UNITED STATES POSTAL SERVICE

2- TON DELIVERY TRUCK

SERVICE MAINTENANCE MANUAL

MORGAN OLSON®

1801 S. Nottawa Street
Sturgis, MI 49091
Phone 800-233-4823
Fax (616-659-0499)
www.morganolson.com
www.morganolsonparts.com

P/N 43004536

INTRODUCTION

This catalog has been prepared to assist the U.S.P.S. In the maintenance of the Morgan Olson 2-Ton delivery truck. Inquiries on items found or not found in this manual may be made through the address and or phone numbers listed below.

Morgan Olson
1801 S. Nottawa
Sturgis, MI 49091
1-800-477-8287
(Customer Service/Fleet Warranty)

For Parts Ordering:
1-800-233-4823
1-616-659-0499 (Fax)
(Service Parts)

NOTE: USE ONLY GENUINE MORGAN OLSON PARTS
USE OF NON OEM PARTS MAY VOID YOUR WARRANTY
AND/OR VIOLATE FMVSS STANDARDS

Latest version of all documents available at;
www.morganolsonparts.com/t-usps_manuals.aspx
Access code: usps2016

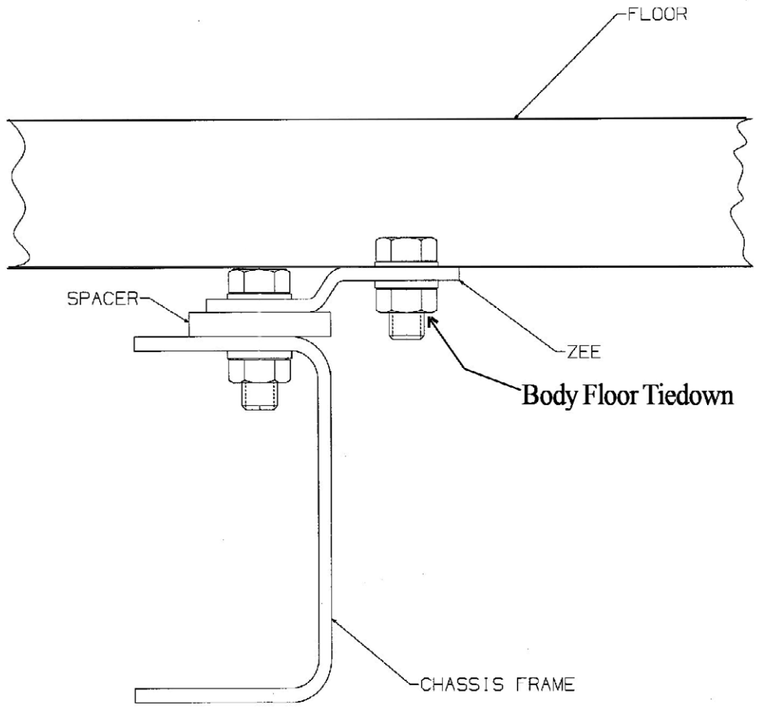
Contents

CONFIDENTIAL NOT FOR DISTRIBUTION

Body Tie/Downs

Tie/Down Check:

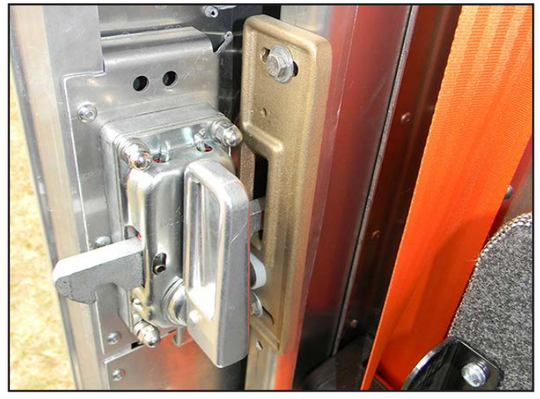
The floor of the truck is fastened to bolsters that extend the length of the floor.
The lower flanges of the bolsters are mounted to the chassis frame rails.
Both sets of fasteners are torqued to specifications.
All cab and body tie/downs should be checked after 3 months and annually.



Side Door

Side Door

For smooth operation the locking mechanism should be oiled every 3 months or as needed.
Grease should also be added at the contact points of locking mechanism arm and striker.
(At opened and closed positions.)



Side Door Removal:

1. Remove screws fastening down the lower door track but leave the track in position.
2. Remove the Phillips screws and door pocket cover plate located in the upper rear corner of the door pocket.
3. Remove the 4 fasteners and the door handles (inner and outer).
4. Using a socket wrench, remove the bolts fastening the door and hanger assembly.
5. To simplify door removal, remove the grab handle located forward of the door.
   *Fold side view mirror back.
6. Holding the top of the door in position, pull out on the bottom front corner of the door until it clears the body of the truck. Then tilt the top of the door down and out and remove the door.

Weather Seal Removal:

1. The forward and rear weather seals are installed simply by sliding into a mated part. To remove simply pull straight out from the top of the door or door frame. Install by feeding into the mated part and sliding into place.

Handle Mechanism Removal:

1. To remove the door handles simply remove the 4 mounting screws. Pay special attention to spacer locations. You can then remove the inside and outside handles. Remember when installing the handles, position of the spacers identical to the way they were at removal.

Door Track (Upper) Removal:

1. The upper track is mounted to the header channel. Remove the nuts, and the track. Reinstall by reversing the removal sequence.

Wear Strip (Lower) Removal:

1. Remove side door.
2. Remove existing rivets.
3. Replace wear strip and rivet in place.

Side Door Installation:

1. Tilt the top of the door in place first. Now position the bottom of the door into the lower door track, which is in position but not fastened down.
2. Put 1/8” shims between the lower door track and the wear strip.
3. Mount door to the hanger assembly.
4. Install door handles. See page 8.
5. Mount cover plate on upper rear door pocket.
6. Mount grab handle forward of door. *Re-adjust mirror.
7. For proper door adjustment see page 10.

Side Door Adjustment:

1. Loosen all nuts on the top of the slotted upper door track.

2. Loosen the 3 screws fastening down the lower door track.

3. The rear holes of the lower door track are oversized to allow for adjustment. Only the rear portion of the track can be adjusted. The forward hole of the lower track is not oversized because the door must retain its forward position to ensure proper alignment when the door is closed.

4. With the door closed and engaged in the forward strike, adjust the upper track for uniform lateral placement of the door in the forward post seal. Snug the forward bolt of the upper door track.

5. With the door open and engaged in the rear strike, the rear portion of the upper and lower tracks can be adjusted laterally to ensure proper alignment with the rear striker.

6. When the door is positioned, tighten a few of the fasteners in the upper and lower tracks. Operate the sliding door to ensure that it slides and latches properly.

7. When the door is operating properly, tighten all the remaining fasteners in the upper and lower door tracks.

8. Replace any broken studs with .25 - 20x1.00 truss head screw.

9 See figure 1 on the following page.

Door Latch Adjustment:

1. The door latches (strikers) and the mounting brackets provide for adjustment in a variety of directions.

2. Once the door has been adjusted to slide smoothly, then adjust the strikers for proper latch operation.

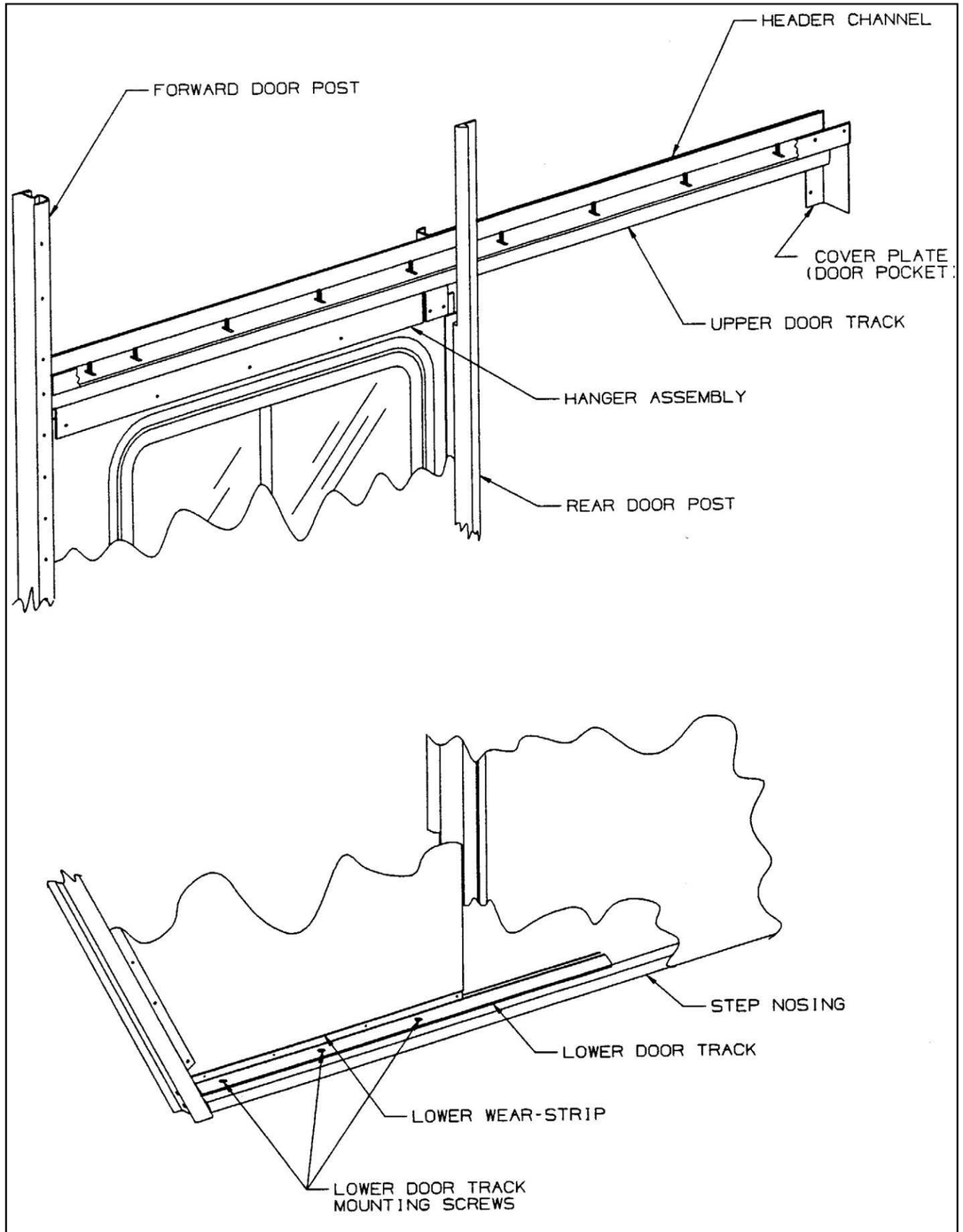


Figure 1

Bulkhead Door

Bulkhead Door:

*NOTE: Where grease is required use a **lithium based.**

1. The latch should be greased to prevent sticking. Grease should be applied at contact points of the latch and striker for smooth operation. This should be done every 3 months.

Rear Door

Rear Roll-Up Door:

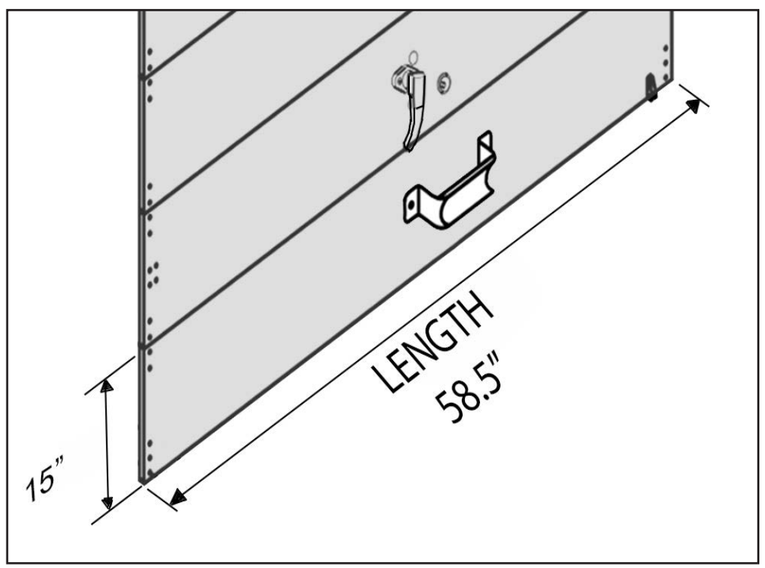
1. Apply oil to the roller shafts and locking mechanism every 6 months.
2. Perform a visual inspection daily checking the lifting mechanism cables and the door strap for fraying.
3. Perform a visual inspection monthly checking for damaged parts replace immediately to prevent wear and fatigue on other components.
4. Refer to Trans global Door Company instructions for proper rear door spring adjustment and/or replacement.

Rear Door

ROLL-UP DOOR SERIAL NUMBER LOCATION

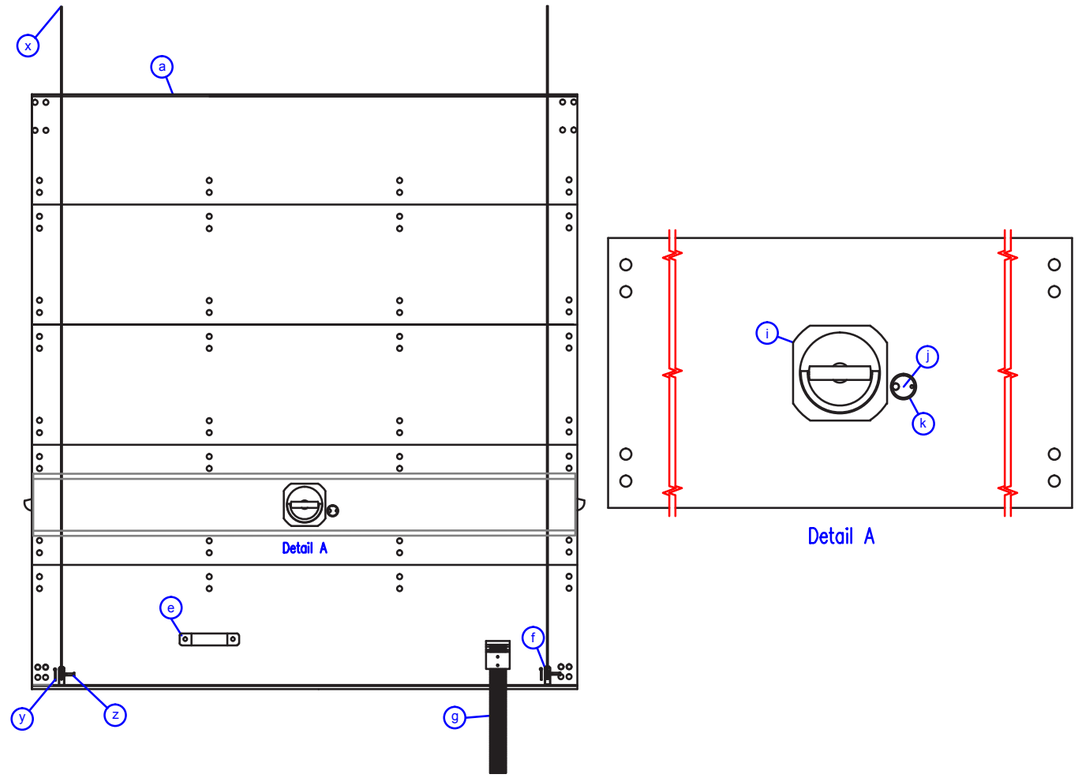
WHEN ORDERING PARTS FOR ROLL-UP DOORS,
PLEASE PROVIDE THE FOLLOWING INFORMATION.
THE SERIAL NUMBER LOCATED ON THE INTERIOR TOP PANEL ROADSIDE EDGE.
THE LENGTH AND HEIGHT OF THE DOOR PANEL(S) TO BE ORDERED.

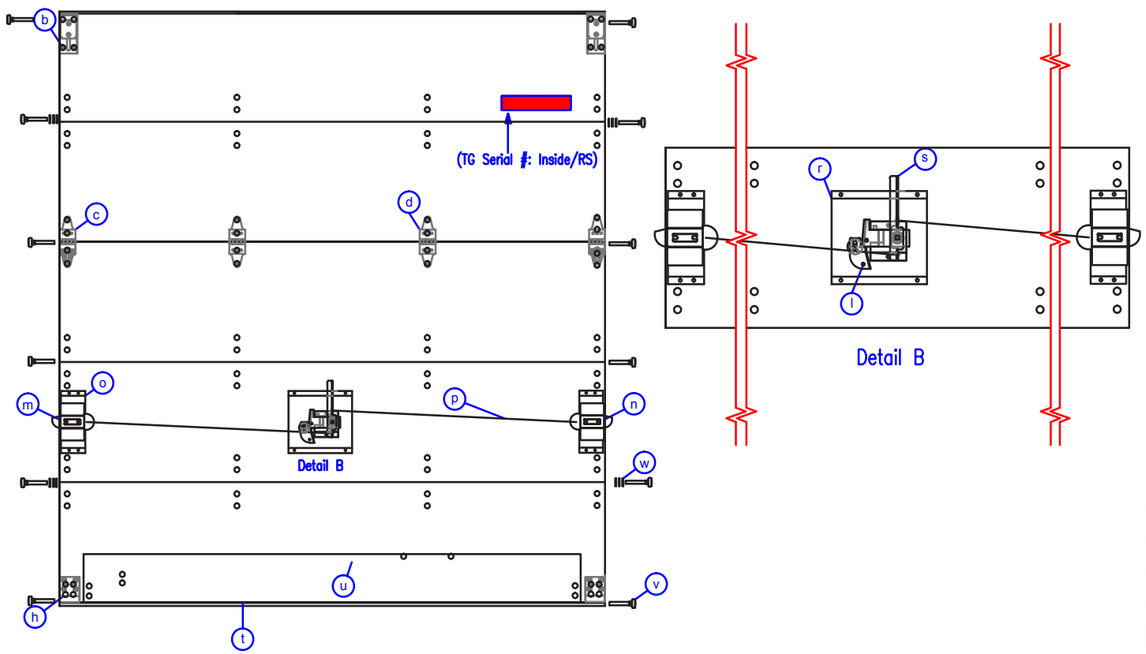
IN THE EVENT OF A DAMAGED, NU-READABLE OR MISSING SERIAL NUMBER,
PLEASE TRY TO PROVIDE THE COMPOSITION DETAILS OF THE DOOR PANEL.
(PLASTIC COATED, ALUMINUM CLAD, PLYWOOD, ETC.)



CONFIDENTIAL NOT FOR DISTRIBUTION

Rear Door





CONFIDENTIAL NOT FOR DISTRIBUTION

Rear Door

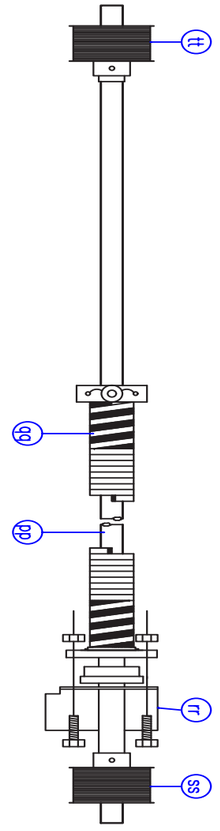
Attached Hardware		
ITEM	Part #	Description (rivet count)
a	TG-70001-.25	Aluminum Top Panel Seal W/ Extended Lip (4- 5/8" SS)
b	TG-6944	Top Closure Complete (8 - 3/4" SS)
c	TG-HD1209-A	HD End Hinge (12- 11/16", 12- 13/16")
d	TG-HD15	Center Hinge (12- 11/16", 12- 13/16")
e	TG-1715	Lift Handle Black (2- 5/8" SS)
f	TG-4004	Cable Anchor Brkt (4 - 5/8" SS)
g	TG-9723-12-2	12" Looped Pull Strap, Black (2- 7/8" SS)
h	TG-5600-2.5-6-1	3 Stud Bottom Fixture .5" & .25" Composite Door (6 - 5/8" SS)
i	TG-EGPSESSSNL-88	D-Ring, non-locking Handle w/ extended shaft, R/Door
j	TG-69011	Best Cylinder Lock Cylinder, R/Door
k	TG-69011-EXT	Best Cylinder Lock Cylinder Collar, .25"
l	TG-69007	Cam for Best Cylinder
m	TG-70472-1	2-PT End Latch CS
n	TG-70472-2	2-PT End Latch RS
o	TG-70194.01	Lock Cover Base - End
p	TG-39545	Cable Assem 2-PT Lock with (2) Stops and Washer
r	TG-70194.08	Latch Base Center - .91" Off, D-Ring .25" & .5"Comp, 1" Track
s	TG-69959	Center Control Complete
t	TG-70497-.25	.25" Composite Bottom Seal 4-PT 98.25" Length (pcs) Rubber
u	TG-61192-85	85" long Bottom Angle for .25" Composite (4 - 5/8" SS)

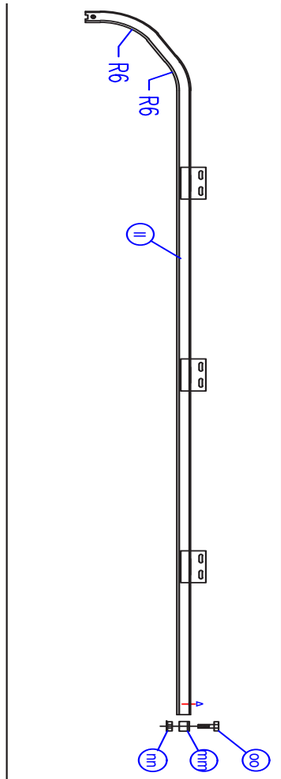
Packaged Loose Hardware		
ITEM	Part #	Description
v	TG-61174	1" Steel Rollers
w	TG-80020	Spacer Washers
x	TG-909514	95" 7x19 Stainless Steel Cable 1/4" Metal Eye
y	TG-61026	1/4" x 1" Cable Anchor Pin
z	TG-80401-316	3/32" x 1" Cotter Pins
(1pr)	TG-5377-80	Push In Side Seal - Cut to 75 1/2"

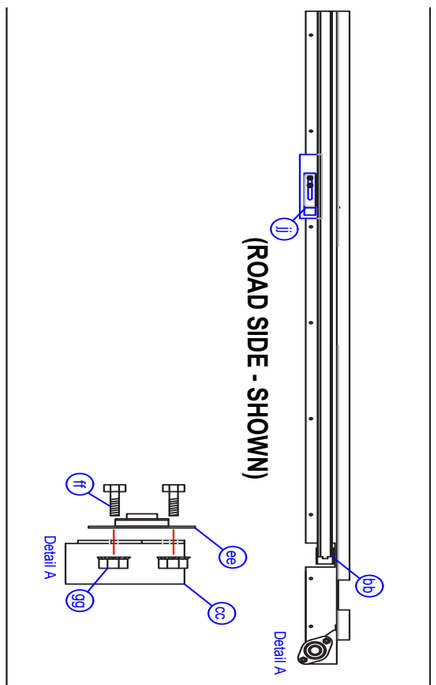
Part #	Description (rivet count)
TG-87000-11	1/4" x 11/16" Aluminum Buck Rivets
TG-87000-13	1/4" x 13/16" Aluminum Buck Rivets
TG-89291-26	5/8" Stainless Steel Rivets
TG-89291-28	3/4" Stainless Steel Rivets
TG-89291-30	7/8" Stainless Steel Rivets
TG-89186-27-SS	1/4 - 20 x 1/4" SS Carriage Bolt
TG-89231-3	1/4 - 20 Nylok
TG-89186-26	12-24 X 1/2" Brass FSLMC (Fastenal # 1175648) For Best Cylinder

CONFIDENTIAL NOT FOR DISTRIBUTION

Rear Door







Vertical Track		
	Part #	Description
aa	TG-49192-1-47106270	1" Vertical Track Assm. - LH/CS (Morgan Olson # 47106270)
bb	TG-49192-2-47106270 (Shown)	1" Vertical Track Assm. - RH/RS (Morgan Olson # 47106270)
cc	TG-59304-2 (Shown)	4 1/8" x 4" Right Anchor Bracket - Clipped
dd	TG-59304-1	4 1/8" x 4" Left Anchor Bracket - Clipped
ee	TG-51038	Bearing Assembly
ff	TG-89186-4	5/16" x 1" Hex Head Bolt
gg	TG-89231-4	5/16" -18 Kep Nut
hh	TG-69953-1	Catch Mounting Plate - LH (CS)
ii	TG-69953-2 (Shown)	Catch Mounting Plate - RH (RS)
jj	TG-69951	Lock Catch

Horizontal Track		
	Part #	Description
kk	TG-49622-1-47106270	Horizontal Track - STD LH / CS (Morgan Olson # 47106270)
ll	TG-49622-2-47106270 (Shown)	Horizontal Track - STD LH / CS (Morgan Olson # 47106270)
mm	TG-69353	Head Protector Yellow
nn	TG-89231-2	1/4" - 20 Kep Nut
oo	TG-89186-5	1/4" x 1 3/4" Hex Head Bolt

Counter Balance Parts		
	Part #	Description
pp	TG-99987	.995 X 11 Ga X 87" Tube (Cut to 68 1/4")
qq	TG-51065-.192X22.25	Spring Assembly .192 x 1 3/4" x 22.25" (RH) Coated
rr	TG-51036-2	4 1/8 x 5 Right Hand Anchor Bracket
ss	TG-59157-4	Cable Drum RH
tt	TG-59157-3	Cable Drum LH
	TG-51078	Silencer Boot

Counter Balance Complete Assembly		
	Part #	Description
	TG-59174-.192X22.25X62 Shaft	CB Assm w/ .192 x 1 3/4 x 22.25" Spring W/ 62"

CONFIDENTIAL NOT FOR DISTRIBUTION

Gas Spring

Gas Spring Replacement:

1. With the hood safely propped, remove the upper and lower retainer clips. Once the clips have been removed a slight tap will remove the gas spring from the ball studs.

2. For safety reasons, when replacing the gas springs use only Morgan Olson OEM replacement parts.

Heater

Motor and Fan Replacement:

1. The heater is mounted to the right hand dash panel.

2. With the power to the motor off, disconnect the motor leads.

3. Remove motor mounting screws. Remove the motor and the impeller wheel.

4. Take out the set screw to remove the impeller wheel (squirrel cage).

5. For installation, reverse the sequence.

Plenum

Plenum Replacement:

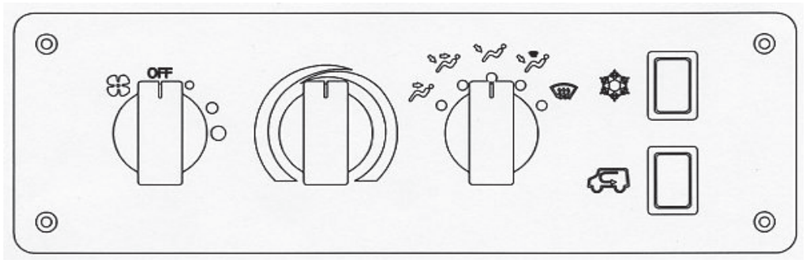
1. Detach air inlet hose from plenum.
2. Disconnect wiring harness at heater box and instrument panel harness.
3. Remove fasteners from plenum diffuser (located on top of the windshield rail).
4. Remove the fasteners located on top of the windshield rail.
5. Installation sequence is opposite of removal.

SERVICING AND TROUBLESHOOTING

A/C-HEATER-DEFROSTER

CONTROL PANEL OPERATION

BLOWER CONTROL The BLOWER CONTROL provides three choices of air velocity in every operating mode. When the blower switch knob is rotated fully counterclockwise (with the knob indicator pointing straight up) the blower is turned OFF. Rotating the knob clockwise will progressively increase the air velocity.



TEMPERATURE CONTROL The TEMPERATURE CONTROL KNOB controls the discharge air temperature in all operating modes. Turning the knob to the right (red zone) increases temperature; turning the knob to the left (blue zone) decreases air temperature. Temperature control is achieved through the regulation of engine coolant through the heater coil.

MODE SELECTION SWITCH

Dash When this mode is selected, all air is discharged through the dash louvers.

Bi-Level With this setting, air is discharged through the dash louvers and onto the floorboard. This is the ideal mode for rapid warm-up in cold weather.

Floor This mode will direct all air to the floorboard. This mode is most frequently selected when heating is required.

Floor/Windshield When this mode is selected, air is discharged onto the floorboard and onto the windshield.

Defrost/De-fog This mode will direct most of the air to the windshield and provides for rapid defrosting of the outside of the windshield and defogging of the inside surface. A reduced volume of air is provided for floor heating.

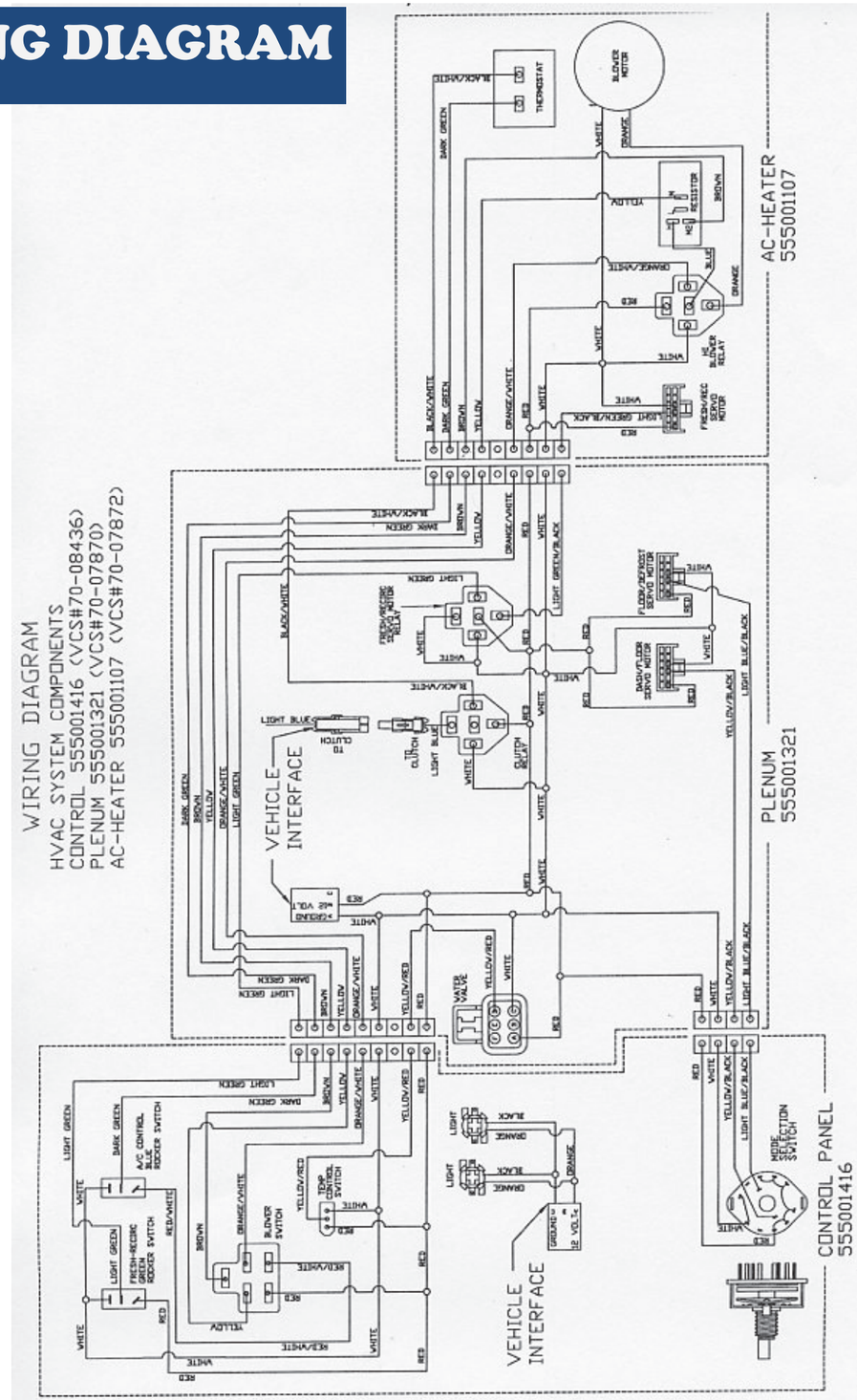
A/C CONTROL

The blue rocker switch will engage the A/C system compressor when the upper edge of the switch is pressed. Pressing the lower side of the switch will turn the A/C compressor off.

AIR SOURCE CONTROL

The green rocker switch permits the driver to re-circulate cabin air or introduce outside air into the HVAC system. Pressing the upper edge of the green switch will block outside air and permit the re re-circulation of inside air. Pressing the lower edge of the switch will introduce outside air.

WIRING DIAGRAM



CONFIDENTIAL NOT FOR DISTRIBUTION

TROUBLESHOOTING

SECTION A: AIRFLOW PROBLEMS

PROBLEM A-1, *No air flow, blower does not operate*

POSSIBLE CAUSE #1 ~ Faulty Blower Motor

CORRECTIVE ACTION ~ With ignition turned ON, unplug the 2-pin connector at the blower motor. Check the orange wire for +12 volts and the white wire for a fully grounded circuit. If power is present and the circuit grounded, remove the motor and wheel from the blower housing. Inspect for any evidence of entrapped debris or a broken blower wheel that might have prevented rotation. If no such evidence exists, replace the blower motor.

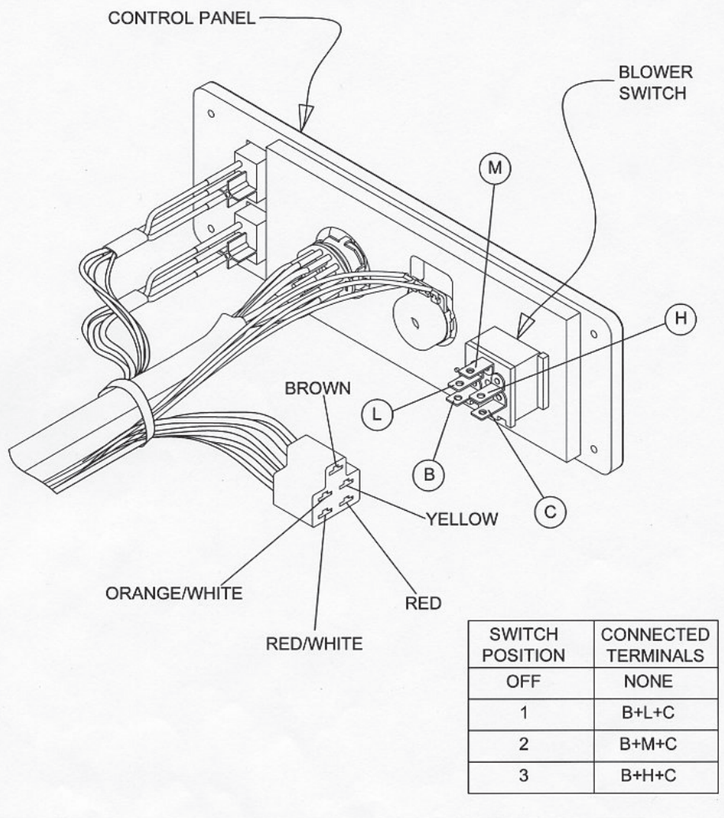
POSSIBLE CAUSE #2 ~ Blown fuse due to short in wire harness

CORRECTIVE ACTION ~ Refer to the **HVAC Wiring Diagram** and the Chassis Manufacturer's wiring information. Trace the entire HVAC wiring for an electrical short. Replace or repair as required.

POSSIBLE CAUSE #3 ~ Defective Blower Switch

CORRECTIVE ACTION ~ Refer to the **Blower Switch Continuity Diagram** and check the blower switch for continuity through the switch in all four switch positions. Replace the blower switch as required.

BLOWER SWITCH CONTINUITY DIAGRAM



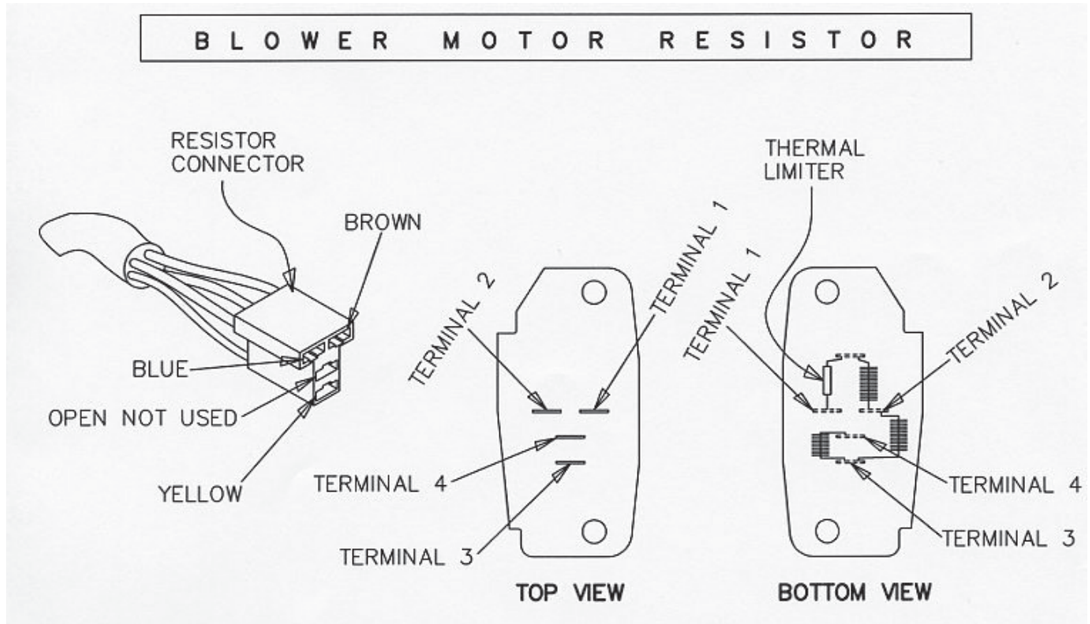
SWITCH POSITION	CONNECTED TERMINALS
OFF	NONE
1	B+L+C
2	B+M+C
3	B+H+C

PROBLEM A-2, *Blower operates, but not in all blower switch settings*

POSSIBLE CAUSE #1 ~ Blower resistor failure.

CORRECTIVE ACTION ~ If the blower operates only on the highest blower speed (blower switch rotated fully clockwise), the blower resistor has, most likely, failed. [Hint: The resistor is bypassed when the highest blower speed is selected.] Refer to the ***Blower Motor Resistor*** illustration (below); remove the three-wire connector from the resistor. Check for electrical continuity between terminal 1 and 2. If an open circuit exists between 1 and 2, the thermal limiter has blown and it will be necessary to replace the resistor. [Note: A failed resistor is often the results of a problem with the blower motor. Make sure that the blower motor is fully operable and is not bound in any sort of way by a broken blower wheel or entrapped debris within the blower housing.]

BLOWER MOTOR RESISTOR



POSSIBLE CAUSE #2 ~ High-blower relay failure

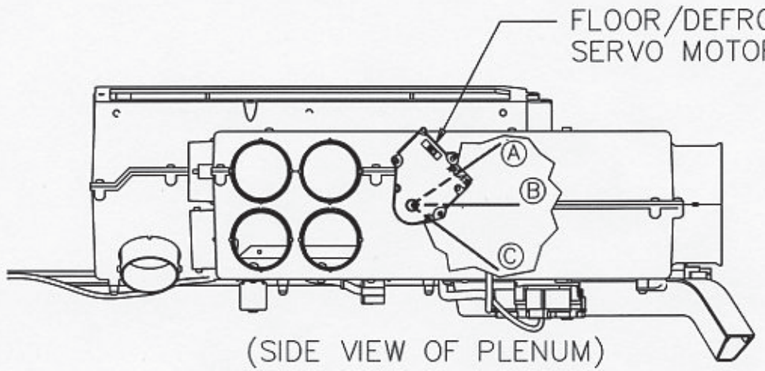
CORRECTIVE ACTION ~ If the blower operates in all speed selections except for the highest selection there is a possibility that the high-blower relay has failed. [Note: The high-blower relay is activated when the highest blower speed is selected. The relay extends the life of the blower switch and insures the highest voltage for the motor.] Remove the relay and test for an open circuit across terminals 85 and 86. If the circuit is open, replace the relay.

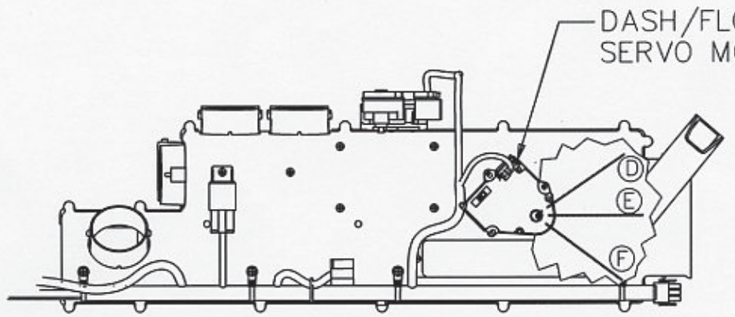
PROBLEM A-3 ~ *Air does not flow from the selected outlets*

POSSIBLE CAUSE #1 ~ Plenum directional doors obstructed

CORRECTIVE ACTION ~ Examine the air distribution Plenum for any possible obstruction that might have become entrapped internally. Refer to the ***Mode Selection & Servo Motor Position Correlation Diagram*** for the position of each of the doors in every mode selection. The output shafts of the servo motors can be observed, externally, as they move through their approximate 100 degrees of travel. Also, the doors can be physically touched by removing the 5" flexible inlet duct and reaching into the plenum's air intake. If a physical obstruction is suspected, it may be necessary to remove the plenum. [Note: Access to the plenum's mounting hardware will require removal of the defroster ducts from atop the dash.]

MODE SELECTION & SERVO MOTOR POSITION CORRELATION DIAGRAM



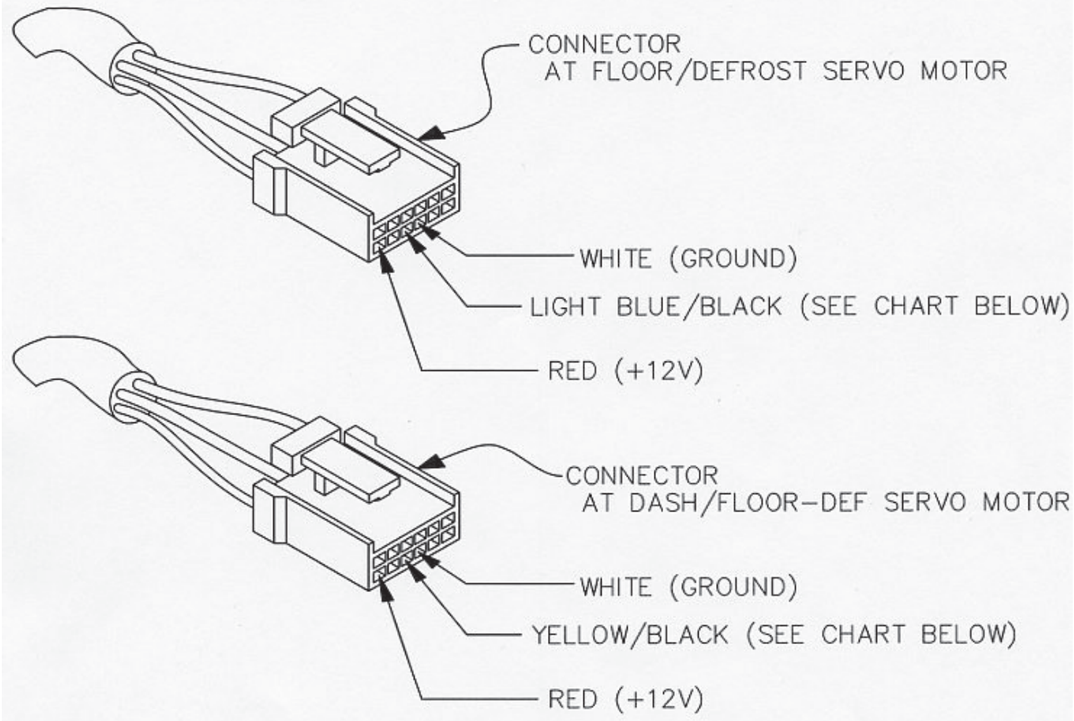


CONTROL PANEL MODE SELECTION	SERVO MOTOR		AIR DISTRIBUTION
	FLOOR/DEFROST	DASH/ FLOOR-DEFROST	
	B	F	DASH LOUVERS
	A	E	DASH LOUVERS AND FLOOR
	A	D	FLOOR
	B	D	FLOOR AND WINDSHIELD
	C	D	WINDSHIELD

POSSIBLE CAUSE #2 ~ Servo motor failure

CORRECTIVE ACTION ~ If servo motor failure is suspected, the first step is to confirm that the electrical connections at the servo motors are delivering the correct signal to the motors. With the ignition switch turned to **Accessory**, unplug each of the servo connectors and test according to the information in the ***Electrical Connection To Plenum Servo Motors Diagram***. If the electrical check is in agreement with the ***Diagram*** and if the directional doors are not obstructed, the likely problem is a failed servo motor. Replace servo motor as required.

ELECTRICAL CONNECTION TO PLENUM SERVO MOTORS



CONTROL PANEL MODE SELECTION	SERVO MOTOR CONNECTOR	
	FLOOR/DEFROST	DASH/FLOOR-DEFROST
	LIGHT BLUE/BLACK WIRE	YELLOW/BLACK WIRE
	OPEN CIRCUIT	GROUND
	+12V	OPEN CIRCUIT
	+12V	+12V
	OPEN CIRCUIT	+12V
	GROUND	+12V

POSSIBLE CAUSE #3 ~ Control Panel Selector Switch is defective

CORRECTIVE ACTION ~ With the ignition turned to Accessory, unplug each of the connectors from the Plenum servo motors and test according to the information in the ***Electrical Connection To Plenum Servo Motors Diagram***. If the test fails to find agreement with the **Diagram** there is a good possibility that the Mode Selection Switch at the control panel is defective. Replace the Mode Selection Switch.

SECTION B: TEMPERATURE CONTROL PROBLEMS

PROBLEM B-1, *Air temperature cannot be controlled*

POSSIBLE CAUSE #1 ~ Water valve not operating

CORRECTIVE ACTION ~ Valve may not be receiving a signal from control panel, or valve is defective. Disconnect the electrical connector from the valve. With the ignition switch turned to **Accessory**, check for the presence of 12 volts between the red wire (+12 V) and the white wire (ground) as noted in the ***Water Valve Electrical Diagram***. The yellow/red signal wire will provide +12 V (full cold position) dropping to zero volts (full hot position) as the temperature control knob is rotated clockwise. If the condition at the connector is in agreement with the **Diagram**, proceed as follows:

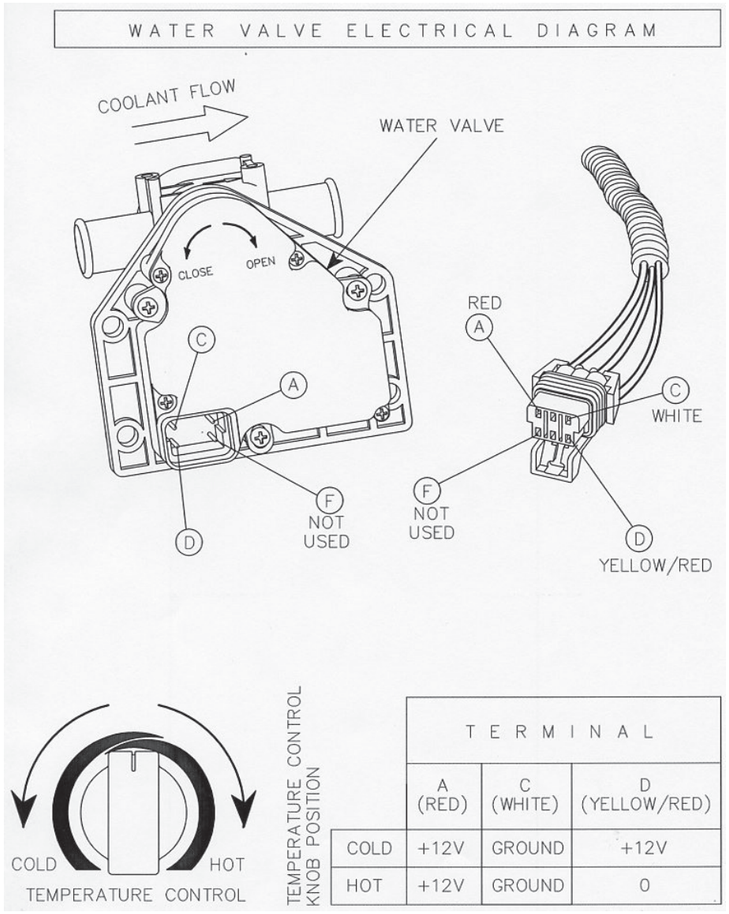
Step 1 Disconnect the water valve from the 5/8" heater hoses,

Step 2 Carefully inspect the four small terminal pins on the motor, make sure that they are not damaged,

Step 2 Reconnect the valve to the electrical connector,

Step 3 Rotate the Temperature Control Knob and watch for any response from the valve,

Step 4 If no valve rotation is observed, replace the valve.



	TERMINAL		
	A (RED)	C (WHITE)	D (YELLOW/RED)
COLD	+12V	GROUND	+12V
HOT	+12V	GROUND	0

POSSIBLE CAUSE #2 ~ Water valve not electrically connected

CORRECTIVE ACTION ~ Disconnect the electrical connector from the valve. With the ignition switch turned to **Accessory**, check for the presence of 12 volts between the red wire (+12 V) and the white wire (ground) as noted in the Water Valve Electrical Diagram. The yellow/red signal wire will provide +12 V (full cold position) dropping to zero volts (full hot position) as the temperature control knob is rotated clockwise. If none of these conditions exist, refer to the ***Wiring Diagram*** and examine the system's wire harness for any loss of continuity. Repair as required.

PROBLEM B-2, *A/C system not providing cool air*

POSSIBLE CAUSE #1 ~ Loss of refrigerant

CORRECTIVE ACTION ~ Verify the presence of 1.75 pounds of refrigerant R134a. If the AC system is either partially low, or completely empty, a search will be required for leakage. Replace and repair as required.

POSSIBLE CAUSE #2 ~ Compressor not engaged

CORRECTIVE ACTION ~ Confirm that the system is fully charged. With the ignition switch turned to **Accessory**, the blower switch turned to the highest speed and the AC (blue) rocker switch engaged, proceed as follows:

Step 1: Check for the presence of 12 volts at the compressor. If yes, make certain that the compressor clutch is fully grounded. If the ground circuit is intact, the compressor clutch has, most likely, failed and requires replacement.

Step 2: If no voltage is present at the compressor clutch, refer to the ***Wiring Diagram*** and check for voltage at each of the system pressure switches.[**Note**: The low pressure switch is located on the suction hose near the firewall and opens on a pressure drop to 8 psi. The binary (high/low) pressure switch is located on the liquid hose near the receiver/drier and opens on a pressure rise to approximately 400 psi and a pressure drop to 28 psi.] With the system fully charged, there should be continuity through both switches. Replace as required.

Step 3: If no voltage is present at the pressure switches, check for voltage at the thermostat (located externally on the HVAC housing). Assuming that the evaporator coil is fully warmed to ambient conditions, the thermostat should be a closed circuit. **[Note**: The thermostat circuit opens when the evaporator coil surface temperature drops below 32 degrees F; this action prevents the accumulation of ice on the evaporator coil surface.] If the thermostat presents an open circuit, replacement is required. Thermostat replacement requires the complete removal and disassembly of the HVAC housing. When replacing thermostat, take special care to not kink the capillary tube. Also, install the new capillary tube in the same location as the original.

POSSIBLE CAUSE #3 ~ Perceived lack of cooling due to extreme conditions

CORRECTIVE ACTION ~ Note that extremely high humidity can reduce the effectiveness of the evaporator. The ***Ambient Temperature vs. Relative Humidity Chart*** (below) illustrates how very high humidity can raise the louver temperatures. This test is best performed with the doors and windows open, the blower turned to the highest speed and the AC system fully engaged. Run the engine at 1500 rpm and allow time for the system to stabilize. Measure the discharge air temperature at one of the dash louvers and compare to the **Chart**.

	AMBIENT TEMPERATURE					
		60	70	80	90	100
RELATIVE HUMIDITY	10%	*	*	38	48	58
	20%	*	*	39	49	59
	30%	*	*	45	49	63
	40%	*	39	48	53	68
	50%	*	42	53	57	73
	60%	*	46	57	60	79
	70%	*	49	61	67	82
	80%	39	52	64	71	85
	90%	42	55	68	74	88
	100%	46	57	71	77	90

* VALUES IN THE SHADED AREA SUBJECT TO FLUCTUATION DUE TO CYCLING OF THE COMPRESSOR

SECTION C: DIAGNOSIS OF REFRIGERANT RELATED PROBLEMS

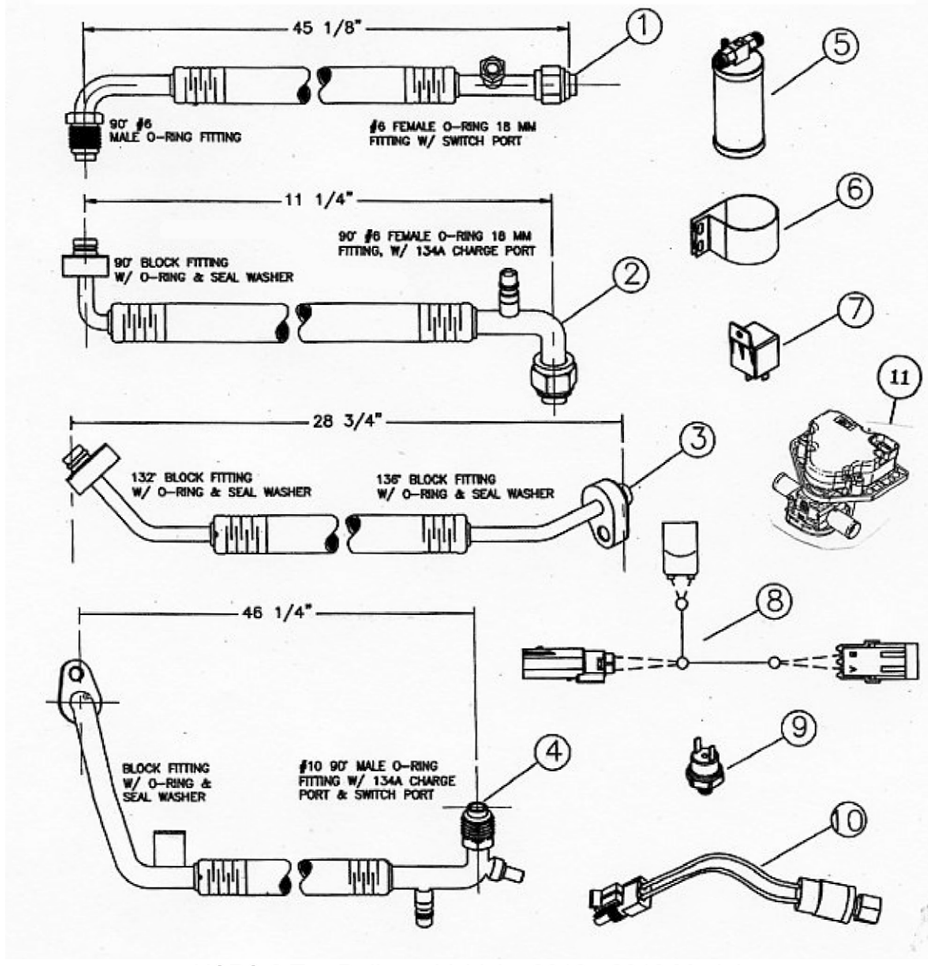
Consult the following ***Refrigerant System Evaluation*** chart (below) for a list of refrigerant related symptoms and their recommended resolution:

REFRIGERANT SYSTEM EVALUATION

SYMPTOM	LOW-SIDE GAUGE	HIGH-SIDE GAUGE	DIAGNOSIS	CORRECTION
AIR SLIGHTLY COOL	NORMAL	NORMAL	AIR & MOISTURE IN SYSTEM	REPLACE RECEIVER/DRIVER RECHARGE
SYSTEM OPERATED NORMALLY FOR A SHORT PERIOD, BUT AIR WARMS AS LOW SIDE DROPS TO ZERO	INITIALLY NORMAL	INITIALLY NORMAL	EXCESS MOISTURE IN SYSTEM TURNING TO ICE WITHIN EXPANSION VALVE	REPLACE RECEIVER/DRIER, RECHARGE
SYSTEM OPERATED NORMALLY, BUT AIR FLOW GRADUALLY DECREASES	INITIALLY NORMAL, BUT DROPS AS AIR FLOW DECREASES	NORMAL, BUT DROPS AS AIR FLOW DROPS	THERMOSTAT FAILURE ALLOWING SURFACE OF EVAPORATOR COIL TO FREEZE	REPLACE THERMOSTAT
POOR COOLING	LOW	LOW	LOW REFRIGERANT CHARGE	REPAIR SYSTEM LEAKS, RECHARGE
POOR COOLING, ICE FORMING ON SURFACE OF EXPANSION VALVE	LOW	LOW	EXPANSION VALVE STUCK IN CLOSED POSITION	REPLACE EXPANSION VALVE, RECHARGE
POOR COOLING, SWEATING MAY APPEAR ON HIGH-SIDE COMPONENTS	LOW	LOW	RESTRICTED REFRIGERANT FLOW ON HIGH SIDE	REPAIR/REPLACE DEFECTIVE HIGH SIDE COMPONENTS, RECHARGE
POOR COOLING NOISY COMPRESSOR	LOW	LOW	COMPRESSOR MALFUNCTION	REPLACE COMPRESSOR RECHARGE
POOR COOLING HIGH SIDE LINES HOT	HIGH	HIGH	SYSTEM OVER CHARGE	RECHARGE SYSTEM (1.75 #R134A)
POOR COOLING HIGH SIDE LINES HOT	HIGH	HIGH	POOR CONDENSING	INSPECT CONDENSER FOR OBSTRUCTIONS THAT COULD REDUCE AIR FLOW
POOR COOLING	HIGH	HIGH	EXPANSION VALVE STUCK OPEN	REPLACE EXPANSION VALVE, RECHARGE

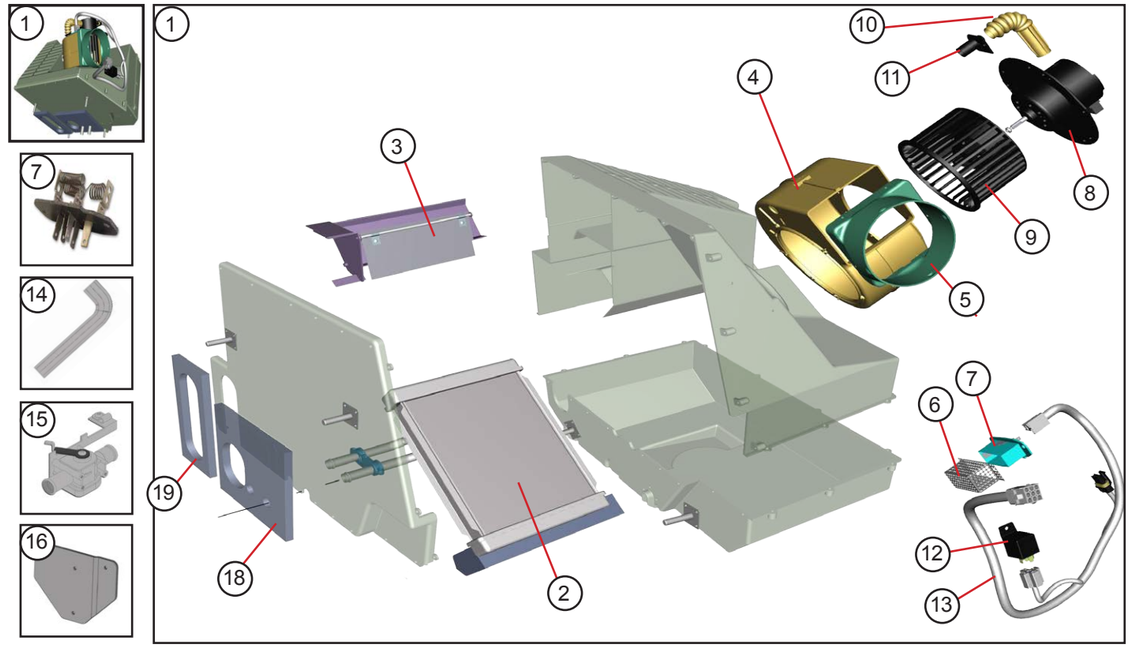
ADDITIONAL SERVICABLE ITEMS

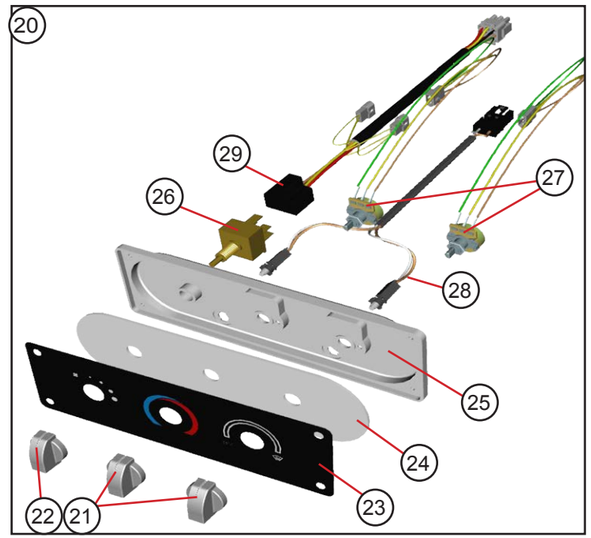
ITEM #	PART NUMBER	DESCRIPTION
1	20-03102	#6 HOSE ASSEMBLY, RECEIVER/DRIER TO EVAPORATOR
2	20-03103	#6 HOSE ASSEMBLY, CONDENSER TO RECEIVER/DRIER
3	20-03104	#8 HOSE ASSEMBLY, COMPRESSOR TO CONDENSER
4	20-03106	#12 HOSE ASSEMBLY, EVAPORATOR TO COMPRESSOR
5	07-01231	RECEIVER/DRIER
6	55-05341	RECEIVER/DRIER MOUNTING BRACKET
7	44-00196	RELAY
8	12-02274	WIRE HARNESS (FOR BINARY PRESSURE SWITCH)
9	11-00644	BINARY PRESSURE SWITCH
10	11-00576	LOW PRESSURE SWITCH
11	70-08468	WATER VALVE

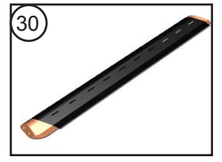


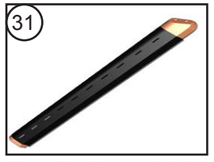
CONFIDENTIAL NOT FOR DISTRIBUTION

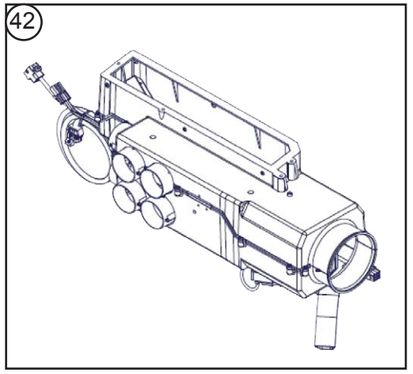
ITEM #	PART #	DESCRIPTION	QTY	UNIT
1	555001107	HEATER CORE ASSEMBLY	1	EA
2	47008760	HEATER COIL W/GASKET & CLAMP	1	EA
3	47008753	DOOR W/SEAL	1	EA
4	47008754	BLOWER HOUSING	1	EA
5	47008755	BLOWER ADAPTER	1	EA
6	47008732	RESISTER CAGE	1	EA
7	47008357	RESISTER	1	EA
8	47008756	BLOWER MOTOR	1	EA
9	47008757	BLOWER WHEEL	1	EA
10	47008730	VENT TUBE	1	EA
11	47008731	VENT TUBE ADAPTER	1	EA
12	47008716	RELAY	1	EA
13	47008758	HARNESS	1	EA
14	47008580	FORMED HEATER HOSE	2	EA
15	555002053	VALVE WATER	1	EA
16	105080401	PLATE MOUNTING FOOT DUMP AL .07X4.25X5.53	1	EA
17	090080401	DUCT FT DUMP SPECIAL	1	EA
18	21-01201	GASKET - PART OF HEATER ASSEMBLY	1	EA
19	21-01202	GASKET - PART OF HEATER ASSEMBLY	1	EA
20	555001416	CONTROL PANEL ASSEMBLY	1	EA
21	47008706	KNOB	2	EA
22	47008735	KNOB	1	EA
23	47008707	DECAL	1	EA
24	47008708	LIGHT PANEL	1	EA
25	47008709	CONTROL SUB PANEL	1	EA
26	47008700	BLOWER SWITCH	1	EA
27	47008710	POTENTIOMETER SWITCH	2	EA
28	47008711	HARNESS ILLUMINATION W/BULBS	1	EA
29	47008712	HARNESS BLOWER MOTOR	1	EA
30	555001721	DEFROST DUCT CURBSIDE METAL	1	EA
31	555001722	DEFROST DUCT ROADSIDE METAL	1	EA
32	093080400	HOLD DOWN PLATE DEFROSTER DUCTS	4	EA
33	555001524	HOSE DEFROSTER 2.5X30	1	EA
34	555001525	HOSE DEFROSTER 2.5X38 (2x DEFROSTER / 1xFOOT DUMP)	3	EA
35	555002003	COLLAR FRESH AIR INTAKE	1	EA
36	555001715	LOUVER BALL	6	EA
37	555002007	PLENUM FRESH AIR SIDE WALL (DRAIN HOSE - 555002008)	1	EA
38	107027405	BRACKET HEATER VENT	1	EA
39	555001533	HOSE BLOWER HEATER/DEFROSTER 5”X7.5”	1	EA
40	005780402	MOUNTING PLATE	1	EA
41	002080400	BRACKET HEATER CONTROL AL .102X3X11.67	1	EA
42	555001321	DUCT HVAC	1	EA
43	555001523	HOSE DEFROSTER 2.5X16	1	EA
44	47008017	CONNECTOR STRAIGHT .62ID BLACK NYLON	2	EA
NS	555002164	CAP DEFROSTER PORT 2.5IN DIA ROUND	2	EA











HOOD

Hood Removal:

1. For removal of the gas springs. See page 14.
2. Disconnect wire harness plug connections.
3. Remove the 4 bolts tying the left and right hinge assemblies to the body of the truck.
4. Disconnect hood prop.
5. At this point the hood can be removed.

Hood Installation:

1. Before installation fasten hinge assemblies to hood assembly. Now using the original 4 fasteners install the completed assembly.
2. For installation of the gas springs, see page 14.
3. Reconnect all wiring.
4. Reconnect hood prop.

Hinge Replacement:

1. To replace hood hinge, remove three bolts attached to hood assembly.
2. Remove two bolts attached to windshield rail.
3. Slide hinge out to the side of the truck.
4. To replace hinge, install in reverse order.

Hood Stop Adjustment:

1. The stops that support the hood should be adjusted if the hood ever comes into contact with the cab skirts. The stop bracket is slotted to allow for vertical adjustment. Adjust brackets so that hood seats evenly and does not come into contact with cab skirts.

LAMPS

Headlight Replacement:

1. Remove screws and trim from around headlight.
2. Remove headlight.
3. Remove wiring plug from back of headlight.
4. Replace headlight.
5. For installation reverse removal sequence.

Tail, Turn Backup and Marker Lamp Replacement:

1. Push tail, turn back-up lamp into rubber grommet and use a small flat head screw driver and pry lamp from rubber grommet.
2. Remove wiring plug from back of lamp.
3. Install new lamp by reconnecting wiring plug to new lamp and pushing lamp into rubber grommet until properly seated.

Clearance Marker and ICC Light Replacement:

1. From inside, unplug the lamp, push lamp out of the grommet. To replace, from the outside push the lamp into grommet. Some lubrication helps installation. Install so the marking is towards the top. Hook up wiring taking care to match the polarity.

CONFIDENTIAL NOT FOR DISTRIBUTION

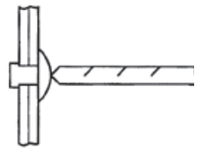
BODY PANEL REPLACEMENTS & RIVETS

Body Panel Replacement:

1. When replacing exterior body panels, remove rivets following procedures outlined below.
2. Apply sealant to new panel as required.
3. Install new panel in reverse order.

Removing A Rivet:

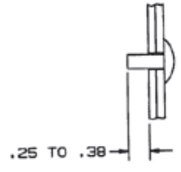
1. When removing an existing rivet, place the drill bit on the small dot in the center of the rivet head. Twist the drill chuck by hand to enlarge the small dot. This will prevent the drill from slipping.
2. *Never drill completely through the rivet or you risk enlarging the hole which can weaken the bond when re-fastened. Drill into the center of the rivet head. With drill turned off but still in place, move it horizontally and vertically until the head of the rivet comes off. Use an awl and a mallet to tap the rivet shank out.
3. If you accidentally drill through the material, see the following instructions.



Re-Riveting:

1. When replacing new panels, use .19 diameter rivets. The correct length rivet will measure .25-.38 beyond the material being joined. (See diagram below)
2. When ever rivets are removed there is always some enlargement to the hole. To ensure the strength of the new bond, follow these steps.
3. Drill the hole out to .25” diameter. If the hole is already .25” diameter then drill it out to .28” diameter and use a .25” bolt and nut, otherwise continue to the next step.
4. Rivet the parts using a .25” rivet. The correct length rivet will measure .25-.38 beyond the material being joined.

   NOTE: As the vehicle ages, it is not uncommon for some rivets to loosen. This can often be detected by a black ring (aluminum oxide) around the head of the rivet. If this happens replace the rivet. See Re-Riveting.

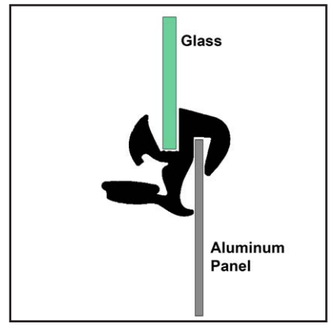


WINDSHIELD REPLACEMENT

Windshield Removal:

1. Special tools are required for windshield removal. Glass and Bead Tools.
2. A soap and water solution should be applied around the rubber seal. This will allow the tools to move smoothly when in contact with the rubber seal.
3. Using the glass tool pry between the windshield and the rubber seal. This will enable you to pry the glass from the seal. Leaving the tool in position work your way around the glass. Pushing the top corners of the windshield from inside the truck will get the removal process started.

NOTE: For safety reasons this task should be performed by two people.



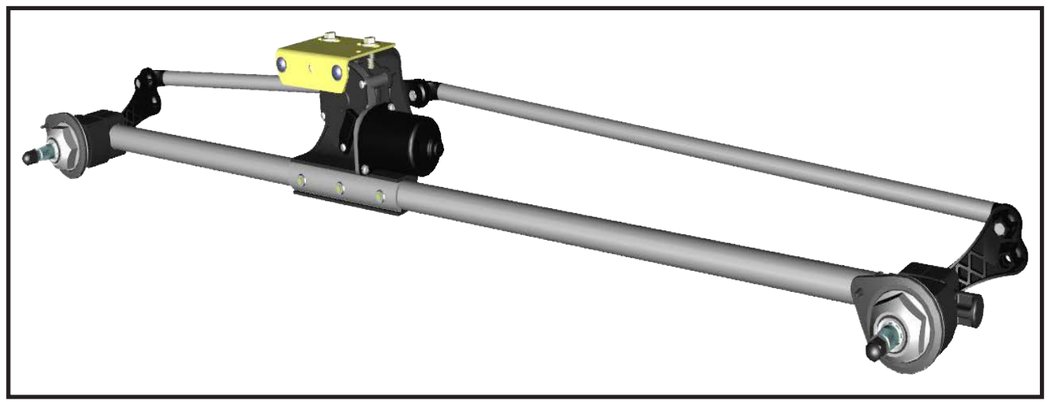
Windshield Installation:

1. Special tools are required for windshield removal. Glass and Bead Tools.
2. Insert rubber seal into window frame.
3. A soap and water solution should be applied around the rubber seal. This will allow the tools to move smoothly when in contact with the rubber seal.
4. Position the bottom of the windshield in place first. Using the glass tool pry the lip on the seal out to allow the windshield to seat in the seal properly. Work your way around the window until it is seated properly.
5. Do this around the whole windshield until the windshield seats properly in the frame.

WINDSHIELD WIPERS & MOTOR

Windshield Wipers and Wiper Drive Assembly:

1. Replace the wiper arm by removing the acorn nut and washer hose. To insure proper placement of the new wiper, mark the position of the old wiper arm before removing.
2. Reinstall in reverse order.



LIFT-GATE

If anyone observes improper installation, improper operation, or damage, they should immediately contact a qualified person for assistance and correction. We strongly urge anyone that has any questions or doubts as to the installation, condition, use, operation, maintenance or repair of the lift-gate to contact us at Waltco where we have qualified personnel that will be happy to assist you. Telephone numbers and addresses of these locations are listed in the Owner's Manual and Installation Instructions.

INSTALLATION

Waltco lift-gates should only be installed by those with sufficient basic skills to understand the installation and operation of the lift-gate, along with the equipment on which the lift-gate is being installed. Waltco's installation instructions are not intended to give rationale for all the instructions that are given; however, it is the intent of these instructions to give the installer both the operations and what we believe to be the most desirable sequence of implementing these operations. These instructions can in no way expand into an area where they will replace a qualified person, or clear thinking and a basic knowledge that must be possessed by the installer.

It has been our experience that a knowledgeable journeyman following these instructions and observing the operation of the lift-gate will have a sufficient comprehension of the lift-gate to enable this person to troubleshoot and correct all normal problems that may be encountered.

Failure to follow the installation instructions, adjustments and mounting dimensions may result in improper and unsafe operation of the lift-gate. Unauthorized alterations of the lift-gate can cause an undesirable and dangerous condition.

OWNER'S MANUAL

The Waltco Owner's Manual is intended to act as a guide for operation and routine maintenance but is no way intended to encourage usage or repair of the lift-gate by those who are not qualified to do so.

The contents of the owner's manual include, but are not limited to general operation instructions, routine lubrication, parts lists, and an outline of things that should be checked but may not be obvious to those not technically qualified. This manual assumes the lift-gate is properly installed, undamaged and operates correctly. Improper installation, improper operation, or damage should be immediately corrected by a qualified person.

INSPECTION

As part of the regular inspection of a lift-gate and after damage or suspicion of an overload, inspect for wear or structural damage and make necessary repairs or replacements. Check all structural components and their attachment to the lift-gate for cracked welds, loose fasteners, wear and part deformation. Check cylinder and hose for leaks. Inspections and repairs should be made by a qualified mechanic.

REPLACEMENT PARTS

Use only Waltco original equipment replacement parts. Components of other lift-gate manufacturers may outwardly appear to be the same but are not interchangeable with Waltco products. Waltco components are specifically designed for safety requirements, reliability and compatibility with our products. Refer to your Waltco parts manual when ordering parts. NOTE: When ordering, give model and serial number of lift-gate.

DECALS

It is important that every vehicle that has a WALTCO Lift gate have legible DECALS clearly posted on the vehicle and an OWNER'S MANUAL in the vehicle at all times as a guide for proper operation and maintenance.

SAFETY INFORMATION

⚠ WARNING

Read, understand, and follow all of the warning listed below.
Failure to follow these warning could result in severe personal injury or death.

- Read and understand the Owner's Manual, all decals and warning on lift-gate before operating lift-gate.
- Do not operate lift-gate without a thorough knowledge and understanding of the operation of the lift-gate.
- Lift gate hazards can result in crushing or falling.
- This lift-gate is designed for loading and unloading of cargo. If personnel are required to ride lift-gate, observe and familiarize yourself with the lift-gate operation, decals and manuals. Ensure stable footing at all times.
- Do not ride lift-gate with unstable loads.
- Wheeled loads must be properly retained from rolling.
- Tall, high center of gravity loads must be retained from falling over.
- Never overload lift-gate: Load platform as close to the vehicle, and towards the middle of the platform as possible. Refer to owner's manual and capacity decal of lift-gate for maximum load and load placement.
- Keep hands and feet clear of all potential pinch points.
- Never use lift-gate if it makes any unusual noise, has unusual vibration, raises or lowers unevenly, or fails to operate smoothly. Never use lift-gate if it shows any signs of structural damage such as cracked welds, bent or distorted members.
- Do not attempt any repairs unless you are qualified to do so. Care should be taken when work is performed on a disabled lift-gate located near moving traffic. When possible the vehicle should be moved away from traffic areas for repair. Precautionary measures should be taken to ensure personal safety including those recommended in Federal Motor Vehicle Safety Standards 571.125.
- When welding to lift-gate, or lift-gate components, take all necessary safety precautions, including using respiratory protection and other pertinent personal protective gear when welding harmful materials.
- All protective covers, guards, and safety devices must be in place and access doors closed before operating lift-gate.
- Do not allow anyone to stand in, or near area, in which Platform will open and close before opening or closing Platform.
- Do not allow anyone to stand near the Platform where a falling load could land on them.
- Platform is always to be properly stored and secured for transit. See the Owner's Manual for details.
- Take care to retain cargo during transit for lift-gate Platforms which function as the tailgate or door of the cargo area. Small objects can fall through the space between the vehicle and the folded Platform.
- A Lock-Out device or Shut-Off Switch should always be used to prevent unauthorized use of lift-gate.
- For lift-gates with Runners, never use lift-gate if Runners do not travel freely and smoothly.
- For lift-gates with Roller Lifting Chain, the Chain should be replaced every (5) five years or 15,000 cycles, whichever comes first. Replace only with Waltco approved Roller Chain.
- Never transfer loads which exceed lifting capacity on or over any part of the Platform unless the lift-gate is equipped with a special reinforced Platform and Platform Support Bars for use when the Platform is used as loading ramp (dock board). Refer to the "Using Platform as a loading ramp" Chapter in the Operation Instructions of the BZ/RZ series Owner's Manual.
- For lift-gates equipped with Trailer Hitches, never exceed the rated capacity of the hitch. Do not exceed the vehicle's weight rating. Refer to the vehicle's Owner's Manual.
- Vehicle must comply with all state and federal standards.
- Follow the "Maintenance Guide" chapter in the Owner's Manual.

SAFETY INFORMATION

⚠ WARNING

Lift-gates with Tilt Function

- Proper use of the Control Switches is of extreme importance.
- Improper use of Tilt Switch could cause load to fall from the Platform or damage the lift-gate.
- Platform should be in a generally horizontal position when raising or lowering with a load.
- In any tilt position, the Platform may vary from level while raising or lowering the Platform.

Lift-gates equipped with spring operated Cam Closer

- Replace Cam Release Spring every five (5) years or 15,000 cycles, whichever comes first.

RGL-Series Lift-gates

- Make certain Platform Brake mechanisms are operating properly.
- The Runners are always to remain powered up against the Up stops Pins when in transit.
- Inspect Cables every three (3) months or 750 cycles, whichever comes first. Cables must be replaced if they show signs of wear, distortion, kinking or if any broken wires are visible.
- Replace cables every five (5) years or 10,000 cycles, whichever comes first.

SIGNAL WORDS

WARNING Indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury. Black letters on an orange background	⚠ **WARNING**
CAUTION Indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. May also be used to alert against unsafe practices.	⚠ **CAUTION**
NOTICE Indicates a potentially hazardous situation, which if not avoided, may result in property damage.	**NOTICE**

CONFIDENTIAL NOT FOR DISTRIBUTION

WALTCO Warranty Policy

WALTCO warrants its products free of defects in materials and workmanship.

WALTCO will replace components found defective during the warranty period. Labor will be reimbursed according to our flat rate labor schedule at the prevailing shop rate.

Contact our Sales or Warranty departments for the warranty period of your model or for information regarding our flat rate labor schedule.

WALTCO Warranty Claim Procedure

For consideration, all claims must be received within 30 days of repair and include the following information:

- Liftgate Serial Number
- Description of problem and corrective actions
- Itemization of the labor charge to include the number of hours and labor rate

Replacement warranty parts can be obtained by contacting Waltco's Parts Department. Parts must be returned for inspection when requested.

Exclusions:

Waltco's warranty does not include reimbursement for service calls, vehicle rental, towing, travel time, fabrication of parts available from WALTCO, damage from misuse or abuse, negligence, accidents, alteration, loss of income or overtime expense, oil, or normal wear.

Diagnosis and troubleshooting time are included in the flat rate labor times.

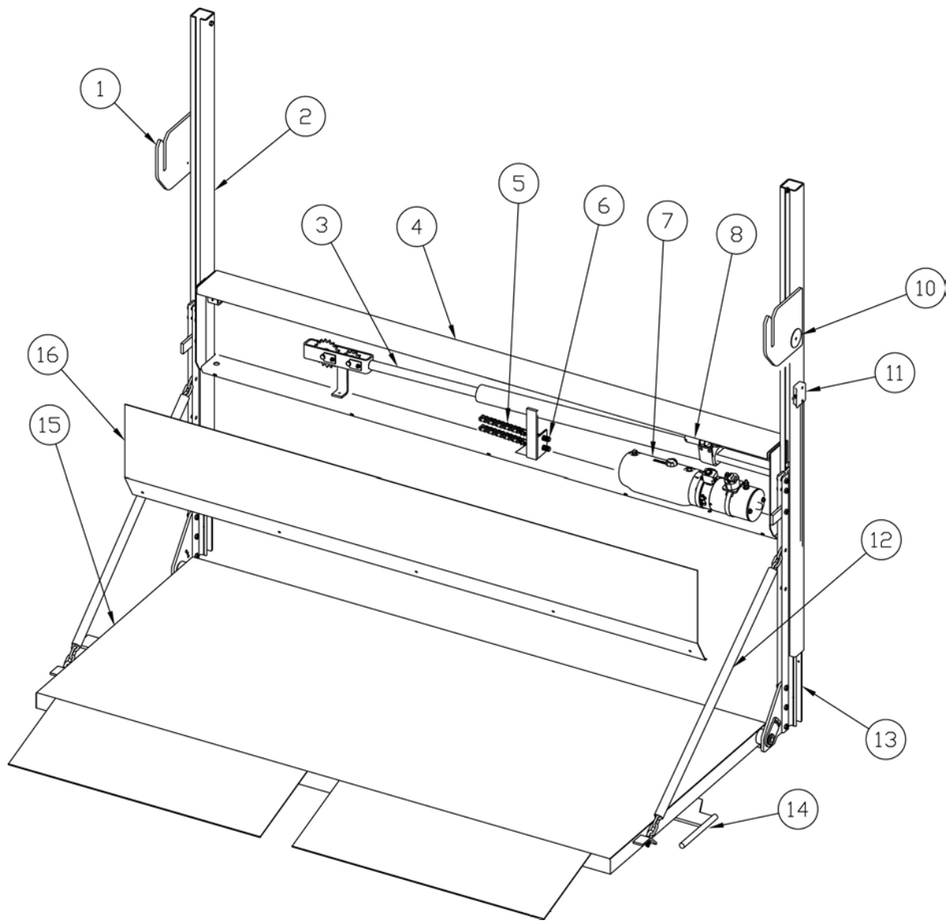
Warranty and technical information is available from WALTCO's toll free customer service lines from 8:00 a.m. to 5:00 p.m. EST.

Waltco Lift Corp
285 Northeast Ave, Box 354, Tallmadge, OH 44278
1-800-211-3074, 330-633-9191
Please visit our websites: http://www.waltco.com or http://www.hiab.com

We're behind you all the way!

Chapter 2 Liftgate Terminology

TERMINOLOGY	
1. Travel Plate (Drop-In Design)	**9.** Latch
2. Rail (Track)	**10.** Spec Tag
3. Lift Cylinder	**11.** Switch Assembly
4. Crossbeam Box (Housing)	**12.** Support Chain
5. Lifting Chain	**13.** Runner (Slider)
6. Anchor Bolt	**14.** Travel Ear and Grab Handle
7. Pump Unit	**15.** Platform
8. Flow Control Valve	**16.** Housing Cover



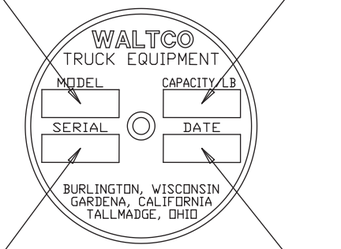
CONFIDENTIAL NOT FOR DISTRIBUTION

Chapter 2 Liftgate Terminology

Explanation of Specification Tag

Model Name	Description	Capacity
MDL-10	Medium Duty Lift	1000 lbs.

MODEL NAME



RATED CAPACITY
Based on an evenly distributed load on the platform flat surface.

SERIAL NUMBER
of liftgate. To be used when ordering parts or when contacting Waltco for service or warranty questions

DATE OF MANUFACTURE
Month / Year

GR00241

Chapter 3 Operation Instructions

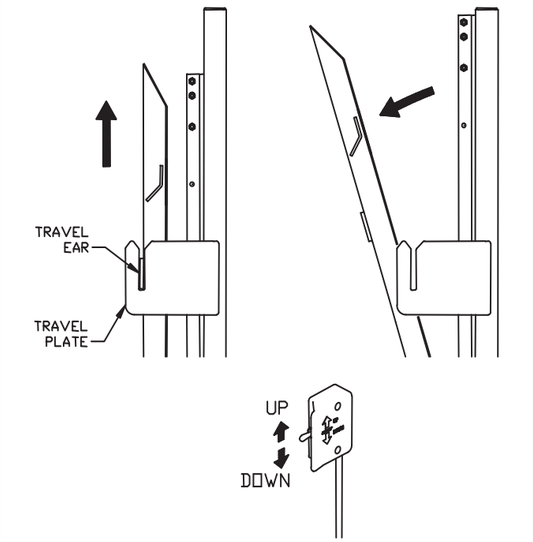
TO OPEN PLATFORM
Drop-In Design Manual Close

Use switch to raise platform up out of travel plates.

Pull platform open to horizontal position.

Never force platform open.
Keep hands away from pinch points.

Ref Operation Decal 80101577



GR02961

TO STORE PLATFORM
Drop-In Design Manual Close

Use switch to raise platform all the way up.

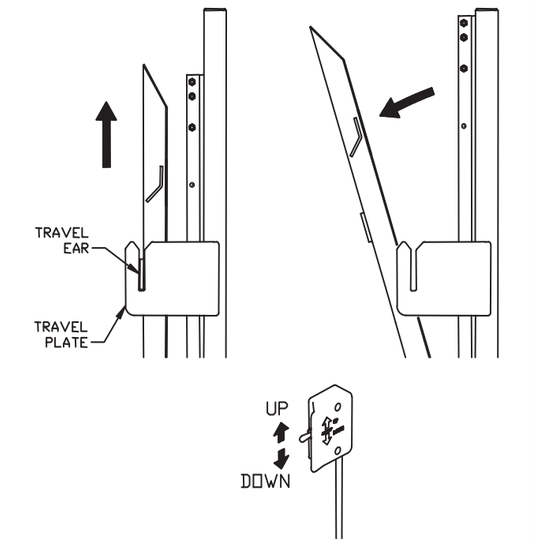
Manually rotate platform up to vertical position.

Use switch to lower platform travel ears into travel plates.

Never force platform open.
Keep hands away from pinch points.

If so equipped, turn power off to liftgate to prevent unauthorized use.

Ref Operation Decal 80101577



GR02961

OPERATION INSTRUCTIONS

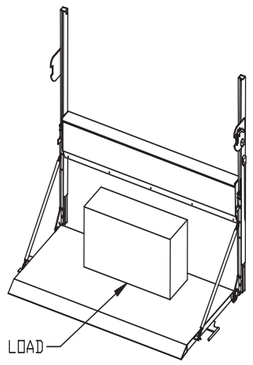
LOADING OF PLATFORM

Load and unload from rear of platform and not side of platform. Never remove side linkage to load or unload platform.

Always load as close to center of platform and as close to truck sill as possible.

Never operate lift trucks on or over any part of platform.

This unit is intended for loading and unloaded of cargo only. Do not use for anything but its intended use.

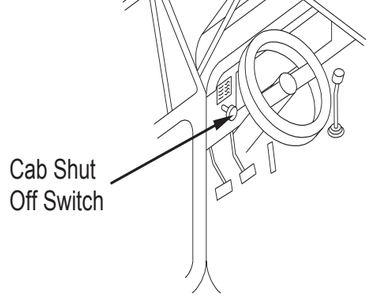


GR02844

POWER OFF TO LIFTGATE (OPTIONAL SWITCH)

Turn power off to liftgate by turning off the Cab Shut-Off switch inside the cab of vehicle. This may be a toggle or rotary type switch.

Turn power off to liftgate to prevent unauthorized use of liftgate.



GR00379

PREVENTIVE MAINTENANCE

Waltco recommends that the MDL Series liftgate be inspected at 6 month or 3000 cycle intervals to help assure proper function and operation of the liftgate.

Note: Photocopy the following PM Checklist to help keep track of periodic maintenance on the liftgate. Keep completed form with maintenance records.

For more detailed instructions on the following checklist items, refer to the appropriate sections in this Owner's Manual.

Do not continue to use liftgate if any points of inspection, listed below, may cause you to think the liftgate is unsafe. Repair immediately.

If liftgate is found to be in need of repair or adjustment not covered in this manual, contact your nearest Waltco Distributor.

WALTCO MDL SERIES LIFTGATE
PREVENTIVE MAINTENANCE CHECKLIST

PM Interval: 6 Months or 3000 Cycles Date: _____ Vehicle No._____

Mechanic:_____ Liftgate S/N:_____ Model:_____

Check appropriate box below for each step:

6 Month Liftgate PM Procedures				
1	OK	Repair Required	Corrected	Check for apparent damage to the lifting structure, such as bent or distorted members or cracked welds, which may have resulted from overloading or abuse.
2	OK	Repair Required	Corrected	Check that all pins, bolts and fasteners are tight and secure.
3	OK	Repair Required	Corrected	Check for worn or damaged bearings sprockets, and roller chains.
4	OK	Repair Required	Corrected	Check that controls operate properly.
7	OK	Repair Required	Corrected	Check that cab shut-off switch cuts power to liftgate.
5	OK	Repair Required	Corrected	Check all battery cables and connections (both positive and ground cables) to be sure they are tight and free of corrosion.
6	OK	Repair Required	Corrected	Check that platform is level.
7	OK	Repair Required	Corrected	Check torsion bars and related hardware.
8	OK	Repair Required	Corrected	Check platform support chains.
9	OK	Repair Required	Corrected	Check for hydraulic leaks in hydraulic cylinder(s), hoses, fittings, and valves.
10	OK	Repair Required	Corrected	Check oil level in reservoir.
11	OK	Repair Required	Corrected	Check lowering speed of platform.
12	OK	Repair Required	Corrected	Check that all decals are in place and legible.
13	OK	Repair Required	Corrected	Lubricate the liftgate per the "Lubrication Instructions".
12 Month Liftgate PM Procedures (Includes steps 1-13 above)				
14	OK	Repair Required	Corrected	Inspect Pump Motor for wear and/or damage.
15	OK	Repair Required	Corrected	Drain and replace Hydraulic Fluid.

PREVENTIVE MAINTENANCE

MONTHLY INSPECTION

Operate the lift-gate throughout its entire operational cycle. Check for:

- Damage to lifting structure such as bent or distorted members or cracked welds.
- Worn or damaged roller chain, sprockets, and bearings.
- Bent or distorted pins or damaged cylinder.
- Torsion bars are in place and properly working.
- All pivot and cylinder pins are securely in place, undamaged and retained by their proper fasteners.
- Damaged or worn bearings that pivot and cylinder pins rest in.
- Controls operate correctly (refer to chapter 3, “Operations Instructions”)
- Check all power cables, ground cables, and connections.
- Clean and tighten all loose connections. Replace any damaged or corroded wires or connectors.

Do not continue to use lift-gate if any points of inspection listed at left, or below, may cause you to think the lift-gate is unsafe. Repair immediately.

If lift-gate is found to be in need of repair or adjustment not covered in this manual, contact your nearest Waltco Distributor.

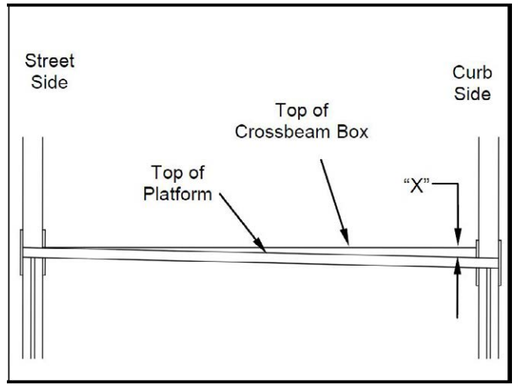
PREVENTIVE MAINTENANCE

PLATFORM ADJUSTMENT

Unfold and raise platform to bed level and check for:

1. If platform travels more than ¼” above the top of the crossbeam box, and lift-gate is not an Above Floor model lift-gate, see below for adjustment.
2. If platform is uneven see below for adjustment.

Lower platform to ground. Remove access cover from crossbeam box.



If lift-gate is Above Floor model:

- Adjust as required to level platform.

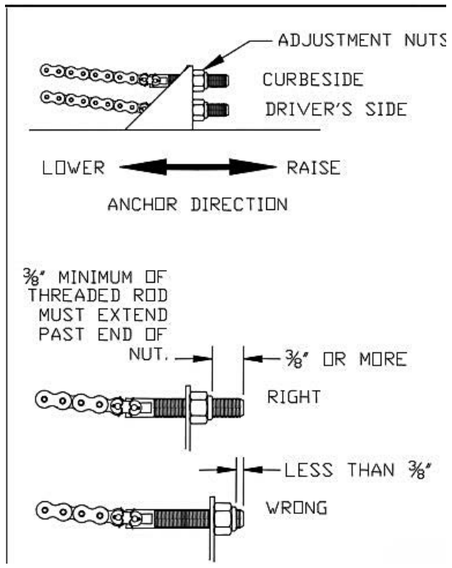
If lift-gate is not an Above Floor model:

- Adjust platform so it is level with top of crossbeam box.

For non-Above Floor lift-gates, never adjust platform to travel above the crossbeam box.

Never adjust nut out less than 3/8” from end of anchor bolt.

Never have any part of your body underneath the platform while making adjustments.



ABOVE FLOOR TRAVEL

If above floor travel is to be reduced, additional links will need to be added to the lifting chains. If additional above floor travel is desired, contact Waltco for assistance. Ability to increase travel varies with each specific model of lift-gate and bed height of vehicle.

CONFIDENTIAL NOT FOR DISTRIBUTION

PREVENTIVE MAINTENANCE

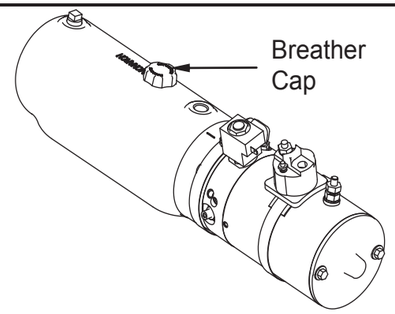
HYDRAULICS

Inspect for oil leaks in:

- Hydraulic cylinder(s)
- Hydraulic hoses - Replace hoses if they show signs of excessive abrasion
- Hydraulic fittings and valves
- Tighten or replace all hydraulic components as may be required to stop oil leakage

CHECK AND FILL HYDRAULIC RESERVOIR

- Lower platform to ground and remove access cover.
- Remove reservoir breather cap.
- Oil level should be 1/2” from top of reservoir.
- If low, fill as required. Use appropriate fluid per chart.
- Replace breather cap.



GR02836

Recommended Fluids	
Temperature Range	Acceptable Fluids
0° to 120° F	Waltco Biodegradable Liftlube™ part #85803860
	Shell Tellus S2 V 32
	Chevron Rando HDZ 32
-20° to 90° F	Waltco Biodegradable LiftLube Arctic part #85803866
	Waltco All Season Hyd Oil Part 85803867
	Shell Tellus S2 V 15 Mobil DTE 10 Excell 15

A good quality SAE 10W motor oil may also be used in temperatures above 32° F.

Fill reservoir

- Fill with recommended fluid or equivalent.
- Fill the reservoir to within 1/2” from the top.
- Fluids are available from the Waltco parts Dept. 1-800-411-5685 www.waltco.com

NOTE:

Do not use the following fluids:

Brake Fluid
Power steering fluid
Automatic Transmission Fluid (ATF)

Rev 06

PREVENTIVE MAINTENANCE

CONFIDENTIAL NOT FOR DISTRIBUTION

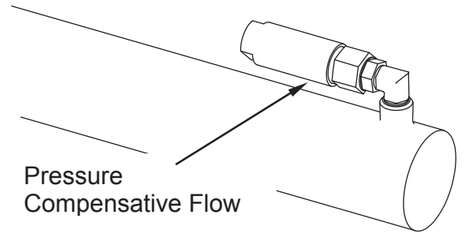
There is no speed adjustment on this liftgate.

Lowering speed is controlled by the pressure compensative valve plumbed at the cylinder.

Regardless of weight on platform, liftgate should lower at approximately six (6) inches per second.

Bed Height (inches) / 6 = Lowering Time (seconds)

This liftgate must have the correct pressure compensative valve install:



GR00160

INSPECT DECALS AND LUBRICATE LIFTGATE

Inspect all decals per Chapter 5 of this manual.

Replace any that are missing or damaged.

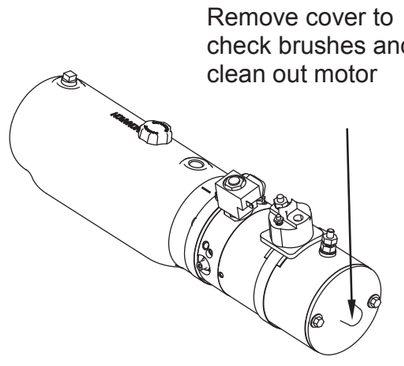
Lubricate liftgate per Chapter 6 of this manual.

ANNUAL INSPECTION

Inspect power motor:

- Disconnect battery cable.
- Remove end cover.
- Examine armature brushes for wear (Motor should be replaced if less than 1/8" long).
- Clean out all residue from inside of motor housing.
- Apply several drops of light weight machine oil to armature shaft bearing in motor end cover.
- Reassemble motor.

Drain hydraulic fluid and replace with new fluid per recommended fluids chart.



GR02836

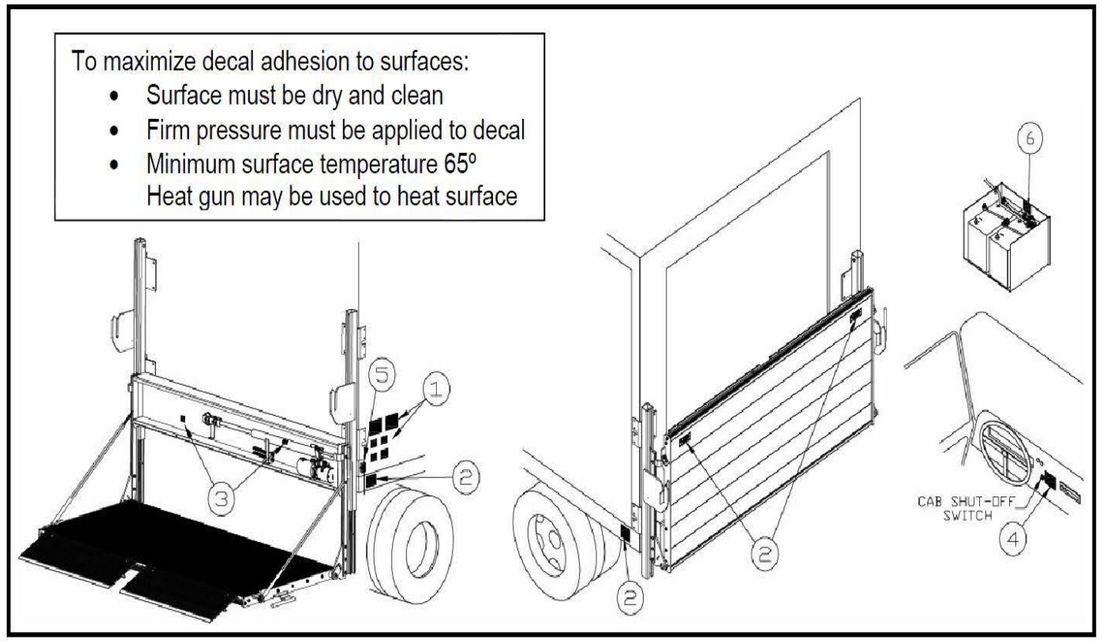
CONFIDENTIAL NOT FOR DISTRIBUTION

PLACEMENT OF DECALS

All decals must be in place and legible or all warranties are void.

ITEM	DECAL	QTY	PART NO	LOCATION
1	Safety Instructions	1	80100850	Locate in a conspicuous place near controls.
	Operation Decals (See Owners Manual for Details)			
	Snap Lock / Manual	1	80101575	
	Drop-In Manual		80101577	
	Drop-In / Power Close		80101536	
	Power Up Storage / Manual		80101639	
	Power Up Storage / Power Close		80101578	
	Drop-In with Cam / Manual		80101540	
	Hazard Decal	1	80101370	
	Important Decal	1	80101828	
	1250# Capacity Decal	2	80100266	Locate one in a conspicuous place near controls. Locate one on curb side platform.
	1600# Capacity Decal		80100252	
	2000# Capacity Decal		80100253	
	3000# Capacity Decal		80100257	
2	Caution Decal	4	75089296	Locate one in a conspicuous place near controls. Locate one in a conspicuous place on driver side of vehicle.
3	Protective Cover Decal	2	75089282	Locate one on hydraulic cylinder. Locate on back of crossbeam box.
4	Cab Shut Off Decal (optional)	1	75089267	Locate inside next to cab shut off switch.
5	Switch Decal	1	80101532 80101533	Locate on switch housing (single toggle switch) Locate on switch housing (2 toggle switch)
6	Warning Decal	1	80100829	Locate next to lift-gate circuit breaker. In applications where more than one circuit breaker is used, decal must be placed in both locations.
If your lift-gate is equipped with dual controls, an additional Safety Instruction decal (80100850) is to be placed in a conspicuous place near the second set of controls.				

PLACEMENT OF DECALS



CONFIDENTIAL NOT FOR DISTRIBUTION

LUBRICATION INSTRUCTIONS

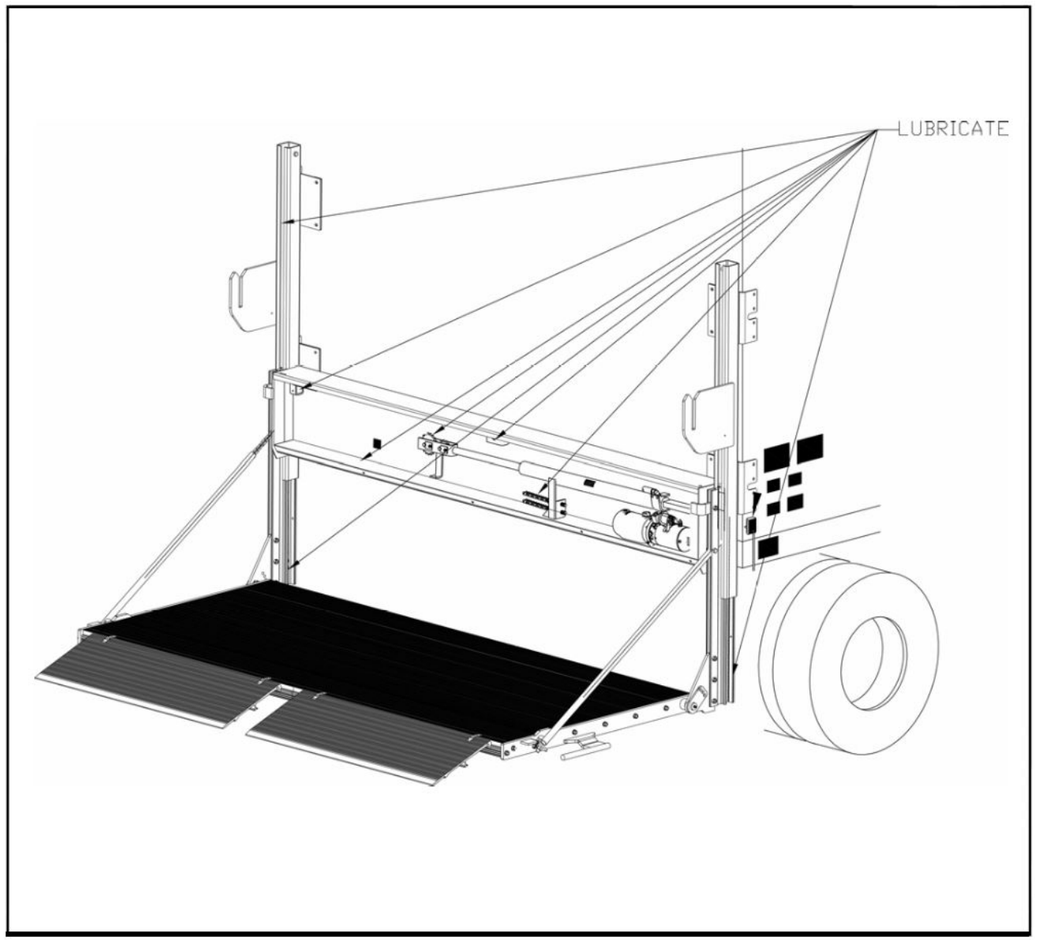
Lubricate lifting chains including sections in crossbeam box, rails, & runner assemblies with machine oil or motor oil.

Lubricate latch, inside rails, crossbeam box, and platform hinges with machine oil or motor oil.

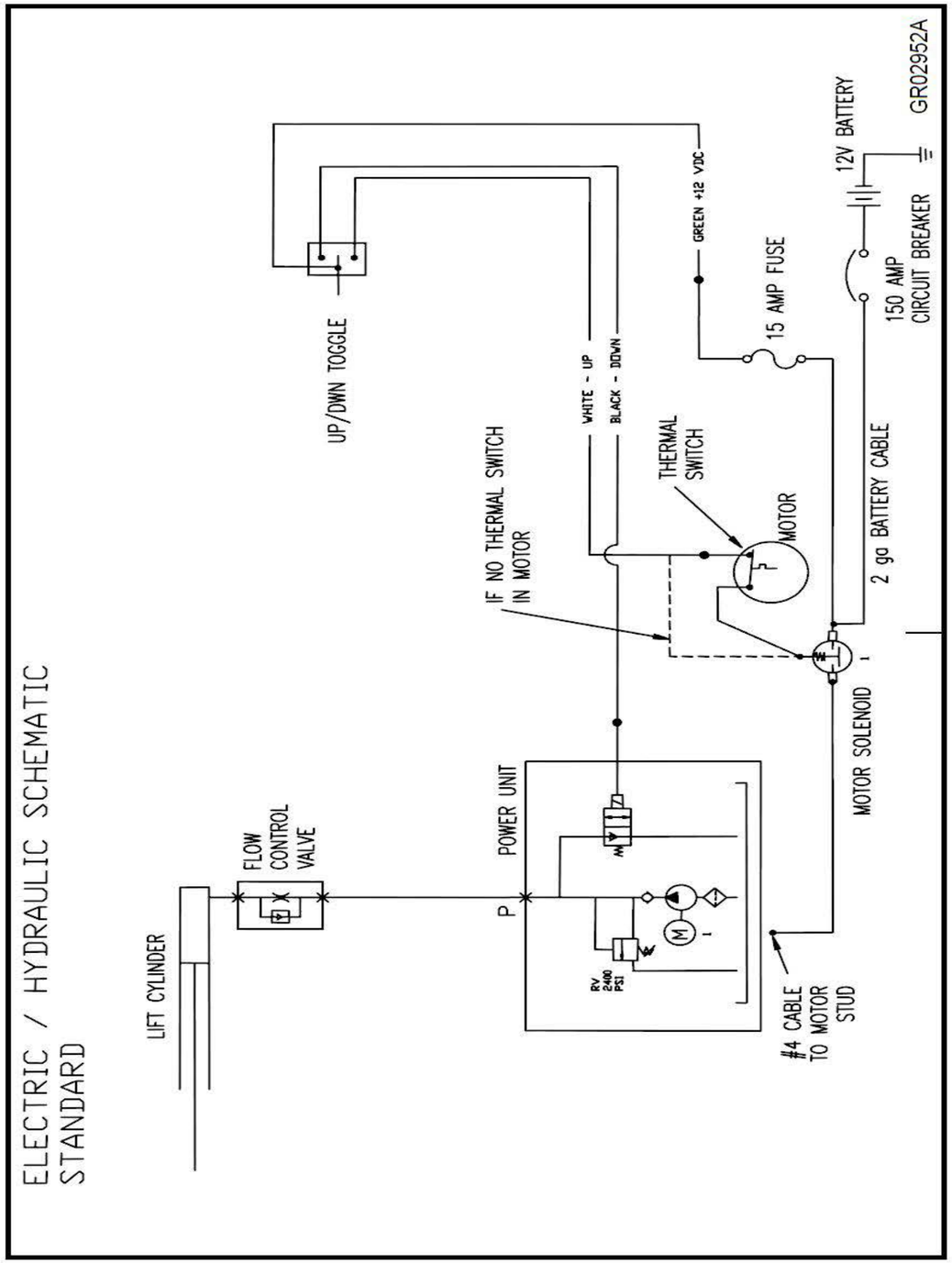
Lubricate driver and passenger side tracks.

Suggested Minimum Lubrication Schedule (days)			
Monthly Cycles	**Light Duty**	**Medium Duty**	**Heavy Duty**
<250	45	30	21
250-350	30	21	14
350-400	21	14	7
>450	Contact Factory		

*** Lubricate every 30 days if cycles are unknown.**

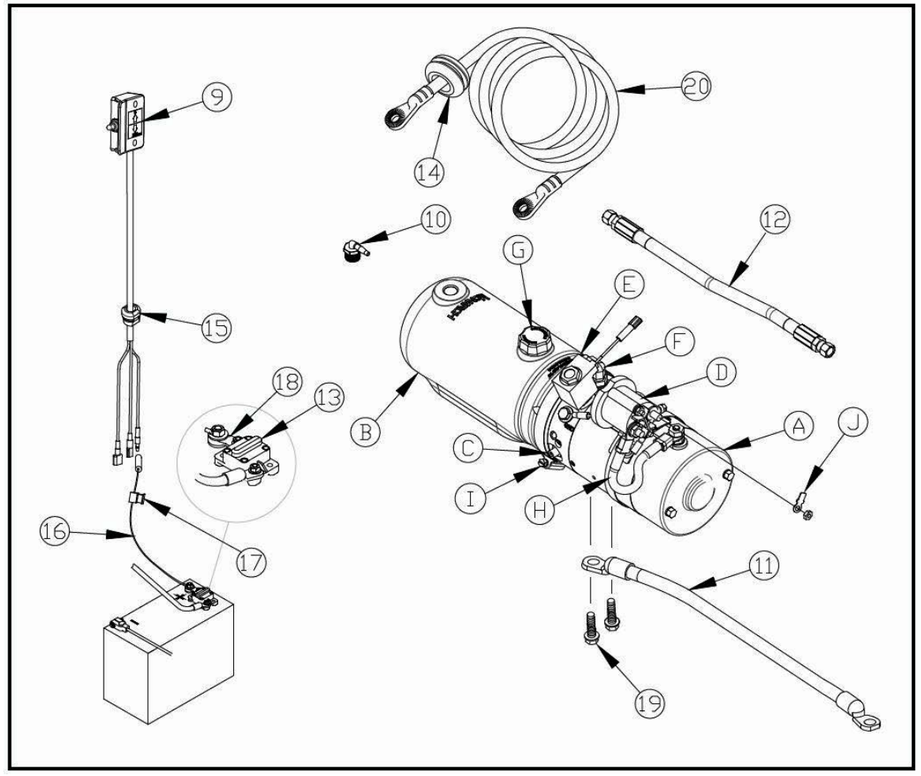


SCHEMATIC



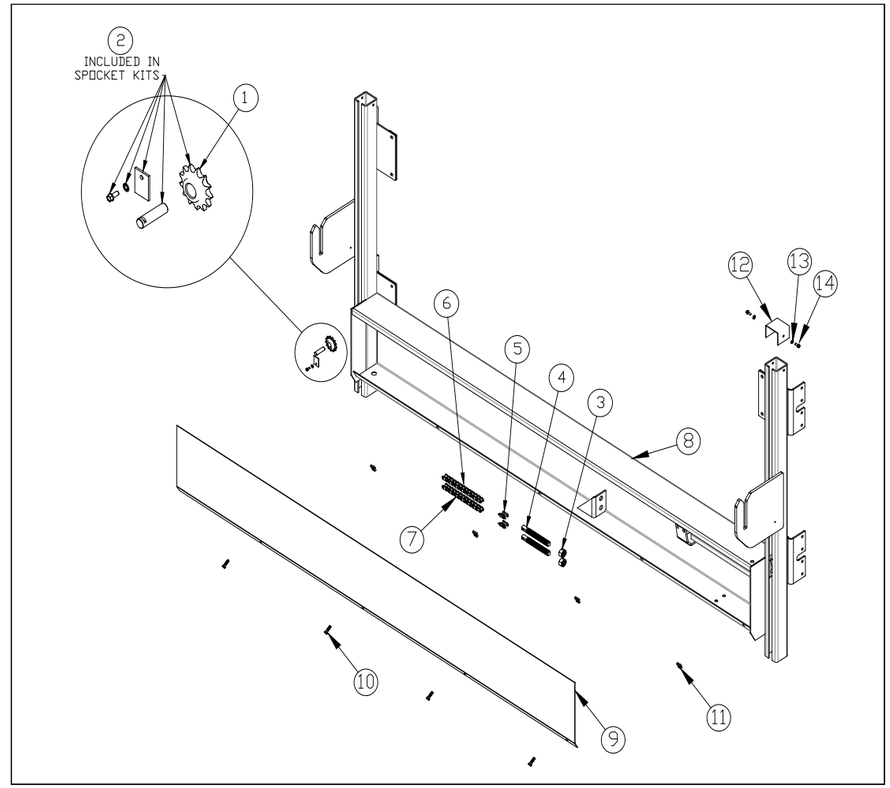
HYDRAULIC PUMP UNIT

ITEM	PART NUMBER	QTY	DESCRIPTION
1	43020013	3	Sprocket, 13T, #50 Chain, MDL-12, 16, 20
	43120213	3	Kit, 13T Sprocket, #50 Chain, MDL-12, 16, 20
3	75085184	2	Locknut, 5/8-18
4	43020014	2	Chain Anchor Bolt, 5/8”-18, #50 Chain
5	80000419	2	Kit, Roller Chain Master Link, #50 Chain
6	90280726	1	C/S Roller Chain, #50
7	43016019	1	D/S Roller Chain, #50
8	91371201	1	H-Frame Assembly
9	91371225	1	Access Door
10	75086062	4	Hex Bolt, ¼-20 x 3/4
11	75085164	4	Tinnerman Clip, ¼”
12	91371241	2	Rail Cover
13	7500012-1	4	External Tooth Lock Washer, 1/4”
14	75086874	4	Screw, 1/4-20 X 5/8” Type F



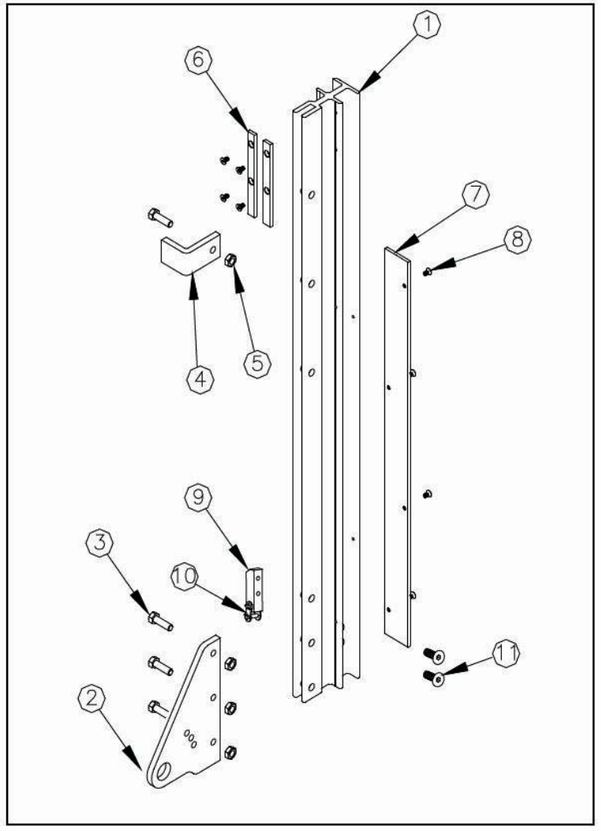
MAIN FRAME ASSEMBLY

ITEM	PART NUMBER	QTY	DESCRIPTION
1	43020013	3	Sprocket, 13T, #50 Chain, MDL-12, 16, 20
	43120213	3	Kit, 13T Sprocket, #50 Chain, MDL-12, 16, 20
3	75085184	2	Locknut, 5/8-18
4	43020014	2	Chain Anchor Bolt, 5/8”-18, #50 Chain
5	80000419	2	Kit, Roller Chain Master Link, #50 Chain
6	90280726	1	C/S Roller Chain, #50
7	43016019	1	D/S Roller Chain, #50
8	91371201	1	H-Frame Assembly
9	91371225	1	Access Door
10	75086062	4	Hex Bolt, ¼-20 x 3/4
11	75085164	4	Tinnerman Clip, ¼”
12	91371241	2	Rail Cover
13	7500012-1	4	External Tooth Lock Washer, 1/4”
14	75086874	4	Screw, 1/4-20 X 5/8” Type F



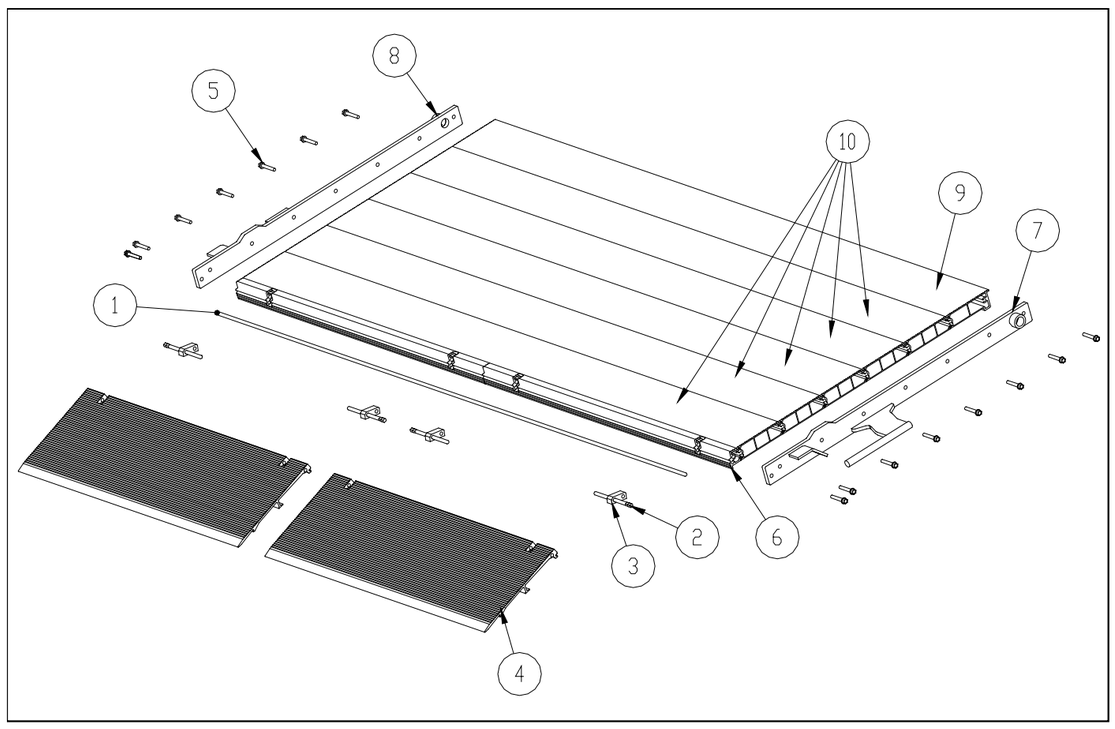
RUNNER ASSEMBLY

ITEM	PART NUMBER	QTY	DESCRIPTION
	91371350	1	Runner Assembly, MDL-10, C/S
	91371355	1	Runner Assembly, MDL-10, D/S
1	43016696	1	Alum Ext Runner, Forked, 4x30.5 C/S
	43116695	1	Alum Ext Runner, Forked, 4x30.5 D/S
2	91371240	1	Runner Ear, Forked, Painted, SP
3	75086218	4	Hex Bolt, 3/8-16x1-1/4" LG GR 8 Plated
4	4311668	1	Stop, Platform, Forked Runner STD
5	75085188	4	Lock Nut, 3/8-16 Center-lock
6	43016701	2	Wear Pad Front Forked, 6"
7	43016602	1	Wear Pad Back Forked Runner
8	75086709	8	Screw, 10-32x3/8 FHSCS
9	43020006	1	Chain Anchor Block, MDL-12
10	80000419	1	Roller Chain Master Link, #50 Chain, MDL-12
11	75085994	2	Screw, 5/16-18x1 FHSCS Black Oxide



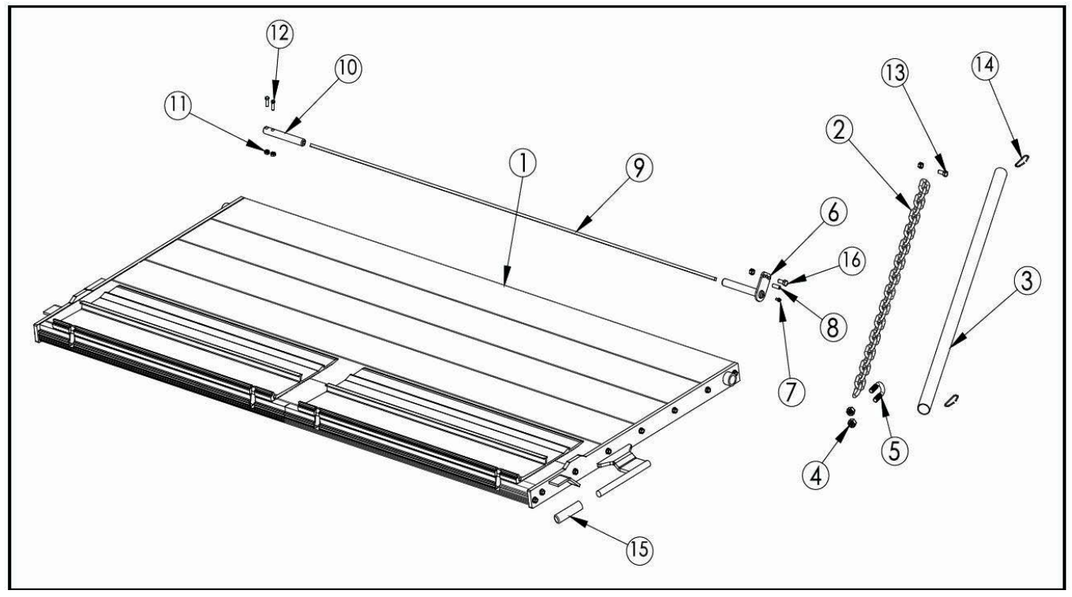
PLATFORM ASSEMBLY

ITEM	PART NUMBER	QTY	DESCRIPTION
	91371110		ENTIRE PLATFORM ASSEMBLY
1	27813982	1	HINGE ROD
2	27813983	4	PIN, CRUSHED ENDS
3	27813985	4	HINGE BLOCK
4	27813998	2	ALUM EXTRUSION, 3WFR, RAMP
5	75087494	16	HEX SCREW, 3/8 x 2
6	91371111	2	ALUM EXTRUSION, 3WFR, HINGE
7	91371120	1	SIDE PLATE ASSEMBLY, CS
8	91371120	1	SIDE PLATE ASSEMBLY, DS
9	91371131	1	ALUM EXTRUSION, STR, 2 x 6
10	91371131	5	ALUM EXTRUSION, CTR, 2 x 6



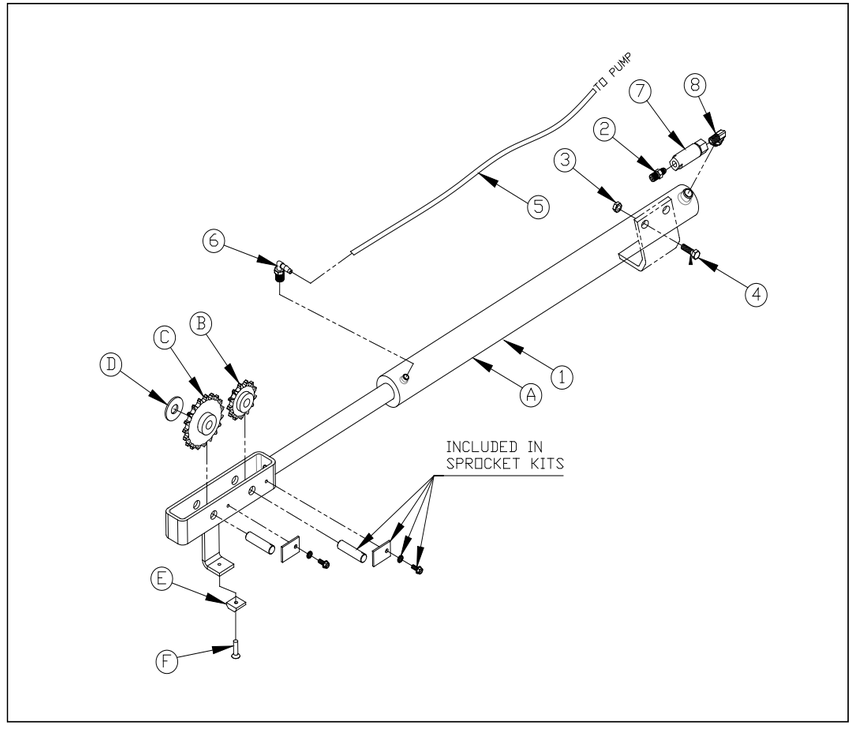
DECK ASSEMBLY

ITEM	PART NUMBER	QTY	DESCRIPTION
1	91371110	1	DECK Assembly, 36 X 82, MOOD FLAP
2	43120213	2	SUPPORT CHAIN, 30” DP 28 LINKS
3	43012382	2	COVER, SUPPORT CHAIN, 30” DEEP
4	75085178	4	LOCKNUT, 7/16-14, STOVER GRADE
5	75080125	2	U-BOLT, #4, 7/16-14X2”
6	91371129	1	HINGE PIN, 1” MOOD FLAP, CS
7	75089307	2	GREASE ZERK, 5/16 DRIVE
8	75089555	1	SLOTTED SPRING PIN, 3/8” X 1
9	43020241	1	TORSION BAR, .50 X 81 HT
10	91371129	1	HINGE PIN Assembly, 1”, MOOD FLAP, DS
11	75085188	5	LOCK NUT, 3/8-16 CENTER LOCK
12	7500010-22	2	HEX BOLT, 3/8-16X2, GR 8
13	75086218	2	HEX BOLT, 3/8-16X1-1/4”LG., GR 8
14	75085168	4	HOG RING, SS 1” BLUNT 14 GA
15	75089294	1	HANDLE GRIP, 3/4 DIA RUBBER
16	7500010-6	1	HEX BOLT, 3/8-16X1”LG., GR 8



CYLINDER ASSEMBLY

ITEM	PART NUMBER	QTY	DESCRIPTION
1	90995801	1	Cylinder Assembly Complete, MDL-10
A	90995850	1	Cylinder Assembly, MDL-10
B	43020013	1	Sprocket, 13T, #50 Chain
	80002232		Kit, 13T Sprocket with Pin & Hardware
C	43020108	1	Sprocket, 19T, #50 Chain
	80002235		Kit 19T Sprocket with Pin & Hardware
D	75088064	1	Washer, 5/8” ID x 1-5/16” OD x .095”
E	43016859	1	Bearing, Shoe Assembly
F	75086854	1	1/4 – 20x5/8” Type F Plated Round Head Phillips Screw
2	75083039	1	Adapter, ¼” NPT Male x #4 JIC Male
3	75085188	1	Locknut, 3/8-16
4	75086218	1	Hex Bolt, 3/8-16x1-1/4”
5	43040082	1	Tube, Flexible PVC, 3/16” ID x 60” LG
6	7500026-5	1	Elbow, 90 deg Barb, 1/8” NPT
7	7010001-15	1	Pressure Comp Valve, 2.5 GPM
8	75083355	1	Elbow, #6 Male SAE x ¼ NPTM



Repairs should be made only by authorized mechanics using WALTCO Replacement parts.

When ordering repair or replacement parts, please include all the information asked for below. If this information is not available, a complete written description or sketch of the required part will help WALTCO identify and deliver the needed part to you.

THE FOLLOWING INFORMATION MUST BE INCLUDED:

1. SERIAL NUMBER - [WALTCO lift-gate serial numbers can be found on the Specification Tag attached to the mount frame. (On older units the Specification Tag is located on the side or bottom of the platform.)]

2. MODEL NUMBER - [Or capacity]
3. PLATFORM SIZE

THEN INCLUDE THE FOLLOWING INFORMATION:

4. PART NUMBERS
5. DESCRIPTION
6. QUANTITY REQUIRED

MAIL, E-MAIL OR PHONE YOUR REQUEST TO:

Waltco Truck Equipment Co.
285 Northeast Avenue
Tallmadge, OH 44278
1-800-411-5685 FAX:
1-800-411-5684
E-MAIL: parts@waltco.com

ALL PARTS ARE F.O.B. FROM THE SHIPPING FACTORY

PLEASE NOTE:

To assure you of continuing and effective quality control, our warranty policy permits replacement of hydraulic cylinders, valves and motor pump units when their factory seals are intact. Parts under warranty will be exchanged promptly after careful inspection of the returned assemblies.

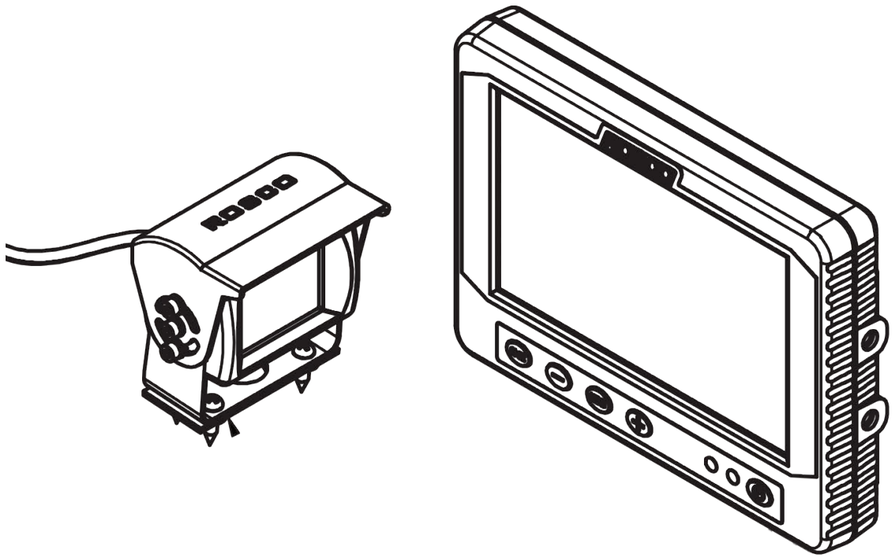
Every vehicle that has a WALTCO Lift gate must have legible WARNING AND OPERATION DECALS clearly posted on the vehicle and an OWNER'S MANUAL in the vehicle at all times as a guide for proper operation and maintenance.

Additional WARNING
DECALS, OPERATION DECALS and OWNER'S MANUALS
Can be obtained from WALTCO LIFT CORP.

NOTE: When ordering, give model
And serial number of the lift-gate.

MORGAN OLSON

BACKUP CAMERA SYSTEM



5" MONITOR & CAMERA KIT
DRIVER / SERVICE MANUAL

BACK-UP CAMERA & MONITOR

TABLE OF CONTENTS

5" COLOR BACKUP CAMERA SYSTEM

Rosco Vision Systems introduces a revolutionary new backup camera system for commercial vehicles. The backup camera system utilizes a 5'' inch monitor to display a 16:9 LCD screen when the vehicle shifts into reverse. This monitor allows the driver to see obstructions behind the vehicle for added convenience and safety.

The camera has an advanced CCD image sensor able to process excellent views under dark and light conditions. A 120° diagonal field of vision yields superb coverage behind the vehicle, and complies with the latest U.S. DOT guidelines when installed properly.

DISCLAIMER

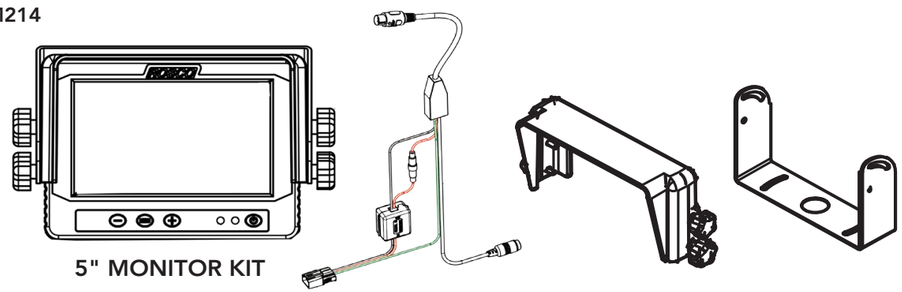
- Please read this manual carefully before using the product.
- This system is intended as an aid for safe reverse operation.
- Drivers must always use extreme caution when operating a vehicle.
- Specifications subject to change without prior notice.
- Keep all cables AWAY from rotating and electrically noisy components.
- Make sure all cables are fastened properly so that you can prevent wire chafing, kinks, cuts, etc...
- Always consult your dealer when fitting any electrical or electronic equipment to a vehicle fitted with a CAN-bus or multiple system.

CONFIDENTIAL NOT FOR DISTRIBUTION

COMPONENT LIST AND DESCRIPTION

PART NO.	DESCRIPTION

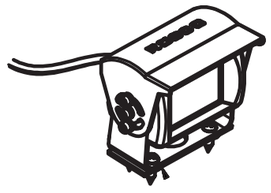
STSM214



5" MONITOR KIT

INCLUDES: STSM214/PHAR POWER HARNESS; STSA1004 MONITOR SUN SHADE KIT; STSU1004 U-BRACKET

STSC141



REARVIEW CAMERA

STSH214

4-PIN 26FT. EXTENSION CABLE

WARNING

- To prevent electrical shock, DO NOT OPEN MONITOR CASE.
- Avoid exposing monitor to water, rain, moisture etc.
- Do not disassemble the camera. This voids the warranty.
- Disassembling the camera will compromise the waterproof seal.

MONITOR BUTTONS

NOTE: The monitor buttons do not function while the vehicle is in reverse. The vehicle must be running and in park/neutral/drive to use the buttons. It is recommended that the buttons are ONLY used in park/neutral.

POWER ON/OFF
Powers on the monitor and displays the Camera 1 channel by default.

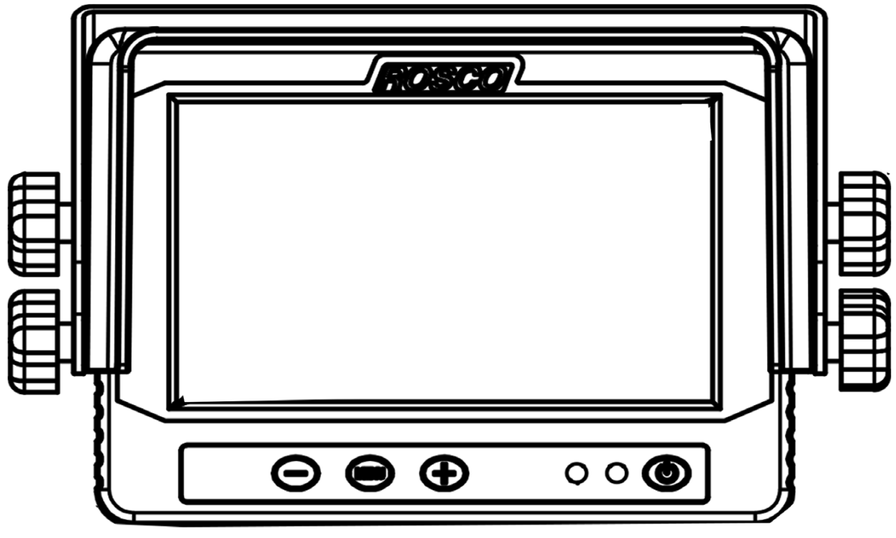
LIGHT SENSOR (LEFT)
Used to adjust screen brightness automatically.

POWER LED (RIGHT)
Green when ON, Red when OFF

+/- VOLUME/MENU SETTING ADJUST BUTTONS
Adjusts the monitor sound volume by default.
Adjusts menu settings (e.g. brightness, contrast) according the menu setting selected

MENU

MENU SETTING AND PAGE TOGGLE
Brings up the monitor settings menu. Press the button again to scroll through the various settings and to access the camera settings menu page (see following page).



CONFIDENTIAL NOT FOR DISTRIBUTION

MENU SETTINGS SUMMARY

NOTE: The monitor buttons do not function while the vehicle is in reverse. The settings can only be adjusted when the vehicle is running in park/neutral/drive. It is recommended that the buttons are ONLY used in park/neutral.

MENU SETTINGS SCREEN 1:
"MONITOR DIM MODE SETTINGS / MONITOR BRIGHT MODE SETTINGS"
Press the menu button (see preceding page) to access this menu. Press the menu button again to scroll through the settings:

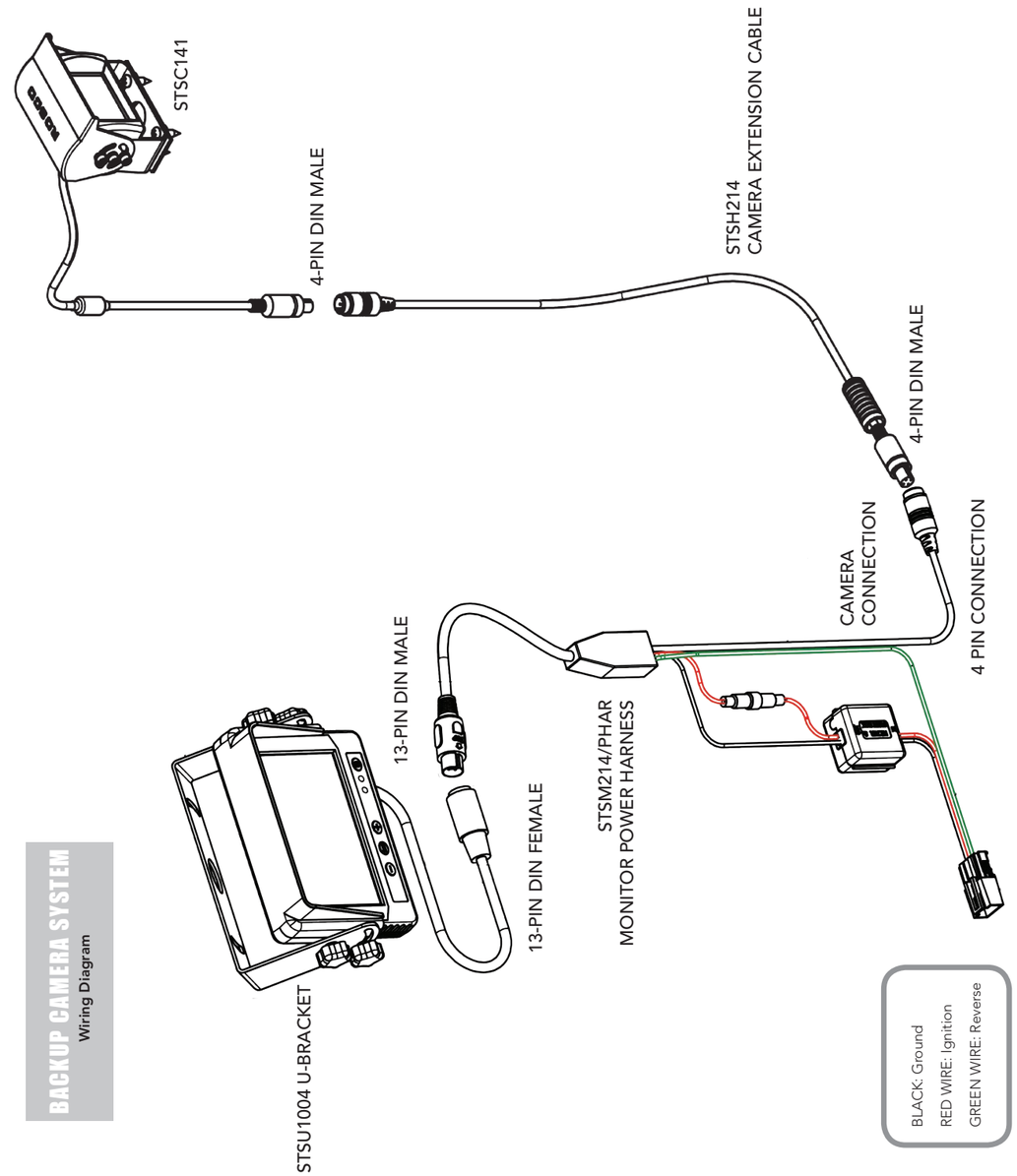
- **BRIGHTNESS** Press +/- to adjust the brightness.
- **CONTRAST** Press +/- to adjust the contrast
- **COLOR** Press +/- to adjust the color saturation
- **TINT** Press +/- to adjust the color tint/hue.
- **LANGUAGE** Press +/- to select the menu language.
- **RESET** Press either + or - to reset all menu settings to factory default.

MENU SETTINGS SCREEN 2:
"CAMERA SETTINGS"
Keep pressing the menu button to access page 2 of the settings:

- **CAM - HORIZONTAL** Press +/- to flip the Camera image horizontally.
- **CAM - VERTICAL** Press +/- to flip the Camera image vertically.
- **DIMMING** Press +/- to choose between "bright", "dim" and "auto". Choosing auto will allow the monitor to brighten and dim according to the amount of ambient light in the cabin.
- **SCALE** Press +/- to toggle the scale grid ON or OFF. If ON, the scale grid will appear when the driver shifts the vehicle into reverse in order to assist with distance perception.
- **ADJUST SCALE** Press + or - to begin adjusting the dimensions of the scale grid. Press - to switch between the vertical features of the scale and the horizontal "rungs". Press + to change the width, height, etc of the various features. Press MENU to save the settings and exit. See figure 1 for an example of the scale grid.

fig 1

BACK-UP CAMERA & MONITOR



BACKUP CAMERA SYSTEM
Wiring Diagram

CAMERA KIT INSTALLATION

CAMERA LOCATION

- Select a high and centered location at the rear of the vehicle to mount the STSC141 camera. See Figure 2 & 3.
- Mounting the camera near the lower area of the vehicle (e.g. the bumper) is not recommended. This reduces the view of the camera and increases the chance of physical damage to the camera.

INSTALL MOUNTING BRACKET

- Once the location for the camera is chosen, use a 3/16" drill bit to drill four holes into the vehicle using the mounting bracket as a guide. Be sure to clear any obstacles before drilling holes.
- Using a 3/4" drill bit, drill a cable hole into the vehicle using the large center hole in the mounting bracket as a guide, or choose a hole location as close as possible to the camera.

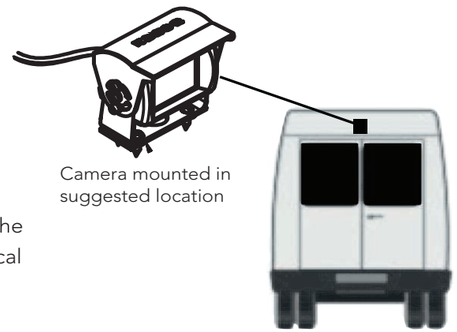
INSTALL CAMERA

- Install the camera mounting bracket. Mount the camera and sunshade onto the bracket. Insert the camera cable into the vehicle through the ¾" hole and install the cable grommet on the hole.
- Connect the camera cable to the male-pinned connector of the camera extension cable (STSH214). Hand-tighten the coupling ring on the camera cable to ensure a secure connection, and slide the environmental boot over the connection.

ROUTE EXTENSION CABLE

- Route the extension cable to the vehicle cabin at the front of the vehicle. Adhere to a minimum bend radius of 2", and keep the cable away from hot, rotating, or electrically noisy components.
- Tuck the cable out of sight and secure/clamp the cable at as many spots as possible to prevent accidental snagging or damage to the cable.

fig 2



Mount camera assembly high and centered

fig 3

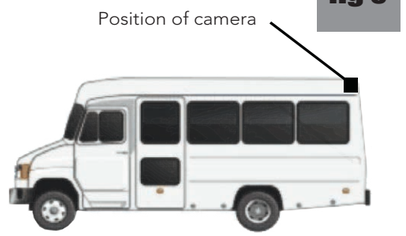
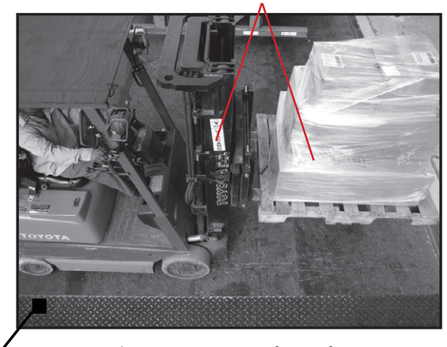


fig 4



Typical monitor image of view from properly installed camera

MONITOR KIT INSTALLATION

MONITOR INSTALLATION

- Find a mounting location inside the vehicle cabin that is convenient to the driver (e.g. center of the dashboard, above the windshield on the ceiling, near the rear view mirror etc).
- Install U-Bracket as desired.
- Using the 4 supplied thumb screws, attach the monitor/sunshade assembly to the U-Bracket

FINALIZING THE INSTALLATION

- Connect the monitor 13-pin connector to the power harness 13-pin connector.
- Connect the camera extension cable from the rear-view camera to the 4-pin connector on the power harness. Slide the environmental sleeve of the extension over the connection.
- Tuck and fasten/clamp the power harness and extension cable as much as possible into the vehicle under the dashboard/pillar liners/etc to be out of sight from the driver and passengers. This reduces the possibility of the cables being hooked or snagged. Keep cables away from HOT, ROTATING and ELECTRICALLY NOISY components.
- Adhere to a 2-inch bend radius for all cables to prevent damage.
- Connect the 3- Pin connector to vehicle source.

CHECK THE REAR VIEW IMAGE

- Apply the parking brake and start the vehicle. Shift into reverse to ensure the monitor powers on and displays a rear image. Shift back into park/neutral and power off the vehicle.
- Adjust the angle camera as needed to achieve the desired rear view image. It is highly
- recommended that the image transmitted by the camera shows the rear bumper and area behind the vehicle. See Figure 4.

CONFIDENTIAL NOT FOR DISTRIBUTION

SYSTEM TECHNICAL SPECIFICATIONS:

STSM214 Monitor: (Includes STSM214/PHAR, STSA1004, STSU1004)

Screen size (diagonal):	5"
Maximum No. of cameras:	1 Input
Screen ratio:	16:9
Contrast ratio:	500:1
Video Input:	Composite, 1 V p-p +/- 20% @75 Ohms
Video system:	NTSC
Voltage input:	12 ~ 32 Vdc
Operating temperature °F (C°):	5°F to 149°F (-15°C to +65°C)
Storage temperature:	-4°F to +158°F (-20°C to + 70°C)
Shock rating:	8g
Vibration Rating:	6.9G @ 3mm amplitude & 10-30 Hz
Speaker Impedance:	8 Ohms
Weight:	0.66 lbs
Dimensions W x H x D:	5.47" x 4.05" x 1.09"

STSC141 Camera: (Includes Sunshade and Mounting Hardware)

Image device:	Sony ¼" CCD
Pixels:	270,000
TV lines:	420
InfraRed LED's:	18 High-Output
Minimum illumination:	0 Lux (infrared LED's on)
Night vision range:	30 feet
Video Output:	1.0 Vp-p, 75 Ohm
Shock rating:	100g
Vibration rating:	15g
Field of view:	120°
Operating temperature °F (°C):	-4°F to +140°F (-20°C to + 60°C)
Storage temperature °F (°C):	-40°F to +176°F (-40°C to + 80°C)
Weight:	0.6 lbs.
Dimensions W x H x D:	3" x 2" x 2"

STSH214 Extension Harness: (Included in Kit)

26' Heavy Duty w/ Twist - Lock Connectors

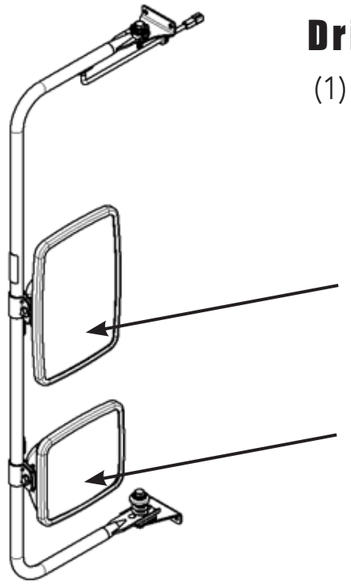
CONFIDENTIAL NOT FOR DISTRIBUTION

MORGAN OLSON

REARVIEW MIRROR SYSTEM

6647RSSPH
6647LSSPH

COMPONENTS LIST AND DESCRIPTIONS

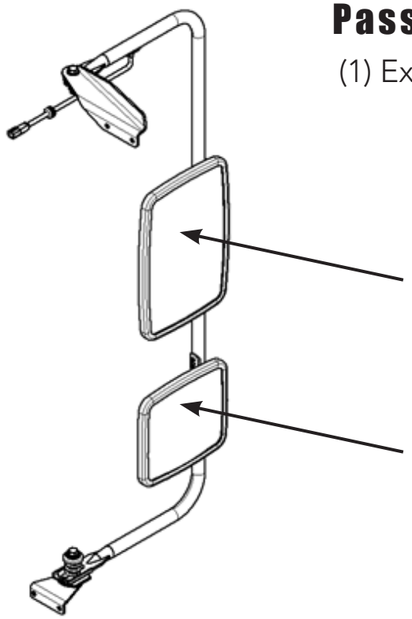


Driver's Side Mirror Assembly

(1) Exterior left hand rear view mirror assembly
Including:
- (1) Heated flat head
- (1) Heated convex mirror head

Heated Flat Mirror Head

Heated Convex Mirror Head



Passenger's Side Mirror Assembly

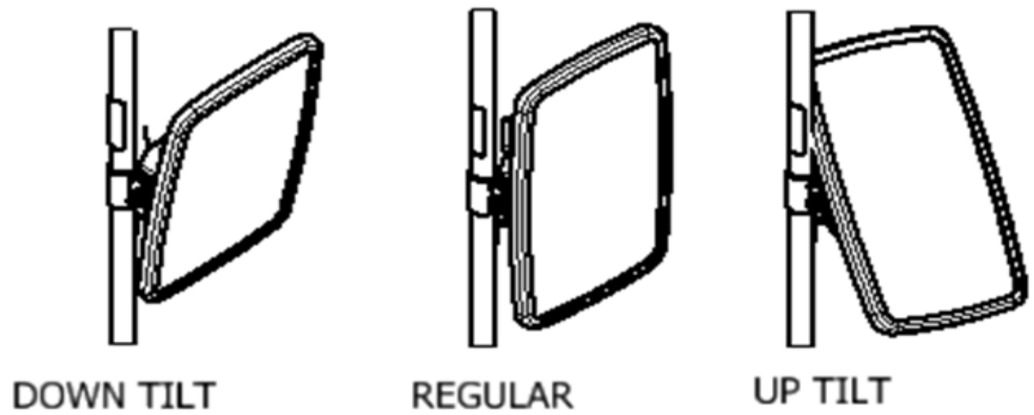
(1) Exterior right hand rear view mirror assembly
Including:
- (1) Heated flat head
- (1) Heated convex mirror head

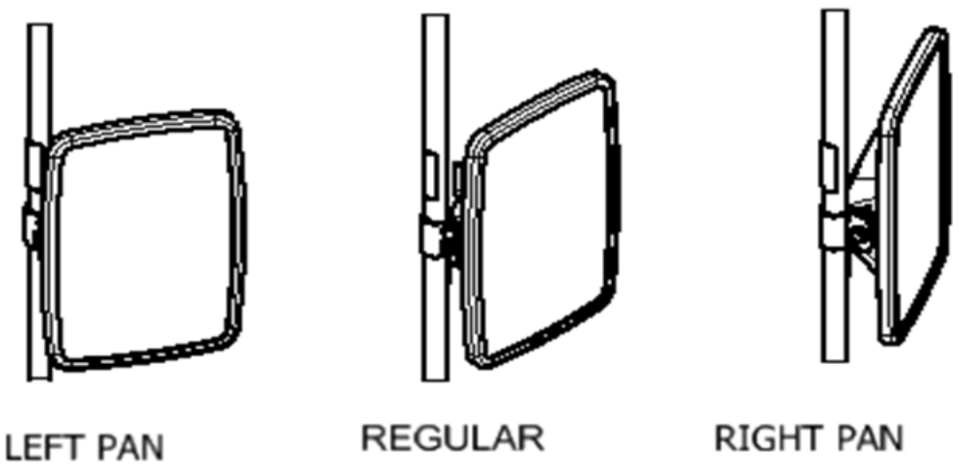
Heated Flat Mirror Head

Heated Convex Mirror Head

MIRROR SYSTEM ADJUSTMENT

Each rearview mirror head is 4-way hand adjustable (up/down/left/right).





According to FEDERAL MOTOR VEHICLE SAFETY STANDARDS No.111, rearview mirrors must be adjusted "…so as to provide the driver a view to the rear along both sides of the vehicle and shall be adjusted both in the horizontal and vertical directions to view the rearward scene."
Adjust the lookdown mirror head so as to provide the driver a view in front of the bumper and to the right of the front-right wheel.

CONFIDENTIAL NOT FOR DISTRIBUTION

OPERATING HEATED MIRRORS

Each rear view mirror head has a heating element behind the glass to assist with defogging / defrosting. When needed, simply depress the heater control switch. A small light (LED) on the bottom will confirm that heaters are on. Heaters will automatically turn off after 12 minutes.

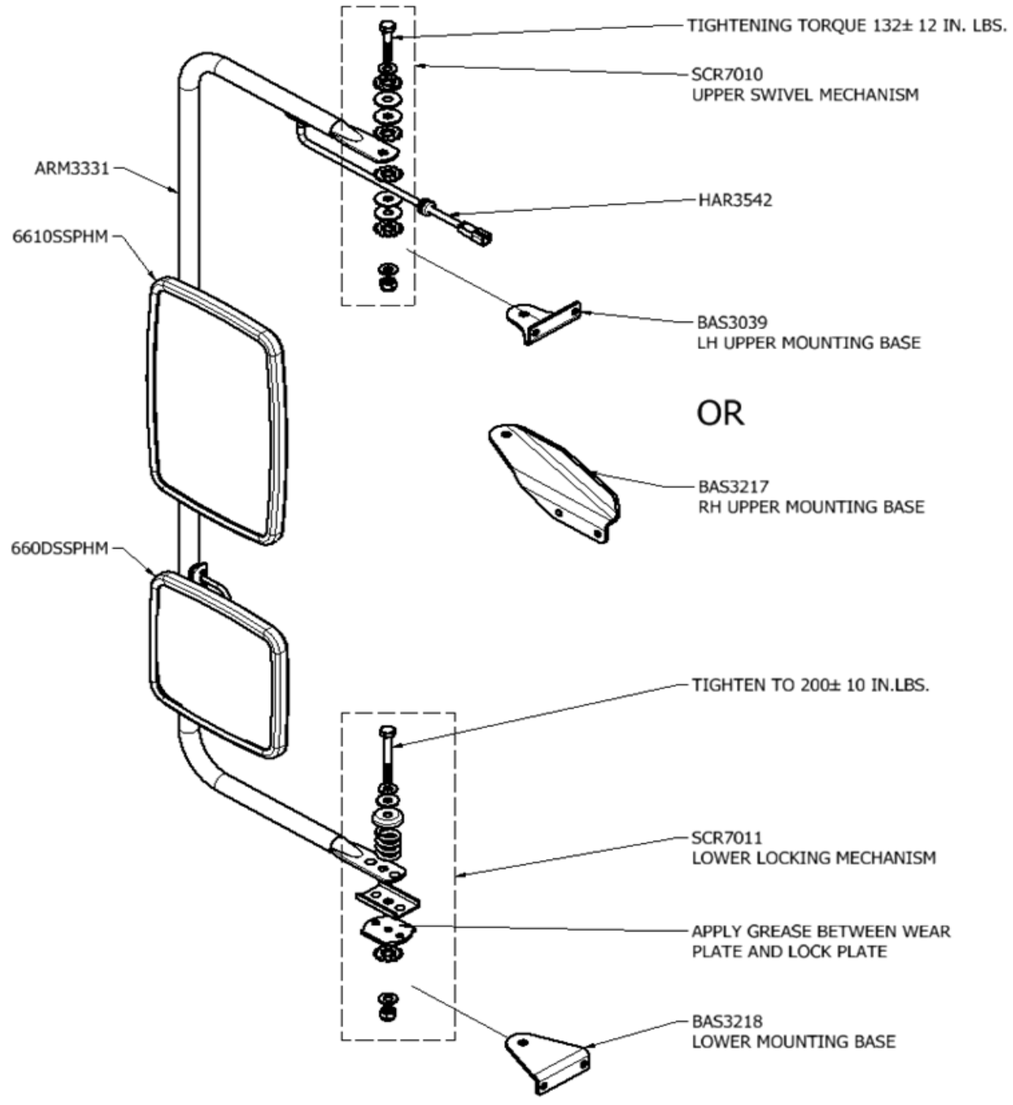
MIRROR STORAGE

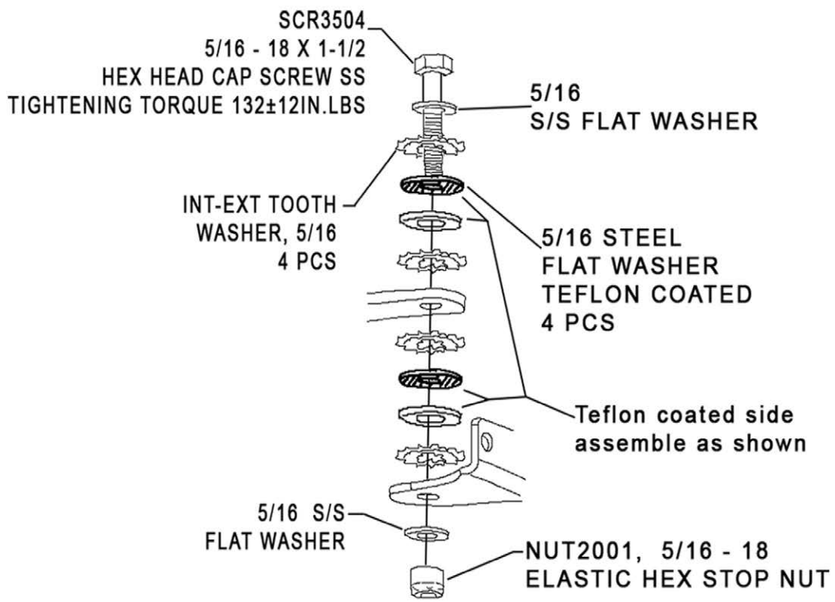
To collapse the mirror assemblies for vehicle storage, transport, or parking in areas where the width profile of the truck should be minimized, the driver should hold the vertical mirror arm between the mirror heads, and rotate it forward or rearward to preference.

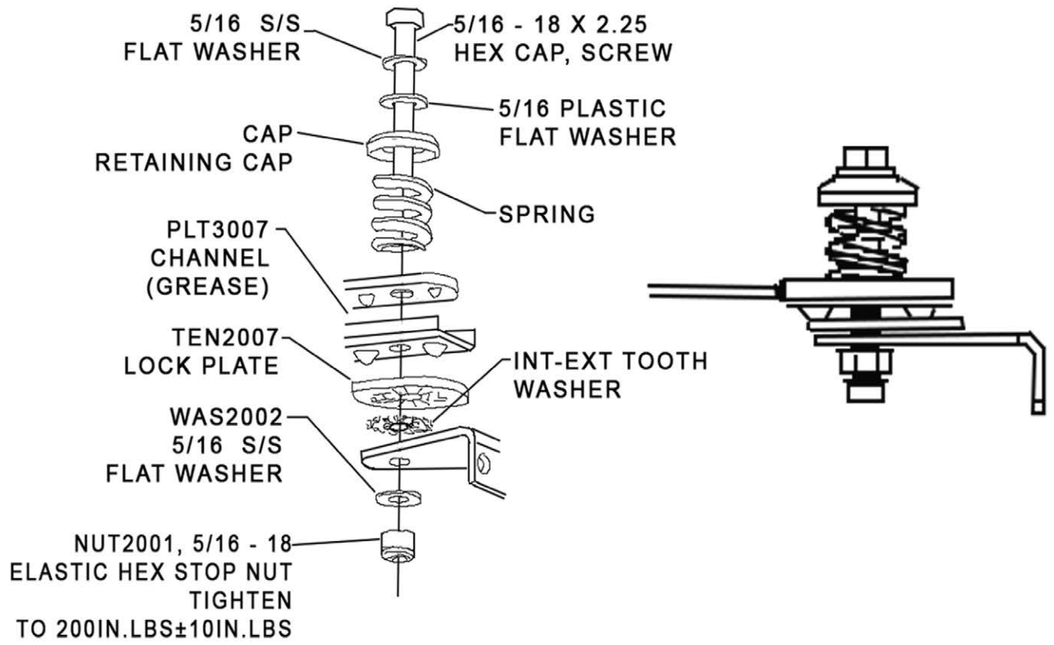
CAUTION - be careful not to forcefully push the mirror assembly into the vehicle side or window so as to cause damage or bodily harm.

WEAR COMPONENT REPLACEMENT

During the life of the mirror assembly, the upper and lower locking mechanism components may wear out and need to be replaced. This is normal. See diagram below for details -- use wrenches compatible with 5/16" fasteners and apply tightening torque accordingly. Wear components are the same between LH and RH assemblies, except upper mounting bases.



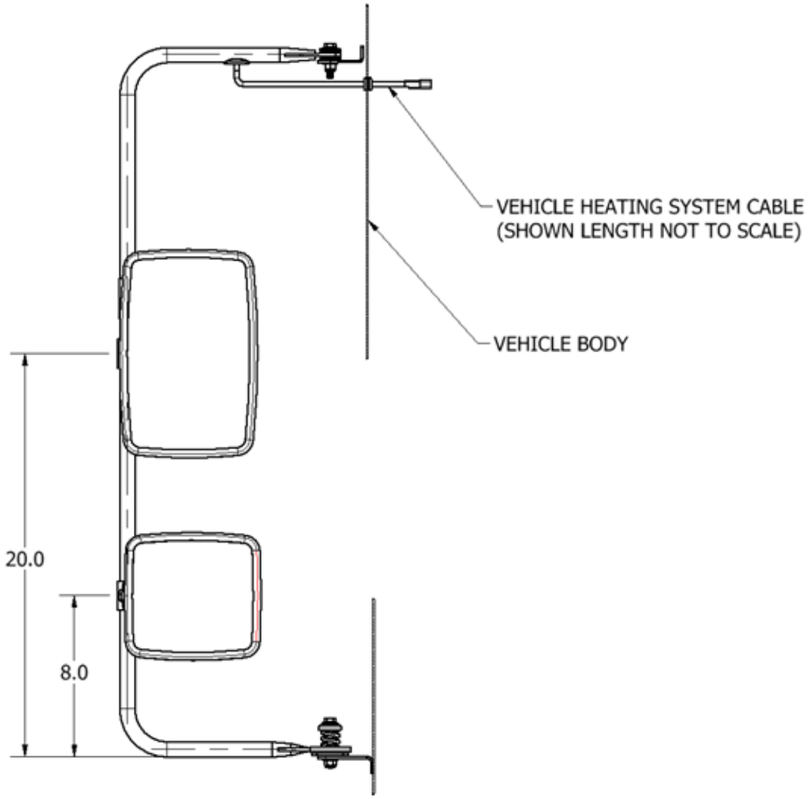




HEATED MIRROR REPLACEMENT

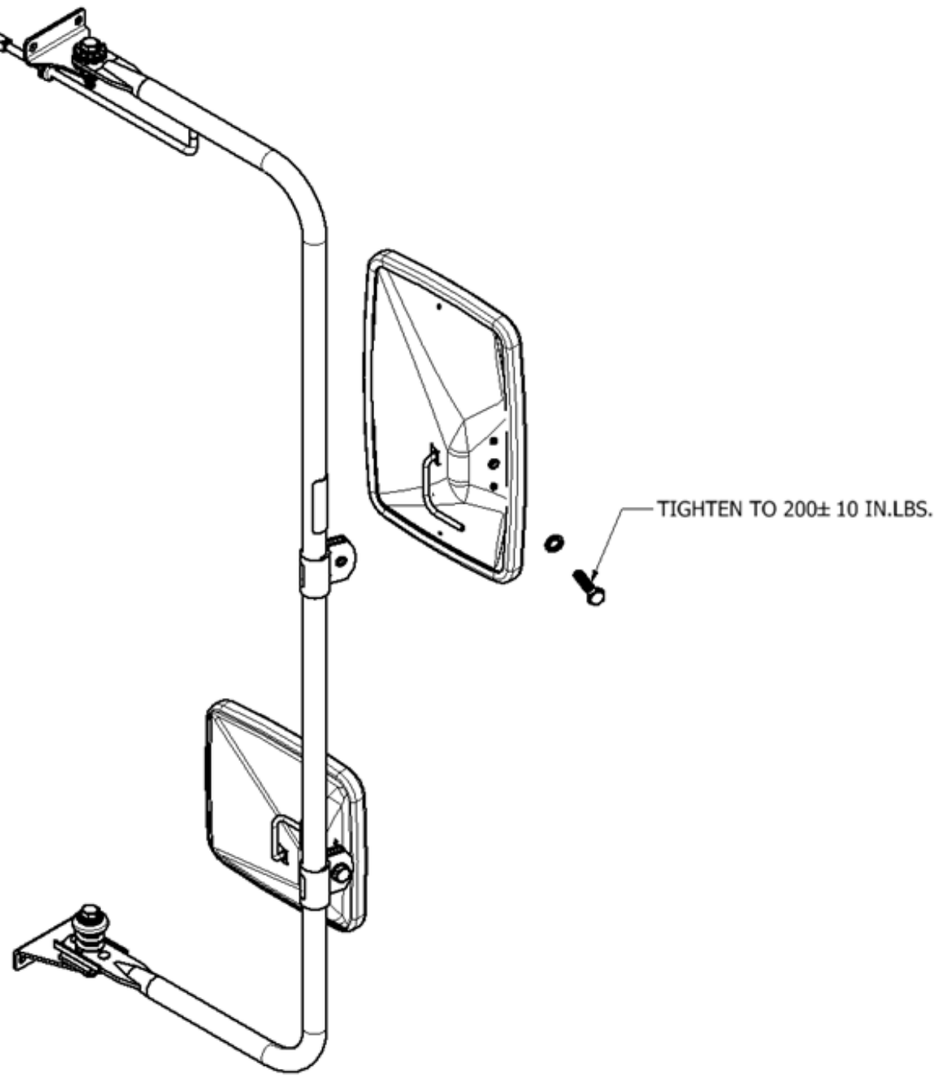
Replace mirror heads when glass is broken, or when the heating element fails to heat the glass. The following steps apply to either a flat or convex mirror head.

Step 1: Pull out black grommet and cable from oval hole, and expose butt spliced connections. Cut wires as shown.
Step 2: Remove 5/16-18" hex head screw and lock washer to disassemble defective mirror head. Remove defective mirror head. Ensure that remaining mirror head harness stays in place.
Step 3: Loosely attach new mirror head to the clamp. Run heater harness through the oval into the tubular arm until the end reaches the other oval hole.
Step 4: Using provided butt splices, crimp black and white wires accordingly. Push wires inside the tubing towards the flattened end and re-attach oval grommet.



CONFIDENTIAL NOT FOR DISTRIBUTION

Step 5: Tighten mirror head hardware on the clamp to 200 in. lbs. be sure that clamp location on the tube is correct per below diagram:



Morgan Olson Operator & Service Manual for Keyless Entry Controller Diagnostics
PN 46029040

DELIVERY VEHICLE SOLUTIONS

MORGAN OLSON®

1801 South Nottawa Road
Sturgis, MI 49091
(800) 233-4823

CONFIDENTIAL NOT FOR DISTRIBUTION

Operation Guide

Morgan Olson - 46029040

Cab Keyless Unlock

Curbside Door Unlock

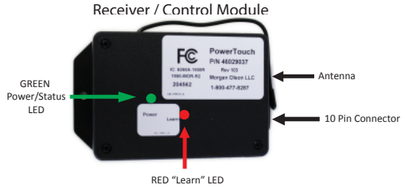
Press and release the fob button.
The curbside and roadside doors unlock.
Auto relocks in 6-seconds.

Cab Manual Unlock

Press and release dash switch.
The curbside and roadside doors unlock.
Auto relocks in 6-seconds.

Transmitters / Keyfobs

Receiver / Control Module



LED	Operation	Status
Green LED	Flashes once every 5-seconds	System ON
	ON solid 6-seconds	Curbside and roadside doors unlocked (Cab Area)
Red LED	ON solid	Unlock request from unlock switch or fob

Status LED on receiver located over driver door.

Keyfob Replacement & Code Management

Code Enrollment Option 1

1. Unplug 10-pin connector on the receiver, then reconnect it.
2. During the 1st 10-seconds after reconnecting the receiver,
   Press and hold the dash unlock switch for 5-seconds.
   Release the dash switch when you observe the red LED start to flicker flash.
   This means the receiver is in "learn" mode. The receiver will be in "learn" mode for 5-seconds.
3. When the receiver is in "learn" mode, press the button on the hand-held fob.
4. The red LED will double flash indicating the new fob has been enrolled.
5. Press the fob button once to test.
   If the green status LED turns on solid for 6-seconds, the fob has been enrolled successfully.

Note:
Both code enrollment options 1 & 2 acheive the same results.

Code Enrollment Option 2

1. Open the receiver by removing the lid.
2. Identify the tact switch location on the PCB, small square component with a round button, which is near relays.
3. Press the tact switch once. The receiver will enter "learn" mode, indicatd by the red status LED flicker flashing.
   The receiver will remain in "learn" mode for 20-seconds.
4. Press the button on the new hand-held fob.
5. The red LED will double flash indicating the new fob has been enrolled.
6. Press the fob button once to test.
   If the green status LED turns on solid for 6-seconds, the fob has been enrolled successfully.

Code Removal OR Code Erase

1. Place receiver into "learn" mode as indicated above in Code Enrollment Option 2.
2. BUT instead of releasing the tact switch button, continue to press and hold it for a full 10-seconds.
3. When all codes are erased, the red status LED will double flash and exit "learn" mode automatically.
5. All codes will be erased.

Trouble Shooting Guide

Morgan Olson - 46029040

Status & Diagnostic LEDs

Green LED

Power Reset
Both Red & Green LED ON for 10-seconds solid.

Quick Learn
Both Red & Green LEDs will turn OFF then Red LED will flicker flash for 5-seconds.
If a new fob is enrolled, it will double flash and turn OFF.

Power
Green status LED flashes once every 5-seconds.

Curbside and Roadside Doors
Green status LED turns on solid for 6-seconds.

Red LED

Input signals
When any input signal is detected (from fob or switch), the red LED will remain ON solid as long as the signal is present.

"Learn" Mode
Red LED flicker flashes in "learn" mode and double flashes when a new fob is enrolled or "learn" mode exits.

Error Code for continuous inputs signal from A1 dash switch or RF fob.

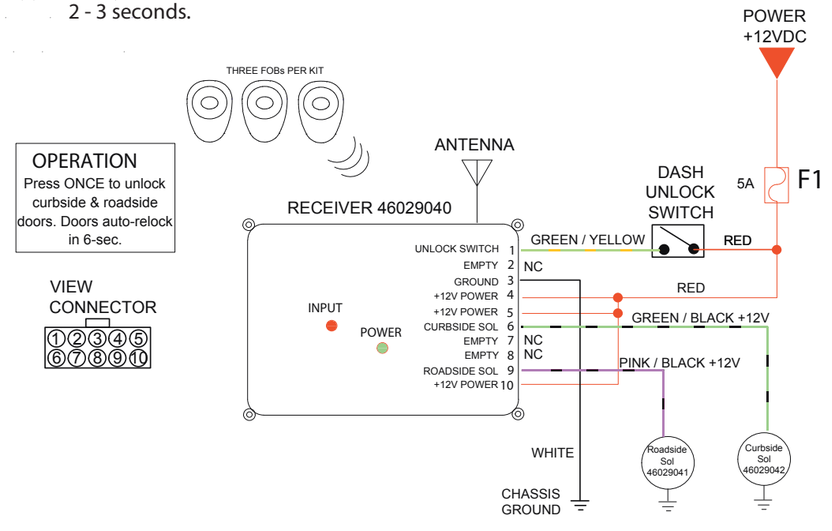
- A1 dash switch - single flash approximately once every 2- 3 seconds.
- RF fob enrolled - triple flash approximately once every 2 - 3 seconds.

System Specifications	
P/N#46029040 / Model #P1550-R	
RANGE	100 Feet Typical Up to 300 Feet
OUTPUT	4 Relays, Positive, 5A
INPUT	2 Inputs, +12V
FREQUENCY	433 MHz
CODES	Rolling Codes Secure Encryption
VOLTAGE	12VDC
CURRENT	5 Amps Max per Output, (Relay) 10 Amp, Input (Max)
ANTENNA, OPTIONAL	Fixed, Standard (shown)
BATTERY	Coin Style, Lithium, CR2032 100,000 1-second pulses 10 year shelf life

Part Numbers

Transmitter - FOB
46029111

Receiver
46029040



CONFIDENTIAL NOT FOR DISTRIBUTION

Trouble Shooting Guide

Morgan Olson - 46029040

Sympton 1
No output from one or more outputs on receiver when transmitter buttons are pressed

Possible Cause	Corrective Actions
1.1 No signal from transmitter	**1.1.1** Verify that transmitter is sending a signal and that transmitter is coded correctly. See Symptom 3.
1.2 One or more of the outputs have failed	**1.2.1** Open receiver and observe yellow LEDs. The yellow output LED should turn ON as long as relay is ON.
	1.2.2 Press each transmitter button in sequence. Using a volt meter, check each output. there should be a +12v present anytime the corresponding transmitter button is pressed. If no outputs, call factory for assistance.
1.3 Receiver outputs OK, but relays or equipment do not operate	**1.3.1** Check wire and equipment for problem.
1.4 Fuse is blown	**1.4.1** Check the F2 fuse in fuse block. If it is blown, replace it.
1.5 Wire harness problem	**1.5.1** Check dash switch input wire connection on P1 green/yellow wire. If no voltage, correct wiring.

Sympton 2
Receiver is Dead. Does not operate, no green power LED.

Possible Cause	Corrective Actions
2.1 Logic ground or power connection to receiver has failed	**2.1.1** Check logic ground and logic power +12v. Use a voltmeter probe when checking voltage.
	2.1.2 If either ground or power is not present, locate failure in wire harness
2.2 Chassis ground connection has failed	**2.2.1** Check chassis ground connection. It should be clean and tight, no paint on metal, an external tooth star washer should be present, no rust or dirt in connections.
	2.2.2 Chassis ground should be located on vehicle frame or directly to battery.
2.3 Receiver and / or microprocessor has failed	**2.3.1** Check heart beat LED. If it is not flashing the microprocessor has failed. Call factory for assistance (in either case).
	2.3.2 Check yellow output LEDs. If they DO NOT flash each time corresponding channel is activated, the receiver has failed.

CONFIDENTIAL NOT FOR DISTRIBUTION

Trouble Shooting Guide Morgan Olson - 46029040

Sympton 3
Poor range 0' to 25' (pulsating 0' to 25')

Possible Cause	Corrective Actions
3.1 Antenna damaged or grounded	**3.1.1** Check antenna placement. It should not be touching any metal or tinted glass.
	3.1.2 It should not be closer than 6' to any motors or relays / contactors.
	3.1.3 If antenna is cut or damaged, call factory for assistance.
	Please Note: Antenna can NOT be shortened or altered in any way.
3.2 Poor ground connection	**3.2.1** Remove any paint or residue from metal. Using an external tooth star washer, tighten chassis ground ring terminal securely to vehicle frame.
3.3 Transmitter battery low	**3.3.1** Replace battery if voltage is 2.8 volts or below. All transmitters use: Lithium Coin Style - # CR2032
3.4 Interference	**3.4.1** Electromagnetic interference (EMI) can be generated by motors, welding equipment, relays, RF from other radio frequency devices, etc. which may be in close proximity to the receiver or transmitter.
	3.4.2 Move closer to antenna or move vehicle out of range of EMI cause by high levels of RF from devices such as welding equipment, as this is a temporary problem.
	3.4.3 If EMI is cause by relays, door motors or lift motors then the receiver must be moved or shielded or the EMI noise diverted to ground. Call factory for detaiils / assistance.
3.5 Receiver component damaged or defective	**3.5.1** Call factory for assistance.
3.6 Other equipment installed in vehicle causing voltage drop when initially turning on	**3.6.1** Remove all other equipment from logic ground and power. Check range. If ok, move other antennas, route wires away from the receiver, move unit away from large motors or run logic power & ground directly from battery.

CONFIDENTIAL NOT FOR DISTRIBUTION

Limited Three (3) Year Warranty

Section One

Seller will warrant any product originally manufactured or assembled and sold by seller for a period of up to THREE YEARS.

Section Two

The following are in lieu of all warranties; expressed; implied; or statutory, including but not limited to, any implied warranty of merchantability of fitness for a particular purpose and of any other warranty obligation on the part of seller. Seller, except as otherwise hereinafter provided, warrants the goods against faulty workmanship or defective materials for a period of up to THREE YEARS.

Seller's sole and exclusive liability shall be (at seller's option) to repair; replace; or credit buyer for such goods which are returned by buyer during the applicable warranty period set forth above, provided that (I) seller is promptly notified in writing or by phone upon discovery by buyer that such goods failed to conform and an explanation of any alleged deficiencies, (II) such goods are returned to seller, (III) sellers examination of such goods shall disclose that such alleged deficiencies actually exist and were not caused by accident, misuse, neglect, alteration, improper installation, unauthorized repair or improper testing. If seller elects to repair or replace such goods, seller shall have a reasonable time to make such repairs or replace such goods.

Seller's warranties as herein above set forth shall not be enlarged, diminished, or affected by, and no obligation or liability shall arise or grow out of, sellers rendering of technical advice or service.

Damage to products caused by the customer or during installation cannot be claimed under this warranty. All devices returned that are not covered under the seller's warranty policy, will be charged a minimum of $25.00 for evaluation plus additional charges for components and labor to repair the device not to exceed the original selling price. Seller considers the following to be typical examples of customer or installation damage: burned or broken traces on the printed circuit board, burned or damaged components, dirt or water residue on the printed circuit board or inside the case, modifications by the customer, broken cases or housings and dead batteries.

Section Three

A return material authorization number (RMA) must be issued by seller before any product is returned for evaluation or repair. Warranty repairs must be completed at authorized repair facilities.

FCC Compliance and Advisory Statement. This hardware device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: 1) this device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed or used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: 1) reorient or relocate the receiving antenna; 2) increase the separation between the equipment and the receiver 3) connect the equipment to an outlet on a circuit different from that to which the receiver is connected; 4) consult the dealer or an experienced radio/TV technician for help. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Where shielded interface cables have been provided with the product or specified additional components or accessories elsewhere defined to be used with the installation of the product, they must be used in order to ensure compliance with FCC regulations.

Canadian DOC Statement. This digital device does not exceed the Class B limits for radio noise emissions from digital apparatus specified in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

This device complies with RSS-210 of Industry Canada. Operation is subject to the following two conditions: 1) this device may not cause interference, and 2) this device must accept any interference, including interference that may cause undesired operation of the device.

Déclaration FCC. Cet équipement a été testé et déclaré conforme à la section 15 du règlement de la FCC. Son fonctionnement est soumis aux conditions suivantes: 1) l'équipement concerné ne doit pas causer d'interférences dangereuses, et 2) il doit accepter toute interférence reçue, y compris les interférences risquant d'engendrer un fonctionnement indésirable. Cet équipement a été testé et déclaré conforme aux limitations prévues dans le cadre de la catégorie B des appareils numériques défini par la section 15 du règlement de la FCC. Ces limitations sont stipulées aux fins de garantir une protection raisonnable contre les interférences gênantes en installation résidentielle. Cet équipement génère, utilise et diffuse des ondes radio, et s'il n'est pas installé ni utilisé en conformité avec les instructions dont il fait l'objet, peut causer des interférences gênantes avec les communications radio. Cependant, nous ne pouvons vous garantir qu'une interférence ne se produira pas dans une installation particulière. Si cet équipement produit des interférences graves lors de réceptions radio ou télévisées qui peuvent être détectées en allumant et en éteignant l'équipement, vous êtes invités à les supprimer de plusieurs manières: 1) Réorienter ou déplacer l'antenne de réception; 2) Augmenter la distance séparant l'équipement et le récepteur 3) Connecter l'équipement à un circuit différent de celui auquel le récepteur est connecté; 4) Contacter votre revendeur ou un technicien radio/TV qualifié. Toutes modifications ou tous changements effectués sans l'accord exprès de la partie responsable de la conformité aux normes pourraient contraindre l'utilisateur à ne plus utiliser son équipement. Afin d'assurer la conformité avec les règlements FCC, les câbles d'interface blindés fournis avec le produit doivent être utilisés, ainsi que tout autres composants ou accessoires également spécifiés, lors de l'installation du produit.

Déclaration du Ministère des Communications Canadien. Cet appareil numérique est conforme aux limitations concernant l'émission d'interférences radio par des appareils numériques de catégorie B, telles que stipulées dans le cadre de la norme Appareils numériques ICES-003 édictée par le Ministère canadien de l'industrie.

Cet équipement a été déclaré conforme à la norme RSS-210 édictée par le Ministère canadien de l'industrie. Son fonctionnement est soumis aux conditions suivantes: 1) l'équipement concerné ne doit pas causer d'interférences, et 2) il doit accepter toute interférence reçue, y compris les interférences risquant d'engendrer un fonctionnement indésirable.

1801 South Nottawa Road
Sturgis, MI 49091
(800) 233-4823

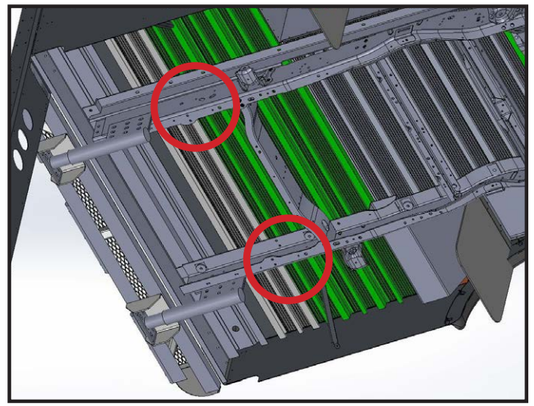
VEHICLE JACKING POINTS

Front

Under the Frame just behind the Front Bumper.

Rear

Under the Frame just behind the Rear Bumper Shocks.



CONFIDENTIAL NOT FOR DISTRIBUTION

SCHEDULED MAINTENANCE

2016 calendar year 6.8L-2V/3V engines will change to SAE 5W-20 engine oil from SAE 5W-30 engine due to dynamometer certification requirements for 6.8L-3V engines.

FORD recommendation to the USPS is to follow OEM maintenance schedules outlined in the owner's manual. The USPS must follow the severe duty cycle as it pertains to engine oil changes at 5000 mile intervals or at 200 hours of operation. The severe duty schedule, found on page 274 of the 2016 E450 owner's manual. This document can be downloaded from Fleet.ford.com. The following pages from Ford's Scheduled Maintenance manual are included here for your convenience. (Pages 87-94)

GENERAL MAINTENANCE INFORMATION

Why Maintain Your Vehicle?

Carefully following the maintenance schedule helps protect against major repair expenses resulting from neglect or inadequate maintenance and may help to increase the value of your vehicle when you sell or trade it. Keep all receipts for completed maintenance with your vehicle.

We have established regular maintenance intervals for your vehicle based upon rigorous testing. It is important that you have your vehicle serviced at the proper times. These intervals serve two purposes; one is to maintain the reliability of your vehicle and the second is to keep your cost of owning your vehicle down.

It is your responsibility to have all scheduled maintenance performed and to make sure that the materials used meet the specifications identified in this owner's manual. See **Capacities and Specifications** (page 191).

Failure to perform scheduled maintenance invalidates warranty coverage on parts affected by the lack of maintenance.

Why Maintain Your Vehicle at Your Dealership?

Factory-trained Technicians

Service technicians participate in extensive factory-sponsored certification training to help them become experts on the operation of your vehicle. Ask your dealership about the training and certification their technicians have received.

Genuine Ford and Motorcraft Replacement Parts

Dealerships stock Ford, Motorcraft and Ford-authorized branded re-manufactured replacement parts. These parts meet or exceed our specifications. Parts installed at your dealership carry a nationwide 24-month or unlimited mile (kilometer) parts and labor limited warranty.

If you do not use Ford authorized parts they may not meet our specifications and depending on the part, it could affect emissions compliance.

Convenience

Many dealerships have extended evening and Saturday hours to make your service visit more convenient and they offer one stop shopping. They can perform any services that are required on your vehicle, from general maintenance to collision repairs.

Note: *Not all dealers have extended hours or body shops. Please contact your dealer for details.*

Protecting Your Investment

Maintenance is an investment that pays dividends in the form of improved reliability, durability and resale value. To maintain the proper performance of your vehicle and its emission control systems, make sure you have scheduled maintenance performed at the designated intervals.

Your vehicle is very sophisticated and built with multiple, complex, performance systems. Every manufacturer develops these systems using different specifications and performance features. That is why it is important to rely upon your dealership to properly diagnose and repair your vehicle.

Scheduled Maintenance

Ford Motor Company has recommended maintenance intervals for various parts and component systems based upon engineering testing. Ford Motor Company relies upon this testing to determine the most appropriate mileage for replacement of oils and fluids to protect your vehicle at the lowest overall cost to you and recommends against maintenance schedules that deviate from the scheduled maintenance information.

We strongly recommend the use of only genuine Ford, Motorcraft or Ford-authorized re-manufactured replacement parts engineered for your vehicle.

Additives and Chemicals

This owner's manual and the Ford Workshop Manual list the recommended additives and chemicals for your vehicle. We do not recommend using chemicals or additives not approved by us as part of your vehicle's normal maintenance. Please consult your warranty information.

Oils, Fluids and Flushing

In many cases, fluid discoloration is a normal operating characteristic and, by itself, does not necessarily indicate a concern or that the fluid needs to be changed. However, a qualified expert, such as the factory-trained technicians at your dealership, should inspect discolored fluids that also show signs of overheating or foreign material contamination immediately.

Make sure to change your vehicle's oils and fluids at the specified intervals or in conjunction with a repair. Flushing is a viable way to change fluid for many vehicle sub-systems during scheduled maintenance. It is critical that systems are flushed only with new fluid that is the same as that required to fill and operate the system or using a Ford-approved flushing chemical.

Owner Checks and Services

Make sure you perform the following basic maintenance checks and inspections every month or at six-month intervals.

Check every month
Engine oil level.
Function of all interior and exterior lights.
Tires (including spare) for wear and proper pressure.
Windshield washer fluid level.

Check every six months
Battery connections. Clean if necessary.
Body and door drain holes for obstructions. Clean if necessary.
Cooling system fluid level and coolant strength.
Door weatherstrips for wear. Lubricate if necessary.

CONFIDENTIAL NOT FOR DISTRIBUTION

Scheduled Maintenance

Check every six months
Hinges, latches and outside locks for proper operation. Lubricate if necessary.
Parking brake for proper operation.
Safety belts and seat latches for wear and function.
Safety warning lamps (brake, ABS, airbag and safety belt) for operation.
Washer spray and wiper operation. Clean or replace blades as necessary.

Multi-point Inspection

In order to keep your vehicle running right, it is important to have the systems on your vehicle checked regularly. This can help identify potential issues and prevent major problems. We recommend having the following multi-point inspection performed at every scheduled maintenance interval to help make sure your vehicle keeps running great.

Multi-point inspection	
Accessory drive belt(s)	Horn operation
Battery performance	Radiator, cooler, heater and A/C hoses
Engine air filter	Suspension component for leaks or damage
Exhaust system	Steering and linkage
Exterior lamps and hazard warning system operation	Tires (including spare) for wear and proper pressure**
Fluid levels*; fill if necessary	Windshield for cracks, chips or pits
For oil and fluid leaks	Washer spray and wiper operation

* Brake, coolant recovery reservoir, automatic transmission, power steering and window washer.

**If your vehicle is equipped with a temporary mobility kit, check the tire sealant expiration Use By date on the canister. Replace as needed.

CONFIDENTIAL NOT FOR DISTRIBUTION

Scheduled Maintenance

Be sure to ask your dealership service advisor or technician about the multi-point vehicle inspection. It is a comprehensive way to perform a thorough inspection of your vehicle. Your checklist gives you immediate feedback on the overall condition of your vehicle.

NORMAL SCHEDULED MAINTENANCE

Every 7500 miles (12000 km) or six months (whichever comes first)
Change engine oil and filter.
Rotate tires*, inspect tire wear and measure tread depth.
Inspect wheels and related components for abnormal noise, wear, looseness or drag.
Perform multi-point inspection (recommended).

* Vehicles with dual rear wheels should rotate the front wheels when specified; rear wheels only if unusual wear is noted.

Every 15000 miles (24000 km) or 12 months (whichever comes first)
Inspect automatic transmission fluid level. Consult dealer for requirements.
Inspect brake pads, rotors, hoses and parking brake.
Inspect engine cooling system strength and hoses.
Inspect exhaust system and heat shields.
Inspect steering linkage, ball joints, suspension, tie-rod ends, driveshaft and U-joints.

Other maintenance items	
Every 30000 miles (48000 km)	Replace engine air filter.
Every 60000 miles (96000 km)	Change automatic transmission fluid and filter (5-Speed Transmission only). Consult dealer for requirements.
	Replace front wheel bearing grease and grease seal if non-sealed bearings are used.
Every 97500 miles (156000 km)	Replace spark plugs.
Every 105000 miles (168000 km)	Change engine coolant.*

CONFIDENTIAL NOT FOR DISTRIBUTION

Scheduled Maintenance

Other maintenance items	
	Replace rear axle fluid.
	Inspect accessory drive belt(s).**
Every 150000 miles (240000 km)	Change automatic transmission fluid.
	Change automatic transmission filter.***
	Replace accessory drive belt(s) if not replaced within the last 100000 miles (160000 km).
	Replace front wheel bearings and seals if non-sealed bearings are used.
Every two years	Replace brake fluid.

* Initial replacement at six years or 105000 miles (168000 kilometers), then every three years or 45000 miles (72000 kilometers).

** If not replaced, inspect every 15000 miles (24000 kilometers).

*** Rear-wheel drive vehicles only.

CONFIDENTIAL NOT FOR DISTRIBUTION

Scheduled Maintenance

SPECIAL OPERATING CONDITIONS SCHEDULED MAINTENANCE

If you operate your vehicle **primarily** in any of the following conditions, you need to perform extra maintenance as indicated. If you operate your vehicle **occasionally** under any of these conditions, it is not necessary to perform the extra maintenance. For specific recommendations, see your dealership service advisor or technician.

Towing a trailer or using a car-top carrier	
Inspect frequently, service as required	Inspect U-joints.
	See axle maintenance items under **Exceptions**.
Every 5000 miles (8000 km)	Inspect the wheels and related components for abnormal noise, wear, looseness or drag.
	Rotate tires*, inspect tires for wear and measure tread depth.
Every 5000 miles (8000 km) or six months	Change engine oil and filter.
	Inspect U-joints.
Every 30000 miles (48000 km)	Replace front wheel bearing grease and grease seals if non-sealed bearings are used.
Every 60000 miles (96000 km)	Replace spark plugs.

*Vehicles equipped with dual rear wheels should rotate the front wheels when specified; rear wheels only if unusual wear is noted.

Extensive idling or low-speed driving for long distances, as in heavy commercial use (such as delivery, taxi, patrol car or livery)	
Every 5000 miles (8000 km)	Inspect brake system.
	Inspect wheels and related components for abnormal noise, wear, looseness or drag.
	Rotate tires*, inspect tires for wear and measure tread depth.
Every 5000 miles (8000 km) or six months	Inspect U-joints.

CONFIDENTIAL NOT FOR DISTRIBUTION

Scheduled Maintenance

Extensive idling or low-speed driving for long distances, as in heavy commercial use (such as delivery, taxi, patrol car or livery)	
Every 5000 miles (8000 km) or six months or 200 engine hours	Change engine oil and filter.
Every 30000 miles (48000 km)	Replace front wheel bearing grease and grease seals if non-sealed bearings are used.
Every 60000 miles (96000 km)	Replace spark plugs.

*Vehicles equipped with dual rear wheels should rotate the front wheels when specified; rear wheels only if unusual wear is noted.

Operating in dusty or sandy conditions (such as unpaved or dusty roads)	
Inspect frequently, service as required	Replace engine air filter.
Every 5000 miles (8000 km)	Inspect the wheels and related components for abnormal noise, wear, looseness or drag.
	Rotate tires*, inspect tires for wear and measure tread depth.
Every 5000 miles (8000 km) or six months	Change engine oil and filter.
	Inspect U-joints.
Every 30000 miles (48000 km)	Replace front wheel bearing grease and grease seals if non-sealed bearings are used.
Every 50000 miles (80000 km)	Change rear axle fluid.

*Vehicles equipped with dual rear wheels should rotate the front wheels when specified; rear wheels only if unusual wear is noted.

Exceptions

There are several exceptions to the Normal Schedule:

Normal vehicle axle maintenance: Rear axles and power take-off units with synthetic fluid and light-duty trucks equipped with Ford-design axles are lubricated for life; do not check or change fluid unless a leak is suspected, service is required or the assembly has been submerged in water. During long periods of trailer towing with outside temperatures

CONFIDENTIAL NOT FOR DISTRIBUTION

Scheduled Maintenance

above 70ºF (21ºC) and at wide-open throttle for long periods above 45 mph (72 km/h), change non-synthetic rear axle fluid every 3000 miles (4800 kilometers) or three months, whichever comes first. This interval can be waived if the axle is filled with 75W140 synthetic gear fluid meeting Ford specification WSL-M2C192-A, part number F1TZ-19580-B, or equivalent. Add friction modifier XL-3 (EST-M2C118-A) or equivalent for complete refill of Traction-Lok rear axles. See **Capacities and Specifications** (page 191).

California fuel filter replacement: If you register your vehicle in California, the California Air Resources Board has determined that the failure to perform this maintenance item does not nullify the emission warranty or limit recall liability before the completion of your vehicle's useful life. Ford Motor Company, however, urges you to have all recommended maintenance services performed at the specified intervals and to record all vehicle service.

Hot climate oil change intervals: Vehicles operating in the Middle East, North Africa, Sub-Saharan Africa or locations with similar climates using an American Petroleum Institute (API) Certified for Gasoline Engines (Certification mark) oil of SM or SN quality, the normal oil change interval is 5000 miles (8000 kilometers).

If the available API SM or SN oils are not available, then the oil change interval is 3000 miles (4800 kilometers).

Engine air filter replacement: The life of the engine air filter is dependent on exposure to dusty and dirty conditions. Vehicles operated in these conditions require frequent inspection and replacement.

SCHEDULED MAINTENANCE RECORD

Repair Order #:

Distance:

Engine hours (optional):

Multi-point inspection (recommended): ☐

Dealer stamp

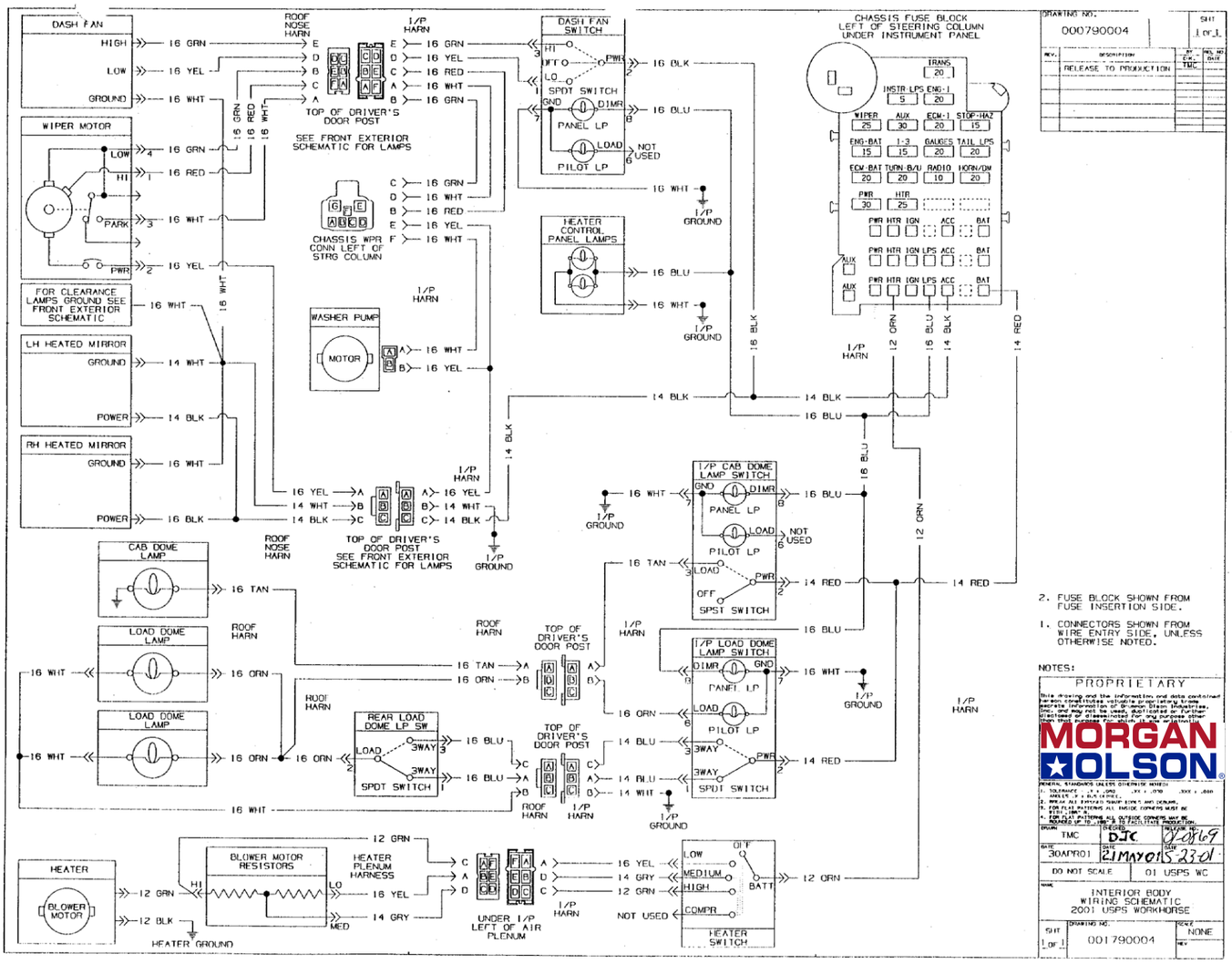
Signature:

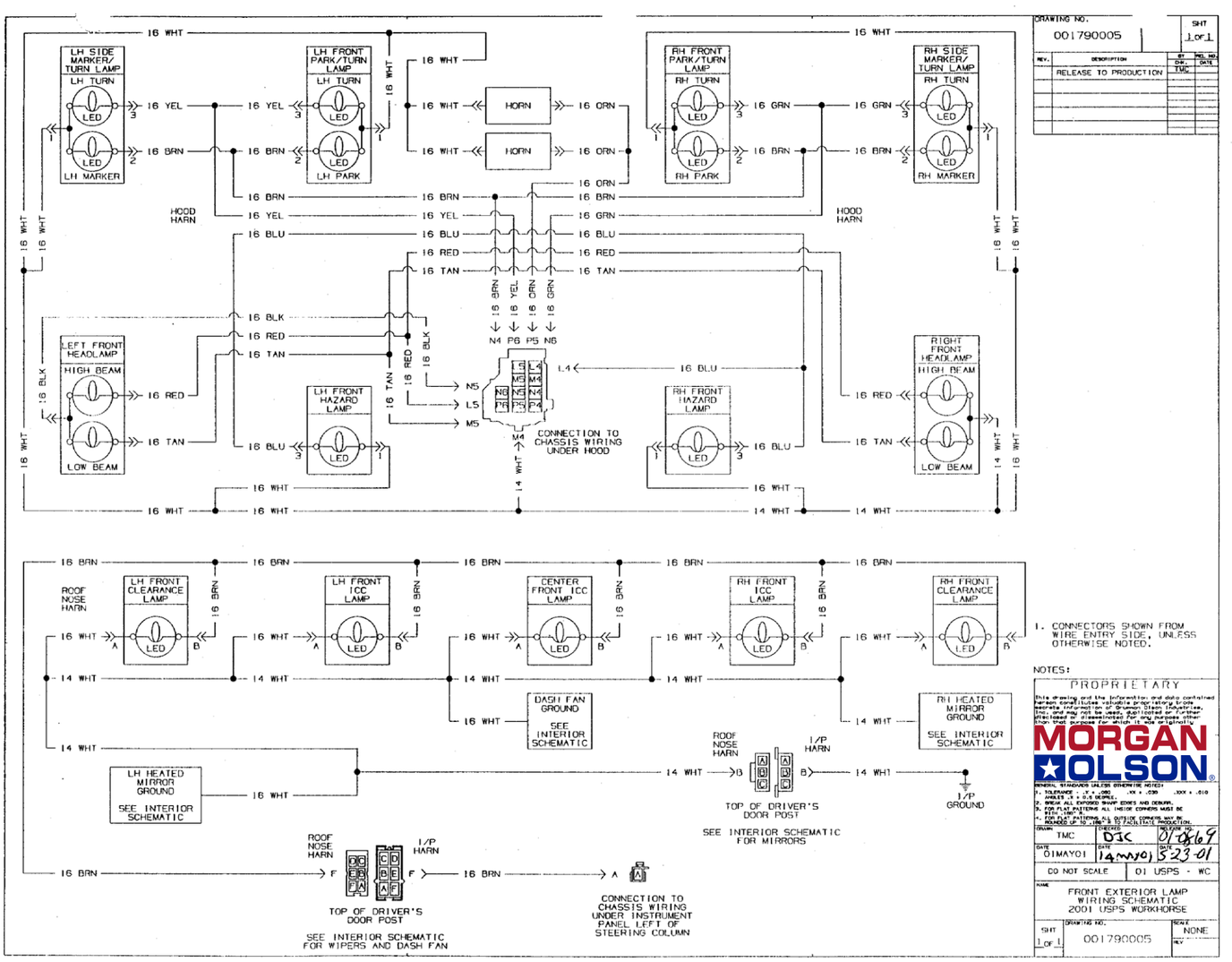
FORD Recommended Maintenance Schedule For Extreme Duty Extensive idling and/or driving at low speeds

Mileage	5K	10K	15K	20K	25K	30K	35K	40K	45K	50K	55K	60K	65K	70K	75K	80K	85K	90K	95K	100K	105K	110K	115K	120K	125K	130K	135K	140K	145K	150K
MEMO: Gas engine; Up to 6.0 quarts of oil	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Replace platinum-tipped spark plugs												X												X						
Inspect complete exhaust system and heat shields			X						X						X						X						X			
Replace front 4x2 wheel bearings and grease seals, lubricate and adjust bearings																														
Replace accessory drive belts (if not replaced within last 100,000 miles)																														
Change Premium Gold engine coolant																														
Replace rear axle lubricant																														
Inspect and lubricate all non-sealed steering linkage, ball joints, suspension joints, half and drive-shafts and u-joints	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X		X				X					X		
Inspect 4x2 front wheel bearings; replace grease and grease seals, and adjust bearings						X						X						X												
Change rear axle fluid (vehicles equipped with Dana axles)																														
Change automatic transmission fluid and filter												X																		
Inspect brake pads/shoes/rotors/drums, brake lines and hoses, and parking brake system	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X		X				X					X		
Inspect cooling system and hoses			X						X						X															
Inspect accessory drive belt(s)																														

CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

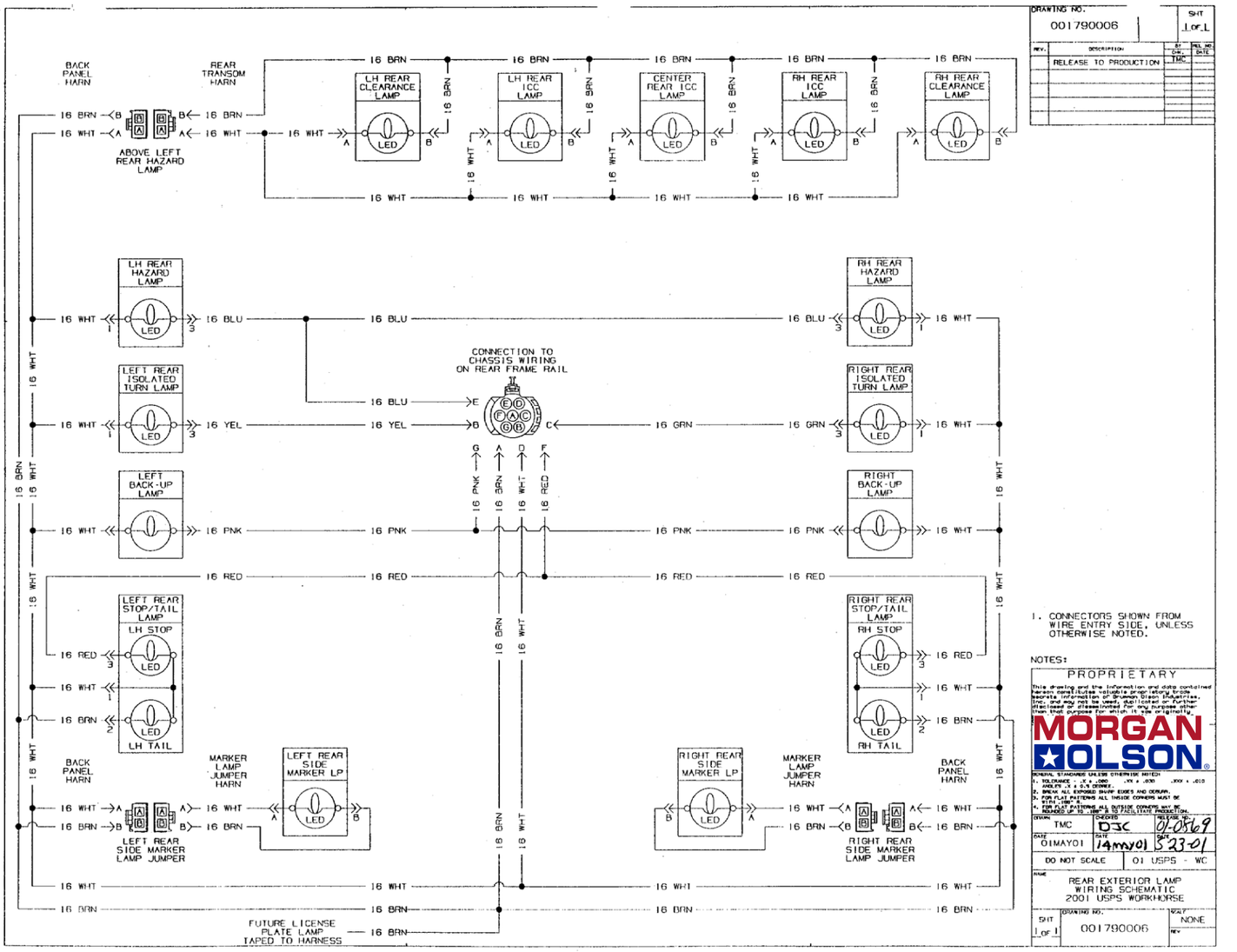




CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION



DRAWING NO. 001790006 SHT 1 OF 1

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE TO PRODUCTION	TMC	

1. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.

NOTES:

PROPRIETARY

This drawing and the information and data contained herein constitute confidential proprietary trade secrets and proprietary know-how of Morgan Olson, Inc. and may not be used, published or further disclosed or disseminated for any purpose other than that purpose for which it was originally provided.

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED:
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010 ANGLES .X ± 0.5 DEGREE.
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE .XXX R MIN.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
TMC	DJC	01-0869
DATE 01MAY01	PART 14MAY01	REV 5-23-01
DO NOT SCALE	01 USPS - WC	

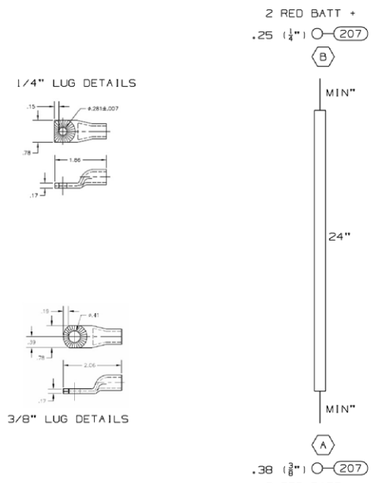
NAME: REAR EXTERIOR LAMP WIRING SCHEMATIC 2001 USPS WORKHORSE

SHT	DRAWING NO.	SCALE
1 OF 1	001790006	NONE

CIRCUIT	GA/COLOR	END POINTS	FUNCTION
207	2 RED	A,B	BATT +

DRAWING NO. 132088206 REV REL SHT 1 OF 1

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		



USE SOLDER AND ADD HEAT SHRINK OVER CRIMPED LUGS

8. VENDOR MAY REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN IN TERMINAL VIEW.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
5. SPLICES TO BE AUTOMATED WITH SOLDER, AND ADHESIVE LINED HEAT SHRINK TUBING.
4. TAPE 1111096: 6" AT BREAKOUTS, 2" AT 18" INTERVALS, FOR UNINTERRUPTED LOOM LENGTHS GREATER THAN 24", AND 2" AT LOOM ENDS.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
2. SPLIT HI-TEMP POLY LOOM UNLESS OTHERWISE NOTED.
1. SGX WIRE.

NOTES:

PROPRIETARY

This drawing and the information and data contained herein constitute confidential proprietary trade secrets and proprietary know-how of Morgan Olson, Inc. and may not be used, published or further disclosed or disseminated for any purpose other than that purpose for which it was originally provided, without the prior written consent of Morgan Olson.

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED:
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010 ANGLES .X ± 0.5 DEGREE. SEND ANGLE .X ± 1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE .XXX R MIN.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL		41992
DATE 170CT13	DATE	DATE 170CT13
DO NOT SCALE		

NAME: HARN BAT POS 2GA BREAKER 24"

SHT	DRAWING NO.	SCALE	REV
1 OF 1	132088206	NONE	REL

HARNESS AND LOOM TOLERANCES

UP TO 60"	-0/+2"
60" TO 100"	-0/+4"
100" TO 200"	-0/+5"
200" TO 400"	-0/+6"
400" TO 600"	-0/+7"
OVER 600"	-0/+8"
BO TO BO	-0/+2"

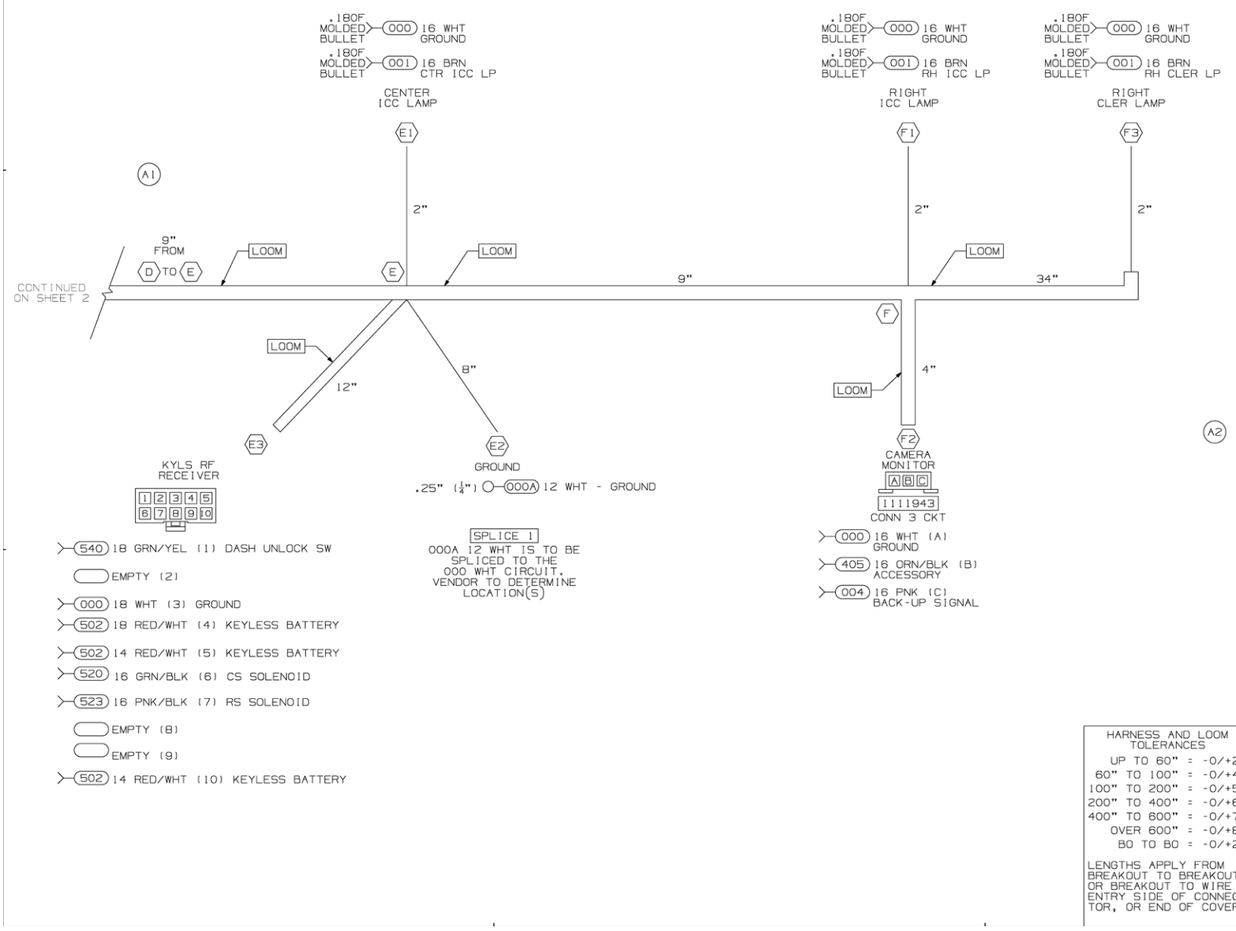
LENGTHS APPLY FROM BREAKOUT TO BREAKOUT, OR BREAKOUT TO WIRE ENTRY SIDE OF CONNECTOR, OR END OF COVER.

CONFIDENTIAL NOT FOR DISTRIBUTION
CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

DRAWING NO.	REV	SHT
150091201	REL	1 OF 2

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		



10. VENDOR TO GREASE FEMALE BULLET TERMINALS.
9. THIS IS A PURCHASED HARNESS. NO BILL OF MATERIAL EXISTS.
8. VENDOR MAY REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN IN TERMINAL VIEW.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
5. SPLICES TO BE AUTOMATED WITH SOLDER, AND ADHESIVE LINED HEAT SHRINK TUBING.
4. TAPE 1111098: 6" AT BREAKOUTS, 2" AT 18" INTERVALS, FOR UNINTERRUPTED LOOM LENGTHS GREATER THAN 24", AND 2" AT LOOM ENDS.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
2. SPLIT POLY LOOM UNLESS OTHERWISE NOTED.
1. SXL WIRE.

NOTES:

HARNESS AND LOOM TOLERANCES	
UP TO 60"	-0/+2"
60" TO 100"	-0/+4"
100" TO 200"	-0/+5"
200" TO 400"	-0/+6"
400" TO 600"	-0/+7"
OVER 600"	-0/+8"
BO TO BO	-0/+2"

LENGTHS APPLY FROM BREAKOUT TO BREAKOUT, OR BREAKOUT TO WIRE ENTRY SIDE OF CONNECTOR, OR END OF COVER.

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED!
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES .X ± 0.5 DEGREE BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL		45755
DATE 12AUG15	DATE	DATE 12AUG15

DO NOT SCALE

NAME: HARN RFNO RSF 2009 M-100

SHT	DRAWING NO.	SCALE	REV
1 OF 2	150091201	NONE	REL

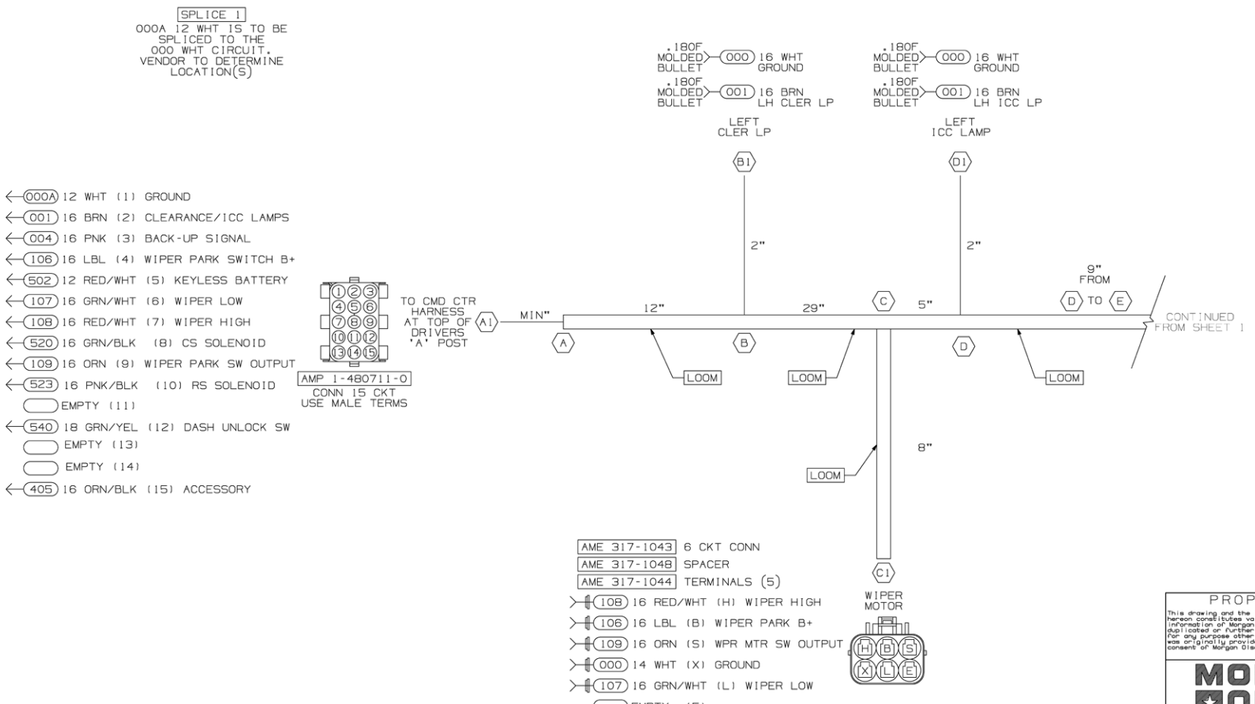
DRAWING NO.	REV	SHT
150091201	REL	2 OF 2

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		

CIRCUIT	GA/COLOR	END POINTS	FUNCTION
000A	12 WHT	A1,E2,SPLICE 1	GROUND
000	14/16 WHT	B1,C1,D1,E1,F1,F2,F3,SPLICE 1	GROUND
001	16 BRN	A1,B1,C1,D1,F1,F3	CLEARANCE/ICC LPS
004	16 PNK	A1,F2	BACK-UP SIGNAL
106	16 LBL	A1,E1	WIPER PARK SWITCH B+
107	16 GRN/WHT	A1,E1	WIPER LOW
108	16 RED/WHT	A1,E1	WIPER HIGH

CIRCUIT	GA/COLOR	END POINTS	FUNCTION
109	16 ORN	A1,E1	WIPER PK SWITCH OUTPUT
405	16 ORN/BLK	A1,F2	ACCY POWER
502	14,16,18 RED/WHT	A1,E3	KEYLESS BATTERY
520	16 BRN/BLK	A1,E3	CS SOLENOID
523	16 PNK/BLK	A1,E3	RS SOLENOID
540	16 GRN/YEL	A1,E3	DASH UNLOCK SW

SPLICE 1
000A 12 WHT IS TO BE SPLICED TO THE 000 WHT CIRCUIT. VENDOR TO DETERMINE LOCATION(S)



MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED!
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES .X ± 0.5 DEGREE BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL		45755
DATE 12AUG15	DATE	DATE 12AUG15

DO NOT SCALE

NAME: HARN RFNO USPS 2015

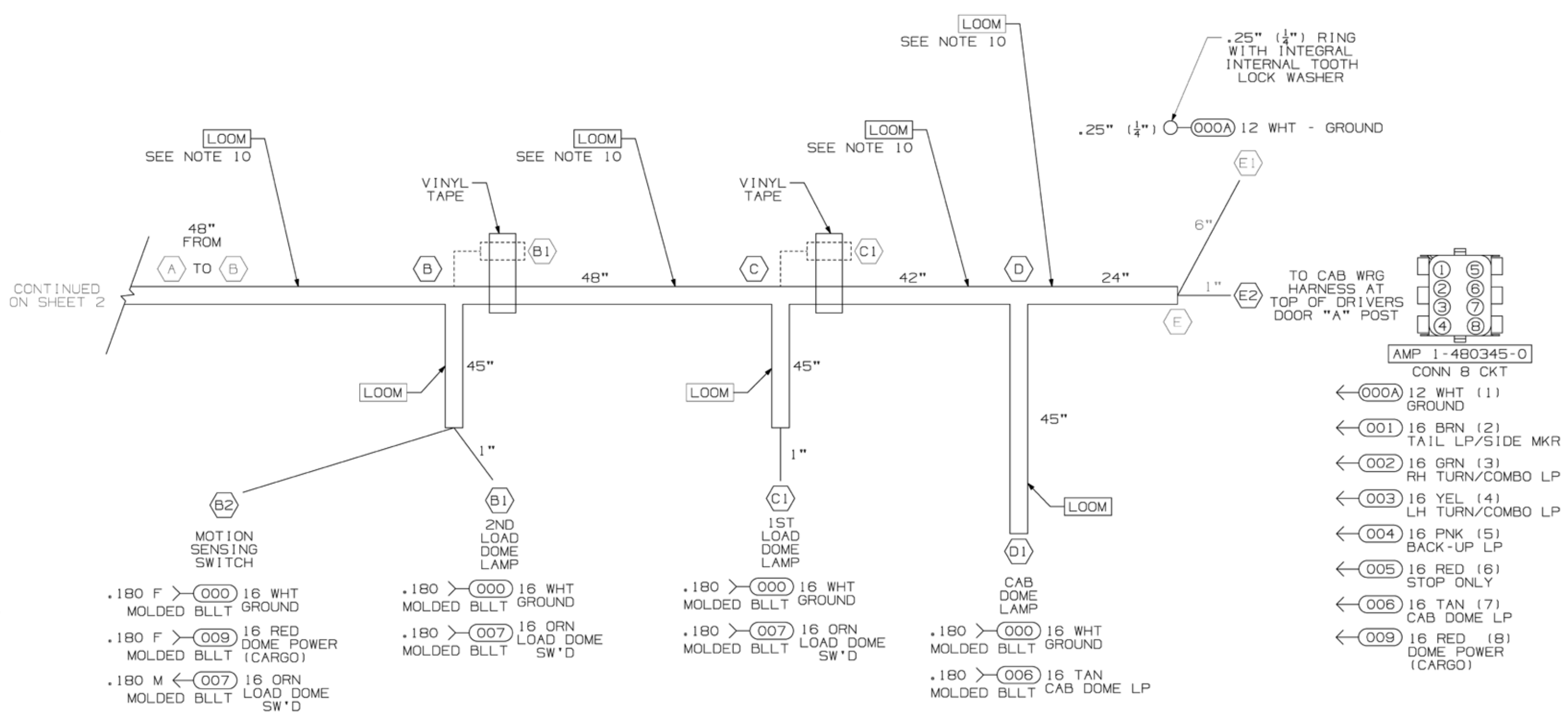
SHT	DRAWING NO.	SCALE	REV
2 OF 2	150091201	NONE	REL

CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

DRAWING NO.	REV	SHT
153093201	REL	1 OF 2

REV.	DESCRIPTION	BY / CHK.	ECO NO. / DATE
	RELEASE TO PRODUCTION		



10. MAIN TRUNK OF HARNESS MUST FIT IN A .75 DIA. WIRE CHANNEL
9. THIS IS A PURCHASED HARNESS. NO BILL OF MATERIAL EXISTS.
8. VENDOR MAY REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN IN TERMINAL VIEW.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
5. SPLICES TO BE AUTOMATED WITH HEAT SHRINK TUBING. HEAT SHRINK BUTT SPLICES ARE ACCEPTABLE FOR M-O FABRICATION IF NECESSARY.
4. TAPE 1111096: 6" AT BREAKOUTS AND 2" AT LOOM ENDS.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
2. SPLIT POLY LOOM UNLESS OTHERWISE NOTED.
1. SXL WIRE.

NOTES:

HARNESS AND LOOM TOLERANCES
UP TO 60" = -0/+2"
60" TO 100" = -0/+4"
100" TO 200" = -0/+5"
200" TO 400" = -0/+6"
400" TO 600" = -0/+7"
OVER 600" = -0/+8"
BO TO BO = -0/+2"
TOLERANCE IS NOT ACCUMULATIVE. LENGTH APPLIES TO OVERALL HARNESS LENGTH, BREAKOUT TO END, OR LOOM.

PROPRIETARY

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED:
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010 ANGLES .X ± 0.5 DEGREE. BEND ANGLE .X ±1.5°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .180" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .180" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 12AUG15	DATE -	DATE 12AUG15

DO NOT SCALE

NAME: HARNESS ROOF USPS 2015

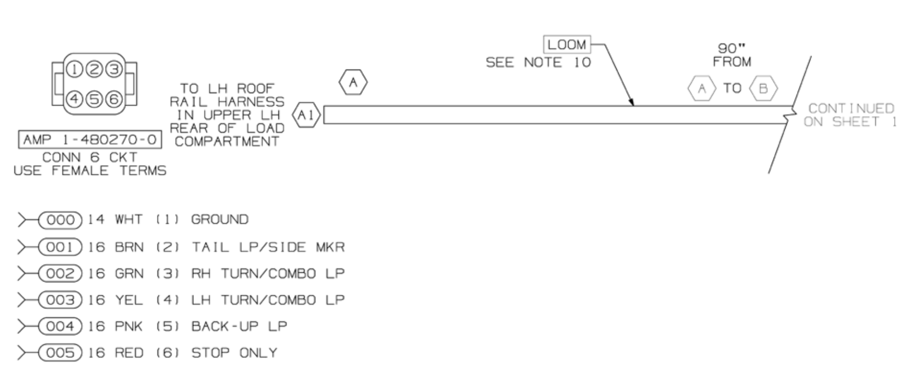
SHT	DRAWING NO.	SCALE / REV
1 OF 2	153093201	NONE / REL

CIRCUIT	DESCRIPTION	END POINTS	FUNCTION
000A	12 WHT	A1,E1,E2,SPLICE 1	GROUND
000	14/16 WHT	A2,B1,C1,D1,SPLICE 1	GROUND
001	16 BRN	A1,E2	CLER/ICC LPS
002	16 GRN	A1,E2	RH TURN LP
003	16 YEL	A1,E2	LH TURN LP
004	16 PNK	A1,E2	BACK-UP LPS
005	16 RED	A1,E2	STOP LPS
006	16 TAN	D1,E2	CAB DOME LP
009	16 RED	B2,E2	DOME POWER (CARGO)
007	16 ORN	B1,B2,C1	LOAD DOME LAMPS SW'D

SPLICE 1
000A 12 WHT IS TO BE SPLICED TO THE 000 WHT CIRCUIT. VENDOR TO DETERMINE LOCATION(S)

DRAWING NO.	REV	SHT
153093201	REL	2 OF 2

REV.	DESCRIPTION	BY / CHK.	ECO NO. / DATE
	RELEASE TO PRODUCTION		



10. MAIN TRUNK OF HARNESS MUST FIT IN A .75 DIA. WIRE CHANNEL
9. THIS IS A PURCHASED HARNESS. NO BILL OF MATERIAL EXISTS.
8. VENDOR MAY REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN IN TERMINAL VIEW.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
5. SPLICES TO BE AUTOMATED WITH HEAT SHRINK TUBING. HEAT SHRINK BUTT SPLICES ARE ACCEPTABLE FOR M-O FABRICATION IF NECESSARY.
4. TAPE 1111096: 6" AT BREAKOUTS AND 2" AT LOOM ENDS.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
2. SPLIT POLY LOOM UNLESS OTHERWISE NOTED.
1. SXL WIRE.
NOTES:

HARNESS AND LOOM TOLERANCES
UP TO 60" = -0/+2"
60" TO 100" = -0/+4"
100" TO 200" = -0/+5"
200" TO 400" = -0/+6"
400" TO 600" = -0/+7"
OVER 600" = -0/+8"
BO TO BO = -0/+2"
TOLERANCE IS NOT ACCUMULATIVE. LENGTH APPLIES TO OVERALL HARNESS LENGTH, BREAKOUT TO END, OR LOOM.

PROPRIETARY

MORGAN OLSON

DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 12AUG15	DATE -	DATE 12AUG15

DO NOT SCALE

NAME: HARNESS ROOF USPS 2015

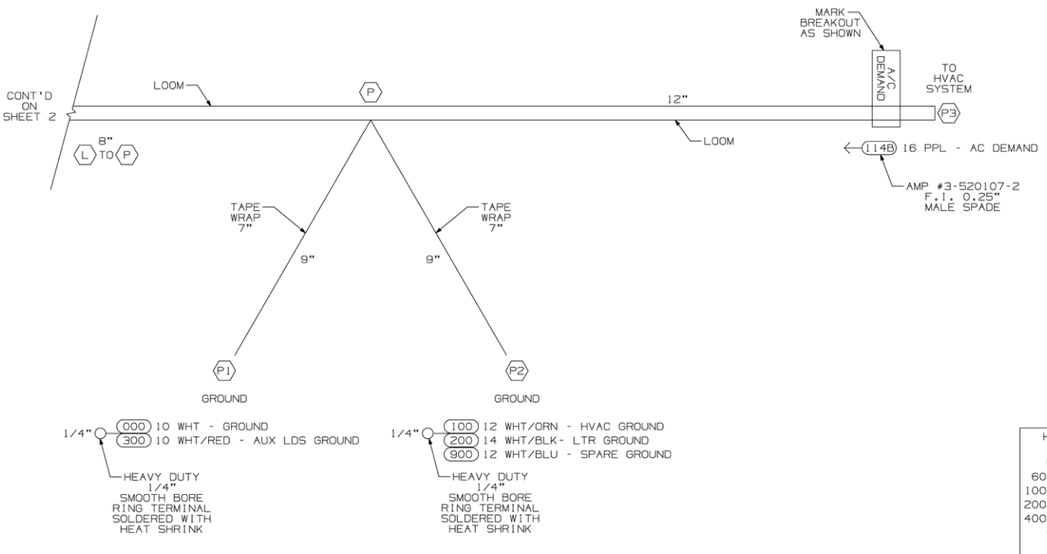
SHT	DRAWING NO.	SCALE / REV
2 OF 2	153093201	NONE / REL

CONFIDENTIAL NOT FOR DISTRIBUTION

DRAWING NO.	REV	SHT
155084201		1 OF 7

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		

VENDOR TO KEEP LOOM SIZE AS SMALL AS POSSIBLE



HARNESS AND LOOM TOLERANCES	
UP TO 60"	= -0/+2"
60" TO 100"	= -0/+4"
100" TO 200"	= -0/+5"
200" TO 400"	= -0/+8"
400" TO 600"	= -0/+7"
OVER 600"	= -0/+8"
BO TO BO	= -0/+2"

LENGTHS APPLY FROM BREAKOUT TO BREAKOUT, OR BREAKOUT TO WIRE ENTRY SIDE OF CONNECTOR.

9. THIS IS A PURCHASED HARNESS. NO BILL OF MATERIAL EXISTS.
8. VENDOR MAY REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN IN TERMINAL VIEW, UNLESS OTHERWISE NOTED.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
5. SPLICES TO BE AUTOMATED WITH SOLDER, AND ADHESIVE LINED HEAT SHRINK TUBING.
4. TAPE 1111096: 6" AT BREAKOUTS AND 2" AT LOOM ENDS.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
2. SPLIT POLY LOOM UNLESS OTHERWISE NOTED.
1. SXL WIRE.

NOTES:

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED!
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES - X ± 0.5 DEGREE. BEND ANGLE ± 1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 18AUG15	DATE -	DATE 18AUG15
DO NOT SCALE		USPS 2015

NAME: HARN I/P E-SERIES USPS 2015

SHT	DRAWING NO.	SCALE	REV
1 OF 7	155084201	NONE	

DRAWING NO.	REV	SHT
155084201		2 OF 7

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		

PREFERRED CONSTRUCTION
IS TO REPLACE THE FORD PIGTAIL WITH THE FORD CONNECTOR AND APPROPRIATE TERMINALS, USING WIRE GAUGES AND COLORS PER TABLE BELOW.

008 - 16 BLU
114 - 16 PPL
119 - 16 GRY
207 - 12 RED/YEL
416 - 16 GRY

ALTERNATE CONSTRUCTION
1. LOCATE FORD DUNNAGE 9C24-14370-AC PIGTAIL (INST-3).
2. SPLICE INTO HARNESS TRUNK AS SHOWN, STAGGERING SPLICES FOR NEAT WIRE BUNDLE LAY.
3. UNUSED LEADS MAY BE TRIMMED BACK TO IMPROVE NEATNESS.
4. APPLY HEAT SHRINK TUBING TO UNUSED LEADS.

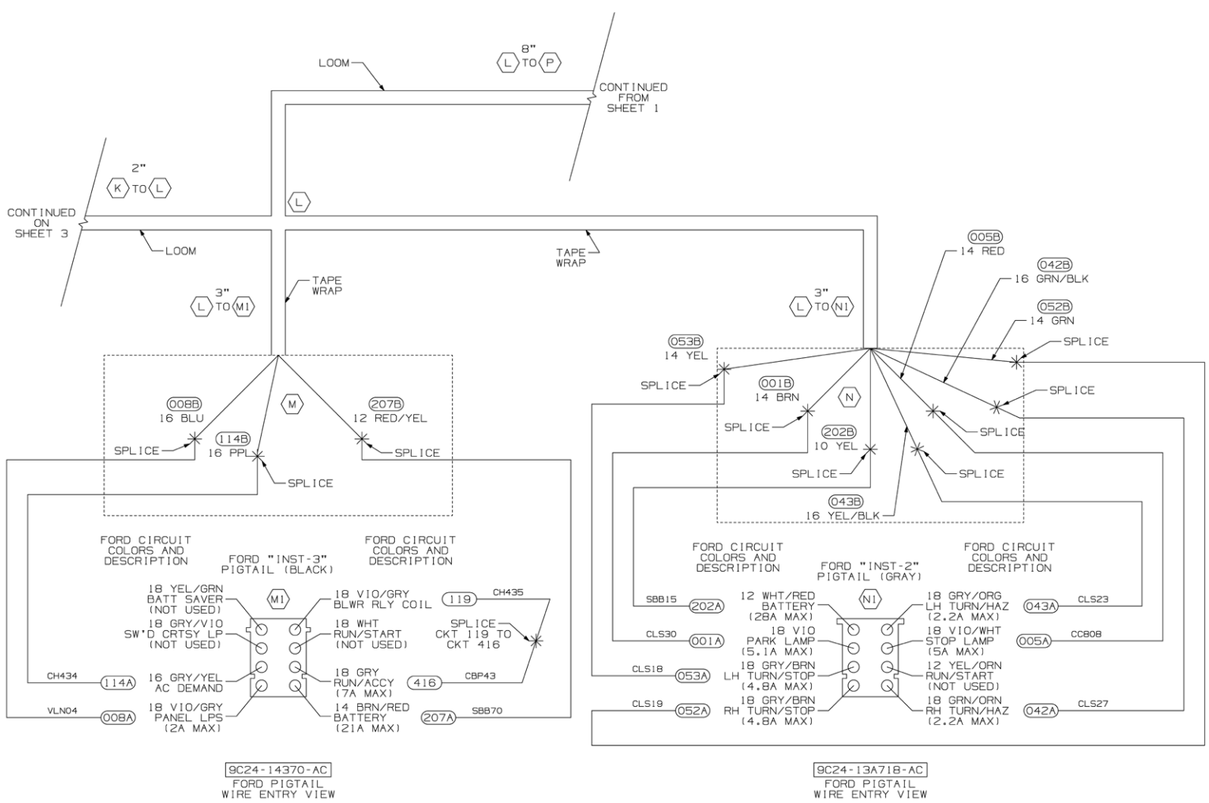
ALTERNATE CONSTRUCTION REQUIRES FORD PIGTAIL TO BE SHIPPED TO WIRE HARNESS SUPPLIER FROM MORGAN OLSON.

PREFERRED CONSTRUCTION
IS TO REPLACE THE FORD PIGTAIL WITH THE FORD CONNECTOR AND APPROPRIATE TERMINALS, USING WIRE GAUGES AND COLORS PER TABLE BELOW.

001 - 14/16 BRN
005 - 14 RED
202 - 10 YEL
042 - 16 GRN/BLK
043 - 16 YEL/BLK
052 - 14 GRN
053 - 14 YEL

ALTERNATE CONSTRUCTION
1. LOCATE FORD DUNNAGE 9C24-13A718-AC PIGTAIL (INST-2).
2. SPLICE INTO HARNESS TRUNK AS SHOWN, STAGGERING SPLICES FOR NEAT WIRE BUNDLE LAY.
3. UNUSED LEADS MAY BE TRIMMED BACK TO IMPROVE NEATNESS.
4. APPLY HEAT SHRINK TUBING TO UNUSED LEADS.

ALTERNATE CONSTRUCTION REQUIRES FORD PIGTAIL TO BE SHIPPED TO WIRE HARNESS SUPPLIER FROM MORGAN OLSON.



MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED!
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES - X ± 0.5 DEGREE. BEND ANGLE ± 1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

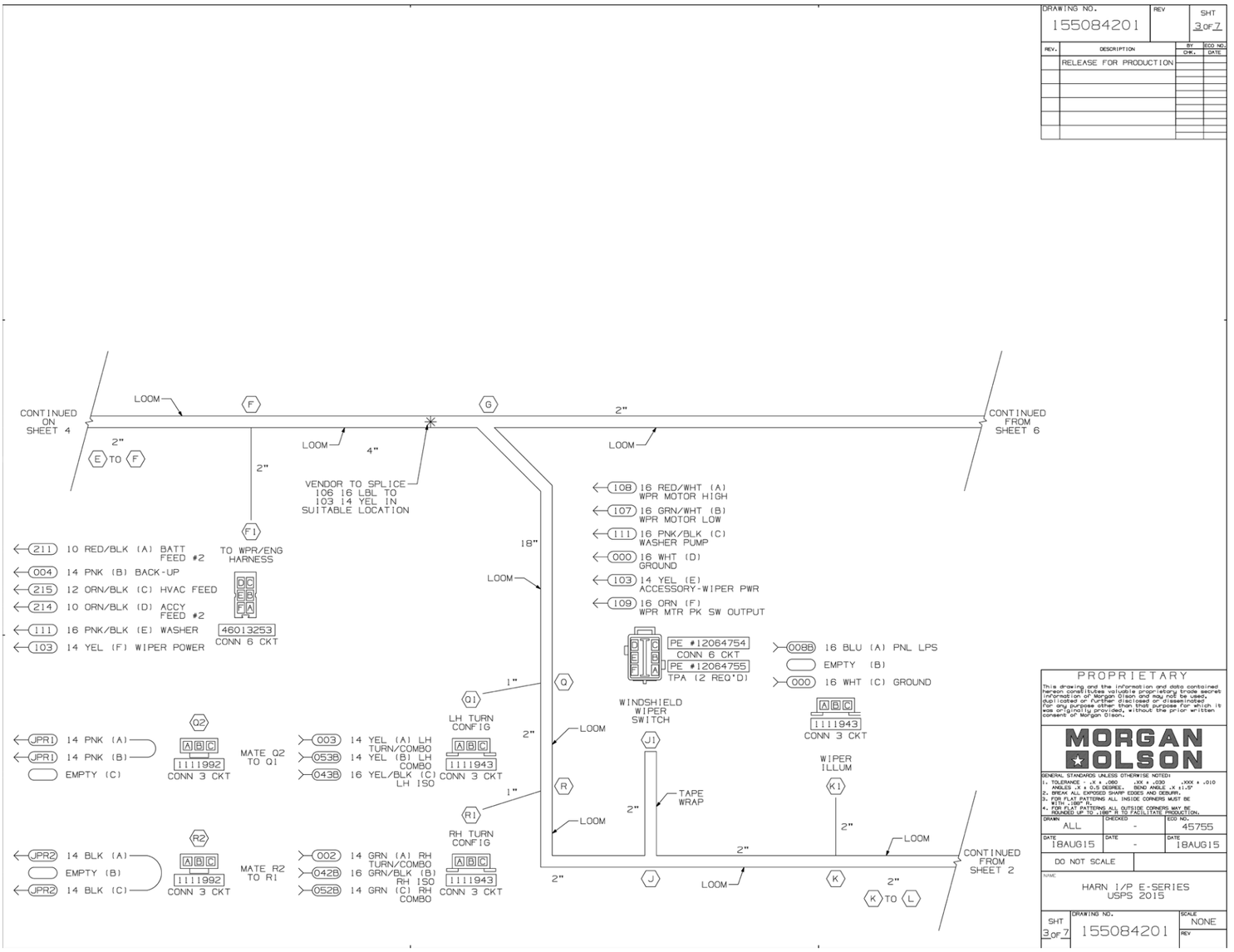
DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 18AUG15	DATE -	DATE 18AUG15
DO NOT SCALE		

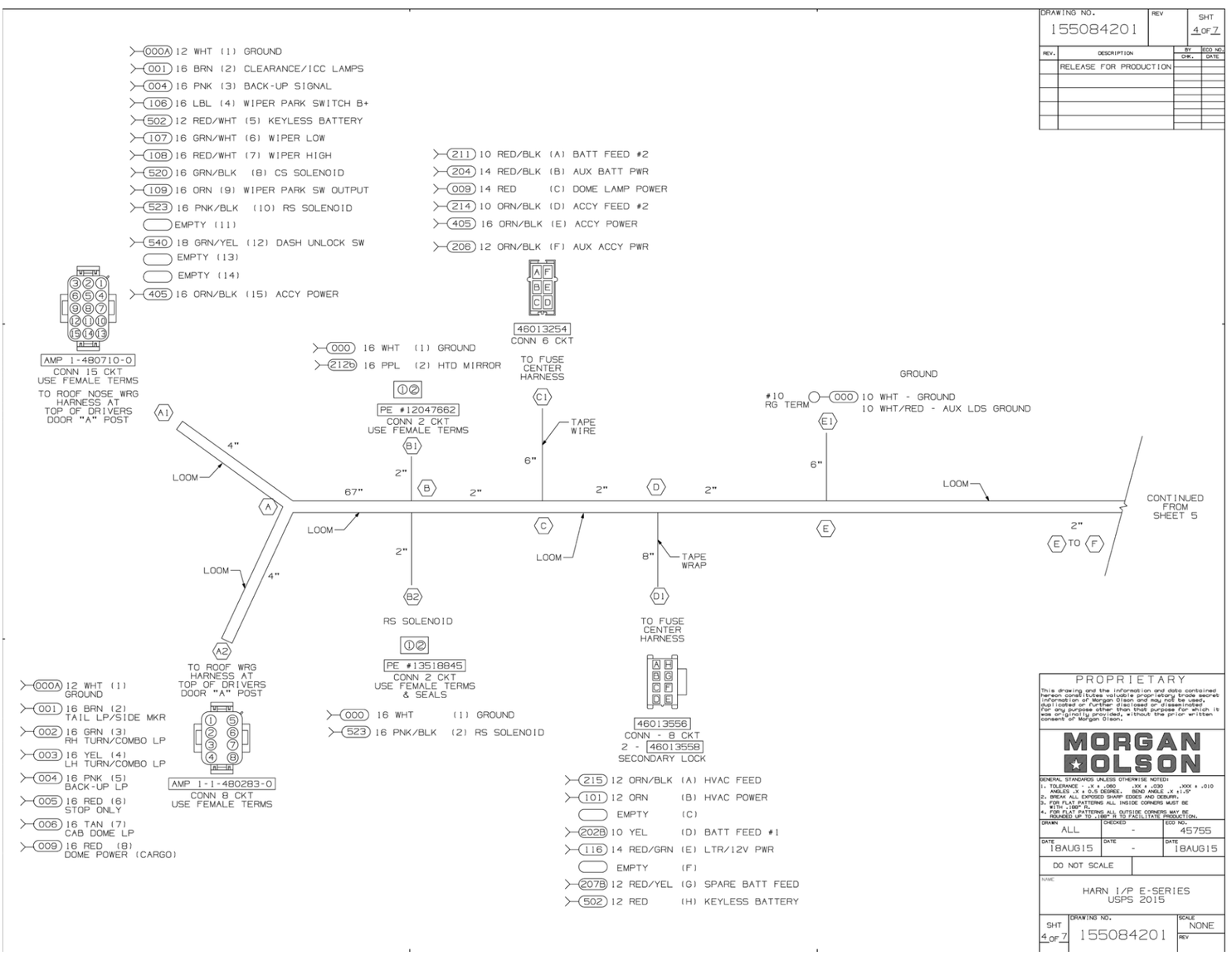
NAME: HARN I/P E-SERIES USPS 2015

SHT	DRAWING NO.	SCALE	REV
2 OF 7	155084201	NONE	

CONFIDENTIAL NOT FOR DISTRIBUTION
CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

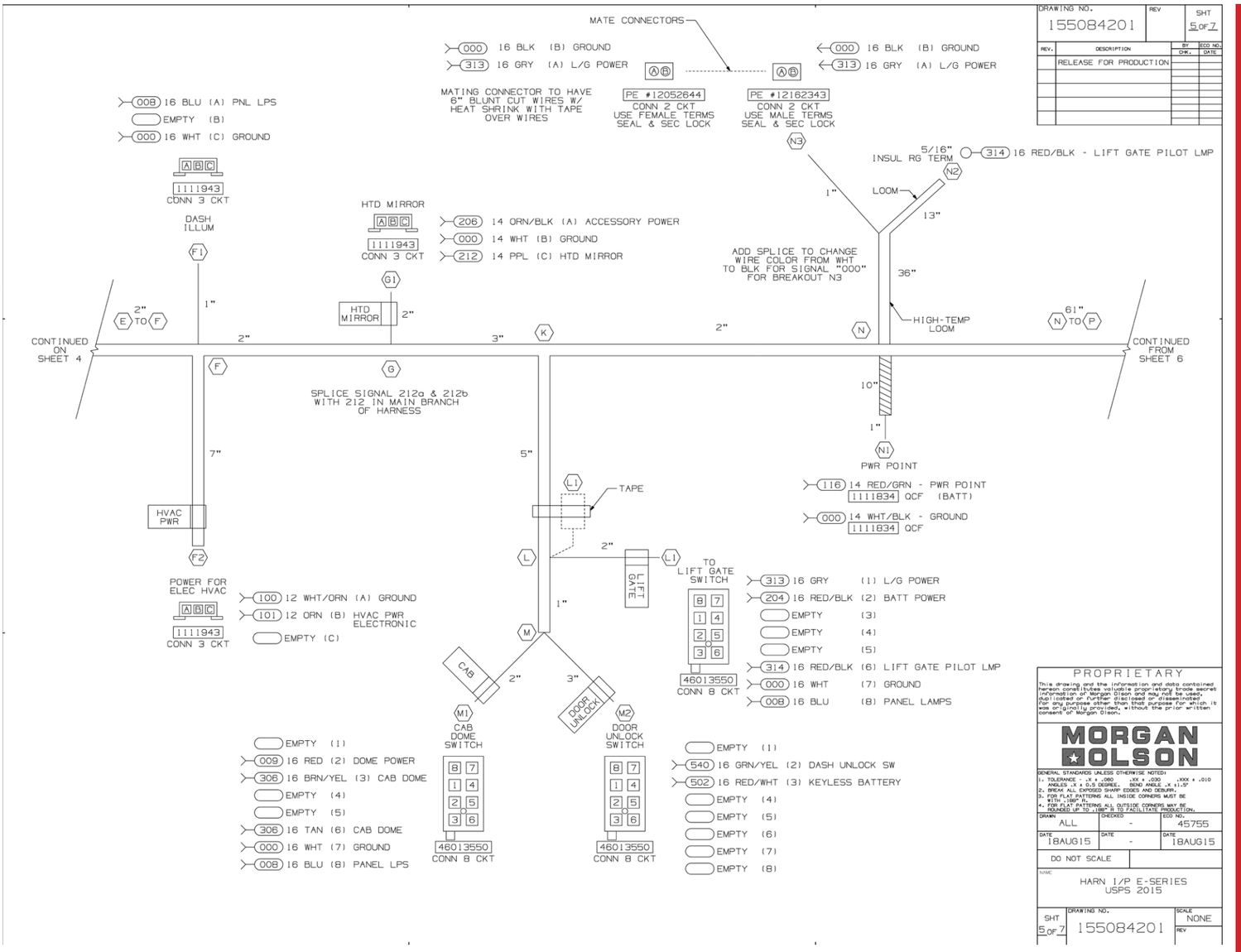




CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION



DRAWING NO. 155084201 REV SHT 5 OF 7

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		

PROPRIETARY

This drawing and the information and data contained hereon constitutes valuable proprietary trade secret information of Morgan Olson and may not be used, duplicated or further disclosed or disseminated for any purpose other than that purpose for which it was originally provided, without the prior written consent of Morgan Olson.

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED!
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES .X ± 0.5 DEGREE. BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

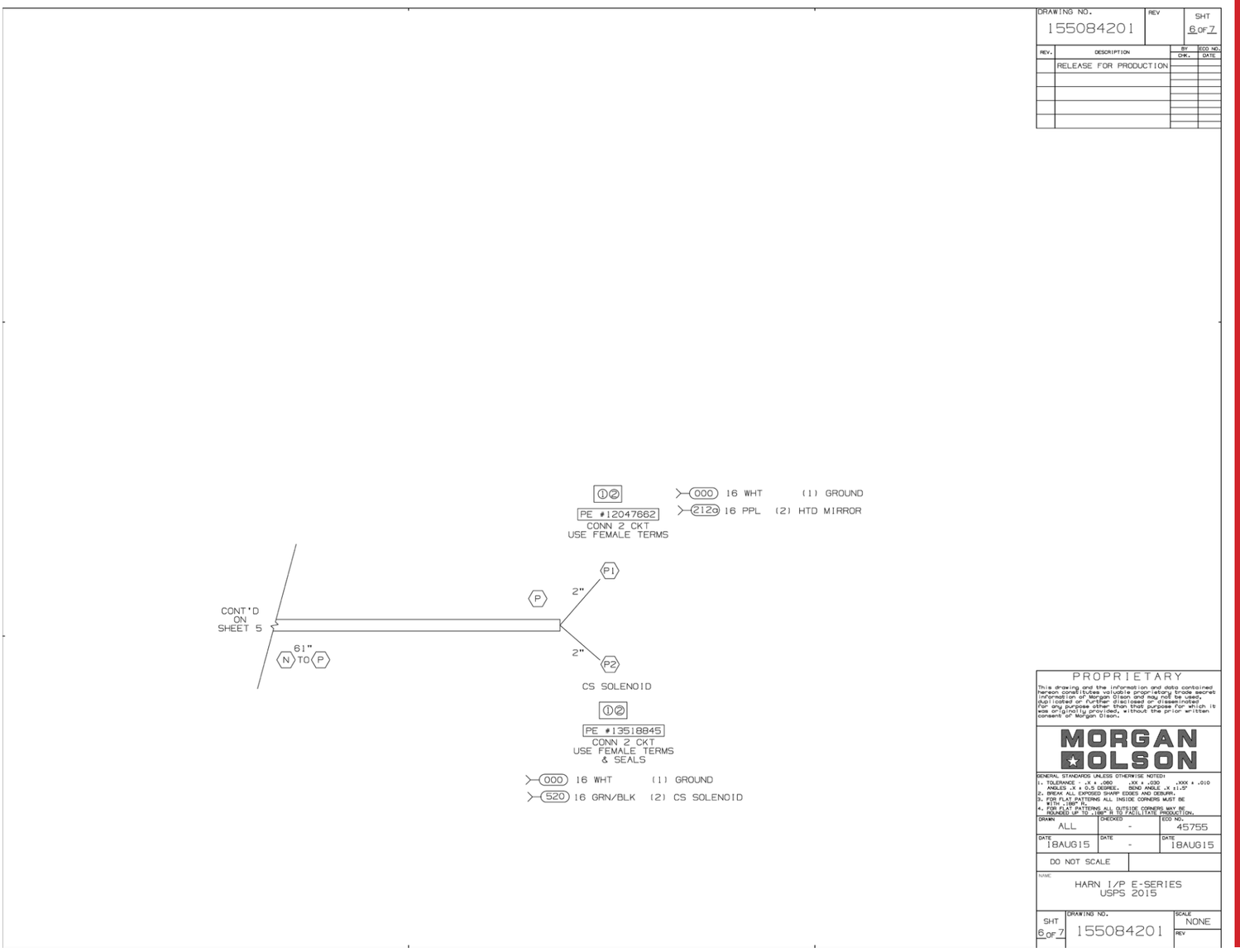
DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 18AUG15	DATE -	DATE 18AUG15

DO NOT SCALE

NAME: HARN I/P E-SERIES USPS 2015

SHT	DRAWING NO.	SCALE
5 OF 7	155084201	NONE

REV



DRAWING NO. 155084201 REV SHT 6 OF 7

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		

PROPRIETARY

This drawing and the information and data contained hereon constitutes valuable proprietary trade secret information of Morgan Olson and may not be used, duplicated or further disclosed or disseminated for any purpose other than that purpose for which it was originally provided, without the prior written consent of Morgan Olson.

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED!
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES .X ± 0.5 DEGREE. BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 18AUG15	DATE -	DATE 18AUG15

DO NOT SCALE

NAME: HARN I/P E-SERIES USPS 2015

SHT	DRAWING NO.	SCALE
6 OF 7	155084201	NONE

REV

CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

CIRCUIT	DESCRIPTION	END POINTS	FUNCTION
000	10/12/16 WHT	A1,A2,H1,J1,K1,P1	GROUND
001A	18 V10 •	N,N1	CLER/MKR/ICC LAMPS
001B	14/16 BRN •	A1,A2,N	CLER/MKR/ICC LAMPS
002	14 GRN	A2,R1	RH TURN/COMBO
003	14 YEL	A2,Q1	LH TURN/COMBO
004	14/16 PNK	A1,A2,F1	BACKUP SIGNAL
005A	18 V10/WHT •	N,N1	STOP ONLY
005B	14 RED •	A2,N	STOP ONLY
007	14 ORN	A2,H2	LOAD DOME LAMP(S)
008A	18 V10/GRY •	M,M1	DASH ILLUMINATION
008B	16 BLU •	H1,K1,M	DASH ILLUMINATION
009	12/16 RED	D1,F2,H1	DOME BATTERY FEED
042A	18 GRN/ORN •	N,N1	RH ISO TURN
042B	16 GRN/BLK •	N,R1	RH ISO TURN
043A	18 GRY/ORN •	N,N1	LH ISO TURN
043B	16 YEL/BLK •	N,Q1	LH ISO TURN
052A	18 GRY/BRN •	N,N1	RH TURN COMBO
052B	14 GRN •	N,R1	RH TURN COMBO
053A	18 GRY/BRN •	N,N1	LH TURN COMBO
053B	14 YEL •	N,Q1	LH TURN COMBO
090	16 BLU/WHT	A2,H1	LOAD DM 3W SW
091	16 BLU/YEL	A2,H1	LOAD DM 3W SW
100	12 WHT/ORN	H2,P2	HVAC GROUND
101	12 ORN	E1,H1	ELEK HVAC POWER
103	14 YEL	F1,J1,SPLICE	WIPER POWER (ACCY)
106	16 LBL	A1,SPLICE	WIPER PARK SWITCH B+
107	16 GRN/WHT	A1,J1	WIPER LOW
108	16 RED/WHT	A1,J1	WIPER HIGH
109	16 ORN	A1,J1	WIPER MOTOR SWITCH
111	16 PNK/BLK	F1,J1	WASHER PUMP
114A	16 GRY/YEL •	M,M1	AC DEMAND
114B	16 PPL •	M,P3	AC DEMAND
116	14 RED/GRN	E1,H1	LIGHTER/12V OUTLET
118	16 GRY	G1,H1	LOAD DOME RELAY COIL B+
119	18 V10/GRY •	M1,M1	HVAC BLOWER RELAY COIL
200	14 WHT/BLK	H2,P2	LIGHTER/12V OUTLET GND
202A	12 WHT/RED •	N,N1	BATTERY FEED #1
202B	10 YEL •	E1,N	BATTERY FEED #1
204	14 RED/BLK	B2,D1,H1	AUX BATTERY POWER
206	12 ORN/BLK	B2,D1,H1	AUX ACCESSORY POWER
207A	14 BRN/RED •	M,M1	SPARE BATTERY FEED
207B	12 RED/YEL •	E1,M	SPARE BATTERY FEED
211	10 RED/BLK	D1,F1	BATTERY FEED #2
214	10 ORN/BLK	D1,F1	ACCESSORY FEED #2
215	12 ORN/BLK	E1,F1	HVAC POWER FEED (ACCY)
224	14 RED/GRN	A1,A2,H2	SWITCHED BATTERY LOADS
226	14 ORN/GRN	A1,A2,H2	SWITCHED ACCESSORY LOADS
300	10/12 WHT/RED	A1,B2,H1,P1	AUXILLARY LOADS GND
304	16 YEL/BLK	A1,H2	DASH FAN LOW
305	16 GRN/BLK	A1,H2	DASH FAN HIGH
306	16 TAN	A2,H2	CAB DOME LAMP
400	16 GRY/BLK	B1,H2	RH SPEAKER (-)
401	16 GRY/WHT	B1,H2	RH SPEAKER (+)
402	16 WHT/BLK	B1,H2	LH SPEAKER (-)
403	16 WHT/GRN	B1,H2	LH SPEAKER (+)
404	14 YEL/RED	E1,H1	RADIO BATTERY POWER
405	16 ORN/BLK	A1,D1,H1	RDO/FAN/CAM ACCY POWER
416	18 GRY •	M1,M1	RUN/ACCESSORY
900	12 WHT/BLU	C1,P2	SPARE GROUND
904	12 RED/WHT	C1,E1	SPARE BATTERY POWER
JPR1	14 PNK	Q2,Q2	LH TURN JUMPER
JPR2	14 BLK	R2,R2	RH TURN JUMPER

•SEE NOTES

OPTIONAL: CIRCUITS 400 & 401 MAY BE SUPPLIED AS STANDARD SPEAKER "ZIP CORD" PAIRS. CIRCUIT NUMBER AND CONNECTOR INDEXING MUST BE MAINTAINED AS SHOWN.

OPTIONAL: CIRCUITS 402 & 403 MAY BE SUPPLIED AS STANDARD SPEAKER "ZIP CORD" PAIRS. CIRCUIT NUMBER AND CONNECTOR INDEXING MUST BE MAINTAINED AS SHOWN.

DRAWING NO. 155084201 REV SHT 7 OF 7

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED!
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES - X ± 0.5 DEGREE BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

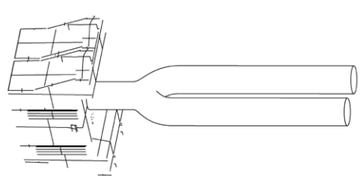
DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 18AUG15	DATE -	DATE 18AUG15

DO NOT SCALE

NAME: HARN I/P E-SERIES USPS 2015

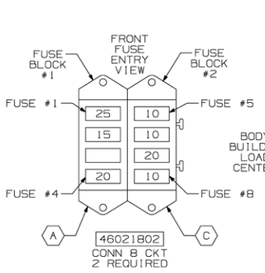
SHT 7 OF 7 | DRAWING NO. 155084201 | SCALE NONE | REV

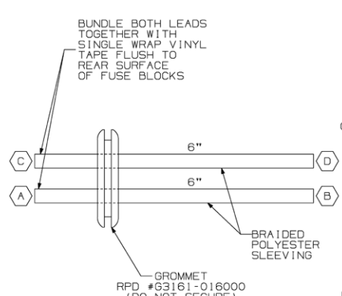
CIRCUIT	DESCRIPTION	END POINTS	FUNCTION
009	12 RED	C,D	DOME LAMP POWER
101	12 ORN	A,B	HVAC POWER
116	14 RED/GRN	A,B	LTR/12V POWER
202	10 YEL	A,B	BATT FEED #1
204	14 RED/BLK	C,D	AUX BATT POWER
206	12 ORN/BLK	C,D	AUX ACCY POWER
207	12 RED/YEL	A,B	SPARE BATT FEED
211	10 RED/BLK	C,D	BATT FEED #2
214	10 ORN/BLK	C,D	ACCY FEED #2
215	12 ORN/BLK	A,B	HVAC FEED
405	16 ORN/BLK	C,D	CAM ACCY PWR
502	12 RED/WHT	A,B	KEYLESS BATTERY

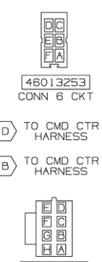


LAY OF WIRE TO BE SUCH THAT WIRING EXTENDS STRAIGHT OUT FROM BEHIND CENTER OF FUSE BLOCK ASSEMBLY, AS SHOWN

NOTE: FUSES AND FUSEBLOCKS MUST BE ORIENTED AS SHOWN BELOW





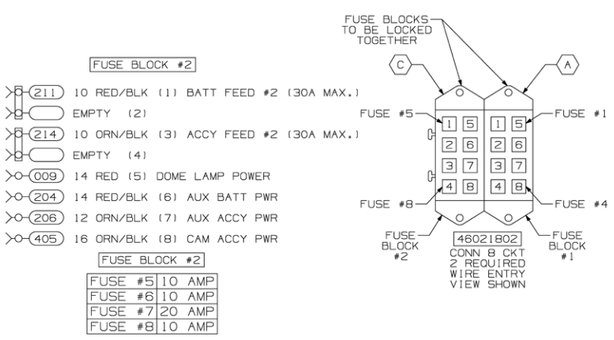


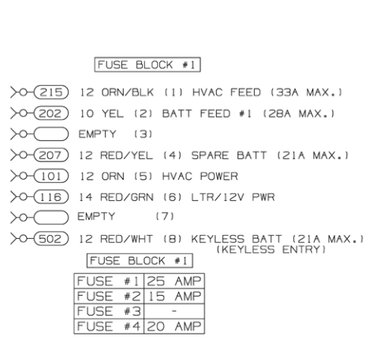
- 211 10 RED/BLK (A) BATT FEED #2 (30A MAX.)
- 204 14 RED/BLK (B) AUX BATT PWR
- 009 14 RED (C) DOME LAMP POWER
- 214 10 ORN/BLK (D) ACCY FEED #2 (30A MAX.)
- 405 16 ORN/BLK (E) CAM ACCY PWR
- 206 12 ORN/BLK (F) AUX ACCY PWR

- 215 12 ORN/BLK (A) HVAC FEED
- 101 12 ORN (B) HVAC POWER
- EMPTY (C)
- 202 10 YEL (D) BATT FEED #1 (28A MAX.)
- 116 14 RED/GRN (E) LTR/12V PWR
- EMPTY (F)
- 207 12 RED/YEL (G) SPARE BATT (21A MAX.)
- 502 12 RED/WHT (H) KEYLESS BATT

10. THIS IS A PURCHASED HARNESS. NO BILL OF MATERIAL EXISTS.
9. BRAIDED POLYESTER SLEEVING TO BE CLOSED AT BOTH ENDS WITH 1-1/2" OF ADHESIVE LINED HEAT SHRINK TUBING, AND TAPED 1111096 6" AT BREAKOUTS.
8. VENDOR MAY REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN IN TERMINAL VIEW.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
5. SPLICES TO BE AUTOMATED WITH SOLDER, AND ADHESIVE LINED HEAT SHRINK TUBING.
4. TAPE 1111096: 6" AT BREAKOUTS AND 2" AT LOOM ENDS.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
2. SPLIT POLY LOOM UNLESS OTHERWISE NOTED.
1. SXL WIRE.

NOTES:





HARNESS AND LOOM TOLERANCES

UP TO 60"	= -0/+2"
60" TO 100"	= -0/+4"
100" TO 200"	= -0/+5"
200" TO 400"	= -0/+6"
400" TO 600"	= -0/+7"
OVER 600"	= -0/+8"
80 TO 80	= -0/+2"

LENGTHS APPLY FROM BREAKOUT TO BREAKOUT, OR BREAKOUT TO WIRE ENTRY SIDE OF CONNECTOR.

DRAWING NO. 155084202 REV REL SHT 1 OF 1

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED!
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES - X ± 0.5 DEGREE BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 18AUG15	DATE -	DATE 18AUG15

DO NOT SCALE | USPS 2015

NAME: HARN FUSE CTR E-SERIES USPS 2015

SHT 1 OF 1 | DRAWING NO. 155084202 | SCALE NONE | REV REL

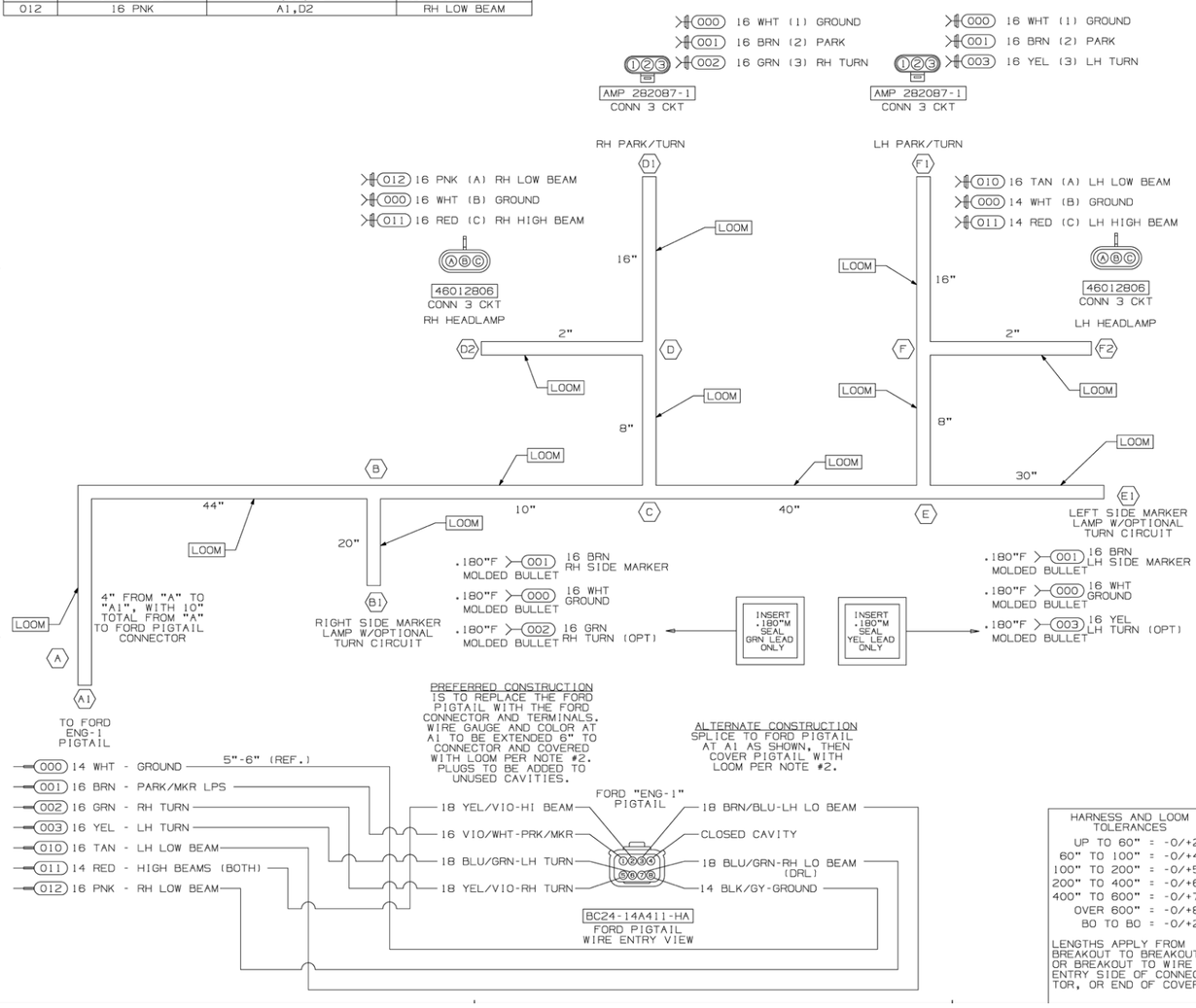
CONFIDENTIAL NOT FOR DISTRIBUTION
CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION

CIRCUIT	DESCRIPTION	END POINTS	FUNCTION
000	14/16 WHT	A1,B1,D1,D2,E1,F1,F2	GROUND
001	16 BRN	A1,B1,D1,E1,F1	PARK/MARKER
002	16 GRN	A1,B1,D1	RH TURN
003	16 YEL	A1,E1,F1	LH TURN
010	16 TAN	A1,F2	LH LOW BEAM
011	14/16 RED	A1,D2,F2	HIGH BEAMS (BOTH)
012	16 PNK	A1,D2	RH LOW BEAM

DRAWING NO. 155085200 REV REL SHT 1 OF 1

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		



HARNESS AND LOOM TOLERANCES

UP TO 60"	-0/+2"
60" TO 100"	-0/+4"
100" TO 200"	-0/+5"
200" TO 400"	-0/+6"
400" TO 600"	-0/+7"
OVER 600"	-0/+8"
BO TO BO	-0/+2"

LENGTHS APPLY FROM BREAKOUT TO BREAKOUT, OR BREAKOUT TO WIRE ENTRY SIDE OF CONNECTOR, OR END OF COVER.

NOTES:

1. SXL WIRE.
2. SPLIT NYLON LOOM, BLACK WITH GRAY STRIPE, VENDOR TO USE THE SMALLEST PRACTICAL SIZE UNLESS SPECIFIED ON THE DRAWING.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
4. TAPE 1111096: 6" AT BREAKOUTS, 2" AT 18" INTERVALS, FOR UNINTERRUPTED LOOM LENGTHS GREATER THAN 24", AND 2" AT LOOM ENDS.
5. SPLICES TO BE AUTOMATED WITH SOLDER, AND ADHESIVE LINED HEAT SHRINK TUBING.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
8. VENDOR MAY REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN IN TERMINAL VIEW.
9. THIS IS A PURCHASED HARNESS. NO BILL OF MATERIAL EXISTS.
10. VENDOR TO GREASE FEMALE BULLET TERMINALS.

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED:
1. TOLERANCE - .X ± .060 .XX ± .020 .XXX ± .010
ANGLES - .X ± 0.5 DEGREE. BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

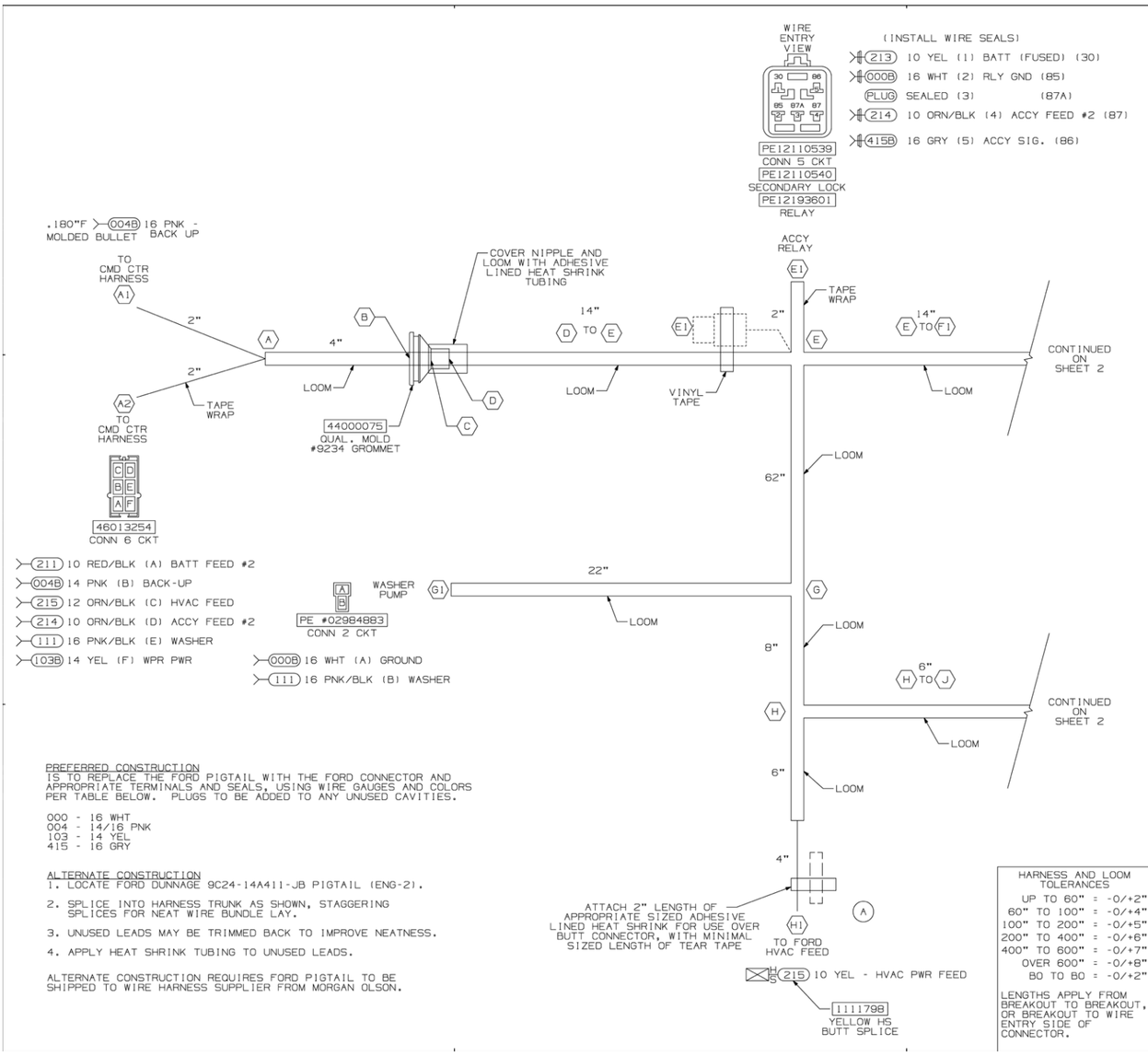
DRAWN	CHECKED	ECO NO.
ALL	-	45755
DATE 12AUG15	DATE -	DATE 12AUG15
DO NOT SCALE		2015 USPS

NAME: HARN HD USPS 2015 LED RECT HDLP LED F/P/T

SHT 1 OF 1 | DRAWING NO. 155085200 | SCALE NONE | REV REL

DRAWING NO. 155088200 REV REL SHT 1 OF 2

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		



HARNESS AND LOOM TOLERANCES

UP TO 60"	-0/+2"
60" TO 100"	-0/+4"
100" TO 200"	-0/+5"
200" TO 400"	-0/+6"
400" TO 600"	-0/+7"
OVER 600"	-0/+8"
BO TO BO	-0/+2"

LENGTHS APPLY FROM BREAKOUT TO BREAKOUT, OR BREAKOUT TO WIRE ENTRY SIDE OF CONNECTOR.

NOTES:

1. SXL WIRE.
2. SPLIT NYLON LOOM, BLACK WITH GRAY STRIPE ONLY, UNLESS OTHERWISE NOTED.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
4. TAPE 1111096: 6" AT BREAKOUTS AND 2" AT LOOM ENDS.
5. SPLICES TO BE AUTOMATED WITH SOLDER, AND ADHESIVE LINED HEAT SHRINK TUBING.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
8. VENDOR MAY REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN FROM TERMINAL SIDE, UNLESS OTHERWISE NOTED.
9. THIS IS A PURCHASED HARNESS. NO BILL OF MATERIAL EXISTS.

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED:
1. TOLERANCE - .X ± .060 .XX ± .030 .XXX ± .010
ANGLES - .X ± 0.5 DEGREE. BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .188" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .188" R TO FACILITATE PRODUCTION.

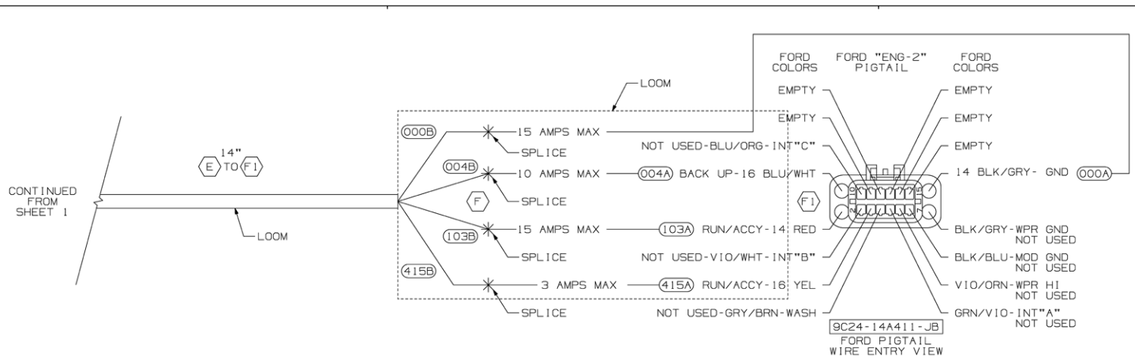
DRAWN	CHECKED	ECO NO.
ALL		45755
DATE 12AUG15	DATE	DATE 12AUG15
DO NOT SCALE		

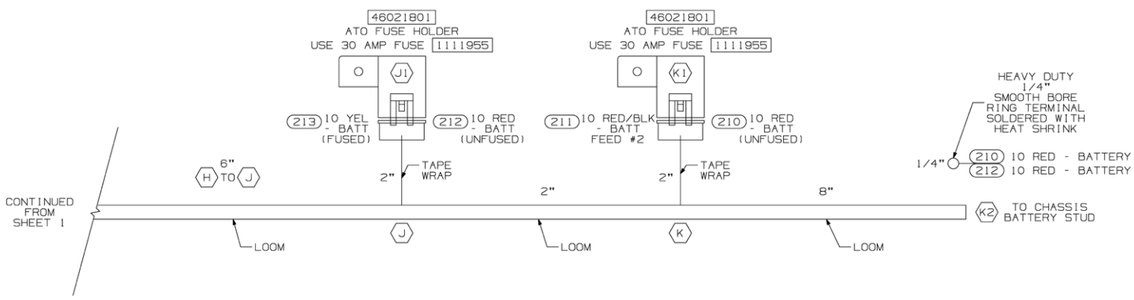
NAME: HARN WPR/ENG E-SERIES NEW-STYLE WSHR BTL

SHT 1 OF 2 | DRAWING NO. 155088200 | SCALE NONE | REV REL

CONFIDENTIAL NOT FOR DISTRIBUTION
CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION





THIS HARNESS IS FOR WIPERS, BACK-UP, HVAC ACCESSORY POWER FEED, AUX. BATTERY FEED, AND AUX. ACCESSORY FEED. IT WILL BE INSTALLED BETWEEN THE FORD WIPER CONNECTION UNDER THE HOOD, THE CHASSIS BATTERY, THE CHASSIS HEATER POWER SOURCE (JUST BEHIND THE BATTERY), THE WIPER/WASHER RESERVOIR, AND THE FORD COMMAND CENTER HARNESS IN THE LH TOEBOARD AREA.

CIRCUIT	DESCRIPTION	END POINTS	FUNCTION
000A	14 BLK/GRY •	F,F1	GROUND
000B	16 WHT •	E1,F,G1	GROUND
004A	16 BLU/WHT •	F,F1	BACK-UP
004B	14/16 PNK •	A1,A2,F	BACK-UP
103A	14 RED •	F,F1	WIPER POWER
103B	14 YEL •	A2,F	WIPER POWER
111	16 PNK/BLK	A2,G1	WASHER
210	10 RED	K1,K2	BATTERY (UNFUSED)
211	10 RED/BLK	A2,K1	BATT FEED #2
212	10 RED	J1,K2	BATTERY (UNFUSED)
213	10 YEL	E1,J1	BATTERY (FUSED)
214	10 ORN/BLK	A2,E1	ACCY FEED #2
215	12 ORN/BLK	A2,H1	HVAC FEED
415A	16 YEL •	F,F1	ACCY SIGNAL
415B	16 GRY •	E1,F	ACCY SIGNAL

• SEE NOTES

PROPRIETARY

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED:
1. TOLERANCE: .X ± .060 .XX ± .030 .XXX ± .010
ANGLES: .X ± 0.5 DEGREE. BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .180" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .180" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL		45755
DATE 12AUG15	DATE	DATE 45755

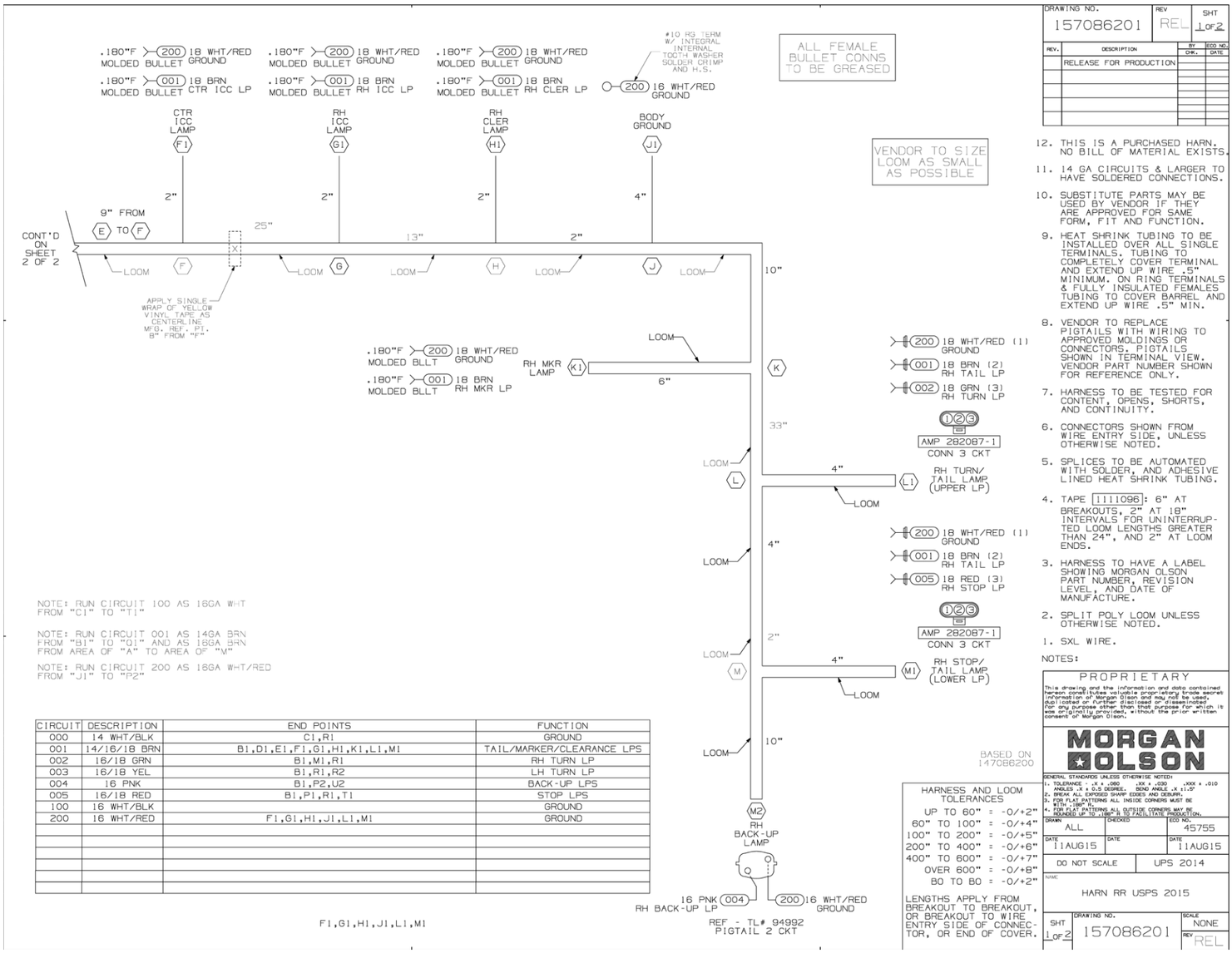
DO NOT SCALE

NAME: HARN WPR/ENG E-SERIES NEW-STYLE WSHR BTL

SHT	DRAWING NO.	SCALE	REV
2 OF 2	155088200	NONE	REL

DRAWING NO. 155088200 | REV REL | SHT 2 OF 2

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		



CIRCUIT	DESCRIPTION	END POINTS	FUNCTION
000	14 WHT/BLK	C1,R1	GROUND
001	14/16/18 BRN	B1,D1,E1,F1,G1,H1,K1,L1,M1	TAIL/MARKER/CLEARANCE LPS
002	16/18 GRN	B1,M1,R1	RH TURN LP
003	16/18 YEL	B1,R1,R2	LH TURN LP
004	16 PNK	B1,P2,U2	BACK-UP LPS
005	16/18 RED	B1,P1,R1,T1	STOP LPS
100	16 WHT/BLK		GROUND
200	16 WHT/RED	F1,G1,H1,J1,L1,M1	GROUND

F1,G1,H1,J1,L1,M1

12. THIS IS A PURCHASED HARN. NO BILL OF MATERIAL EXISTS.
11. 14 GA CIRCUITS & LARGER TO HAVE SOLDERED CONNECTIONS.
10. SUBSTITUTE PARTS MAY BE USED BY VENDOR IF THEY ARE APPROVED FOR SAME FORM, FIT AND FUNCTION.
9. HEAT SHRINK TUBING TO BE INSTALLED OVER ALL SINGLE TERMINALS. TUBING TO COMPLETELY COVER TERMINAL AND EXTEND UP WIRE .5" MINIMUM. ON RING TERMINALS & FULLY INSULATED FEMALES TUBING TO COVER BARREL AND EXTEND UP WIRE .5" MIN.
8. VENDOR TO REPLACE PIGTAILS WITH WIRING TO APPROVED MOLDINGS OR CONNECTORS. PIGTAILS SHOWN IN TERMINAL VIEW. VENDOR PART NUMBER SHOWN FOR REFERENCE ONLY.
7. HARNESS TO BE TESTED FOR CONTENT, OPENS, SHORTS, AND CONTINUITY.
6. CONNECTORS SHOWN FROM WIRE ENTRY SIDE, UNLESS OTHERWISE NOTED.
5. SPLICES TO BE AUTOMATED WITH SOLDER, AND ADHESIVE LINED HEAT SHRINK TUBING.
4. TAPE 1111096: 6" AT BREAKOUTS, 2" AT 18" INTERVALS FOR UNINTERRUPTED LOOM LENGTHS GREATER THAN 24", AND 2" AT LOOM ENDS.
3. HARNESS TO HAVE A LABEL SHOWING MORGAN OLSON PART NUMBER, REVISION LEVEL, AND DATE OF MANUFACTURE.
2. SPLIT POLY LOOM UNLESS OTHERWISE NOTED.
1. SXL WIRE.

NOTES:

PROPRIETARY

MORGAN OLSON

GENERAL STANDARDS UNLESS OTHERWISE NOTED:
1. TOLERANCE: .X ± .060 .XX ± .030 .XXX ± .010
ANGLES: .X ± 0.5 DEGREE. BEND ANGLE .X ±1.0°
2. BREAK ALL EXPOSED SHARP EDGES AND DEBURR.
3. FOR FLAT PATTERNS ALL INSIDE CORNERS MUST BE WITH .180" R.
4. FOR FLAT PATTERNS ALL OUTSIDE CORNERS MAY BE ROUNDED UP TO .180" R TO FACILITATE PRODUCTION.

DRAWN	CHECKED	ECO NO.
ALL		45755
DATE 11AUG15	DATE	DATE 11AUG15

DO NOT SCALE | UPS 2014

NAME: HARN RR USPS 2015

SHT	DRAWING NO.	SCALE	REV
1 OF 2	157086201	NONE	REL

DRAWING NO. 157086201 | REV REL | SHT 1 OF 2

REV.	DESCRIPTION	BY CHK.	ECO NO. DATE
	RELEASE FOR PRODUCTION		

BASED ON 147086200

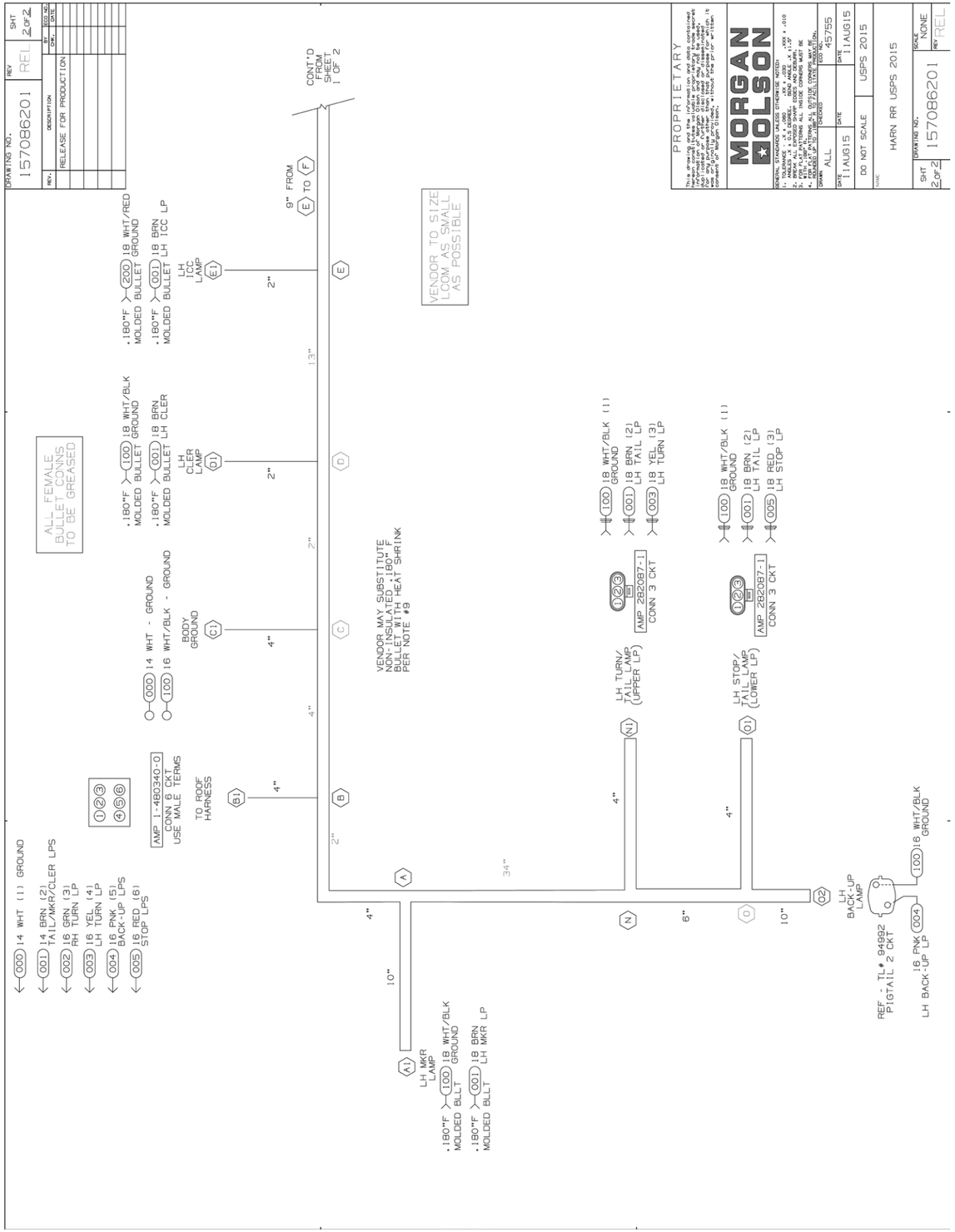
HARNESS AND LOOM TOLERANCES

UP TO 60"	= -0/+2"
60" TO 100"	= -0/+4"
100" TO 200"	= -0/+5"
200" TO 400"	= -0/+6"
400" TO 600"	= -0/+7"
OVER 600"	= -0/+8"
80 TO 80	= -0/+2"

LENGTHS APPLY FROM BREAKOUT TO BREAKOUT, OR BREAKOUT TO WIRE ENTRY SIDE OF CONNECTOR, OR END OF COVER.

CONFIDENTIAL NOT FOR DISTRIBUTION

CONFIDENTIAL NOT FOR DISTRIBUTION



NOTES

CONFIDENTIAL NOT FOR DISTRIBUTION