Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8223	8	2	LSS STRAIN GAUGE 2 - STAGNANT	The control system has determined that the strain gauge 2 reading in the load sensor is stagnant (not changing). If the platform is not considered to be overloaded boom functions will be restricted to creep. If DTC 8222 is active in combination with DTC 8223 the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8224	8	2	LSS STRAIN GAUGE 1 - OUT OF RANGE LOW	The shear beam is reporting an out of range low issue with the strain gauge 1 reading. If the platform is not overloaded the machine will be placed in to creep. If DTC 8225 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8225	8	2	LSS STRAIN GAUGE 2 - OUT OF RANGE LOW	The shear beam is reporting an out of range low issue with the strain gauge 2 reading. If the platform is not overloaded the machine will be placed in to creep. If DTC 8224 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8226	8	2	LSS STRAIN GAUGE 1 - OUT OF RANGE HIGH	The shear beam is reporting an out of range high issue with the strain gauge 1 reading. If the platform is not overloaded the machine will be placed in to creep. If DTC 8227 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8227	8	2	LSS STRAIN GAUGE 2 - OUT OF RANGE HIGH	The shear beam is reporting an out of range high issue with the strain gauge 2 reading. If the platform is not overloaded the machine will be placed in to creep. If DTC 8226 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8228	8	2	LSS STRAIN GAUGE 1 - INITIALIZATION ERROR	The shear beam is reporting an initialization issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8229 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8229	8	2	LSS STRAIN GAUGE 2 - INITIALIZATION ERROR	The shear beam is reporting an initialization issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8228 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8230	8	2	LSS STRAIN GAUGE 1 - NOT CALIBRATED	The shear beam is reporting a calibration issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8231 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
823	82		LSS CELL #3 ERROR		
8231	8	2	LSS STRAIN GAUGE 2 - NOT CALIBRATED	The shear beam is reporting a calibration issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8230 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8232	8	2	LSS STRAIN GAUGE 1 - SENSOR DEFECT	The shear beam is reporting a sensor defect issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8233 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8233	8	2	LSS STRAIN GAUGE 2 - SENSOR DEFECT	The shear beam is reporting a sensor defect issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8232 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8234	8	2	LSS STRAIN GAUGE 1 - NOT INSTALLED	The shear beam is reporting a not installed issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8235 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8235	8	2	LSS STRAIN GAUGE 2 - NOT INSTALLED	The shear beam is reporting a not installed issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8234 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8236	8	2	LSS NOT DETECTING CHANGE	The control system has determined that the load sensor reading has not deviated by more than 1lb for 5s while operating drive or boom functions at greater than creep speed. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8237	8	2	LSS STRAIN GAUGE 1 - A/D DEFECT	The shear beam is reporting an internal issue with the strain gauge 1 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8238 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
8238	8	2	LSS STRAIN GAUGE 2 - A/D DEFECT	The shear beam is reporting an internal issue with the strain gauge 2 sensor. If the platform is not overloaded the machine will be placed in to creep. If DTC 8237 is also active the machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
824	82		LSS CELL #4 ERROR		
825	8	2	LSS HAS NOT BEEN CALIBRATED	The load sensing system is configured but has not been calibrated. The machine will assume the platform is overloaded.	Calibrate the load sensing system.
826	82	6	RUNNING AT CREEP - PLATFORM OVERLOADED	All functions at creep, the Load Sensing System indicates the Platform is overloaded AND is configured to warn only while the Platform is overloaded.	
827	82	7	DRIVE & BOOM PREVENTED - PLATFORM OVERLOADED	Driving and boom functions are not possible while the Load Sensing System indicates the Platform is overloaded AND is configured to prevent drive and boom functions while the Platform is overloaded.	
828	82	8	LIFT UP & TELE OUT PREVENTED - PLATFORM OVERLOADED	Lift up and telescope out are not possible while the Load Sensing System indicates the Platform is overloaded AND is configured to prevent Lift up and telescope out while the Platform is overloaded.	
830	**83**	**0**	**<<< PLATFORM LEVELING >>>**		
831	83	1	PLATFORM LEVELING OVERRIDE ON	Platform Leveling forced on with Access Level 0 selection.	
832	83	2	PLATFORM LEVELING OVERRIDE OFF	Platform Leveling forced off with Access Level 0 selection.	
833	83	3	PLATFORM LEVEL UP CRACKPOINT - NOT CALIBRATED	The Platform Level Up Valve Crackpoint has not been calibrated.	- Electronic leveling system equipped vehicles only.
834	83	4	PLATFORM LEVEL DOWN CRACKPOINT - NOT CALIBRATED	The Platform Level Down Valve Crackpoint has not been calibrated.	- Electronic leveling system equipped vehicles only.
837	83	7	PLATFORM LEVEL SENSOR #1 - SHORT TO BATTERY	There is a Short to Battery to the Platform Level Sensor #1.	- Electronic leveling system equipped vehicles only.
838	83	8	PLATFORM LEVEL SENSOR #1 - SHORT TO GROUND OR OPEN CIRCUIT	There is a Short to Ground or an Open Circuit to the Platform Level Sensor #1.	- Electronic leveling system equipped vehicles only.
8311	83	11	PLATFORM LEVEL SENSOR #2 - SHORT TO BATTERY	There is a Short to Battery to the Platform Level Sensor #2.	- Electronic leveling system equipped vehicles only.
8312	83	12	PLATFORM LEVEL SENSOR #2 - SHORT TO GROUND OR OPEN CIRCUIT	There is a Short to Ground or an Open Circuit to the Platform Level Sensor #2.	- Electronic leveling system equipped vehicles only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8313	83	13	PLATFORM LEVEL SENSOR #1 - REFERENCE VOLTAGE OUT OF RANGE	Platform Level Sensor #1 reverence voltage is outside acceptable range (4.9 to 5.1 volts).	- Electronic leveling system equipped vehicles only.
8314	83	14	PLATFORM LEVEL SENSOR #2 - REFERENCE VOLTAGE OUT OF RANGE	Platform Level Sensor #2 reverence voltage is outside acceptable range (4.9 to 5.1 volts).	- Electronic leveling system equipped vehicles only.
8315	83	15	PLATFORM LEVELING SENSOR - DISAGREEMENT	The Control System reads the sensor values at power-up. The fault is triggered when there is a ± 5 degree difference from the initial reading.	- Electronic leveling system equipped vehicles only.
8316	83	16	PLATFORM LEVEL SENSOR #1 - COMMUNICATIONS LOST	Platform Level Sensor #1 serial communication lost.	- 1200S and 1350S only.
8317	83	17	PLATFORM LEVEL SENSOR #2 - COMMUNICATIONS LOST	Platform Level Sensor #2 serial communication lost.	- 1200S and 1350S only.
8318	83	18	PLATFORM LEVELING SYSTEM TIMEOUT	The Platform was unable to maintain desired level within range for the allotted time.	
840	**84**	**0**	**<<< ENVELOPE >>>**		
841	84	1	BOOM ANGLE SENSOR DISAGREEMENT	There is a disagreement between the Boom Angle Sensors.	- Envelope Control equipped vehicles only.
842	84	2	BOOM LENGTH SWITCH FAILED	The Boom Length Switches are reporting the same state.	- Envelope Control equipped vehicles only.
843	84	3	BOOM LENGTH SWITCH/SENSOR DISAGREEMENT	There is a disagreement between the Boom Length Switch and the Boom Length Sensor.	- Envelope Control equipped vehicles only.
844	84	4	BOOM LENGTH SENSOR NOT DETECTING LENGTH CHANGE	The Boom Length Sensor is not changing during a boom telescope command.	- Envelope Control equipped vehicles only.
845	84	5	BOOM LENGTH SENSOR - OUT OF RANGE HIGH	Boom Length Sensor out of range high.	- Envelope Control equipped vehicles only. -1200/1350 only
846	84	6	BOOM LENGTH SENSOR - OUT OF RANGE LOW	Boom Length Sensor out of range low.	- Envelope Control equipped vehicles only. -1200/1350 only
847	84	7	BOOM LENGTH SENSOR - VALUE OUT OF RANGE HIGH	Boom Length out of range high.	- Envelope Control equipped vehicles only. -1200/1350 only
848	84	8	BOOM LENGTH SENSOR - VALUE OUT OF RANGE LOW	Boom Length out of range low.	- Envelope Control equipped vehicles only. -1200/1350 only

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
849	84	9	BOOM ANGLE SENSOR #1 - COMMUNICATIONS FAULT	Boom Angle Sensor #1 communications lost.	- Envelope Control equipped vehicles only.
8410	84	10	BOOM ANGLE SENSOR #2 - COMMUNICATIONS FAULT	Boom Angle Sensor #2 communications lost.	- Envelope Control equipped vehicles only.
8411	84	11	BOOM ANGLE SENSOR #1 - INVALID ANGLE	Boom Angle Sensor #1 out of range.	- Envelope Control equipped vehicles only.
8412	84	12	BOOM ANGLE SENSOR #2 - INVALID ANGLE	Boom Angle Sensor #2 out of range.	- Envelope Control equipped vehicles only.
8413	84	13	WRONG TELESCOPE RESPONSE	Boom telescope is moving in the opposite direction of the command.	- Envelope Control equipped vehicles only.
8414	84	14	WRONG LIFT RESPONSE	Boom lift is moving in the opposite direction of the command.	- Envelope Control equipped vehicles only.
8415	84	15	TOWER ANGLE SENSOR DISAGREEMENT	There is a disagreement between the Tower Angle Sensors.	- Envelope Control equipped vehicles only. -1250

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
84151	8	4	TOWER LENGTH SENSOR 1 FAULTY	There are three ways (a, b, c) that these faults can be set: (a) If the length sensor voltage changes more than 0.0168 volts within 40 milliseconds a counter for the respective length sensor shall be incremented to aid service in diagnosing bad sensor performance. The counter below shall be incremented anytime the description above is met. It is cleared/reset by a power cycle TwrLenSnsr(1/2)FaultCounter_PowerCycle > 30 (b) The counter below shall be incremented every time TwrLenSnsr(1/2)FaultCounter_PowerCycle (described above) reached its threshold. This value is stored in EEPROM in order to track the history of the issue. (A successful Boom Sensor Calibration will reset this counter – this is reflected in the boom sensor calibration document) TwrLenSnsr(1/2)FaultCounter_EEPROM > 3 (c) The fault counter below shall be incremented every time the trigger condition described in section (a) is observed during certain steps during Boom Sensor Calibration (please see that document section for further details) TwrLenSnsr(1/2)FaultCounter_BmSnsrCal > 20 If (a) or (b) or (c) are met (fault triggered) the machine will be put into Electrical Retrieval Fault, once triggered, is maintained within a given key-cycle Machine will be trapped in transport	Check Hardware, Wiring

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
84152	8	4	TOWER LENGTH SENSOR 2 FAULTY	There are three ways (a, b, c) that these faults can be set: (a) If the length sensor voltage changes more than 0.0168 volts within 40 milliseconds a counter for the respective length sensor shall be incremented to aid service in diagnosing bad sensor performance. The counter below shall be incremented anytime the description above is met. It is cleared/reset by a power cycle TwrLenSnsr(1/2)FaultCounter_PowerCycle > 30 (b) The counter below shall be incremented every time TwrLenSnsr(1/2)FaultCounter_PowerCycle (described above) reached its threshold. This value is stored in EEPROM in order to track the history of the issue. (A successful Boom Sensor Calibration will reset this counter – this is reflected in the boom sensor calibration document) TwrLenSnsr(1/2)FaultCounter_EEPROM > 3 (c) The fault counter below shall be incremented every time the trigger condition described in section (a) is observed during certain steps during Boom Sensor Calibration (please see that document section for further details) TwrLenSnsr(1/2)FaultCounter_BmSnsrCal > 20 If (a) or (b) or (c) are met (fault triggered) the machine will be put into Electrical Retrieval Fault, once triggered, is maintained within a given key-cycle Machine will be trapped in transport	Check Hardware, Wiring

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
84153	8	4	BOOM LENGTH SENSOR 1 FAULTY	There are three ways (a, b, c) that these faults can be set: (a) If the length sensor voltage changes more than 0.0168 volts within 40 milliseconds a counter for the respective length sensor shall be incremented to aid service in diagnosing bad sensor performance. The counter below shall be incremented anytime the description above is met. It is cleared/reset by a power cycle BmLenSnsr(1/2)FaultCounter_PowerCycle > 30 (b) The counter below shall be incremented every time BmLenSnsr(1/2)FaultCounter_PowerCycle (described above) reached its threshold. This value is stored in EEPROM in order to track the history of the issue. (A successful Boom Sensor Calibration will reset this counter – this is reflected in the boom sensor calibration document) BmLenSnsr(1/2)FaultCounter_EEPROM > 3 (c) The fault counter below shall be incremented every time the trigger condition described in section (a) is observed during certain steps during Boom Sensor Calibration (please see that document section for further details) BmLenSnsr(1/2)FaultCounter_BmSnsrCal > 20 If (a) or (b) or (c) are met (fault triggered) the machine will be put into Electrical Retrieval Fault, once triggered, is maintained within a given key-cycle Machine will be trapped in transport	Check wiring and hardware

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
84154	8	4	BOOM LENGTH SENSOR 2 FAULTY	There are three ways (a, b, c) that these faults can be set: (a) If the length sensor voltage changes more than 0.0168 volts within 40 milliseconds a counter for the respective length sensor shall be incremented to aid service in diagnosing bad sensor performance. The counter below shall be incremented anytime the description above is met. It is cleared/reset by a power cycle BmLenSnsr(1/2)FaultCounter_PowerCycle > 30 (b) The counter below shall be incremented every time BmLenSnsr(1/2)FaultCounter_PowerCycle (described above) reached its threshold. This value is stored in EEPROM in order to track the history of the issue. (A successful Boom Sensor Calibration will reset this counter – this is reflected in the boom sensor calibration document) BmLenSnsr(1/2)FaultCounter_EEPROM > 3 (c) The fault counter below shall be incremented every time the trigger condition described in section (a) is observed during certain steps during Boom Sensor Calibration (please see that document section for further details) BmLenSnsr(1/2)FaultCounter_BmSnsrCal > 20 If (a) or (b) or (c) are met (fault triggered) the machine will be put into Electrical Retrieval Fault, once triggered, is maintained within a given key-cycle Machine will be trapped in transport	Check wiring and hardware

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8416	84	16	TOWER LENGTH SENSOR DISAGREEMENT	There is a disagreement between the Tower Length Sensors.	- Envelope Control equipped vehicles only. -1250
8417	84	17	MAIN ANGLE SENSOR DISAGREEMENT	There is a disagreement between the Main Boom Angle Sensors.	- Envelope Control equipped vehicles only. -1250
8418	84	18	TOWER LENGTH SENSOR #1 - OUT OF RANGE HIGH	Tower Boom Angle Sensor #1 out of range high.	- Envelope Control equipped vehicles only. -1250
8419	84	19	TOWER LENGTH SENSOR #1 - OUT OF RANGE LOW	Tower Boom Angle Sensor #1 out of range low.	- Envelope Control equipped vehicles only. -1250
8420	84	20	TOWER LENGTH SENSOR #2 - OUT OF RANGE HIGH	Tower Boom Angle Sensor #2 out of range high.	- Envelope Control equipped vehicles only. -1250
8421	84	21	TOWER LENGTH SENSOR #2 - OUT OF RANGE LOW	Tower Boom Angle Sensor #2 out of range low.	- Envelope Control equipped vehicles only. -1250
8422	84	22	TOWER LENGTH SENSOR - NOT DETECTING LENGTH CHANGE	The Tower Length Sensor is not changing during a tower telescope command.	- Envelope Control equipped vehicles only. -1250
8423	84	23	TOWER LENGTH MOVEMENT WITHOUT COMMAND	The Tower Length Sensor is changing without a tower telescope command.	- Envelope Control equipped vehicles only. -1250
8424	84	24	TOWER LENGTH SENSOR #1 - OUT OF RANGE HIGH	Tower Boom Angle Sensor #1 out of range high.	- Envelope Control equipped vehicles only. -1250
8425	84	25	TOWER LENGTH SENSOR #1 - OUT OF RANGE LOW	Tower Boom Angle Sensor #1 out of range low.	- Envelope Control equipped vehicles only. -1250

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8426	84	26	TOWER LENGTH SENSOR #2 - OUT OF RANGE HIGH	Tower Boom Angle Sensor #2 out of range high.	- Envelope Control equipped vehicles only. -1250
8427	84	27	TOWER LENGTH SENSOR #2 - OUT OF RANGE LOW	Tower Boom Angle Sensor #2 out of range low.	- Envelope Control equipped vehicles only. -1250
8428	84	28	TOWER ANGLE SENSOR #1 - INVALID ANGLE	Tower Boom Angle Sensor #1 out of range.	- Envelope Control equipped vehicles only. -1250
8429	84	29	TOWER ANGLE SENSOR #2 - INVALID ANGLE	Tower Boom Angle Sensor #2 out of range.	- Envelope Control equipped vehicles only. -1250
8430	84	30	TOWER ANGLE SENSOR #1 - INVALID MODEL	Wrong Tower Boom Angle Sensor #1 installed.	- Envelope Control equipped vehicles only. - 1250AJP Only - Must be a Rieker Sensor, not a Spectron Sensor.
8431	84	31	TOWER ANGLE SENSOR #2 - INVALID MODEL	Wrong Tower Boom Angle Sensor #2 installed.	- Envelope Control equipped vehicles only. - 1250AJP Only - Must be a Rieker Sensor, not a Spectron Sensor.
8432	84	32	MAIN ANGLE SENSOR #1 - INVALID ANGLE	Main Boom Angle Sensor #1 out of range.	- Envelope Control equipped vehicles only. -1250
8433	84	33	MAIN ANGLE SENSOR #2 - INVALID ANGLE	Main Boom Angle Sensor #2 out of range.	- Envelope Control equipped vehicles only. -1250
8434	84	34	MAIN ANGLE SENSOR - NOT DETECTING ANGLE CHANGE	The Main Boom Angle Sensor is not changing during a main lift command.	- Envelope Control equipped vehicles only. -1250
8435	84	35	MAIN ANGLE MOVEMENT WITHOUT CMD	The Main Boom Angle Sensor is changing without a main lift command.	- Envelope Control equipped vehicles only. -1250
8436	84	36	WRONG TOWER TELESCOPE RESPONSE	Tower telescope is moving in the opposite direction of the command.	- Envelope Control equipped vehicles only. -1250
8437	84	37	WRONG TOWER LIFT RESPONSE	Tower lift is moving in the opposite direction of the command.	- Envelope Control equipped vehicles only. -1250
8438	84	38	TOWER CYLINDER ANGLE SENSOR - OUT OF RANGE HIGH	The Tower Cylinder Angle Sensor is < 4721 A/D counts.	- Envelope Control equipped vehicles only. -1250

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8439	84	39	TOWER CYLINDER ANGLE SENSOR - OUT OF RANGE LOW	The Tower Cylinder Angle Sensor is > 29535 A/D counts.	- Envelope Control equipped vehicles only. -1250
8440	84	40	TOWER CYLINDER ANGLE SENSOR - NOT DETECTING CHANGE	The Tower Cylinder Angle Sensor is not changing during a tower lift command.	- Envelope Control equipped vehicles only. -1250
8441	84	41	TOWER CYLINDER ANGLE MOVEMENT WITHOUT COMMAND	The Tower Cylinder Angle Sensor is changing without a tower lift command.	- Envelope Control equipped vehicles only. -1250
8442	84	42	MAIN TRANSPORT ANGLE SWITCH FAILED	The Main Boom Angle Switch is bad.	- Envelope Control equipped vehicles only. -1250
8443	84	43	TWR TRANSPORT SWITCH DISAGREEMENT	There is a disagreement between the Tower Boom Length Switch and the Tower Length Sensor.	- Envelope Control equipped vehicles only. -1250
8444	84	44	TRANSPORT DUAL CAPACITY SWITCHES BAD	Both the Dual Capacity Switch and the Transport Switch are bad.	- Envelope Control equipped vehicles only. -1250
8445	84	45	TRANSPORT DUAL CAPACITY BAD TRANSITION	The Dual Capacity Switch and the Transport Switch changed state out of order.	- Envelope Control equipped vehicles only. -1250
8446	84	46	MAIN TRANSPORT LENGTH SWITCH DISAGREEMENT	There is a disagreement between the Main Boom Transport Length Switches.	- Envelope Control equipped vehicles only. -1250
8447	84	47	MAIN DUAL CAPACITY LENGTH SWITCH DISAGREEMENT	There is a disagreement between the Main Boom Dual Capacity Length Switches.	- Envelope Control equipped vehicles only. -1250
8448	84	48	MAIN TRANSPORT ANGLE SWITCH/SENSOR DISAGREEMENT	There is a disagreement between the Main Boom Angle Switch and the Main Boom Angle Sensor.	- Envelope Control equipped vehicles only. -1250
8449	84	49	TOWER CYLINDER ANGLE SWITCH/SENSOR DISAGREEMENT	There is a disagreement between the Tower Boom Angle Switch and the Tower Cylinder Angle Sensor.	- Envelope Control equipped vehicles only. -1250
8450	84	50	NEW MAIN ANGLE SENSOR #1 DETECTED	A new Main Angle Sensor 1 has been detected.	-1250
8451	84	51	NEW MAIN ANGLE SENSOR #2 DETECTED	A new Main Angle Sensor 2 has been detected.	-1250
8452	84	52	TOWER LENGTH SWITCH/SENSOR DISAGREEMENT	There is a disagreement between the Tower Length Switch and the Tower Length Sensor.	- Envelope Control equipped vehicles only. -1250
8453	84	53	WRONG MAIN TELE RESPONSE	Main telescope is moving in the opposite direction of the command.	- Envelope Control equipped vehicles only. -1250
8454	84	54	WRONG MAIN LIFT RESPONSE	Main lift is moving in the opposite direction of the command.	- Envelope Control equipped vehicles only. -1250

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8482	84	82	TOWER ENVELOPE MASSIVELY ENCROACHED	8482 TOWER ENVELOPE MASSIVELY ENCROACHED - Tower has exceeded the maximum tower path stop line. 1250 Only	8482 TOWER ENVELOPE MASSIVELY ENCROACHED - Tower has exceeded the maximum tower path stop line. 1250 Only
8483	84	83	TOWER ENVELOPE MULTIPLE ENCROACHMENTS	The tower has encroached the envelope twice in a 15 minute period.	-1250
8484	84	84	BCS VIOLATION - BOOM LOCKED	Control system has detected one of the following faults 8423, 8435, 8441, 8482, 8483. Main lift will be disallowed and boom will be locked in transport until a boom unlock procedure has been performed. This fault is maintained through a power cycle.	-1250
8485	84	85	BCS - HYDRAULIC RETRIEVAL ACTIVE	Alerts operator when control system is in hydraulic retrieval mode.	-1250
8486	84	86	BCS - ELECTRICAL RETRIEVAL ACTIVE	Alerts operator when control system is in electrical retrieval mode.	-1250
8487	84	87	BCS - MULTIPLE FAILURES ACTIVE	Control system has detected a main and a tower envelope encroachment at the same time.	-1250
850	**85**	**0**	**<<< MOMENT / LOAD PINS >>>**		
851	85	1	MOMENT PIN - HORIZONTAL FORCE OUT OF RANGE	The Moment Pin horizontal force is out of range.	
852	85	2	MOMENT PIN - VERTICAL FORCE OUT OF RANGE	The Moment Pin vertical force is out of range.	
853	85	3	LOAD PIN - HORIZONTAL FORCE OUT OF RANGE	The Load Pin horizontal force is out of range.	-1250
854	85	4	LOAD PIN - VERTICAL FORCE OUT OF RANGE	The Load Pin vertical force is out of range.	-1250
855	85	5	MOMENT PIN - SENSOR FAULT	The Moment Pin has reported a fault.	
856	85	6	LOAD PIN - SENSOR FAULT	The Load Pin has reported a fault.	-1250
857	85	7	NEW MOMENT PIN DETECTED	A new Moment Pin has been detected.	
858	85	8	NEW LOAD PIN DETECTED	A new Load Pin has been detected.	-1250

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
859	85	9	LOAD PIN/TOWER LIFT CYLINDER ANGLE DISAGREEMENT	There is a disagreement between the Load Pin and the Tower Lift cylinder Angle.	-1250
8510	85	10	LOAD PIN - FORCE VALUES NOT CHANGING	The Load Pin is not changing.	-1250
8511	85	11	LOAD PIN - FORCE TOO LOW OVER TOWER ANGLE CHANGE	Load pin force did not change enough for the tower angle movement.	-1250
8512	85	12	LOAD PIN - FORCE TOO LOW OVER MAIN ANGLE CHANGE	Load pin force did not change enough for the main angle movement.	-1250
8513	85	13	LOAD PIN - FORCE TOO LOW OVER MAIN LENGTH TRANSITION	Load Pin force did not change enough for main length movement.	-1250
860	**86**	**0**	**<<< STEERING / AXLE >>>**		
861	86	1	RESTRICTED TO TRANSPORT - OSCILLATING AXLE PRESSURE SWITCH DISAGREEMENT	The Oscillating Axle Pressure Switch indicates pressure while not driving or does not indicate pressure while driving and restricted to transport.	- Electrically released Oscillated Axles equipped vehicles only.
862	86	2	AXLE EXTEND VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Axle Extend Valve.	
863	86	3	AXLE EXTEND VALVE - SHORT TO GROUND	There is a Short to Ground to the Axle Extend Valve.	
864	86	4	AXLE RETRACT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Axle Retract Valve.	
865	86	5	AXLE RETRACT VALVE - SHORT TO GROUND	There is a Short to Ground to the Axle Retract Valve.	
866	86	6	RIGHT FRONT STEER RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Right Front Steer Right Valve.	
867	86	7	RIGHT FRONT STEER RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Right Front Steer Right Valve.	
868	86	8	RIGHT FRONT STEER LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Right Front Steer Left Valve.	
869	86	9	RIGHT FRONT STEER LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Right Front Steer Left Valve.	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8610	86	10	LEFT FRONT STEER RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Left Front Steer Right Valve.	
8611	86	11	LEFT FRONT STEER RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Left Front Steer Right Valve.	
8612	86	12	LEFT FRONT STEER LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Left Front Steer Left Valve.	
8613	86	13	LEFT FRONT STEER LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Left Front Steer Left Valve.	
8614	86	14	RIGHT REAR STEER RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Right Rear Steer Right Valve.	
8615	86	15	RIGHT REAR STEER RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Right Rear Steer Right Valve.	
8616	86	16	RIGHT REAR STEER LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Right Rear Steer Left Valve.	
8617	86	17	RIGHT REAR STEER LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Right Rear Steer Left Valve.	
8618	86	18	LEFT REAR STEER RIGHT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Left Rear Steer Right Valve.	
8619	86	19	LEFT REAR STEER RIGHT VALVE - SHORT TO GROUND	There is a Short to Ground to the Left Rear Steer Right Valve.	
8620	86	20	LEFT REAR STEER LEFT VALVE - SHORT TO BATTERY OR OPEN CIRCUIT	There is a Short to Battery or an Open Circuit to the Left Rear Steer Left Valve.	
8621	86	21	LEFT REAR STEER LEFT VALVE - SHORT TO GROUND	There is a Short to Ground to the Left Rear Steer Left Valve.	
8622	86	22	FRONT RIGHT STEER SENSOR - DECOUPLED	The Front Right Steer Sensor has become decoupled.	
8623	86	23	FRONT LEFT STEER SENSOR - DECOUPLED	The Front Left Steer Sensor has become decoupled.	
8624	86	24	REAR RIGHT STEER SENSOR - DECOUPLED	The Rear Right Steer Sensor has become decoupled.	
8625	86	25	REAR LEFT STEER SENSOR - DECOUPLED	The Rear Left Steer Sensor has become decoupled.	
8626	86	26	FRONT LEFT STEER SENSOR - NOT RESPONDING	The Front Right Steer Sensor is not responding to steer commands.	
8627	86	27	FRONT RIGHT STEER SENSOR - NOT RESPONDING	The Front Left Steer Sensor is not responding to steer commands.	
8628	86	28	REAR LEFT STEER SENSOR - NOT RESPONDING	The Rear Right Steer Sensor is not responding to steer commands.	
8629	86	29	REAR RIGHT STEER SENSOR - NOT RESPONDING	The Rear Left Steer Sensor is not responding to steer commands.	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
8630	86	30	FRONT RIGHT STEER SENSOR - SHORT TO GROUND OR OPEN CIRCUIT	There is a Short to Ground or an Open Circuit to the Front Right Steer Sensor.	
8631	86	31	FRONT RIGHT STEER SENSOR - SHORT TO BATTERY	There is a Short to Battery to the Front Right Steer Sensor.	
8632	86	32	FRONT LEFT STEER SENSOR - SHORT TO GROUND OR OPEN CIRCUIT	There is a Short to Ground or an Open Circuit to the Front Left Steer Sensor.	
8633	86	33	FRONT LEFT STEER SENSOR - SHORT TO BATTERY	There is a Short to Battery to the Front Left Steer Sensor.	
8634	86	34	REAR RIGHT STEER SENSOR - SHORT TO GROUND OR OPEN CIRCUIT	There is a Short to Ground or an Open Circuit to the Rear Right Steer Sensor.	
8635	86	35	REAR RIGHT STEER SENSOR - SHORT TO BATTERY	There is a Short to Battery to the Rear Right Steer Sensor.	
8636	86	36	REAR LEFT STEER SENSOR - SHORT TO GROUND OR OPEN CIRCUIT	There is a Short to Ground or an Open Circuit to the Rear Left Steer Sensor.	
8637	86	37	REAR LEFT STEER SENSOR - SHORT TO BATTERY	There is a Short to Battery to the Rear Left Steer Sensor.	
8651	86	51	ENGINE SHUTDOWN - AXLE LOCKOUT VALVE FAULT	Engine Start is prevented while there is an Oscillating Axle fault and vehicle is out of transport position	
876	87	6	WIRE ROPE SERVICE REQUIRED	MACHINE SETUP → CABLE SWITCH = YES; Wire Rope Service = Enabled	
990	**99**	**0**	**<<< HARDWARE >>>**		
991	99		LSS WATCHDOG RESET		
992	99		LSS EEPROM ERROR		
993	99		LSS INTERNAL ERROR - PIN EXCITATION		
994	99		LSS INTERNAL ERROR - DRDY MISSING FROM A/D		
998	99	8	EEPROM FAILURE - CHECK ALL SETTINGS	The Ground Module has reported an EEPROM failure.	
9910	99	10	FUNCTIONS LOCKED OUT - PLATFORM MODULE SOFTWARE VERSION IMPROPER	The Platform Module software version is not compatible with the rest of the system.	
9911	9	9	FUNCTIONS LOCKED OUT		
9914	99	14	PLATFORM MODULE SOFTWARE UPDATE REQUIRED	The Platform Module software requires an updated.	
9915	99	15	CHASSIS TILT SENSOR NOT GAIN CALIBRATED	The Chassis Tilt Sensor gain calibration has been lost.	

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
9916	99	16	CHASSIS TILT SENSOR GAIN OUT OF RANGE	The Chassis Tilt Sensor gain calibration has become corrupted.	
9917	99	17	HIGH RESOLUTION A2D FAILURE - INTERRUPT LOST	The Platform Module has reported that its ADS1213 chip has stopped asserting its interrupt.	
9918	99	18	HIGH RESOLUTION A2D FAILURE - REINIT LIMIT	The Platform Module has reported that its ADS1213 chip had to be reset 3 or more times.	
9919	99	19	GROUND SENSOR REF VOLTAGE OUT OF RANGE	The Ground Module has reported that its sensor reference voltage is outside acceptable range.	- Not reported during power-up.
9920	99	20	PLATFORM SENSOR REF VOLTAGE OUT OF RANGE	The Platform Module has reported that its sensor reference voltage is outside acceptable range.	- Not reported during power-up.
9921	99	21	GROUND MODULE FAILURE - HIGH SIDE DRIVER CUTOUT FAULTY	The Ground Module has reported that its high side driver cutout failed.	
9922	99	22	PLATFORM MODULE FAILURE - HWFS CODE 1	The Platform Module has reported that the V(Low) FET has failed.	
9923	99	23	GROUND MODULE FAILURE - HWFS CODE 1	The Ground Module has reported that the V(Low) FET has failed.	
9924	99		FUNCTIONS LOCKED OUT - MACHINE NOT CONFIGURED		
9925	99	25	FUNCTIONS LOCKED OUT - CHASSIS MODULE SOFTWARE VERSION IMPROPER	The Chassis Module software version is not compatible with the rest of the system.	
9926	99	26	FUNCTIONS LOCKED OUT - BLAM MODULE SOFTWARE VERSION IMPROPER	The BLAM software version is not compatible with the rest of the system.	
9927	99	27	GROUND MODULE CONSTANT DATA UPDATE REQUIRED	The Ground Module constant data requires an updated.	
99285	9	9	LSS - FACTORY CALIBRATION ERROR	The load sensor is reporting a factor calibration issue (internal error) The machine will assume the platform is overloaded. This fault, once annunciated is latched within a given key cycle.	Possible sensor hardware issue.
9929	99	29	MOMENT CONTROL DISABLED	Moment Control has been disabled by the user from Access Level 0.	- Envelope Control equipped vehicles only.
9930	99	30	STEER SENSORS NOT CALIBRATED	The Steer Sensors have not been calibrated.	- Chassis Module equipped vehicles only.
9931	99	31	BOOM SENSORS NOT CALIBRATED	The Boom Sensors have not been calibrated.	- BLAM equipped vehicles only.

Table 6-11. Diagnostic Trouble Code Chart

DTC	Flash Code	Sequence	Fault Message	Fault Description	Check
9932	99	32	LIFT CRACKPOINTS NOT CALIBRATED	The Lift Valves have not been calibrated.	- 1200S and 1350S only.
9933	99	33	TELESCOPE CRACKPOINTS NOT CALIBRATED	The Telescope Valves have not been calibrated.	- 1200S and 1350S only.
9934	99	34	DRIVE CRACKPOINTS NOT CALIBRATED	The Drive Valves have not been calibrated.	- 1200S and 1350S only.
9935	99	35	BLAM SENSOR SUPPLY OUT OF RANGE HIGH	The Boom Angle Sensors supply voltage is high.	- BLAM equipped vehicles only.
9936	99	36	BLAM SENSOR SUPPLY OUT OF RANGE LOW	The Boom Angle Sensors supply voltage is low.	- BLAM equipped vehicles only.
9937	99	37	LENGTH SENSOR REF VOLTAGE HIGH	The Boom Length Sensors supply voltage is high.	
9938	99	38	LENGTH SENSOR REF VOLTAGE LOW	The Boom Length Sensors supply voltage is low.	
9939	99	39	BLAM HIGH RES A/D FAILURE	The BLAM high resolution analog to digital converter has failed.	- BLAM equipped vehicles only.
9940	99	40	CHASSIS SENSOR SUPPLY OUT OF RANGE HIGH	The Chassis Sensors supply voltage is high.	
9941	99	41	CHASSIS SENSOR SUPPLY OUT OF RANGE LOW	The Chassis Sensors supply voltage is low.	
9942	99	42	BLAM BACKUP COMMUNICATIONS LINK FAULTY	The BLAM backup communications link test was activated at startup, but no communication connection established/maintained.	- BLAM equipped vehicles only. -1250
9943	99	43	BLAM BACKUP COMMUNICATIONS LOST - HYDRAULICS SUSPENDED	The BLAM backup communications link was activated, but no communication connection established/maintained.	- BLAM equipped vehicles only. -1250
9944	99	44	CURRENT FEEDBACK GAINS OUT OF RANGE	The factory set current feedback gains are out of range.	
9945	99	45	CURRENT FEEDBACK CALIBRATION CHECKSUM INCORRECT	The factory set current feedback checksum is not correct.	
9975	99	75	LOAD PIN NOT CALIBRATED	The Load Pin has not been calibrated.	-1250
9977	99		LSS CORRUPT EEPROM		
9979	99	79	FUNCTIONS LOCKED OUT - GROUND MODULE SOFTWARE VERSION IMPROPER	Temporary fault for the telematics project. The model needs to be a 600S or 1350S if not this fault will be generated and Platform controls will be prevented. This fault was to insure that the software will only work for these two models.	

Table 6-12. Analyzer Diagnostics Menu

Menu:	Submenu:	Selection:	Description:
DIAGNOSTICS:			
	SYSTEM:		
		GM BATTERY (XX.XX) V	Displays battery voltage at ground module
		PM BATTERY (XX.XX) V	Displays battery voltage at platform module
		AMB. TEMP (XX) C	Displays ambient temperature
		PLATFORM SW (CL or OP)	Displays the OPEN or CLOSED condition of the ground switch
		GROUND SW (CL or OP)	Displays the OPEN or CLOSED condition of the platform switch
		MODE (GROUND or PLAT)	Displays the current operation mode of the machine
		ABOVE ELEV. (YES or NO)	Displays the current condition of the ABOVE ELEVATION case
		LEN SW 1 (CL or OP)	Displays the current condition of length switch #1
		LEN SW 2 (CL or OP)	Displays the current condition of length switch #2
		RETRACTED (YES or NO)	Displays the status of the RETRACTED case
		TRANSPORT (YES or NO)	Displays the status of the TRANSPORT case
		BR CABLE CUT (OP or CL)	Displays the status of the BROKEN CABLE case
		BCS (NORMAL or XXXX VIOL)	Displays the status of the Boom Control System
		MN ENV (NOMINAL or (STOP or VIOL)(TOP or BOT))	Displays the main boom envelope status
		TW ENV (NOMINAL or (STOP or VIOL)(FWD or BACK))	Displays the tower envelope status
		(HR or ER)(GRAV or PWR)(DOWN or DN)(SS or NP)(ML or TT)	Displays the current retrieval mode and conditions
		LENGTH ZONE (A or B or C or d or ERR)	Displays the status of the main boom length zone
		ANGLE ZONE (1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or HI)	Displays the status of the main boom angle zone
		CREEP (NOT ACTIVE or ACTIVE)	Displays creep switch status
		CRP MODE (NOT ACT or ACTIVE)	Displays the current condition of creep mode
		SUPER CREEP (OFF or ON)	Displays the current condition of super creep mode
		TILT (XX.XX) DEG	Displays the measured vehicle combined tilt
		TILT X (X.X)	Displays the measured vehicle tilt of the X axis
		TILT Y (X.X)	Displays the measured vehicle tilt of the Y axis
		AUX POWER (CL or OP)	Displays the status of auxiliary power switch
		HORN (CL or OP)	Displays status of horn switch
		BASKET STOWED (YES or NO)	Displays the status of the BASKET STOWED switch
		SOFT LIMIT (CL or OP)	Displays the OPEN or CLOSED condition of the soft touch limit switch

Table 6-12. Analyzer Diagnostics Menu

Menu:	Submenu:	Selection:	Description:
		SOFT O/R (CL or OP)	Displays the OPEN or CLOSED condition of the soft touch over ride switch
		GENSET/WELDER (CL or OP)	Displays the OPEN or CLOSED condition of the GENSET/WELDER switch
		LIGHTS (CL or OP)	Displays the OPEN or CLOSED condition of the LIGHTS switch
		BSK TILT1 (X.X)	Displays the status of basket tilt sensor #1
		BSK TILT2 (X.X)	Displays the status of basket tilt sensor #2
		AXLE RET SW (CL or OP)	Displays the OPEN or CLOSED condition of the axle retract switches
		AXLE EXT SW (CL or OP)	Displays the OPEN or CLOSED condition of the axle extend switches
		AXLE LIM SW (RET or EXT)	Displays the condition of the AXLE LIMIT SWITCH case
		DOS LIM SW (CL or OP)	Displays the OPEN or CLOSED condition of the drive orientation switch
		CAPACITY SW (500 or 1000)	Displays the status of the capacity switch
		OSC AXLE P SW (CL or OP)	Displays the condition of the axle pressure switch
		SKY WELDER (YES or NO)	Indicates if the accessory has been included in the boom sensor calibration
		SKY CUTTER (YES or NO)	Indicates if the accessory has been included in the boom sensor calibration
		SKY GLAZIER (YES or NO)	Indicates if the accessory has been included in the boom sensor calibration
		SKY BRIGHT (YES or NO)	Indicates if the accessory has been included in the boom sensor calibration
		PIPE RACKS (YES or NO)	Indicates if the accessory has been included in the boom sensor calibration
		CAMERA MOUNT (YES or NO)	Indicates if the accessory has been included in the boom sensor calibration
		H OIL TEMP SW (CL or OP)	Displays the status of the hot oil temperature switch
		ML PILOT P SW (CL or OP)	Displays the status of the main lift pilot pressure switch
	TRANSPORT DATA:		
		TRANSPORT (YES or NO)	Displays the status of the TRANSPORT case
		LENGTH ZONE (A or B or C or d or ERR)	Displays the status of the main boom length zone
		ANGLE ZONE (1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or HI)	Displays the status of the main boom angle zone
		ABOVE ELEV. (YES or NO)	Displays the current condition of the ABOVE ELEVATION case
		TWR BOOM (OUT or IN) TRN	Displays the tower status being within or outside of the transport case
		TWR BOOM (EXT or RET)	Displays the tower status
		TWR BOOM (ABV or BLW) ELE	Displays the tower status being above or below of the elevated case
		MAIN BOOM (EXT or RET)	Displays the main boom status

Table 6-12. Analyzer Diagnostics Menu

Menu:	Submenu:	Selection:	Description:
		MAIN BOOM (ABV or BLW) ELE	Displays the main boom status being above or below of the elevated case
		MAIN TRN LENC (CL or OP)	Displays the status of the normally open length switch
		MAIN TRN LENO (CL or OP)	Displays the status of the normally closed length switch
		MAIN TRN LEN (A/D or B/C or DISAGREE)	Displays the status of the combined length switches
		DUAL CAP LENC (CL or OP)	Displays the status of the normally open dual capacity switch
		DUAL CAP LENO (CL or OP)	Displays the status of the normally closed dual capacity switch
		DUAL CAP LEN (A or A/B or B or B/C or C/D or D or FLT)	Displays the status of the combined dual capacity switches
		TWR TRN SW C (CL or OP)	Displays the status of the normally open tower transport switch
		TWR TRN SW O (CL or OP)	Displays the status of the normally closed tower transport switch
		TWR TRN SW (CL or OP or FLT)	Displays the status of the combined tower transport switches
		TWR TR ANG SW (CL or OP)	Displays the status of the tower angle switch
		MAIN TRN AGLC (CL or OP)	Displays the status of the normally open main angle switch
		MAIN TRN AGLO (CL or OP)	Displays the status of the normally closed main angle switch
		MAIN TRN AGL (CL or OP or FLT)	Displays the status of the combined main angle switches
	LOAD PIN:		
		MOMENT (XXXXXXX)	Displays the calculated value of the moment pin
		RATIO (XX.XXX)	Displays the calculated value of the lift cylinder vector force ratio
		ANGLE (XX.X)	Displays the calculated angle of the vector force
		V.F. (X)	Displays the vector force applied to the moment pin
		RAW MOMENT (XXXXXXX)	Displays the raw data value of the moment pin
		RAW RATIO (XX.XXX)	Displays the raw value of the lift cylinder vector force ratio
		RAW ANGLE (XX.X)	Displays the raw angle of the vector force
		RAW V.F. (X)	Displays the raw data vector force applied to the moment pin
		CAL PT ANGLE (XX.X)	Displays the angle of the vector force applied to the moment pin during calibration
		CAL PT VECTOR (X)	Displays the vector force applied to the moment pin during calibration
		CAL PT MOMENT (XXXXXXX)	Displays the value of the moment pin recorded during calibration
		E FLAGS (#X####)	Displays error flags from the moment pin
		X (XXX)	Displays the calculated horizontal force applied to the moment pin
		Y (XXX)	Displays the calculated vertical force applied to the moment pin
		RAW X (XXX)	Displays the horizontal force applied to the moment pin
		RAW Y (XXX)	Displays the calculated vertical force applied to the moment pin

Table 6-12. Analyzer Diagnostics Menu

Menu:	Submenu:	Selection:	Description:
	ENVELOPE SENSORS:		
		TWR LEN1 (X.X)"	Displays the measured value of tower length sensor #1
		TWR LEN2 (X.X)"	Displays the measured value of tower length sensor #2
		TWR ANGL1 (XX.X)	Displays the measured value of tower angle sensor #1
		TWR ANGL2 (XX.X)	Displays the measured value of tower angle sensor #2
		CYL ANGL (XX.X)	Displays the measured value of cylinder angle sensor #2
		MN ANGL1 (XX.X)	Displays the measured value of main angle sensor #1 to the tower
		MN ANGL2 (XX.X)	Displays the measured value of main angle sensor #2 to the tower
		TO GRAV MN ANGL L (XXXX)	Displays the measured value of lowest value main angle sensor to gravity
		TO GRAV MN ANGL H (XXXX)	Displays the measured value of largest value main angle sensor to gravity
		A/D T LEN1 (X)	Displays the analog to digital counts of tower length sensor #1
		A/D T LEN2 (X)	Displays the analog to digital counts of tower length sensor #2
		A/D ANG1 (XX.X)	Displays the analog to digital counts of tower angle sensor #1
		A/D ANG2 (XX.X)	Displays the analog to digital counts of tower angle sensor #2
		A/D CYL (X)	Displays the analog to digital counts of cylinder angle sensor
		MN ANG A/D SNSR1 (XXXX)	Displays the analog to digital counts of main angle sensor #1
		MN ANG A/D SNSR2 (XXXX)	Displays the analog to digital counts of main angle sensor #2
		MN ANG RAW SNSR1 (X.X)	Displays the raw value of main angle sensor #1
		MN ANG RAW SNSR2 (X.X)	Displays the raw value of main angle sensor #2
		RET LEN 1 (X)	displays the retracted length of the tower found by sensor #1 during calibration
		RET LEN 2 (X)	displays the retracted length of the tower found by sensor #2 during calibration
		EXT LEN 1 (X)	displays the extended length of the tower found by sensor #1 during calibration
		EXT LEN 2 (X)	displays the extended length of the tower found by sensor #2 during calibration
		TRIP LEN (XXXX.X)	Displays the length of the tower recorded at the transport trip point during calibration
		TA1 CAL L (X.X)	Displays the lowest tower angle #1 value recorded during calibration
		TA2 CAL L (X.X)	Displays the lowest tower angle #2 value recorded during calibration
		TA1 CAL H (X.X)	Displays the highest tower angle #1 value recorded during calibration
		TA2 CAL H (X.X)	Displays the highest tower angle #2 value recorded during calibration
		CYL CAL L (X)	Displays the lowest cylinder angle value recorded during calibration
		CYL CAL H (X)	Displays the highest cylinder angle value recorded during calibration

Table 6-12. Analyzer Diagnostics Menu

Menu:	Submenu:	Selection:	Description:
		MA1 CAL L (X)	Displays the lowest main angle #1 value recorded during calibration
		MA2 CAL L (X)	Displays the lowest main angle #2 value recorded during calibration
		MA1 CAL H (X)	Displays the highest main angle #1 value recorded during calibration
		MA2 CAL H (X)	Displays the highest main angle #2 value recorded during calibration
		TRIP ANG (X.X)	Displays the length of the tower recorded at the transport trip point during calibration
		TWR CYL: LONG	Displays type of cylinder installed on machine
	CALIBRATION DATA:		
		LOAD ZERO (X)	Displays the value of the moment pin recorded during calibration
		LOAD 500LB (X)	Displays the value of the moment pin recorded during calibration
		BASKET UP (X)	Displays the value of the basket up crack point recorded during calibration
		BASKET DOWN (X)	Displays the value of the basket down crack point recorded during calibration
		L FWD DRIVE (XXXX)	Displays the value of the left forward drive crack point recorded during calibration
		R FWD DRIVE (XXXX)	Displays the value of the right forward drive crack point recorded during calibration
		L REV DRIVE (XXXX)	Displays the value of the left reverse drive crack point recorded during calibration
		R REV DRIVE (XXXX)	Displays the value of the right reverse drive crack point recorded during calibration
		F LT STEER (XXXX)	Displays the value of the front left steer crack point recorded during calibration
		F RT STEER (XXXX)	Displays the value of the front right steer crack point recorded during calibration
		R LT STEER (XXXX)	Displays the value of the rear left steer crack point recorded during calibration
		R RT STEER (XXXX)	Displays the value of the rear right steer crack point recorded during calibration
		M LIFT UP (XXXX)	Displays the value of the main lift up crack point recorded during calibration
		M LIFT DOWN (XXXX)	Displays the value of the main lift down crack point recorded during calibration
		M TELE IN (XXXX)	Displays the value of the main telescope in crack point recorded during calibration
		M TELE OUT (XXXX)	Displays the value of the main telescope out crack point recorded during calibration
		BM ANG 1 LO (X)	Displays the low value boom angle recorded from sensor 1 during calibration
		BM ANG 1 HI (X)	Displays the high value boom angle recorded from sensor 1 during calibration
		BM ANG 2 LO (X)	Displays the low value boom angle recorded from sensor 2 during calibration
		BM ANG 2 HI (X)	Displays the high value boom angle recorded from sensor 2 during calibration
		LEN RETRACT (XXXX)	Displays minimum tower length recorded during calibration
		LEN WIT (XXXX)	Displays the recorded value of tower length at the witness mark found during calibration
		LEN SWITCH (XXXX)	Displays the recorded value of tower length at the transport switch found during calibration

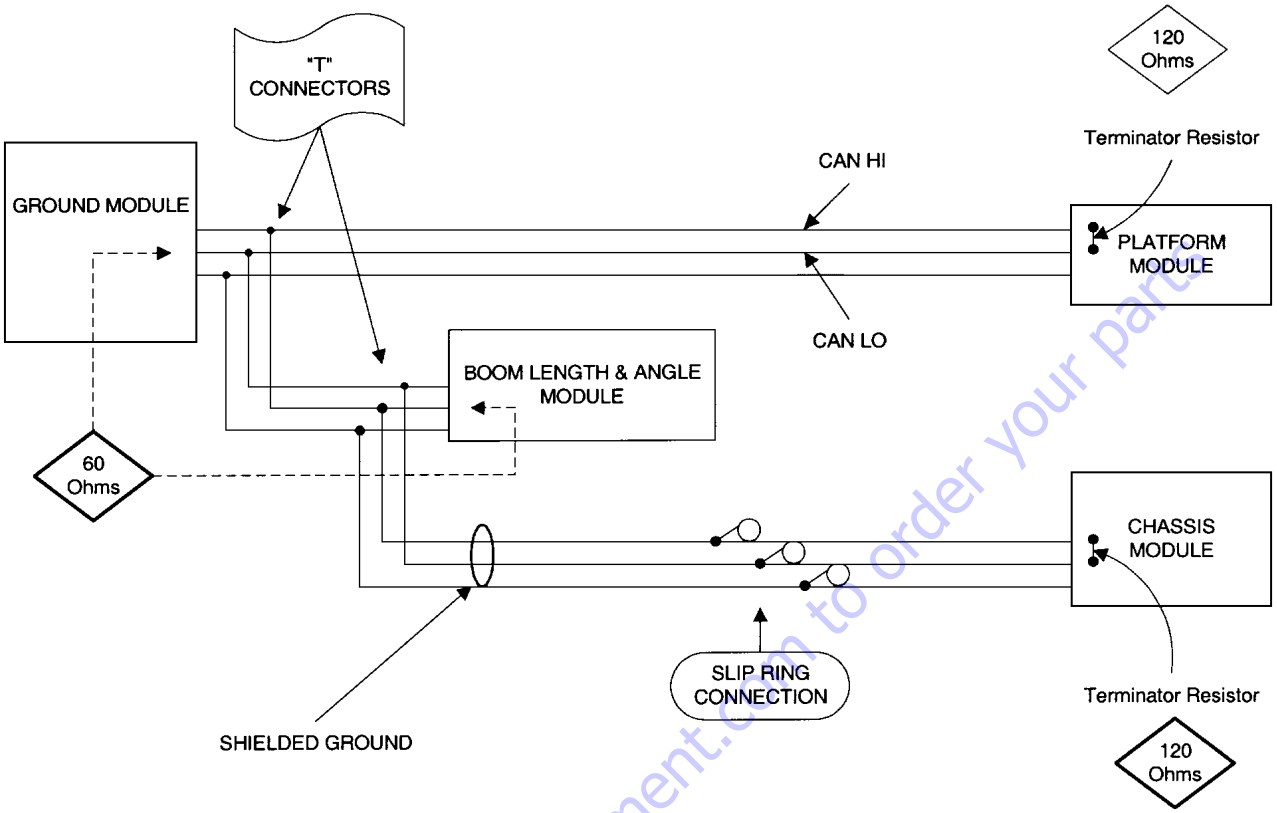
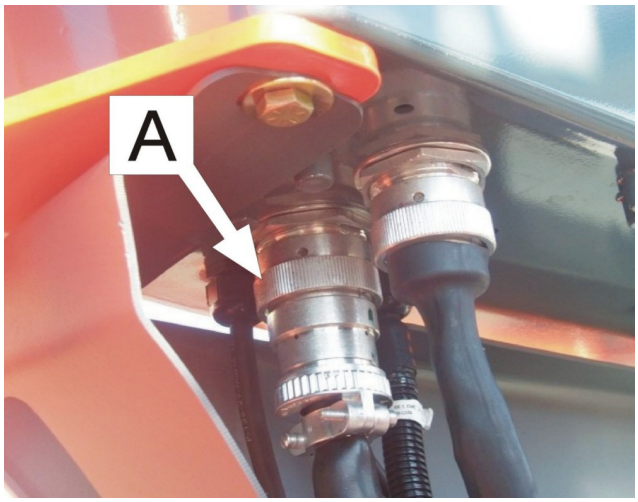
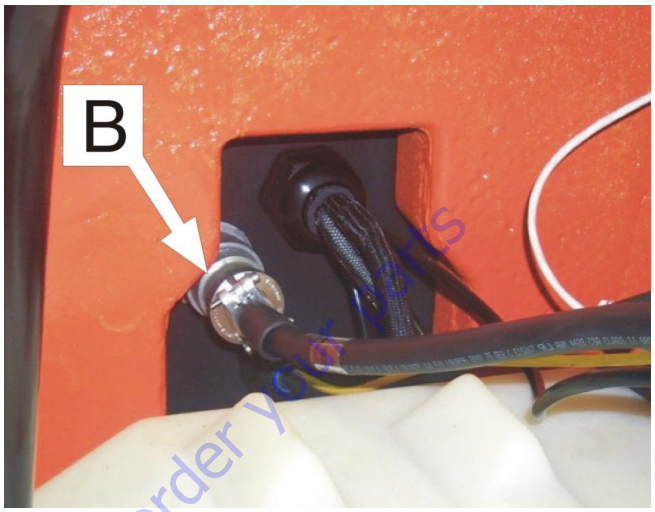


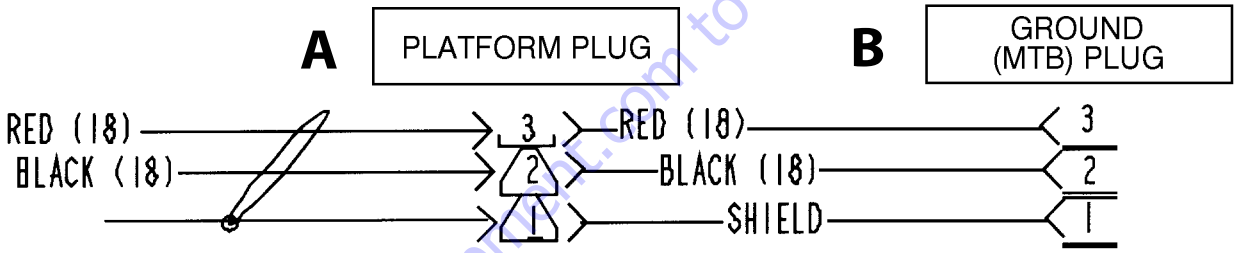
Figure 6-17. CANbus Connections Diagram

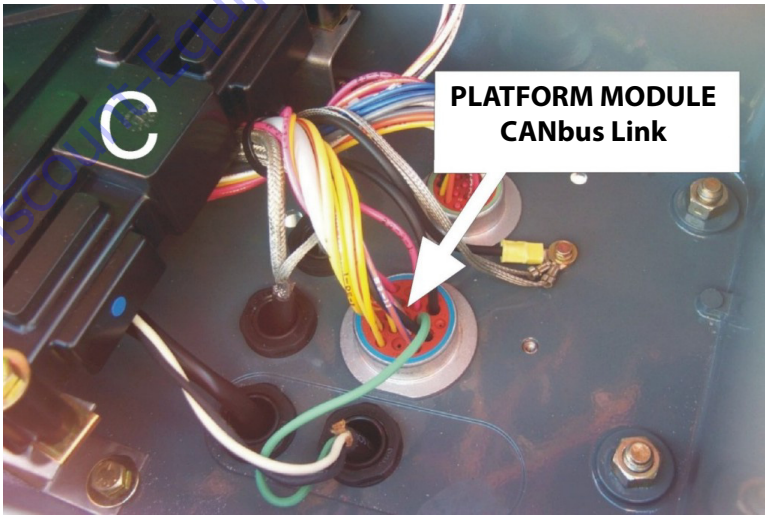
6.17 CANBUS TROUBLESHOOTING

The PLATFORM MODULE and the CHASSIS MODULE have "Terminator Resistors" located inside the modules, these resistors squelch high speed signal reflections in the CANbus transmission lines. The value of the terminators is determined by wire properties, this includes the type of insulation and geometry, combined to determine the perfect value for bus termination. Improper values or missing terminators allow bus ringing. A complete CANbus circuit (wired in parallel) is approximately 60 Ohms at the "T" fitting inside the Ground Station or at the Boom Length & Angle Module. Each individual circuit from their respective Module should read approximately 120 Ohm. For CANbus connections, refer to Figure 6-17., Figure 6-18., Figure 6-19., Figure 6-20., and Figure 6-21.









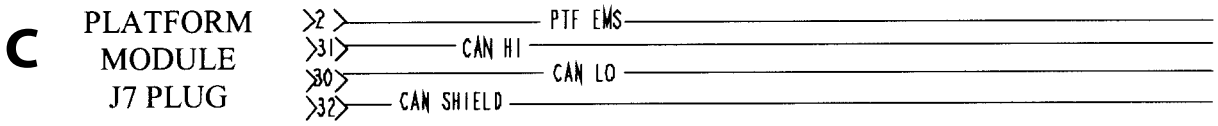
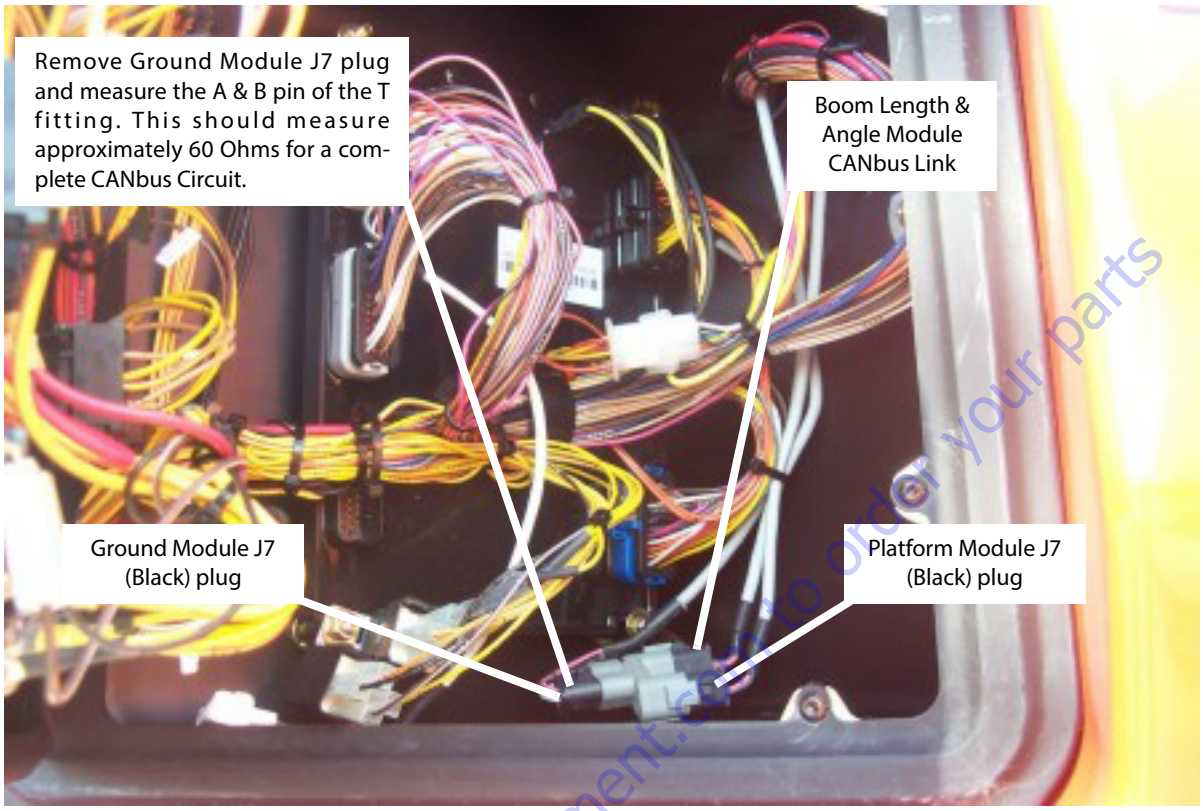


Figure 6-18. CANbus Connections - Sheet 1 of 4



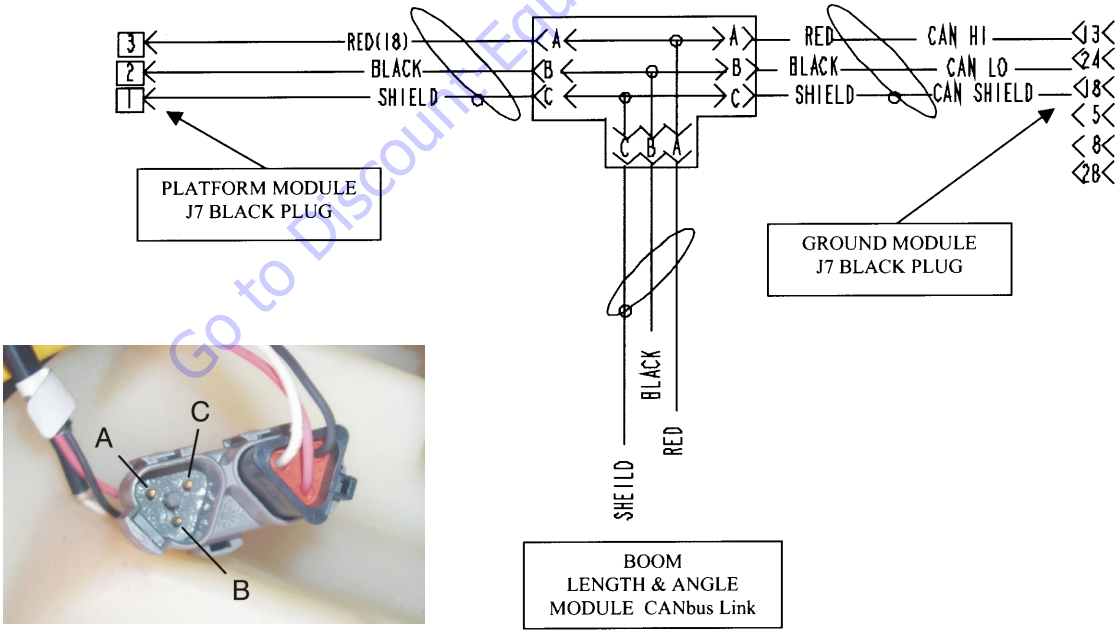


Figure 6-19. CANbus Connections - Sheet 2 of 4

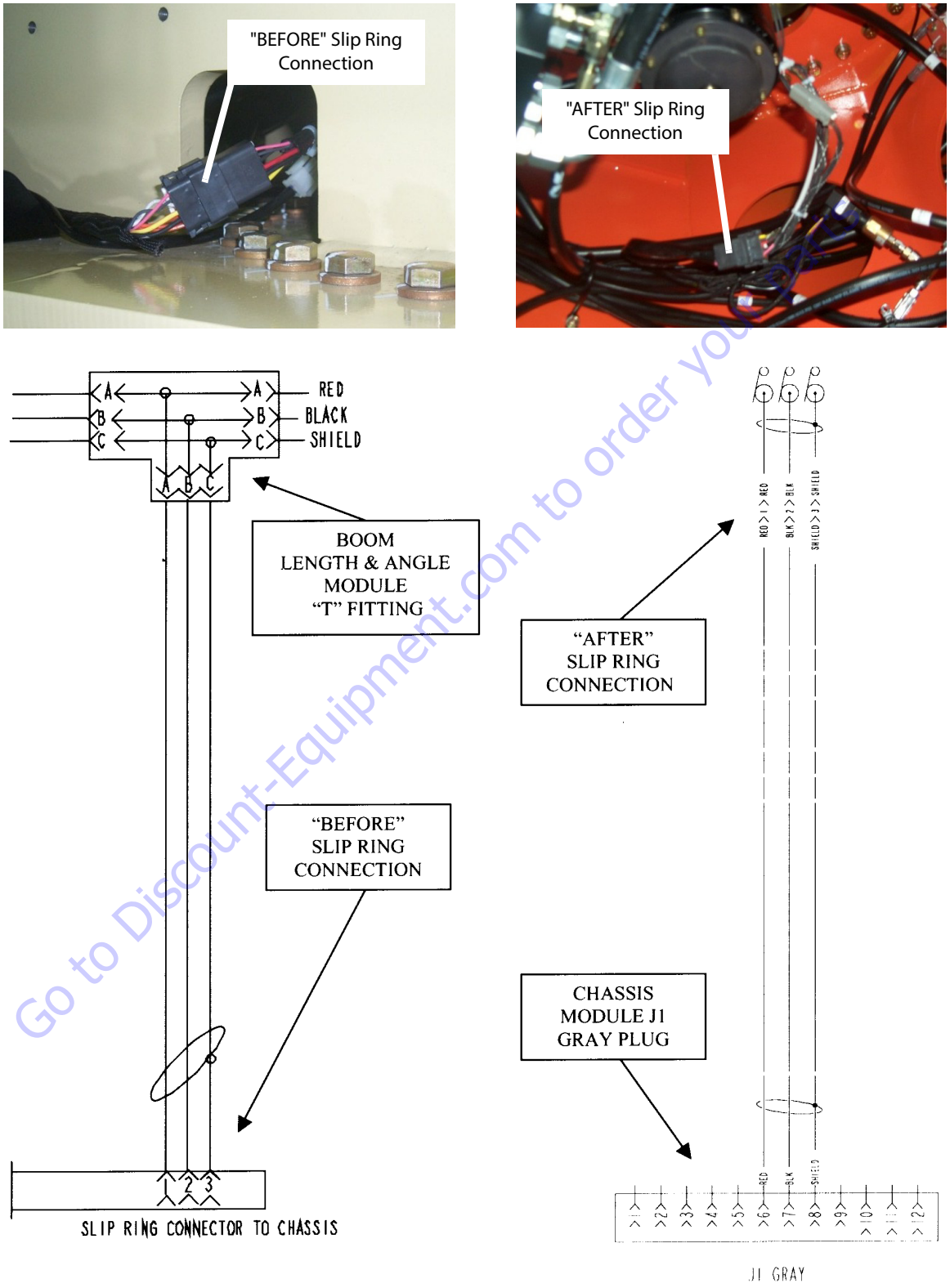
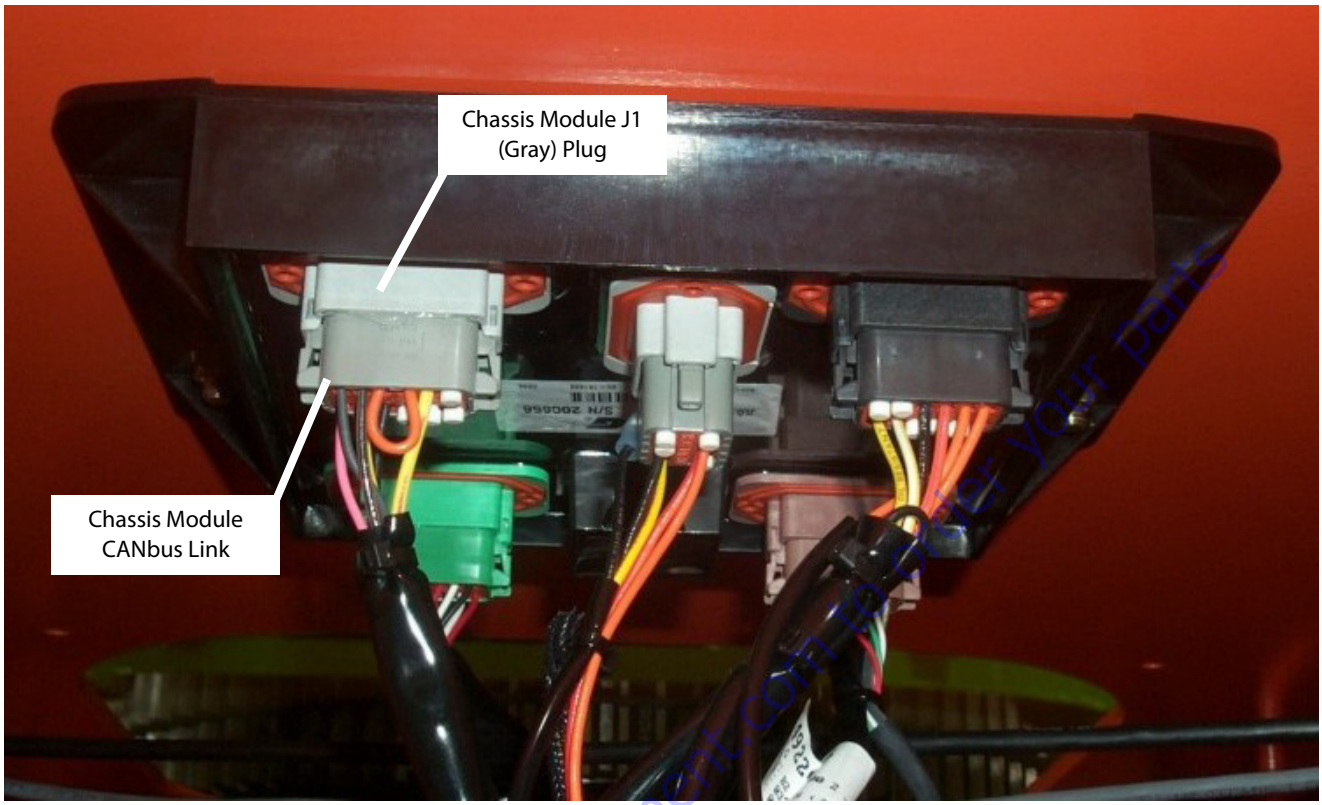


Figure 6-20. CANbus Connections - Sheet 3 of 4



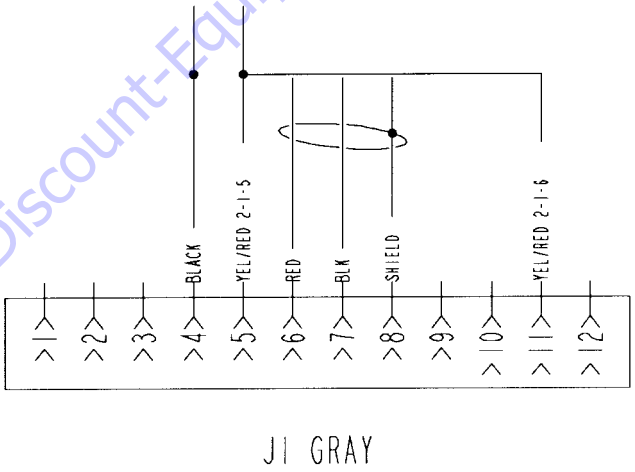


Figure 6-21. CANbus Connections - Sheet 4 of 4

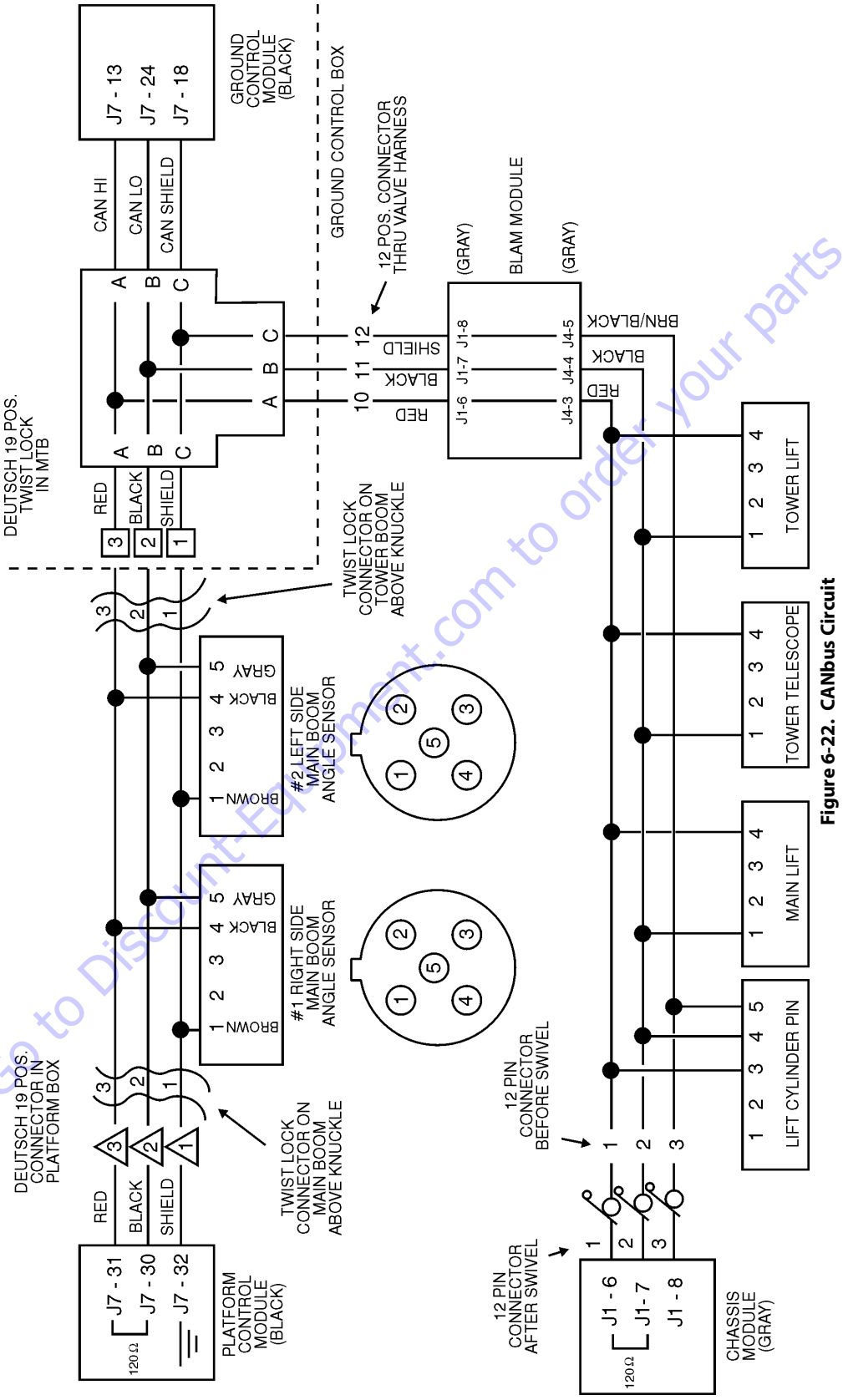


Figure 6-22. CANbus Circuit

CANbus Communication Failure

If a problem in the CANbus system is suspected, use the following step-by-step procedure to verify which part of the CANbus communication system has failed.

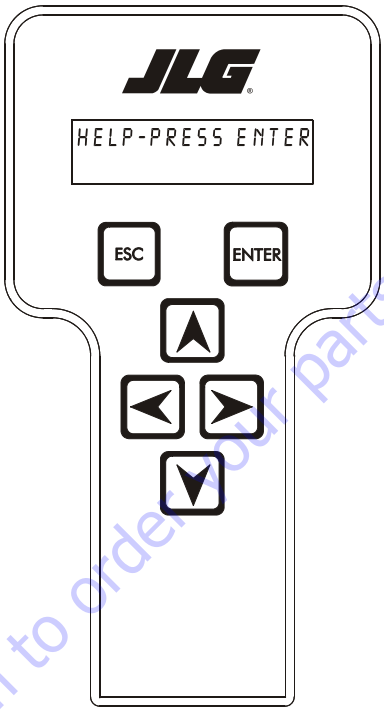
CANBUS LINK FROM THE PLATFORM MODULE LOST

1. Position the Platform/Ground select switch to the Ground position.

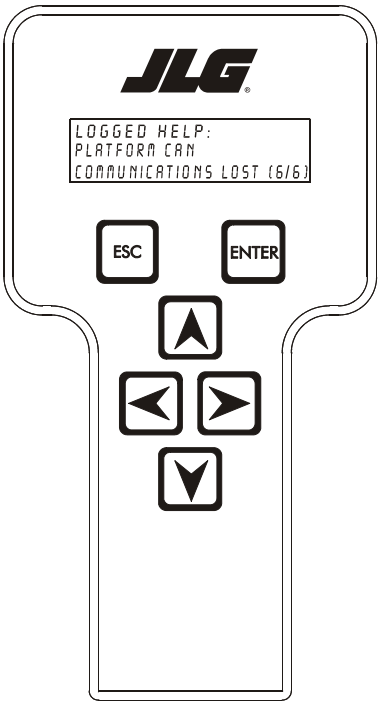
2. Plug the analyzer into the connector inside the Ground control box.

3. Pull out the Emergency Stop switch.

4. The analyzer screen should read:

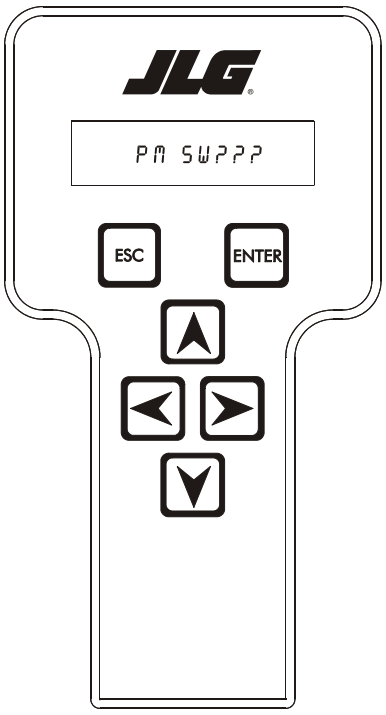


5. Press enter twice to reach Logged Help. The screen will read:

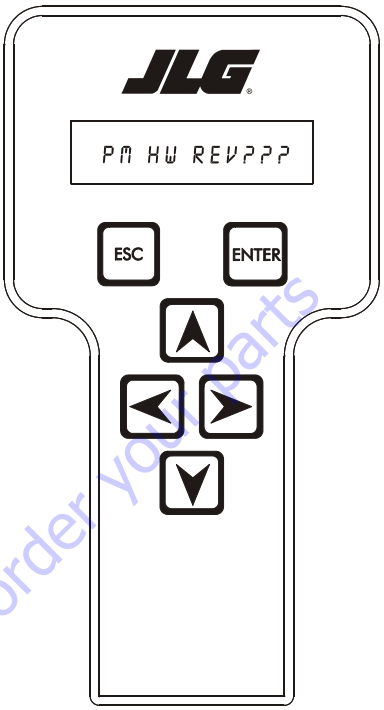


6. Hit ESC to get back to the HELP screen and then use the arrow button to reach VERSIONS. Hit Enter.

7. If the CANbus link from the platform module is lost, you will see the Ground Module SW version, Ground Module HW version, Ground Module SN, BM SW version, Chassis SW version, Platform Module SN, but you will not see the Platform Module SW version or the Platform Module HW version. The Analyzer screen will read:



8. Hit the right arrow button once. The screen will read:



TROUBLESHOOTING: PLATFORM CAN COMMUNICATIONS LOST

NOTE: *PLATFORM CAN COMMUNICATIONS LOST (6/6) (Help Fault Code 6-6) basically means all communication linked to the Platform Module is lost. This does not mean that the Platform Module Link only is affected, this means the communication link between the Platform Module down to the Chassis Module has been broken, therefore all Canbus links have to be checked. Remember this link is wired in parallel, so the Ground Module has lost all MSA communication.*

Table 6-13. Troubleshooting: Platform Can Communications Lost

STEP	ACTION REQUIRED	SPEC	YES	NO
1	Install the Analyzer at the ground station, scroll to the "Diagnostics" sub level menu, press "enter" then scroll to the "Versions" menu item press "enter" and view the screen, reference the Diagnostics / Version Chart to assist you in determining which module has lost it's communication link. In some cases the module that shows up with a question may be defective if all other CAN-bus links check OK.	See Diagnostics / Version Chart	See step 2	See step 2
2	Disconnect the Ground Module J7 deutsche plug connection at the "T" fitting inside of the ground control station. Perform an ohms check at the "A" and "B" pins of the "T" fitting. Inspect the shield wire "C" for shorts.	Approximately 60 ohms.	CANbus circuit is complete. Platform Module suspected defective	Reconnect plug and go to step 3
3	Make sure the CANbus link wires are installed correctly at the Platform Module.	See Electrical Schematic in Section 7	Go to step 4	Wire per Electrical Schematic
4	Disconnect the platform cannon plug and ground cannon plug that holds the CANbus link. Red (3) Black (2) and Shield (1) perform a continuity test.	Continuity	Reconnect plug and go to step 5	Repair or replace platform harness.
5	Disconnect the deutsche plug connection from the Platform Module at the "T" fitting inside of the ground station. Perform an ohms check at the "A" and "B" sockets of the deutsche plug. Inspect the shield wire "C" for shorts.	Approximately 120 ohms.	Reconnect plug and go to step 6	Suspected defective Platform Module.
6	Inspect the Platform Module harness connection at the ground cannon plug and at the "T'" fitting inside of the ground control station.	Continuity	Reconnect harness and go to step 7	Repair or replace harness inside the ground control station.
7	Disconnect the deutsche plug connection from the Boom Length & Angle Module at the "T' fitting inside of the ground station. Perform an ohms check at the "A" and "B" sockets of the deutsche plug. Inspect the shield wire "C" for shorts.	Approximately 120 ohms	Reconnect plug and go to step 8	Verify step 7, inspect the BLAM to Ground Module harness connection s at both "T" fitting connections for proper continuity and correct wiring per Electrical schematic.
8	Disconnect all deutsche plug connections at the "T" fitting in the ground station and the BLAM, perform a continuity test on all "A" "B" and "C" pins use the singular end of the fitting and cross probe the corresponding letters of the other two connections.	Continuity (NO OHM VALUES)	Reconnect all deutsche plugs at the "T" fitting and go to step 9	Replace defective "T" fitting plug.

Table 6-13. Troubleshooting: Platform Can Communications Lost

STEP	ACTION REQUIRED	SPEC	YES	NO
9	Disconnect the Chassis Module deutsche plug at the "T' fitting below the Boom Length & Angle Module. Perform an ohms check at the "A" and "B" sockets of the deutsche plug. Inspect the shield wire "C" for shorts.	Approximately 120 ohms	Reconnect deutsche plug and go to step 10	Inspect the harness from the "T" fitting at the BLAM to the Chassis Module plug connection at the battery. Assure proper continuity and correct wiring per Electrical Schematic.
10	Disconnect the Chassis Module connection at the right side of the battery at the turntable lock pin. Perform an ohms check at the #1 and #2 connections of the plug. Inspect shield wire #3 for possible short.	Approximately 120 ohms	Reconnect plug and go to step 11	Inspect the harness from the slip ring connections at the top and bottom plug connections of the swivel. Assure proper continuity and correct wiring per Electrical Schematic.
11	Disconnect the Chassis Module connection below the swivel under the machine. Perform an ohms check at the #1 and #2 connections of the plug that is routed to the Chassis Module. Inspect shield wire #3 for possible short.	Approximately 120 ohms	Reconnect plug and go to step 12	Inspect the harness from the bottom of the swivel into the Chassis Module. Assure proper continuity and wiring r schematic 1870149A.
12	Make sure the Chassis Module CANbus link wires are installed correctly at the plug near the battery, the plug below the swivel and 31 plug at the Chassis Module.	Electrical Schematic	Stop	Replace the Chassis Module.

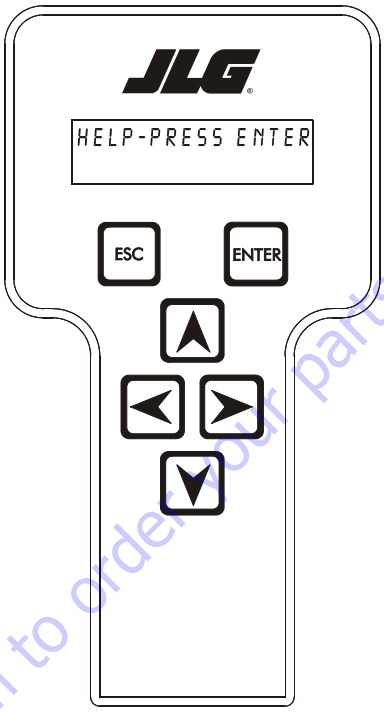
CANBUS LINK FROM THE GROUND MODULE LOST

1. Position the Platform/Ground select switch to the Ground position.

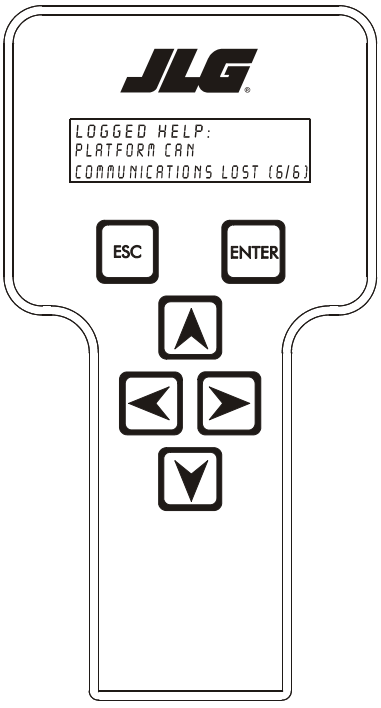
2. Plug the analyzer into the connector inside the Ground control box.

3. Pull out the Emergency Stop switch.

4. The analyzer screen should read:

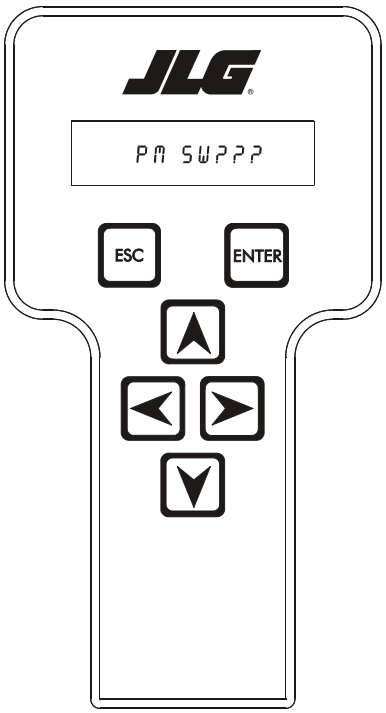


5. Press enter twice to reach Logged Help. The screen will read:

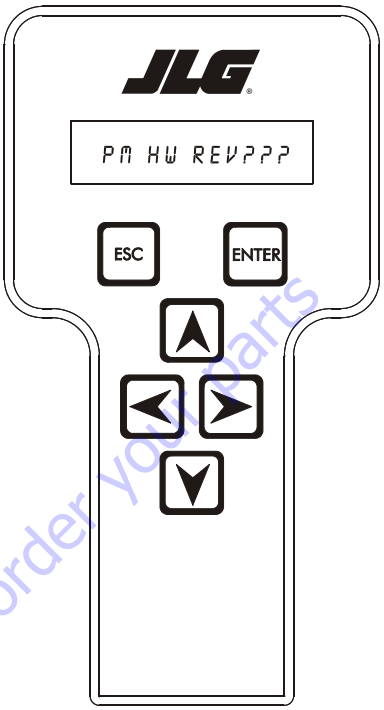


6. Hit ESC to get back to the HELP screen and then use the arrow button to reach VERSIONS. Hit Enter.

7. If the CANbus link from the ground module is lost, you will see the Ground Module SW version, Ground Module HW version, Ground Module SN, BM SW version, Chassis SW version, Platform Module SN, but you will not see the Platform Module SW version or the Platform Module HW version. The Analyzer screen will read:



8. Hit the right arrow button once. The screen will read:



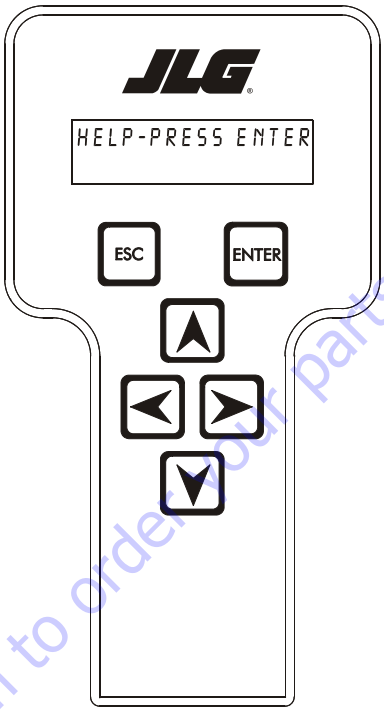
CANBUS LINK FROM THE BOOM LENGTH & ANGLE MODULE (BLAM) LOST

1. Position the Platform/Ground select switch to the Ground position.

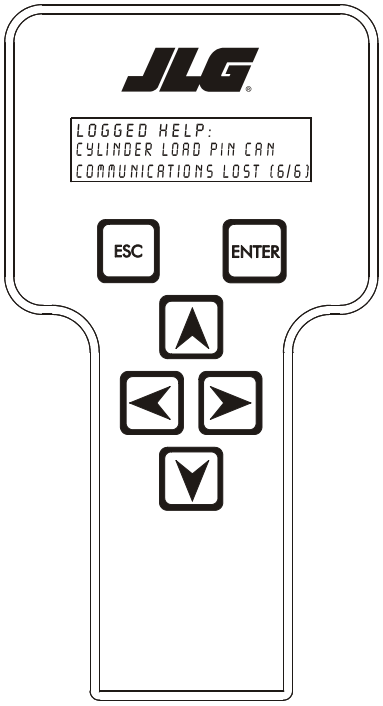
2. Plug the analyzer into the connector inside the Ground control box.

3. Pull out the Emergency Stop switch.

4. The analyzer screen should read:

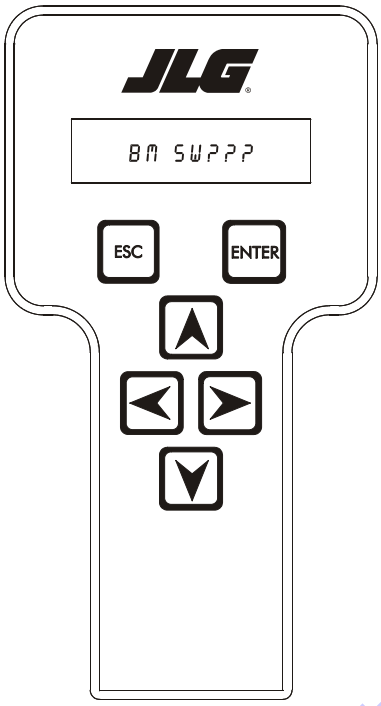


5. Press enter twice to reach Logged Help. The screen will read:



6. Hit ESC to get back to the HELP screen and then use the arrow button to reach VERSIONS. Hit Enter.

7. If the CANbus link from the Boom Length & Angle Module is lost, you will see the Platform Module SW version, Platform Module HW Rev, Platform Module SN, Ground Module SW version, Ground Module HW Revision, Ground Module SN, Chassis SW version, but you will not see the Boom Length & Angle Module SW revision. The Analyzer screen will read:



TROUBLESHOOTING: BLAM CAN COMMUNICATIONS LOST

NOTE: *BLAM CAN COMMUNICATIONS LOST (6/6) (Help Fault Code 6-6) basically means all communication linked from the Ground Module to the Boom Length &: Angle Module is lost. This also includes the lift cylinder load moment pin as well.*

Table 6-14. Troubleshooting: BLAM Can Communications Lost

STEP	ACTION REQUIRED	SPEC	YES	NO
1	Install the Analyzer at the ground station, scroll to the "Diagnostics" sub level menu, press "enter" then scroll to the "Versions" menu item press "enter" and view the screen, reference the Diagnostics / Version Chart to assist you in determining which module has lost it's communication link. In some cases the module that shows up with a question may be defective if all other CAN-bus links check OK.	See Diagnostics / Version Chart	See step 2	See step 2
2	Disconnect the BLAM **J 1** deutsche plug connection at the "T" fitting just above the fuel tank. Perform an ohms check at the "A" and "B" pins of the "T" fitting. Inspect the shield wire "C" for possible short.	Approximately 60 ohms.	CANbus circuit is complete. BLAM suspected defective.	Reconnect plug and go to step 3
3	Disconnect the Ground Module deutsche plug from "T" fitting at the BLAM above the fuel tank. Perform an ohm check at the "A" and "B" sockets of the deutsche plug. Inspect the shield wire "C " for possible short.	Approximately 120 Ohms	Reconnect harness and go to step 4	Repair or replace the Ground Module to BLAM harness.
4	Verify the CANbus link signal wires are installed correctly at the "T" fitting at the Ground Module.	Electrical Schematic	Reconnect plug and go to step 5	Wire per Electrical Schematic
5	Verify the lift cylinder load moment harness has good continuity and wired correctly at the J4 plug on the BLAM.	Continuity	Reconnect plug and go to step 6	Repair or replace Chassis Module harness.
6	Disconnect the Chassis Module plug connection at the battery and perform an ohm check at the #1 and #2 socket of the deutsche plug. Inspect the shield wire #3 for possible short.	Approximately l 20 Ohms	Reconnect plug and stop	Inspect harness and connections to the Chassis Module.

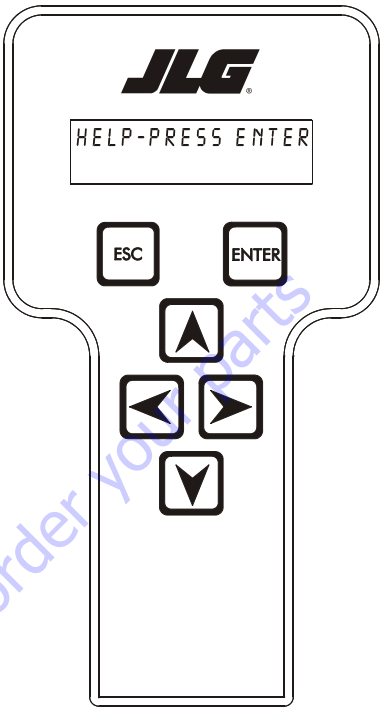
CANBUS LINK FROM THE CHASSIS MODULE LOST

1. Position the Platform/Ground select switch to the Ground position.

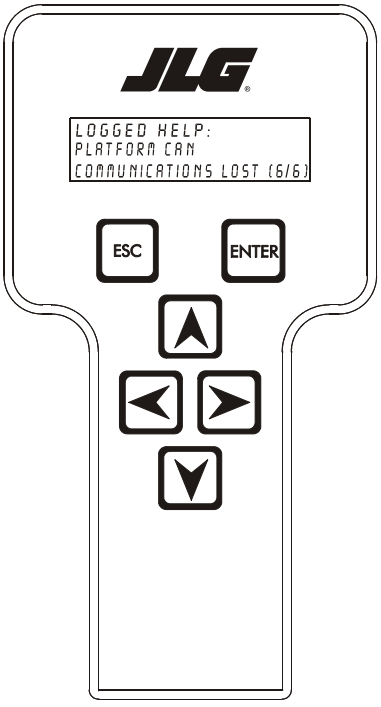
2. Plug the analyzer into the connector inside the Ground control box.

3. Pull out the Emergency Stop switch.

4. The analyzer screen should read:

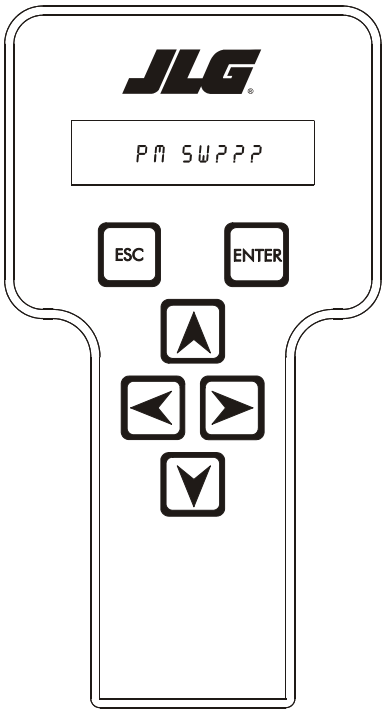


5. Press enter twice to reach Logged Help. The screen will read:

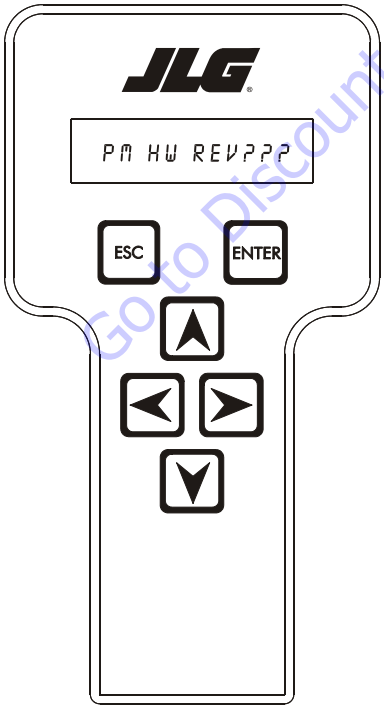


6. Hit ESC to get back to the HELP screen and then use the arrow button to reach VERSIONS. Hit Enter.

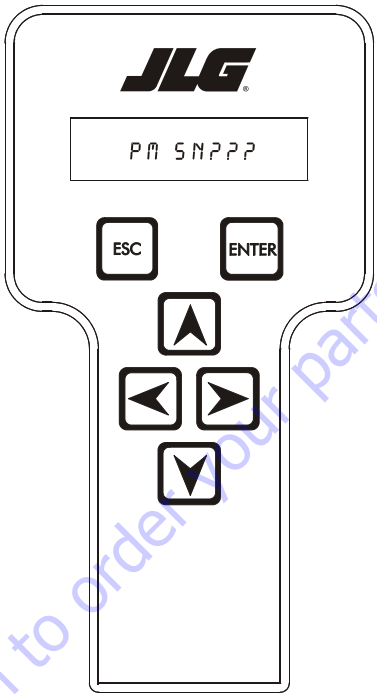
7. If the CANbus link from the Chassis Module is lost, you will NOT see the Platform Module SW version, Platform Module HW rev, Platform Module SN, Chassis SW version, Boom Length & Angle Module SW version, but you WILL see the Ground Module SW version, Ground Module HW rev, and the Ground Module SN. The analyzer screen will read:



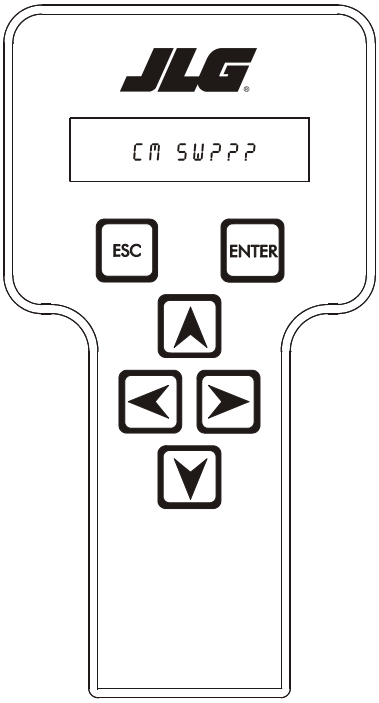
8. Hit the right arrow button once. The screen will read:



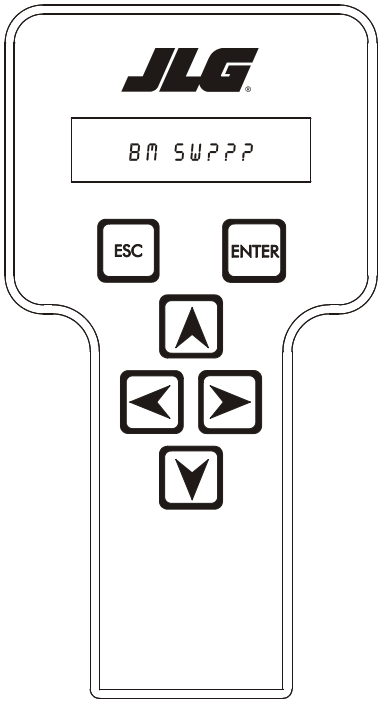
9. Hit the right arrow button once. The screen will read:



10. Hit the right arrow button once. The screen will read:



11. Hit the right arrow button once. The screen will read:



TROUBLESHOOTING: CHASSIS CAN COMMUNICATIONS LOST

NOTE: *CHASSIS CAN COMMUNICATIONS LOST (6/6) (Help Fault Code 6-6) basically means all communication linked from the Ground Module to the Chassis Module is lost.*

Table 6-15. Troubleshooting: Chassis Can Communications Lost

STEP	ACTION REQUIRED	SPEC	YES	NO
1	Install the Analyzer at the ground station, scroll to the "Diagnostics" sub level menu, press "enter" then scroll to the "Versions" menu item press "enter" and view the screen, reference the Diagnostics / Version Chart to assist you in determining which module has lost it's communication link. In some cases the module that shows up with a question may be defective if all other CAN-bus links check OK.	See Diagnostics / Version Chart	See step 2	See step 2
2	Disconnect the BLAM J1 deutsche plug connection at the "T" fitting just above the fuel tank. Perform an ohms check at the "A" and "B" pins of the "T" fitting. Inspect the shield wire "C" for possible short.	Approximately 60 ohms.	CANbus circuit is complete. Chassis Module suspected defective.	Reconnect plug and go to step 3
3	Disconnect the Chassis Module communication harness from the BLAM "T" fitting and Chassis Module plug connection at the battery. Perform a continuity test.	Continuity	Reconnect harness and go to step 4	Repair or replace BLAM and Chassis Module harness.
4	Verify the CANbus link signal wires are installed correctly at the Chassis Module plug connection at the battery and at the plug below the swivel.	Electrical Schematic	Reconnect plug and go to step 6	Wire per Electrical Schematic
5	Verify continuity at the Chassis Module harness from the plug connection at the battery down to the plug connection below the swivel.	Continuity	Reconnect plug and go to step 6	Repair or replace Chassis Module harness.
6	Disconnect the Chassis Module plug connection below the swivel and perform an ohms check at the #1 and #2 of the plug. Inspect the shield wire #3 plug connection for possible short.	Approximately 120 Ohms	Stop	Replace Chassis Module

Load Moment Pin Troubleshooting

The following Troubleshooting Charts outline diagnostic measures to be taken to diagnose problems within the Load Moment Pin portion of the JLG Control System. If necessary, refer to Section 4 for information concerning replacement of the Load Moment Pin.

Table 6-16. Load Moment Pin Troubleshooting: Can Communications Lost

STEP	FAULT CODE/SYMPTOM	REPAIR	YES	NO
1	6/6 CYLINDER LOAD PIN CAN COMMUNICATIONS LOST	Check for correct and tight wire connections at the deutsch and phoenix connectors of the Load Sensing Pin harness and perform a continuity check.	Go to step 2	Replace harness. (4922826)
2		Check for loose pins in the potting of the Boom Length & Angle Module J4 connection.	Replace the BLAM & Perform the Boom Sensor calibration process.	Go to step 3
3		Inspect the CANbus link "T" fitting connections at the BLAM & Ground Module. Are the fittings dry?	Go to step 4	Replace "T" fitting connector. (4460945)
4		Inspect the CANbus link "T" fitting connections at the BLAM & Ground Module. Perform a continuity check.	Go to step 5	Replace "T" fitting connector. (4460945)
5		Check the J1 and J4 plug connections on the BLAM, make sure the notched plugs line up with the plug sockets correctly.	Go to step 6	Position plug correctly.
6		Use the Analyzer, scroll – + to the DIAGNOSTICS menu, press ENTER, then scroll to the MOMENT menu, and press ENTER, check to see i f Actual / Over / Under moment values are registering on the screen display.	Go to step 6	Replace the load moment pin. & Perform the Boom Sensor calibration process.
7		If they are, try boom sensor calibration to see if the values come within the chart.	If the problem still exists, verify steps 1-7 again before contacting the JLG Service Dept.	Replace the load moment pin. & Perform the Boom Sensor calibration process.

Table 6-17. Load Moment Pin Troubleshooting: Moment Pin Horizontal Force Out of Range

STEP	FAULT CODE/SYMPTOM	REPAIR	YES	NO
1	8/6 MOMENT PIN HORIZONTAL FORCE OUT OF RANGE The horizontal force is out of allowed range.	Check to see if the platform is overloaded in the vertical position. Check the rated capacity requirement.	Remove excess weight	Go to step 2
2		Check to see if any additional accessories have been added to the platform without proper calibration.	Perform the Boom Sensor calibration process.	Go to step 3
3		Perform the BCS daily check procedure to make sure the boom sections are stopping correctly at the witness marks matching their capacity selection.	Go to step 4	Perform the Boom Sensor calibration process.
4		Inspect the job the machine is performing, making sure that there is no additional force applied when the boom sections are in the horizontal position. Also consider weather conditions (Wind).	Go to step 5	Position machine correctly.
5		Use the Analyzer, scroll to the DIAGNOSTICS menu, press ENTER, then scroll to the MOMENT menu, and press ENTER, check to see if Actual / Over / Under moment values are registering on the screen display.	Go to step 6	Replace the load moment pin. & Perform the Boom Sensor calibration process.
6		If they are, try boom sensor calibration to see if the values come within the chart.	If the problem still exists, verify steps 1-6 again before contacting the JLG Service Dept.	Replace the load moment pin. & Perform the Boom Sensor calibration process.

Table 6-18. Load Moment Pin Troubleshooting: Moment Pin Vertical Force Out of Range

STEP	FAULT CODE/SYMPTOM	REPAIR	YES	NO
1	8/6 MOMENT PIN VERTICAL FORCE OUT OF RANGE The vertical force is out of allowed range.	Check to see if the platform is overloaded in the vertical position. Check the rated capacity requirement.	Remove excess weight	Go to step 2
2		Check to see if any additional accessories have been added to the platform without proper calibration.	Perform the Boom Sensor calibration process.	Go to step 3
3		Perform the BCS daily check procedure to make sure the boom sections are stopping correctly at the witness marks matching their capacity selection.	Go to step 4	Perform the Boom Sensor calibration process.
4		Inspect the job the machine is performing, making sure that there is no additional force applied when the boom sections are in the horizontal position. Also consider weather conditions (Wind).	Go to step 5	Position machine correctly.
5		Use the Analyzer, scroll to the DIAGNOSTICS menu, press ENTER, then scroll to the MOMENT menu, and press ENTER, check to see if Actual / Over / Under moment values are registering on the screen display.	Go to step 6	Replace the load moment pin. & Perform the Boom Sensor calibration process.
6		If they are, try boom sensor calibration to see if the values come within the chart.	If the problem still exists, verify steps 1-6 again before contacting the JLG Service Dept.	Replace the load moment pin. & Perform the Boom Sensor calibration process.

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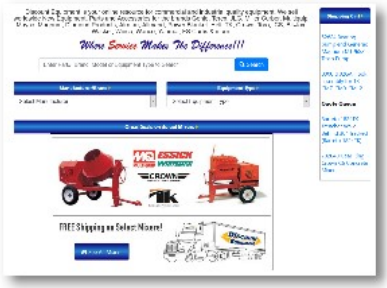

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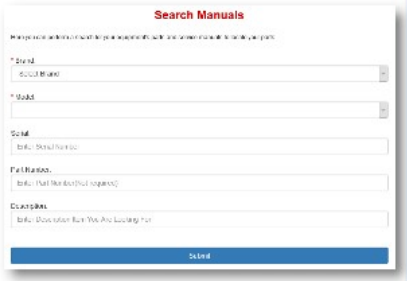

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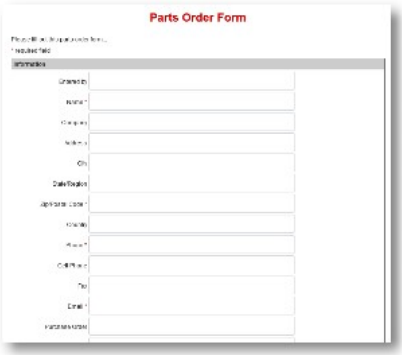

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We sell worldwide for the brands: Genie, Terex, JLG, MultiQuip, Mikasa, Essick, Whiteman, Mayco, Toro Stone, Diamond Products, Generac Magnum, Airman, Haulotte, Barreto, Power Blanket, Nifty Lift, Atlas Copco, Chicago Pneumatic, Allmand, Miller Curber, Skyjack, Lull, Skytrak, Tsurumi, Husquvarna Target, , Stow, Wacker, Sakai, Mi-T- M, Sullair, Basic, Dynapac, MBW, Weber, Bartell, Bennar Newman, Haulotte, Ditch Runner, Menegotti, Morrison, Contec, Buddy, Crown, Edco, Wyco, Bomag, Laymor, Barreto, EZ Trench, Bil-Jax, F.S. Curtis, Gehl Pavers, Heli, Honda, ICS/PowerGrit, IHI, Partner, Imer, Clipper, MMD, Koshin, Rice, CH&E, General Equipment, ,AMida, Coleman, NAC, Gradall, Square Shooter, Kent, Stanley, Tamco, Toku, Hatz, Kohler, Robin, Wisconsin, Northrock, Oztec, Toker TK, Rol-Air, Small Line, Wanco, Yanmar

SECTION 7. BASIC ELECTRICAL INFORMATION & ELECTRICAL SCHEMATICS

7.1 GENERAL

This section contains basic electrical information and schematics to be used for locating and correcting most of the operating problems which may develop. If a problem should develop which is not presented in this section or which is not corrected by listed corrective actions, technically qualified guidance should be obtained before proceeding with any maintenance.

7.2 MULTIMETER BASICS

A wide variety of multimeters or Volt Ohm Meters (VOM) can be used for troubleshooting your equipment. This section shows diagrams of a common, digital VOM configured for several different circuit measurements. Instructions for your VOM may vary. Please consult the meter operator's manual for more information.

Grounding

"Grounding the meter" means to take the black lead (which is connected to the COM (common) or negative port) and touch it to a good path to the negative side of the Voltage source.

Backprobing

To "backprobe" means to take the measurement by accessing a connector's contact on the same side as the wires, the back of the connector. Readings can be done while maintaining circuit continuity this way. If the connector is the sealed type, great care must be taken to avoid damaging the seal around the wire. It is best to use probes or probe tips specifically designed for this technique, especially on sealed connectors. Whenever possible insert probes into the side of the connector such that the test also checks both terminals of the connection. It is possible to inspect a connection within a closed connector by backprobing both sides of a connector terminal and measuring resistance. Do this after giving each wire a gentle pull to ensure the wires are still attached to the contact and contacts are seated in the connector.

Min/Max

Use of the "Min/Max" recording feature of some meters can help when taking measurements of intermittent conditions while alone. For example, you can read the Voltage applied to a solenoid when it is only operational while a switch, far from the solenoid and meter, is held down.

Polarity

Getting a negative Voltage or current reading when expecting a positive reading frequently means the leads are reversed. Check what reading is expected, the location of the signal and that the leads are connected to the device under test correctly. Also check that the lead on the "COM" port goes to the Ground or negative side of the signal and the lead on the other port goes to the positive side of the signal.

Scale

M = Mega = 1,000,000 * (Displayed Number)

k = kilo = 1,000 * (Displayed Number)

m = milli = (Displayed Number) / 1,000

µ = micro = (Displayed Number) / 1,000,000

Example: 1.2 kΩ = 1200 Ω
Example: 50 mA = 0.05 A

Voltage Measurement

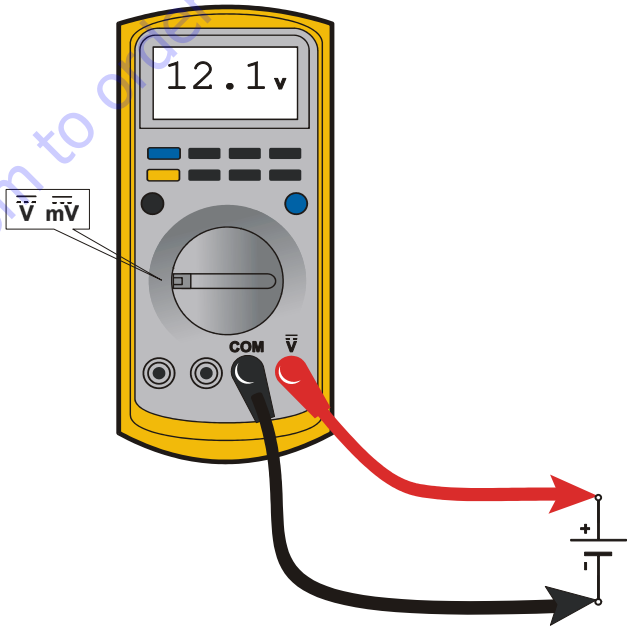


Figure 7-1. Voltage Measurement (DC)

- If meter is not auto ranging, set it to the correct range (See multimeter's operation manual)
- Use firm contact with meter leads

Resistance Measurement

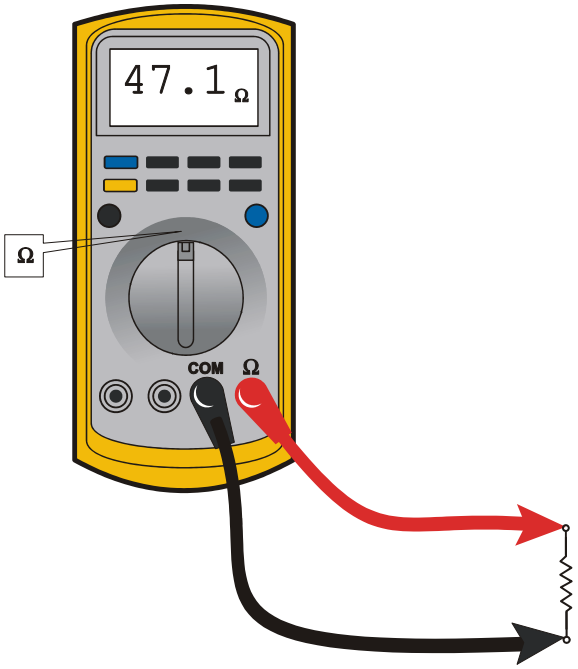


Figure 7-2. Resistance Measurement

- First test meter and leads by touching leads together. Resistance should read a short circuit (very low resistance)
- Circuit power must be turned OFF before testing resistance
- Disconnect component from circuit before testing
- If meter is not auto ranging, set it to the correct range (See multimeter's operation manual)
- Use firm contact with meter leads

Continuity Measurement

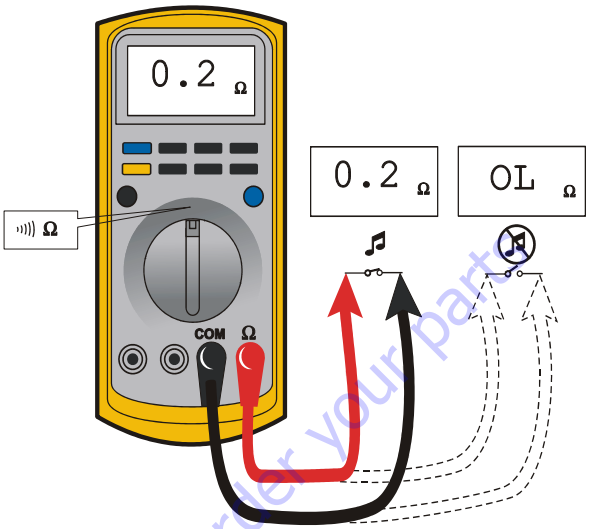


Figure 7-3. Continuity Measurement

- Some meters require a separate button press to enable audible continuity testing
- Circuit power must be turned OFF before testing continuity
- Disconnect component from circuit before testing
- Use firm contact with meter leads
- First test meter and leads by touching leads together. Meter should produce an audible alarm, indicating continuity

Current Measurement

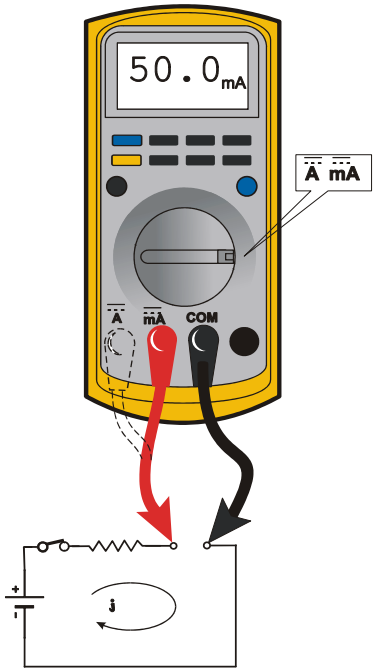


Figure 7-4. Current Measurement (DC)

- Set up the meter for the expected current range
- Be sure to connect the meter leads to the correct jacks for the current range you have selected
- If meter is not auto ranging, set it to the correct range (See multi meter's operation manual)
- Use firm contact with meter leads

7.3 APPLYING SILICONE DIELECTRIC COMPOUND TO ELECTRICAL CONNECTIONS

NOTE: *Do NOT apply dielectric grease to the following connections:*

- Main Boom Rotary sensor connections (on Celesco Sensor),
- LSS Modules connections,
- Deutz EMR 2 ECM connection.

Silicone Dielectric Compound must be used on all electrical connections except for those mentioned above for the following reasons:

- To prevent oxidation at the mechanical joint between male and female pins.
- To prevent electrical malfunction caused by low level conductivity between pins when wet.

Use the following procedure to apply Silicone Dielectric Compound to the electrical connectors. This procedure applies to all plug connections not enclosed in a box. Silicone grease should not be applied to connectors with external seals.

1. To prevent oxidation, silicone grease must be packed completely around male and female pins on the inside of the connector prior to assembly. This is most easily achieved by using a syringe.

NOTE: *Over a period of time, oxidation increases electrical resistance at the connection, eventually causing circuit failure.*

2. To prevent shorting, silicone grease must be packed around each wire where they enter the outside of the connector housing. Also, silicone grease must be applied at the joint where the male and female connectors come together. Any other joints (around strain reliefs, etc.) where water could enter the connector should also be sealed.

NOTE: *This condition is especially common when machines are pressure washed since the washing solution is much more conductive than water.*

3. Anderson connectors for the battery boxes and battery chargers should have silicone grease applied to the contacts only.

NOTE: *Curing-type sealants might also be used to prevent shorting and would be less messy, but would make future pin removal more difficult.*

7.4 DIELECTRIC GREASE APPLICATION

Dielectric grease helps to prevent corrosion of electrical contacts and improper conductivity between contacts from moisture intrusion. Non-waterproof connectors benefit from the application of dielectric grease.

Installation

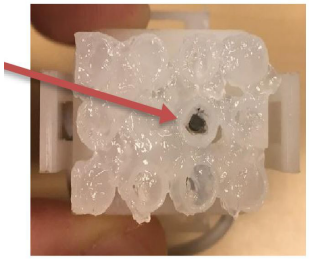
The following is general guidance for the installation of dielectric grease in a connector system.

- Use dielectric grease in a tube for larger connection points or apply with a syringe for small connectors.
- Apply dielectric grease to plug/male connector housing which typically contains sockets contact/female terminals.
- Leave a layer of dielectric grease on the mating face of the connector, completely covering each connector terminal hole. Refer the pictures shown below.
- Assemble the connector system immediately to prevent moisture ingress or dust contamination.

The following connector systems are specifically addressed because of their widespread use at JLG. However, this guidance may be applied to similar devices.

AMP Mate-N-Lok

This connector system is widely used inside enclosures for general-purpose interconnect. Follow the general guidance for installation.



Improper

Proper

AMP Faston

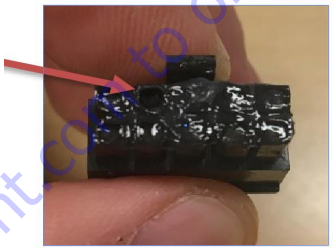
This connector system is typically used on operator switches at JLG. Follow the general guidance for installation.

Improper

Proper

AMP Micro-Fit

This connector system is typically used on control modules at JLG. Follow the general guidance for installation.

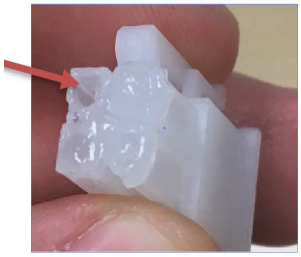


Improper

Proper

AMP Mini Fit Jr

This connector system is typically used on control modules at JLG. Follow the general guidance for installation.

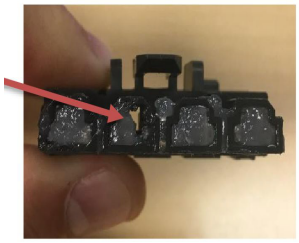


Improper

Proper

Mini Fit Sr

This connector system is typically used on control modules at JLG. Follow the general guidance for installation.

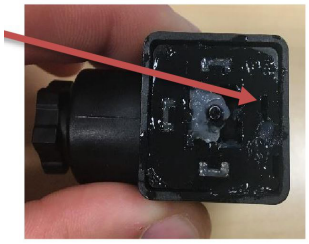


Improper

Proper

DIN Connectors

This connector is typically used on hydraulic valves. Follow the installation instructions



Improper

Proper

Exceptions

Some waterproof connector applications do benefit from dielectric grease, and some non waterproof connectors do not benefit from dielectric grease.

In the exceptions below, we have found dielectric grease is not needed for some applications, and in some cases can interfere with the intended connection. Dielectric grease shall be used as an exception in other applications.

Enclosures

Application of dielectric grease is not required in properly sealed enclosures. To meet criteria, the enclosure must be rated to at least IP56 (dust protected; protected from powerful jets of water).

Carling Switch Connectors

Carling switches may experience high impedance, or discontinuity, due to silicone dielectric grease ingress when switching inductive loads. Therefore, dielectric grease shall not be applied to Carling switch mating connectors unless specifically noted.

7.5 AMP CONNECTOR

Applying Silicone Dielectric Compound to AMP Connectors

Silicone Dielectric Compound must be used on the AMP connections for the following reasons:

- To prevent oxidation at the mechanical joint between male and female pins.
- To prevent electrical malfunction caused by low level conductivity between pins when wet.

Use the following procedure to apply Silicone Dielectric Compound to the electrical connectors.

1. To prevent oxidation and low level conductivity, silicone dielectric grease must be packed completely around male and female pins on the inside of the connector after the mating of the housing to the header. This is easily achieved by using a syringe to fill the header with silicone dielectric compound, to a point just above the top of the male pins inside the header. When assembling the housing to the header, it is possible that the housing will become air locked, thus preventing the housing latch from engaging.
2. Pierce one of the unused wire seals to allow the trapped air inside the housing to escape.
3. Install a hole plug into this and/or any unused wire seal that has silicone dielectric compound escaping from it.

Assembly

Check to be sure the wedge lock is in the open, or as-shipped, position (See Figure 7-5.). Proceed as follows:

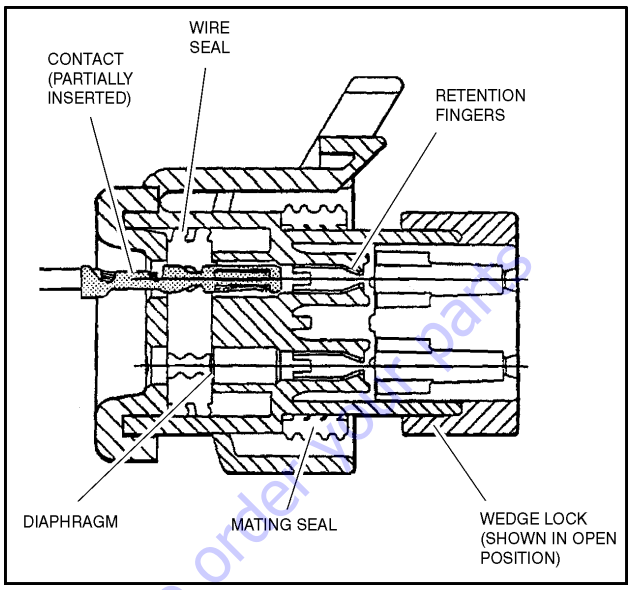


Figure 7-5. Connector Assembly Figure 1

1. To insert a contact, push it straight into the appropriate circuit cavity as far as it will go (See Figure 7-7.).
2. Pull back on the contact wire with a force of 1 or 2 lbs. to be sure the retention fingers are holding the contact (See Figure 7-7.).

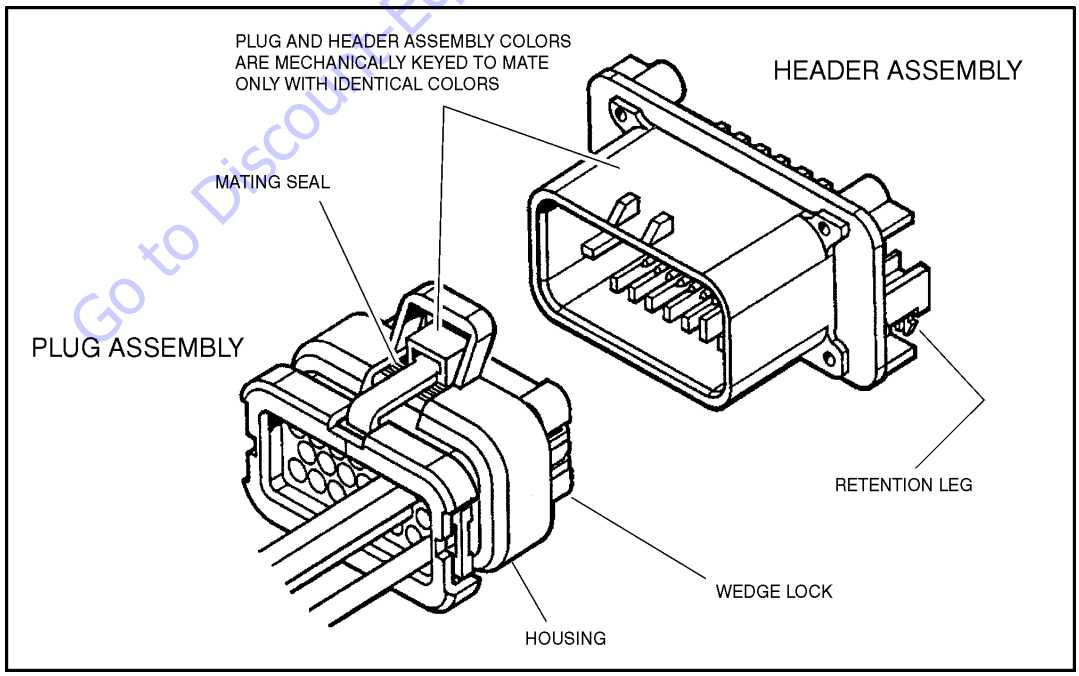


Figure 7-6. AMP Connector

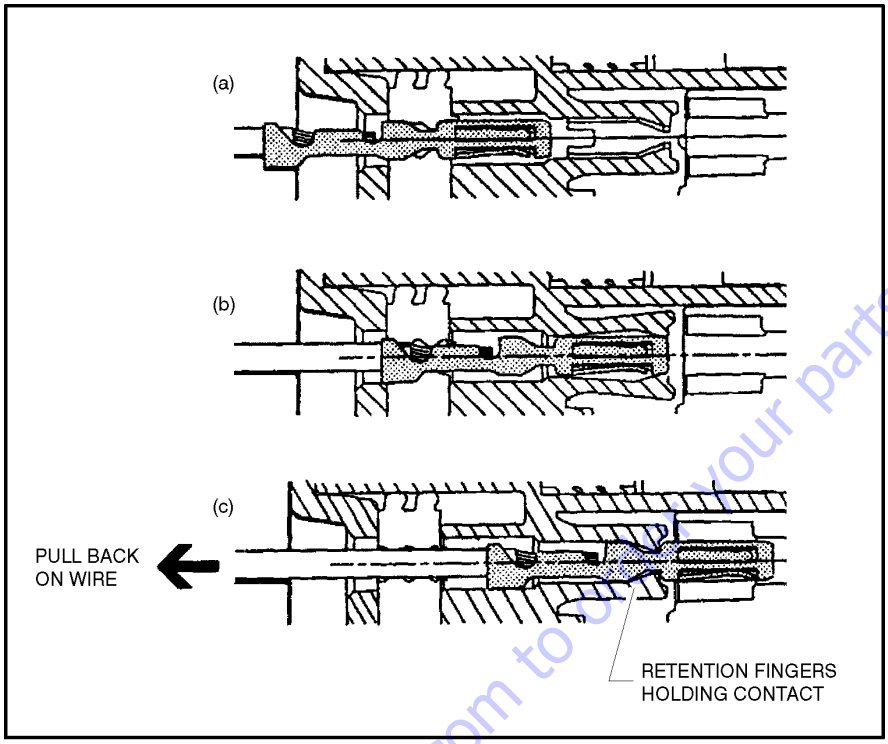


Figure 7-7. Connector Assembly Figure 2

3. After all required contacts have been inserted, the wedge lock must be closed to its locked position. Release the locking latches by squeezing them inward (See Figure 7-8.).

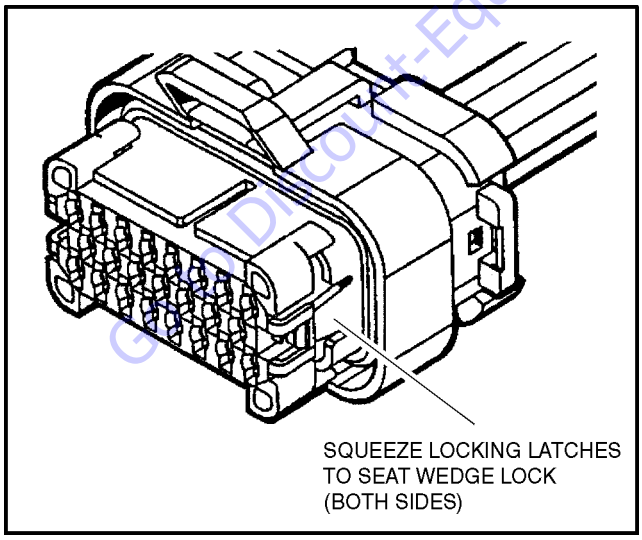


Figure 7-8. Connector Assembly Figure 3

4. Slide the wedge lock into the housing until it is flush with the housing (See Figure 7-9.).

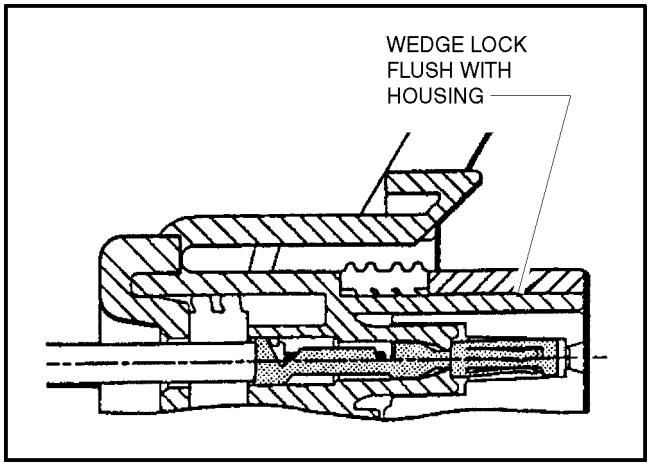


Figure 7-9. Connector Assembly Figure 4

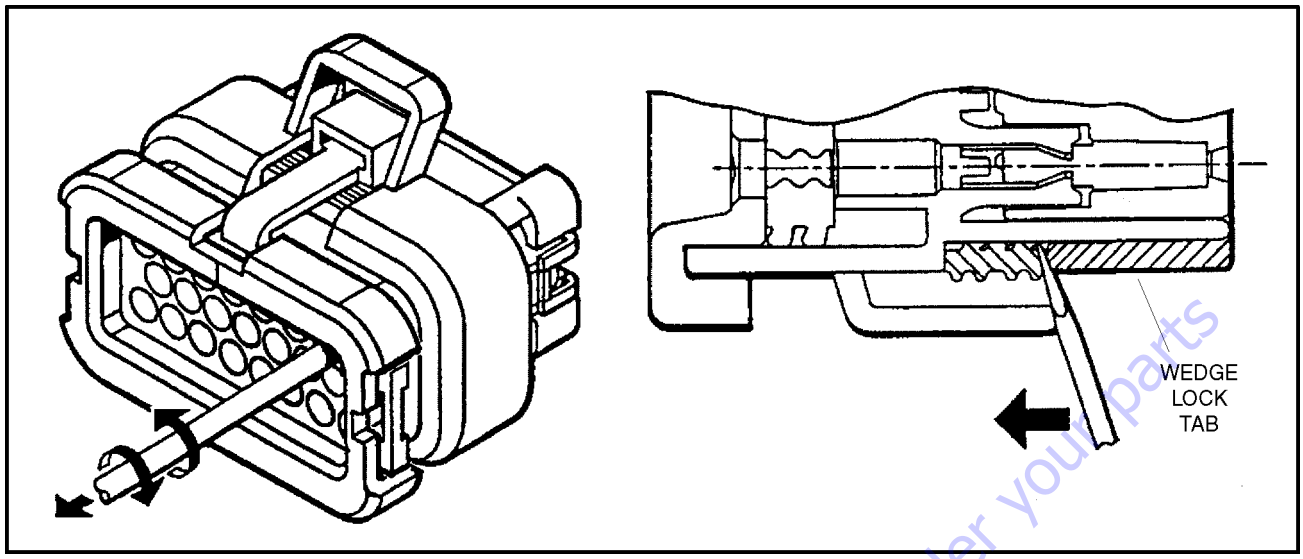


Figure 7-10. Connector Disassembly

Disassembly

5. Insert a 4.8 mm (3/16") wide screwdriver blade between the mating seal and one of the red wedge lock tabs.
6. Pry open the wedge lock to the open position.
7. While rotating the wire back and forth over a half turn (1/4 turn in each direction), gently pull the wire until the contact is removed.

NOTE: *The wedge lock should never be removed from the housing for insertion or removal of the contacts.*

Wedge Lock

The wedge lock has slotted openings in the forward, or mating end. These slots accommodate circuit testing in the field, by using a flat probe such as a pocket knife. DO NOT use a sharp point such as an ice pick.

Service - Voltage Reading

NOTICE

DO NOT PIERCE WIRE INSULATION TO TAKE VOLTAGE READINGS.

It has been common practice in electrical troubleshooting to probe wires by piercing the insulation with a sharp point. This practice should be discouraged when dealing with the AMPSEAL plug assembly, or any other sealed connector system. The resulting pinholes in the insulation will allow moisture to invade the system by traveling along the wire strands. This nullifies the effectiveness of the connector seals and could result in system failure.

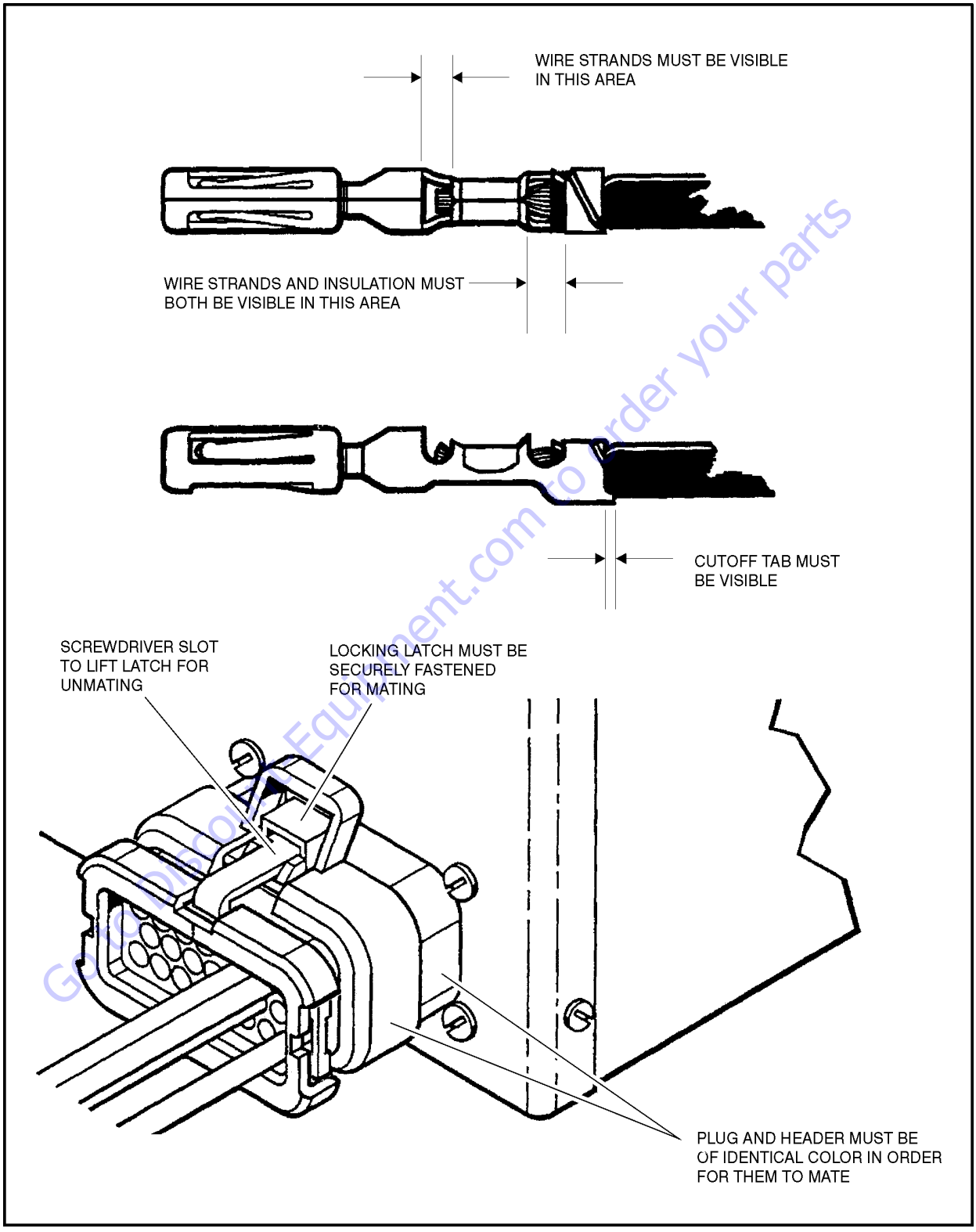


Figure 7-11. Connector Installation

7.6 DEUTSCH CONNECTORS

DT/DTP Series Assembly

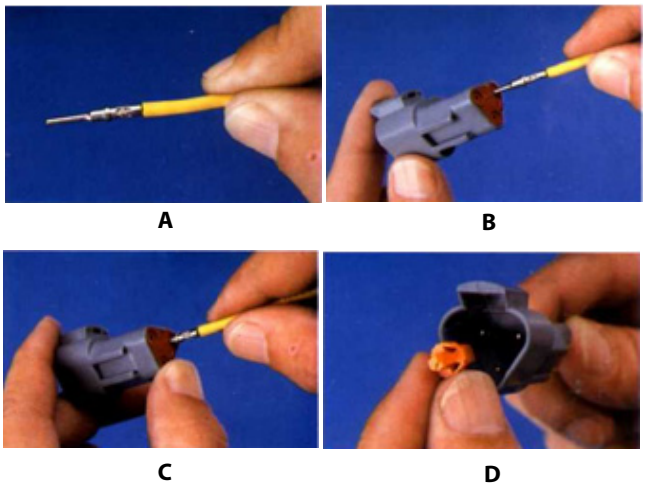


Figure 7-12. DT/DTP Contact Installation

1. Grasp crimped contact about 25mm behind the contact barrel.
2. Hold connector with rear grommet facing you.
3. Push contact straight into connector grommet until a click is felt. A slight tug will confirm that it is properly locked in place.
4. Once all contacts are in place, insert wedgelock with arrow pointing toward exterior locking mechanism. The wedgelock will snap into place. Rectangular wedges are not oriented. Thy may go in either way.

NOTE: *The receptacle is shown - use the same procedure for plug.*

DT/DTP Series Disassembly

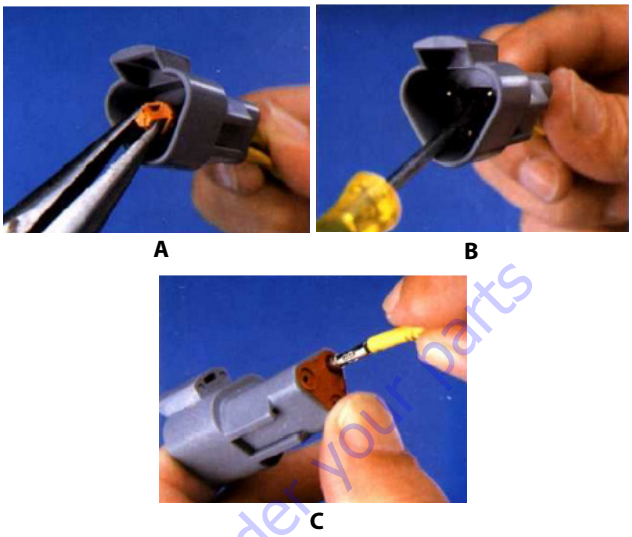


Figure 7-13. DT/DTP Contact Removal

5. Remove wedgelock using needlenose pliers or a hook shaped wire to pull wedge straight out.
6. To remove the contacts, gently pull wire backwards, while at the same time releasing the locking finger by moving it away from the contact with a screwdriver.
7. Hold the rear seal in place, as removing the contact may displace the seal.

HD30/HDP20 Series Assembly

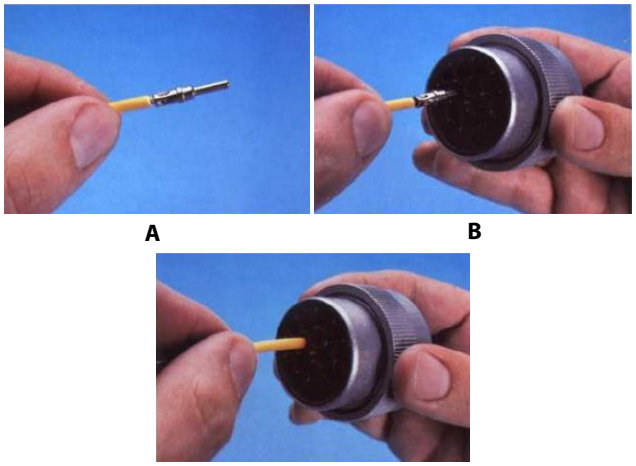


Figure 7-14. HD/HDP Contact Installation

8. Grasp contact about 25mm behind the contact crimp barrel.
9. Hold connector with rear grommet facing you.
10. Push contact straight into connector grommet until a positive stop is felt. A slight tug will confirm that it is properly locked in place.

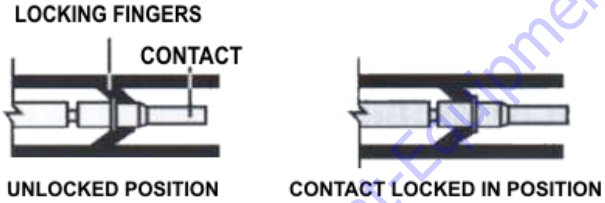


Figure 7-15. HD/HDP Locking Contacts Into Position

NOTE: *For unused wire cavities, insert sealing plugs for full environmental sealing*

HD30/HDP20 Series Disassembly

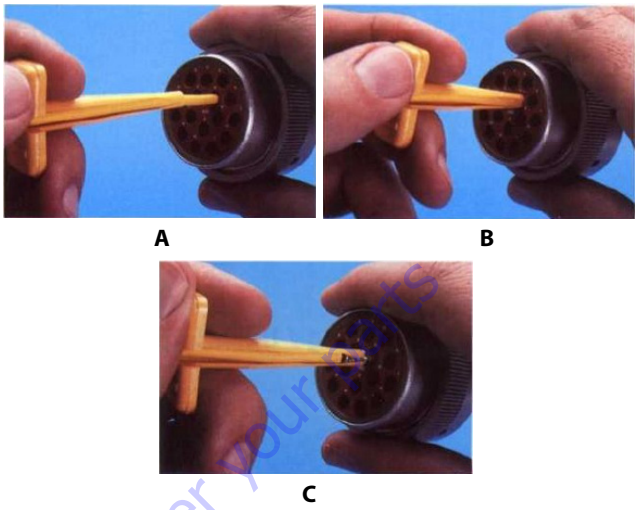


Figure 7-16. HD/HDP Contact Removal

11. With rear insert toward you, snap appropriate size extractor tool over the wire of contact to be removed.
12. Slide tool along into the insert cavity until it engages contact and resistance is felt.
13. Pull contact-wire assembly out of connector.

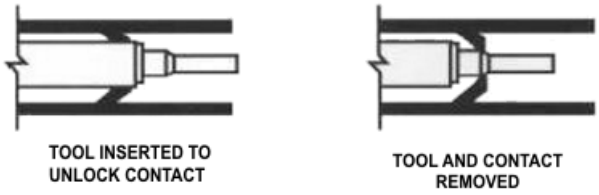


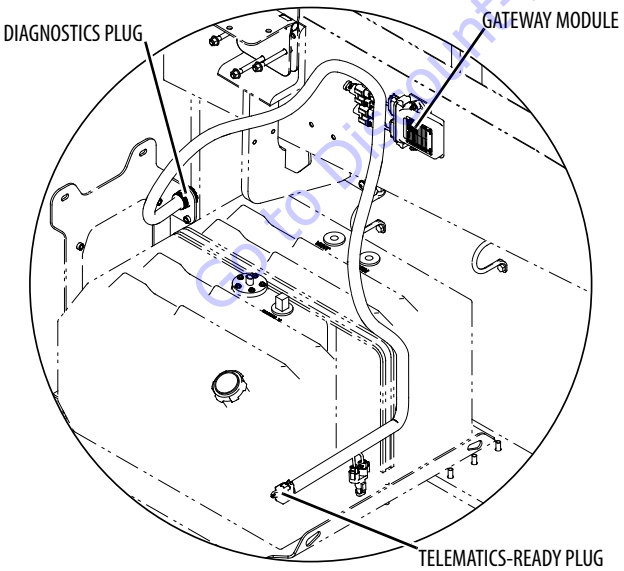
Figure 7-17. HD/HDP Unlocking Contacts

NOTE: *Do Not twist or insert tool at an angle.*

7.7 TELEMATICS GATEWAY

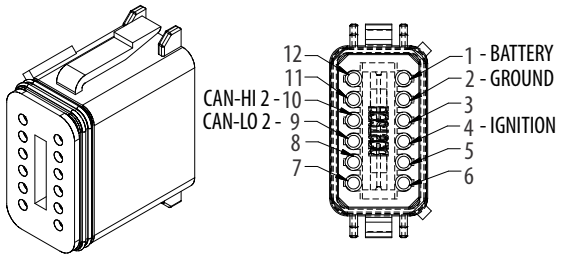
Personnel using machines equipped with an optional telematics gateway will be able to view the following data through their telematics device:

JLG LABEL	DESCRIPTION	UNIT
Engine Speed	Actual engine speed.	RPM
DEF Tank Level (If Equipped)	Indicates the level of DEF (diesel exhaust fluid) within the DEF tank if the machine is equipped with DEF tank. • 0% = Empty • 100% = Full	Percentage (%)
JLG Machine Faults: Active / Not-Active	• 00 - No Machine Faults • 01 - Active Machine Fault • 10 - Error • 11 - Not available	Bit
Total Idle Fuel Used	Total amount of fuel used during vehicle operation during idle conditions.	Liters
Total Idle Hours	Total time of engine operation during idle conditions.	Seconds
Total Engine Hours	Total time of engine operation.	Seconds
Total Fuel Used	Total amount of fuel used during vehicle operation.	Liters
Fuel Rate	Amount of fuel consumed by engine per unit of time.	Liters/Hour
Fuel Level	Ratio of fuel volume to the total volume of the fuel storage container. When a low fuel limit switch is present, the fuel level will indicate "full" until the switch opens, which will then indicate 10% fuel remaining. When Fuel Level 2 (SPN 38) is not used, Fuel Level 1 represents the total fuel in all fuel storage containers. When Fuel Level 2 is used, Fuel Level 1 represents the fuel level in the primary or left side fuel storage container.	Percentage (%)
DM1 Engine Faults	Shows actual engine fault codes.	N/A



Telematics-Ready (TCU) Plug

The telematics-ready (TCU) plug is a standard 12-pin Deutsch connector. Pin-out locations are shown below:



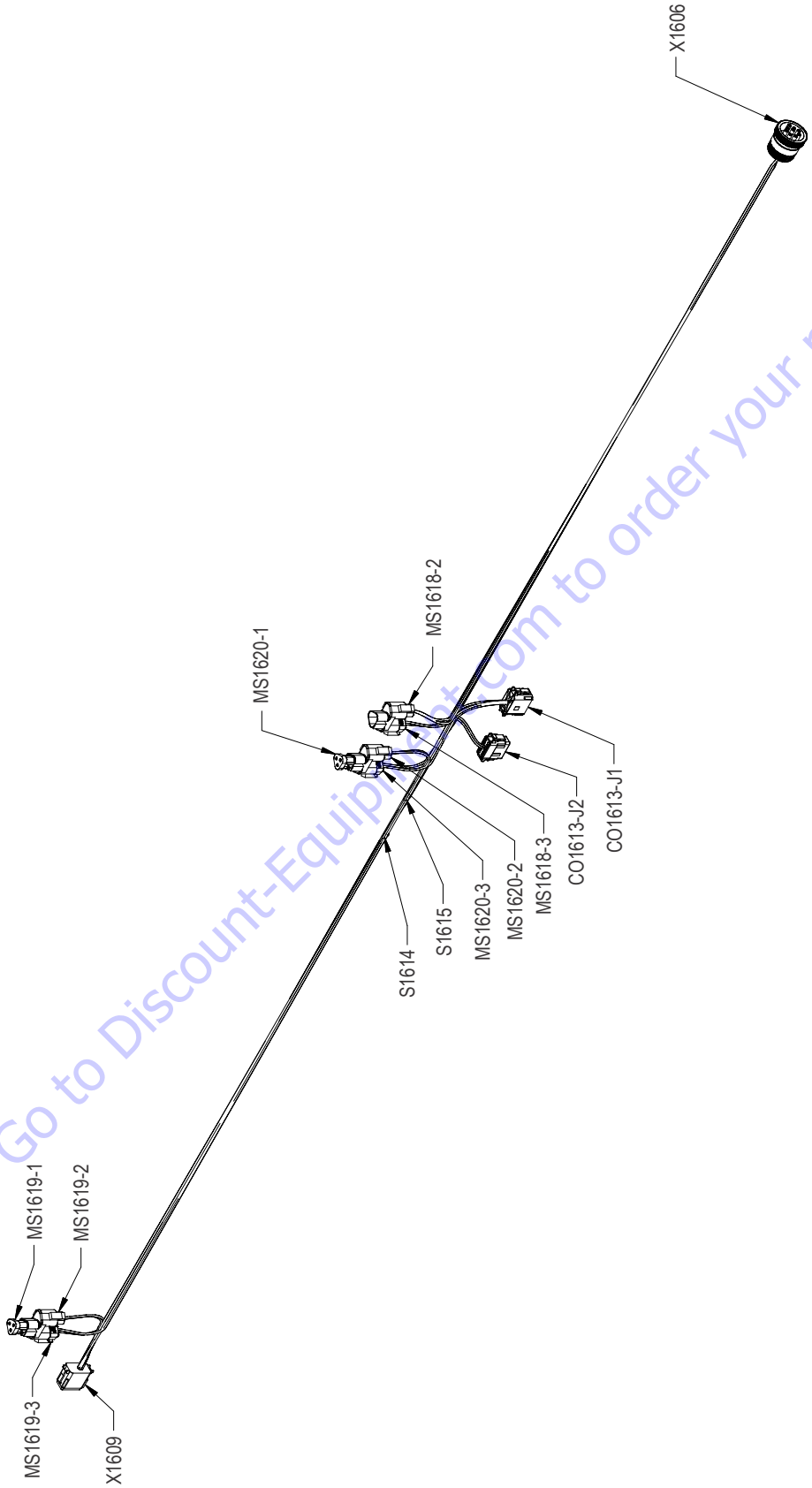


Figure 7-18. Telematics Gateway Harness - Sheet 1 of 3

X1609 (TCU)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	RED	1-0 BAT	16 AWG	GXL	X1606 (B)
2	BLK	0-0 GND	16 AWG	GXL	S1615 (1)
4	ORN	2-0 IGN	16 AWG	GXL	S1614 (1)
9	GRN	CANL2	18 AWG	GXL	MS1619-2 (B)
10	YEL	CANH2	18 AWG	GXL	MS1619-2 (A)

MS1619-2 (CAN-T 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH2	18 AWG	GXL	X1609 (10)
B	GRN	CANL2	18 AWG	GXL	X1609 (9)

MS1619-3 (CAN-T 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH2	18 AWG	GXL	MS1620-2 (A)
B	GRN	CANL2	18 AWG	GXL	MS1620-2 (B)

CO1613-J1 (GATEWAY 1)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
9	GRN	CAN1	18 AWG	GXL	MS1618-2 (B)
10	YEL	CANH1	18 AWG	GXL	MS1618-2 (A)
11	BLK	0-2 GND	16 AWG	GXL	S1615 (2)
12	ORN	2-2 IGN	16 AWG	GXL	S1614 (2)

CO1613-J2 (GATEWAY 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
9	GRN	CANL2	18 AWG	GXL	MS1620-3 (B)
10	YEL	CANH2	18 AWG	GXL	MS1620-3 (A)

MS1620-2 (CAN-T 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH2	18 AWG	GXL	MS1619-3 (A)
B	GRN	CANL2	18 AWG	GXL	MS1619-3 (B)

MS1620-3 (CAN-T 2)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH2	18 AWG	GXL	CO1613-J2 (10)
B	GRN	CANL2	18 AWG	GXL	CO1613-J2 (9)

S1614					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	ORN	2-0 IGN	16 AWG	GXL	X1609 (4)
2	ORN	2-1 IGN	16 AWG	GXL	X1606 (H)
2	ORN	2-2 IGN	16 AWG	GXL	CO1613-J1 (12)

S1615					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
1	BLK	0-0 GND	16 AWG	GXL	X1609 (2)
2	BLK	0-1 GND	16 AWG	GXL	X1606 (A)
2	BLK	0-2 GND	16 AWG	GXL	CO1613-J1 (11)

MS1618-2 (CAN-T 1)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH1	18 AWG	GXL	CO1613-J1 (10)
B	GRN	CANL1	18 AWG	GXL	CO1613-J1 (9)

MS1618-3 (CAN-T 1)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	YEL	CANH1	18 AWG	GXL	X1606 (C)
B	GRN	CANL1	18 AWG	GXL	X1606 (D)

X1606 (DIAG)					
CONN POS	WIRE COLOR	WIRE LABEL	GAUGE	JACKET	TO
A	BLK	0-1 GND	16 AWG	GXL	S1615 (2)
B	RED	1-0 BAT	16 AWG	GXL	X1609 (1)
C	YEL	CANH1	18 AWG	GXL	MS1618-3 (A)
D	GRN	CANL1	18 AWG	GXL	MS1618-3 (B)
H	ORN	2-1 IGN	16 AWG	GXL	S1614 (2)

Figure 7-19. Telematics Gateway Harness - Sheet 2 of 3

					FROM		TO	
WIRE NO.	COLOR	WIRE GAUGE	LENGTH (mm)	JACKET	REFERENCE	PIN	REFERENCE	PIN
CAN L2	GRN	18 AWG	1151	GXL	MS1619-3	B	MS1620-2	B
CAN L2	GRN	18 AWG	151	GXL	X1609	9	MS1619-2	B
CAN L1	GRN	18 AWG	157	GXL	MS1618-2	B	CO1613-J1	9
CAN L2	GRN	18 AWG	225	GXL	MS1620-3	B	CO1613-J2	9
CAN L1	GRN	18 AWG	1076	GXL	MS1618-3	B	X1606	D
CAN H2	YEL	18 AWG	155	GXL	X1609	10	MS1619-2	A
CAN H2	YEL	18 AWG	233	GXL	MS1620-3	A	CO1613-J2	10
CAN H1	YEL	18 AWG	157	GXL	MS1618-2	A	CO1613-J1	10
CAN H2	YEL	18 AWG	1150	GXL	MS1619-3	A	MS1620-2	A
CAN H1	YEL	18 AWG	1079	GXL	MS1618-3	A	X1606	C
0-0 GND	BLK	16 AWG	1006	GXL	X1609	2	S1615	1
0-1 GND	BLK	16 AWG	1145	GXL	X1606	A	S1615	2
0-2 GND	BLK	16 AWG	223	GXL	CO1613-J1	11	S1615	2
1-0 BAT	RED	16 AWG	2150	GXL	X1609	1	X1606	B
2-0 IGN	ORN	16 AWG	939	GXL	X1609	4	S1614	1
2-1 IGN	ORN	16 AWG	1212	GXL	S1614	2	X1606	H
2-2 IGN	ORN	16 AWG	287	GXL	CO1613-J1	12	S1614	2

Figure 7-20. Telematics Gateway Harness - Sheet 3 of 3

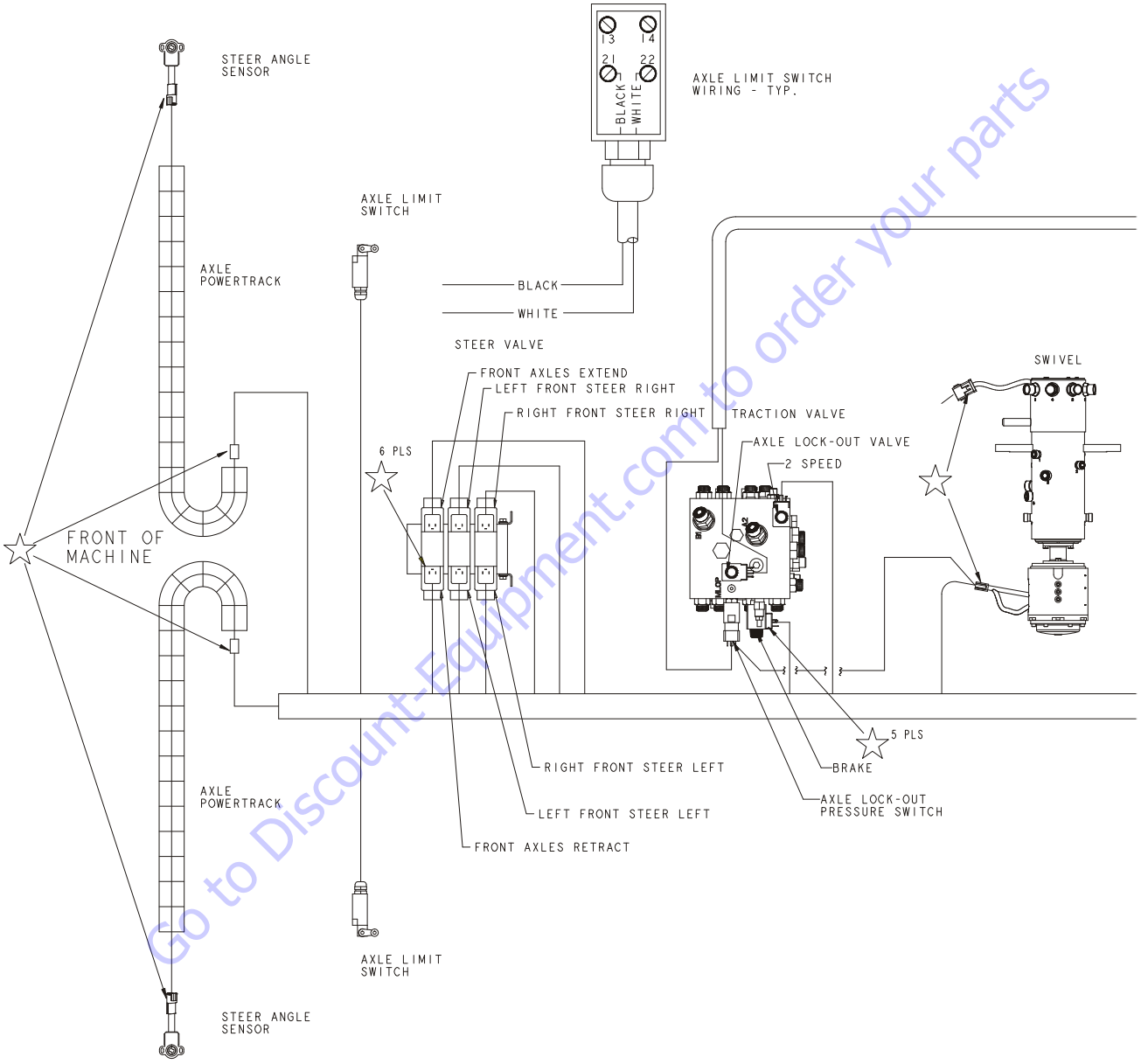
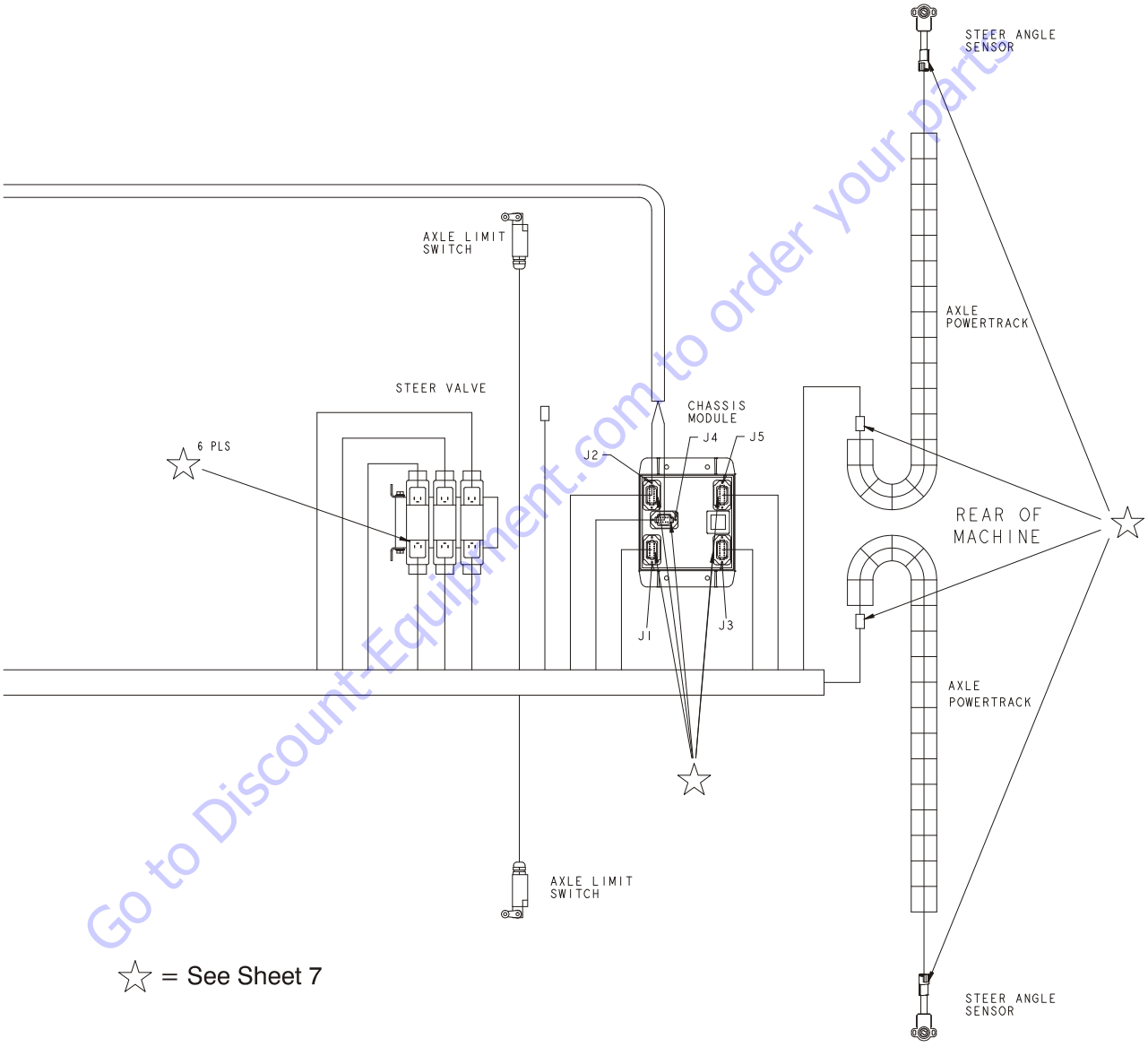


Figure 7-21. Wiring Harness Installation- Sheet 1 of 7



0274670 E

Figure 7-22. Wiring Harness Installation - Sheet 2 of 7

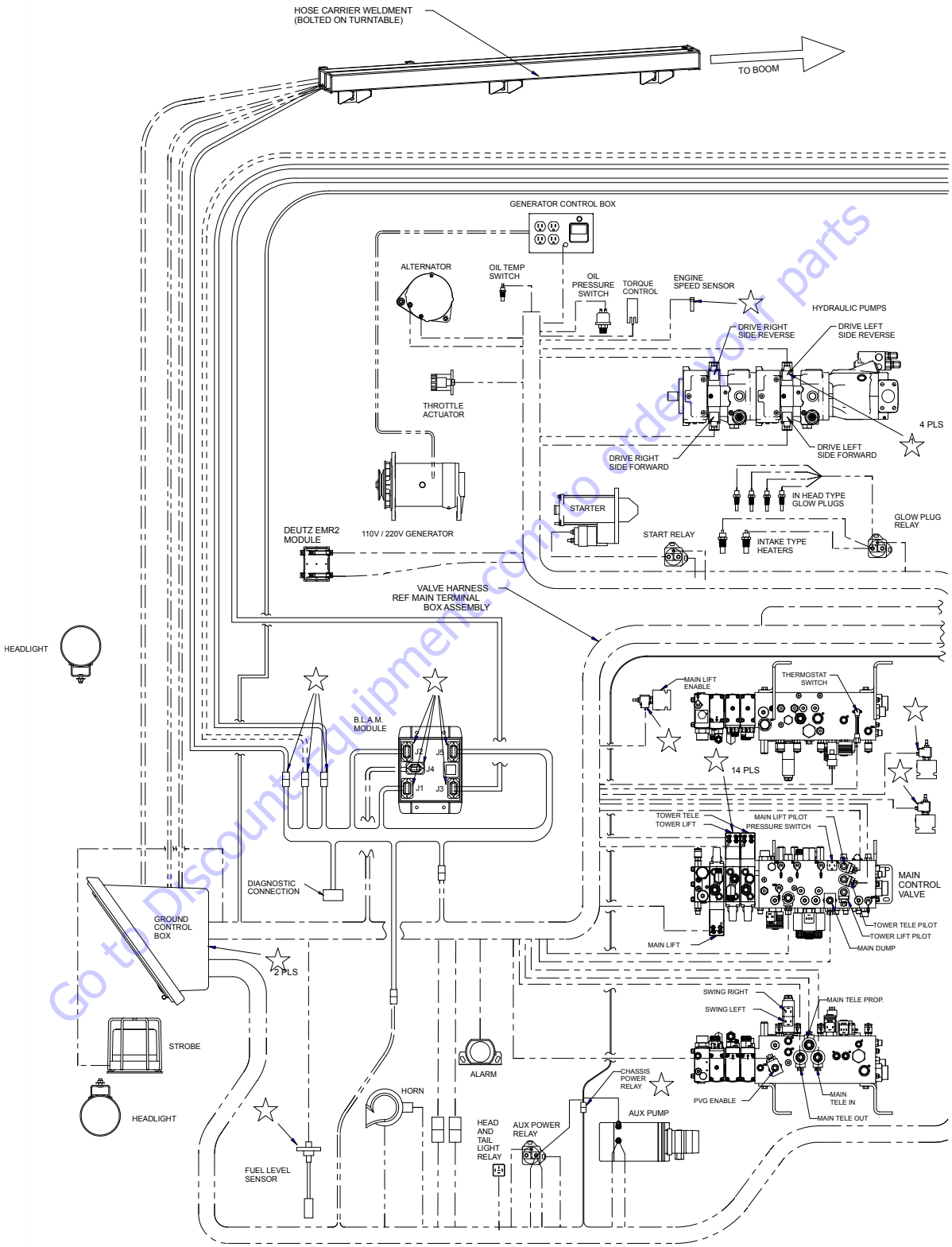
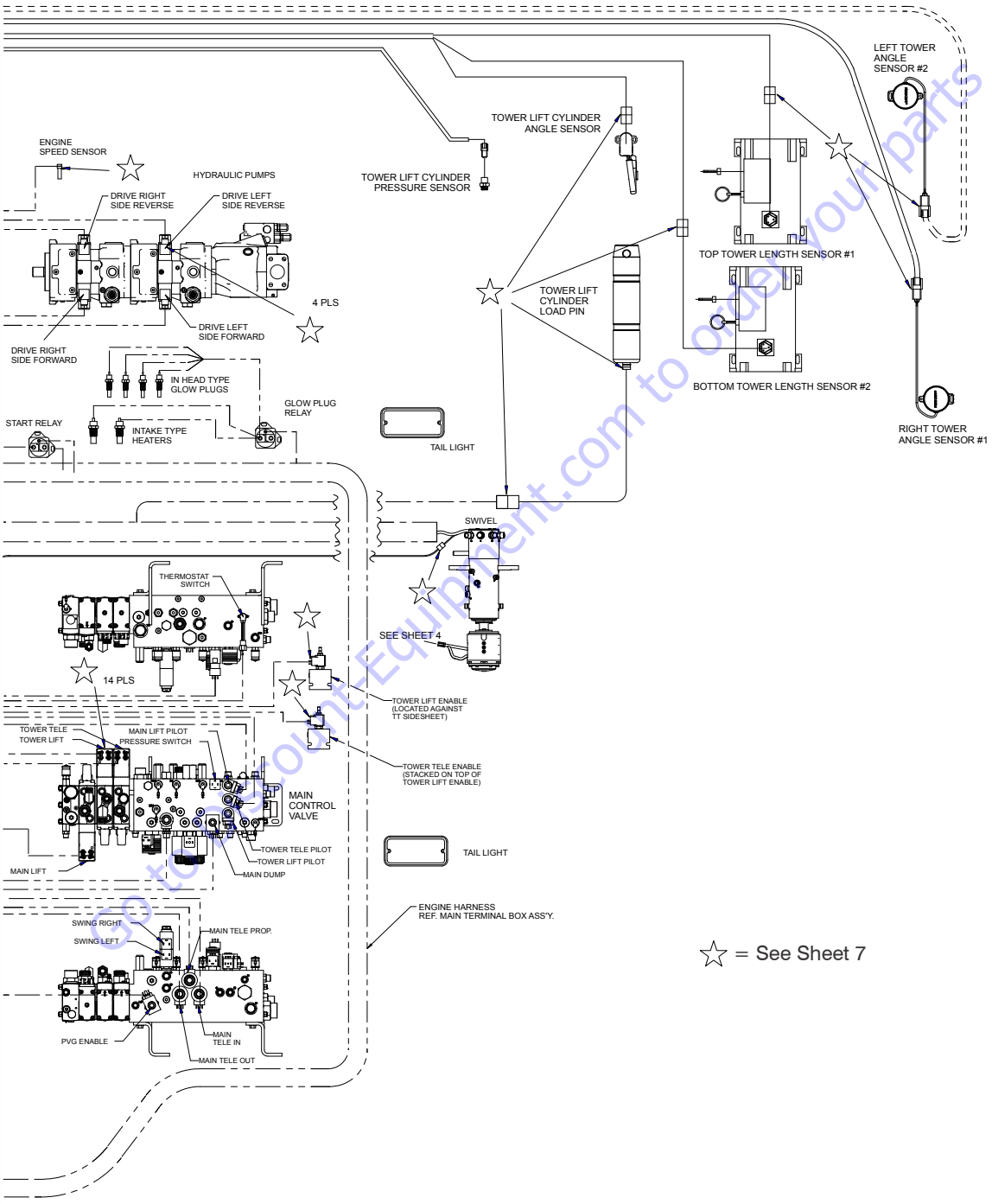


Figure 7-23. Wiring Harness Installation - Sheet 3 of 7



0274670 E

Figure 7-24. Wiring Harness Installation - Sheet 4 of 7

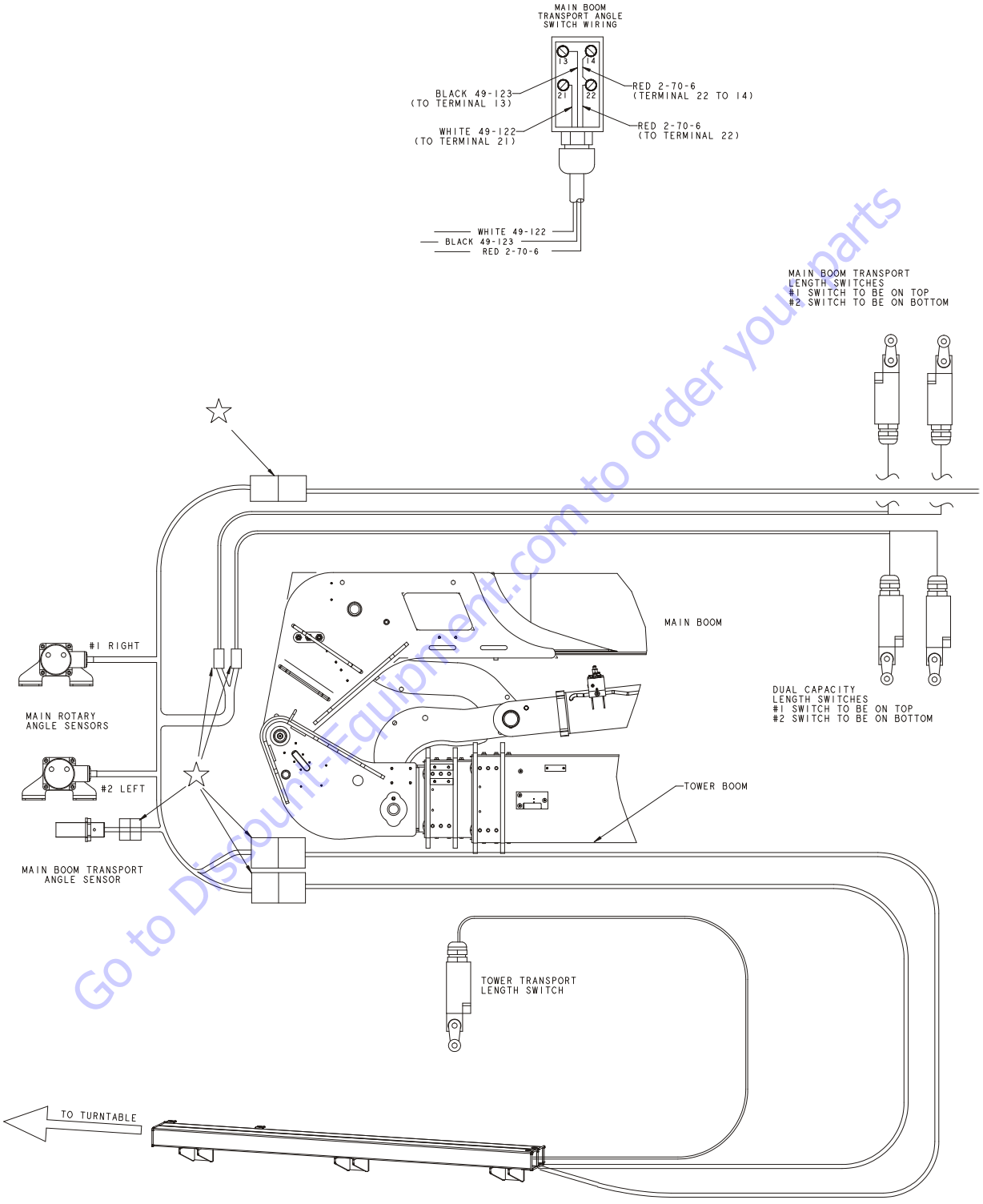
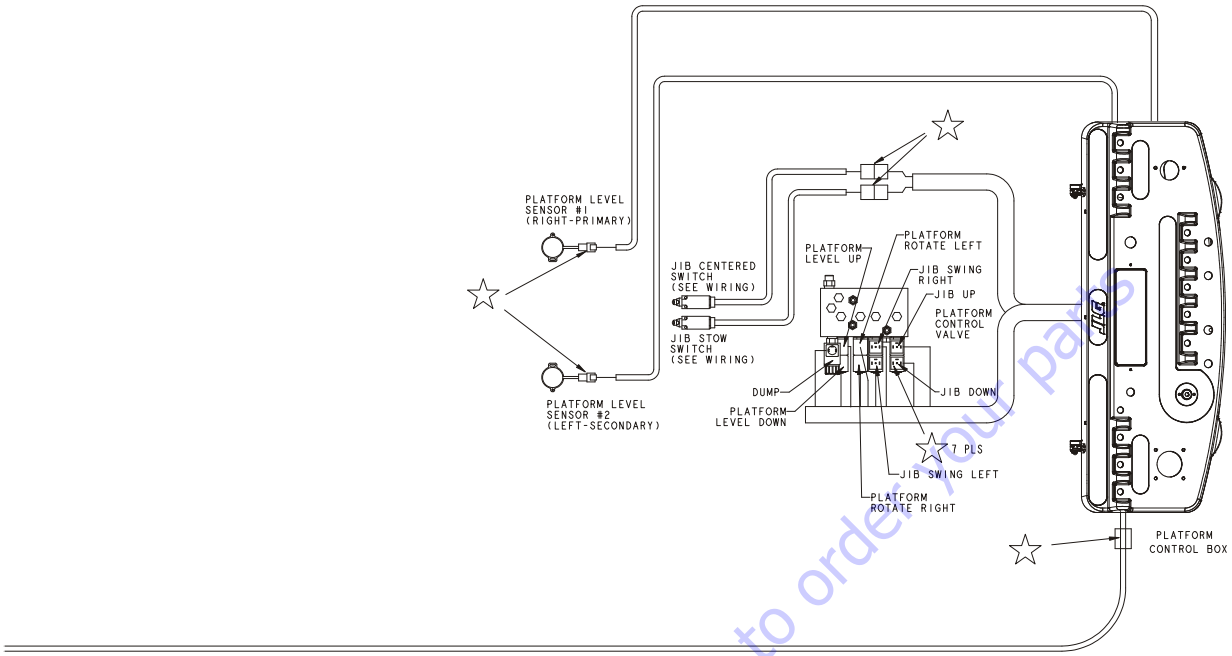
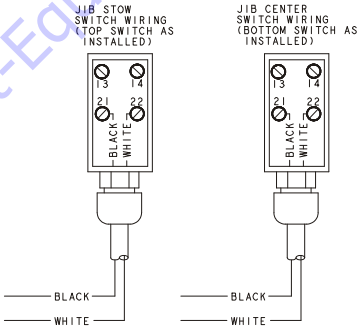


Figure 7-25. Wiring Harness Installation - Sheet 5 of 7





☆ = See Sheet 7

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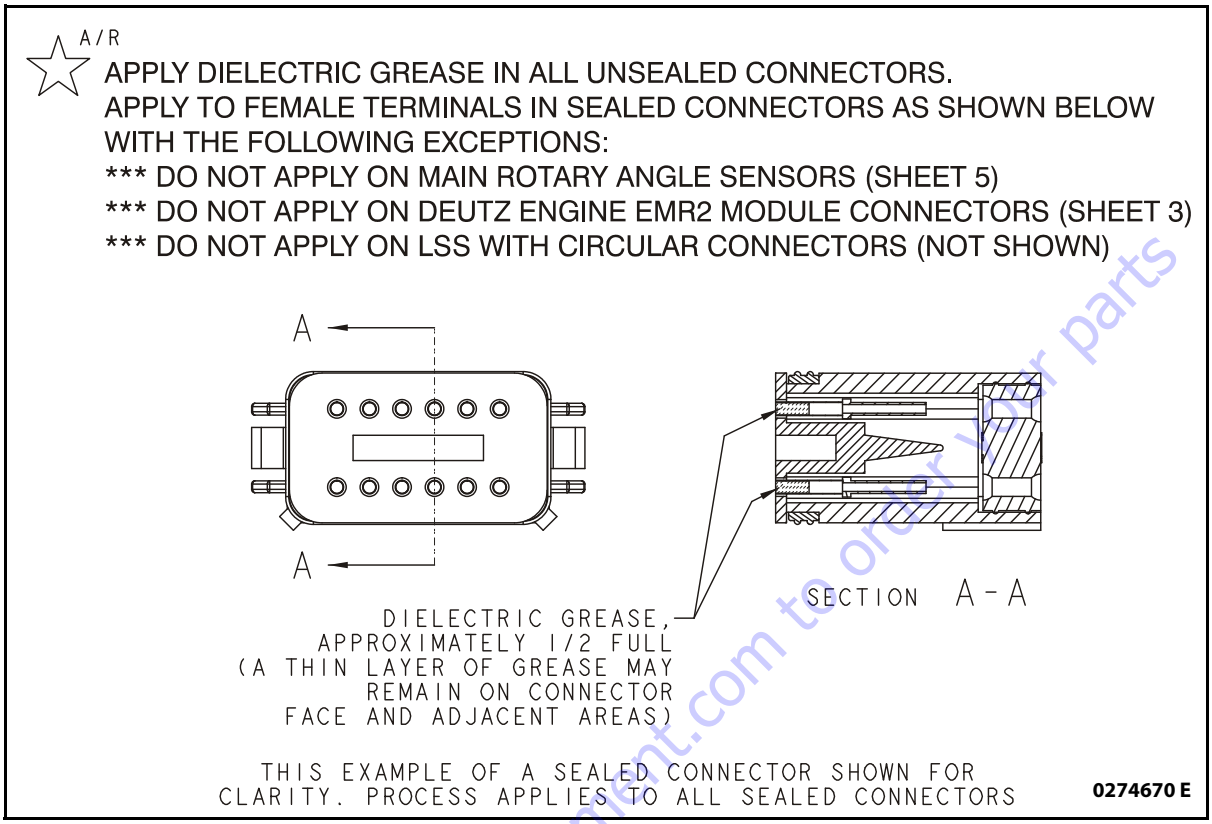
Figure 7-26. Wiring Harness Installation - Sheet 6 of 7



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7.8 ELECTRICAL SCHEMATICS

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SHEET 11: CRIBBING HARNESS
ALERT BEACON OPTION
GEN 2 PLAT INTERFACE HARNESS

SHEET 1

1001119861-O
MAE37550O

Figure 7-28. Electrical Schematic - Sheet 1 of 21

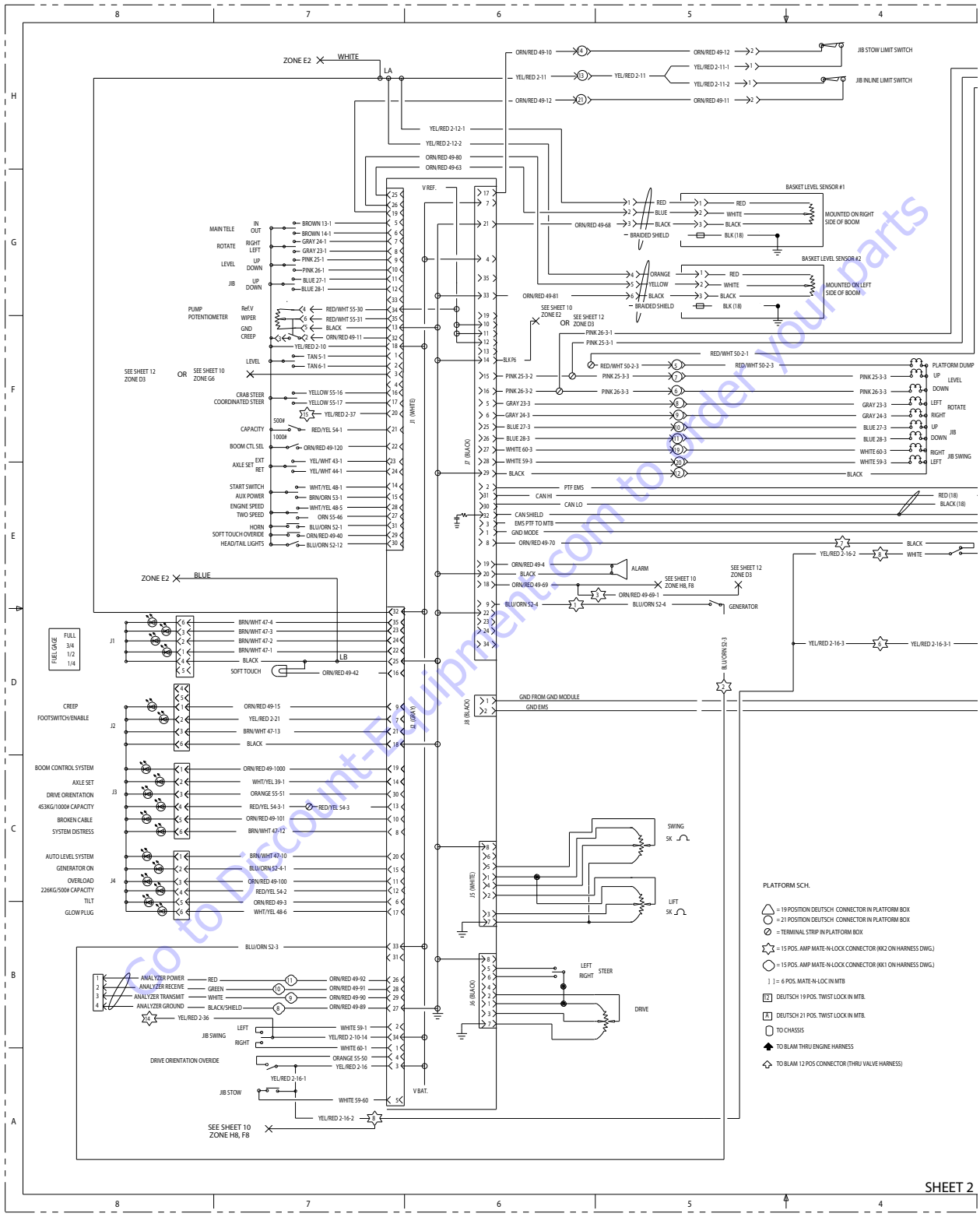


Figure 7-29. Electrical Schematic - Sheet 2 of 21

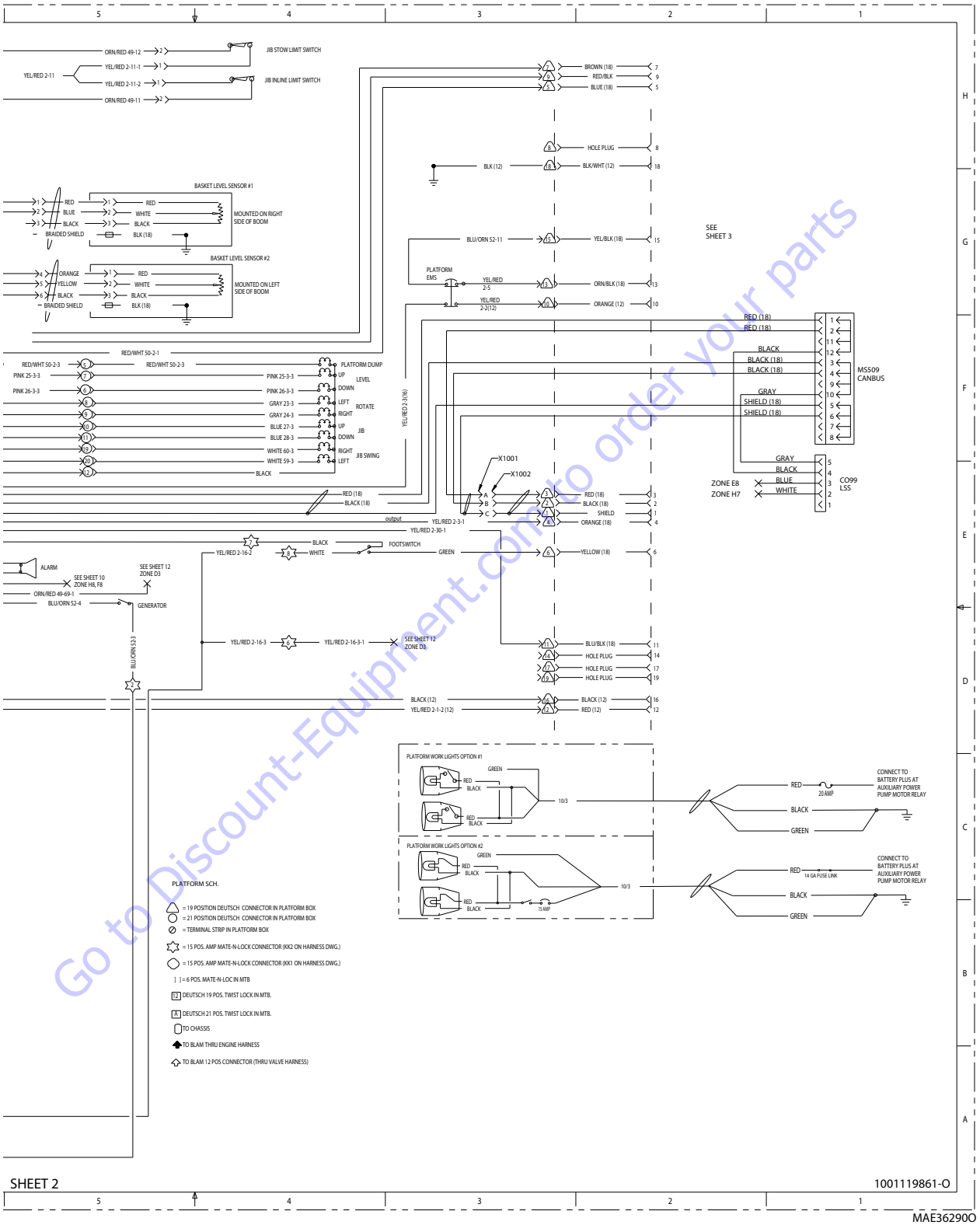


Figure 7-30. Electrical Schematic - Sheet 3 of 21

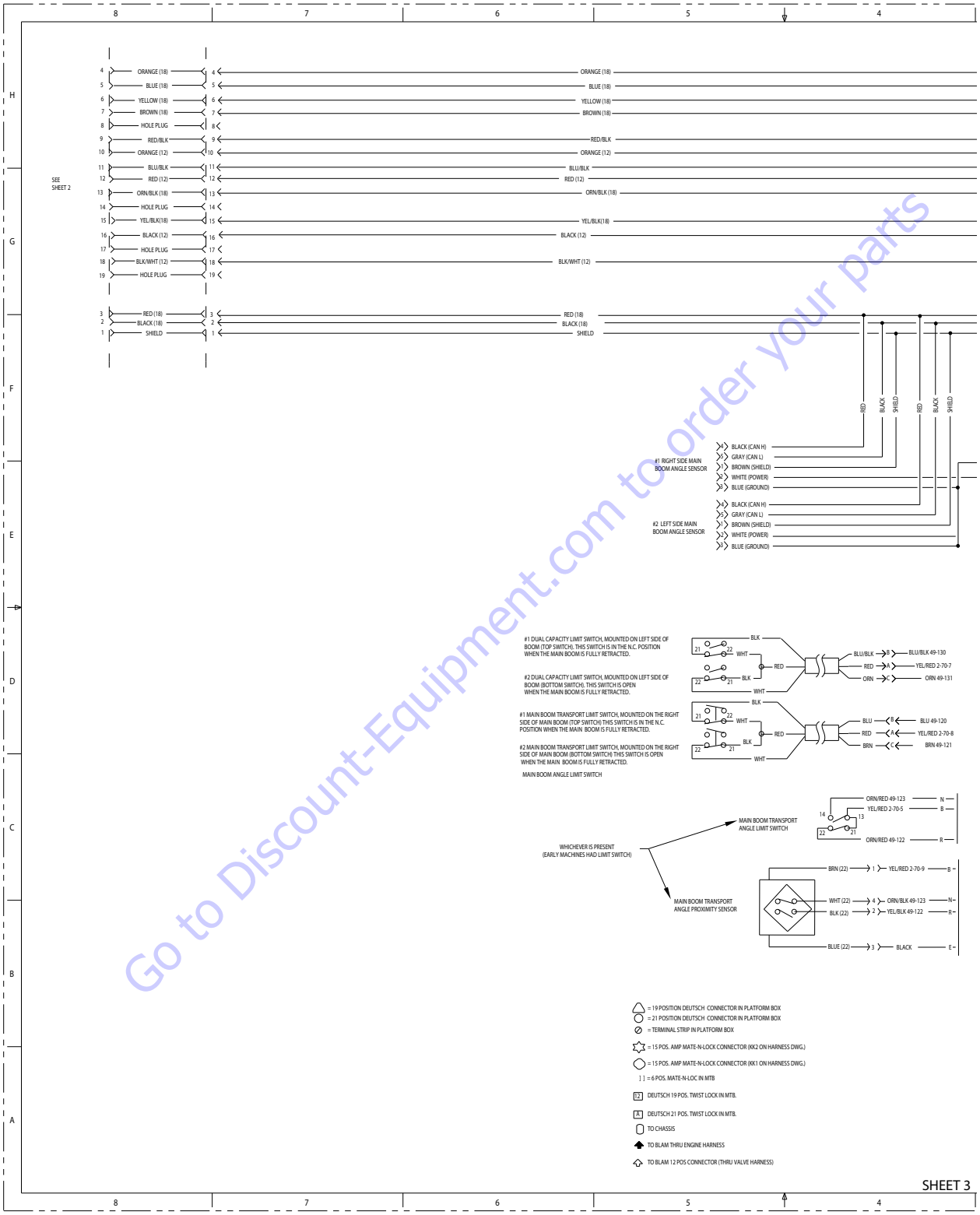


Figure 7-31. Electrical Schematic - Sheet 4 of 21

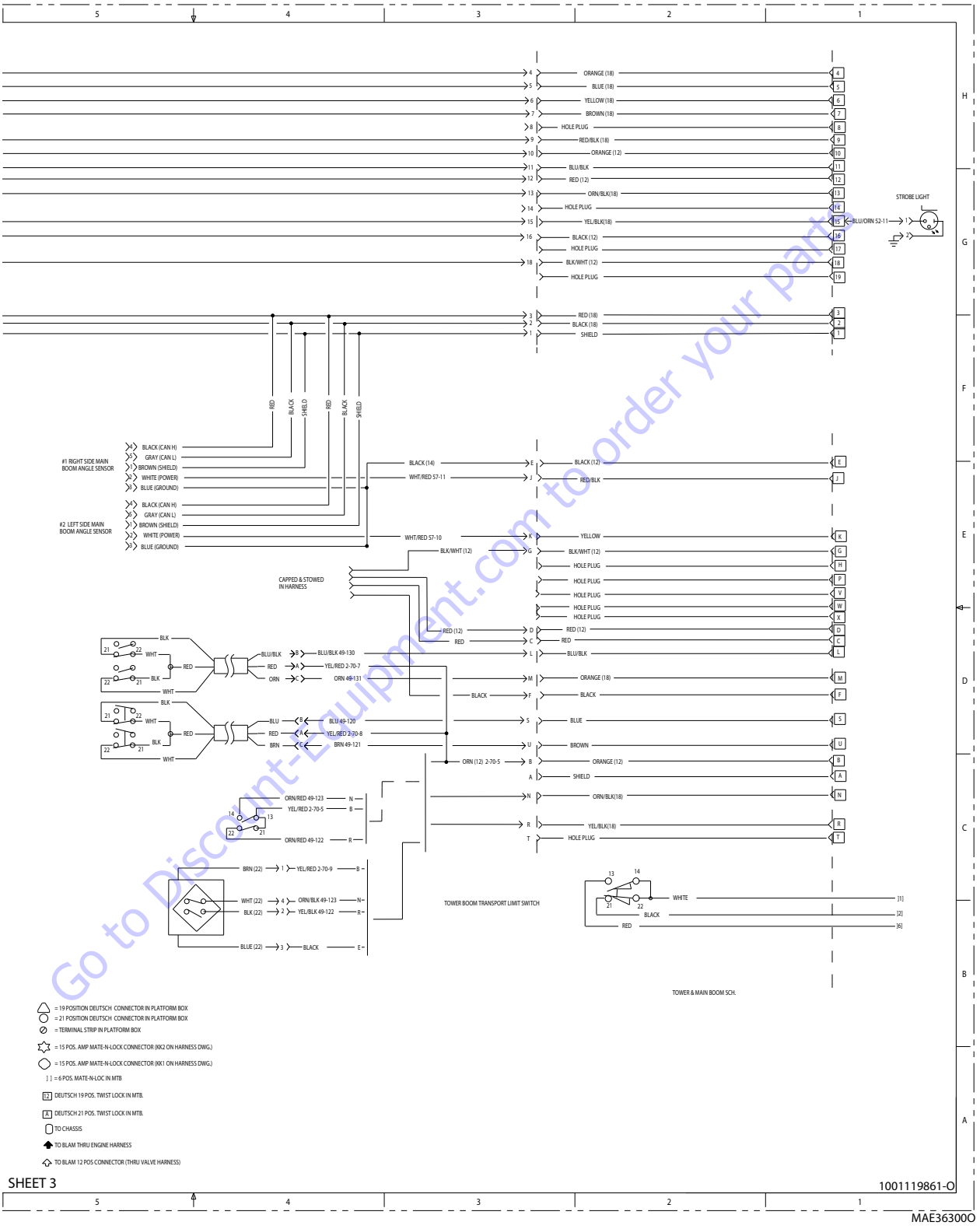


Figure 7-32. Electrical Schematic - Sheet 5 of 21

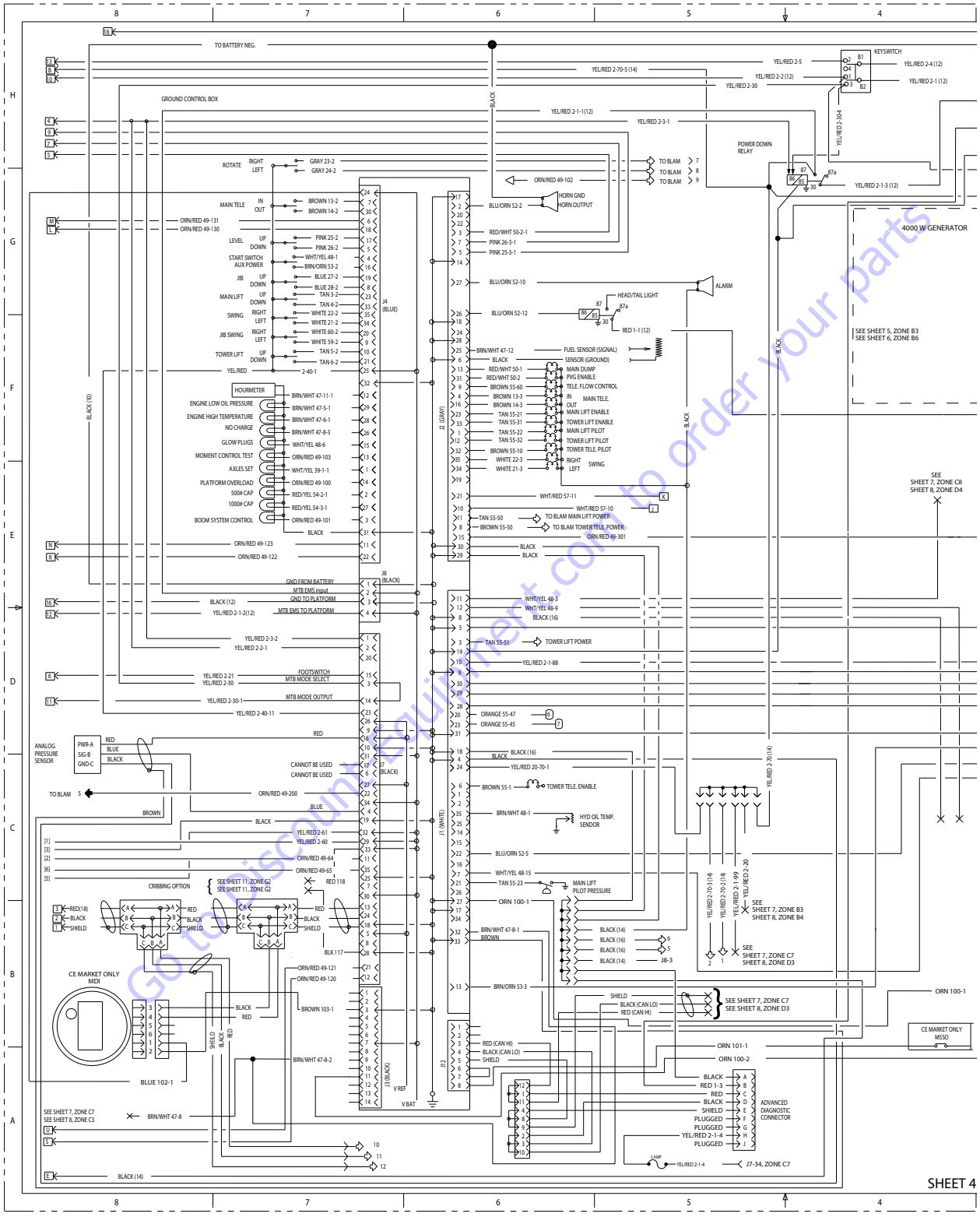


Figure 7-33. Electrical Schematic - Sheet 6 of 21

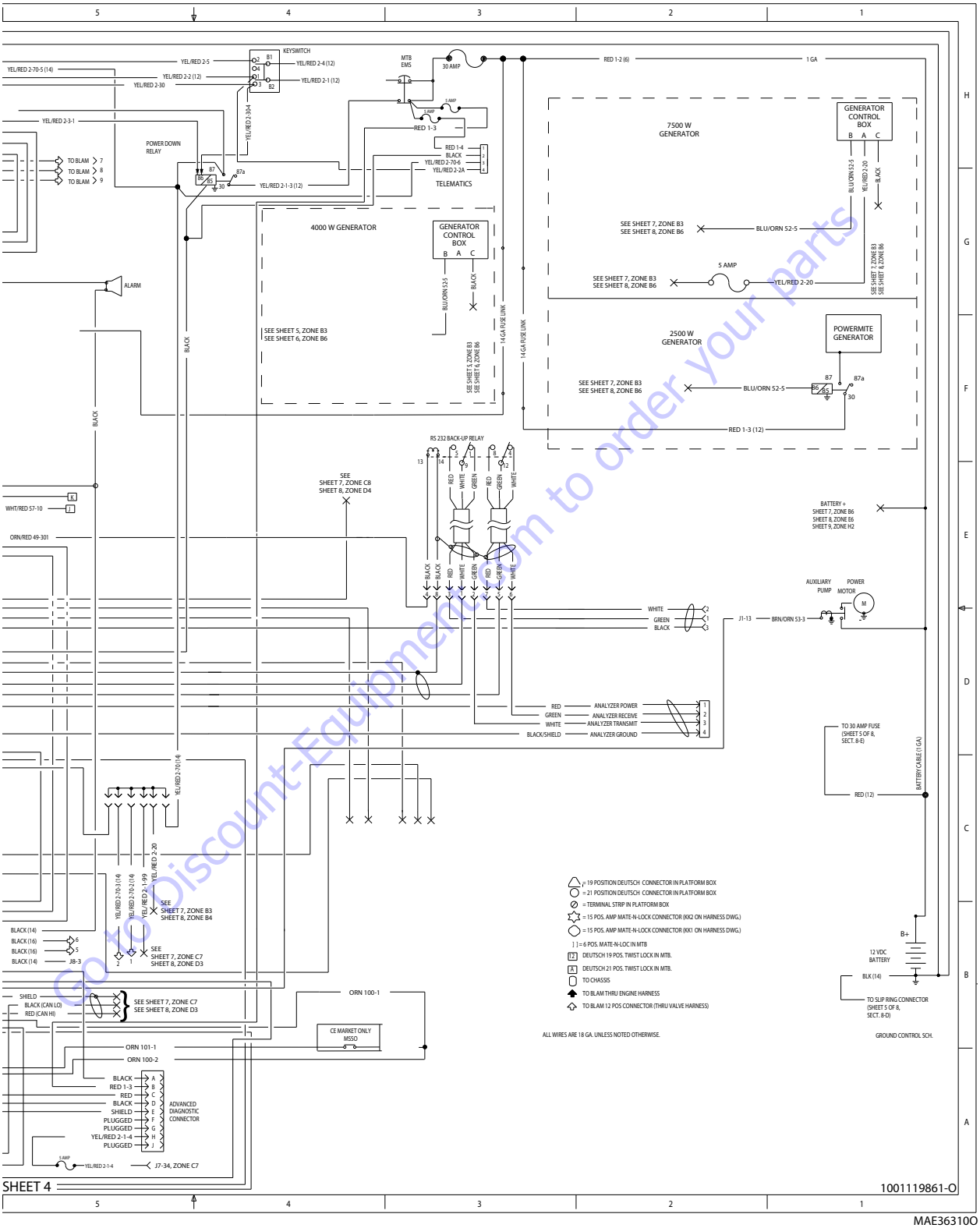


Figure 7-34. Electrical Schematic - Sheet 7 of 21

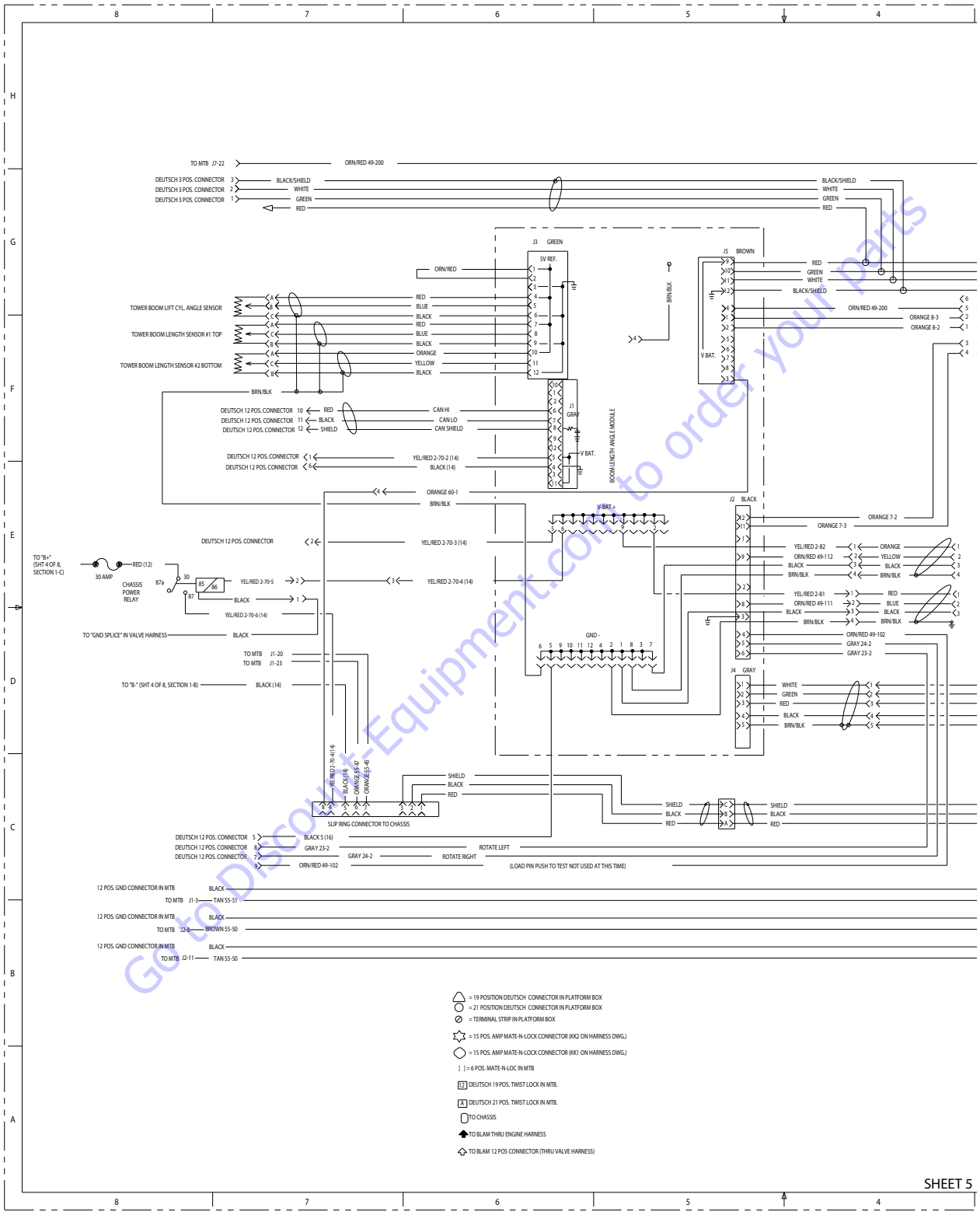


Figure 7-35. Electrical Schematic - Sheet 8 of 21

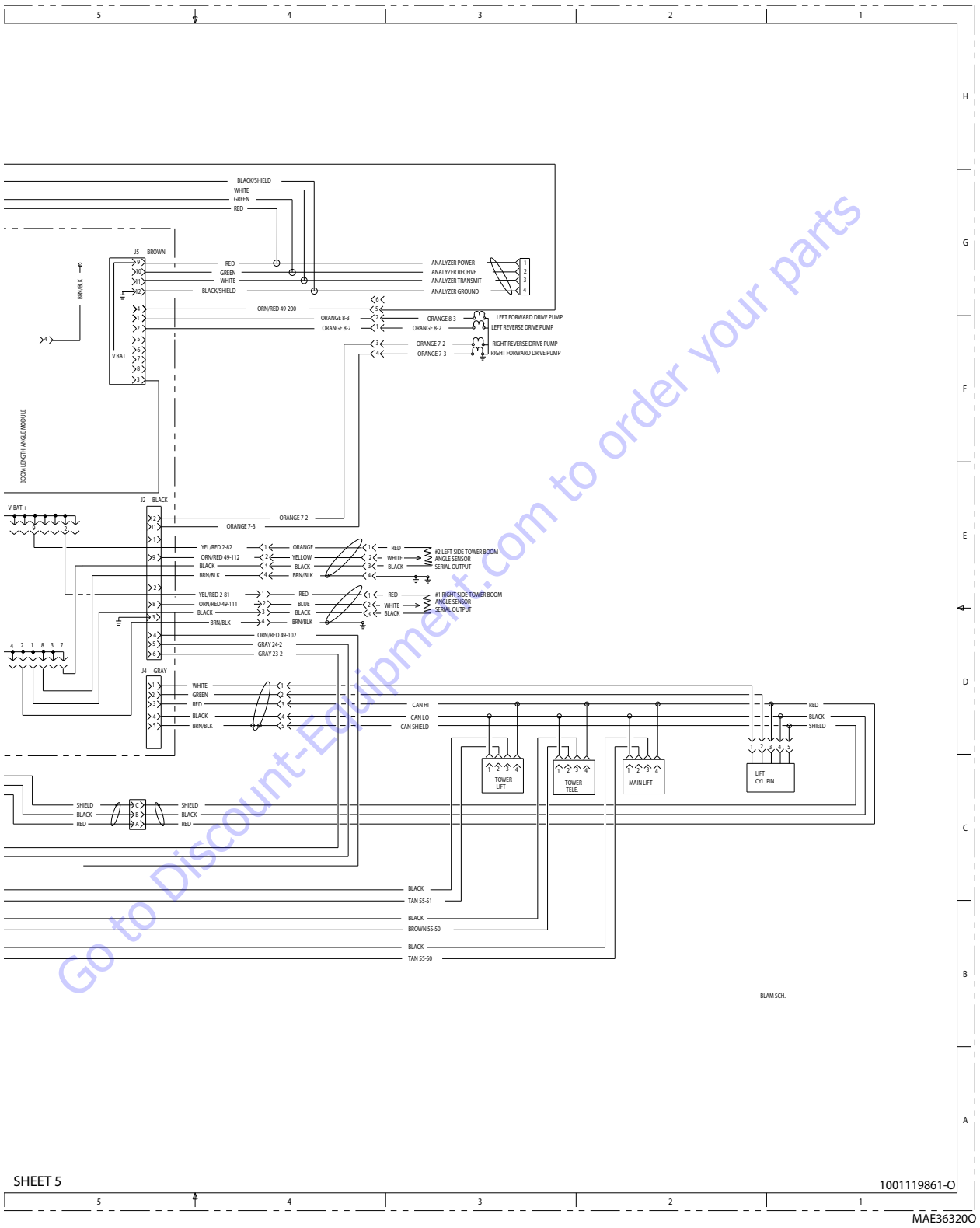


Figure 7-36. Electrical Schematic - Sheet 9 of 21

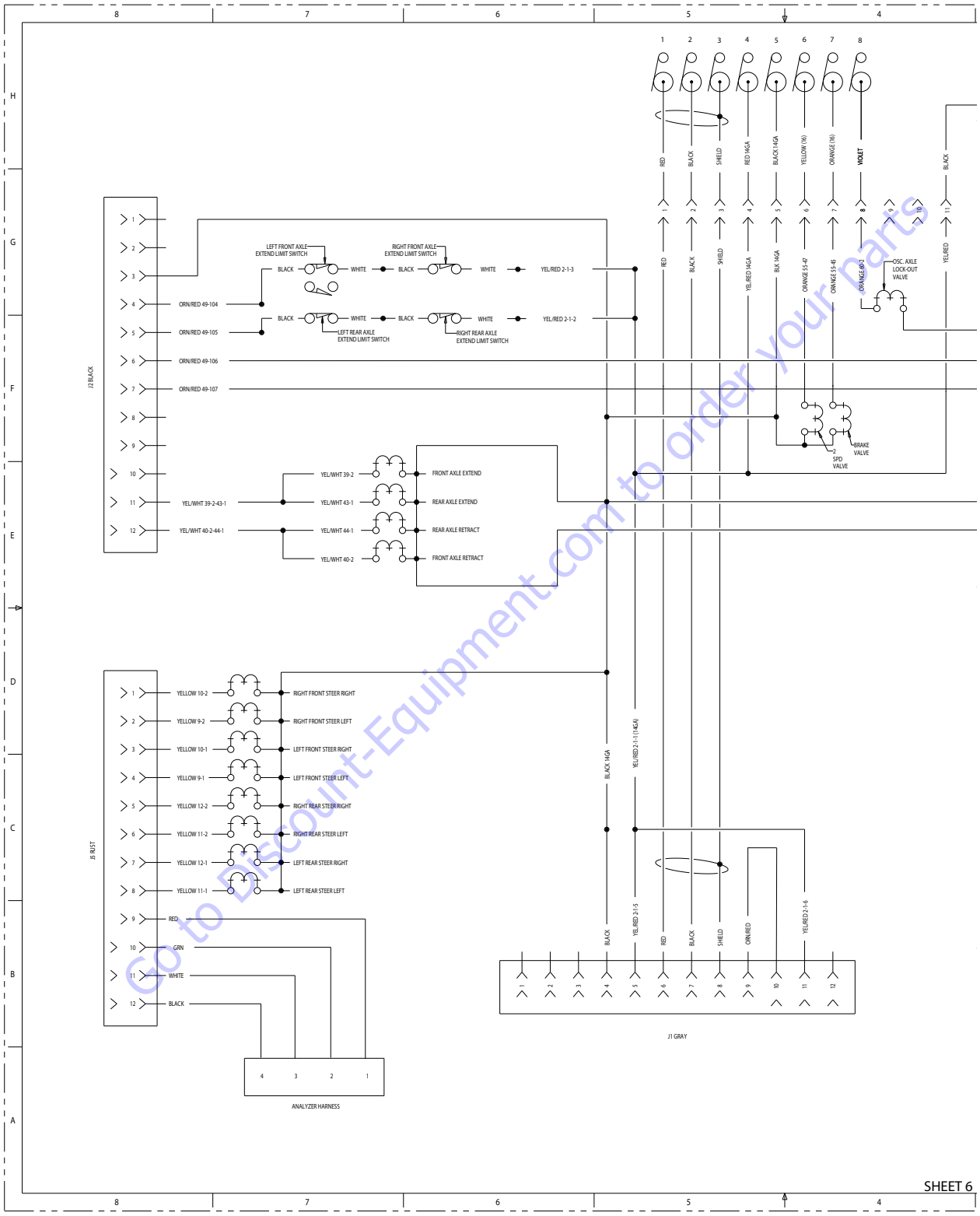
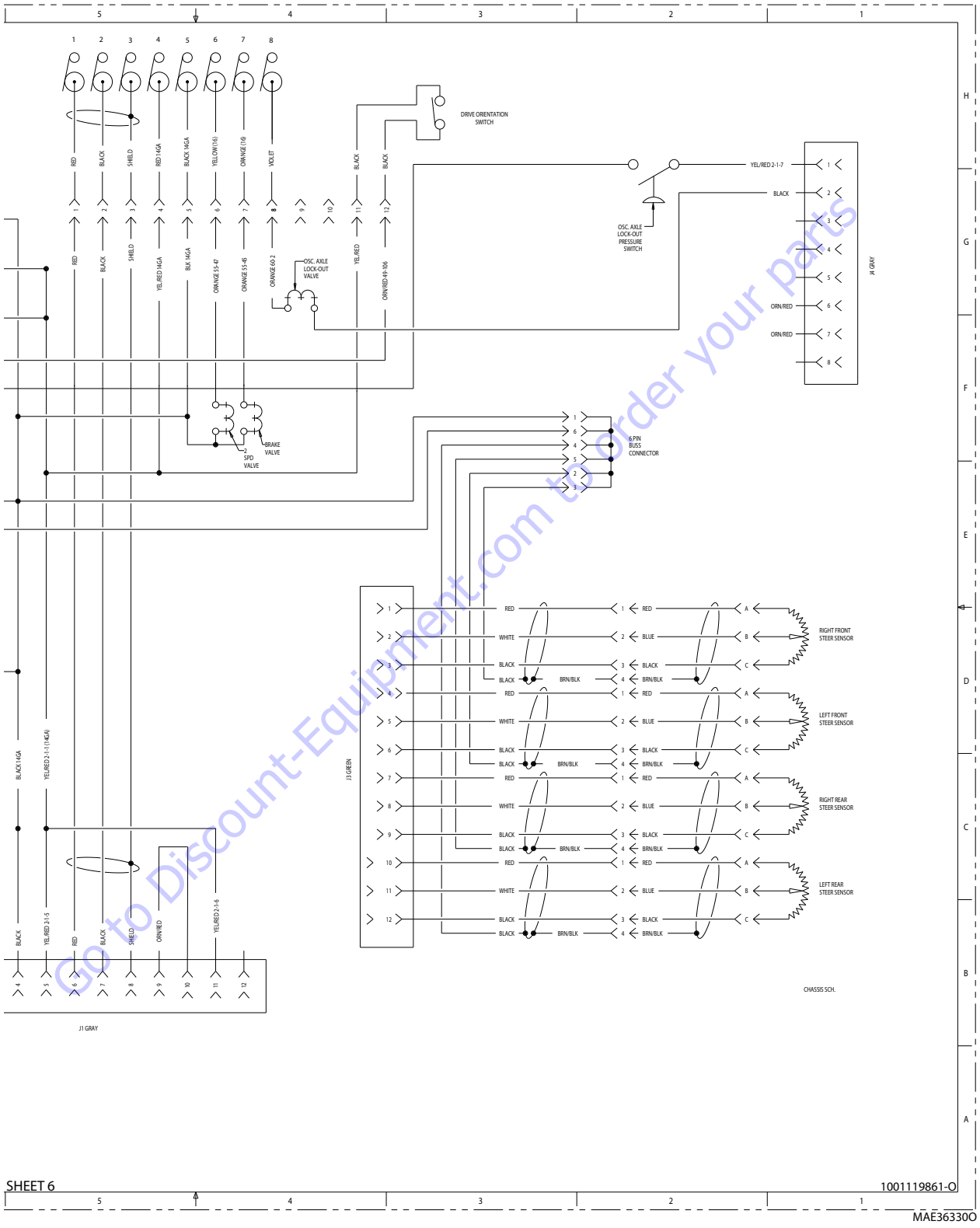


Figure 7-37. Electrical Schematic - Sheet 10 of 21



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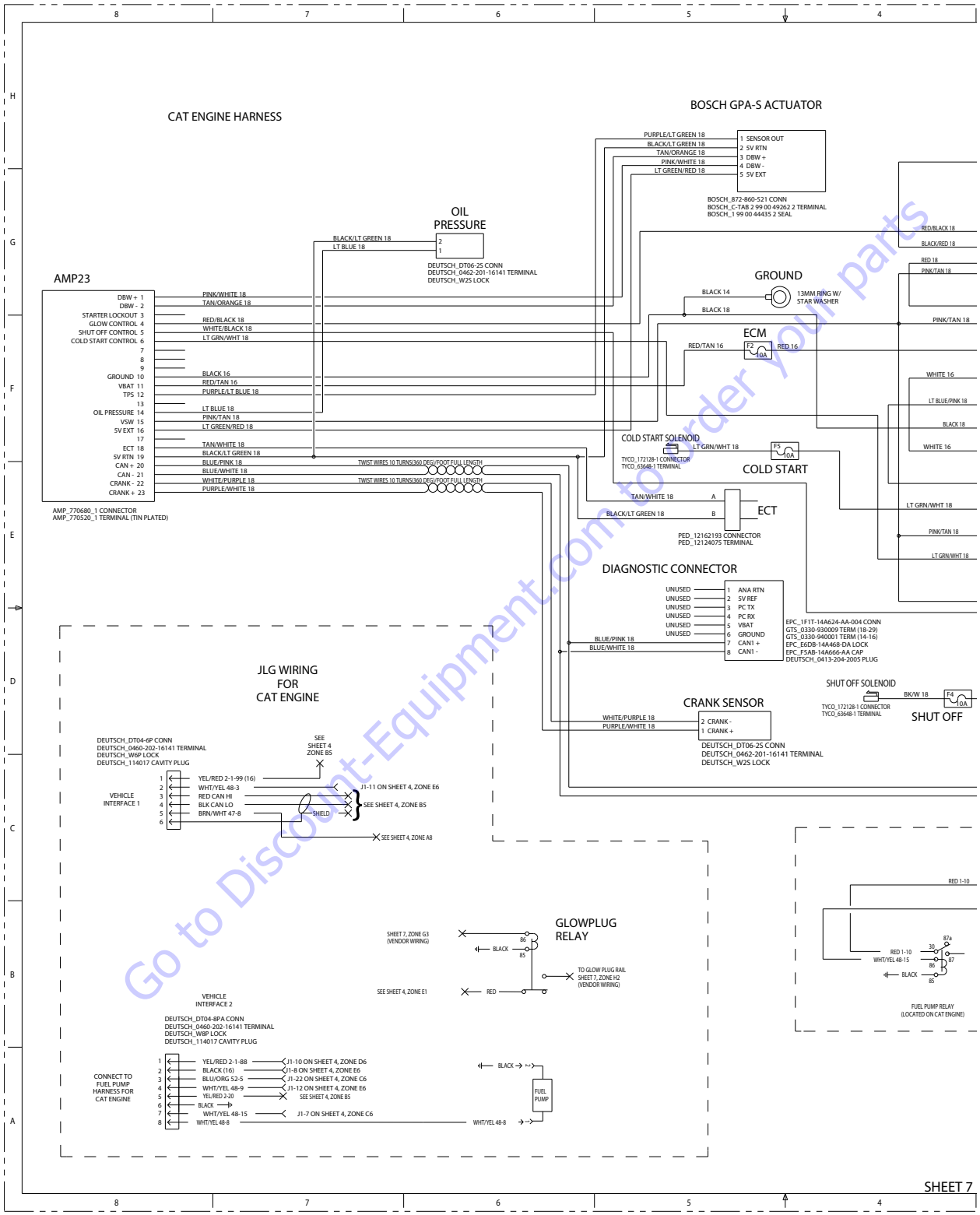

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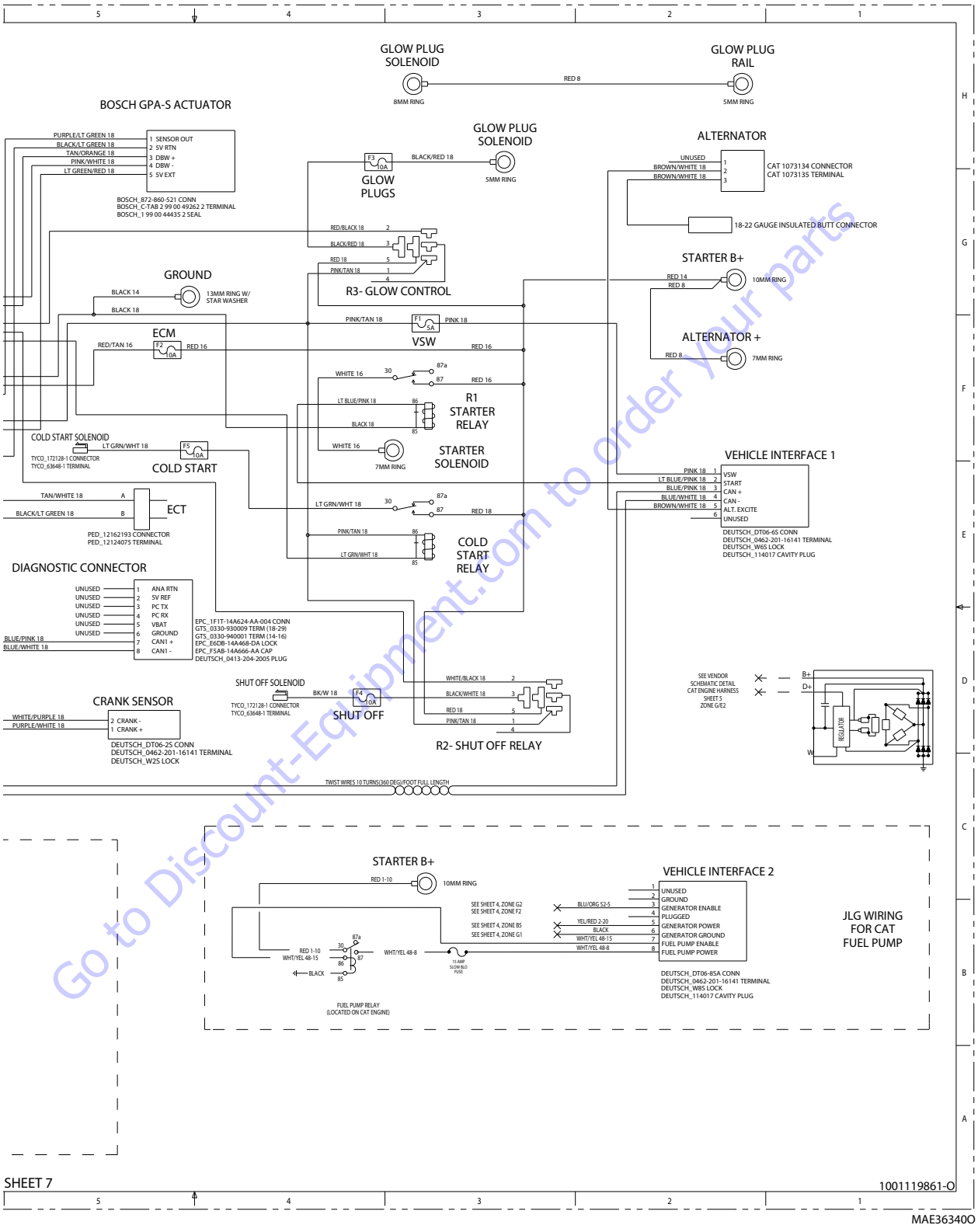

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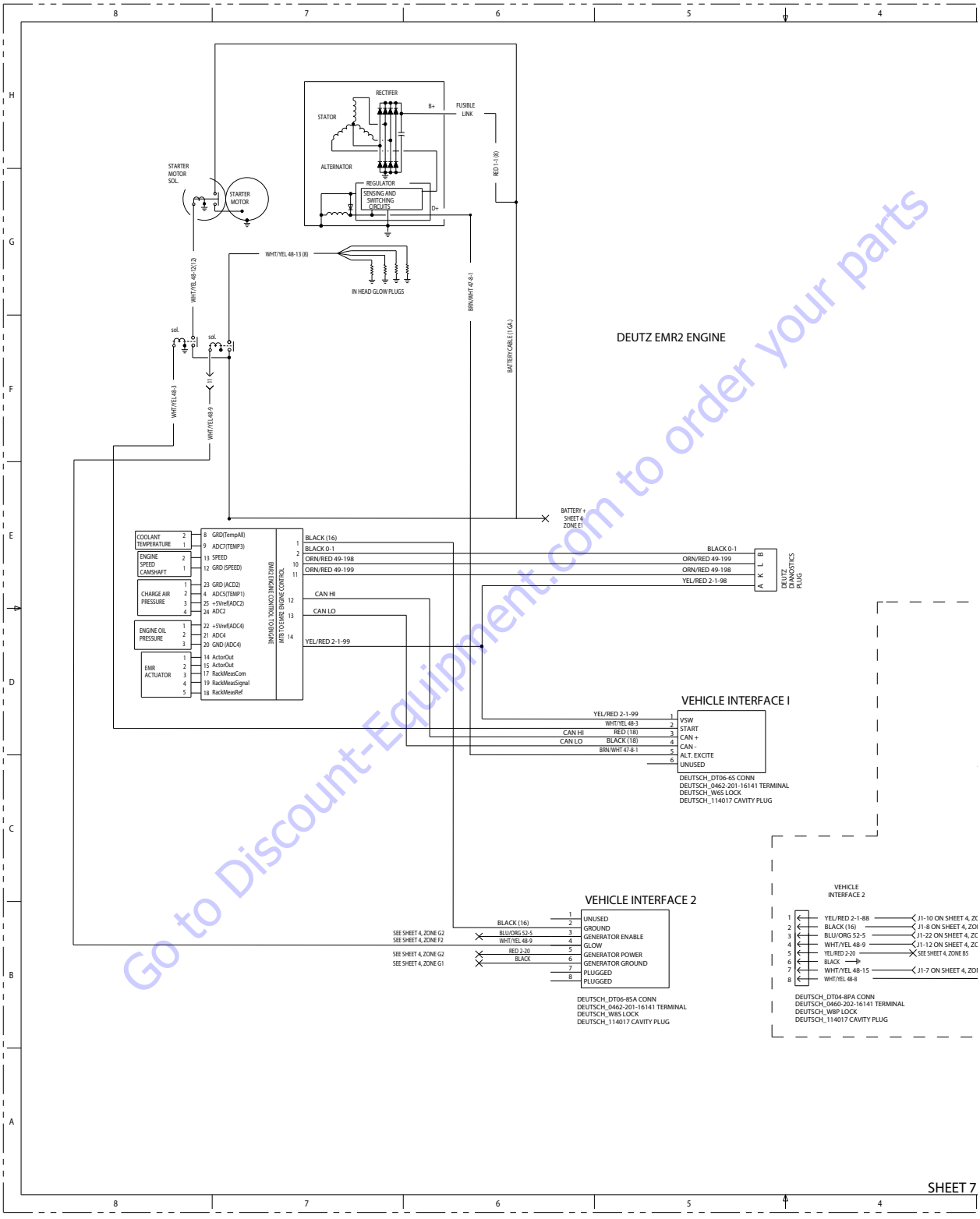

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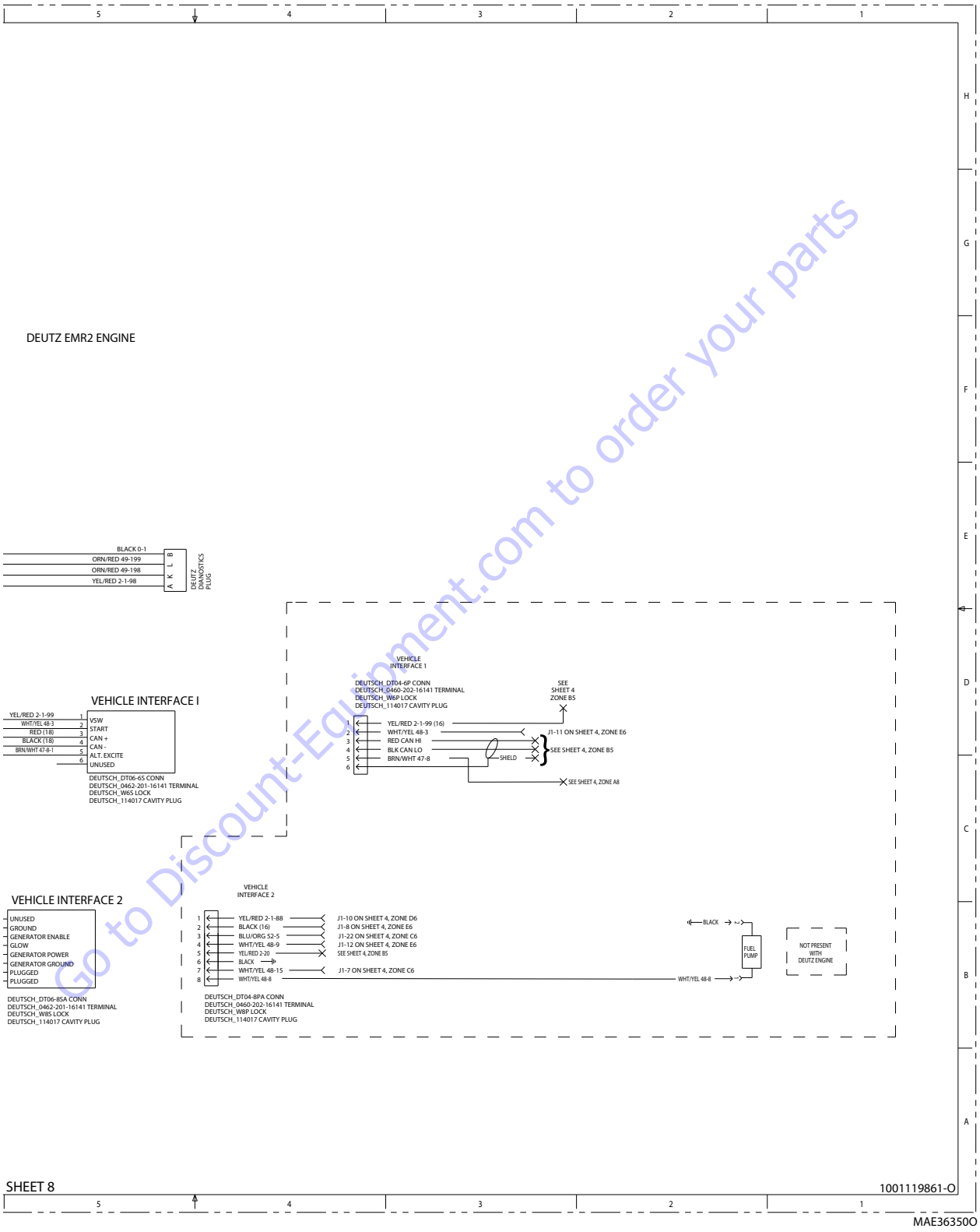

Figure 7-42. Electrical Schematic - Sheet 15 of 21

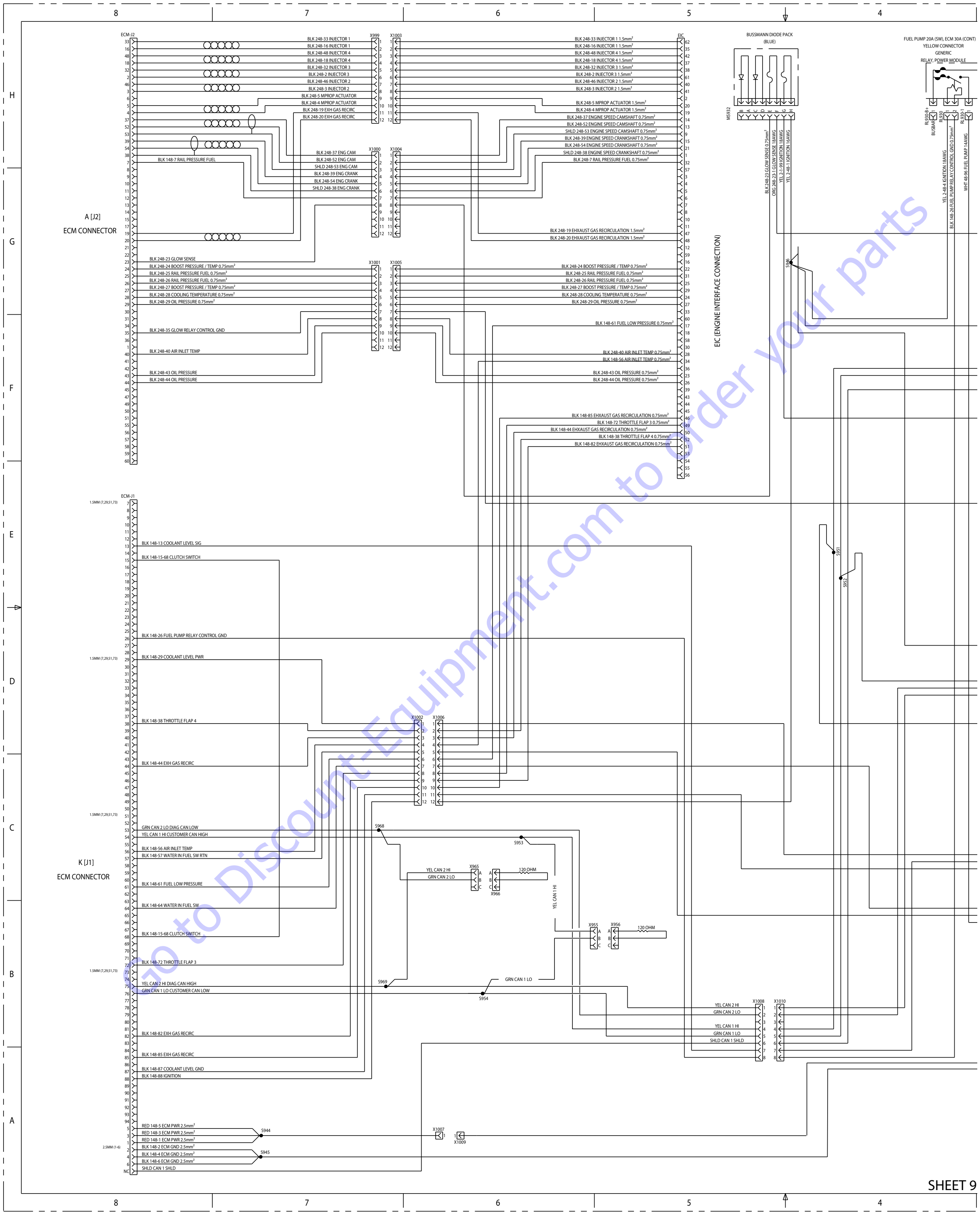

Figure 7-43. Electrical Schematic - Sheet 16 of 21

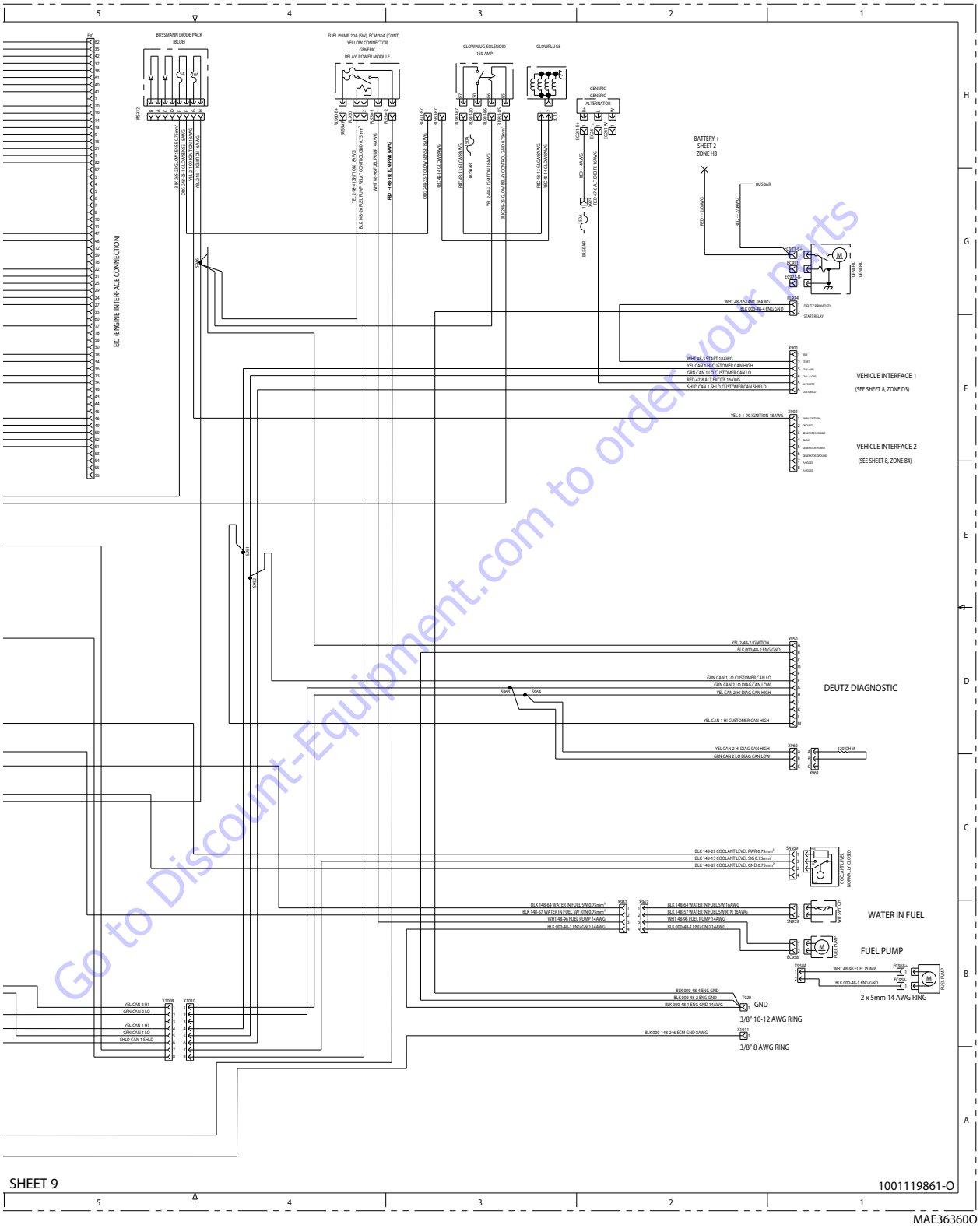

Figure 7-44. Electrical Schematic - Sheet 17 of 21

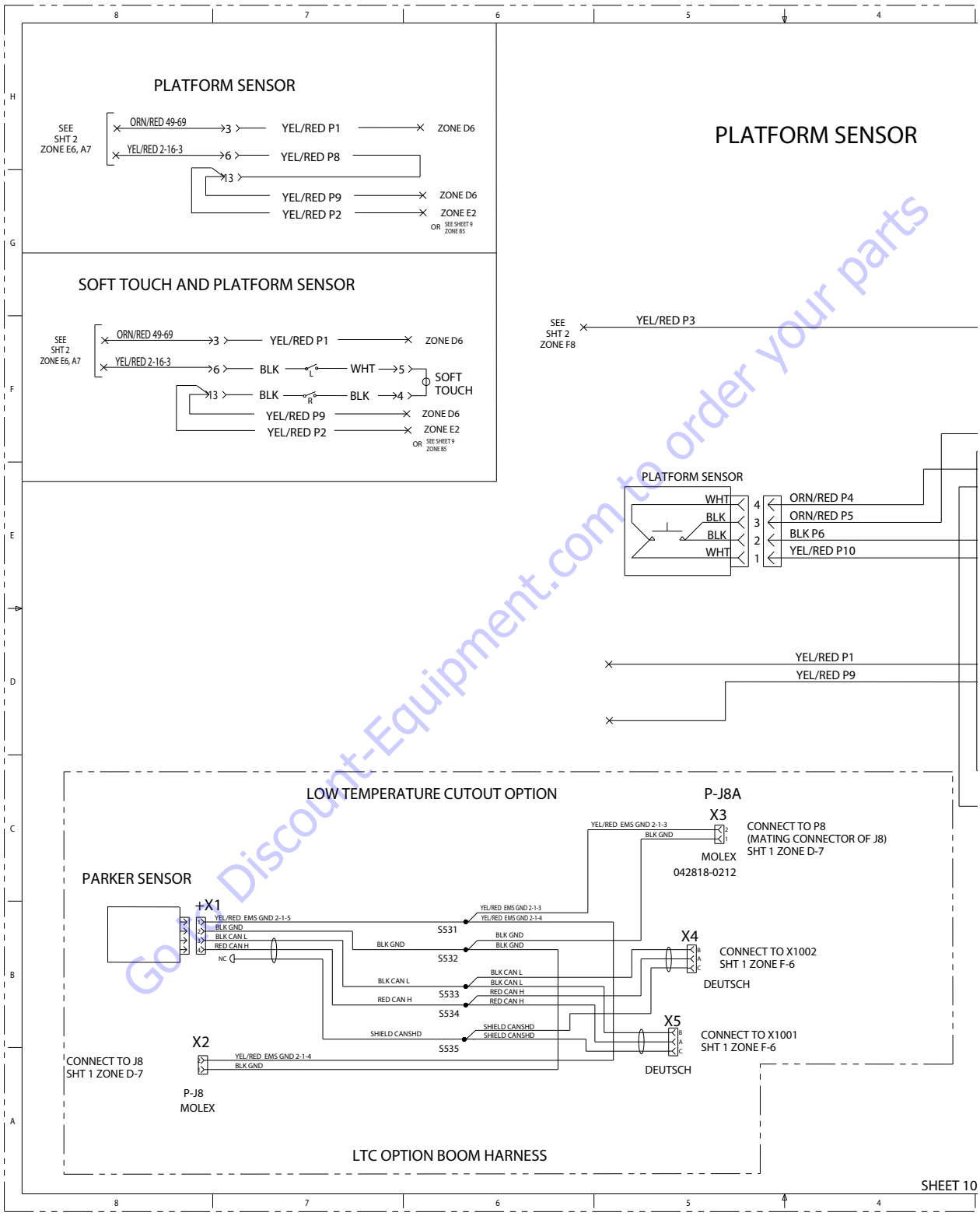

Figure 7-45. Electrical Schematic - Sheet 18 of 21

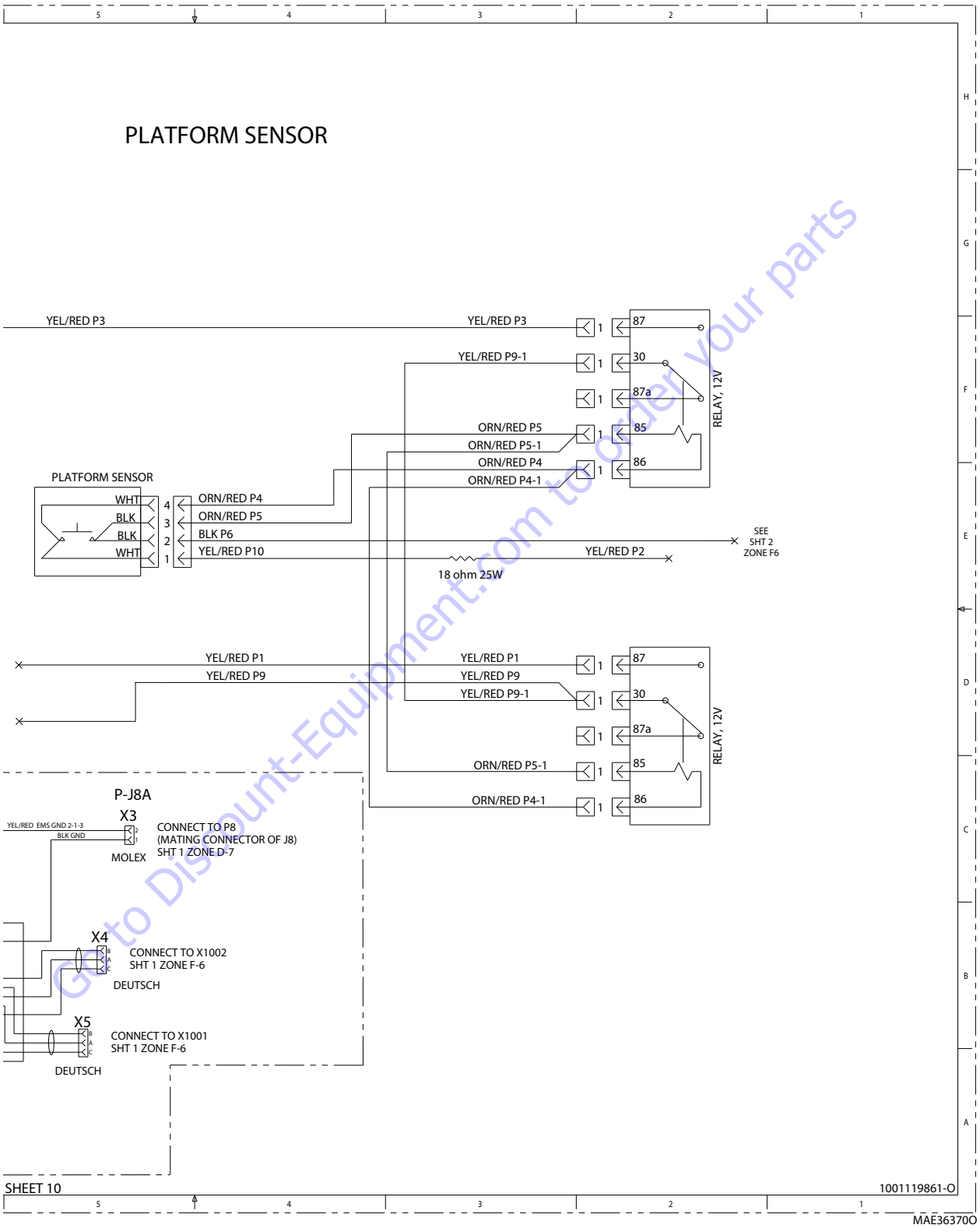

Figure 7-46. Electrical Schematic - Sheet 19 of 21

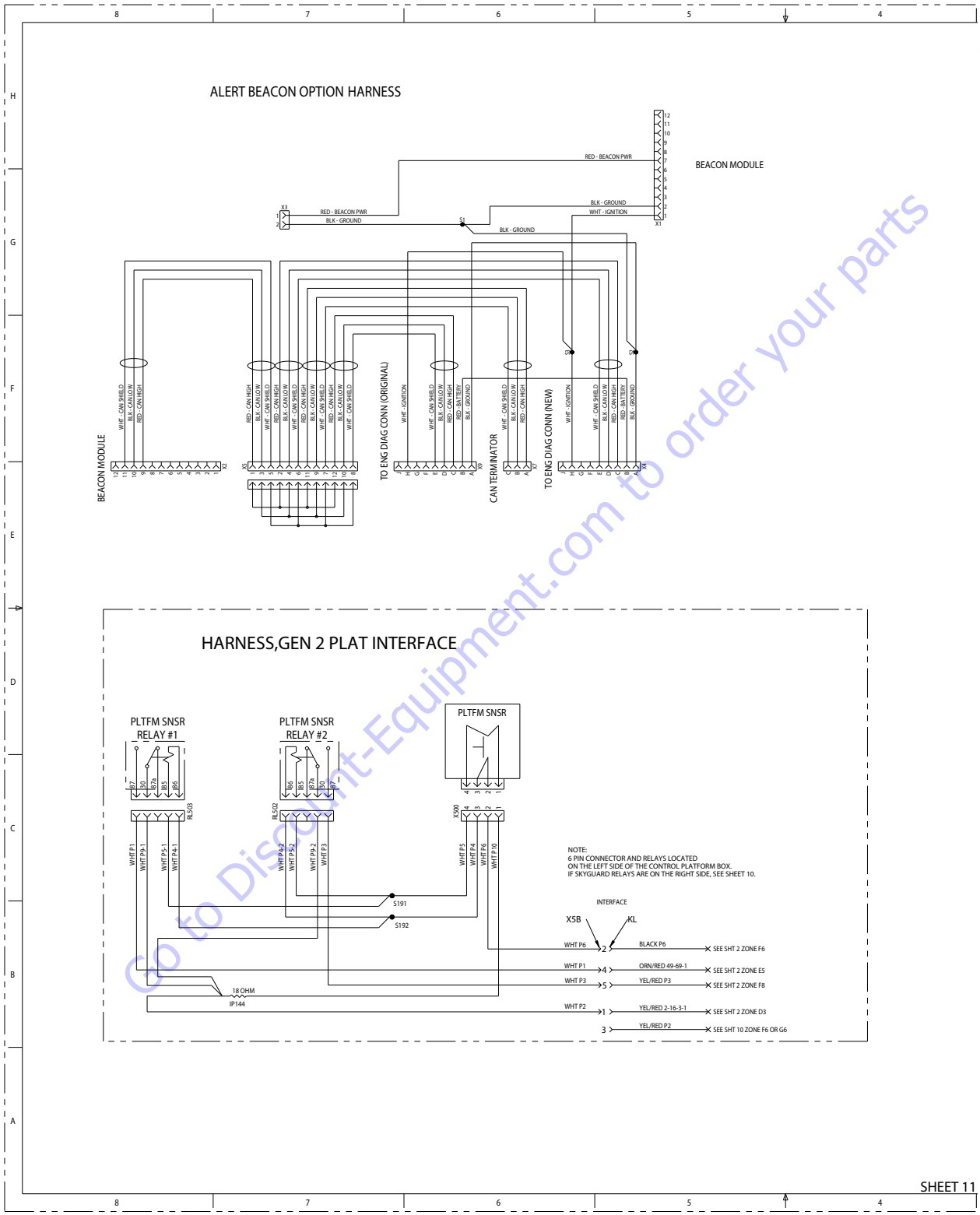

Figure 7-47. Electrical Schematic - Sheet 20 of 21

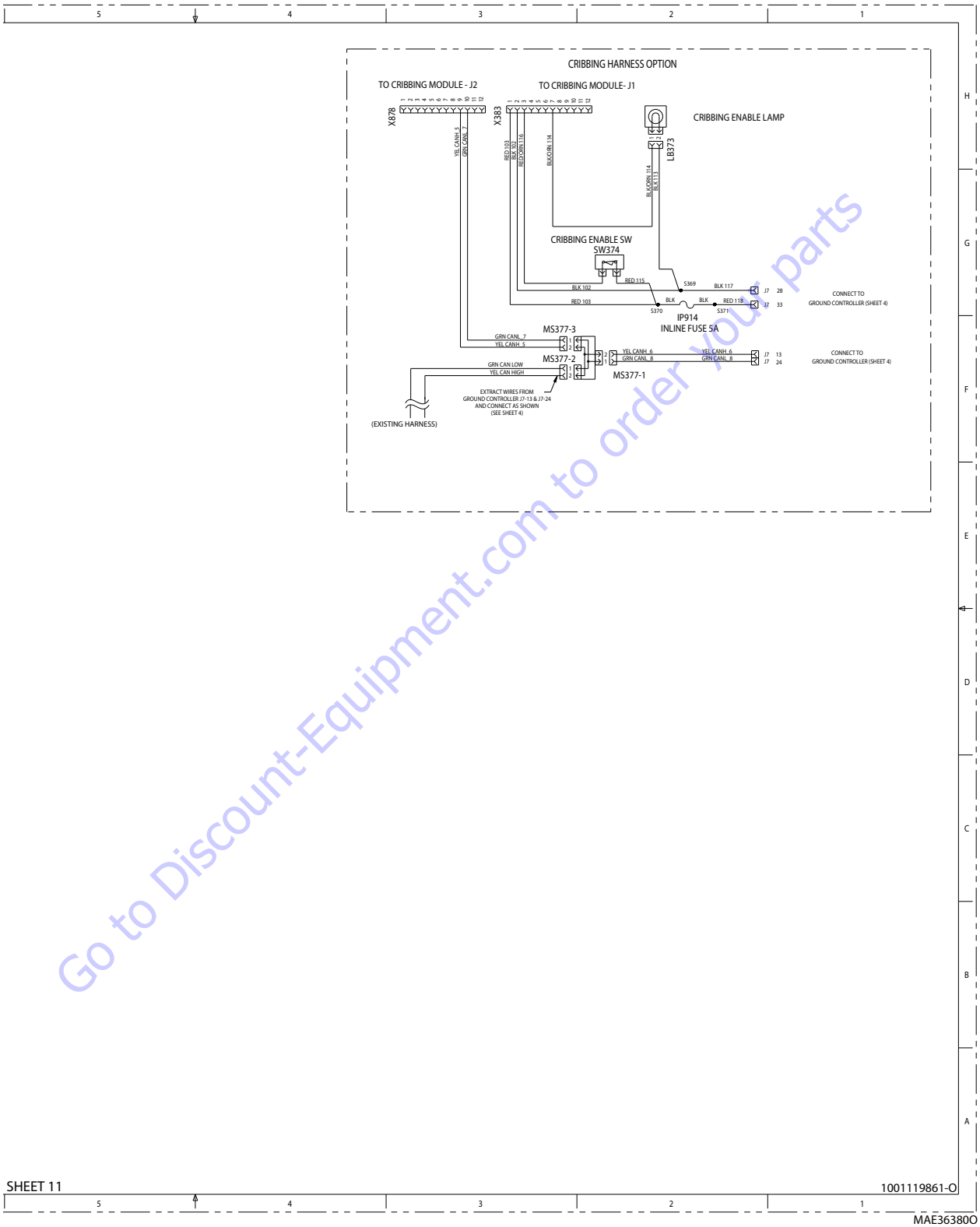

Figure 7-48. Electrical Schematic - Sheet 21 of 21

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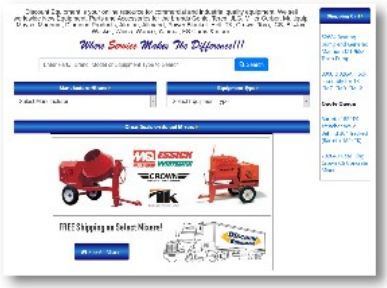

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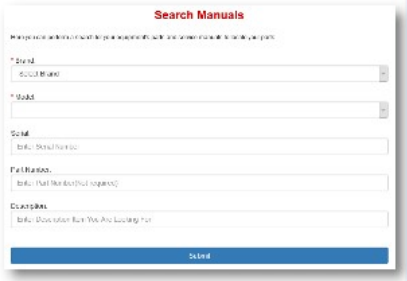

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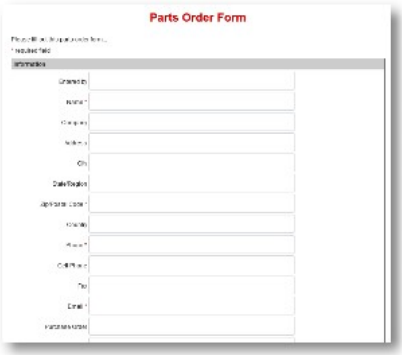

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