



Subject: Lightning to FRO/RT 13-Speed Conversion Instructions

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Issue Description:

Due to the Lightning model transmissions no longer available for new production; some customers may want to move away from the Lightning product. Remanufactured Lightning transmissions are available through the Eaton authorized distributors. Customers have the option of moving to FRO or RT 13-speed models. The following instructions will help guide the customer/technician through the conversion process.

Current Process:

Real Time Warranty assists customers on a one-on-one basis.

Revised Process:

The instructions listed below cover the process of removing a Lightning transmission and the reinstallation of an FRO or RT 13-speed model transmission. These instructions cover most of the vehicle configurations in the marketplace. If any additional information is needed, please contact the Roadranger Call Center at 1-800-826-4357.

Listed at the bottom of this service bulletin are conversion kit part numbers. These kits do not include transmissions or oil coolers. Special applications may require ordering of additional clutch housings.

Best Transmission Options for a Lightning Conversion Chart

Current Lightning Model	Optional Transmission Model	Part Number
FRLO-XX410C	FRO-16210C	TA-D60-10R – Reman w/ internal cooler (preferred option)
		TA-D60-12R – Reman w/ internal pump w/o internal cooler
	RTLO-16913A	TA-F04-50R – Reman RTLO-16913A (internal pump model)
FRLOF-XX410C	FROF-16210C	TA-D61-10R – Reman w/ internal cooler
		TA-D61-12R – Reman w/ internal pump w/o internal cooler
	RTLOF-16913A	TA-F05-50R – Reman RTLOF-16913A (internal pump model)

Note: Dependent on chassis model and configuration, a “Forward” or “Standard” shift bar housing model needs to be utilized.



Warning: Internal cooler FRO models cannot be used with a hydraulic clutch release system application



Caution: Lightning PTO configurations are not directly transferable to FRO or RT 13-speed model transmissions. Consult the PTO manufacturer for PTO fit up requirements. The customer is responsible for any costs associated with the PTO conversion

Clutch Housing Options Chart

Note: Reman transmissions come standard with an upper and lower bushed clutch housing.

Note: Hydraulic actuator clutch housings for hydraulic actuated clutch applications needs to be ordered separately

Lightning CL HSG	FRO/F-10 Speed CL HSG	RTLO/F 13 Speed CL HSG
TA-D66/75-SAU-10 Standard aluminum upper cross shaft bushing location	A-5992 (#1, Pull, Alum)	K-3676 (#1, Pull, Alum) Forced Lube CL HSG Kit
TA-D84-SAL-10 Standard aluminum (non-nodal) lower cross shaft bushing location	A-7665 (#1, Pull, Alum, Below Centerline, Non-Nodal)	A-7664 (#1, Pull, Alum, Below Centerline, Forced Lube, Non-Nodal)
TA-D66/75-NAU-10 Nodal aluminum upper cross shaft bushing location	A-4456 (#1, Pull, Alum)	K-3673 (#1, Pull, Alum, Nodal) Forced Lube CL HSG Kit
TA-D66/75-NAL-10 Nodal aluminum lower cross shaft bushing location	A-4550 (#1, Pull, Lower, Alum)	A-7589 (#1, Alum, Nodal)
TA-D66/75-HA-10 Hydraulic actuator housing	K-3759 (#1, Alum) 4305781 (#1, Alum, Nodal)	K-3760 (#1, Forced Lube, Hydraulic)

Transmission Removal & Installation

1. Refer to OEM service manual for proper removal and installation of transmission.

Note: Clutch housing replacement may be necessary on remanufactured FRO or RT 13-speed model transmissions if the Lightning transmission was equipped with a hydraulic clutch release system.

Note: Ensure replacement transmission is filled with lube to the correct level before vehicle is operated.

Master Control Valve Replacement

Note: See “Air System Troubleshooting Guide” TRTS0902, available on Roadranger.com, for proper air line installation of the applicable model transmission.

1. Remove Lightning shift control knob from shift lever.
2. Install supplied master control valve and skirt onto shift lever, orientate to the correct position and tighten jam nut.
3. Install $\frac{5}{32}$ " air line fittings into the master control valve. Install the $\frac{5}{32}$ " air line from the master control valve on the shift lever to the air module/slave valve/splitter cylinder on the transmission.
4. Secure all air lines to prevent chaffing.
5. Install skirt for master control valve.

Oil Cooler/Heat Exchanger

Installing an internal cooler FRO model:

1. Install the existing Lightning oil cooler lines to correct “In” and “Out” oil cooler ports on the FRO model transmission.

Note: Alter coolant lines for correct fit.

2. Secure all oil lines to prevent chaffing.

Installing a non-internal cooled FRO model:

1. Several cooler options are available for this conversion. The facility initiating the conversion must choose the type and part number of cooler that best fits the cab/chassis configuration. The available options are:

Oil to Water Heat Exchanger Options	Part #
Bottom, Rear Mount, Oil-Water Heat Exchanger	K-4121
Front Mount, Shift Bar Housing, Oil-Water Heat Exchanger	K-4000
Left Mount, Shift Bar Housing, Oil-Water Heat Exchanger	K-3740

Note: The Bottom, Rear Mount, Oil-Air Type Heat Exchanger kit may interfere with some PTO applications.

Installing a RT 13-speed model:

External air to oil cooler kit: K-1956

Oil to Water Heat Exchanger Options for RT-13 speed model:

Heat Exchanger Kit Part Numbers
K-3952
K-3963
K-3954
K-3965
K-3955
K-3966
K-3956
K-3967
K-3699
K-3959
K-3972

Note: See www.inforanger.roadranger.com/epc/index.asp?modelID=373&groupID=1095 for heat exchanger mounting configurations to fit applicable vehicle model and chassis configurations.

Heat Exchanger Installation

1. Install oil cooler/heat exchanger onto transmission.
2. Connect coolant lines to newly installed oil cooler/heat exchanger. If the cooler is an oil-water type cooler, coolant lines may need to be altered for correct fit.
3. Install transmission cooler line fittings to transmission oil pump ports and heat exchanger (if applicable).
4. Install oil lines from heat exchanger to oil pump port fittings. Ensure the oil lines are installed onto the correct ports of the heat exchanger and transmission ports.
5. Secure all oil lines to prevent chaffing.

 **Important:** Engine coolant level and transmission oil level must be checked after heat exchanger installation is completed.

 **Important:** Check for any leaks after operation of vehicle.

Shift Decal Replacement

1. Remove the original Lightning model shift decal from the cab area.
2. Install the new FRO or RT 13-speed model shift decal in place of the removed shift decal. Decals are included in conversion kits:

Transmission Model	Shift Label Part Number
FRO/F 10-Speed	20400
RTLO/F 13-Speed	4300764

Lightning 18-Way Harness Connector Cap Installation

1. After the original Lightning 18-way harness connector is removed from the transmission ECU (Electronic Control Module), install the supplied 18-way harness connector cover (K-3756).
2. Secure harness in area that will prevent any future harness damage.

VSS (Vehicle Speed Sensor) Installation/Program

Some Lightning transmission ECUs broadcast speed information over the J1939 data link to the vehicle and engine. This can be identified by the presence of only 1 VSS on the rear bearing cover of the transmission. When converting to the FRO model transmission this type of speed information will no longer be able to be broadcasted on the J1939 data link. The FRO model transmission will require the installation of a VSS in this case. For the vehicle/engine VSS:

1. Install speed sensor into the 12 o'clock position of the rear bearing cover.
Note: Refer to engine manufacture specifications for correct VSS application.
2. Hard wire the VSS to the chassis electrical system.
Note: Refer to OEM wiring diagrams and harness specifications. Most OEMs already have the harness in-place on the chassis somewhere and would just need routed to the newly installed VSS.
3. Reprogram the VSS engine parameter to reflect a "Manual" VSS application.
Note: Refer to engine manufacture parameter setting specifications.
4. Ensure VSS is reading correctly during vehicle operation.

Driveshaft Modification

1. The main driveshaft attached to the transmission must be shortened 1.8" to be compatible with the installation of the FRO model transmission or 5.0" for an RT 13-speed installation. The shaft should be modified by a reputable driveshaft repair facility.

Conversion Kits

Part Number: K-3998		Description: Kit, Conversion Lightning, FRO/F
Comments: Kit used with the conversion from Lightning to FRO/F Series Transmission		
Quantity	Part Number	Description
1	K-3756	Harness Cap
1	S-2543	Master Valve
1	20400	Shift Label
2	84005	Connector, STR
2	52622	Harness Tubing (48 in.)
1	L-2009-03	L-Letter

Part Number: K-3999		Description: Kit, Conversion Lightning Hydraulic Clt Hsg, FRO/F
Comments: Kit used with the conversion from Lightning with Hydraulic Clutch Housing to FRO/F Series Transmission		
Quantity	Part Number	Description
1	K-3756	Harness Cap
1	S-2543	Master Valve
1	4301180	Skirt, Valve
1	20400	Shift Label
1	K-3759	Hydraulic Clutch Housing for FRO Series
2	84005	Connector, STR
2	52622	Harness Tubing (48 in.)
1	L-2009-03	L-Letter

Part Number: K-4002		Description: Kit, Conversion Lightning, RTLO/F 13-Speed
Comments: Kit used with the conversion from Lightning to RTLO/F 13-Speed Series Transmission		
Quantity	Part Number	Description
1	K-3756	Harness Cap
1	S-2578	Master Valve (includes fittings)
1	4300764	Shift Label
4	52622	Harness Tubing (48 in.)
1	22940	Switch, Reverse
1	L-2009-03	L-Letter

Part Number: K-4003		Description: Kit, Conversion Lightning Hydraulic CLT HSG, RTLO/F 13-Speed
Comments: Kit used with the conversion from Lightning with Hydraulic Clutch Housing to RTLO/F 13-Speed Series Transmission		
Quantity	Part Number	Description
1	K-3756	Harness Cap
1	S-2578	Master Valve (includes fittings)
1	4300764	Shift Label
1	K-3760	Hydraulic Clutch Housing for FRO Series
1	22940	Switch, Reverse
4	52622	Harness Tubing (48 in.)
1	L-2009-03	L-Letter

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