Hirschmann, Inc.

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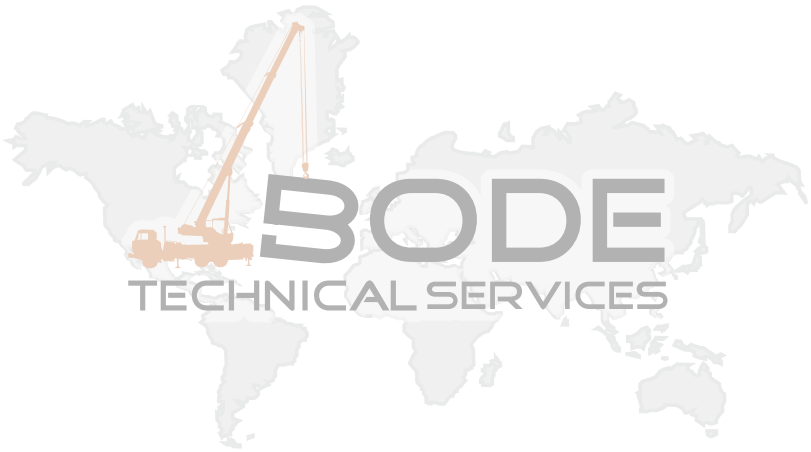
LENGTH-ANGLE-RADIUS-LOAD INDICATING SYSTEM

Mentor EI65

SERVICE MANUAL

P/N 190234 Rev.E, 02/02/10


BODE
TECHNICAL SERVICES

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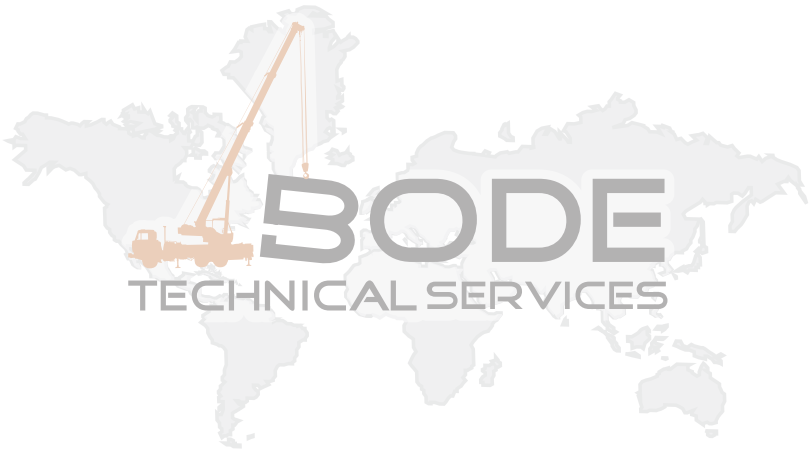
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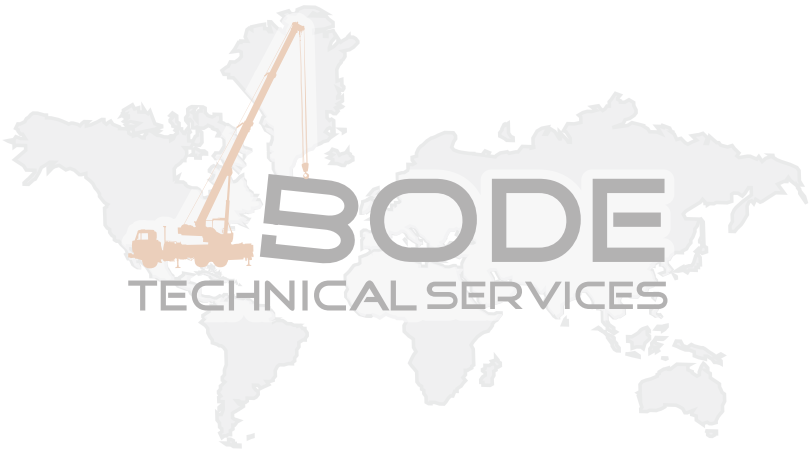
Table of Contents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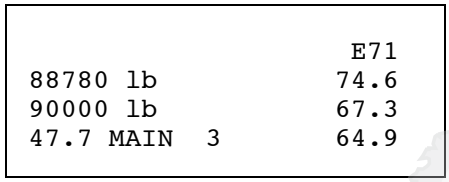
1 GENERAL INFORMATION

The purpose of this service manual is to provide additional information to assist a service or maintenance person in identifying malfunctions or system problems with the Mentor EI65 System. A digital voltmeter and regular maintenance and service tools will be required to troubleshoot the system. Note: Knowledge of how to use a digital voltmeter is assumed.

REFERENCE:

Operator's Manual 190231
Calibration Manual 190232
Installation Manual 190233

SYSTEM MALFUNCTION:



In case of a malfunction of the system, a code that identifies the system malfunction will be displayed in the upper right portion of the display. The error codes are listed in Section 5, Error Codes. The table identifies various faults that can occur with the Mentor EI65, explain each fault, and describe the action, which shall be taken to correct the fault.

Faults within the electronic microprocessor shall be repaired by factory trained service personnel. When these faults occur, contact your authorized dealer or service organization.

If the operator identifies a possible problem in the system, perform the pre-operation inspection Section 5 in the Operator's Manual to define the problem.

SYSTEM DESCRIPTION:

The Length-Angle-Radius-Load Indicator System Mentor EI65 has been designed to provide the crane operator with the essential information required to enable the machine to be used within its design parameters. The Mentor EI65 System indicates the length and angle of the boom, tip height, working radius and the total weight being lifted by the crane. Using the various sensors and the limits set by the operator, the Mentor EI65 System warns the crane operator of certain approaching hazardous conditions which could occur during the operation of his crane.

WARNING

Always refer to operational instructions and load charts provided by the crane manufacturer for specific crane operation and load limits.

2 WARNINGS

- The Mentor EI65 is an operational aid, which warns a crane operator of certain approaching hazardous conditions, which could cause damage to equipment and personnel.
- The device is not, and shall not be, a substitute for good operator judgment, experience and use of accepted safe crane operating procedures.
- The responsibility for the safe operation of the crane shall remain with the crane operator who shall ensure that all warnings and instructions supplied are fully understood and observed.
- Prior to operating the crane, the operator must carefully and thoroughly read and understand the information in the operator's manual to ensure that he/she knows the operation and limitations of the indicating system and crane.

3 TROUBLESHOOTING USING THE ANALOG VALUES SCREEN

For a sensor error or problem with a sensor, look at the output voltage of the linerider and angle sensors and compare the reading with the following:
Angle sensor 1.875 at 0°, 2.5 at 45°, or 3.125 at 90°
Linerider under no load is 0 to 15mV not to exceed 2500 mV.
To access the analog output screen use the following procedure.

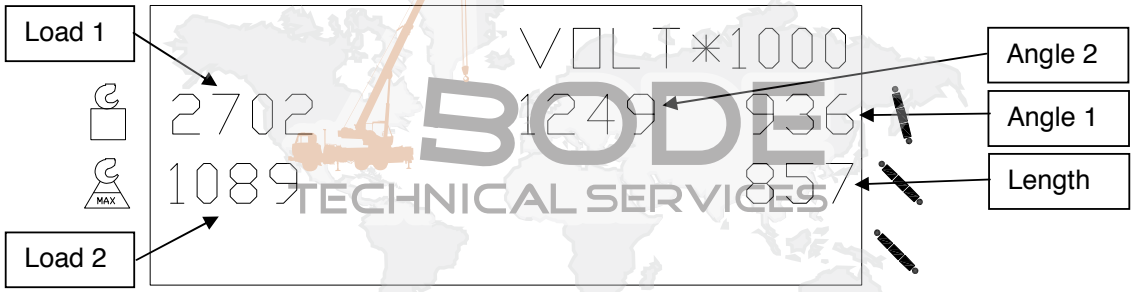
1. Power up the system. The screen will display Mentor EI65, with the software version and date.

2. When the startup screen shows MENTOR EI65 and the startup version, press the “i” button to enter the service mode. The screen will change to “CALIB. PASSWORD”.

3. Enter the calibration password “0815”. Use the “UP” and “DOWN” buttons to select the number and the “OK” button to confirm each entry. Enter 0 — OK, 8 — OK, 1 — OK, 5 — OK

4. Scroll to the ANALOG VALUES screen by pressing the “UP” or “DOWN” arrows, pressing “OK” to select and show the following screen.

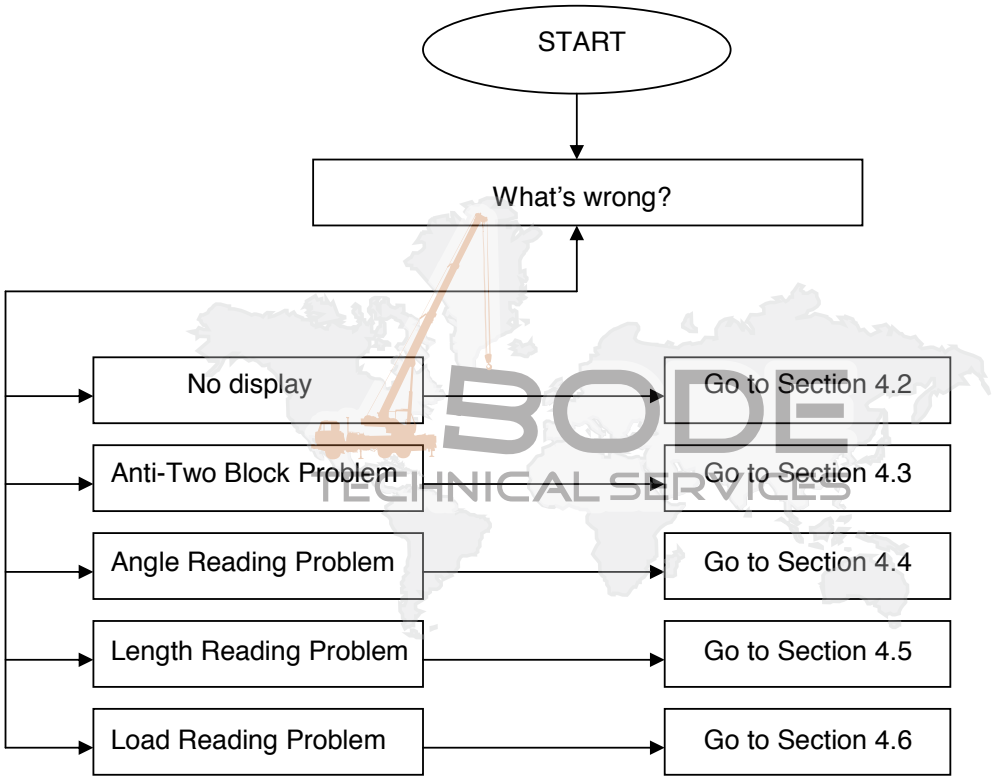
All Analog input voltages (shown in millivolts), received from the sensors will be displayed here as described below. The values shown in the screen below are random.



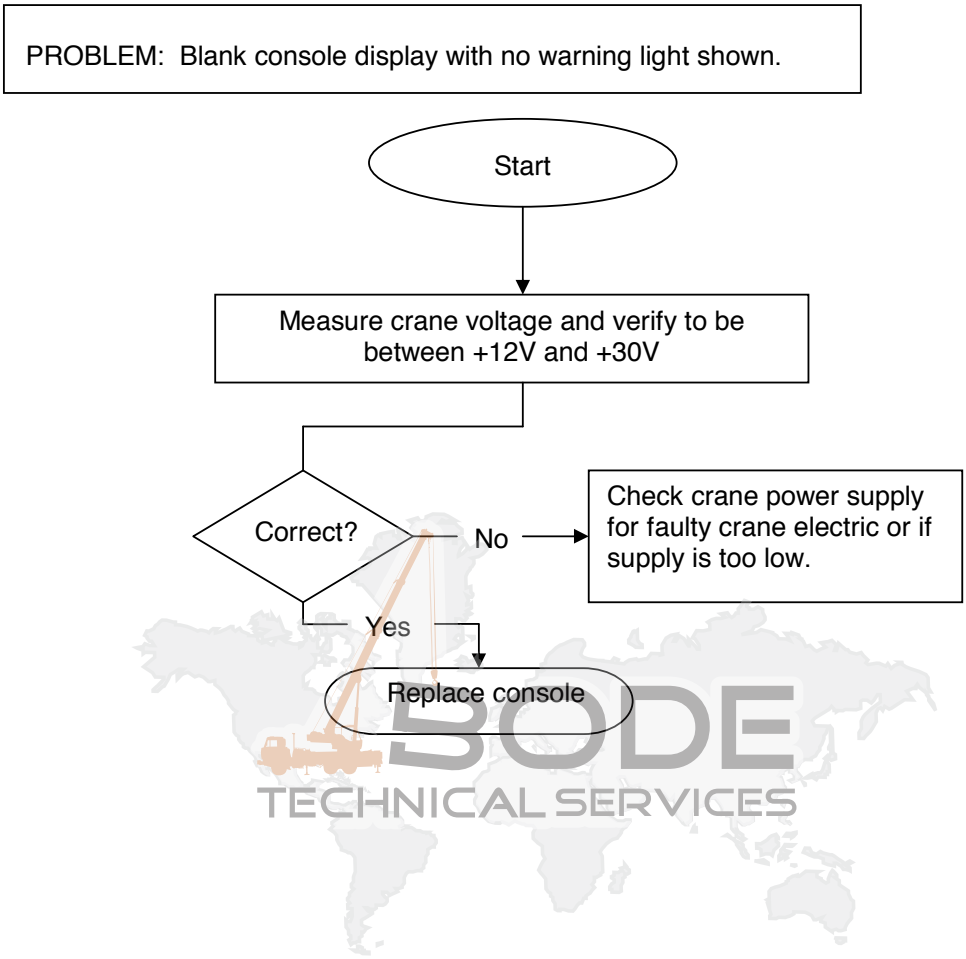
4 TROUBLESHOOTING FLOW CHARTS

This section explains how to handle a problem that may arise with the Mentor EI65 Load Indicator System. The procedures are easy to follow and are given in flowcharts on the following pages. Start with the general flowchart below that will guide you to one of the detailed flowcharts shown in this section. Section 6 contains the necessary drawings needed for troubleshooting.

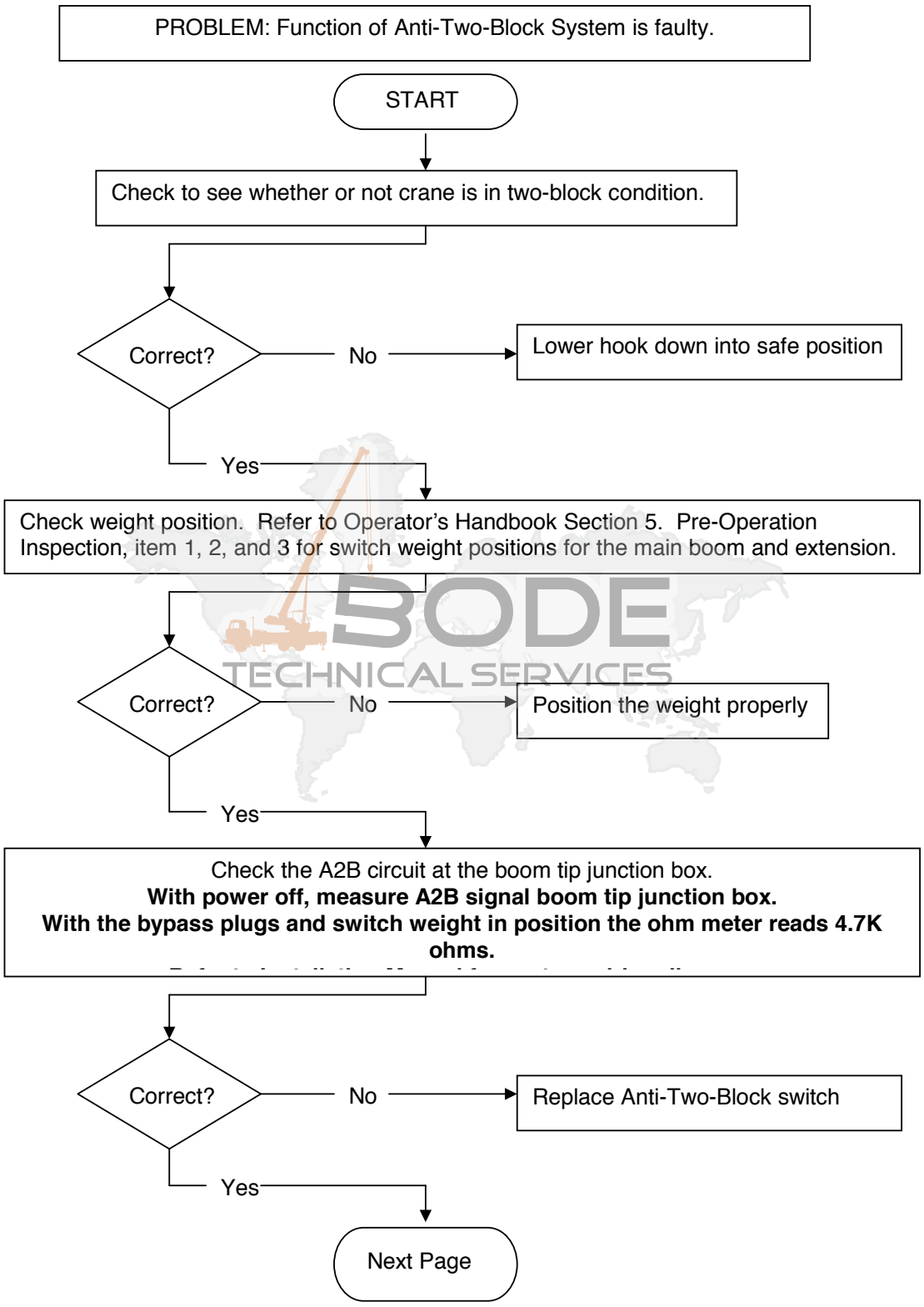
4.1 GENERAL FLOW CHART

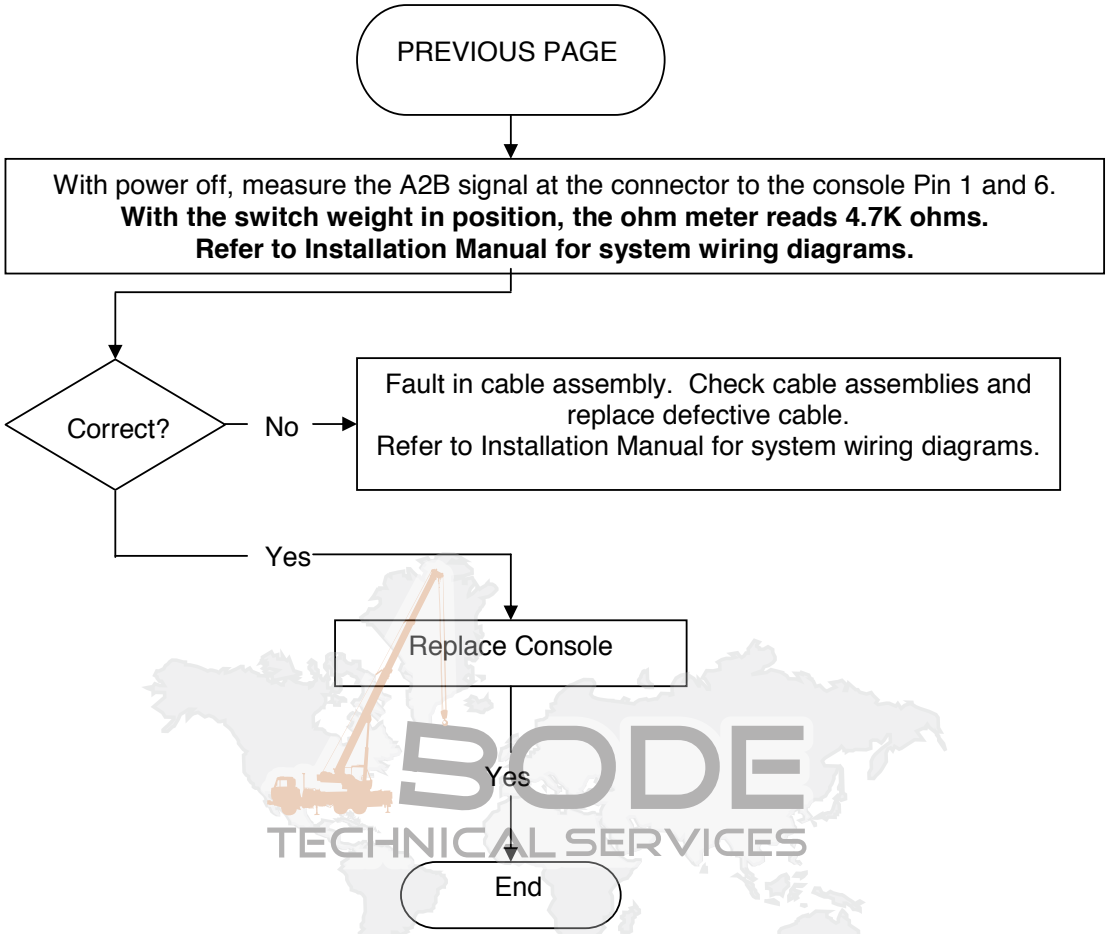


4.2 NO DISPLAY

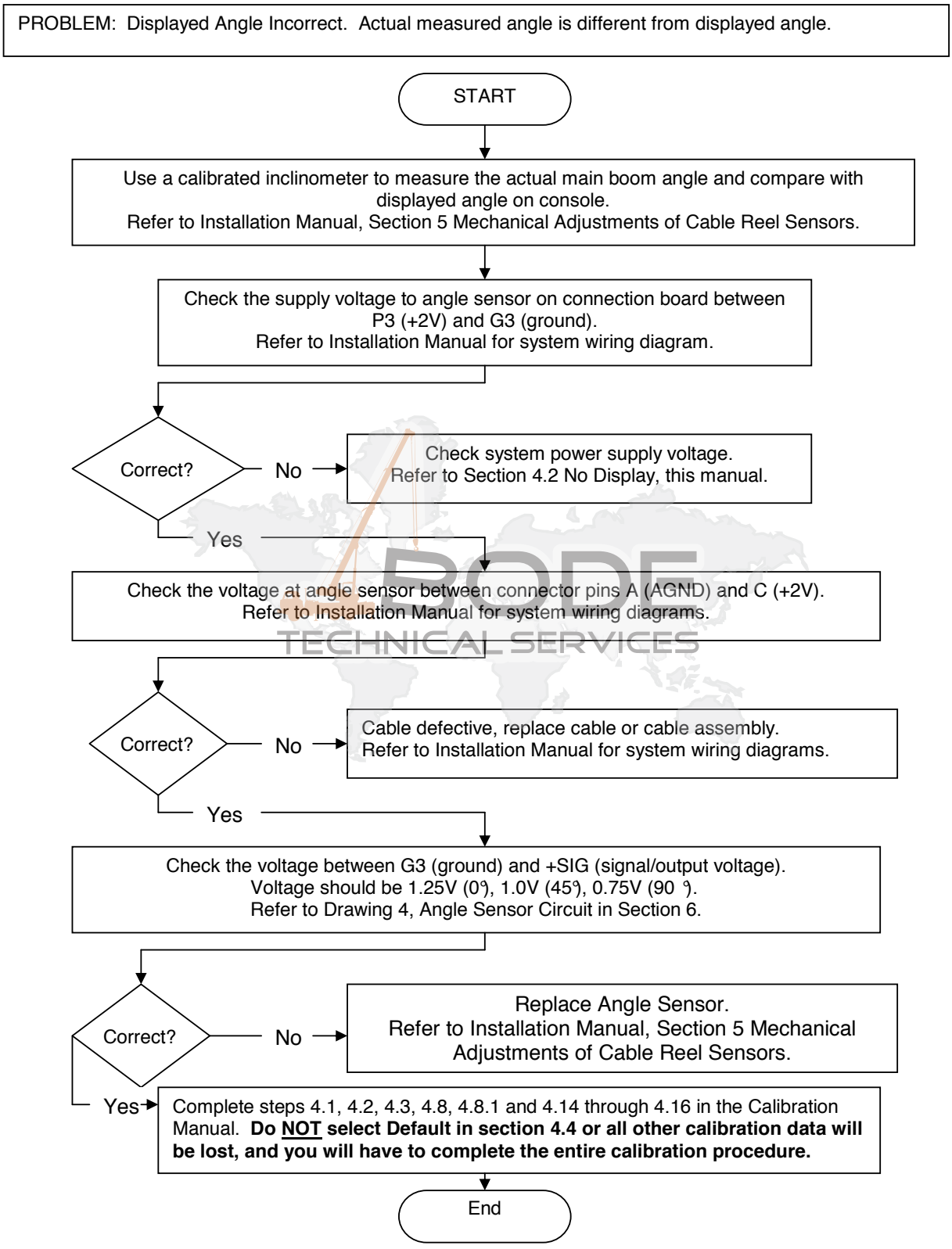


4.3 ANTI TWO BLOCK PROBLEM

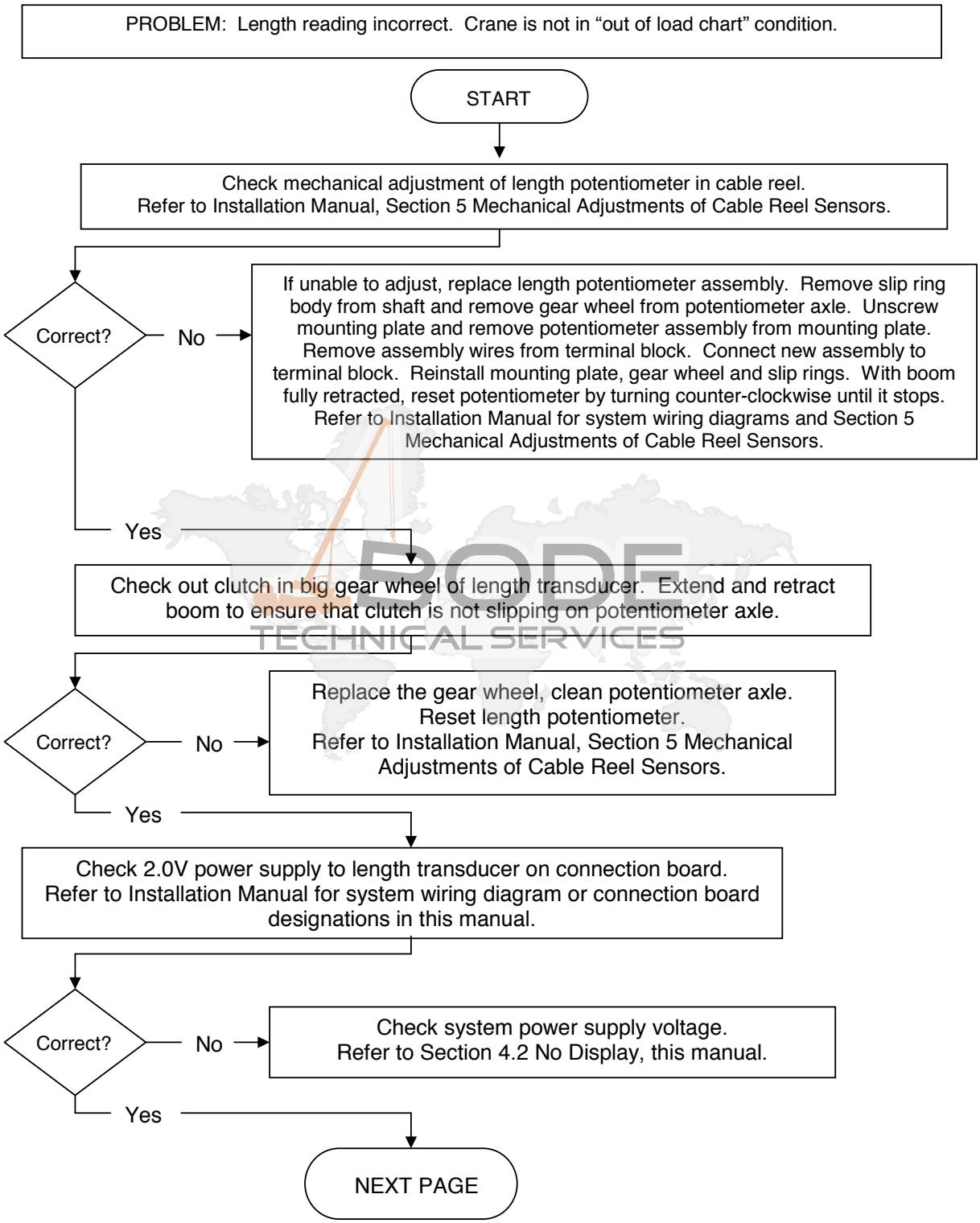


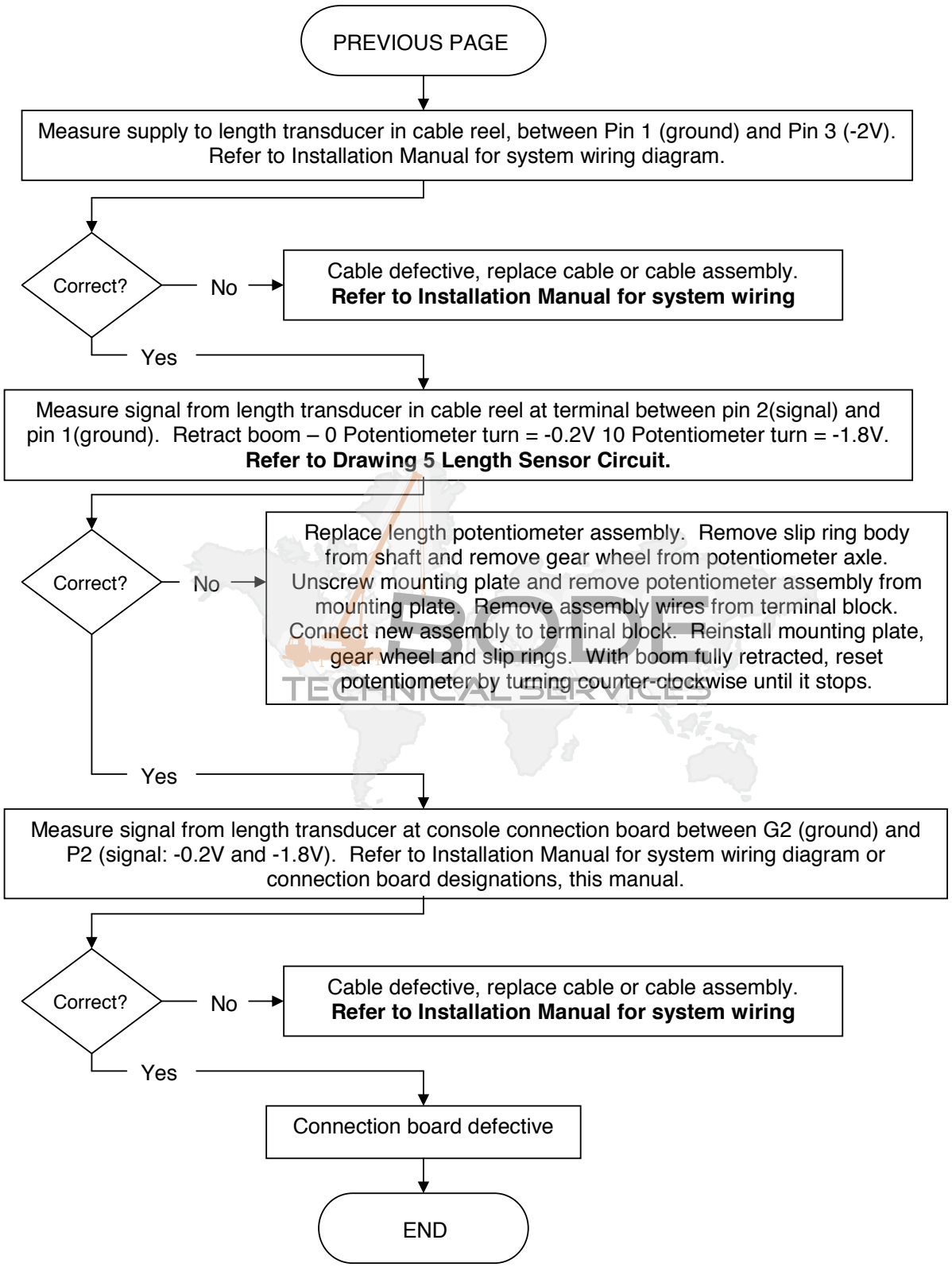


4.4 ANGLE READING PROBLEM



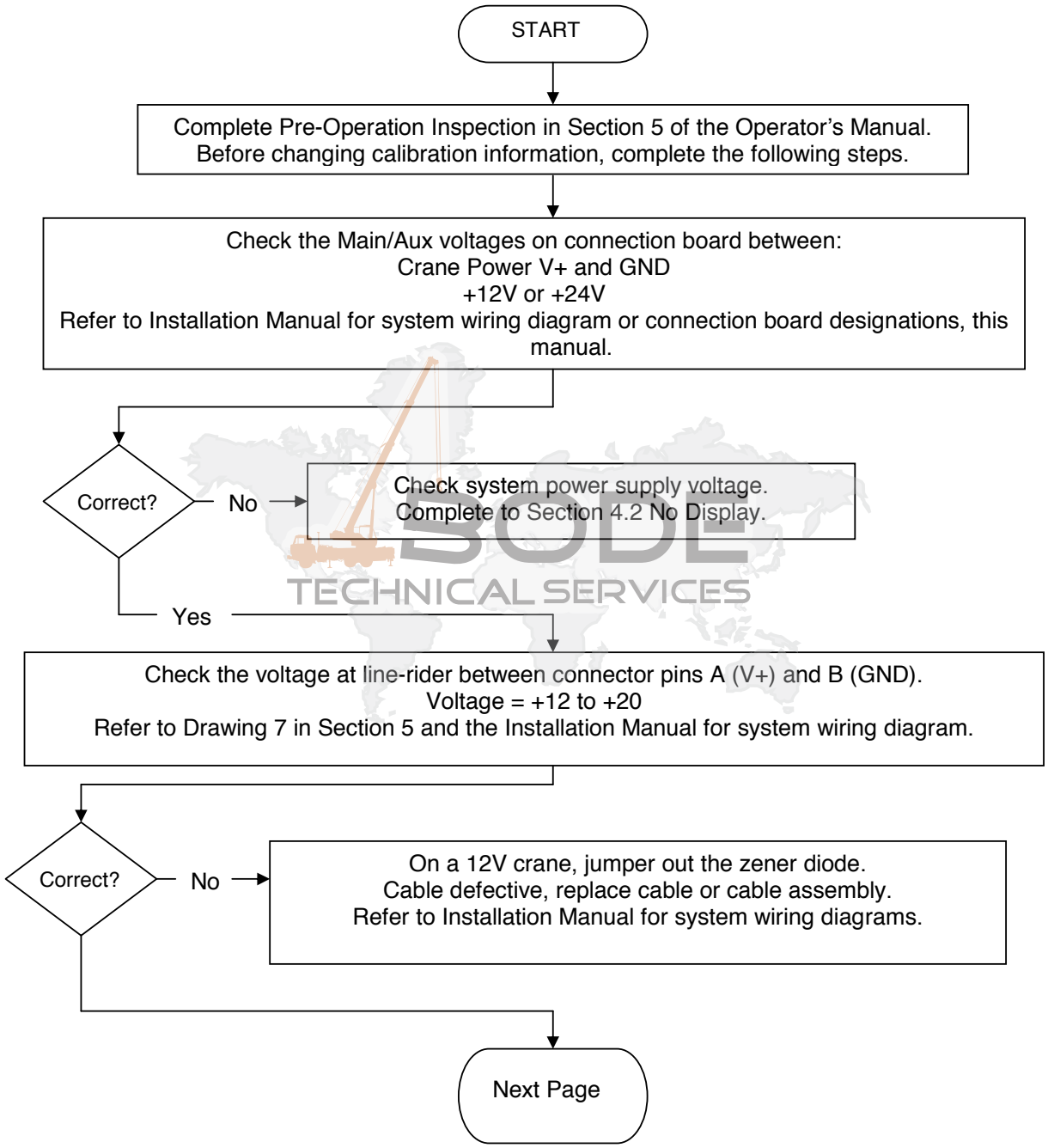
4.5 LENGTH READING PROBLEM

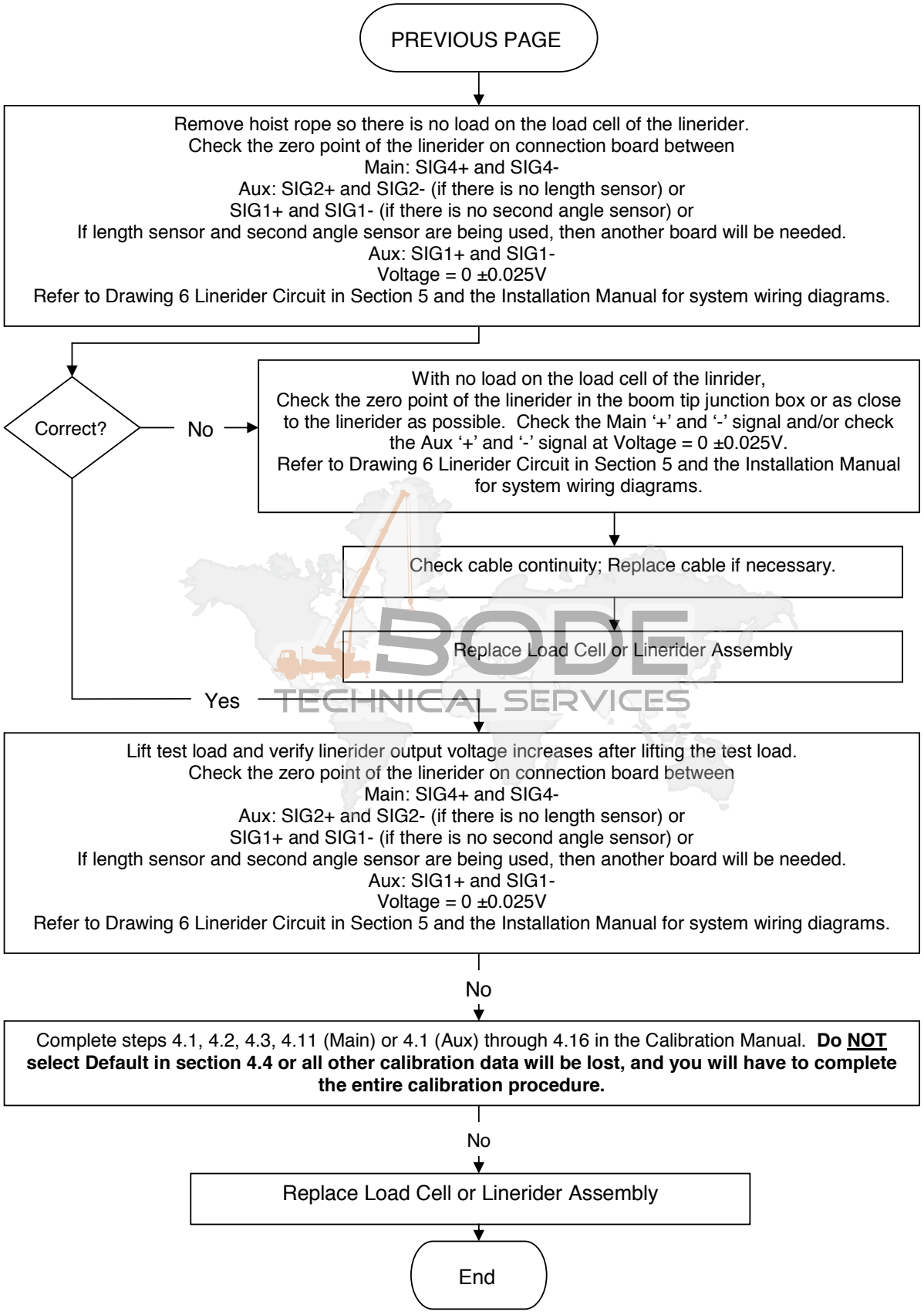



PREVIOUS PAGE
Measure supply to length transducer in cable reel, between Pin 1 (ground) and Pin 3 (-2V). Refer to Installation Manual for system wiring diagram.
Correct?
No
Cable defective, replace cable or cable assembly. Refer to Installation Manual for system wiring
Yes
Measure signal from length transducer in cable reel at terminal between pin 2(signal) and pin 1(ground). Retract boom – 0 Potentiometer turn = -0.2V 10 Potentiometer turn = -1.8V. Refer to Drawing 5 Length Sensor Circuit.
Correct?
No
Replace length potentiometer assembly. Remove slip ring body from shaft and remove gear wheel from potentiometer axle. Unscrew mounting plate and remove potentiometer assembly from mounting plate. Remove assembly wires from terminal block. Connect new assembly to terminal block. Reinstall mounting plate, gear wheel and slip rings. With boom fully retracted, reset potentiometer by turning counter-clockwise until it stops.
Yes
Measure signal from length transducer at console connection board between G2 (ground) and P2 (signal: -0.2V and -1.8V). Refer to Installation Manual for system wiring diagram or connection board designations, this manual.
Correct?
No
Cable defective, replace cable or cable assembly. Refer to Installation Manual for system wiring
Yes
Connection board defective
END

4.6 LOAD READING PROBLEM

PROBLEM: Displayed Load is out of tolerance. The displayed load should be equal to or 10% greater than the actual load.

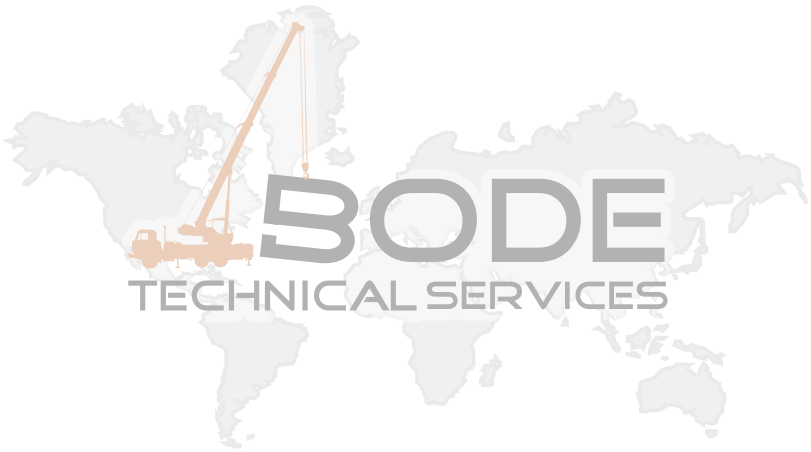




5 ERROR CODE TABLE

Error code	Reason	Action
11	Operating data in the buffered RAM	Turn on the system again and adjust operating data
21	Crane parameters in the serial EPROM incorrect	Re-calibrate the system
31	Wrong EPROM programming or EPROM defective	Exchange EPROM
51	Short circuit min layer device term 11&12	Check minimum layer device
52	Cable break min layer device term 11&12	Check minimum layer device
53	Short circuit A2B -switch - 2 term 13&14	Check anti-two block system
54	Cable break A2B -switch - 2 term 13&14	Check anti-two block system
55	Short circuit A2B -switch - 1 term 9&10	Check anti-two block system
56	Cable break A2B -switch - 1 term 9&10	Check anti-two block system
•61	Load on the main hoist hook too big	Reduce load on main hoist
•63	Load on the auxiliary hoist hook too big	Reduce load on aux. hoist
•71	Limit Length - Main - Boom - Max.	Decrease length limit
•72	Limit Length - Main - Boom - Min.	Increase length limit
•73	Limit WG - Main - Boom - Max.	Decrease main boom angle
•74	Limit WG - Main - Boom - Min.	Increase main boom angle
•75	Limit Boom height - Max.	Decrease main boom angle
•76	Limit Boom height - Min.	Increase main boom angle
•77	Limit Working radius - Max.	Increase main boom angle
•78	Limit Working radius - Min.	Decrease main boom angle
81	ADC-Measuring value KMD1 voltage too low	Check zero point in main linerider
82	ADC-Measuring value KMD1 voltage too high	Check zero point in main linerider
83	ADC-Measuring value KMD2 voltage too low	Check zero point in aux linerider
84	ADC-Measuring value KMD2 voltage too high	Check zero point in aux linerider
91	ADC-Measuring value LG1 voltage too high	Check main length sensor circuit
92	ADC-Measuring value LG1 voltage too low	Check main length sensor circuit
93	ADC-Measuring value WG1 voltage too low	Check main angle sensor circuit
94	ADC-Measuring value WG1 voltage too high	Check main angle sensor circuit
95	ADC-Measuring value WG2 voltage too low	Check luffing angle sensor circuit
96	ADC-Measuring value WG2 voltage too high	Check luffing angle sensor circuit

• Limit set by the operator refer to Operator's Manual, Section 4.3. Activating and Setting Preset Limits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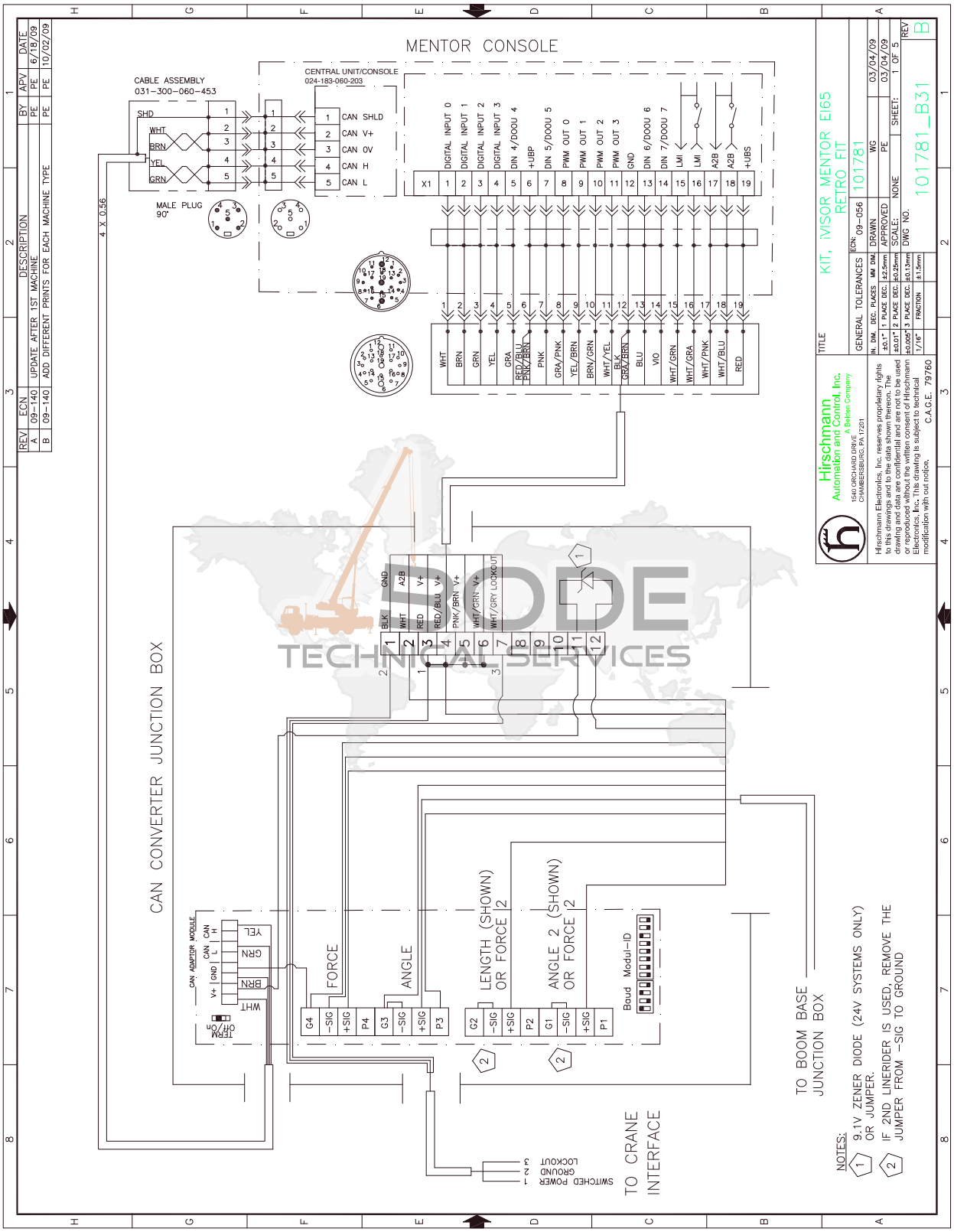
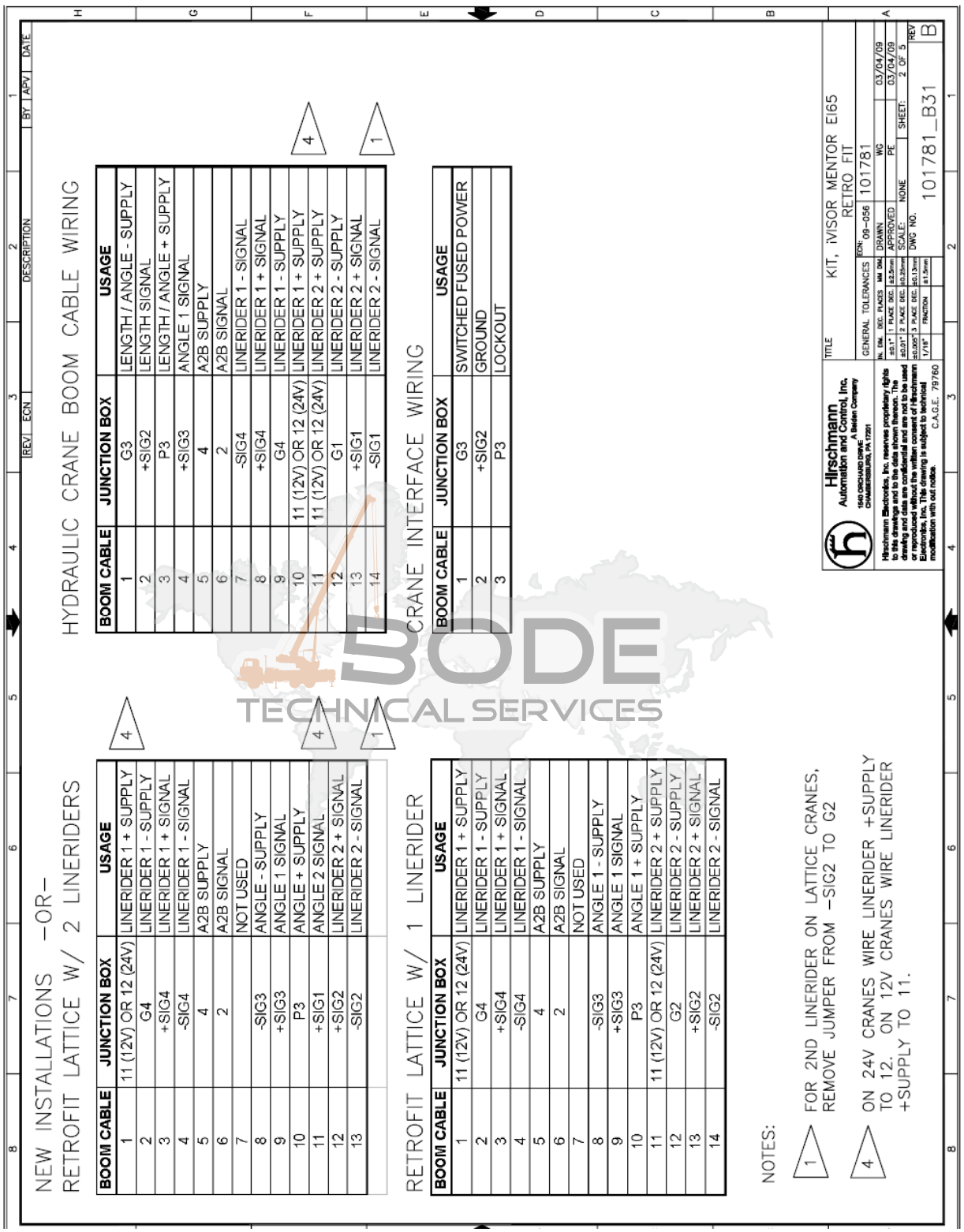
6 SYSTEM DRAWINGS

The Mentor EI65 System drawings in this section are provided as reference material for the troubleshooting flow charts. Use the drawings in conjunction with the flow charts to help understand the operation of the Mentor EI65 system.

Refer to the Operator's Manual for basic component layout on the crane and console drawing. The Mentor EI65 console connection board has the following terminal designations.

6.1 DRAWING 1. SYSTEM WIRING DIAGRAM





HYDRAULIC CRANE BOOM CABLE WIRING

BOOM CABLE	JUNCTION BOX	USAGE
1	G3	LENGTH / ANGLE - SUPPLY
2	+SIG2	LENGTH SIGNAL
3	P3	LENGTH / ANGLE + SUPPLY
4	+SIG3	ANGLE 1 SIGNAL
5	4	A2B SUPPLY
6	2	A2B SIGNAL
7	-SIG4	LINERIDER 1 - SIGNAL
8	+SIG4	LINERIDER 1 + SIGNAL
9	G4	LINERIDER 1 - SUPPLY
10	11 (12V) OR 12 (24V)	LINERIDER 1 + SUPPLY
11	11 (12V) OR 12 (24V)	LINERIDER 2 + SUPPLY
12	G1	LINERIDER 2 - SUPPLY
13	+SIG1	LINERIDER 2 + SIGNAL
14	-SIG1	LINERIDER 2 - SIGNAL

NEW INSTALLATIONS -OR-
RETROFIT LATTICE W/ 2 LINERIDERS

BOOM CABLE	JUNCTION BOX	USAGE
1	11 (12V) OR 12 (24V)	LINERIDER 1 + SUPPLY
2	G4	LINERIDER 1 - SUPPLY
3	+SIG4	LINERIDER 1 + SIGNAL
4	-SIG4	LINERIDER 1 - SIGNAL
5	4	A2B SUPPLY
6	2	A2B SIGNAL
7		NOT USED
8	-SIG3	ANGLE - SUPPLY
9	+SIG3	ANGLE 1 SIGNAL
10	P3	ANGLE + SUPPLY
11	+SIG1	ANGLE 2 SIGNAL
12	+SIG2	LINERIDER 2 + SIGNAL
13	-SIG2	LINERIDER 2 - SIGNAL

CRANE INTERFACE WIRING

BOOM CABLE	JUNCTION BOX	USAGE
1	G3	SWITCHED FUSED POWER
2	+SIG2	GROUND
3	P3	LOCKOUT

RETROFIT LATTICE W/ 1 LINERIDER

BOOM CABLE	JUNCTION BOX	USAGE
1	11 (12V) OR 12 (24V)	LINERIDER 1 + SUPPLY
2	G4	LINERIDER 1 - SUPPLY
3	+SIG4	LINERIDER 1 + SIGNAL
4	-SIG4	LINERIDER 1 - SIGNAL
5	4	A2B SUPPLY
6	2	A2B SIGNAL
7		NOT USED
8	-SIG3	ANGLE 1 - SUPPLY
9	+SIG3	ANGLE 1 SIGNAL
10	P3	ANGLE 1 + SUPPLY
11	11 (12V) OR 12 (24V)	LINERIDER 2 + SUPPLY
12	G2	LINERIDER 2 - SUPPLY
13	+SIG2	LINERIDER 2 + SIGNAL
14	-SIG2	LINERIDER 2 - SIGNAL

NOTES:

1. FOR 2ND LINERIDER ON LATTICE CRANES, REMOVE JUMPER FROM -SIG2 TO G2
4. ON 24V CRANES WIRE LINERIDER +SUPPLY TO 12. ON 12V CRANES WIRE LINERIDER +SUPPLY TO 11.

Hirschmann Automation and Control, Inc.
150 ORCHARD DRIVE, A Belden Company
CHARLESTON, SC 29407

TITLE: KIT, iVISOR MENTOR EI65 RETRO FIT

ECN: 09-056 101781

DRAWN: WG 03/04/09
APPROVED: PE 03/04/09
SCALE: NONE SHEET: 2 OF 5
DWG NO. 101781_B31 REV B

GENERAL TOLERANCES
IN. DIM. DEC. PLACES MM DIM.
±0.1" 1 PLACE DEC. ±2.5mm
±0.01" 2 PLACE DEC. ±0.25mm
±0.005" 3 PLACE DEC. ±0.13mm
1/16" FRACTION ±1.5mm

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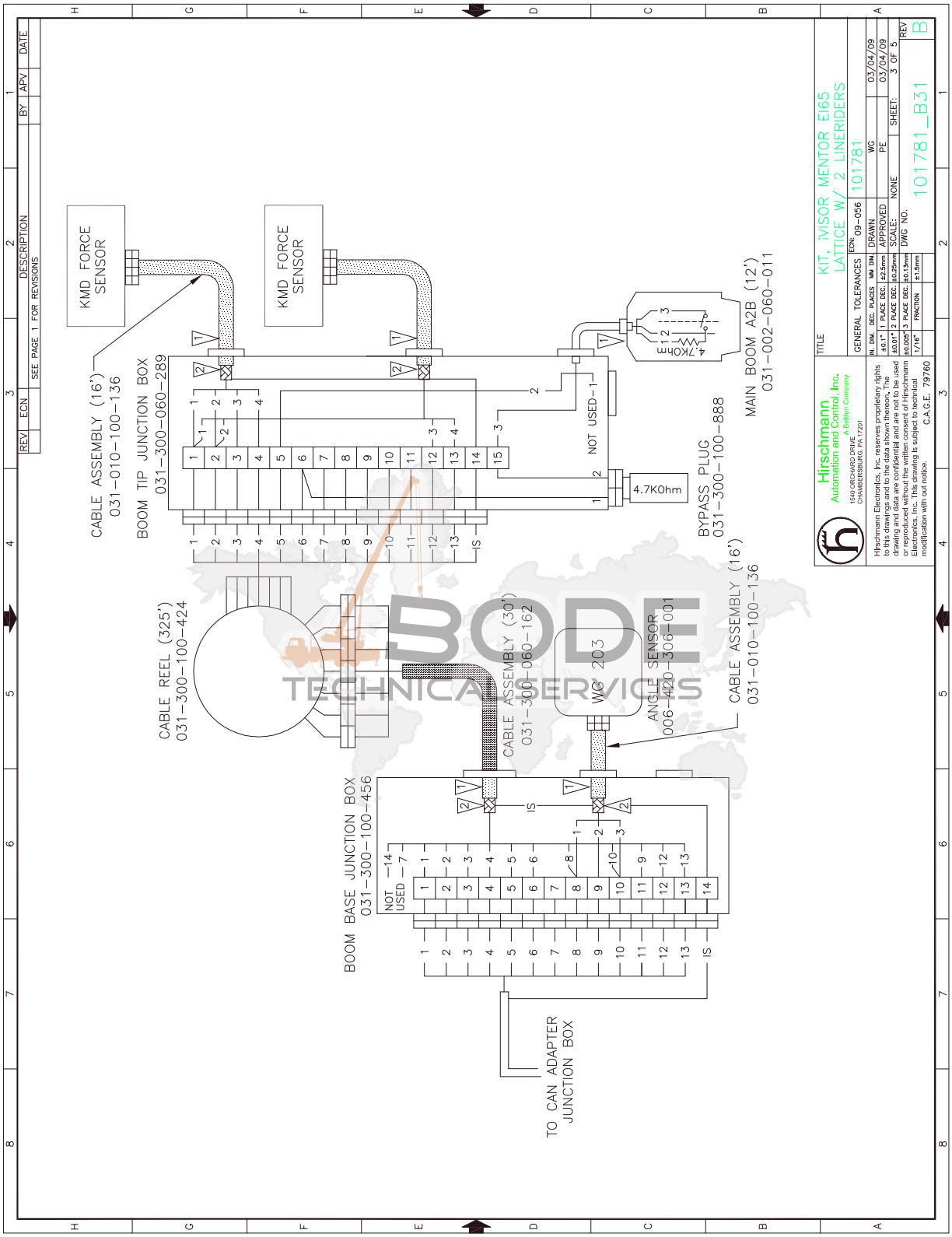
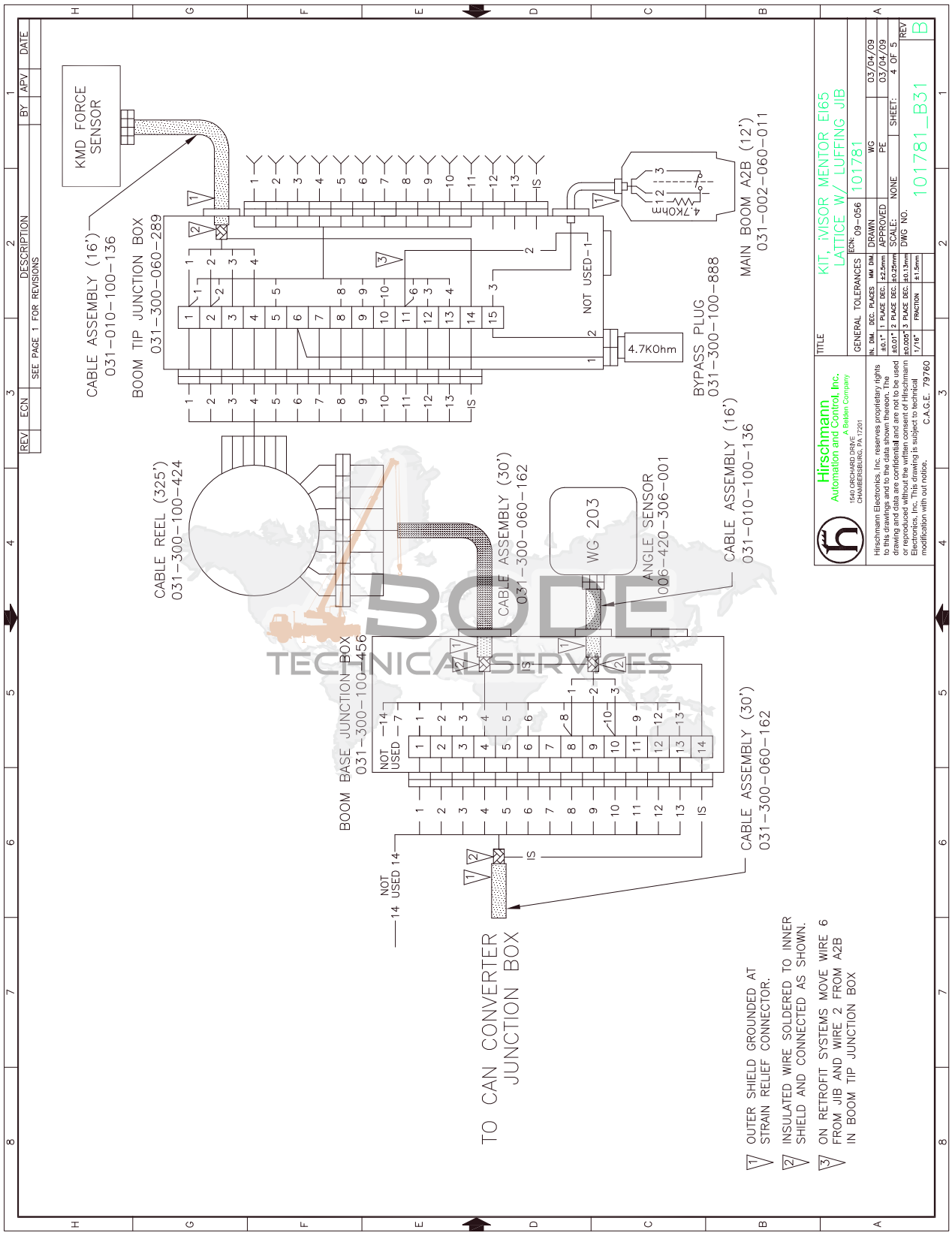
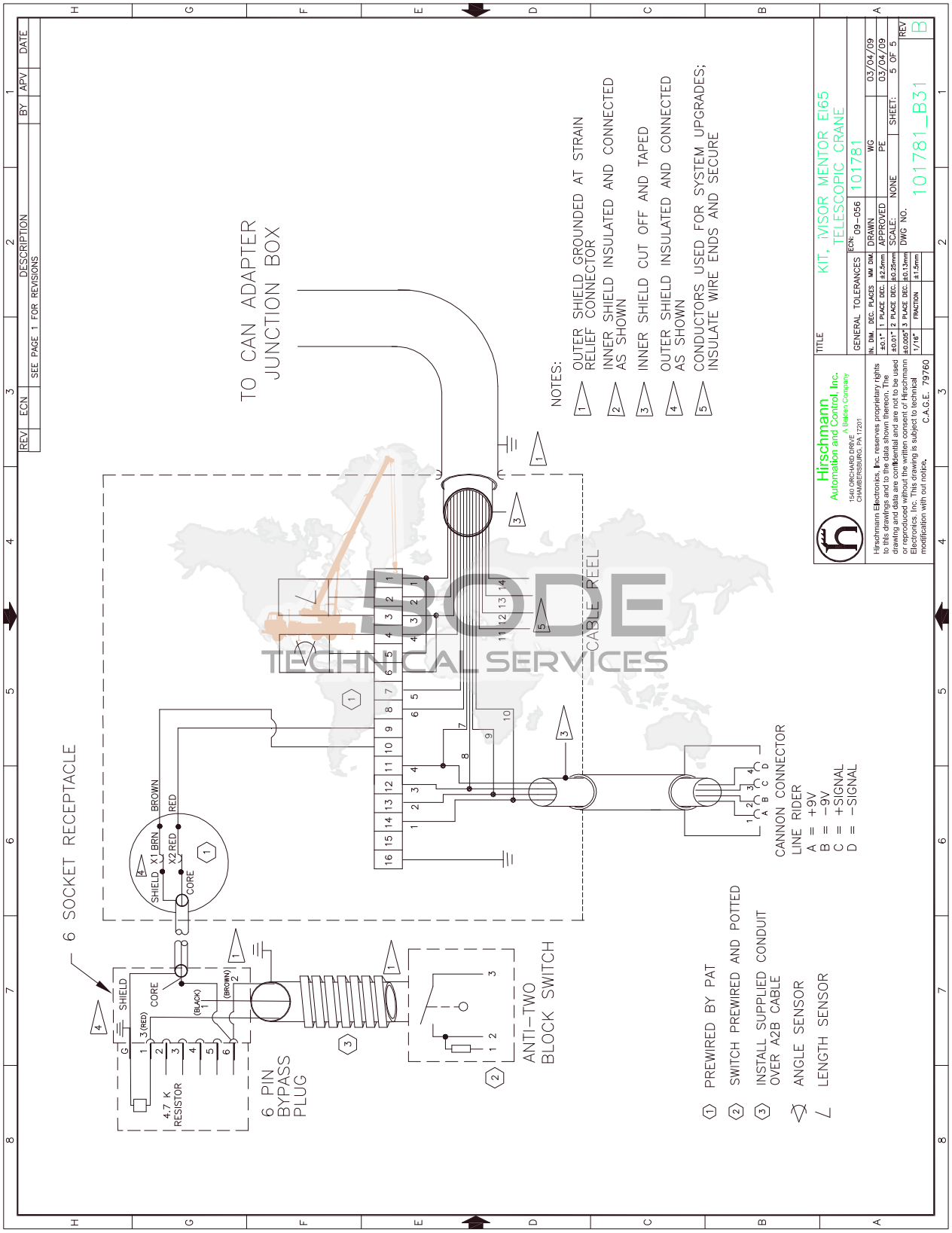
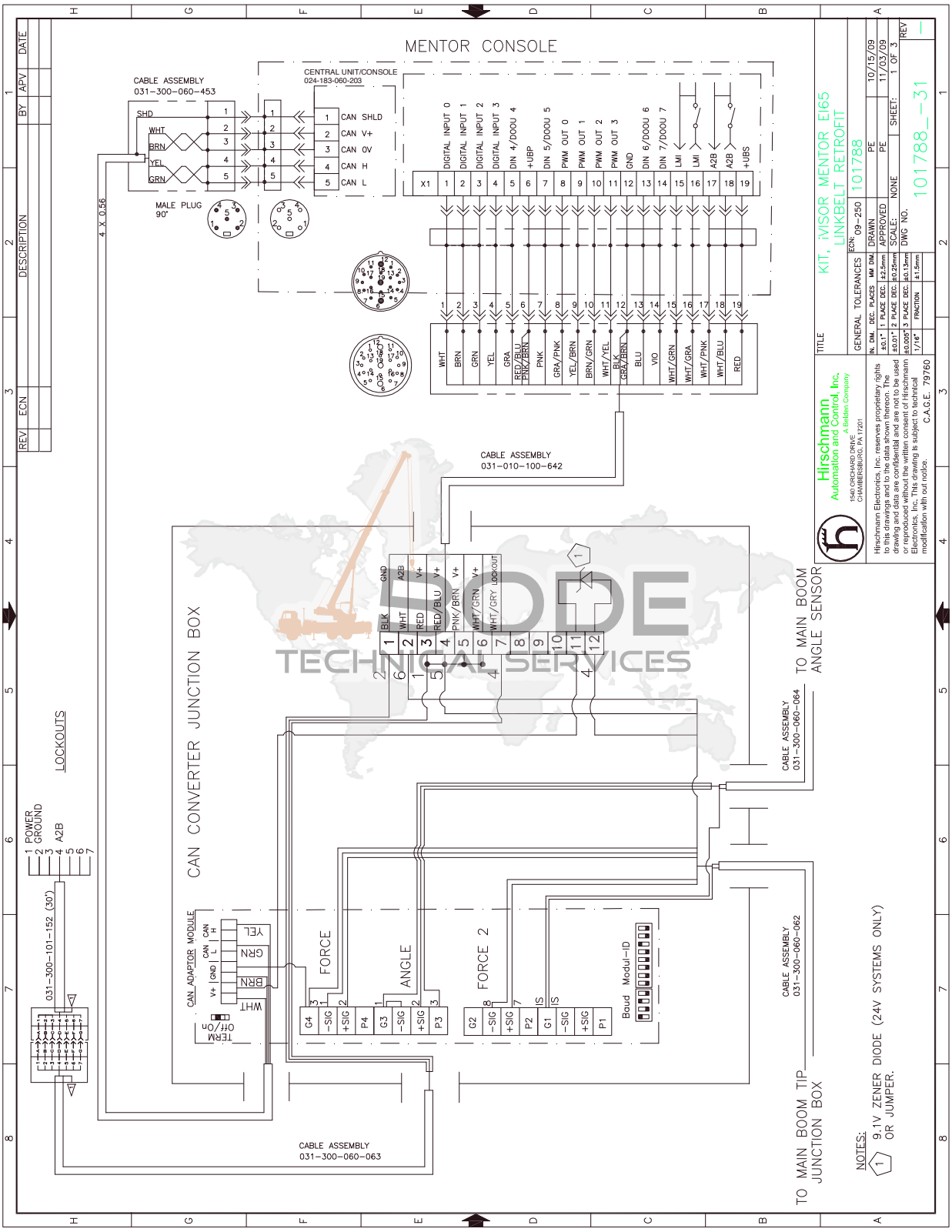
C.A.G.E. 79760

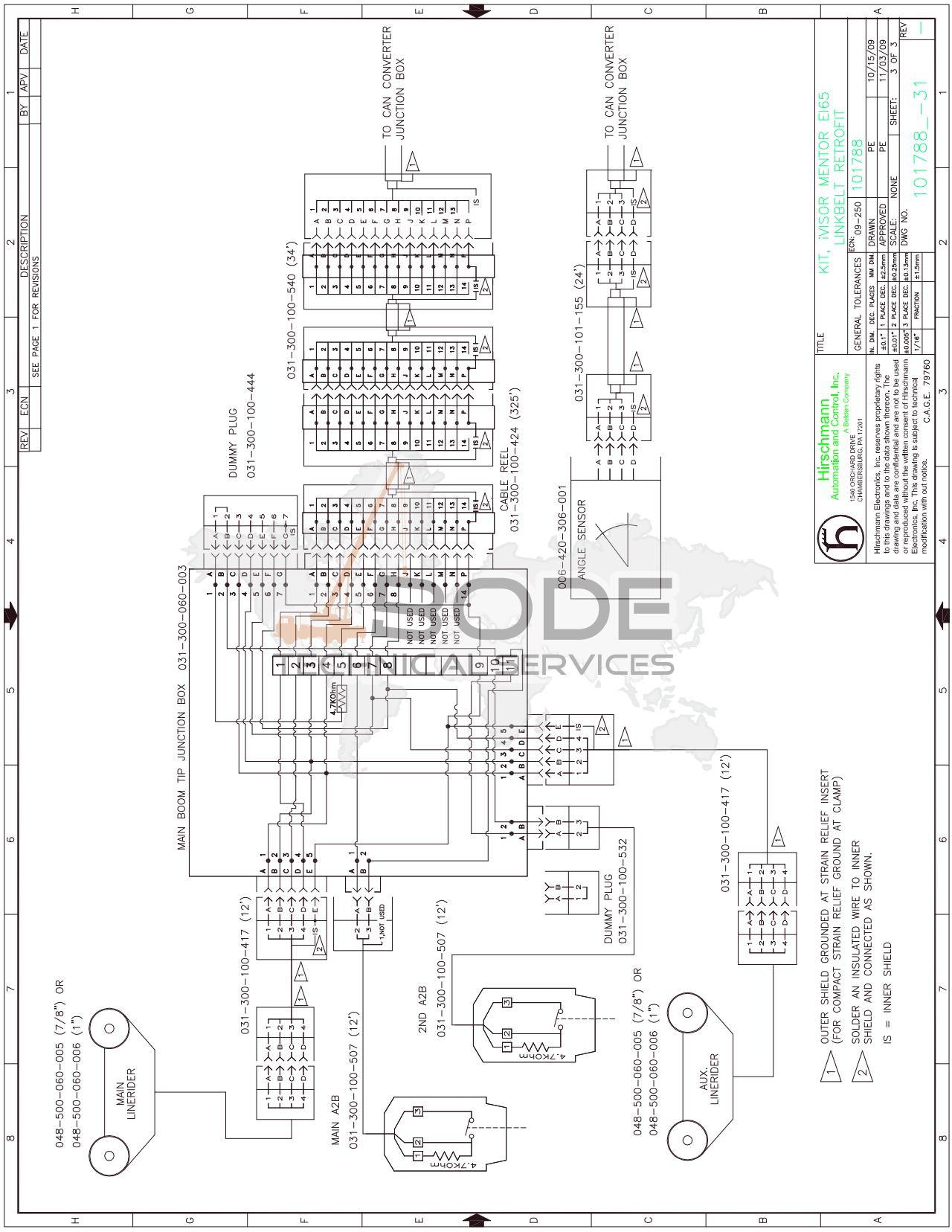




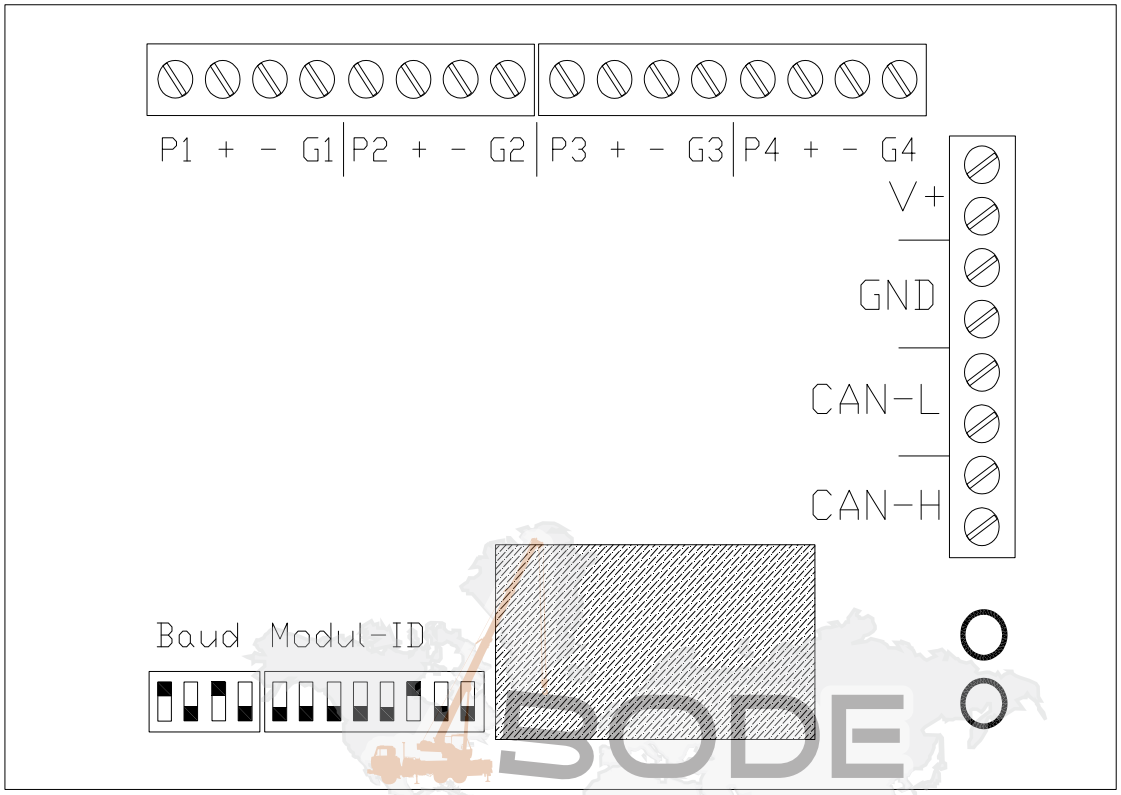


DRAWING 2. SYSTEM WIRING DIAGRAM, LINKBELT



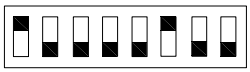


6.2 DRAWING 3. CONNECTION BOARD LAYOUT

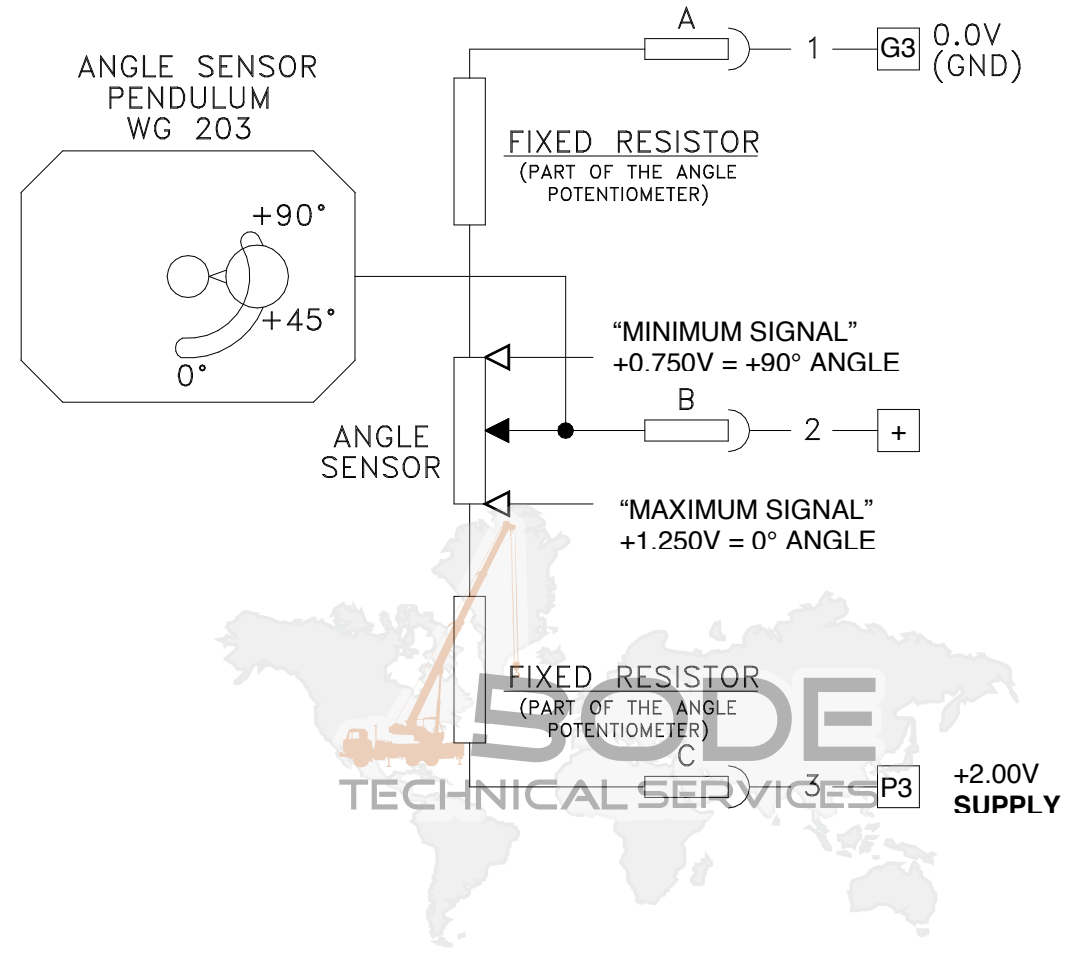


P1, P2, P3, P4	+2.0V supply
G1, G2, G3, G4	Sensor Ground
+	Sensor + input
–	Sensor – input
V+	Crane power (+12VDC or +24VDC)
GND	Crane ground (0VDC)
CAN-L	CAN bus low signal
CAN-H	CAN bus high signal

For the second converter possibly used for a second force sensor (if the length and second angle sensor are used), the Module ID switches need to be set as shown below (not the same as shown above).



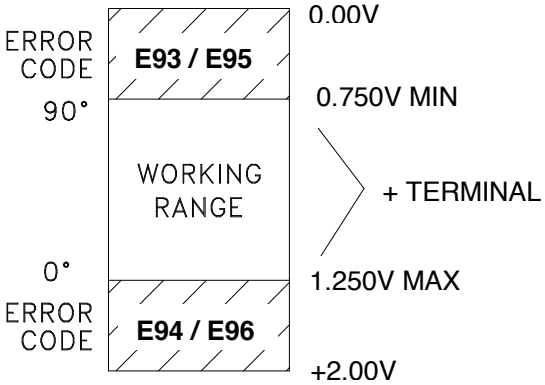
6.3 DRAWING 4, ANGLE SENSOR CIRCUIT



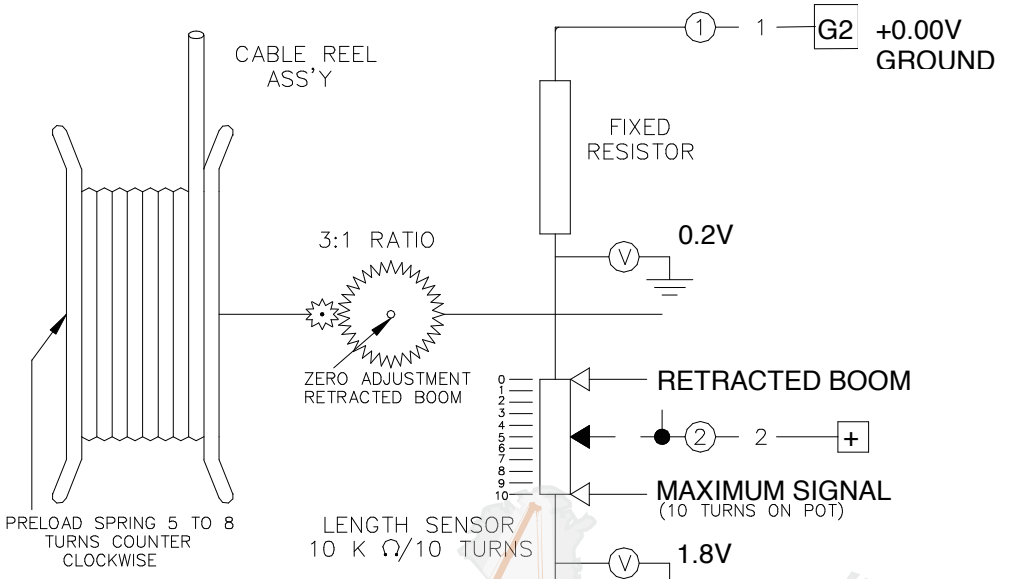
NOTE: MINIMUM AND MAXIMUM VOLTAGES ARE MEASURED BETWEEN THE SENSOR + AND - TERMINALS.

"MINIMUM SIGNAL"
+0.750v = +90° ANGLE

"MAXIMUM SIGNAL"
+1.250v = 0° ANGLE



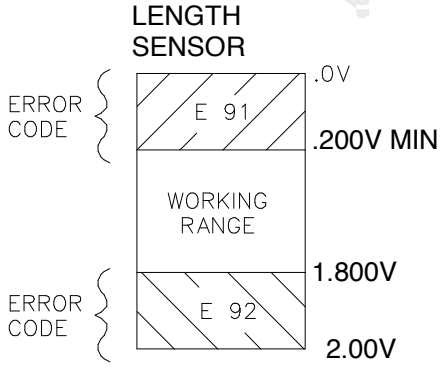
6.4 DRAWING 5, LENGTH SENSOR CIRCUIT



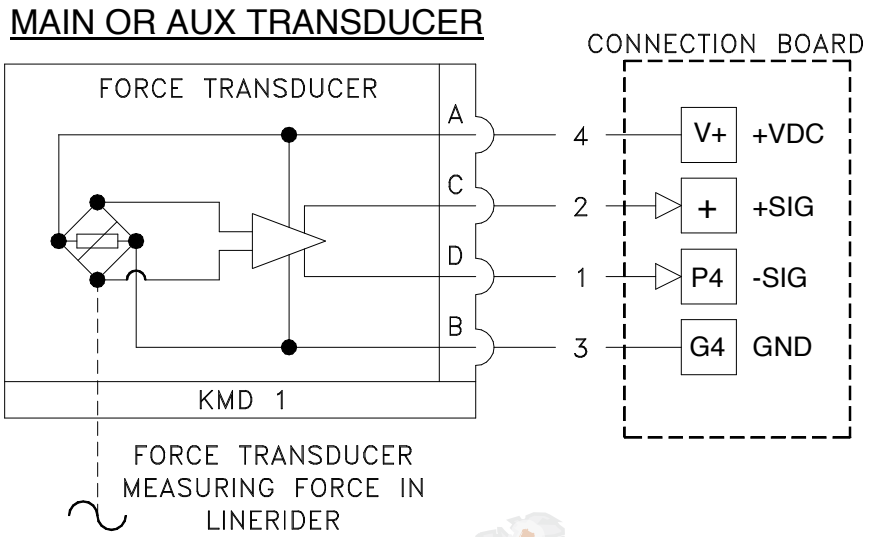
MINIMUM AND MAXIMUM VOLTAGES ARE MEASURED BETWEEN THE SENSOR + AND - TERMINALS.

+0.200V = MIN SIGNAL (RETRACTED BOOM)

+1.800v = MAX SIGNAL (10 TURNS ON POT)

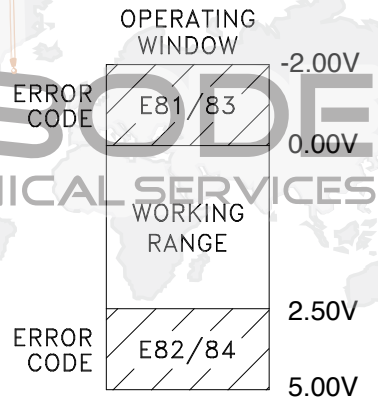


6.5 DRAWING 6, LINERIDER CIRCUIT



DIFFERENTIAL OUTPUT SIGNAL
MEASURED BETWEEN +SIG (+)
AND -SIG (P4)

ZERO FORCE = 0.00V +/- 25mV
MAX RATED FORCE = 2.50V



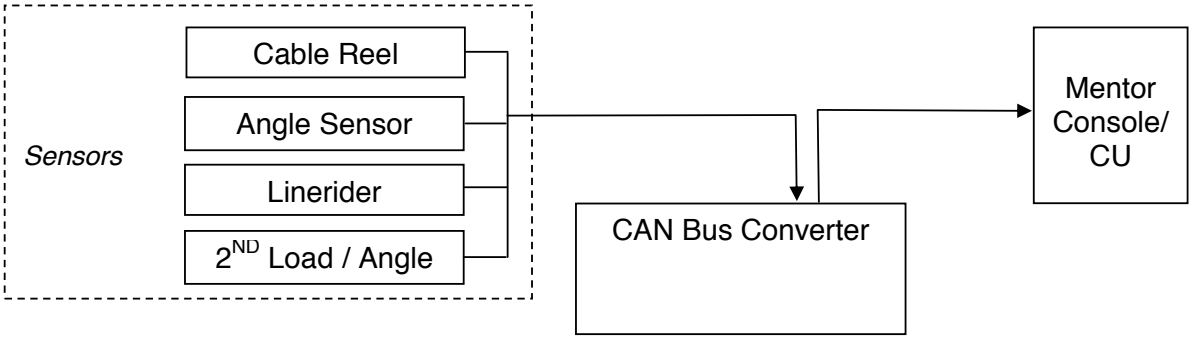
6.6 CAN-BUS COMMUNICATION

The System measures the length of the main boom, the angle of the main boom, the pressures of the lift cylinder, and the A2B state of the machine via a CAN-Bus connection. Since this is a digital bus connection, it is not possible to measure the signals on the bus with a multimeter. Instead, the Mentor EI65 provides you with error codes that give you an indication of the bus state.

The error codes are one of the following:

CAN BUS ERROR Error in the CAN bus data transfer for all CAN units

Block Diagram



The block diagram tries to clarify that: If the CU does not see any CAN-Bus component, it will report a CAN BUS ERROR.

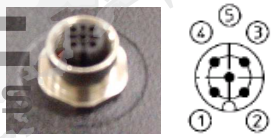
6.6.1 Troubleshooting TEXT CAN BUS ERROR

In case of a CAN BUS error, ensure that the CAN bus cable from the Mentor EI65 to the Analog to CAN converter is connected. When power is correctly applied to the CAN converter, one or both of the LEDs on the converter board will be lighted. If the converter board has power but is not communicating with at least one other CAN device on the bus (including a second CAN converter module), the ON/CAN LED will switch between flashing green and red.

Connector M12, 5 contacts

Pin Layout (CiA DR-303-1 7.2)

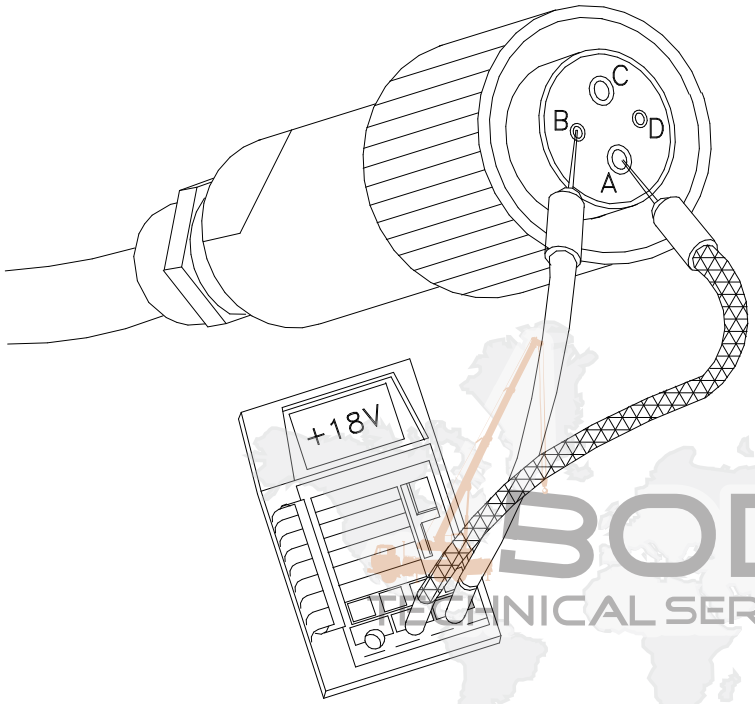
Pin 1	Shield
Pin 2	+ U_b
Pin 3	Ground
Pin 4	CAN High
Pin 5	CAN Low



Measure between pins 3 and 2 for crane voltage. If you see voltage, check all pins for continuity. The central unit must be replaced if this cable is functioning correctly. Use the Ohm-meter to check the connector in the cable reel. Either the connector has failed or the can bus converter boards must be replaced.

6.7 DRAWING 7, LINERIDER SUPPLY VOLTAGES

The supply voltage can be checked directly at the cannon connection. Using a digital voltmeter measure between pins A and B (A= Crane Power) (B= Ground). This must be at least 11.0V but not more than 27.0V. If this voltage is not correct refer to the system wiring diagram and verify all cable connections and the zener diode in the terminal box.



6.8 SPARE PARTS LISTINGS

CONSOLE ASSY W/ RAM MOUNT
PART NO. 031-300-060-648

NO.	PART NO.	QTY	DESCRIPTION
1	024-183-100-201	1	FRONTFACE, HIRSCHMANN
2	050-000-100-294	1	LCD, UNIT
3	024-183-100-008	1	HOUSING, PRE-ASSEMBLED
4	024-000-100-103	1	BREATHER ELEMENT
5	031-300-060-382	1	MOUNTING ARM
6	092-000-060-391	1	CONNECTOR, CAN M12 5 PIN
7	024-183-260-010	1	CONNECTOR, M23 19 POL.
8	024-183-290-001	1	CONNECTOR, SUB-D 9 PIN

MANUAL REVISIONS

REV	DATE	NAME	DESCRIPTION
-	01/07/09	PE	Mentor EI65 SERVICE Manual created.
A	06/18/09	PE	Revised after first field installation
B	10/02/09	PE	Add standard electrical prints
C	11/03/09	PE	Add Linkbelt specific electrical prints
D	12/22/09	PE	Change drawing line & text colors to black for improved visibility
E	02/02/10	PE	Correct the method for entering service & calibration screens