVE / SEALANT REQUIRED

## Publications and Drawings

### Publications

TBSG-011	Troubleshooting Guide
DR-122	Drivers Instructions
Form 220	Service Manual
P-636	Illustrated Parts List - RTLO-9118A-MT
P-637	Illustrated Parts List - RTLO-11118A-MT
TC-018	Product Literature Order Form
INST-011	OEM Installation Guide
Form 188	Air System Troubleshooting Guide

### Drawing Numbers

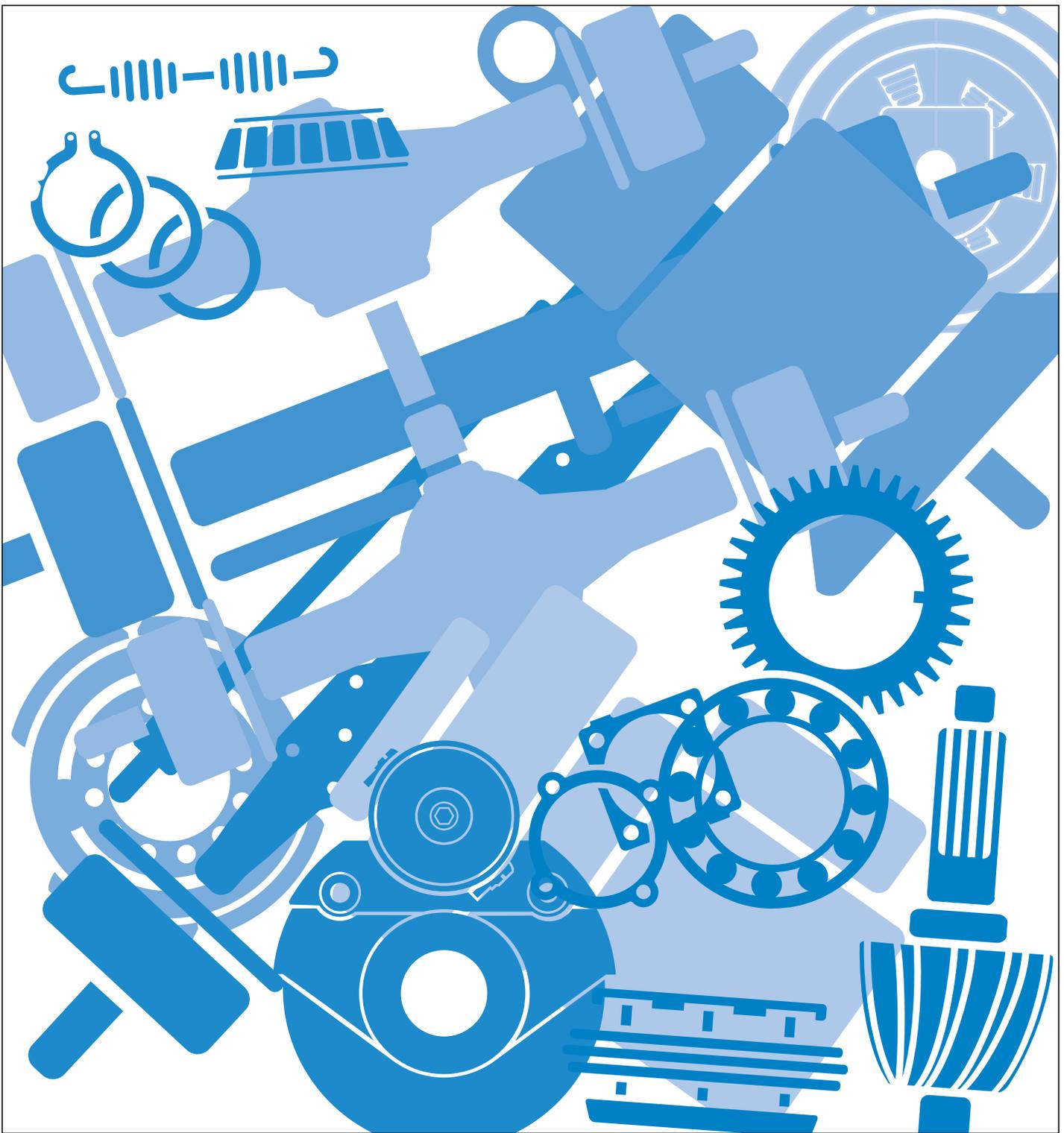
090D-AD	RTLO-9118A-MT
091-AD	RTLO-11118A-MT
5500500	Dipstick Tube Chart
5500503	Dipstick Tube Detail - SAE #1 Applications
5501000	Dipstick Detail - Std. on SAE #1 Applications

### Miscellaneous Drawings

4300315	90 Degree Torque Converter Outlet Fitting
4300307	45 Degree Torque Converter Outlet Fitting
4300809	Straight Torque Converter Outlet Fitting







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