



**TL113046
INSTALLATION MANUAL
FOR TELMA AF50-90
ON FORD F650
WITH SPL100 U-JOINTS
FROM MODEL YEAR 2017**

Installation Manual Ford F650 TELMA AF50-90 SPL100 relay box 124 UIM
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SCOPE OF THIS MANUAL

This manual covers the installation of Telma into the Ford F650 chassis equipped with Spicer SPL100 driveline. This manual and the kit listed is not compatible with driveline u-joint sizes larger than SPL100. Contact Telma engineering support at engineering@telmacse.com for additional information or help with a Telma installation on a chassis equipped with larger u-joint sizes.

Due to the variations of the Ford F650 chassis which can have many different options which affect the driveline such as engine choice, air or hydraulic brakes, and air or spring suspension, it is necessary to submit an installation drawing request using our [Online Installation Drawing Request Form](#). [TIL03019 Chassis Measurement Templates](#) and [TIL03020 Driveline Retarder Pre-Installation Measurement Guide](#) can be used as worksheets to gather the necessary information. Contact Telma engineering support at engineering@telmacse.com if you have any questions.

SECTION 1 PREPARATION OF THE CHASSIS

1.1 DRIVELINE

Remove the complete drive-shaft assembly after measurements have been taken.

1.2 EXHAUST

Remove the exhaust just past the DPF sensors.



SECTION 2 RETARDER INSTALLATION

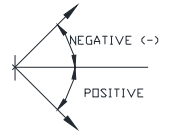
2.1 INSTALLATION KIT TIK10611

PART NUMBER	DESCRIPTION	QTY
LBA101158	AF50-90 12V 1480/1550/1610	1
JZ1007XX-45	Rubber mount kit	1
TIB01017	CONTROL/RELAY BOX BRACKET	2
TIB03100	Control Module Bracket	1
TIB03104	UNIVERSAL CHASSIS BRACKET	2
TIB03107	TOP WASHER FOR AXIAL RETARDER BRACKET	4
TIB07010	AF5 retarder bracket - Zero Degrees	2
TID15005	HARNESS ASSEMBLY 8G_2G TRCM2 with relay box 124	1
TID31020	UIM CAN harness	1
TID31015	CAN extension harness	1
TIF01064	hex head bolt 1/4 - 28 x 1.25 grade 8 yellow zinc for TRCM mounting	2
TIF01066	nylon insert locknut 1/4-28UNF for TRCM mounting	2
TIF03001	all metal lock nut 3/8-24UNF	16
TIF05010	LOCKWASHER 5/16 SPLIT	4
TIF05011	NUT 5/16	4
TIF05012	BOLT 5/16-18UNC x 1-3/4 HEX HEAD G5	4
TIF05013	BOLT 1/2-13UNC x 1-1/2 HEX HEAD G5	2
TIF05014	LOCKWASHER 1/2 MED SPLIT	2
TIF05025	5/8-18 x 2 GRADE 8 HEX FLANGE CAP SCREW	2
TIF05026	5/8-18 GRIP FLANGE LOCKNUT	2
TIF05031	1/2 - 20 X 1.75 flanged head bolt	8
TIF05032	1/2 - 20 flanged nut	8
TIF07001	M12 x 1.75 x 35 Grade 10.9 DIN 933 Black Phosphate 200+ Salt	6
TIG11010	TELMA LIGHT BAR DISPLAY	1
TIG31075	TRCM2a control module	1
VF201382	Trep Washer	6

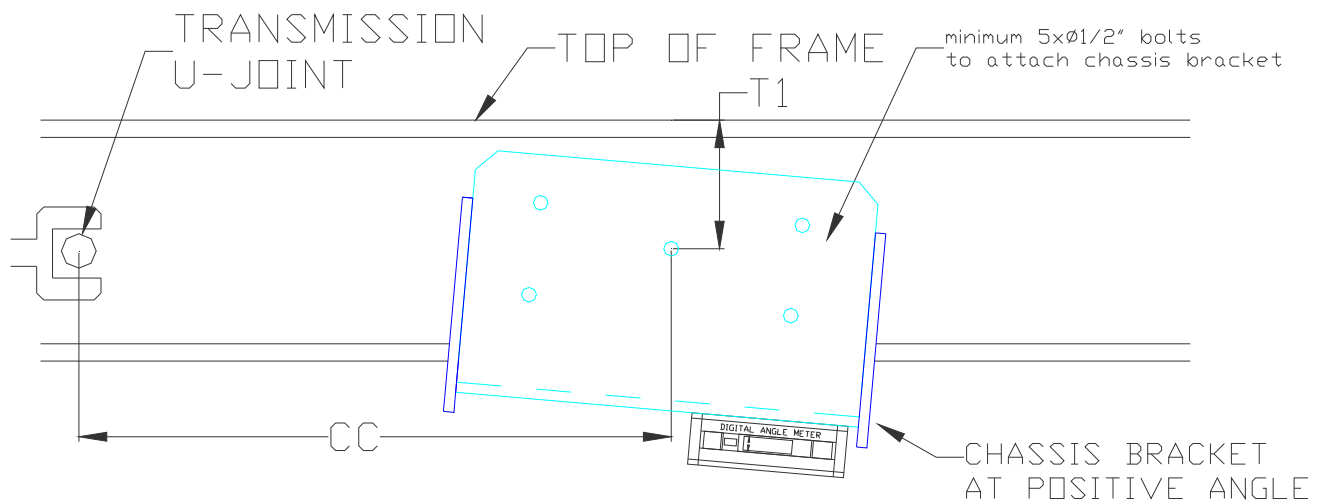
Note1: SPL90 flange yokes 2 x Spicer part number 90-2-19 must be ordered separately.

2.2 INSTALLATION OF THE CHASSIS BRACKETS

- Remove any bolts such as battery box and/or exhaust hanger mounts that will interfere with the chassis bracket mounting
 - Mark the reference hole at dimension T1 from the outside top of the frame down to the reference hole and at dimension CC from the center of the transmission u-joint.
 - Drill a 5/8" hole in the frame and bolt the chassis bracket (TIB03104) against the outside of the frame rail using the reference hole in the bracket.
 - Rotate the bracket to the angle specified on the installation drawing and tighten the reference bolt and nut to 150 lb-ft ($\pm 10\%$) to hold the bracket in place at the correct angle.
- Note: Use an electronic angle meter with 0.1° accuracy (e.g. Mitutoyo Pro 360 950-317 digital protractor). Use "alt zero" to get a frame reference of zero degrees so that all angles are measured with the frame at 0°. In order to maintain the frame reference, do not rotate the angle meter in the horizontal plane after setting alternate zero.
- Drill four 1/2" holes in each chassis bracket and frame rail evenly distributed across the chassis bracket using existing holes when possible. Keep away from fuel and brake lines and secure with the 1/2"-20UNF x 1.75" flanged bolts (TIF05031) and 1/2"-20UNF flanged lock nuts (TIF05032) included in the kit. Tighten to 100 lb-ft ($\pm 10\%$).
 - Drill through the chassis bracket any holes needed for battery box and/or exhaust hanger mounts and reinstall the original bolts that were previously removed.

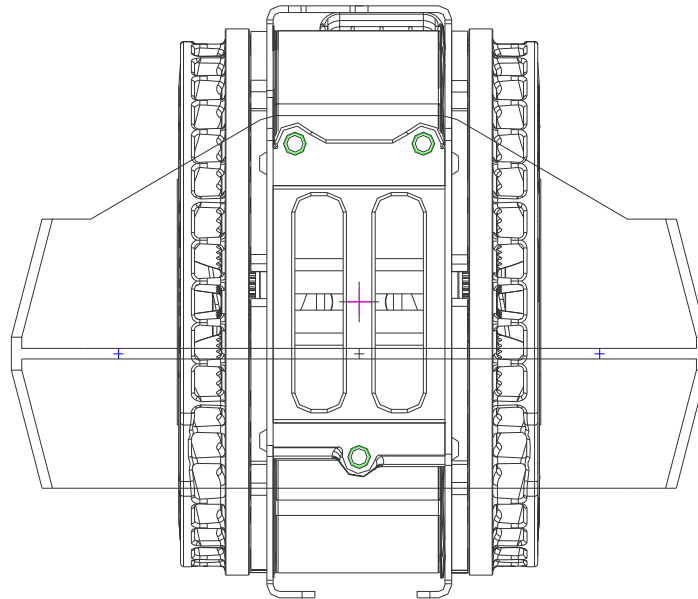


OUTSIDE VIEW DRIVER SIDE FRAME RAIL

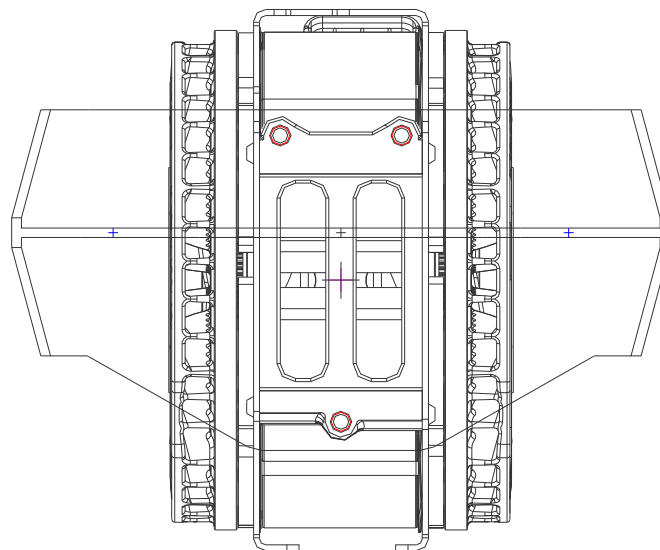


2.3 RETARDER BRACKET INSTALLATION

- Attach the retarder brackets TIB07010 to the retarder as shown below according to the position indicated on the installation drawing.
- Use three of the M12x1.75x35mm bolts with nylon patch lock (TIF07001), and Trep washers (VF201382) provided with the kit to fasten each Telma bracket onto the side of the unit. Tighten bolts to 35 lb.-ft. (± 5 lb-ft).



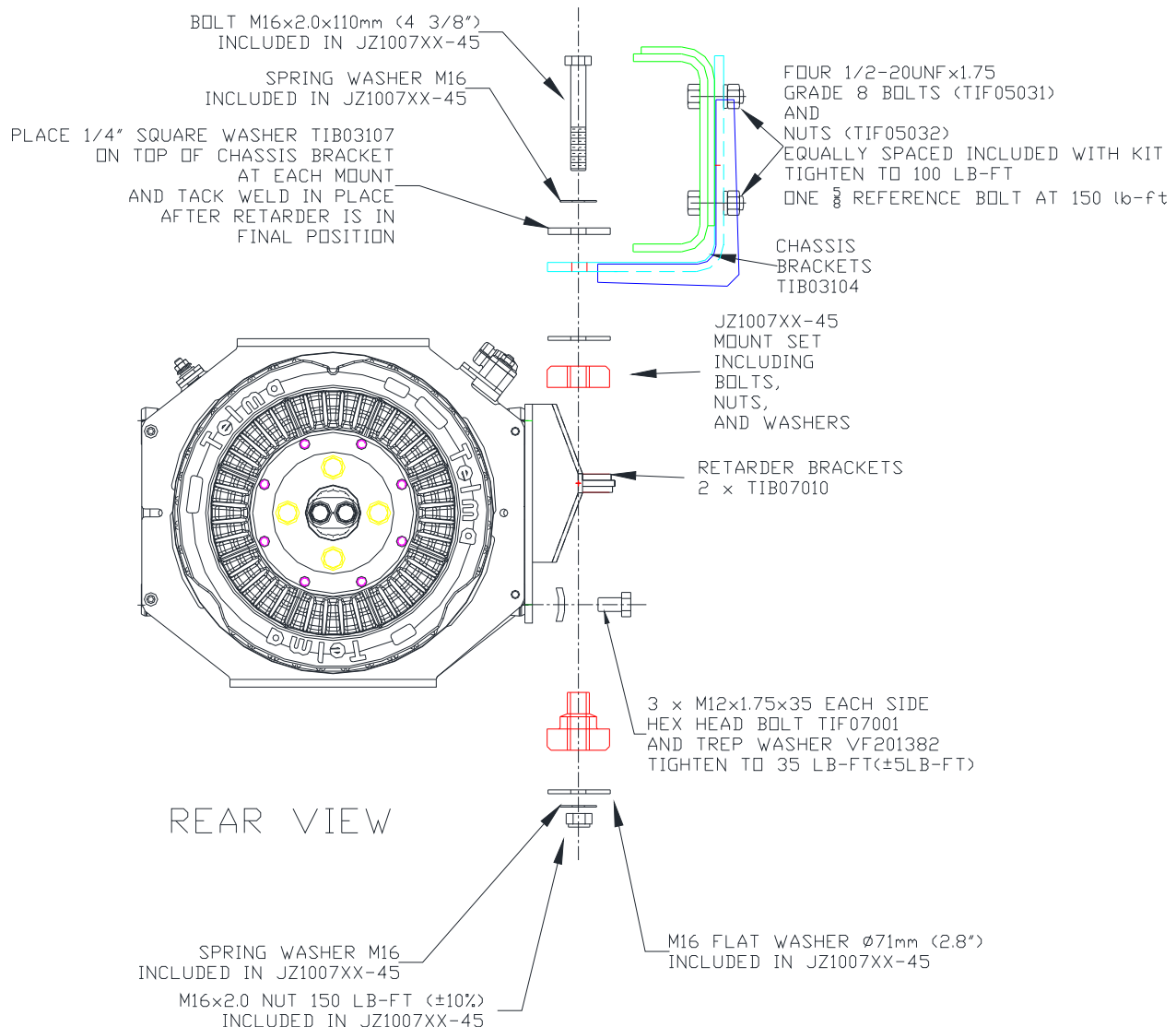
POSITION 1



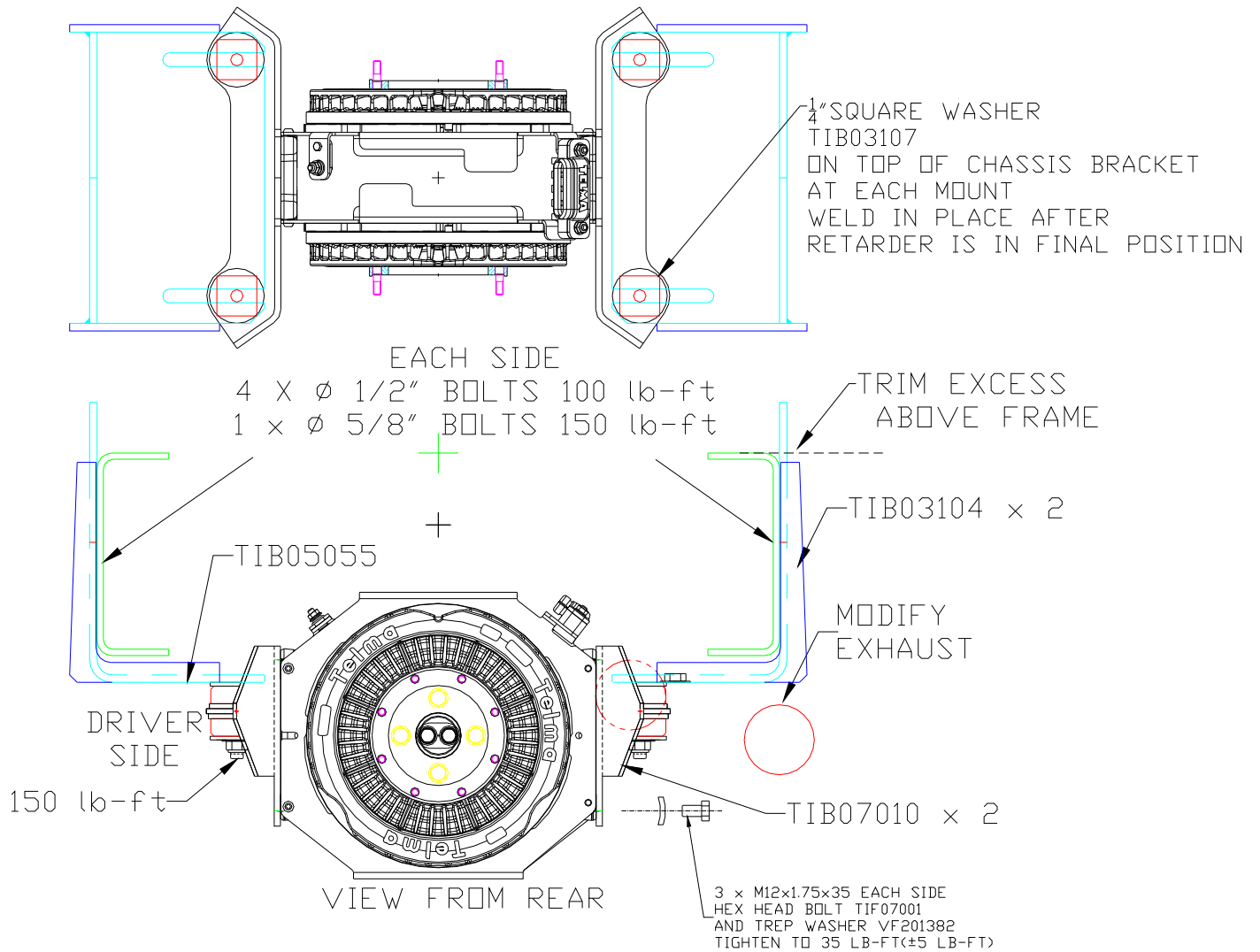
POSITION 2

2.4 INSTALLATION OF THE TELMA IN THE CHASSIS

- Assemble the mounts to the Telma brackets as shown below with the male portion of the mounts on the bottom side of the brackets.
- Use fasteners included in the rubber mount kit JZ1007XX-45 to attach the Telma and bracket assembly to the chassis brackets which were installed previously.
- Install the Telma, equipped with the brackets and rubber mounts to the chassis brackets in the hanging position.
- As shown below, secure the Telma to the chassis bracket using the M16x2.0x110mm long bolts through the holes in the chassis brackets, mounts and retarder brackets. At each mount, install two M16x71mm (2.80") diameter flat washers (one on each end of the rubber mount, one M16 spring washer under the head of the bolt and another between the large diameter flat washer and the M16 all metal lock nut. Tighten to 150 lb.-ft. ($\pm 10\%$).
- Place $\frac{1}{4}$ " square washer TIB03107 on top of chassis bracket at each mount and tack weld in place after retarder is in final position.



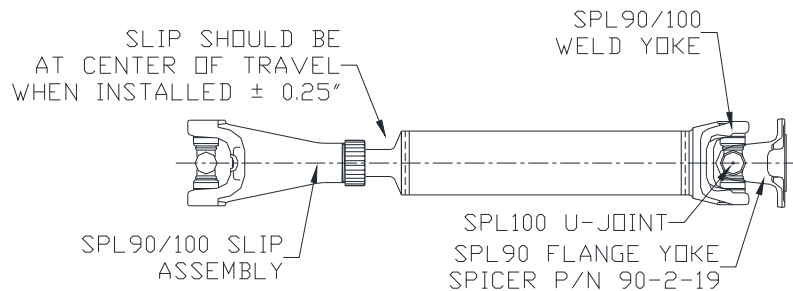
2.5 END and TOP VIEW - TELMA INSTALLED IN CHASSIS



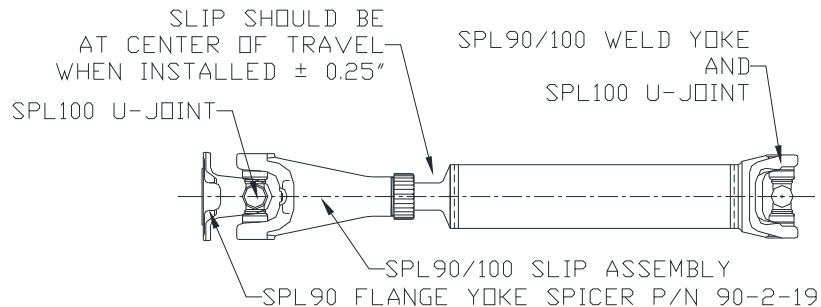
2.6 DRIVE SHAFT MODIFICATION AND INSTALLATION

- A slip assembly is required on each side of the Telma. The slip position should be at center of slip travel when the shaft is installed.
- Refer to chassis manufacturers guidelines for proper drive shaft manufacture, balance, straightness, and critical speed limits.
- Refer to the installation drawings for approximate shaft lengths.
- Always verify proper shaft lengths before modification.
- Connect the flange yoke to the Telma coupling flange using 3/8-24UNF all metal locknuts TIF03001.

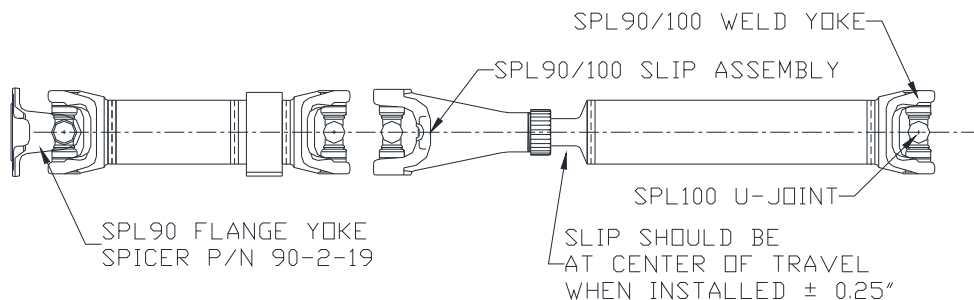
FRONT DRIVE SHAFT 1-1 OR 1-2 CONFIGURATION



REAR DRIVE SHAFT 1-1 CONFIGURATION



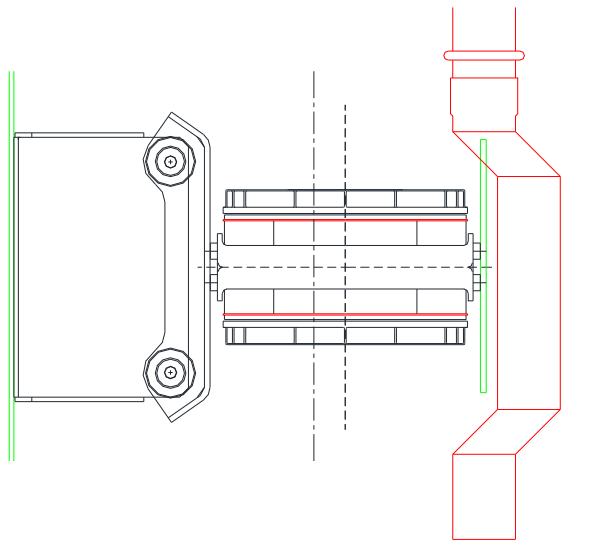
REAR DRIVE SHAFT 1-2 CONFIGURATION



FOLLOW DANA-SPICER GUIDELINES PERTAINING TO MANUFACTURE, STRAIGHTNESS, DYNAMIC BALANCING AND CRITICAL SPEED.
ALWAYS VERIFY SHAFT LENGTHS BEFORE MODIFICATION

2.7 EXHAUST MODIFICATION

If necessary, modify the exhaust to go around the Telma (for example four 45° bends).



SECTION 3 CONTROL SYSTEM COMPONENTS INSTALLATION

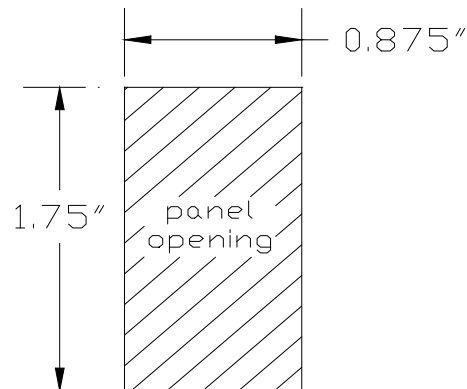
3.1 RELAY BOX MOUNTING

- Mount the relay box brackets 2 x TIB01017 to the relay box using the 5/16" bolts, nuts, and lock washers supplied in the kit.
- Mark and drill two 1/2" holes in the frame using the relay box and bracket assembly as a guide. Install the relay box and bracket assembly to the inside of the left frame rail using the 1/2" bolts and lock washers supplied in the kit.
- Tighten the four 5/16" bolts to 17 lb-ft ($\pm 10\%$) and the two 1/2" bolts to 75 lb-ft ($\pm 10\%$).

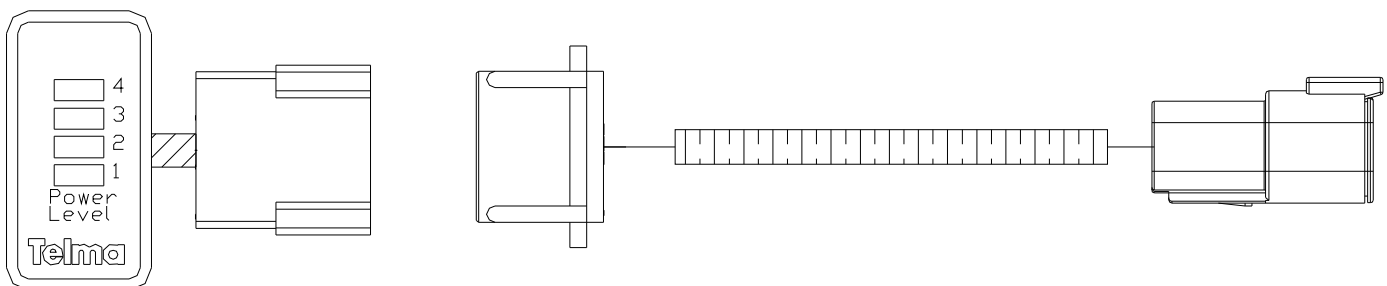
NOTE: Brackets TIB01017 are not needed if the relay box is to be mounted to the outside of the frame rail.

3.2 LIGHT BAR INSTALLATION

- The Light Bar should be mounted so that it is easily visible to the driver.
- Make a rectangular hole 7/8" wide x 1 3/4" tall in the lower dash to the right of the steering column or install the Light Bar in an existing console receptacle.
- Plug the Light Bar harness TID31014 on to the Light Bar TIG11010.
- Feed the harness with the Light Bar connected through the hole.
- Plug the Light Bar into the hole



PANEL OPENING

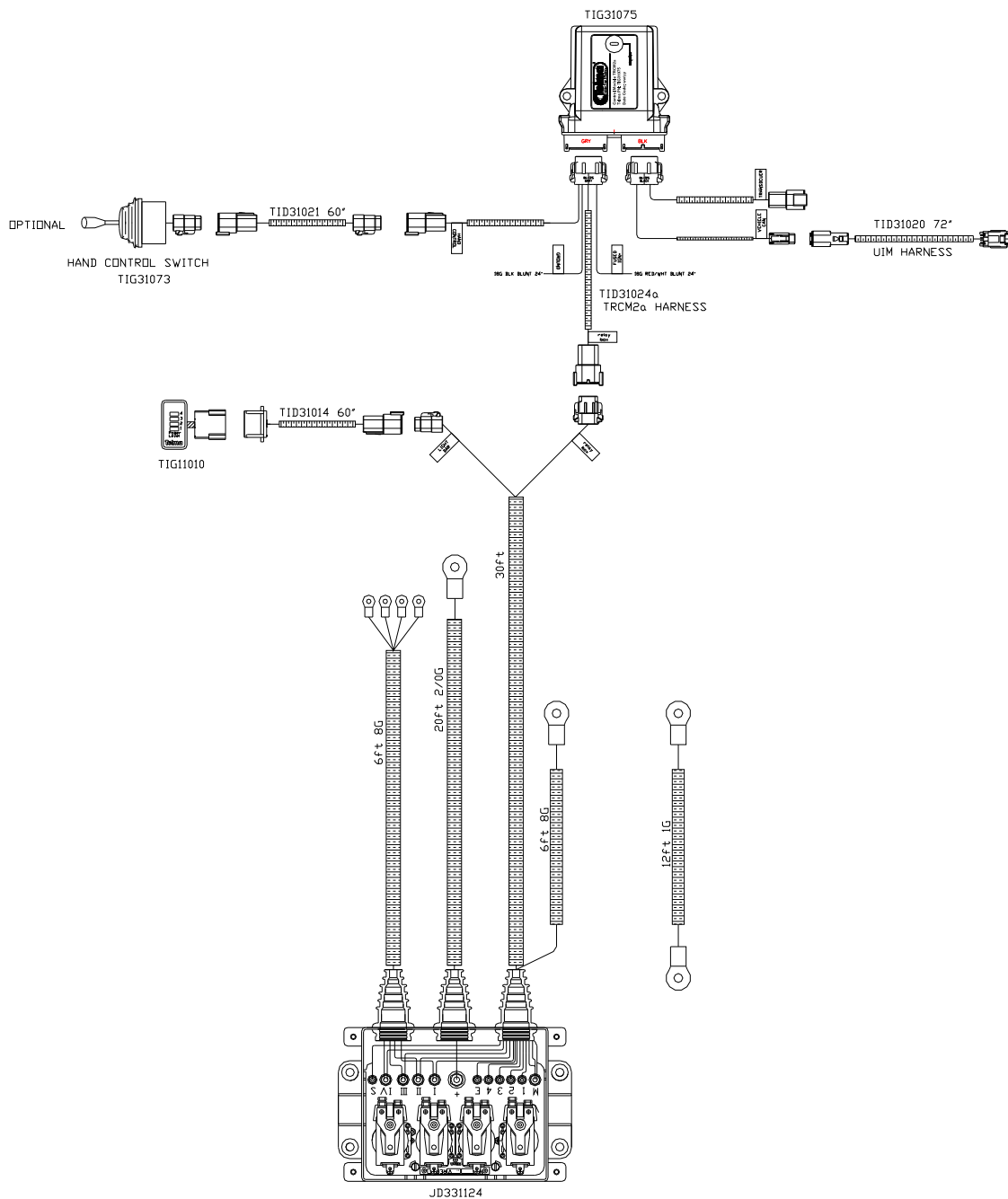


3.3 TRCM INSTALLATION

Mount the TRCM under the driver side dash using bracket TIB03100 high enough and with wiring oriented to be away from driver interference.

SECTION 4 WIRING HARNESS INSTALLATION

4.1 HARNESS ASSEMBLY LAYOUT



4.2 POWER HARNESS INSTALLATION

- From the relay box, route the Telma power connection and ground harness along the inside of the frame rail and up over the top along the middle of the Telma.
- Connect the 8G orange, blue, yellow, and brown wires to the connecting block at the top right corner.
- Connect the 8G relay box ground cable and the 2G Telma main ground cable to the insulated ground terminal at the Telma top left corner. Coat the terminals with anti-corrosion paint or body undercoat after the connections are made.
- Secure the harness to the center of the Telma brackets with rubber coated cable clamps. The harness should be secured along the centerline of the Telma and as far away as possible from either rotor to avoid heat damage to the harness. No cables should cross the heat outlets in the periphery of the rotors.
- Connect the black 2G ground cable and to negative terminal of the battery pack or frame mounted battery pack ground point. Secure the cable with rubber coated cable clamps.
- Connect the red 2G power positive cable to the positive terminal of the battery pack or battery disconnect switch. Secure the cable with rubber coated cable clamps.



GROUND CONNECTION AT
TOP LEFT CORNER

SECURE HARNESS TO
RETARDER USING RUBBER
COATED CABLE CLAMPS



POWER CONNECTIONS AT
TOP RIGHT CORNER

4.3 TRCM HARNESS INSTALLATION

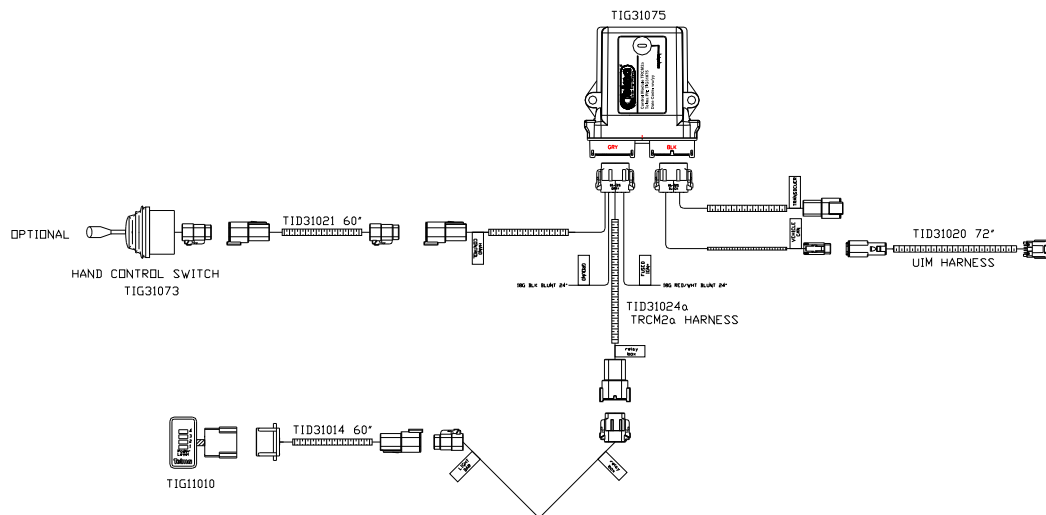
- Follow the OEM harness and route the control harness equipped with two plugs labeled “relay box’ and “light bar” along the inside of the left frame through the firewall and into the cab on the left side. Connect the main harness to the cab harness at the connector labeled “TO RELAY BOX”.
- Find the TRCM2a harness TID31024 and insert the gray and black 12way plugs into the module.
- Open the lower dash panel on the passenger side and find the Universal Interface Module (UIM) plug. Contact Telma technical department if the optional UIM is installed.



- Plug the Telma UIM harness TID31020 into the UIM plug. Route the harness across to the left side and connect to the TRCM2 harness plug labeled “vehicle CAN”. If necessary, use the CAN extension harness TID31015 to reach the TRCM2.
- Plug the connector of the control harness labeled “relay box” into the connector of the TRCM2 harness labeled “relay box”.
- Plug the connector of the control harness labeled “light bar” into the light bar harness previously installed.
- Connect the red/white wire labeled “ign+” to 5 amp fused ignition source.
- Connect the black wire labeled “ground” to a good chassis ground source.

NOTE1: If the hand control option has been specified by the customer the hand control switch TIG31073 can be installed using the hand control harness TID31021.

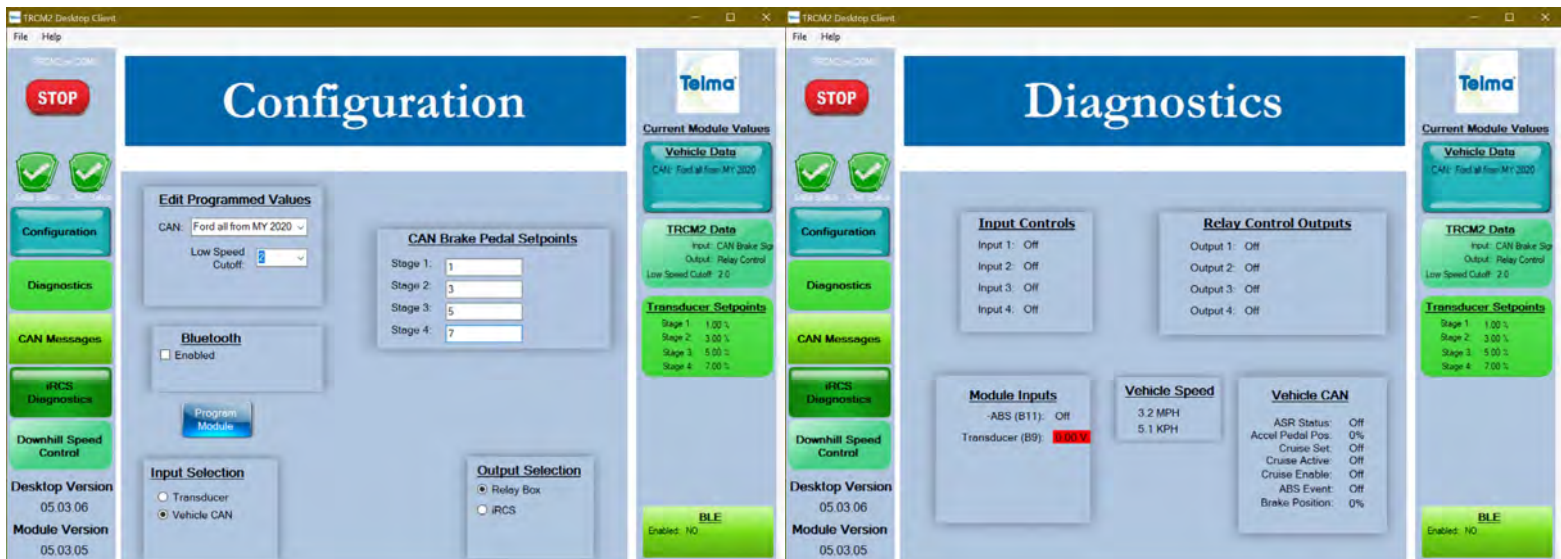
NOTE2: The transducer connector in the TRCM2 harness is not used for this application.



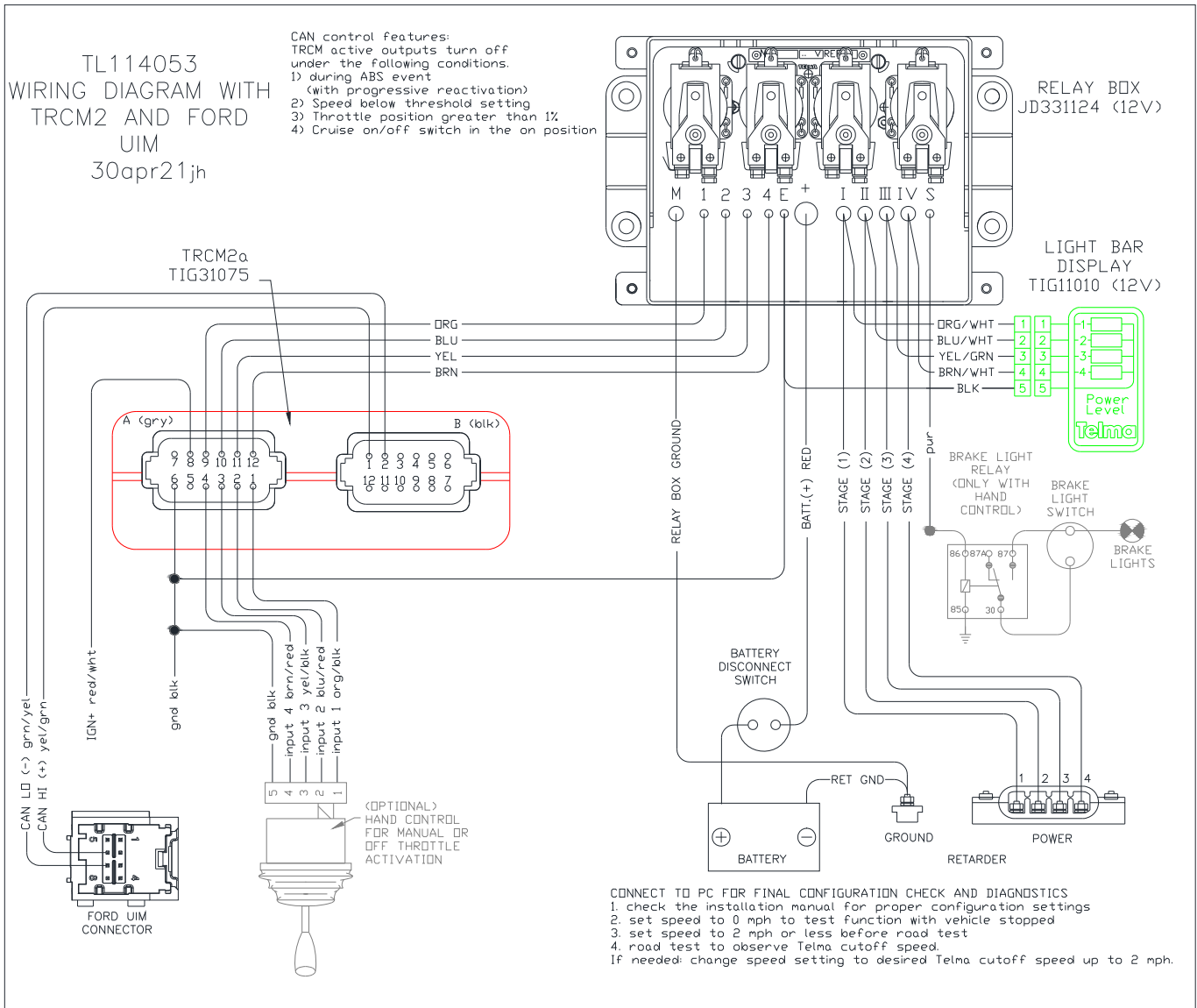
4.4 TRCM2 CONFIGURATION

After installation is complete, connect the PC to the TRCM2 using a usb-a to usb-c cable to configure and test the system as follows.

- Do not turn on the vehicle ignition or start the vehicle at this time.
 - Plug the usb cable into the computer
 - Open the TRCM2 Telma software. The [TRCM2 Software](https://telmausa.com/Downloads/TRCM2.exe) is a free download from <https://telmausa.com/Downloads/TRCM2.exe>
 - Plug the usb cable into the TRCM2 usb-c board connector through the hole in the TRCM2 housing. In the configuration section of the TRCM2 software just above the green start button you should see “TRCM2 connected to COM”.
 - Left click on the green start button. Data Status should change to a green check mark.
 - Under “Edit Programmed Values” choose the CAN drop down “Ford all from MY2020” and the “Low Speed Cutoff” drop down to 0mph.
 - Under “Input Selection” choose “vehicle CAN”.
 - Under “Output Selection” choose “Relay Box”.
 - Under “CAN Brake Pedal Setpoints” type the following settings stage 1=1, stage 2=3, stage 3=5, and stage 4=7. Do not enable “Bluetooth” or “Dual Config”.
 - Left click on the blue “Program Module” button and check on the right side that “Current Module Values” change to the settings you have chosen.
 - Start the vehicle and verify that “CAN Status” shows a green check mark.
 - Left click on the “diagnostics” tab.
 - Push on the brake pedal and observe that
 - 1) “Brake Position” in lower right corner changes from 0% to some higher number.
 - 2) “Relay Control Outputs” stages 1-4 turn on progressively as brake pedal is pushed further (speed set to zero). All four stages should be on when “Brake Position” box reaches 4%.
 - Release the brake pedal and left click on the Configuration tab.
 - Choose the “Low Speed Cutoff” of 2.0.
 - Left click on the “Program Module” button and verify that under “Current Module Values” that Low Speed Cutoff has changed to 2.0 mph and that all other settings are still at the settings mentioned above.
 - Close the TRCM2 software
 - Disconnect USB cable from module
 - Turn off vehicle ignition.
- Congratulations, you are finished configuring TRCM2.



4.5 WIRING DIAGRAM



SECTION 5 RECOMMENDED TOOLS

- Transmission Jack
- Heavy duty drill motor
- Standard assortment of mechanics hand tools
- Vehicle hoist, pit, or floor jack with stands
- Electrical terminal crimping pliers for use with non-insulated terminals
- Electronic angle meter with 0.1° accuracy (e.g. SPI Pro 360 digital protractor)



SECTION 6 INSTALLATION FOLLOWUP CHECKLIST

TL133010
Revised
21jun16

INSTALLATION FOLLOWUP CHECKLIST



Retain a copy of this checklist in the chassis VIN record
Record Telma serial number in electronic VIN record

CHASSIS #:
CHASSIS MAKE/MODEL:
Telma part number:
Telma Serial number:
End Customer:
INSTALLER:
INSPECTION DATE:
INSPECTED BY:

	√	X	COMMENTS
ELECTRICAL			harness properly routed along center of Telma away from rotors and secured with cable clamps to retarder bracket
			minimum 1/4" clearance between chassis bracket and retarder bracket
			harnesses routed on inside of frame rail away from heat sources, sharp edges, etc. and secured with rubber coated metal cable clamps
			correct cable eyelet size at battery / disconnect switch
			relay box mounted vertical with wiring exiting from the bottom and can be easily accessed
			Telma battery power cable connected to battery switch or to battery "+" terminal and is protected with corrosion inhibitor
			Telma battery ground cable connected to frame rail bare metal surface where battery pack is grounded or directly to battery ground post and protected with corrosion inhibitor
			relay box ground connected to retarder ground post
			electrical connections (weatherproof connectors, no quick splice, avoid butt connectors)
			Light Bar Display installed correctly, visible to driver, and operates properly
			Telma Control Module accessible and secured with screws
			Telma foot control shuts off automatically at 1mph
			Telma activates when moving and brakes are applied
			Connect PC to TRCM to check proper configuration and function
MECHANICAL			All fasteners are paint marked after tightening to proper torque
			cables, hoses and air lines are at least 4" from rotors or heat shield installed
			drive shaft weld quality, slip installed on each side of Telma at center of travel, balance, u-joints same quality as OEM
			Transmission angle measurement
			Telma angle measurement
			First shaft angle and installed length measurement
			Second shaft angle and installed length measurement
			Third shaft angle and installed length measurement
			Fourth shaft angle and installed length measurement
			Axle angle measurement
		drive shaft lengths/angles, transmission, Telma, and axle angle conform to drawing	
		Flange yokes are in same plane	

SECTION 7 INSTALLATION DRAWINGS

(SUBMIT AN INSTALLATION DRAWING REQUEST ON OUR
WEBSITE AT <https://telmausa.com/drawing-request>)