CREATING VALUE

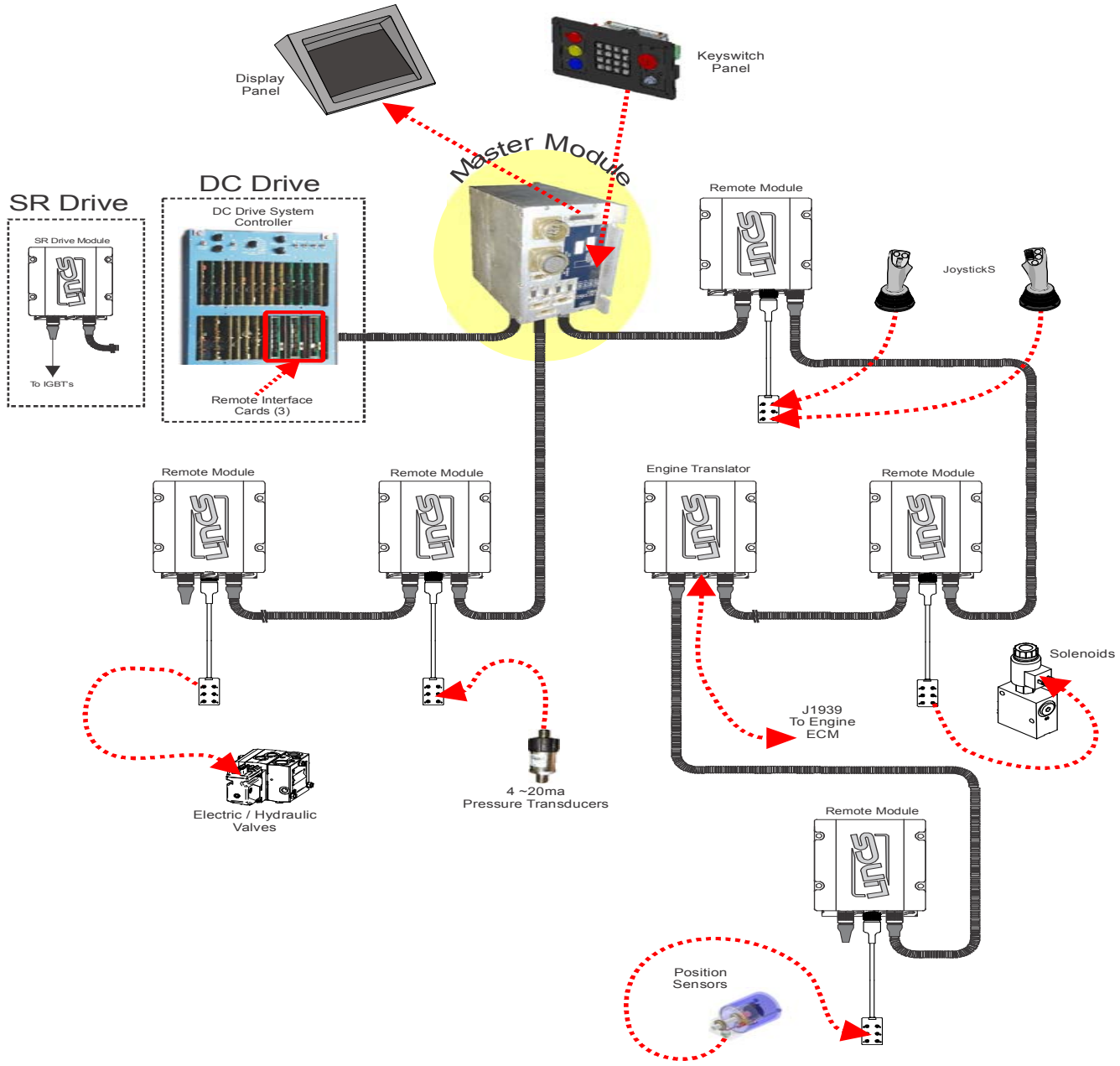
LINCS v1.2

JOYGLOBAL

LINCS v1.2

- Theory of Operation
- Component Descriptions
- Menu Navigation
- Circuit Descriptions
- Troubleshooting
- Support Software

THEORY OF OPERATION


Display Panel
Keyswitch Panel
Master Module
SR Drive
SR Drive Module
To IGBT's
DC Drive
DC Drive System Controller
Remote Interface Cards (3)
Remote Module
JoystickS
Remote Module
Remote Module
Engine Translator
Remote Module
Solenoids
J1939 To Engine ECM
4 ~20ma Pressure Transducers
Electric / Hydraulic Valves
Remote Module
Position Sensors

COMPONENT DESCRIPTIONS

COMPONENT DESCRIPTIONS

- 24VDC VOLTAGE STABILIZER
- BATTERY CHARGING PANEL
- MASTER CONTROL MODULE
- I-BUTTON
- REMOTE CONTROL MODULE
- TRANSLATOR MODULE
- DRIVE MODULE
- SERVICE TOOL CONNECTOR
- KEYPAD AND INDICATOR PANEL
- INTERFACE CABLING
- TURCK BOX
- STEERING INTERFACE CARD
- ROTARY POTENTIOMETER
- LINEAR TRANSDUCER
- PRESSURE TRANSDUCER
- LEFT/RIGHT HAND JOYSTICK
- FOOT POT
- THERMISTORS / RTD'S

+24VDC VOLTAGE STABILIZER

PROVIDES CONTINUOUS 24VDC OUTPUT WITH AN INPUT DOWN TO 10.5VDC

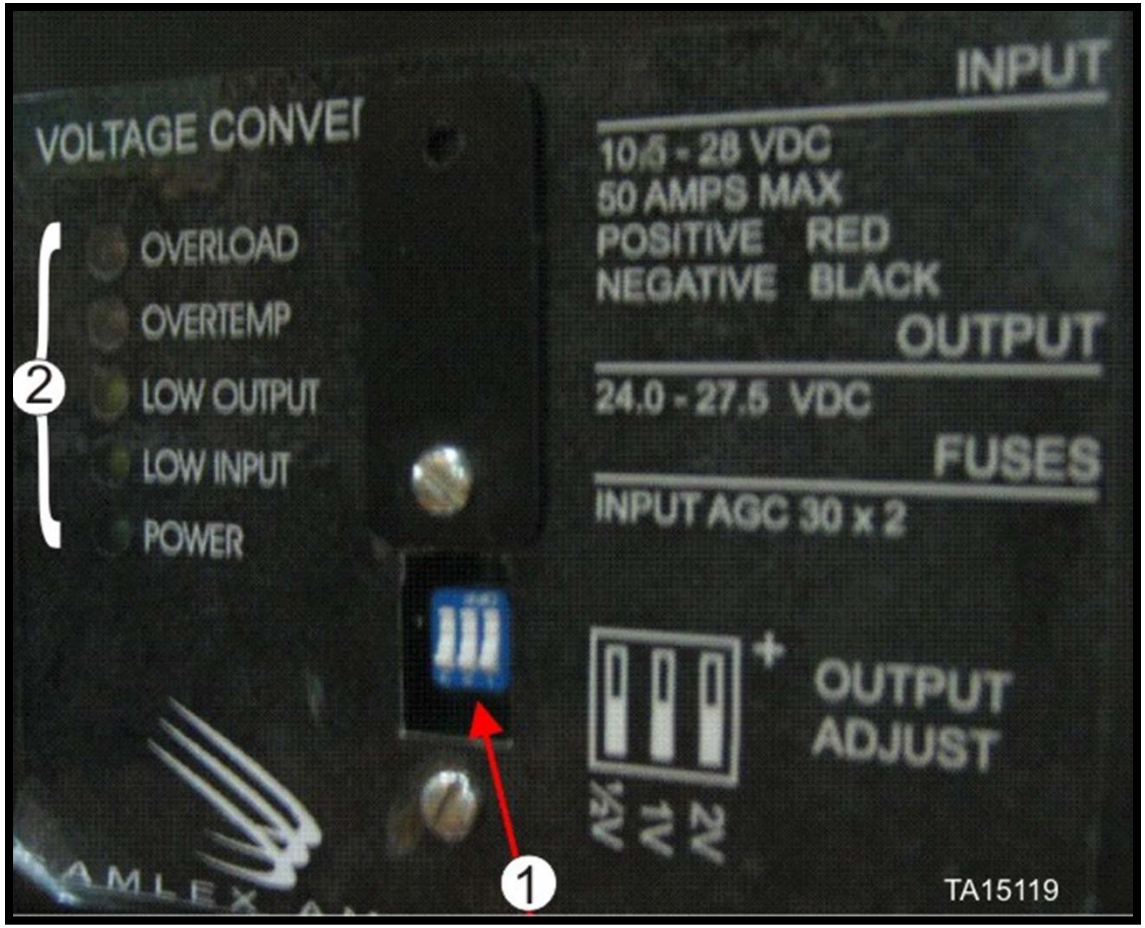
	1.VOLTAGE OUTPUT SELECT (24 TO 27.5 VDC) **2.SET AT 27.5 VDC**

FIGURE 69. VOLTAGE STABLIIZER RIGHT VIEW (INPUT)

FIGURE 70. VOLTAGE STABLIZER LEFT VIEW (OUTPUT)

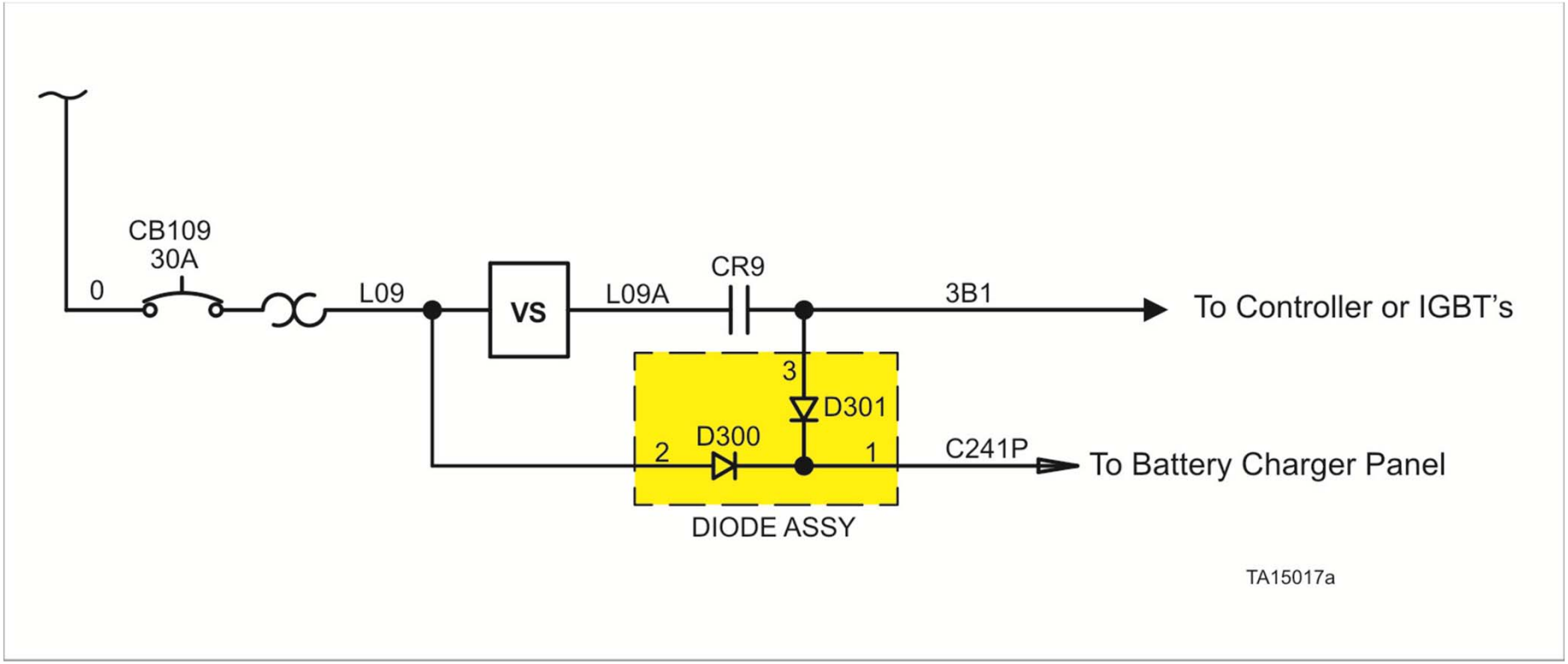
+24VDC VOLTAGE STABILIZER

DIP SWITCH POSITIONS

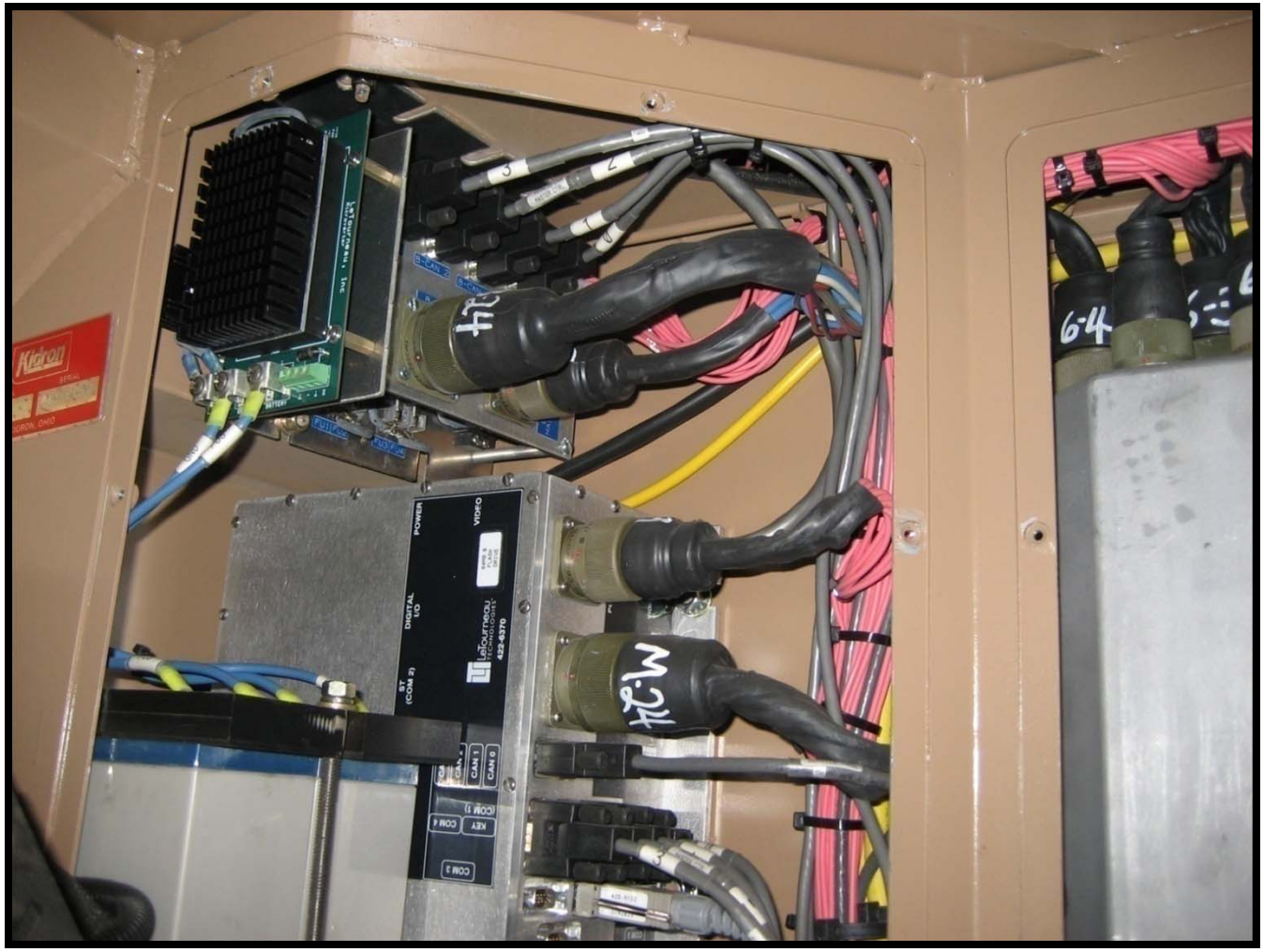


+24VDC VOLTAGE STABILIZER

PROVIDES CONTINUOUS 24VDC OUTPUT WITH AN INPUT DOWN TO 10.5VDC



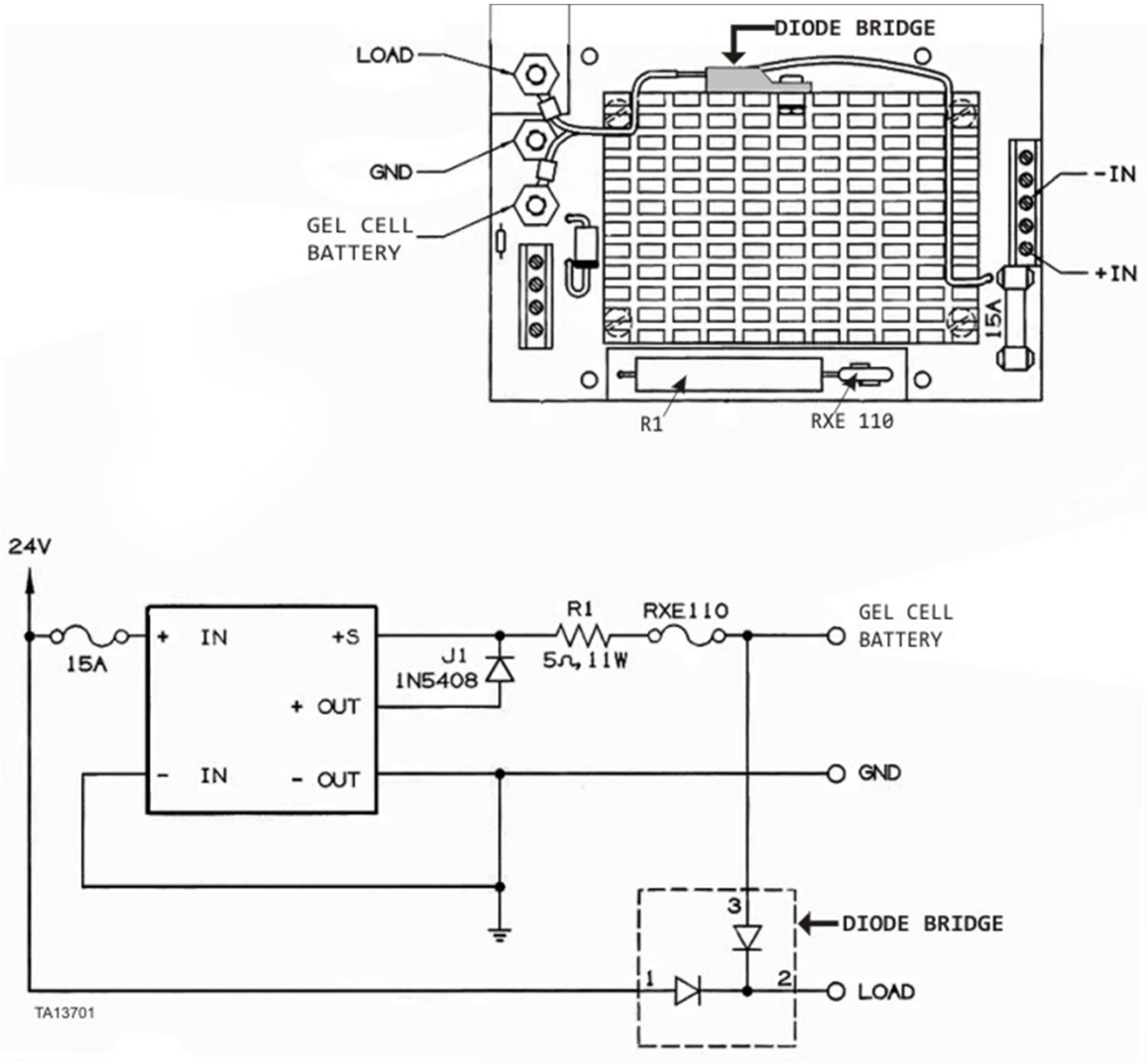
BATTERY CHARGING PANEL/MASTER CONTROL MODULE/GEL CELL



BATTERY CHARGING PANEL

Provides continuous 24VDC to power digital functions of the Master and Remotes via the “Load” supply

BATTERY CHARGING PANEL



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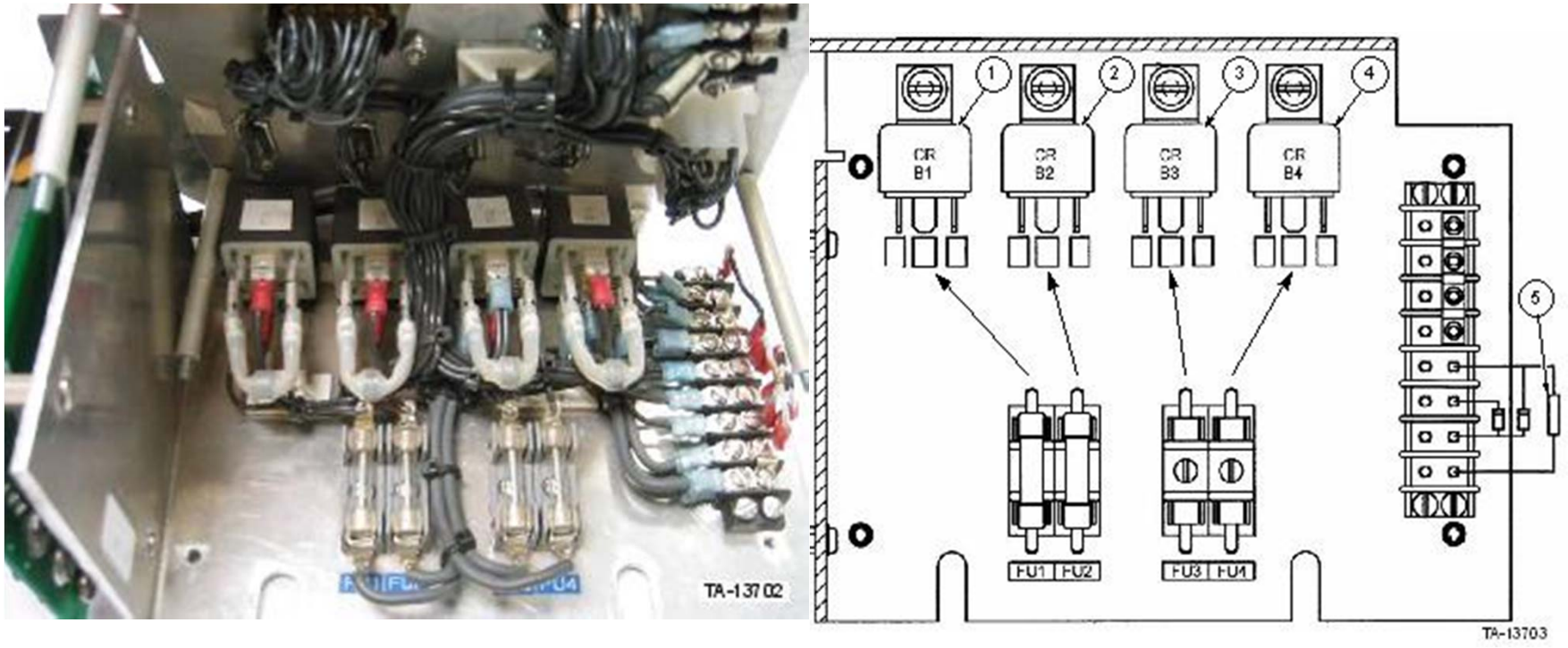
BATTERY CHARGING PANEL

Provides continuous 24VDC to power digital functions of the Master and Remotes via the “Load” supply



1. A/C CONTROL POWER –WIPER CONTROL RELAYS
2. CAB I/O – 24v POWER
3. CAN BUS 24v
4. 24v SUPPLY TO MASTER MODULE
5. R 11-10k

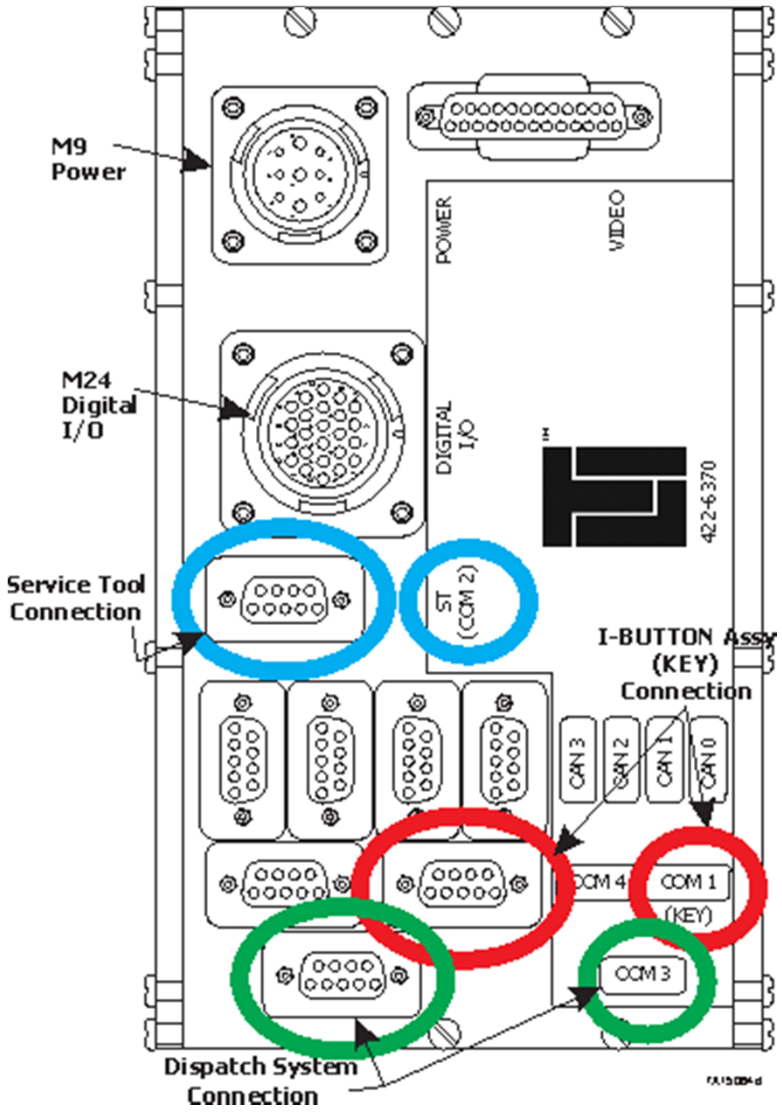
Figure 64. CHARGING PANEL RELAYS AND FUSES

MASTER CONTROL MODULE

THE “MASTER MODULE” OR MCM:

- Central processor “Brains” of machine
- Contains the software specific for the machine
- Basic industrialized PC
- Manages all communications to and from Remote devices
- Gathers data and sends commands to remote devices for INTELLIGENT machine control
- Monitors remote modules and can verify and update their configurations
- Direct connection to operator interface for input and alarm and diagnostic info
- Uses machine specific configuration
- Stores Alarm History and Production Data
- Can be accessed via service tool cable and laptop or via RF modems and Laptop.

MASTER CONTROL MODULE



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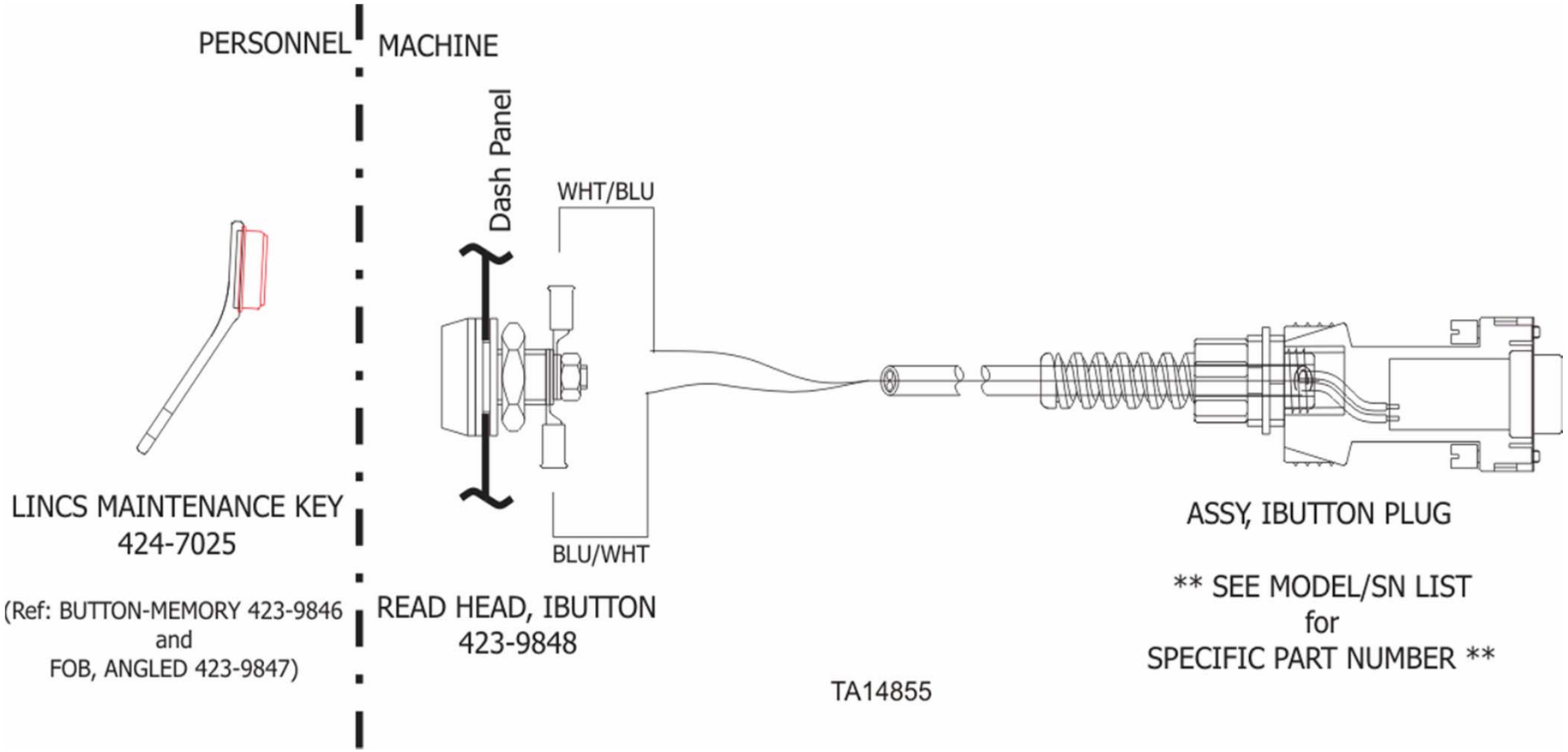
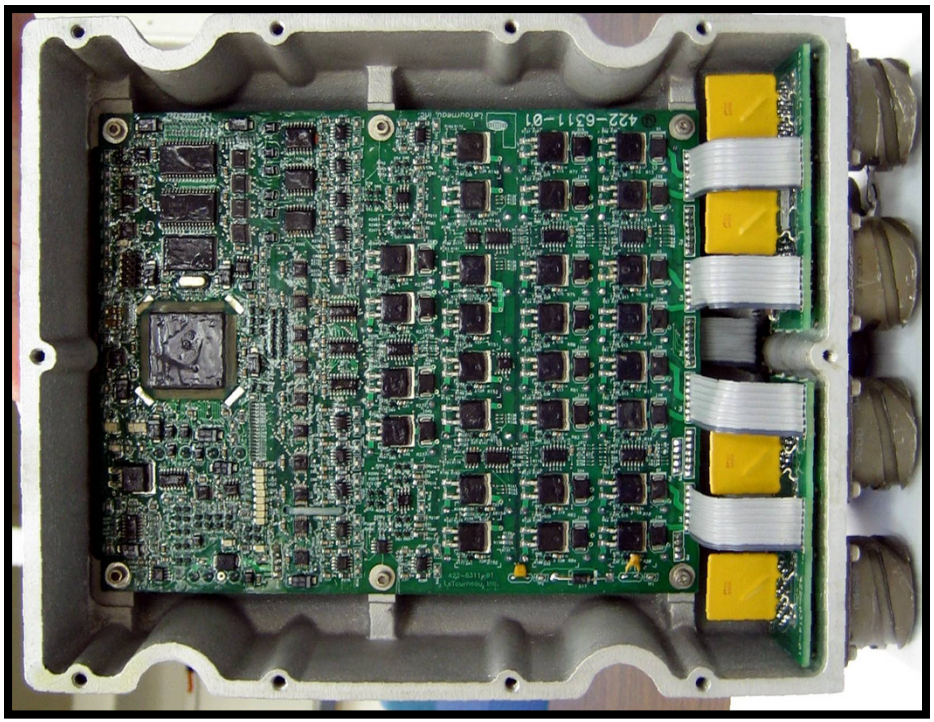
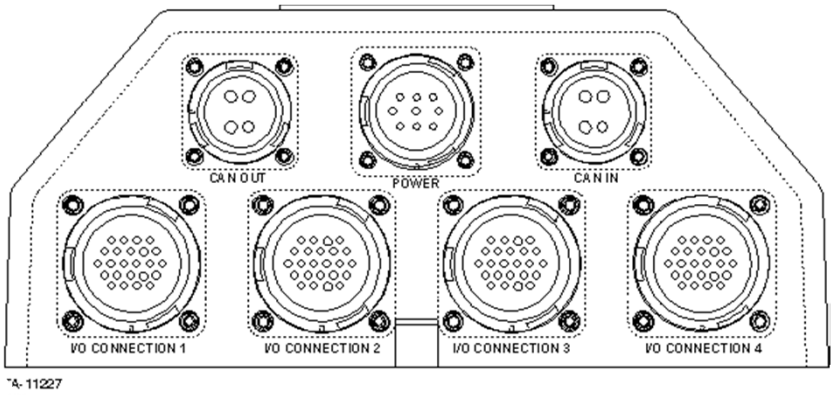
I-BUTTON SOCKET AND READER



REMOTE CONTROL MODULE

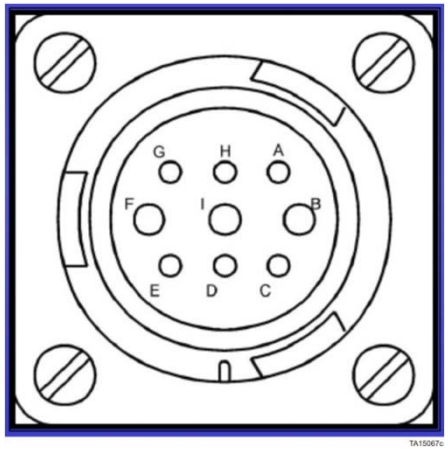




REMOTE CONTROL MODULE

- Connection from CAN bus “LOGIC” to real I/O and Vice Versa
- The “Hands” of the control system
- Each RCM has 24 I/O connections between 4 independent I/O connectors
- I/O can be PWM, High Side, or Low Side switched – 4 high side per remote
- Interchangeability assist in troubleshooting

RCM POWER CONNECTOR
I/O POWER AND ADDRESS



Pin	Function
A	Address 1 (value 1) – **Used to specify address this function of RCM**
B	Output Ground
C	Address 4 (value 8)) – Used to specify address this function of RCM
D	Address 5 (value 16)) – Used to specify address this function of RCM
E	Address 6 (value 32)) – Used to specify address thus function of RCM
F	Output Power (24V)
G	Address 3 (value 4)) – Used to specify address thus function of RCM
H	Address 2 (value 2)) – Used to specify address thus function of RCM
I	Address Common (ground)) – Used to specify address thus function of RCM

RCM POWER CONNECTOR
I/O POWER AND ADDRESS

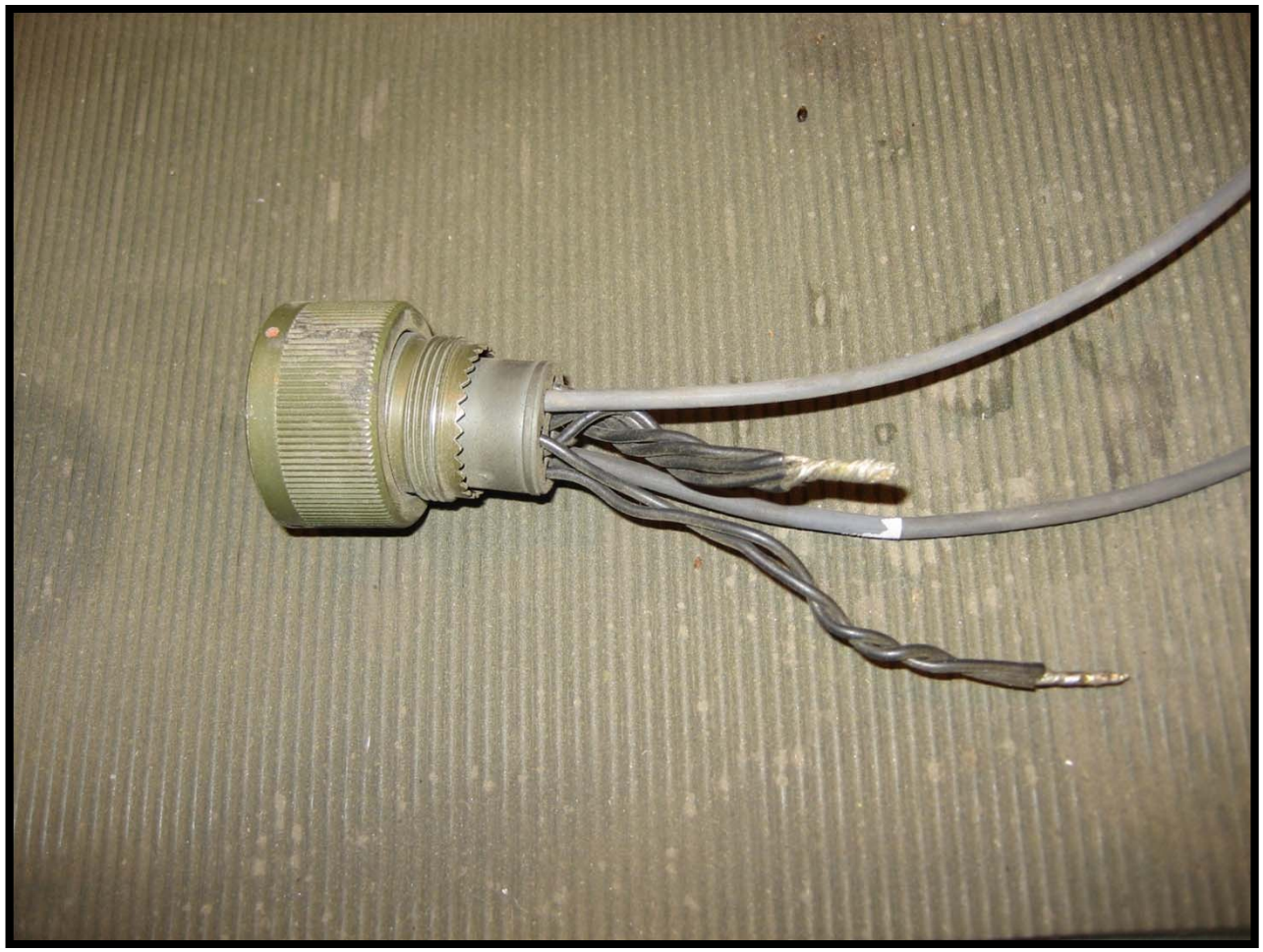
ADDRESSCHART												
ADDRESS	SOLDERTOPINI						SOLDERTOGETHER					
01		H	G	C	D	E	A					
02	A		G	C	D	E		H				
03			G	C	D	E	A	H				
04	A	H		C	D	E			G			
05		H		C	D	E	A		G			
06	A			C	D	E		H	G			
07				C	D	E	A	H	G			
08	A	H	G		D	E				C		
09		H	G		D	E	A			C		
10	A		G		D	E		H		C		
11			G		D	E	A	H		C		
12	A	H			D	E			G	C		
13		H			D	E	A		G	C		
14	A				D	E		H	G	C		
15					D	E	A	H	G	C		
16	A	H	G	C		E					D	
17		H	G	C		E	A				D	

POWERCONNECTORPIN ADDRESS&VALUECHART	
PIN	FUNCTION/VALUE
A	ADDRESS1/VALUE=1
B	GND /
C	ADDRESS4/VALUE=8
D	ADDRESS5/VALUE=16
E	ADDRESS6/VALUE=32
F	+24V/
G	ADDRESS3/VALUE=4
H	ADDRESS2/VALUE=2
I	ADDRESSCOM/

NOTE:
The address is determined by adding the values of the address pins that are NOT soldered to Pin I [refer to address chart].

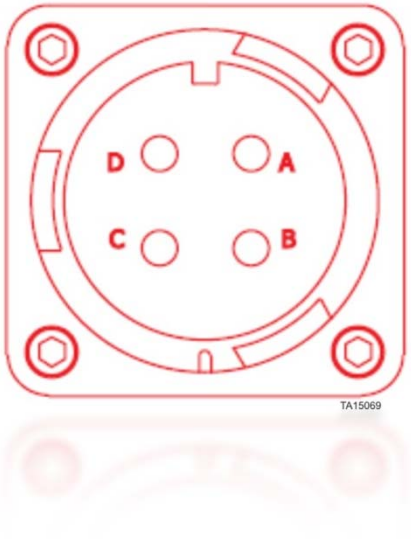
Example:
Pin A & Pin D not soldered to Pin I would result in an address of 17 [1 + 16 = 17]

RCM POWER CONNECTOR – ADDRESSING



RCM CAN BUS CONNECTION –

Digital power and communication

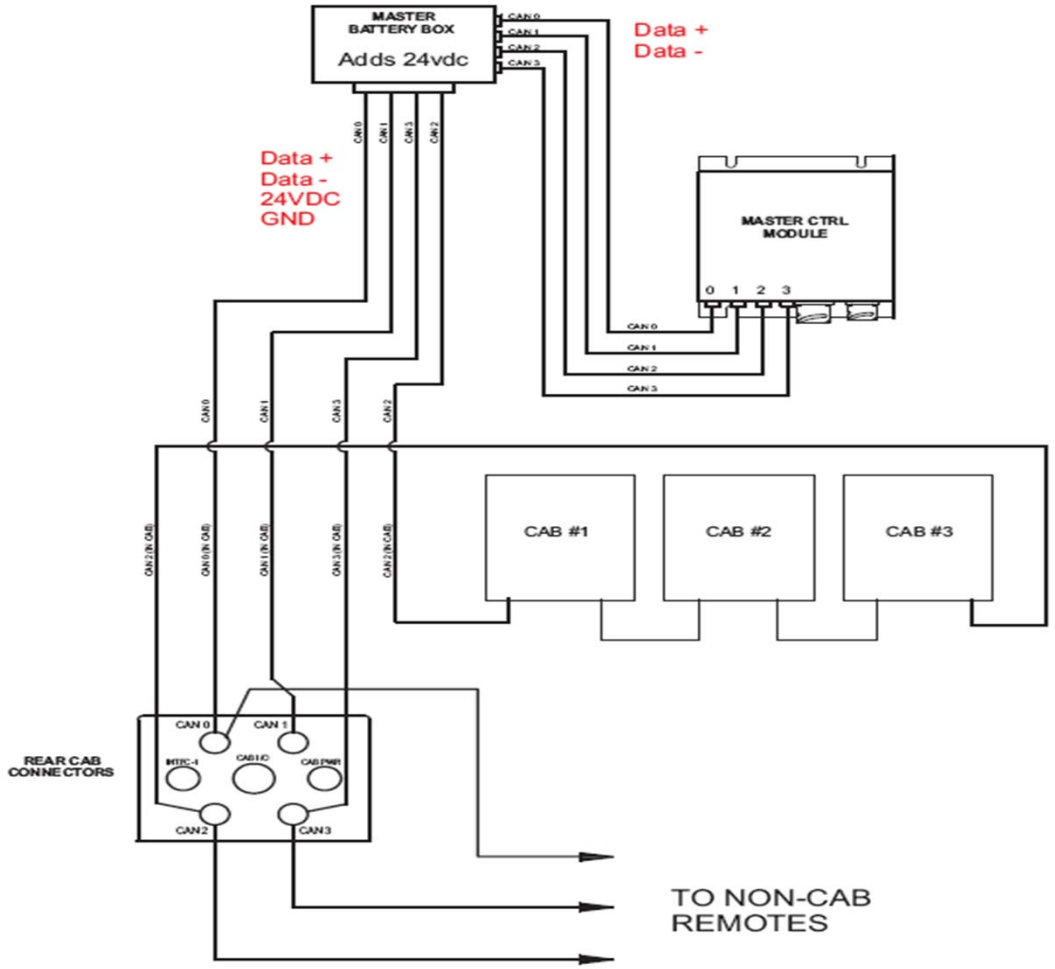


Pin	Function
A	Data +
B	Data -
C	Power Common
D	24V Digital Power

Figure 36. 4-PIN CAN BUS CONNECTOR TO RCM PINOUT

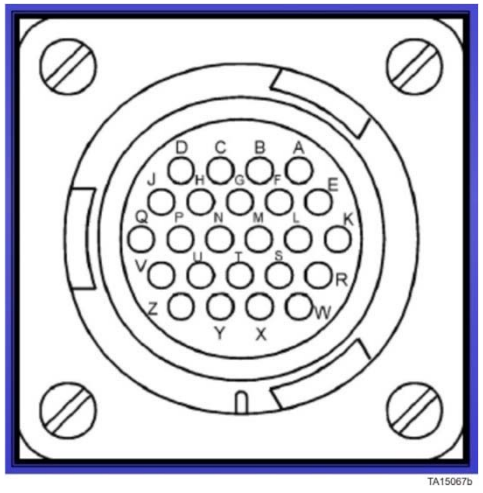
CAN BUS ROUTING –

Digital power and communication



RCM I/O CONNECTON –

Input and output

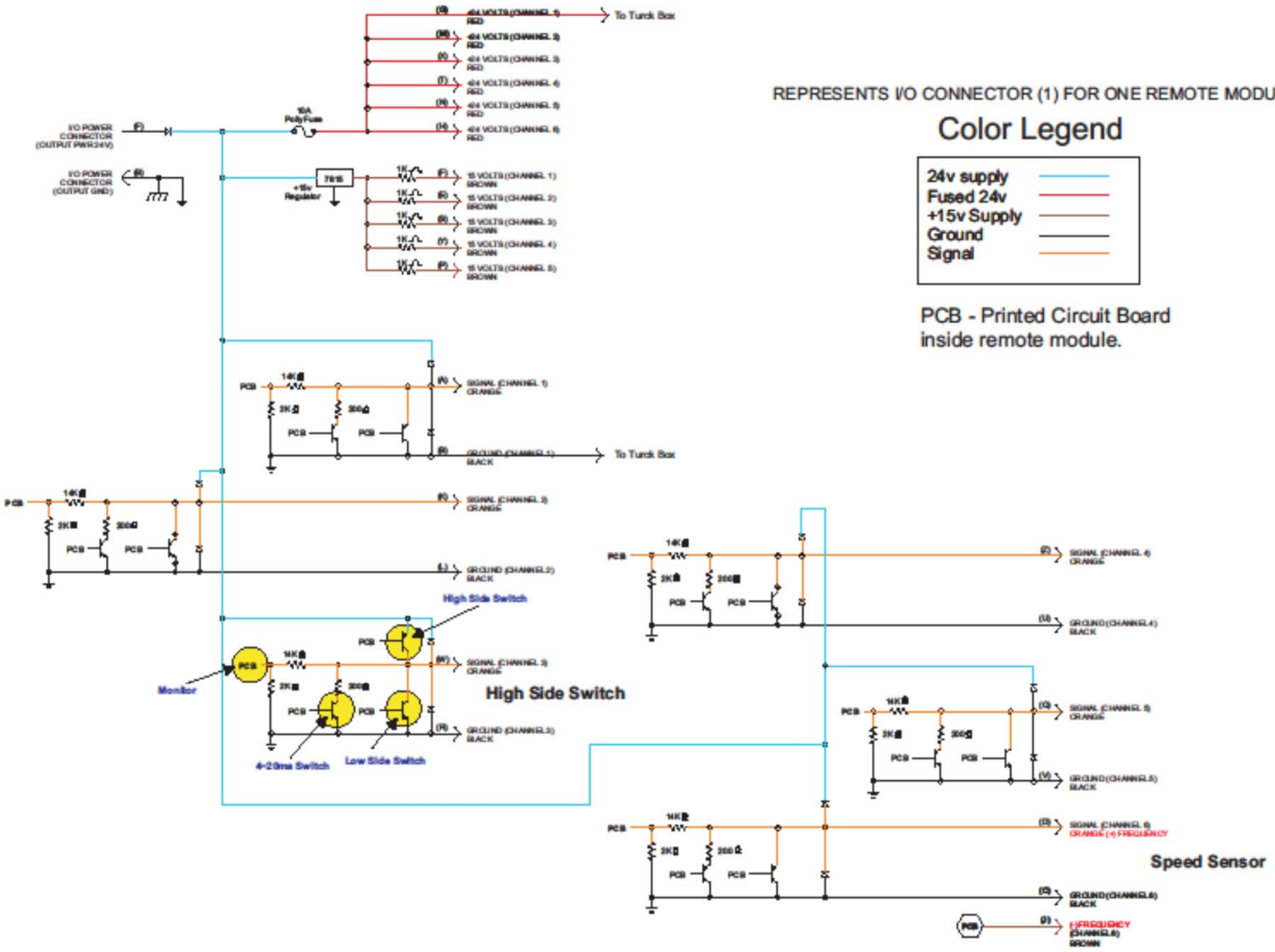


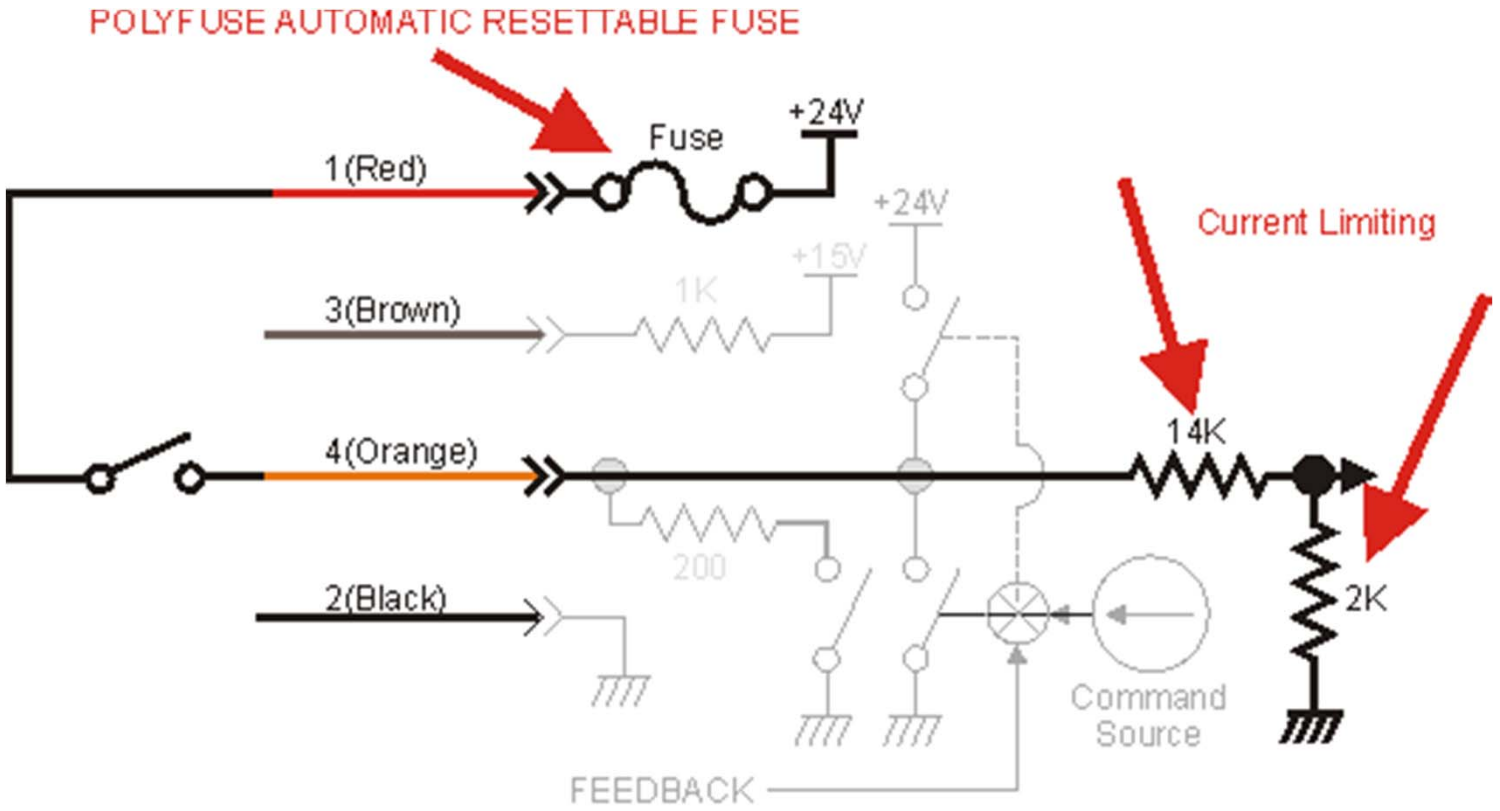
Remote Module Input/Output Connector to Pin Table							
Channel Function	Color Code	Connector Pin					
		Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6
+24 V	Red	G	M	X	T	N	H
GND	Black	B	L	R	U	V	C
+15 V	Brown	F	E	S	Y	P	J
Signal		A	K	W	Z	Q	D

Figure 24. REMOTE MODULE 24-PIN INPUT/OUTPUT CONNECTOR PINOUT (1-4)

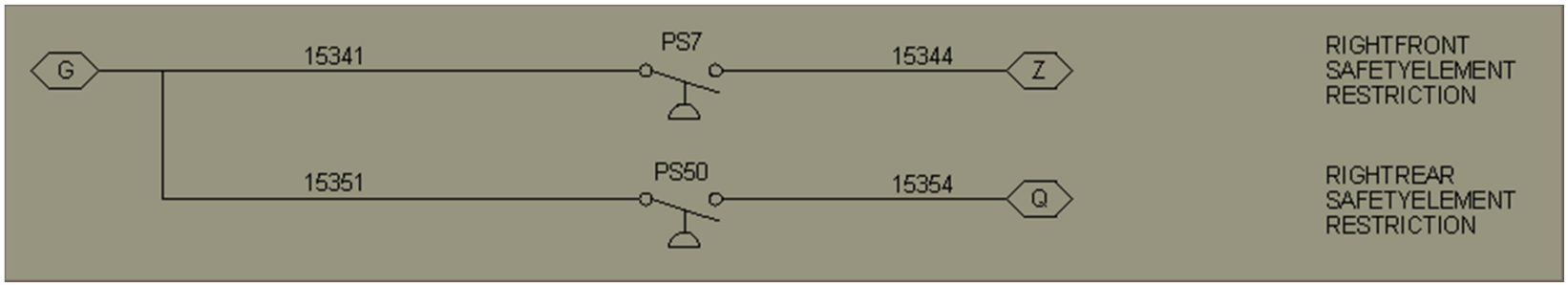
ON TURCK WIRED MACHINES
Pin “G” (24V) supplies all 6 ports of the TURCK box with 24 VDC
Pin “B” (Ground) supplies all 6 ports of the TURCK box with Ground

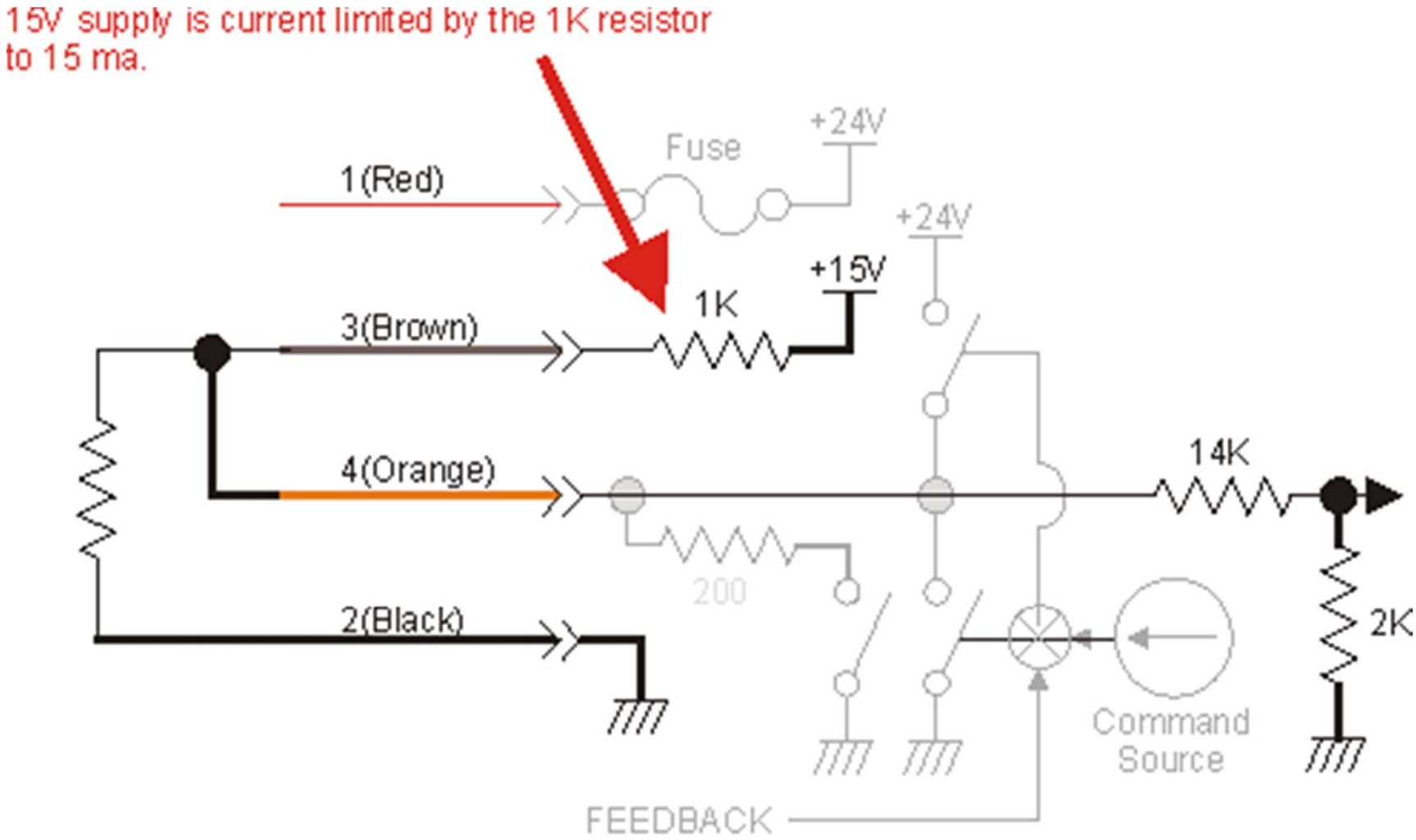
Non-TURCK wired machines


REPRESENTS I/O CONNECTOR (1) FOR ONE REMOTE MODULE
Color Legend
24v supply
Fused 24v
+15v Supply
Ground
Signal
PCB - Printed Circuit Board inside remote module.
To Turck Box
To Turck Box
High Side Switch
Monitor
High Side Switch
4-20ma Switch
Low Side Switch
Speed Sensor

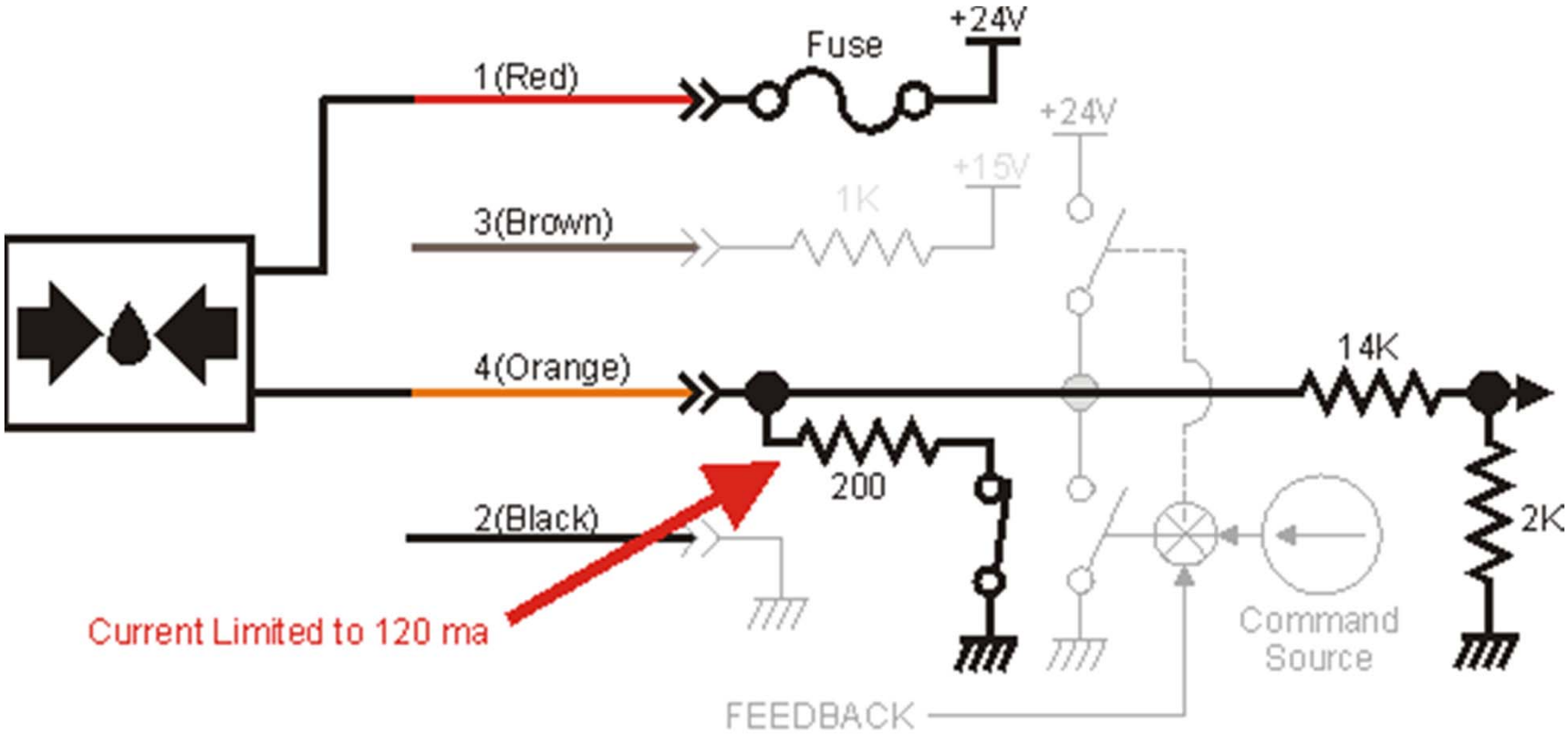


0-40 VDC Input - Generic Switch

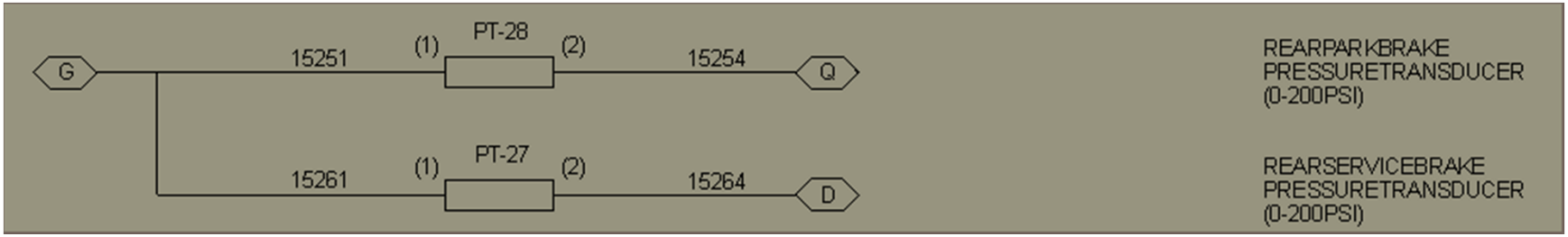


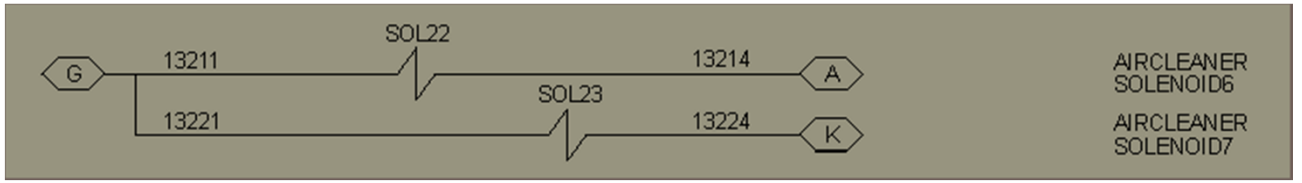


15V SUPPLY - CURRENT PROTECTION

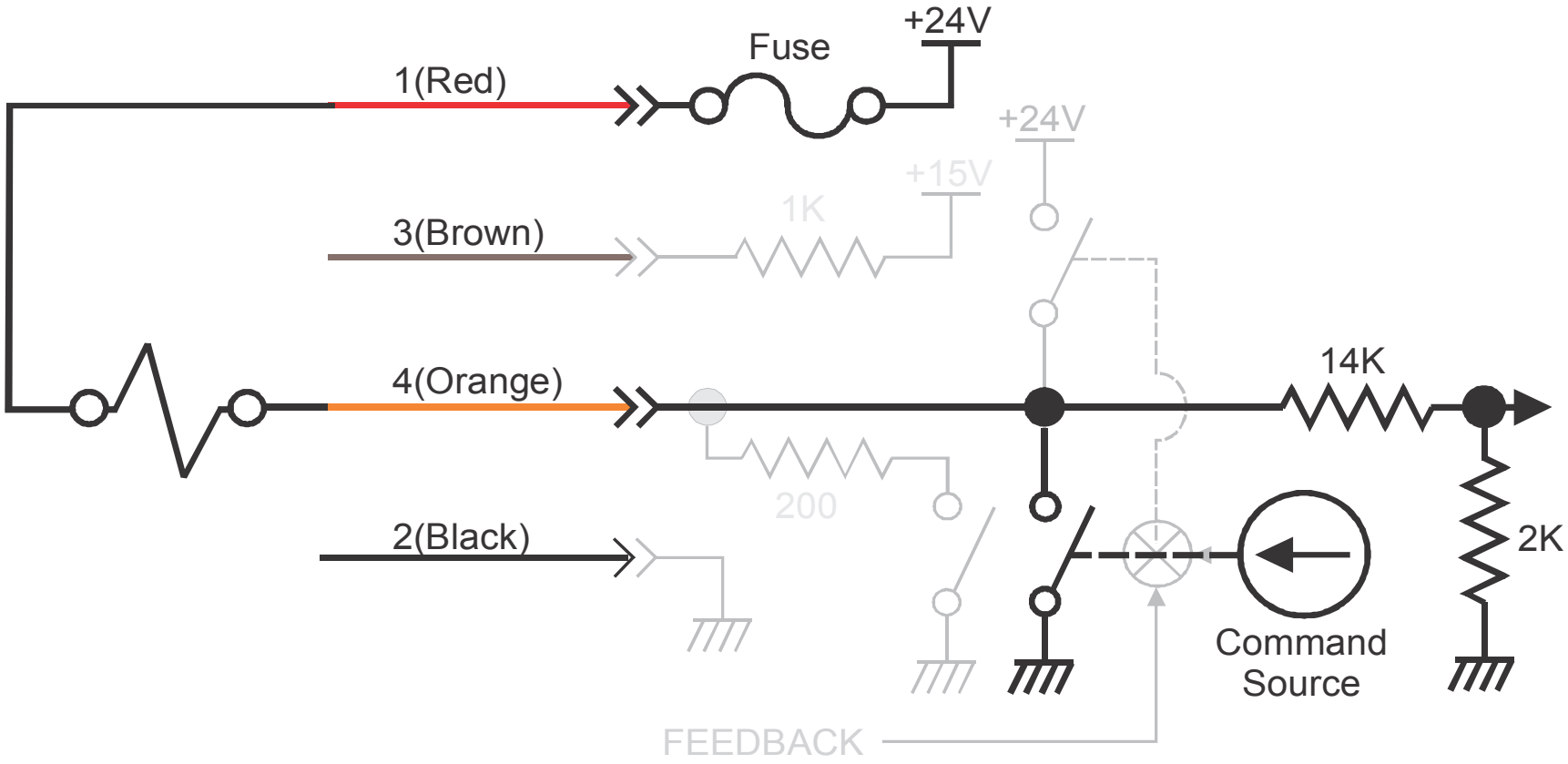


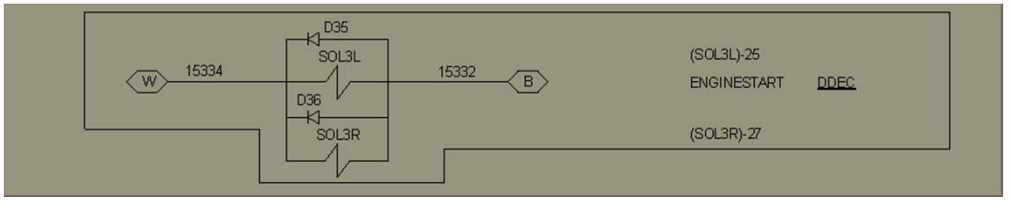
4-20MA TRANSDUCERS - CURRENT PROTECTION



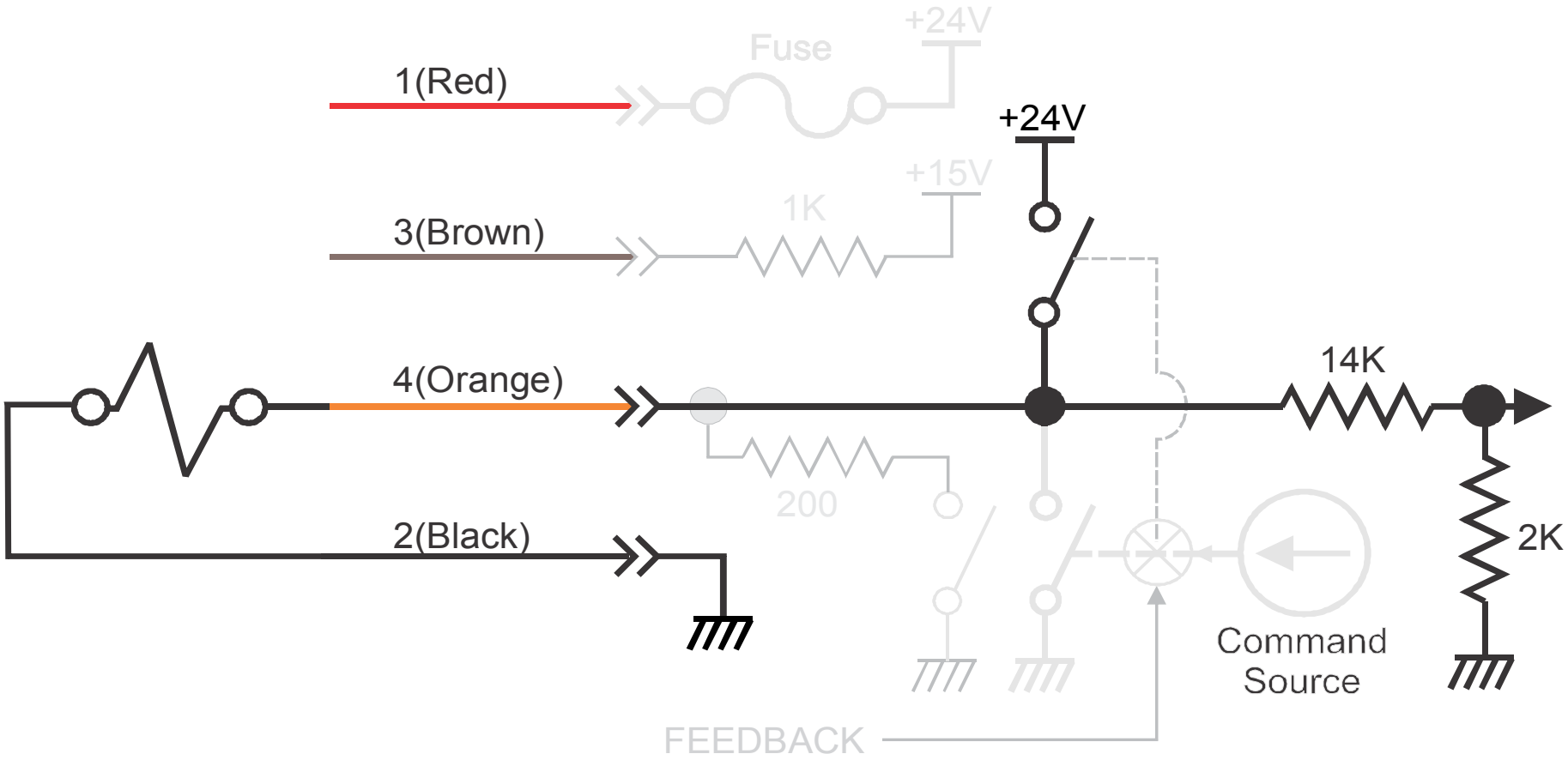


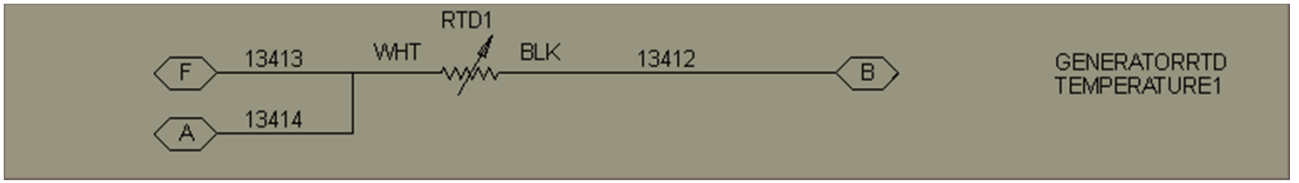
Low side switch output - variable duty cycle
Solenoid load
Action: Turn solenoid on and off or modulate



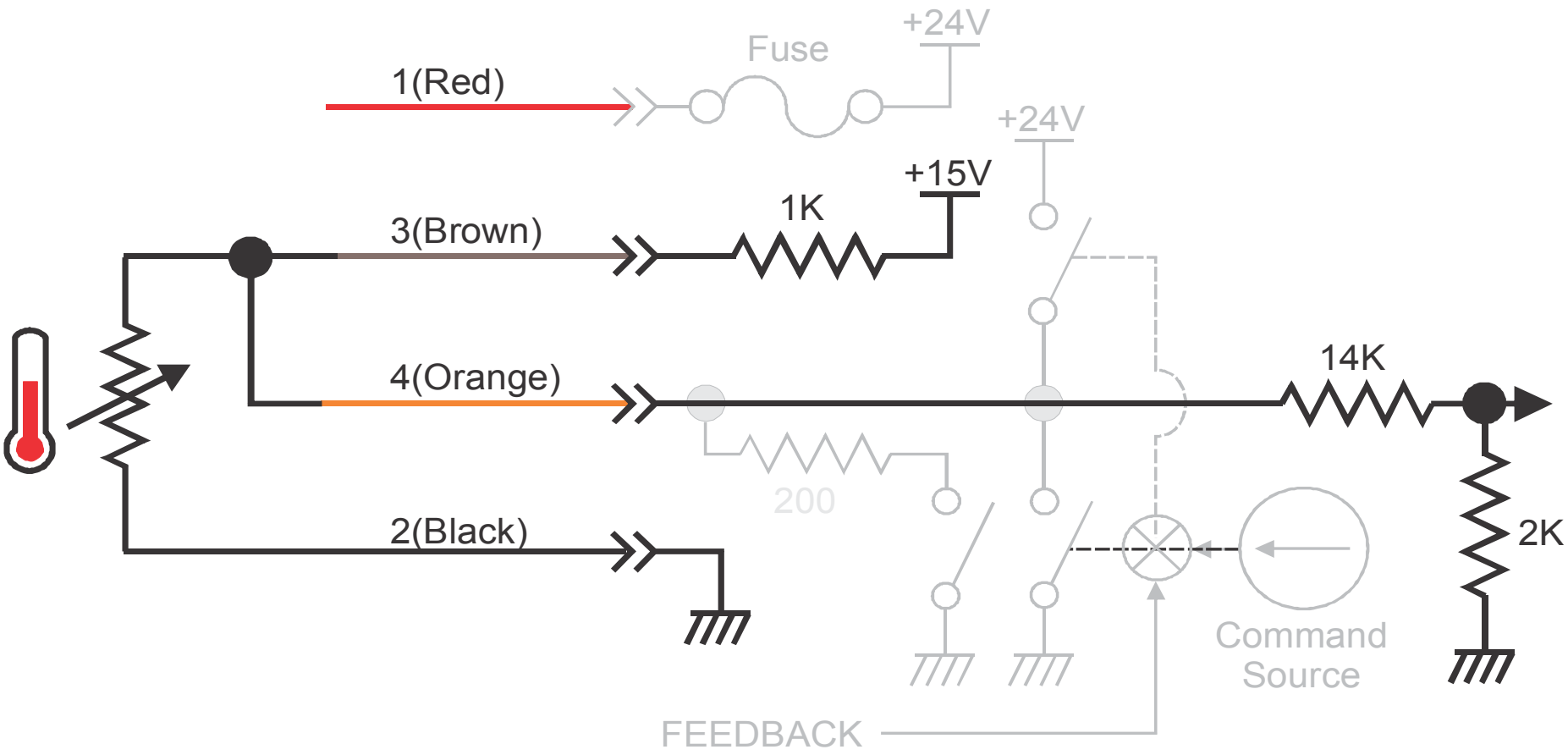


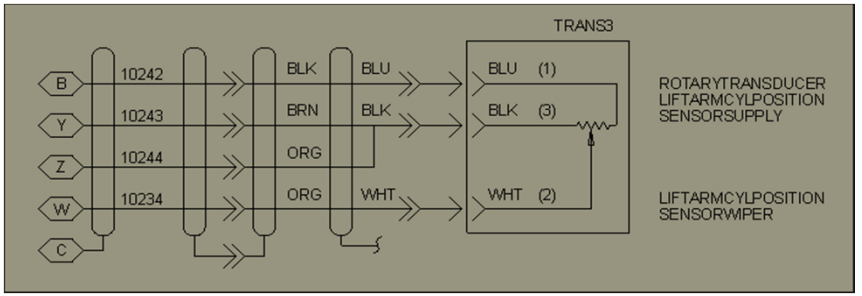
High side switch output - variable duty cycle
Solenoid load
Action: Turn solenoid on and off or modulate



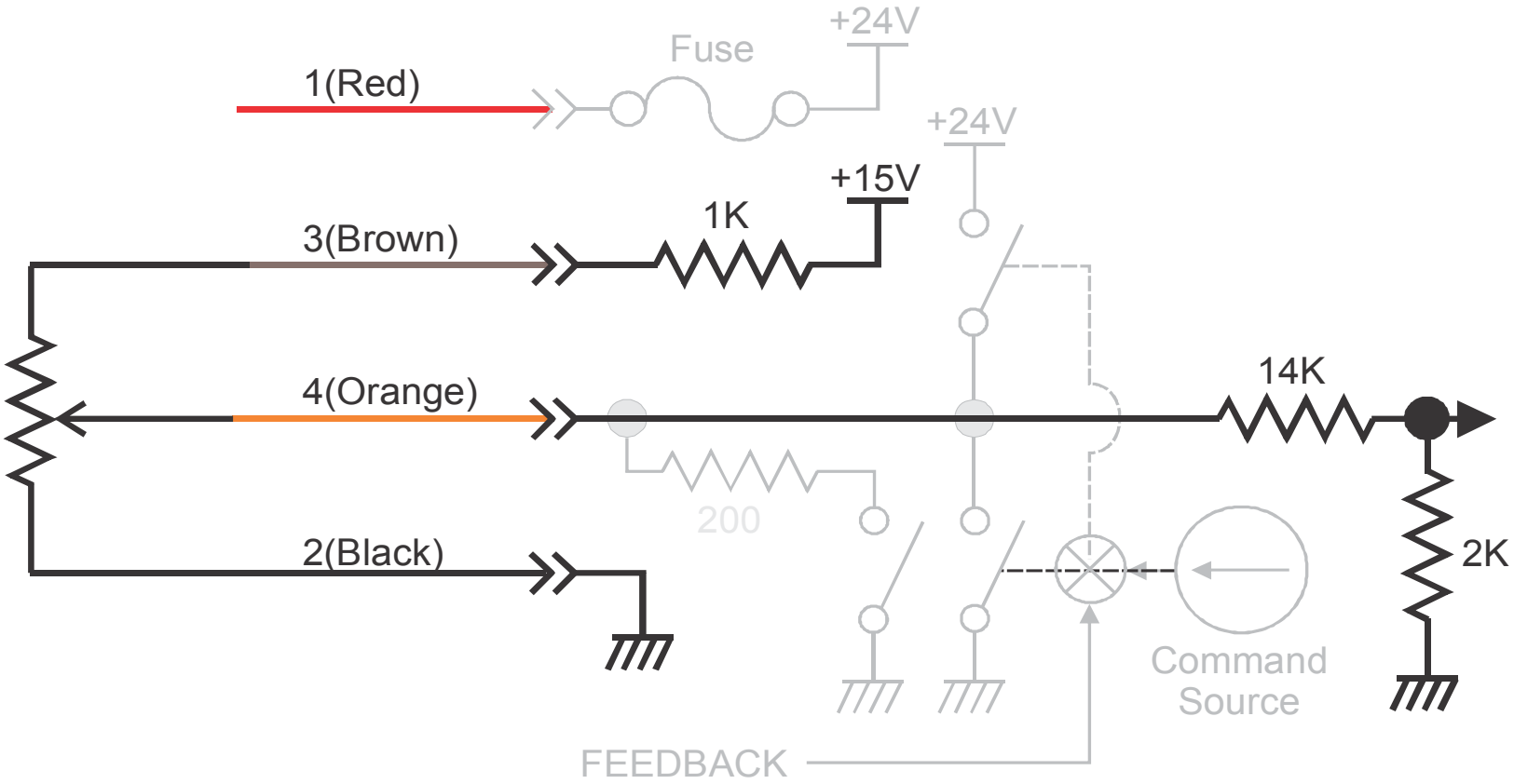


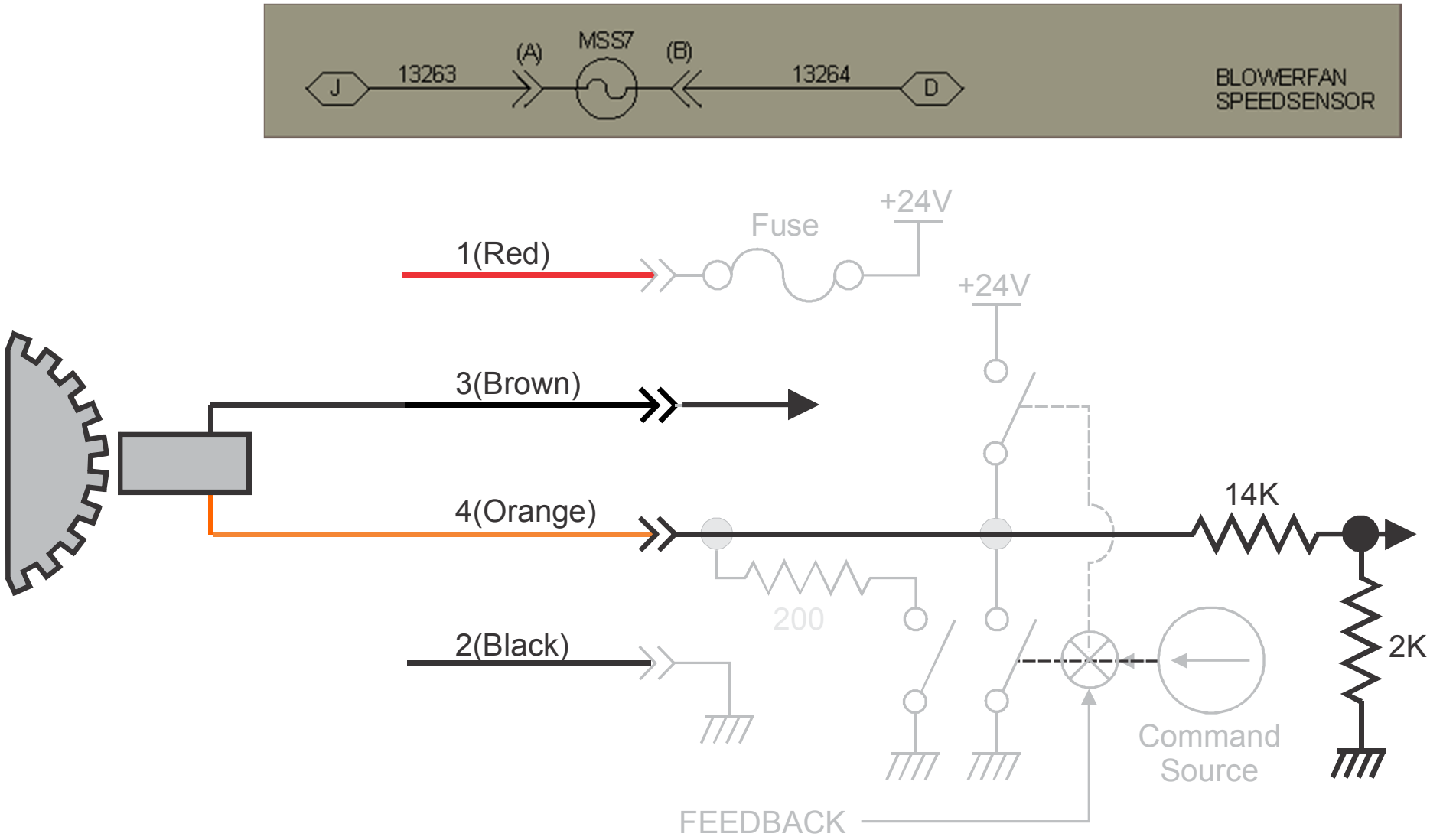
0-5VDC input
Temperature sender (such as engine temperture)
RTD type





0-10VDC input
Potentiometer wiper
Linear or rotorary position indicator



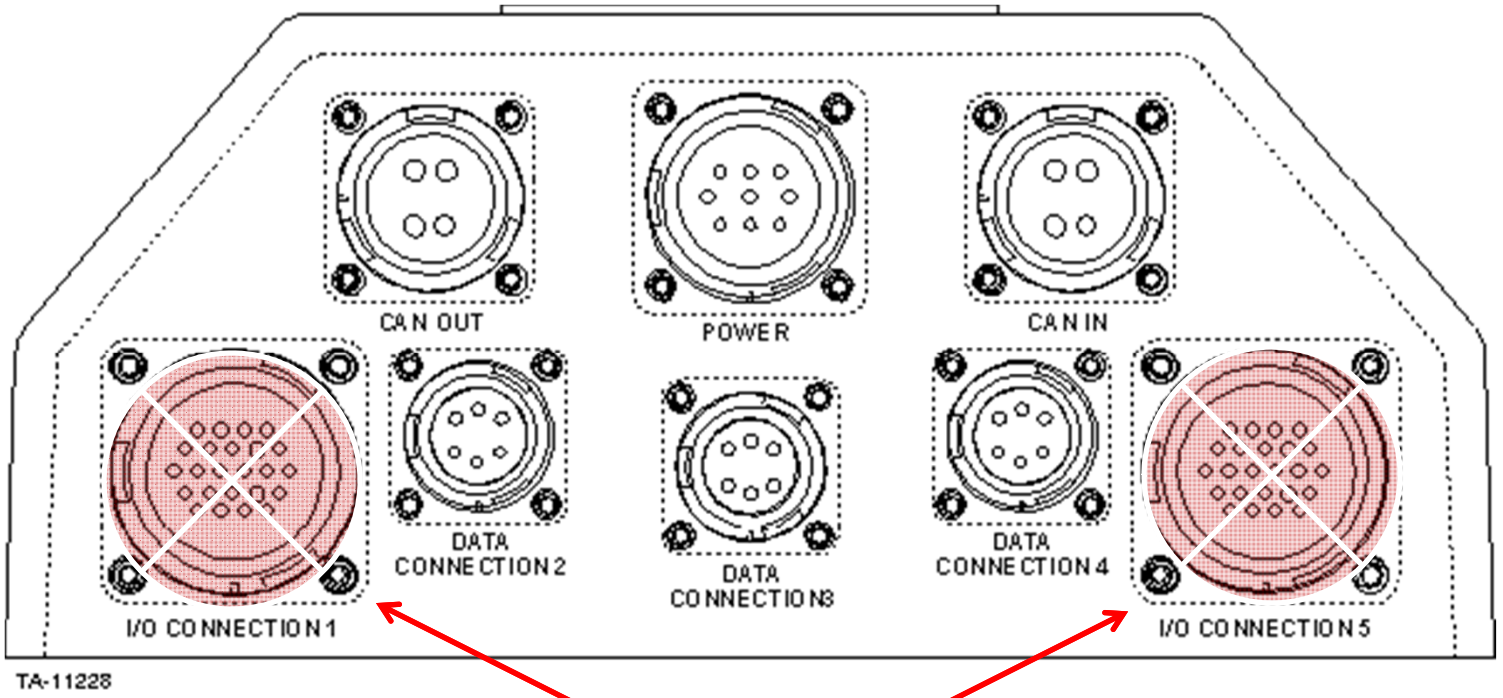

J
13263
(A)
MSS7
(B)
13264
D
BLOWERFAN
SPEEDSENSOR
+24V
Fuse
1(Red)
+24V
3(Brown)
4(Orange)
14K
200
2K
2(Black)
Command
Source
FEEDBACK

REMOTE INTERFACE CARD –

Controller # 1-3

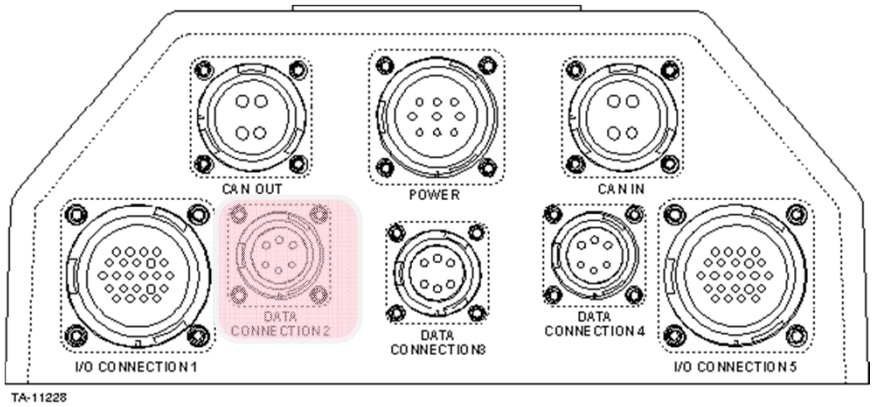
TRANSLATOR MODULE

Similar to RCM – Dedicated to communications to / from Engine ECM
Not interchangeable with Standard Remote

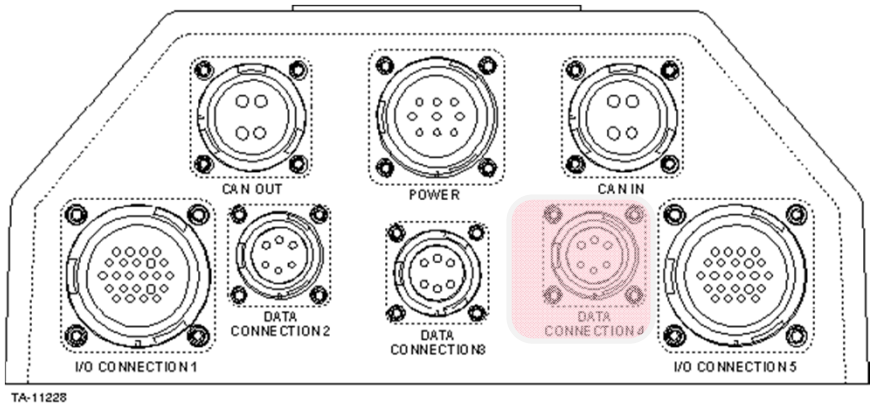


TRANSLATOR DATA CONNECTORS

Detroit Diesel – RPM commanded by Engine RCM



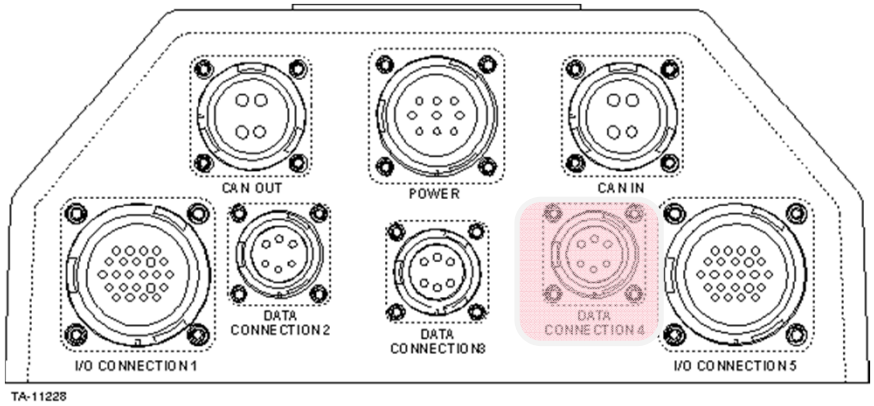
Detroit Diesel
Tier I



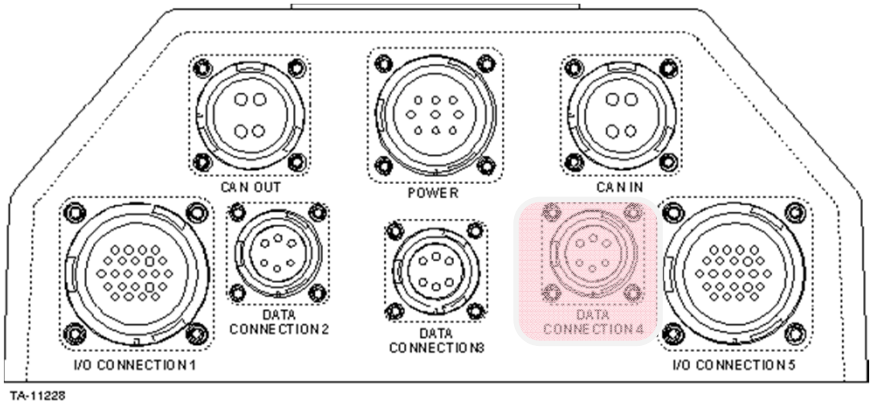
Detroit Diesel
Tier II

TRANSLATOR DATA CONNECTORS

Cummins – RPM commanded by Translator via J1939 bus



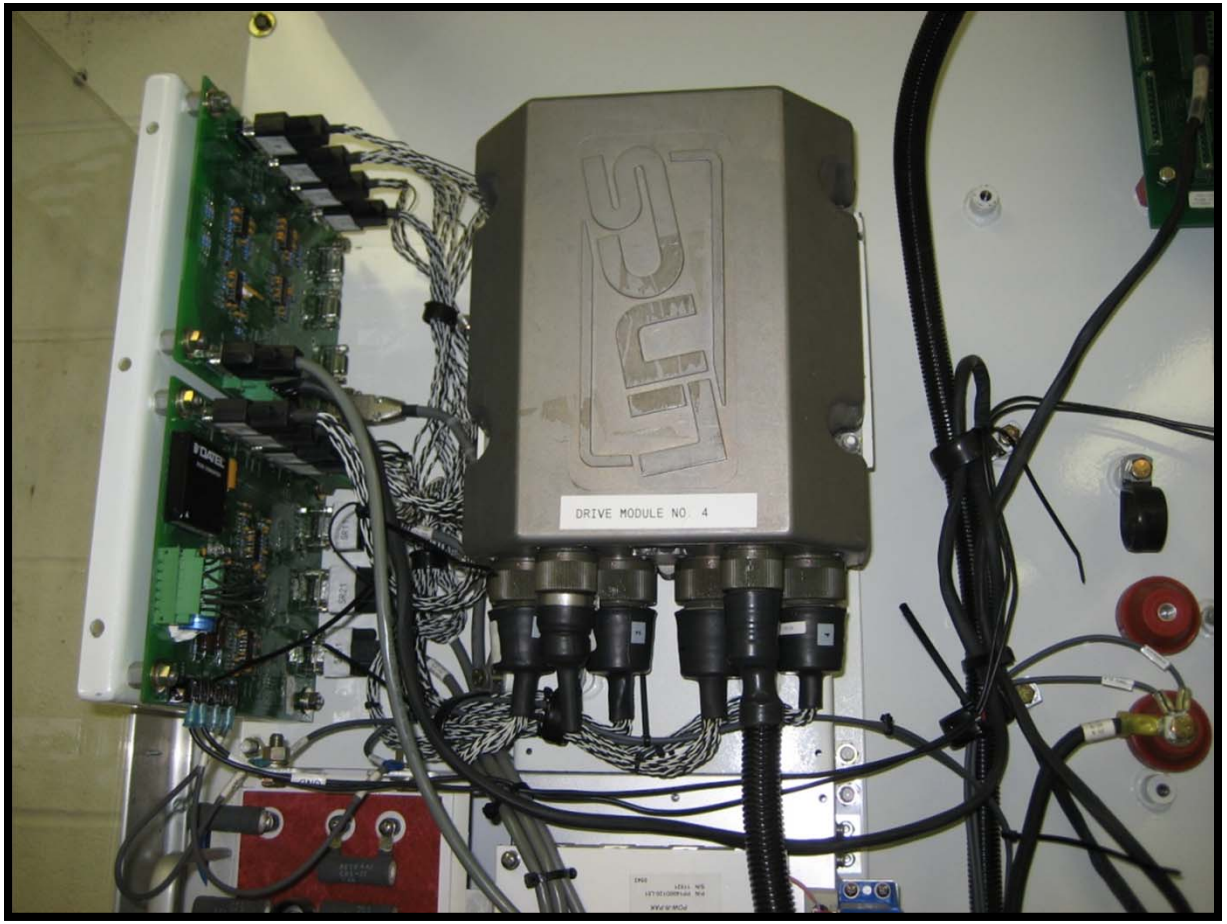
Cummins Tier I



Cummins Tier II

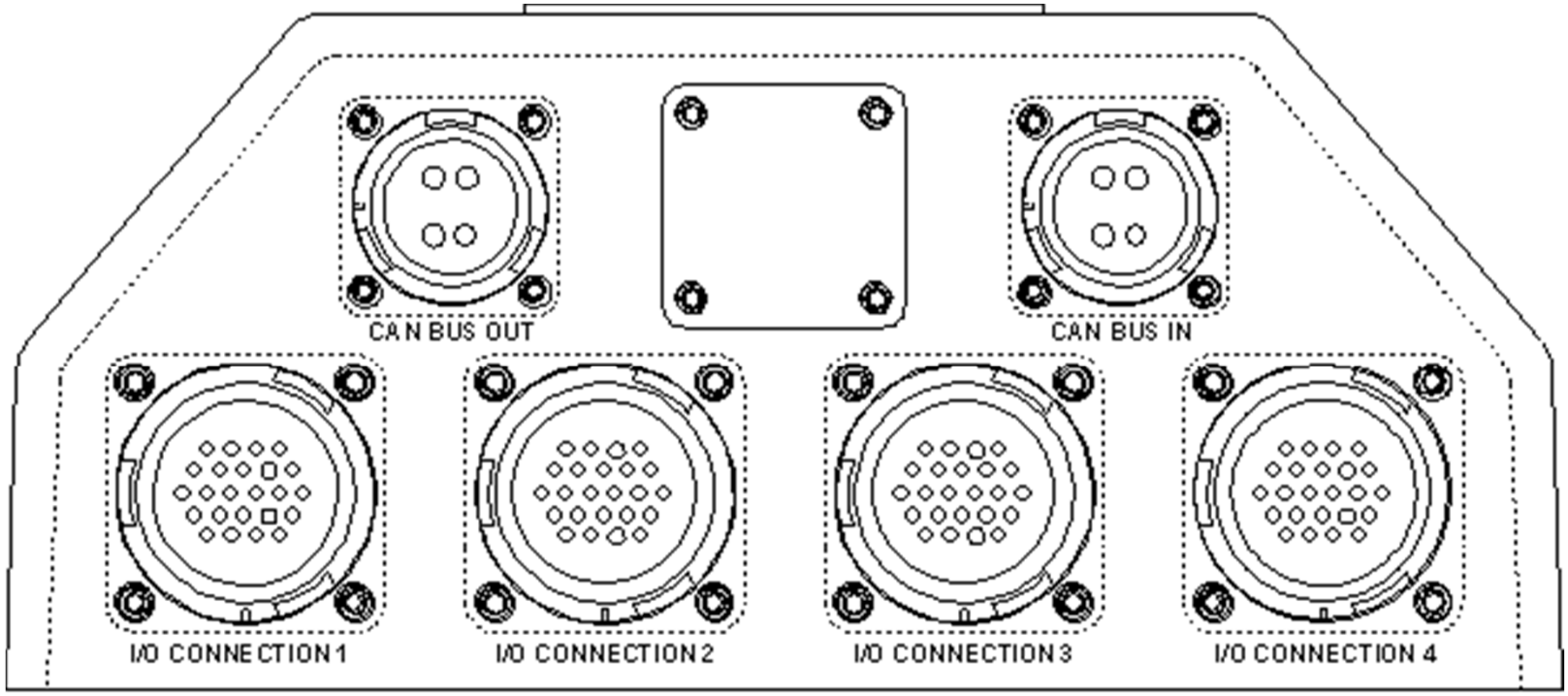
DRIVE MODULE (SR DRIVE)

Contains hardware and software needed to run an SR motor and drive

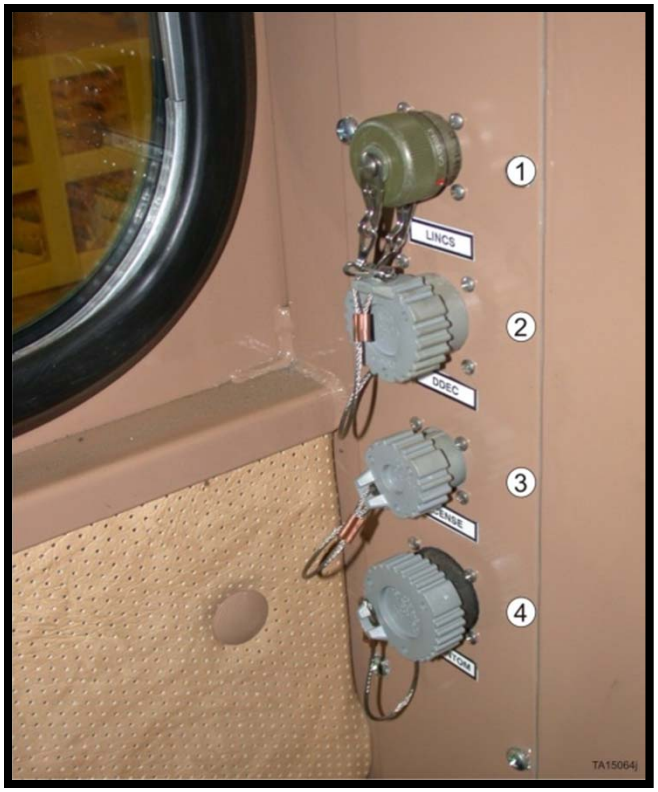


DRIVE MODULE (SR DRIVE)

Contains hardware and software to run an SR motor and drive



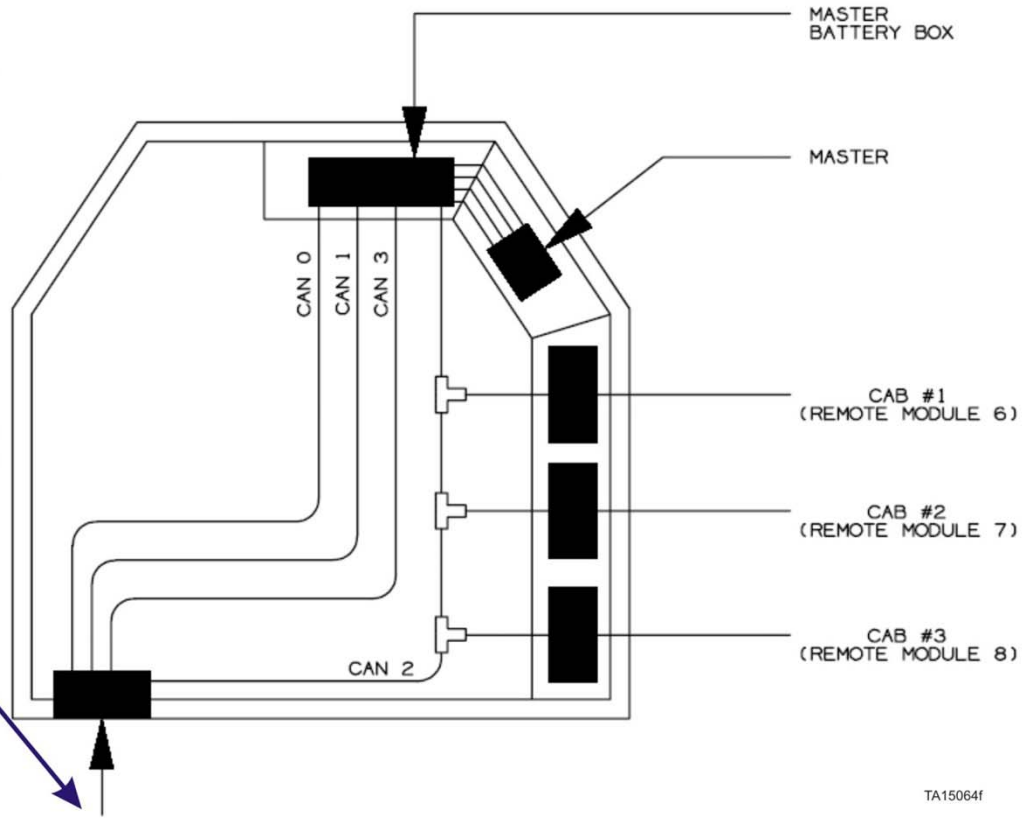
SERVICE TOOL CONNECTOR



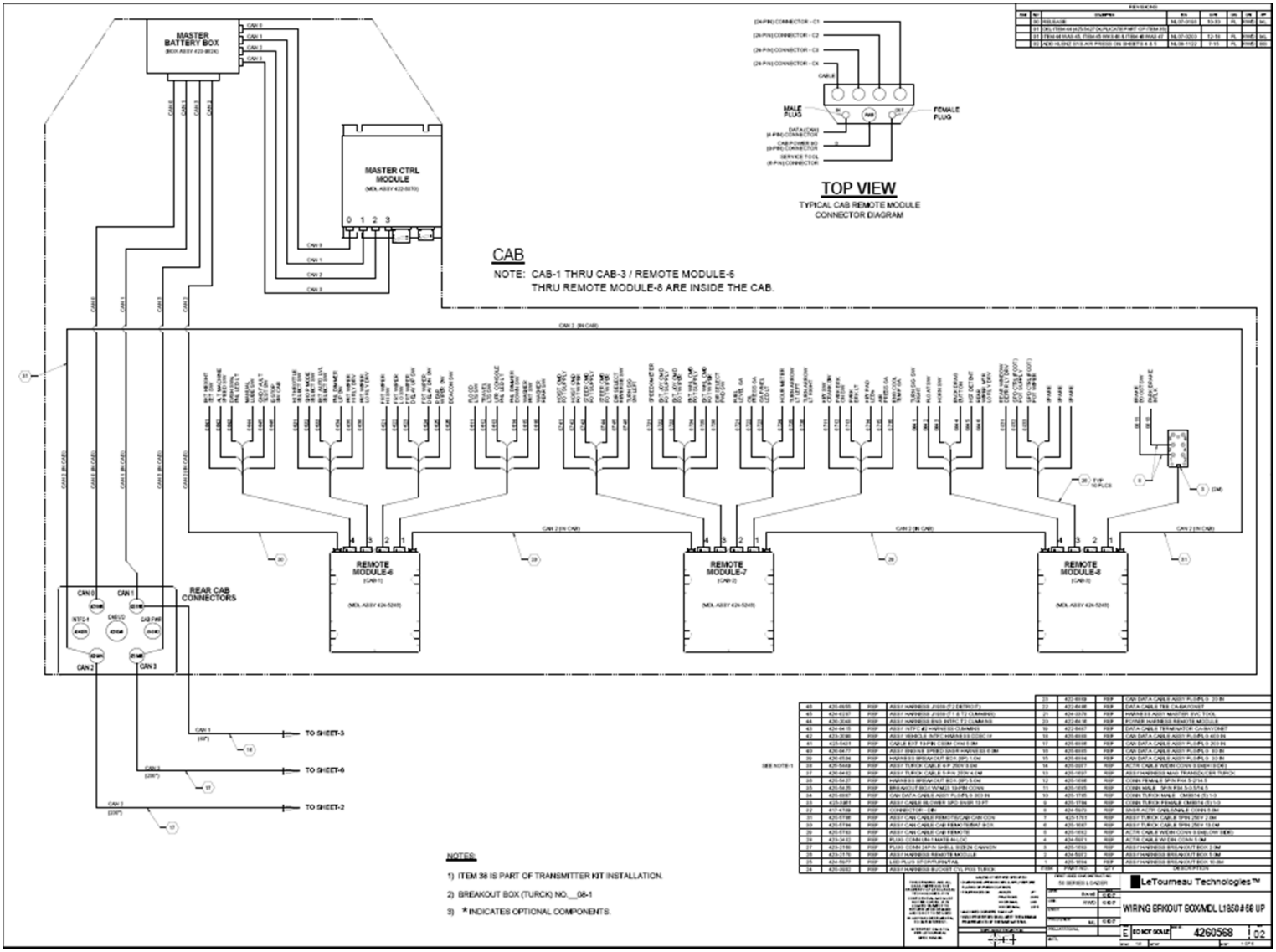
(MOUNTED ON REAR CAB WALL)	
1.	SERVICE TOOL
2.	DDEC READER PORT
3.	CUMMINS ECM CENSE PORT
4.	CUMMINS ECM QUANTUM PORT

Figure 43. DIAGNOSTIC DATA PORTS

CAN BUS LAYOUT (CAB)



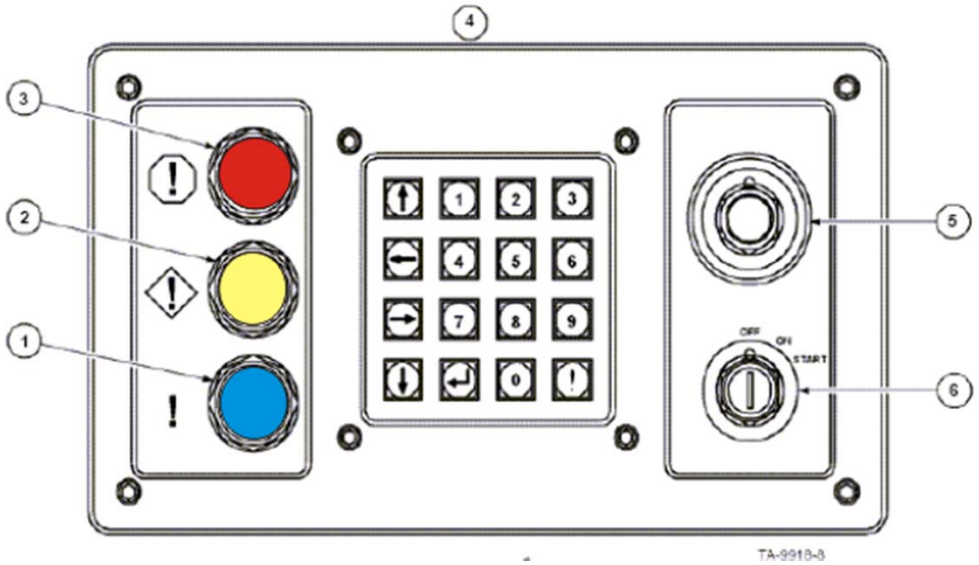
CAB CONNECTIONS



JOYGLOBAL

KEYPAD / INDICATOR PANEL

Keypad is main operator input – Used to acknowledge and navigate
Lights inform operator of active problem(s)



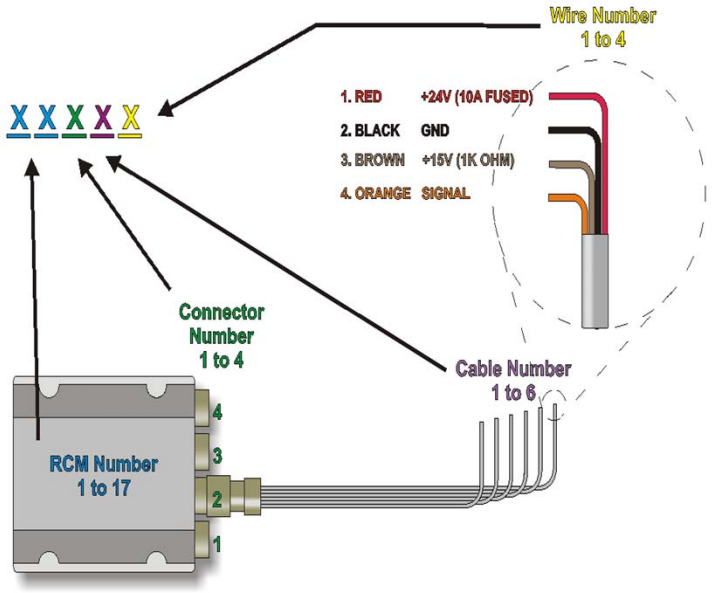
1.	PM ALERT LIGHT (BLUE)
2.	WARNING LIGHT (AMBER)
3.	ALARM LIGHT (RED)
4.	KEYPAD
5.	PARK BRAKE CONTROL
6.	KEY SWITCH

Figure 44. LINCS V1.2 KEYPAD AND WARNING LIGHTS PANEL

INTERFACE CABLING

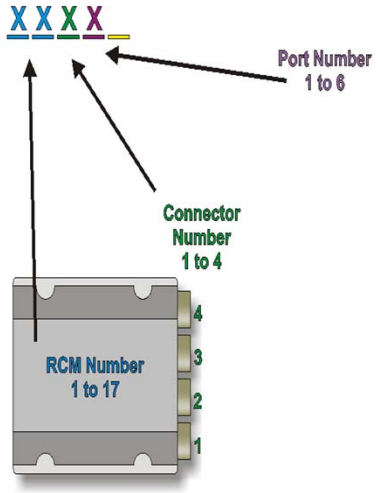
Old Style

LINCS Wiring System

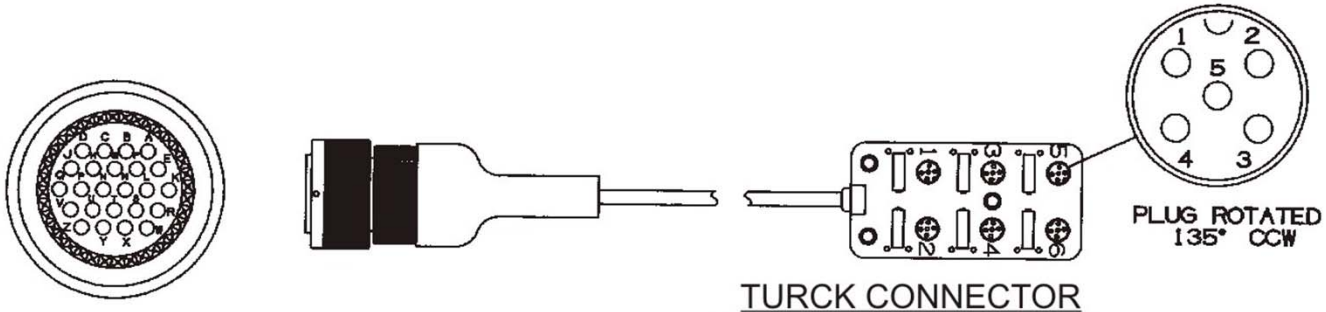


New Style

LINCS Wiring System



TURCK BOX



P/N 125-5840-03
CONNECTOR
(24-PIN)

TURCK CONNECTOR
PIN/WIRE COLOR CODE

Wire #	PIN	4/C W/SHLD	INDICATES
1	1	RED	24V
4	2	ORANGE	SIGNAL
2	3	BLACK	GROUND
3	4	BROWN	+15V

TURCK BOX PLUG #

PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6		
							TURCK CONN PIN #
G	G	G	G	G	G	24VDC	1
A	K	W	Z	Q	D	SIGNAL	2
B	B	B	B	B	B	GND	3
F	E	S	Y	P	-	15VDC	4
C	C	C	C	C	C	SHIELD	5
-	-	-	-	-	J	FREQ. RETURN	4

TA10564-v1

TURCK CABLES

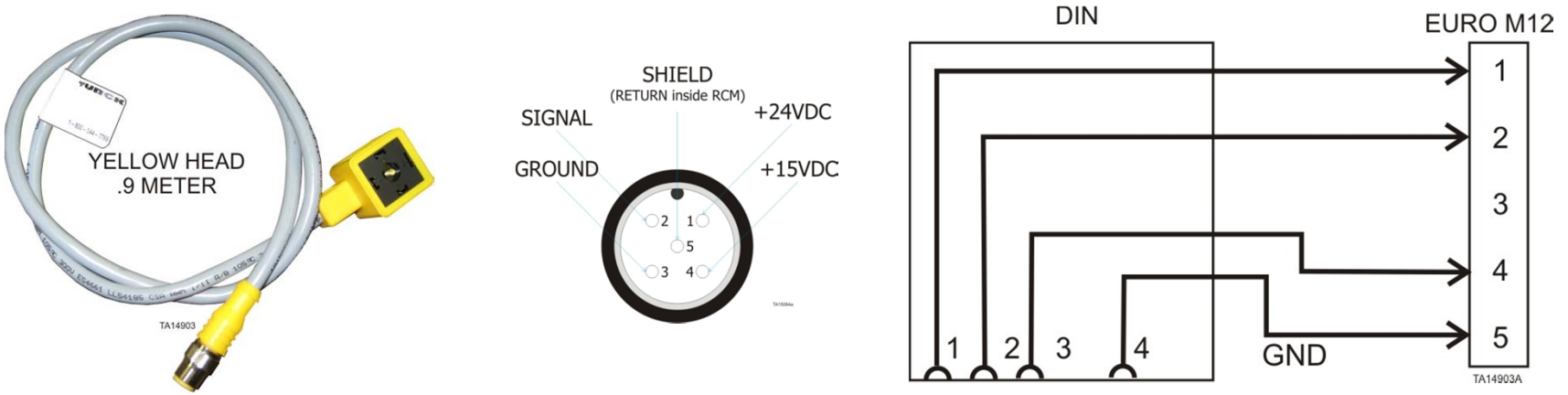


FIGURE 48. 425-1682 TURCK DIN CABLE – STRAIGHT THROUGH CONNECTIONS - .9 METER HAS YELLOW HEAD

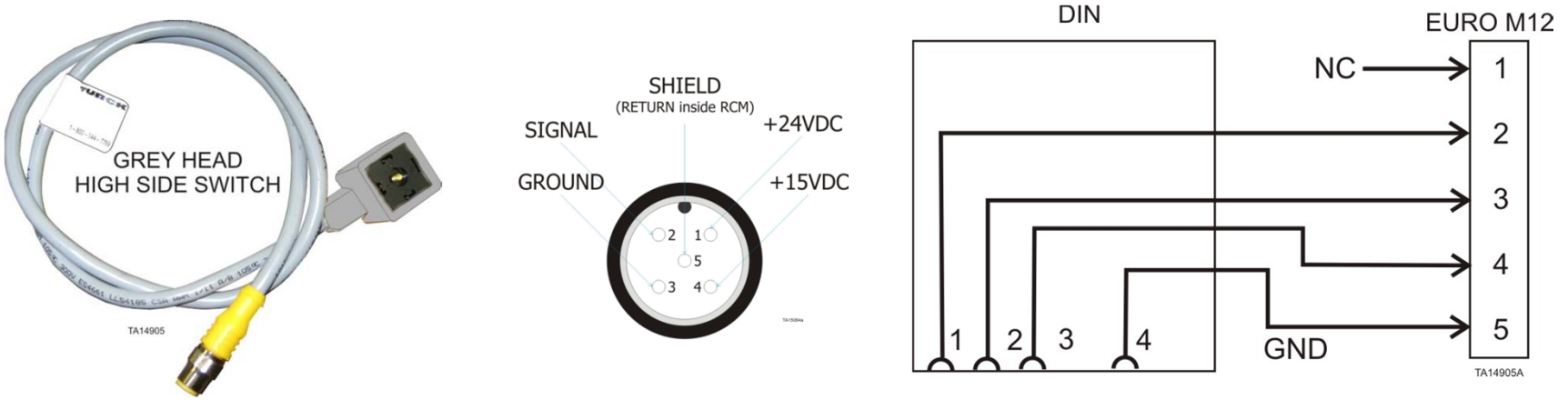


FIGURE 50. P/N 425-3977 TURCK DIN CABLE – CROSSOVER FOR HIGH SIDE SWITCH - .9 METER HAS GRAY HEAD

TURCK CABLES

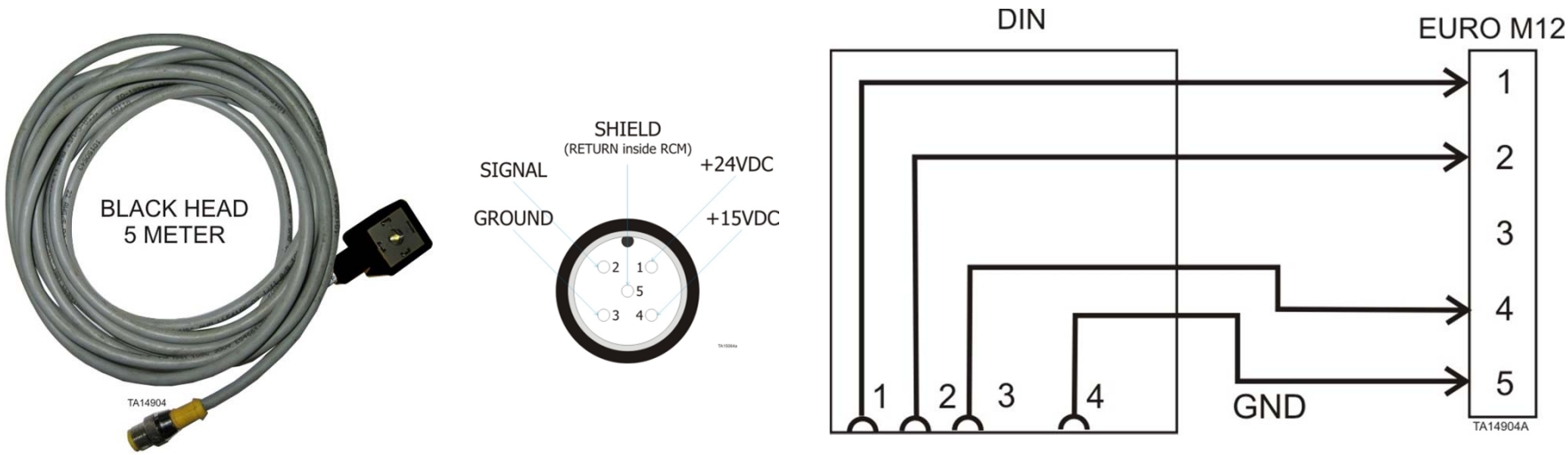
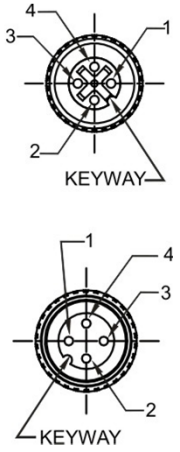


FIGURE 49. 424-5971 TURCK DIN CABLE – STRAIGHT THROUGH CONNECTIONS - 5 METER HAS BLACK HEAD

TURCK CABLES



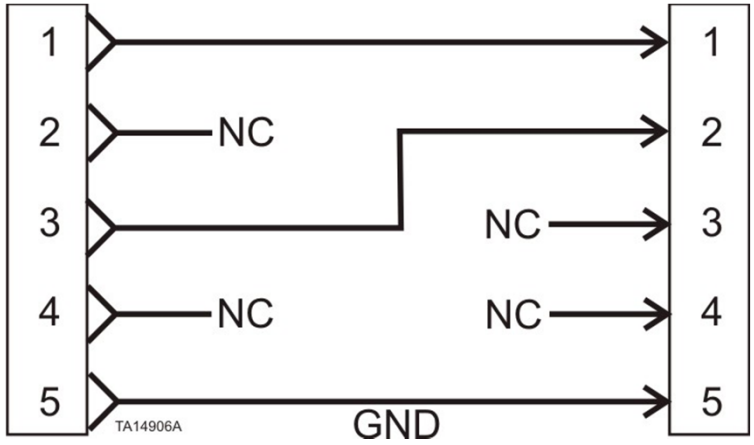
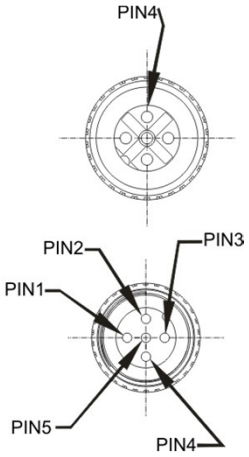


FIGURE 52. CROSSOVER CABLE 425-5449 .9 METER REQUIRED WITH EURO TYPE TRANSDUCER (IDENTIFIED BY BLUE BOOT)

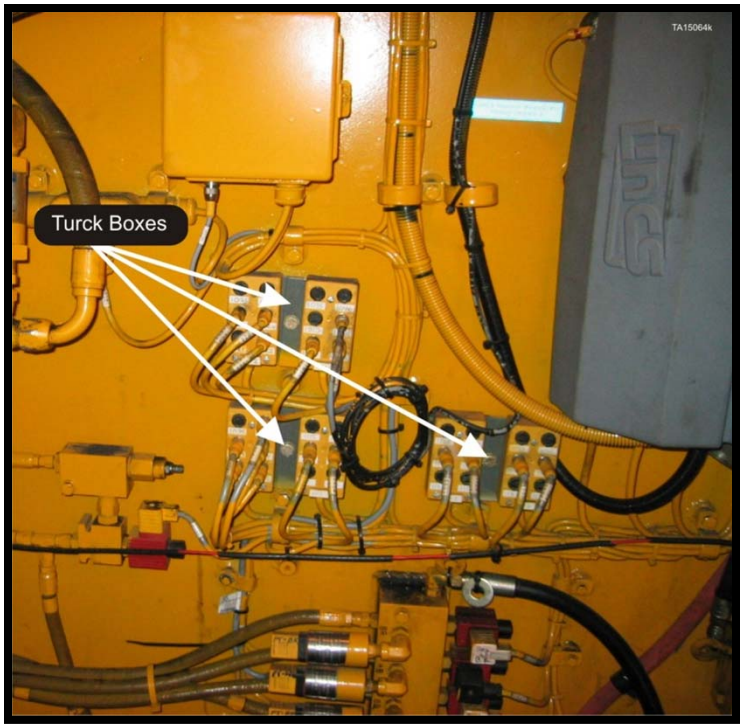


425-1781 2 meter
425-1687 10 meter

Figure 53. STRAIGHT THROUGH EURO EXTENSION CABLE

TURCK BOX

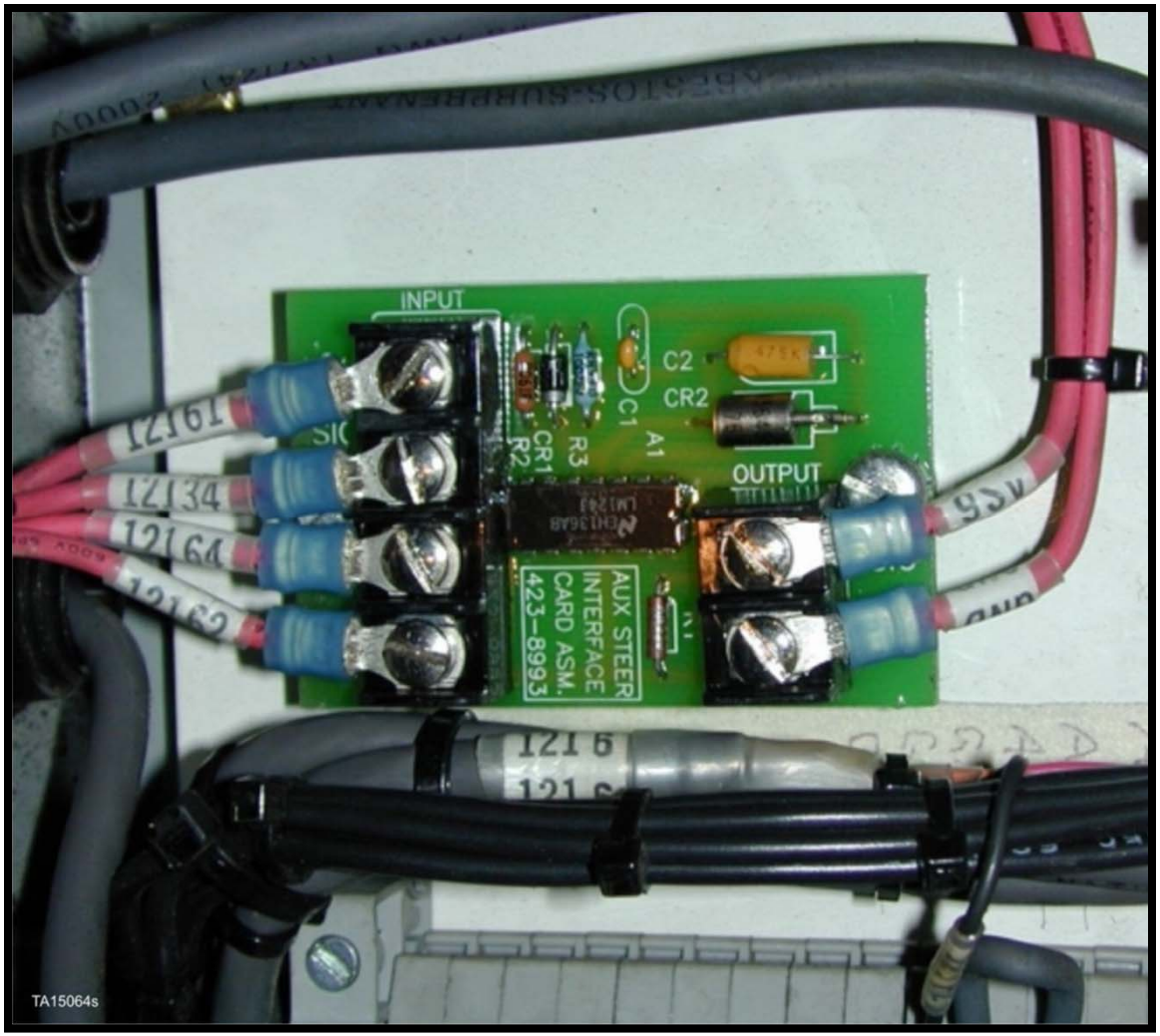
Each box provides 6 I/O connections – Easily replaced without excessive wiring – Interchangeable for troubleshooting



TA14913

STEERING INTERFACE CARD

Converts PWM output from Remote to a clean DC voltage required by PVG32



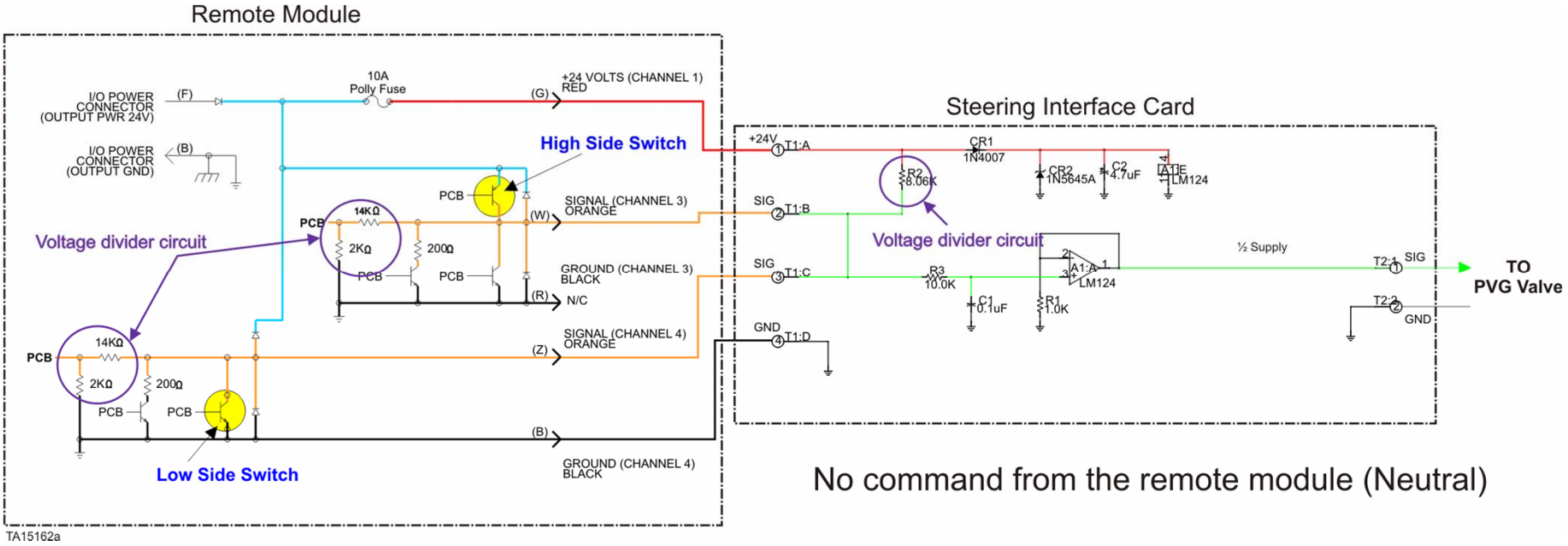


Figure 66. INTERFACE CARD OPERATION (1 of 3)

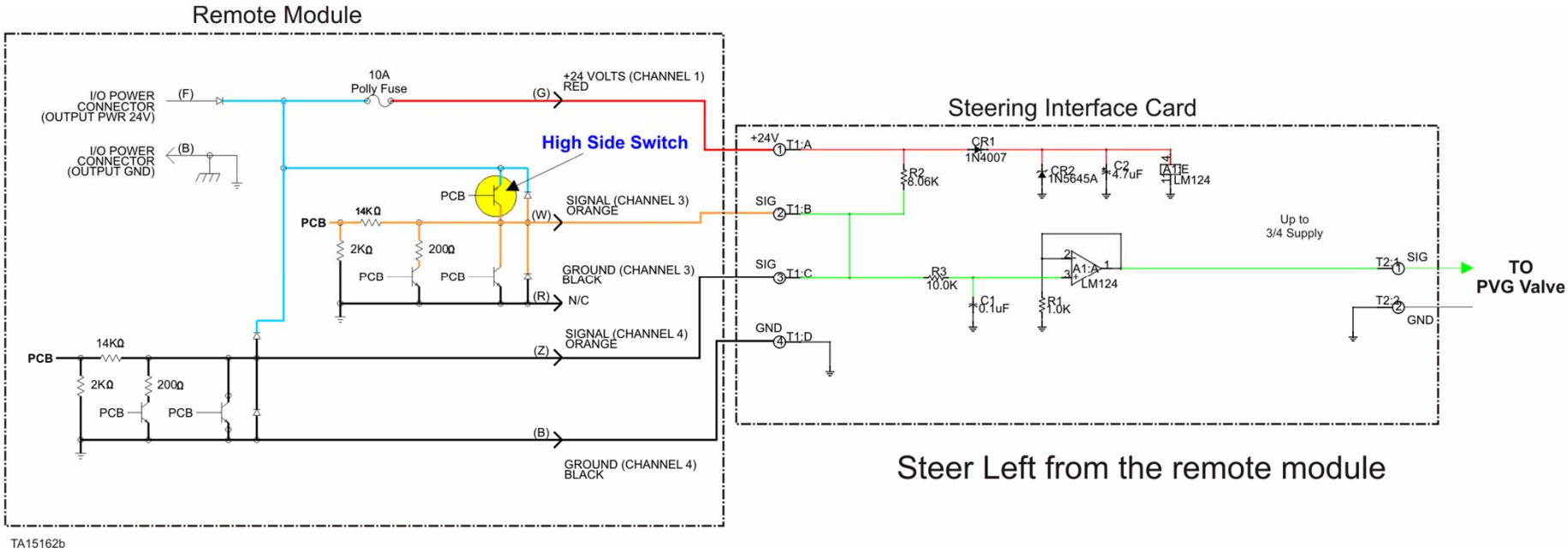


Figure 66. INTERFACE CARD OPERATION (2 of 3)

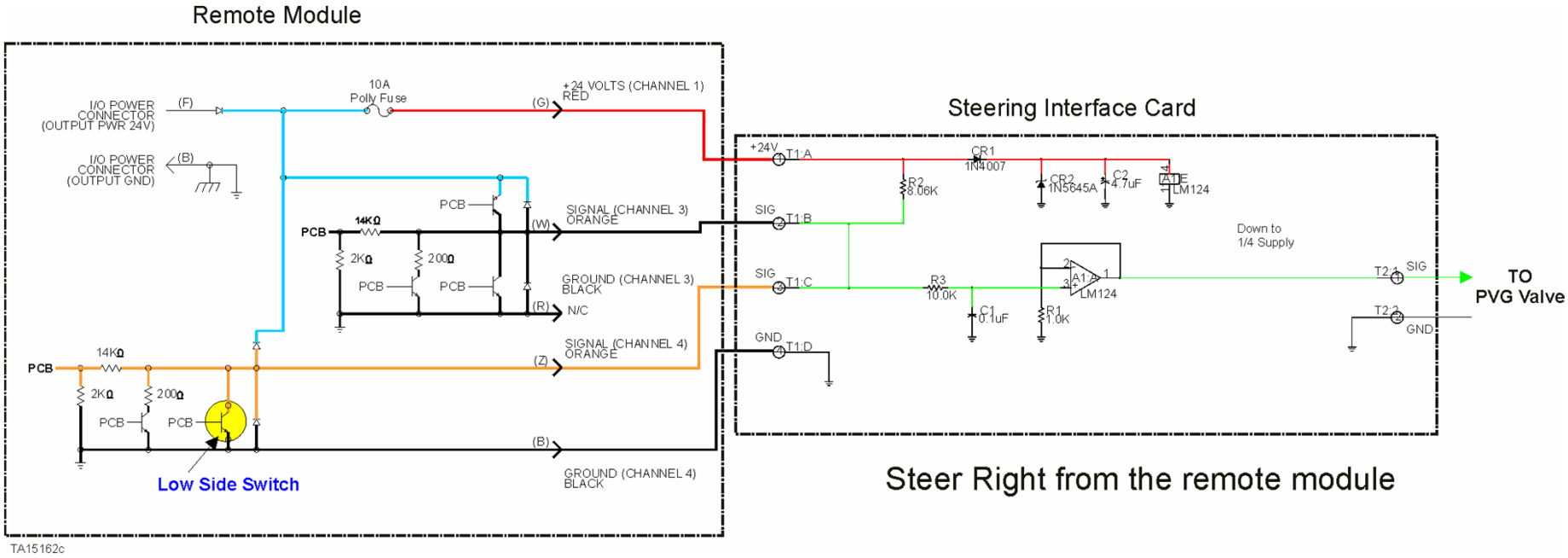
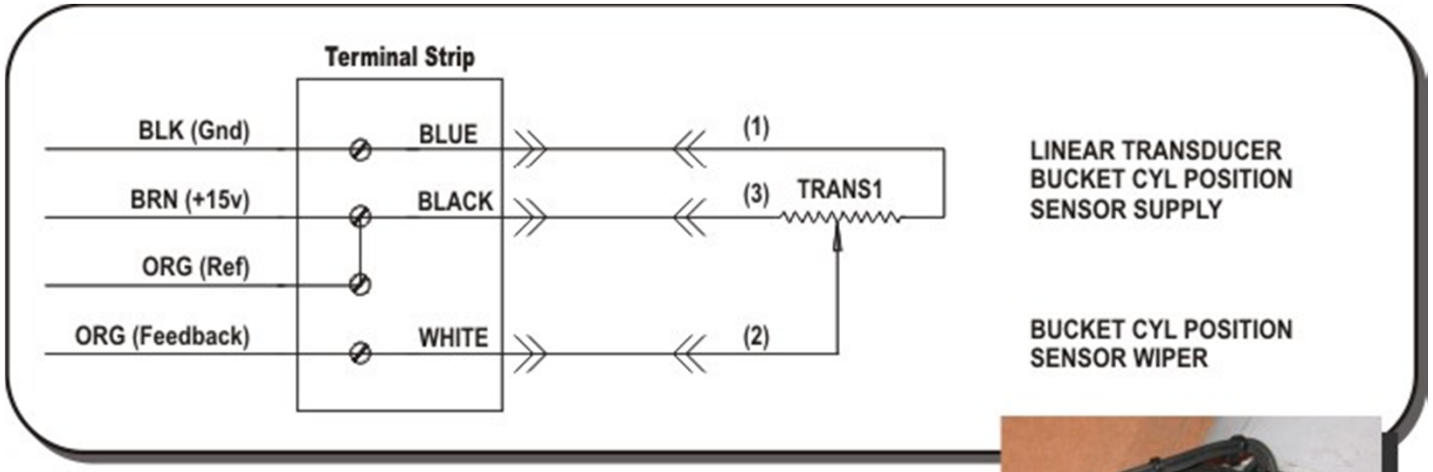


Figure 66. INTERFACE CARD OPERATION (3 of 3)

ROTARY POTENTIOMETER

Position feedback for Lift Arm, Steering, and Bucket
Current production design



TA15064L

LINEAR TRANSDUCER

Used for Steering and Bell Crank functions on early machines.

PRESSURE TRANSDUCER

Different pressure ratings – Water resistant design

PRESSURE TRANSDUCER

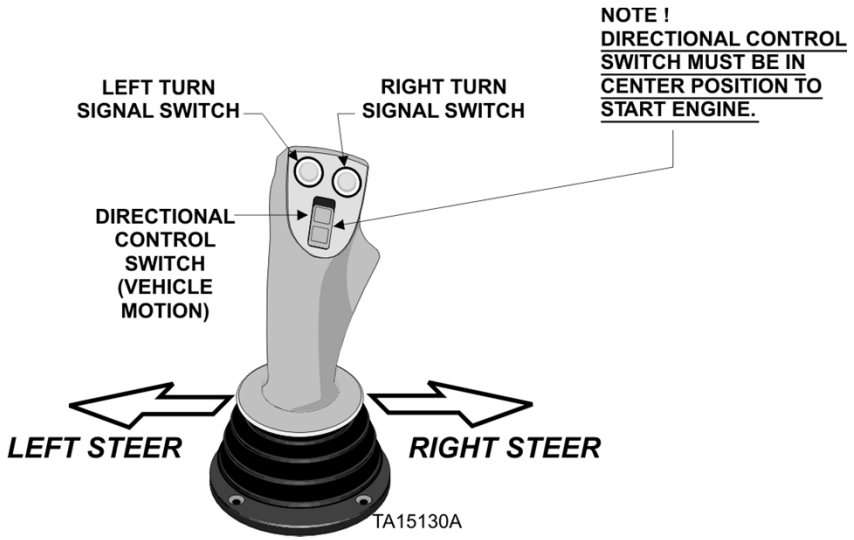
LINCS acceptable ranges – allowable tolerance ± 2%

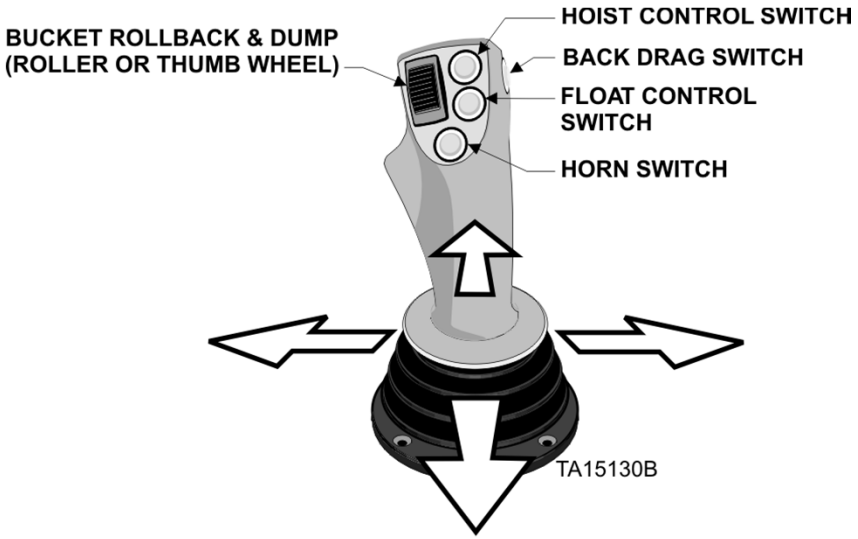
Measuring	4-20 mA Device Range	@ 4mA Low Value*	@ 4mA High Value*	@ 20mA Low Value*	@ 20mA High Value*
Pressure	0 – 15 PSIG	-0.3	0.3	14.7	15.3
	0 – 50 PSIG	-1	1	49	51
	0 – 200 PSIG	-4	4	196	204
	0 – 600 PSIG	-12	12	588	612
	0 – 1500 PSIG	-30	30	147 0	1530
	0 – 5000 PSIG	-100	100	4900	5100
	0 – 7500 PSI	-150	150	7350	7650
Δ P	0 – 20 IN H_2O	-0.4	0.4	19.6	20.4
Temperature	-10 – 100°c	-22.4	-17.6	97.6	102.4

* As displayed in LINCS.

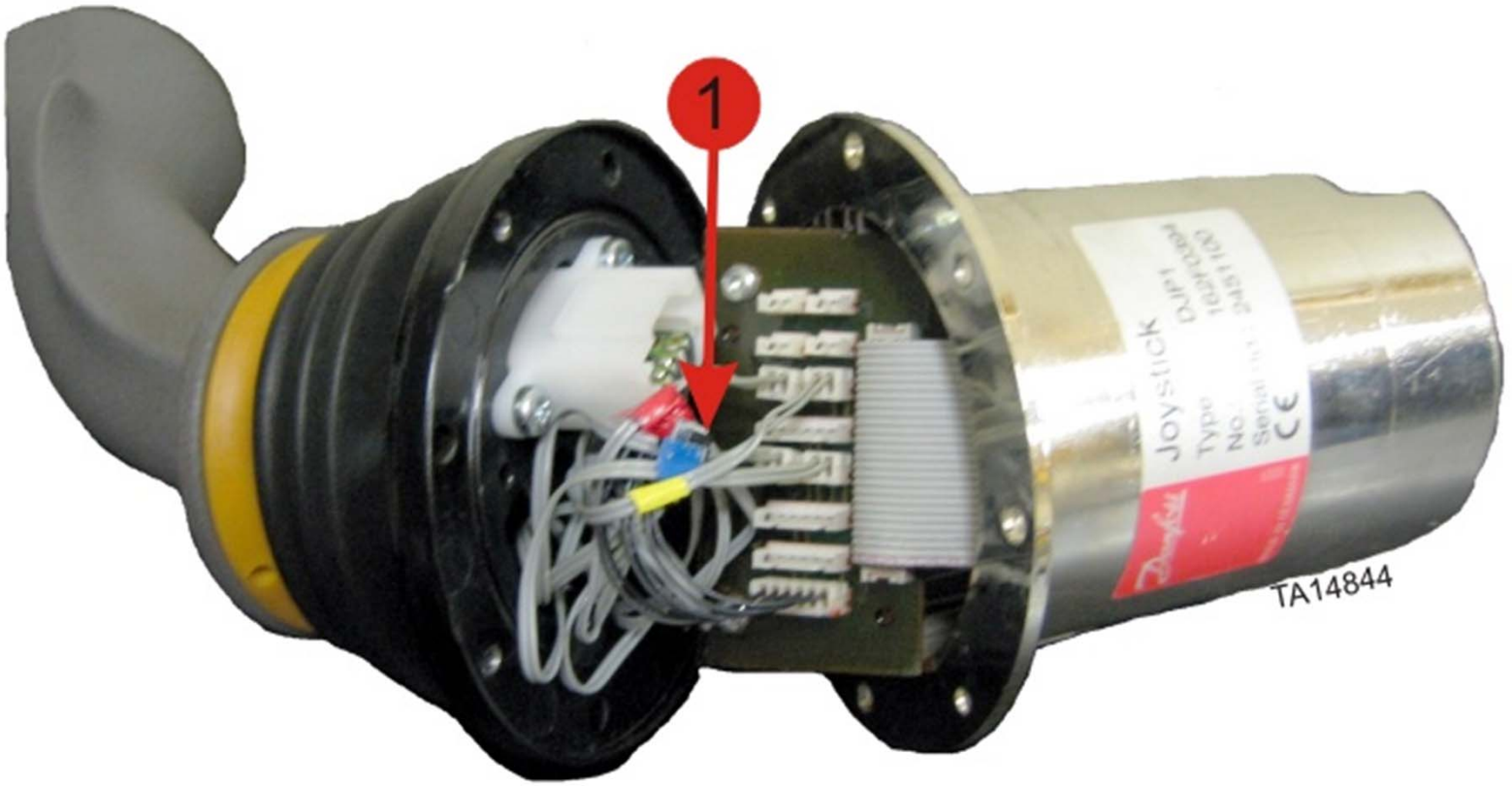
LEFT / RIGHT HAND JOYSTICK

Modular / ergonomic design – Easy to replace – Requires calibration





LEFT / RIGHT HAND JOYSTICK



FOOT POT

Commands machine speed – Requires calibration if replaced

FOOT POT

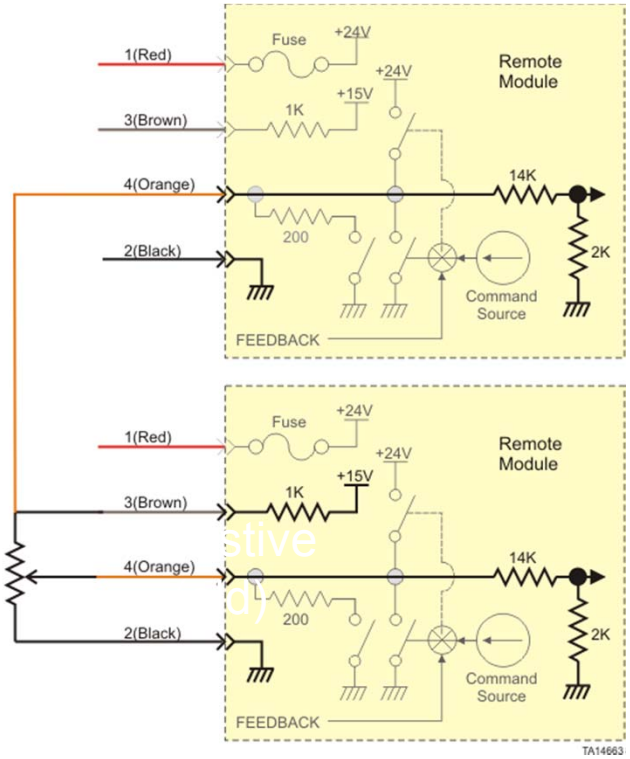
Orders placed for the old style accelerator assembly P/N 425-3373 or the P/N 425-5396 assembly kit will receive the 425-9996 new style accelerator retrofit kit.

- The kit includes all items required to install the new style accelerator assembly.
- Minor cab console and wiring modifications are required to install the pedal kit *
- A new LINCS V1.2 configuration is not required provided that major releases from SIL 353.01 or later have been installed.
- You should contact the LeTourneau Technologies Product Support Group in Longview, Texas prior to installation, if you have questions.

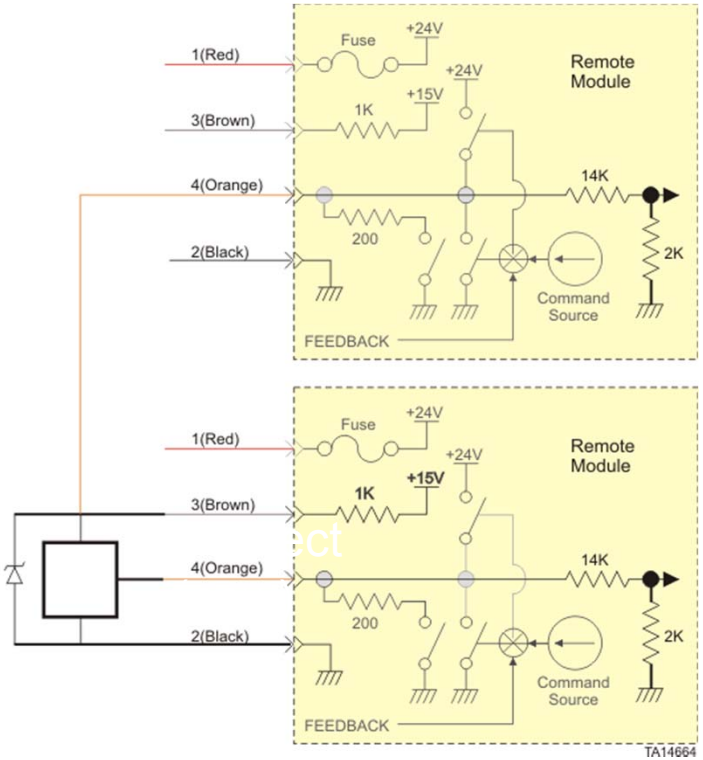
* New pedal is 5v supply

FOOT POT

Potentiometer wiper
Rotary foot pot indicator
Mechanical wiper

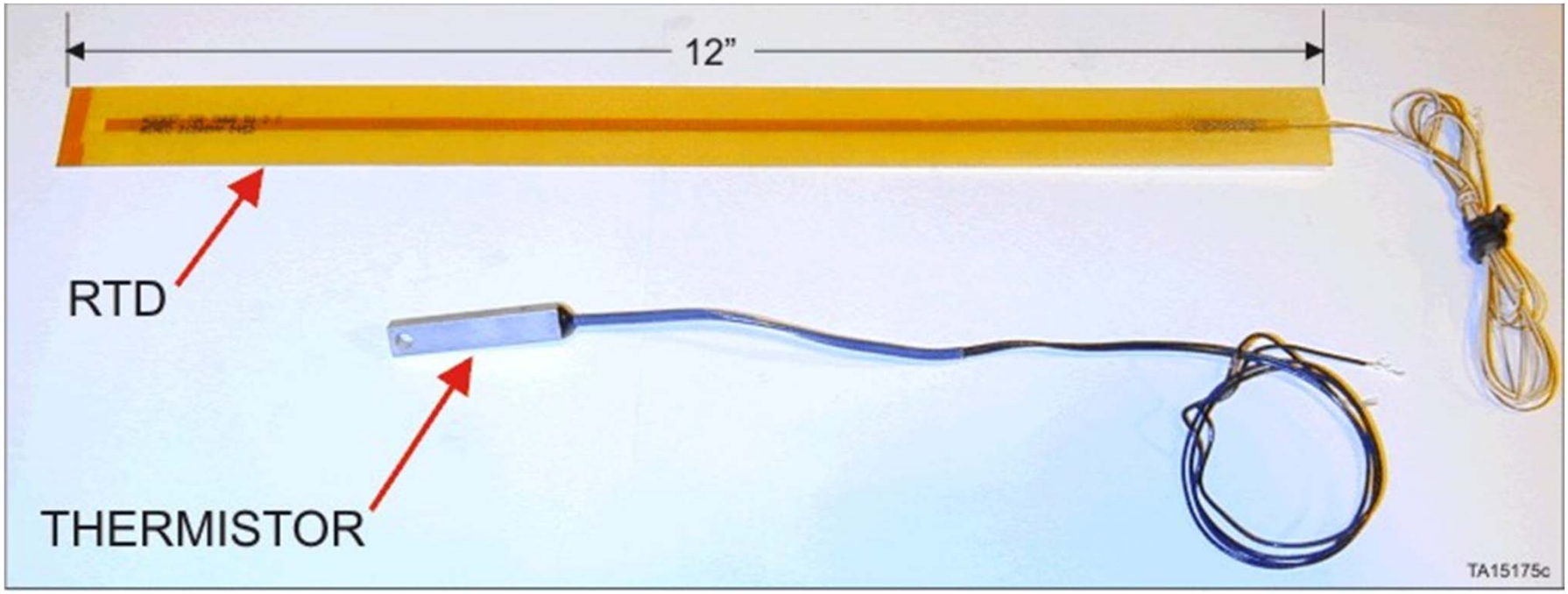


Hall Effect Sensor
Non contact
Requires 5V supply
Zener diode across 15V
used to supply 5V

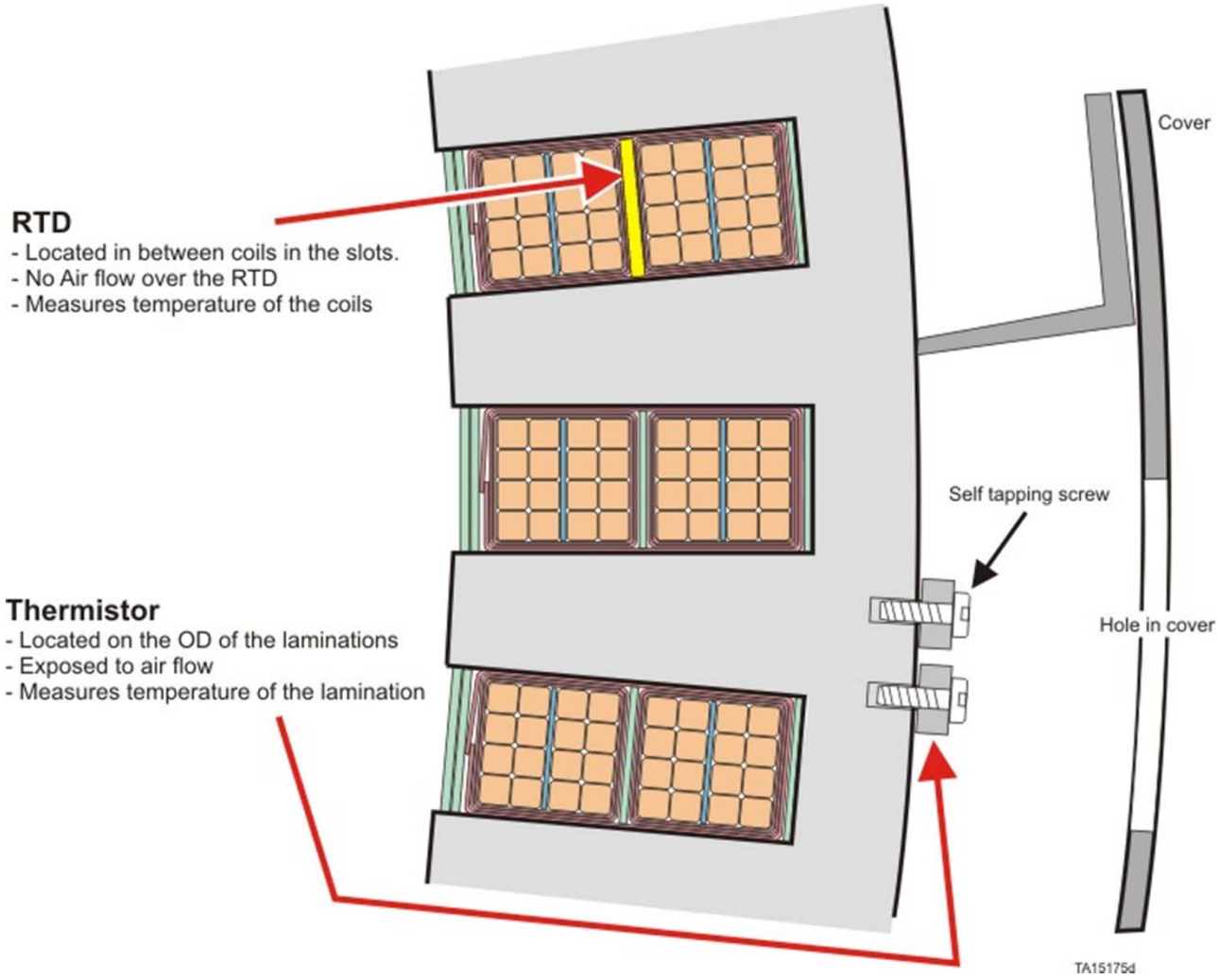


THERMISTORS/RTD'S

Thermistors only provide over-temp warning



THERMISTORS / RTD'S



THERMISTORS / RTD'S

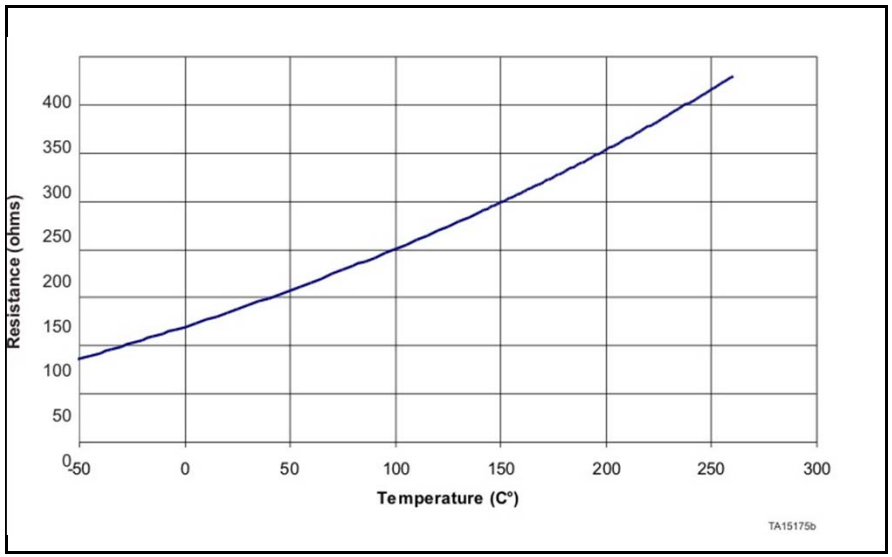


Figure 91. RTD RESISTANCE VS. TEMPERATURE

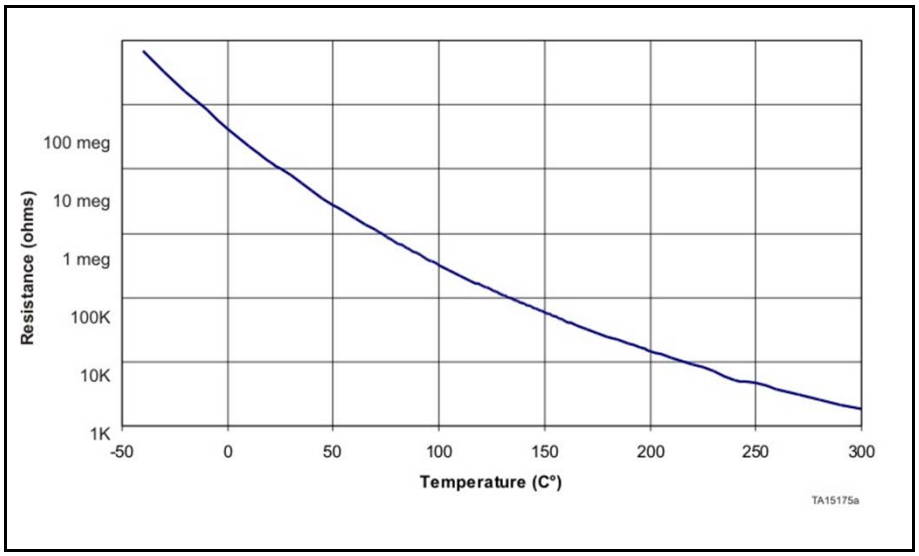
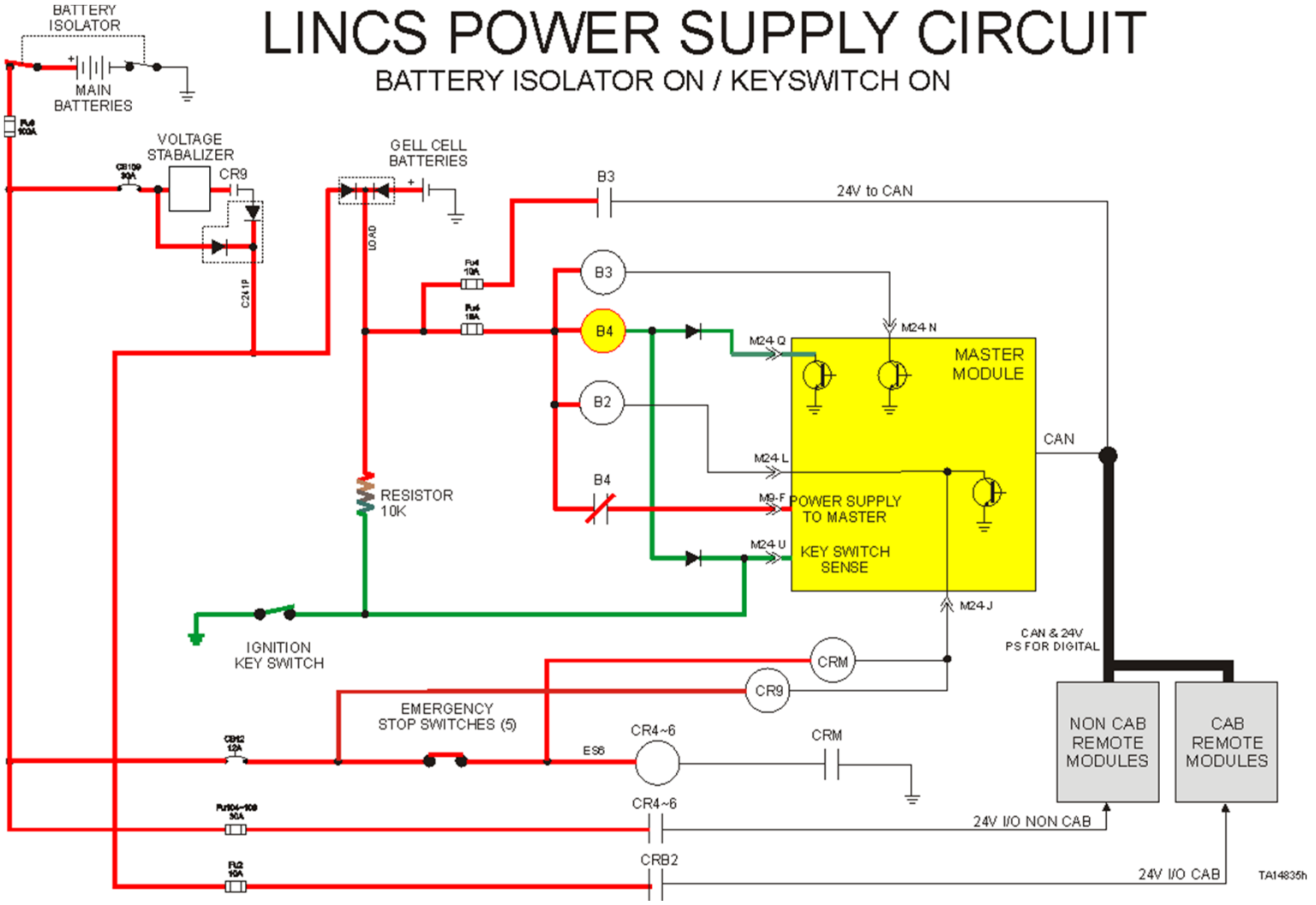


Figure 90. GRAPH OF TEMPERATURE VS. RESISTANCE IN THERMISTORS

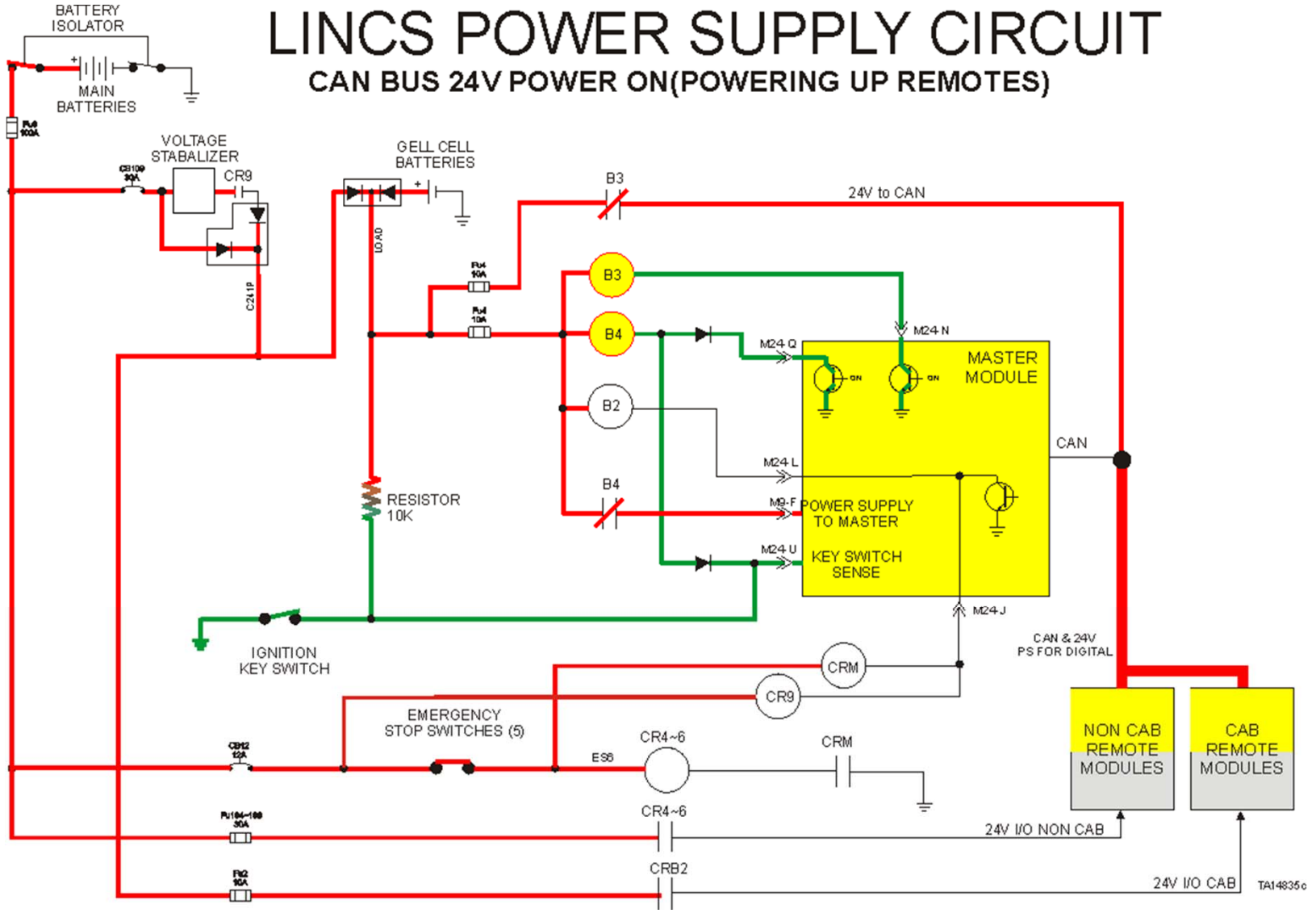
The two styles operate inversely
Requires software selection of device type

CIRCUIT DESCRIPTIONS

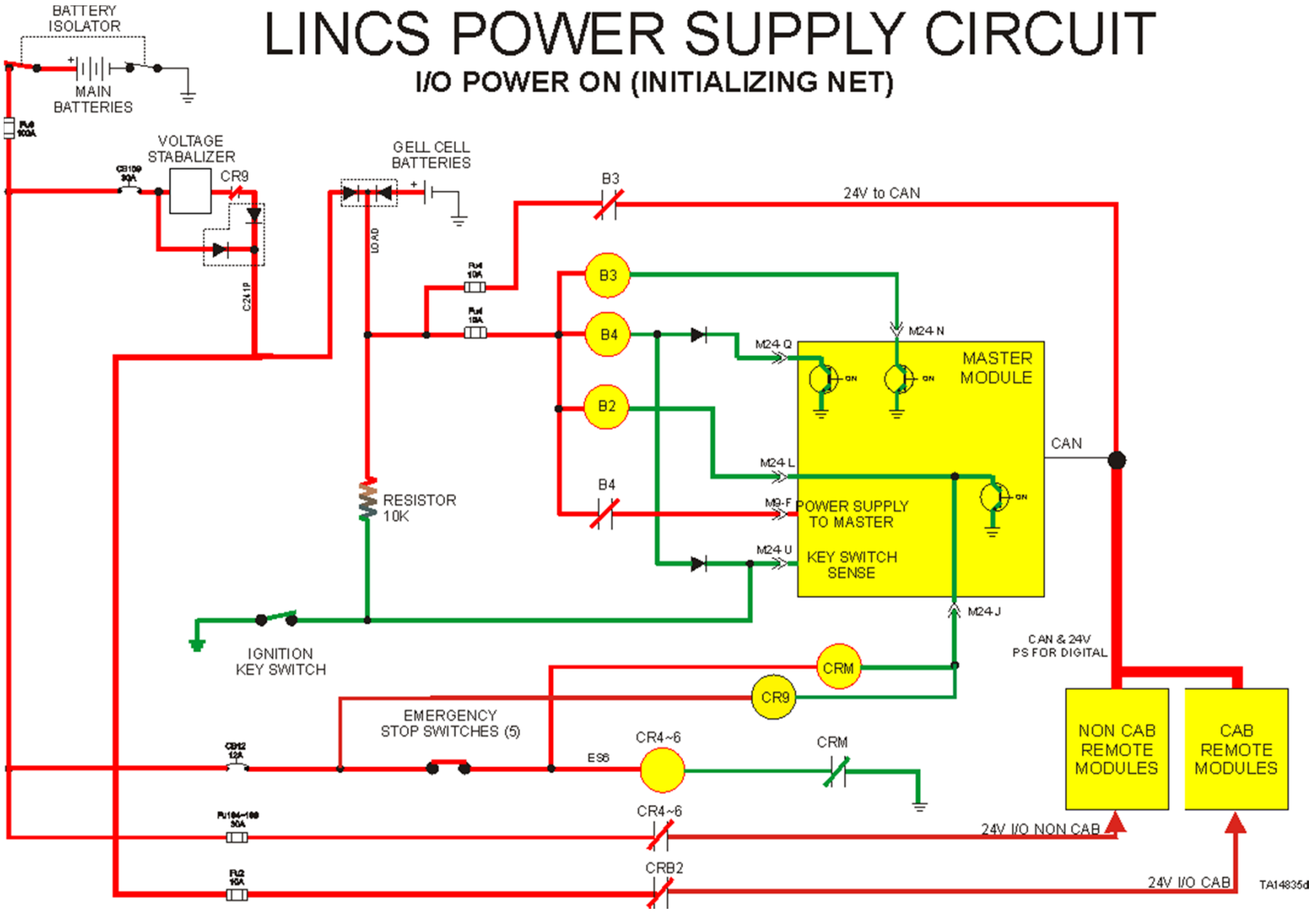
BATTERY ISOLATOR ON/KEY ON



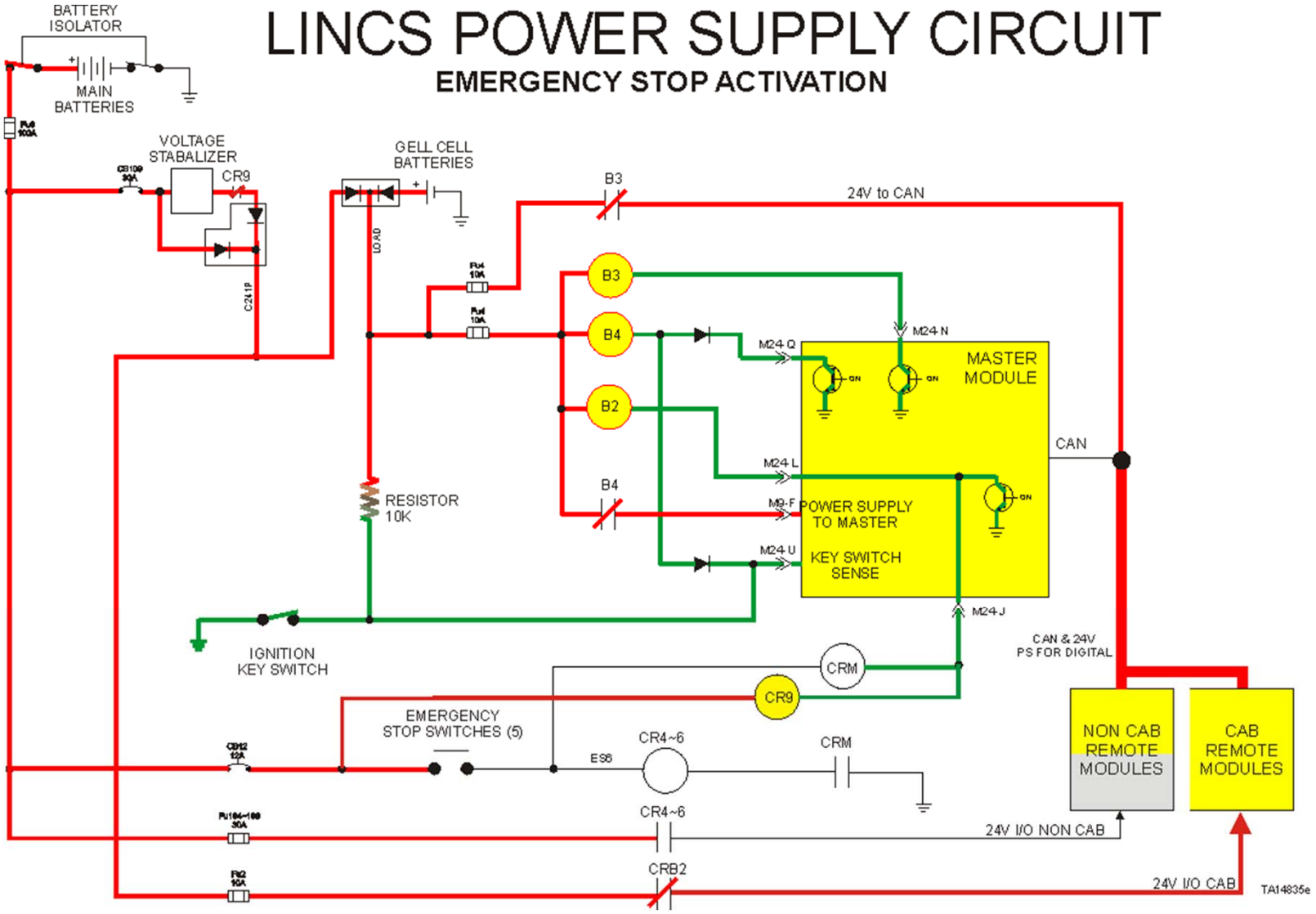
CAN BUS +24V POWER ON (POWERING UP REMOTES)



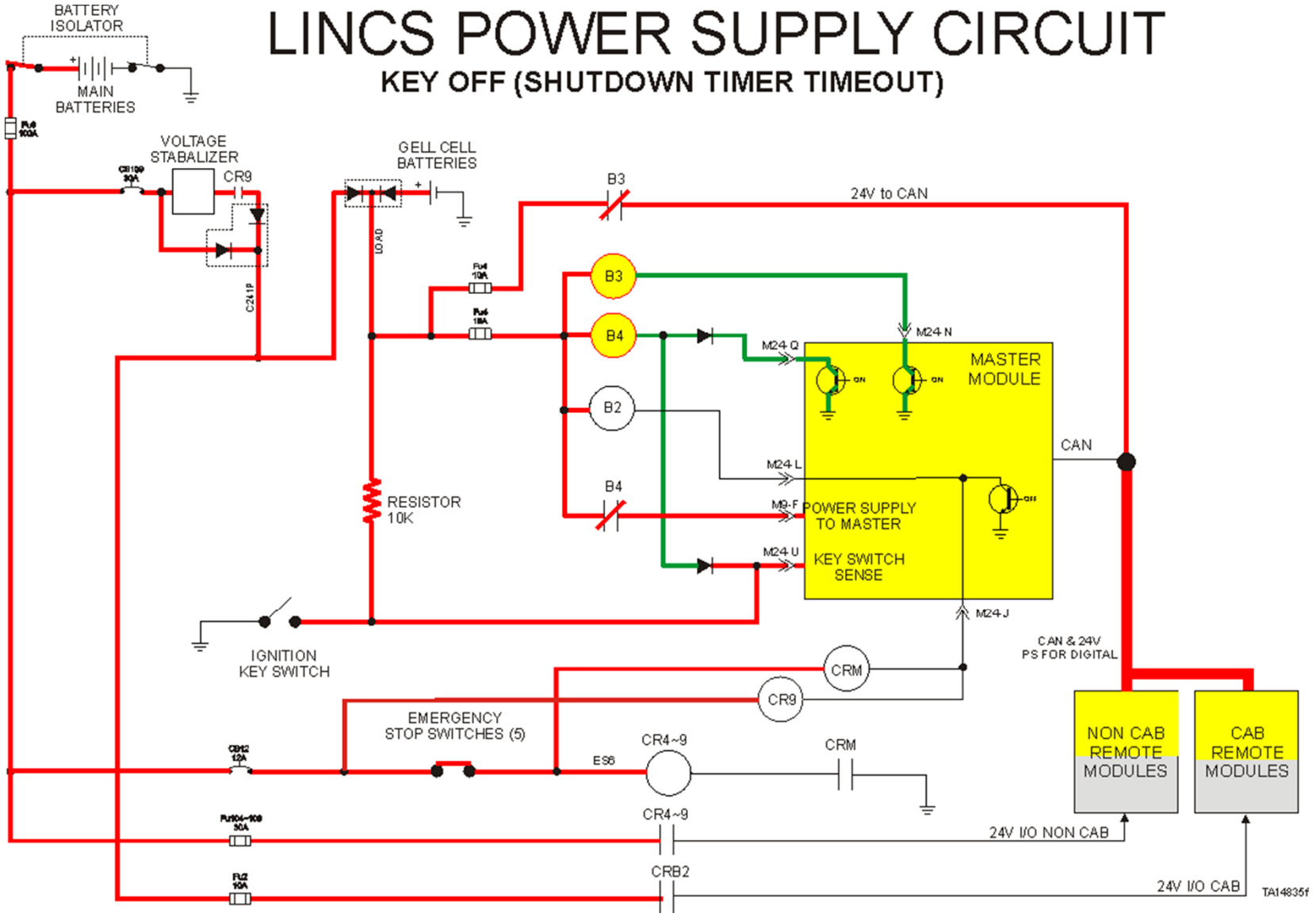
I/O POWER ON


LINCS POWER SUPPLY CIRCUIT
I/O POWER ON (INITIALIZING NET)
BATTERY ISOLATOR
MAIN BATTERIES
VOLTAGE STABALIZER
CR9
GELL CELL BATTERIES
B3
24V to CAN
B4
B2
M24-Q
M24-N
MASTER MODULE
CAN
M24-L
M9-F
POWER SUPPLY TO MASTER
KEY SWITCH SENSE
M24-U
M24-J
RESISTOR 10K
IGNITION KEY SWITCH
CAN & 24V PS FOR DIGITAL
CRM
CR9
EMERGENCY STOP SWITCHES (5)
ES6
CR4~6
CRB2
NON CAB REMOTE MODULES
CAB REMOTE MODULES
24V I/O NON CAB
24V I/O CAB
TA14835d

EMERGENCY STOP ACTIVATION



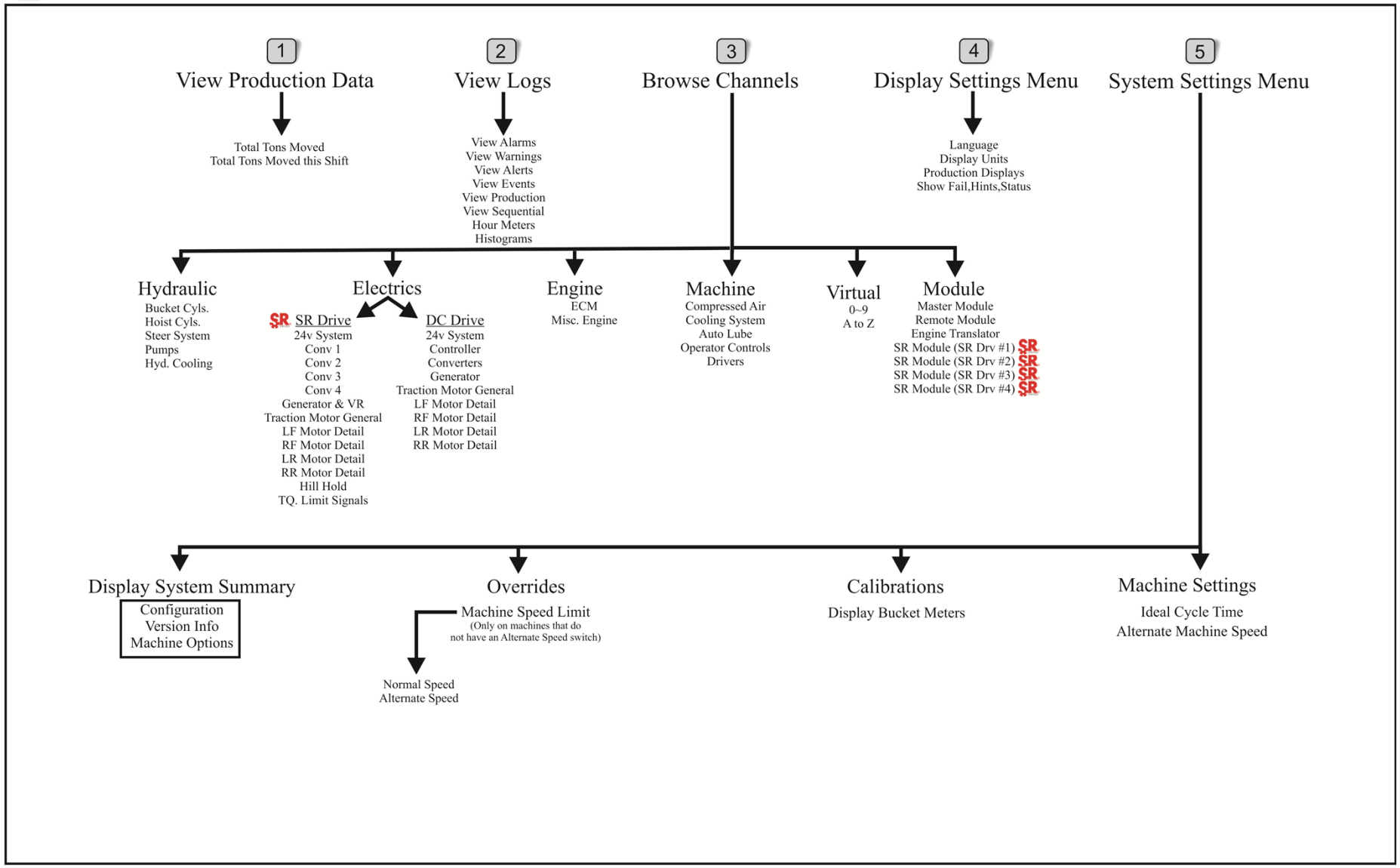
KEY OFF (SHUTDOWN TIMER TIMED OUT)



NAVIGATION

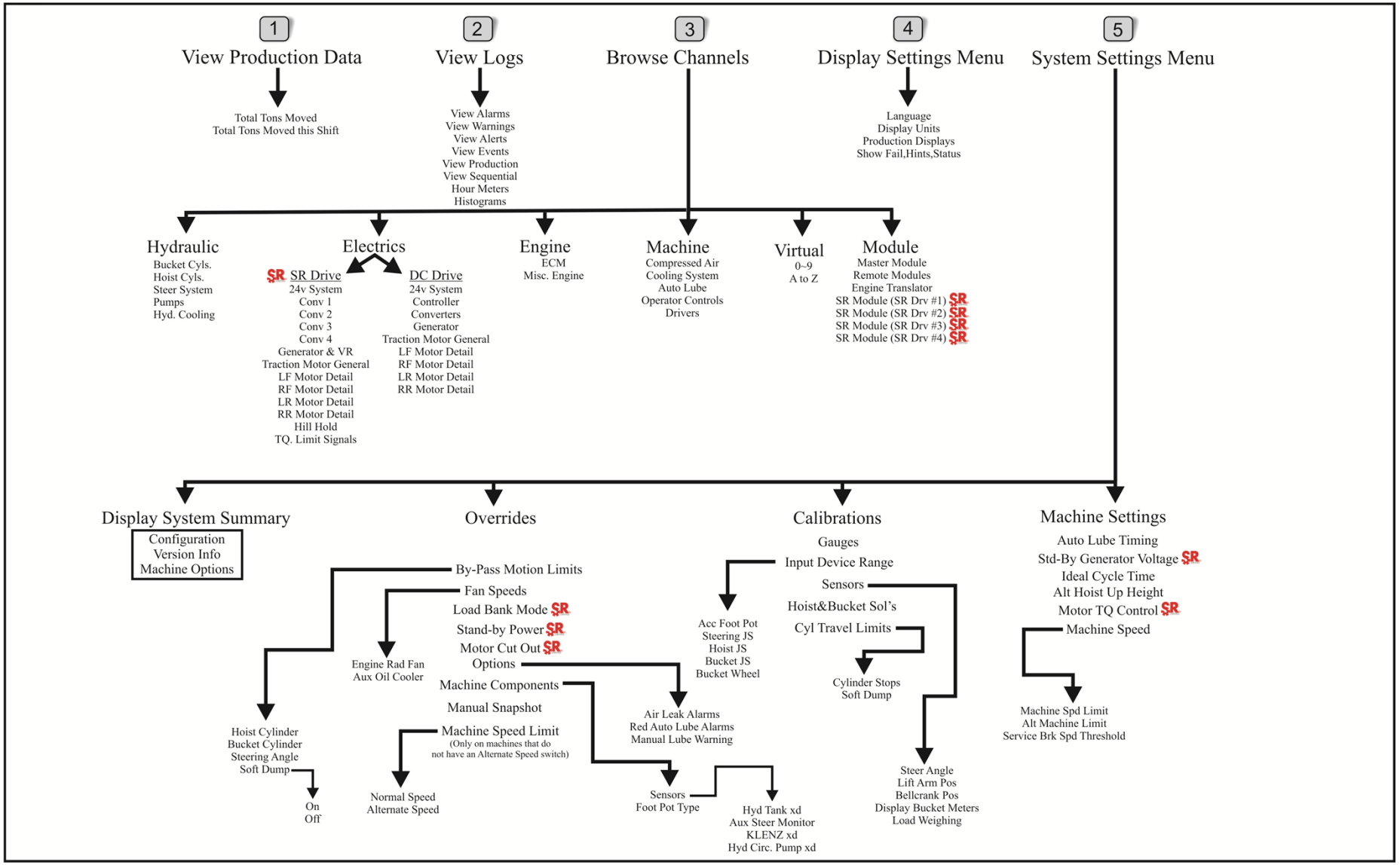
1 Menu

LINCS Menu Structure - Operator Level

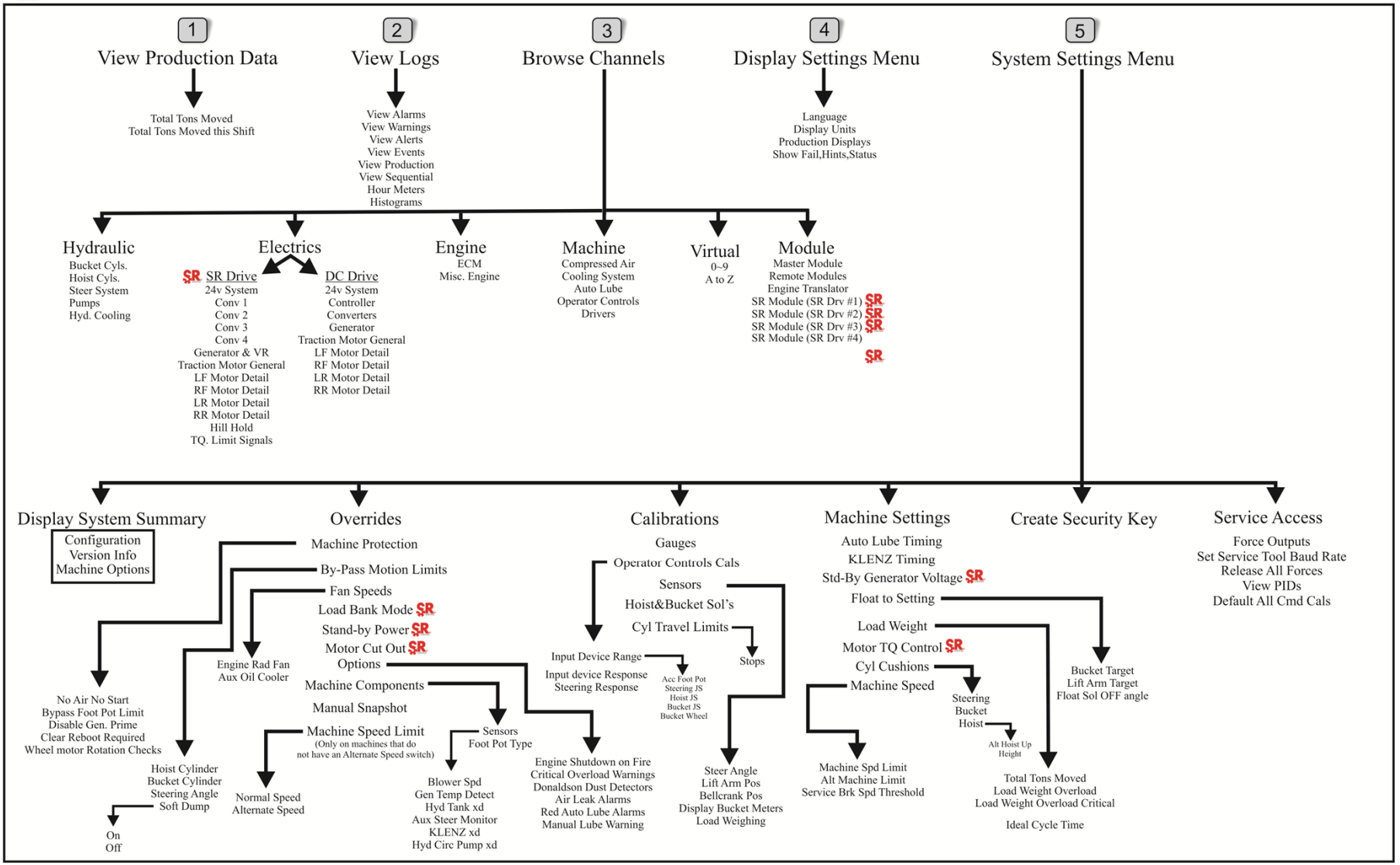


1 Menu

LINCS Menu Structure - Maintenance Level



LINCS Menu Structure - Service Level

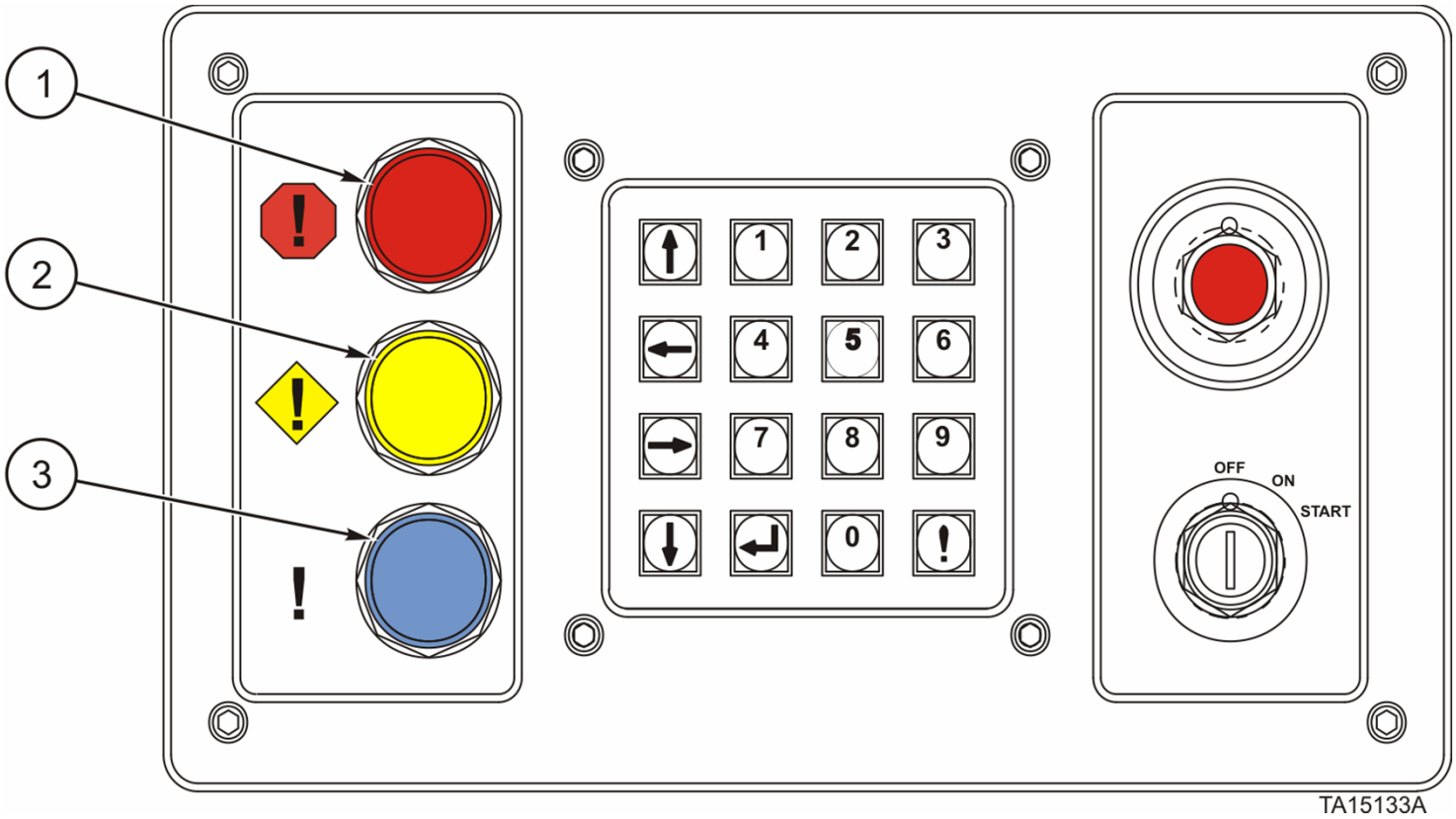


TROUBLESHOOTING

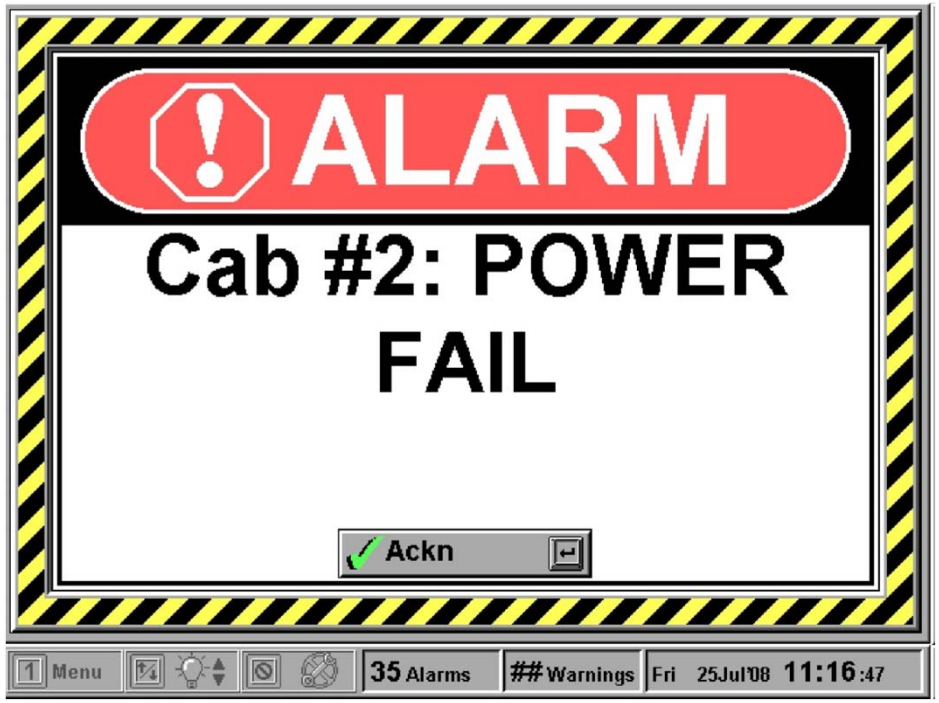
TROUBLESHOOTING

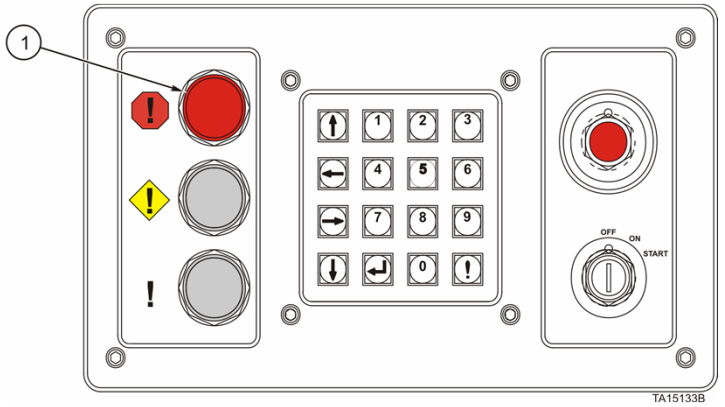
- INDICATOR LIGHTS
- GENERAL INFORMATION
- ACTIONS OF AN ALARM/WARNING
- ACKNOWLEDGE ALARM/WARNING
- CLEARING AN ALARM/WARNING
- RED ALARMS [NORMAL & DELAYED]
- YELLOW WARNINGS
- BLUE EVENTS
- LOG FILE STORAGE
- 50 SERIES DIAGNOSTIC TOOL & TROUBLESHOOTING FLOWCHARTS

INDICATOR LIGHTS



RED ALARMS

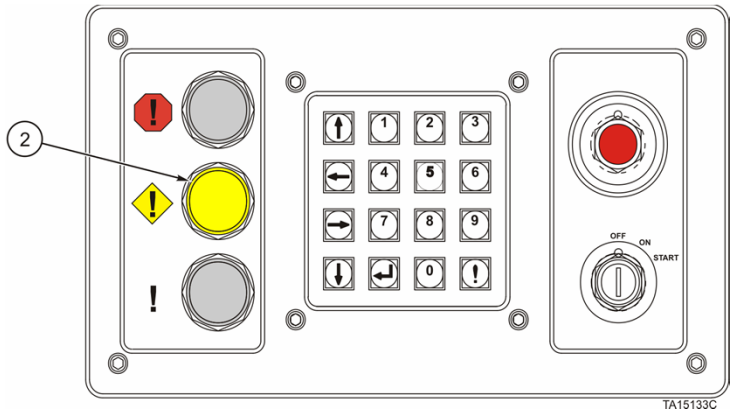




DELAYED - 60 second delay – initially light only

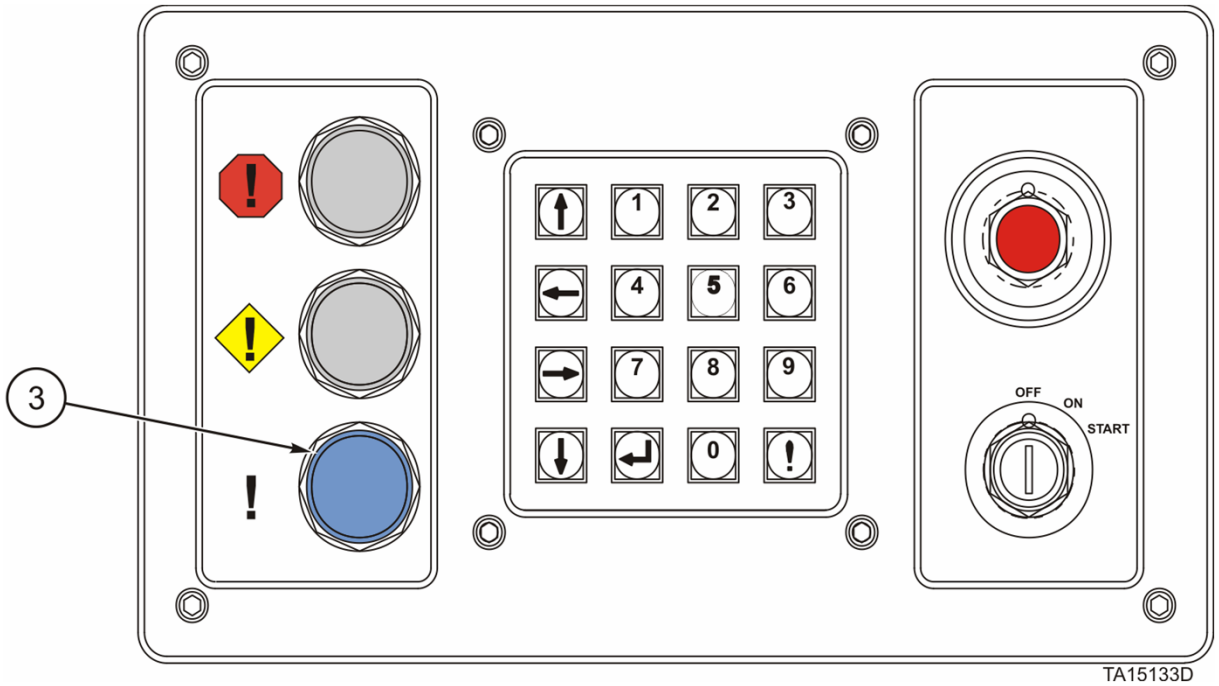
NORMAL – Places the machine in dynamic braking. Once the machine stops the engine is commanded to low throttle.]

YELLOW WARNINGS



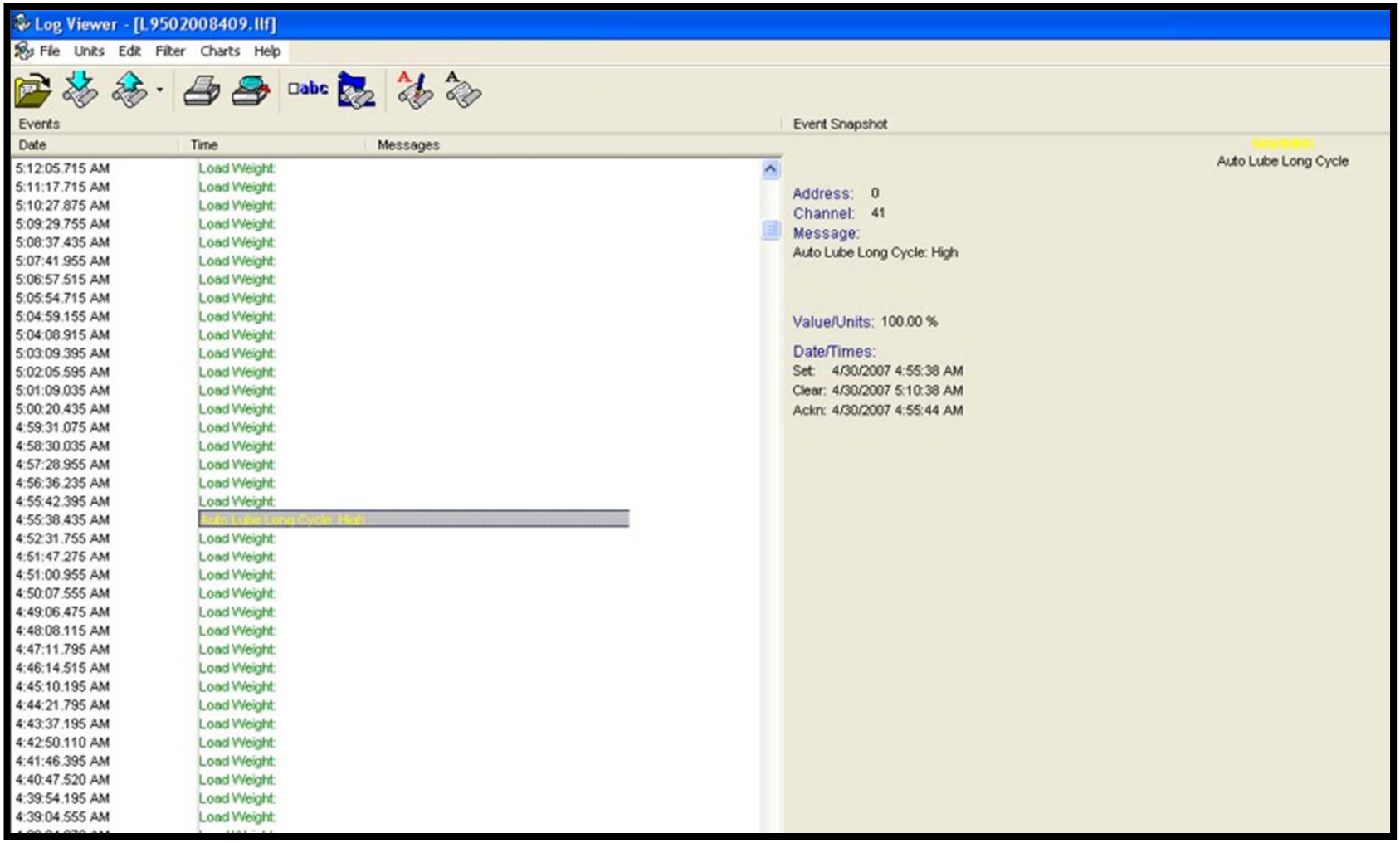
A condition exists that is affecting normal machine operation. The machine will not shut down, but the Warning may escalate to an Alarm if left unaddressed.

BLUE ALERTS

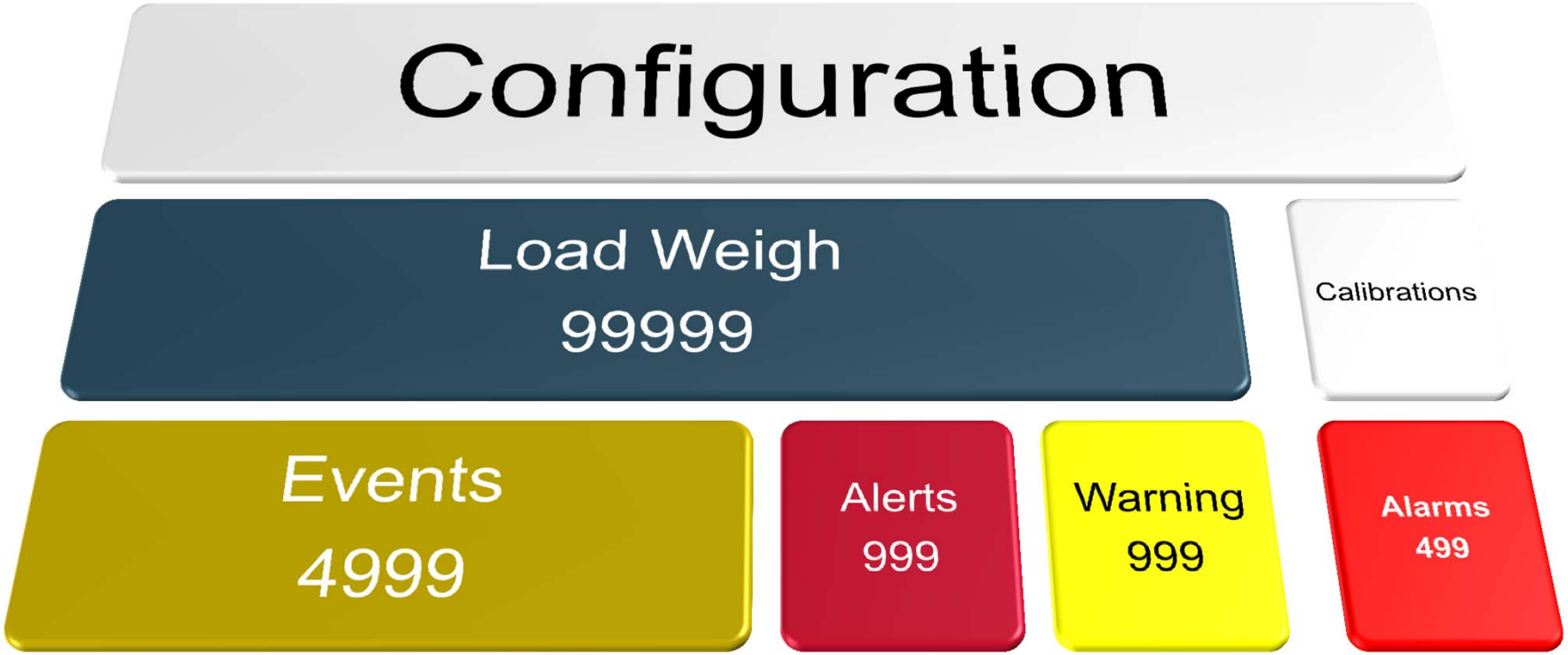


Also known as a PM notice, the Alert is generally logged as a event to be addressed during the next scheduled maintenance.

ACKNOWLEDGE AND CLEARING OF AN ALARM WARNING



LOG FILE STORAGE



SUPPORT SOFTWARE AND TOOLS

- 50 Series Diagnostic Tool
- Service Tool
- eLeTrochart
- Log Viewer
- Remote I/O Breakout Box
- Remote I/O Interface Tester
- Remote Cab Tester
- RF Modems

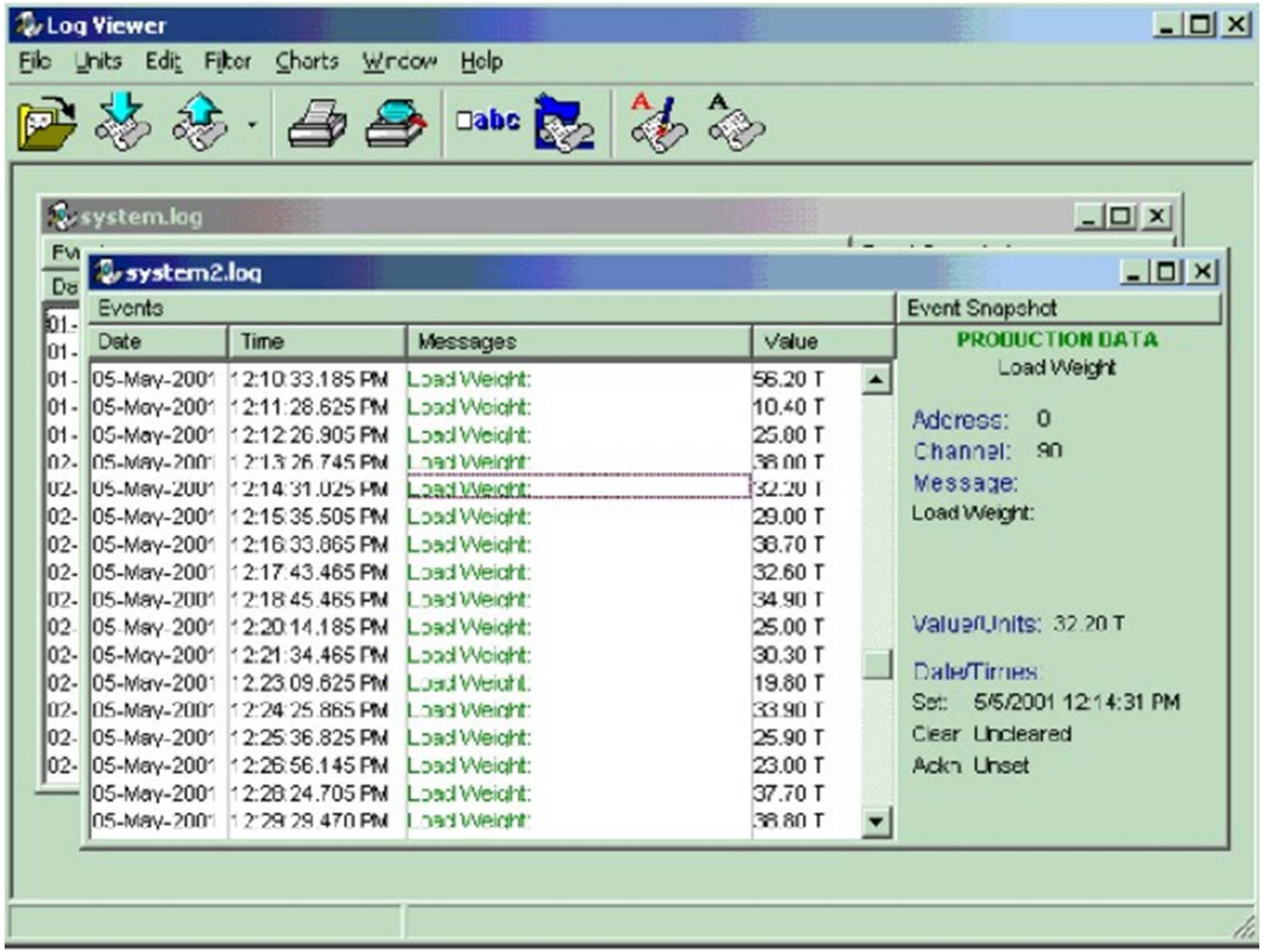
50 Series Diagnostic Tool

SERVICE TOOL

LINCS®
Service Tool

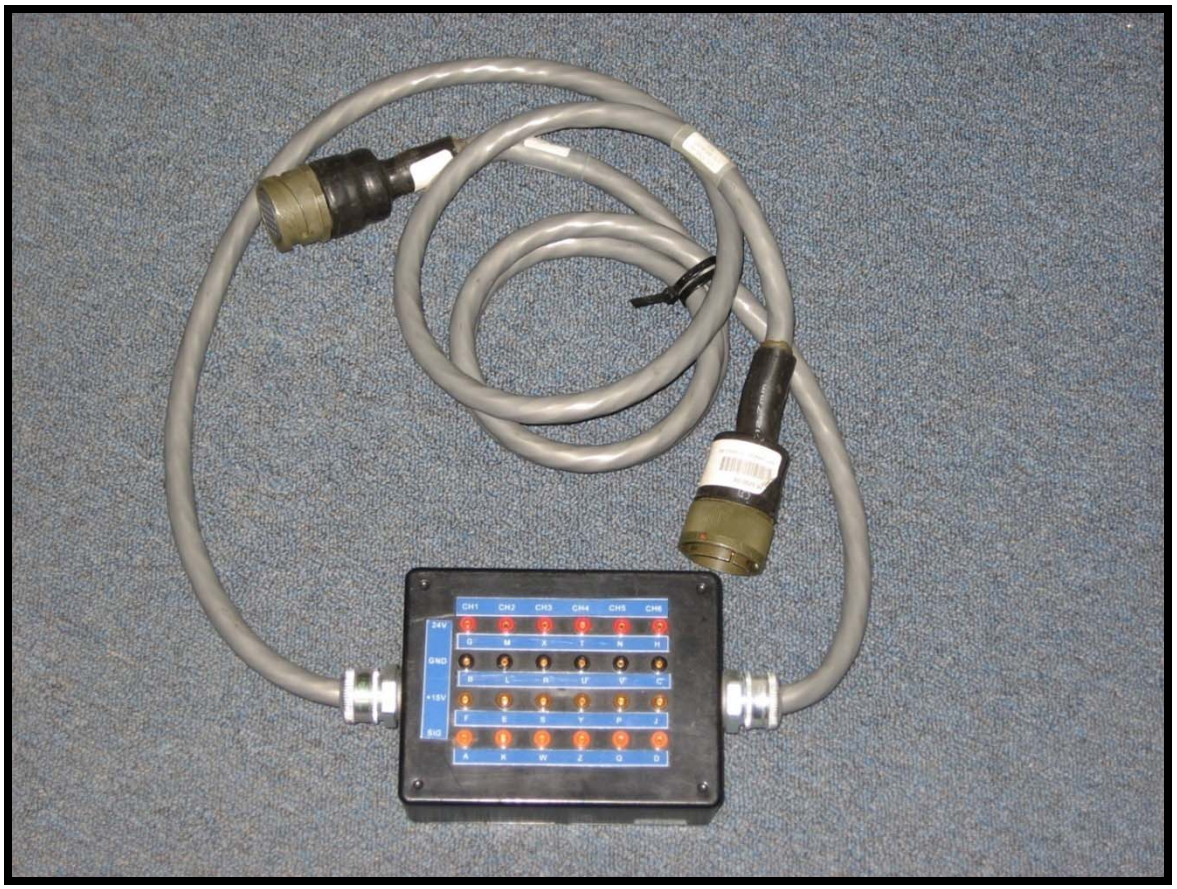
ELETROCHART

LOG VIEWER



JOYGLOBAL

REMOTE I/O BREAKOUT BOX



P/N: 425-5739

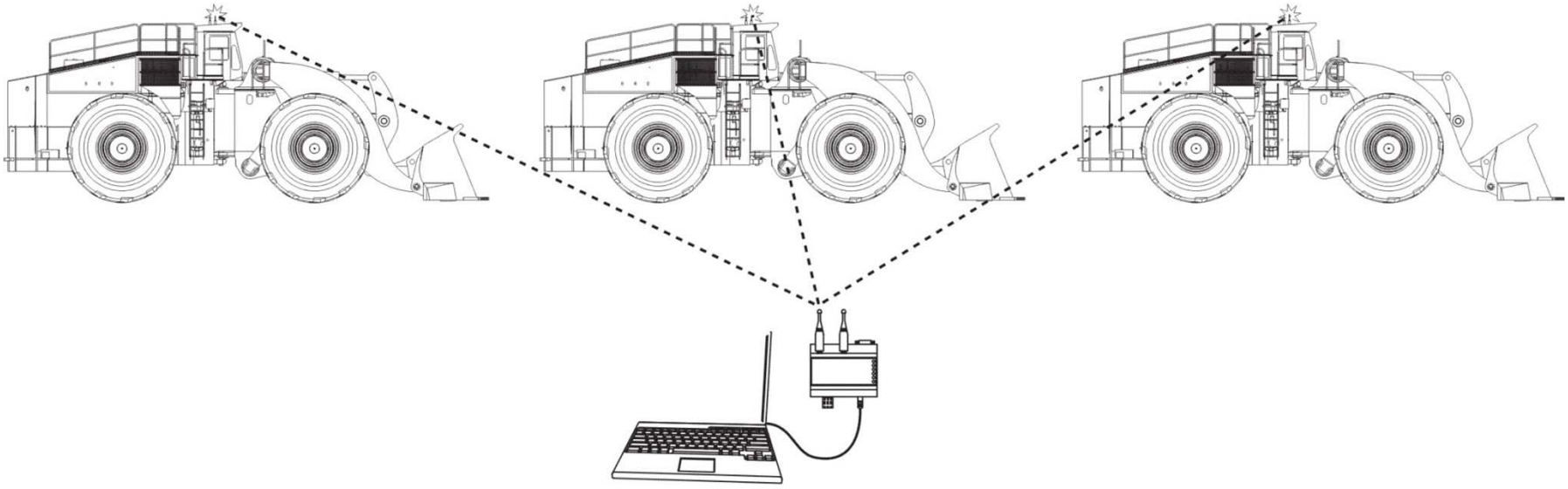
REMOTE I/O INTERFACE TESTER

P/N: 425-5840

REMOTE CAB TESTER

P/N: 425-5857

RF MODEMS



P/N: 425-0496

JOYGLOBAL

P&H

P&H Brand LeTourneau-Series wheel loader