# 5 ERROR CODES

## 5.1 Operating Errors E01 through E05

These errors are usually caused by operating in a way that is not allowed per the load charts.
**Note:** If an error message is displayed which is not contained in the following list, please contact the PAT service department.

| Error Code | Error | Cause | Elimination |
|---|---|---|---|
| **E01** | Fallen below radius range or angle range exceeded | • Fallen below the minimum radius or gone past the maximum angle specified in the respective load chart due to hoisting up the boom too far | • Hoist the boom down to a radius or angle specified in the load chart. |
| **E02** | Radius range exceeded or fallen below angle range | • Gone past the maximum radius or fallen below the minimum angle specified in the respective load chart due to hoisting down the boom too far | • Hoist the boom up to a radius or angle specified in the load chart. |
| **E04** | Operating mode not existing or non permitted slewing zone | • A non existing operating mode has been selected<br>• The selected operating mode is not available in the data EPROM or blocked.<br>• The boom is in a non-permitted slewing zone | • Set the correct operating mode for the crane configuration in question<br>• Check programming of the data EPROM<br>• Slew the crane into a permitted area. |
| **E05** | Forbidden length range of the main boom | • Boom has been extended too far or not enough, e.g. the boom length has been moved out of the permitted range for load charts.<br>• The length sensor adjustment was modified, e.g. cable slid off the length sensor reel.<br>• Clutch between length sensor pot and drive is defective<br>• Failure of the +5V-supply for the analog part of the LMI-analog board.<br>• Length potentiometer defective. | • Retract or extend boom to the correct length.<br>• Retract the boom. Check the pretention on the cable. Open the length sensor and carefully turn the length pot counterclockwise to the detent with a screwdriver.<br>• Completely replace the clutch with the drive wheel and adjust length sensor pot<br>• Check +5V-voltage. If there is no voltage or break down at a charge of 50 ohm approximately, exchange LMI board.<br>• Replace length potentiometer. |

## 5.2 Lockout Function Errors 07 and 08

These errors are caused by defects around the function lockouts.

| Error Code | Error | Cause | Elimination |
|---|---|---|---|
| **E07** | Faulty acknowledgment of the overload relay on the connection board.<br>The relay should be energized, the 2nd contact however is indicated to be off, or the 2nd contact is indicated to be on while the relay should be de-energized. | • Overload relay or main board are defective<br>• LMI board defective | • Replace main board |
| **E08** | No acknowledgment from the anti-two-block relay | • refer to E07 | • refer to E07 |

## 5.3 Analog Input Channel Errors

These errors occur if the input signal of an analog input channel falls below (E1x) the minimum (500V) or exceeds (E2x) the maximum (4500V) as measured on the troubleshooting display.

The analog channels are as follows (Use theory section to define voltage or current at terminal strip):

| Sensor | Pins Terminal X1 | Lower Limit | Upper Limit |
|---|---|---|---|
| **Piston Pressure Transducer** | 32 | E12 | E22 |
| **Rod Pressure Transducer** | 33 | E13 | E23 |
| **Length Sensor** | 34 | E11 | E21 |
| **Angle Sensor** | 35 | E15 | E25 |

### 5.3.1 Troubleshooting a Sensor Problem using the Display

For a sensor error or problem with a sensor, look at the output voltage of the pressure transducer, length, and angle sensors on the display screen and compare the reading with the following:
Pressure transducers (piston and rod), 500mV @ 0psi
Length sensor, 500mV @ retracted boom length
Angle sensor, 4500mV at 0°, 2500mV at 45°, or 500mV at 90°

**Note:** The sensor output voltages displayed will not be the same as measured in the central unit.

To access the analog output screen use the following procedure.

1. From the operating screen, press and hold the information button  for 5 seconds.
2. The screen show the following selections:
   - sensor outputs
   - exit
3. Use the ‘UP’ and ‘DOWN’ arrows to high light (text flashes) sensor outputs, and then press ‘OK’ to display a similar screen as shown below:
4. Press the ‘OK button to exit back to operating screen.

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


### 5.3.2 Error Codes for the Analog Inputs

If it exceeds these limits, the following errors are triggered: (NOTE: the upper limit follows the lower limit error, i.e. 11 and 21, 12 and 22, 13 and 23…)

| Error Code | Error | Cause | Elimination |
|---|---|---|---|
| **E11** | Fallen below limit for the measuring channel "Length telescopic boom". | • Length sensor potentiometer defective.<br>• Electronic board in the measuring channel defective. | • Replace length sensor potentiometer.<br>• Replace LMI board. |
| **E21** | Upper limit value for measuring channel "length telescopic boom" exceeded. | • Length sensor potentiometer defective.<br>• Electronic part in the measuring channel defective. | • Replace length sensor potentiometer.<br>• Replace LMI board. |
| **E12** | Fallen below the lower limit value in the measuring channel "pressure piston side" | • Cable between the central unit and pressure transducers defective or water inside the plugs<br>• Pressure transducer is defective.<br>• Electronic component in the measuring channel is defective. | • Check cable as well as plugs, replace, if need be.<br>• Replace pressure transducer<br>• Replace LMI main board or processor board. |
| **E22** | Upper limit value in measuring channel "pressure piston side" has been exceeded | • refer to E12 | • refer to E12 |

| Error Code | Error | Cause | Elimination |
|---|---|---|---|
| **E13** | Fallen below lower limit value in the measuring channel "pressure rod side" | • refer to E12 | • refer to E12 |
| **E23** | Upper limit value in measuring channel "pressure rod side" has been exceeded. | • refer to E12 | • refer to E12 |
| **E15** | Fallen below lower limit value for the measuring channel "angle main boom". | • Angle sensor defective.<br>• Electronic part in the measuring channel defective. | • Replace angle sensor.<br>• Replace LMI board. |
| **E25** | Upper limit value in measuring channel "angle main boom" exceeded | • refer to E15 | • refer to E15 |
| **E16** | Fallen below lower limit value for the measuring channel "middle section". | • Angle sensor defective.<br>• Electronic part in the measuring channel defective. | • Replace angle sensor.<br>• Replace LMI board. |
| **E26** | Upper limit value in measuring channel "middle section" exceeded | • refer to E16 | • refer to E16 |
| **E17** | Fallen below lower limit value for the measuring channel "telescopic jib". | • Angle sensor defective.<br>• Electronic part in the measuring channel defective. | • Replace angle sensor.<br>• Replace LMI board. |
| **E27** | Upper limit value in measuring channel "telescopic jib" exceeded | • refer to E17 | • refer to E17 |
| **E19** | Reference and/or supply voltage defective | • The supply voltage is falsified by one of the sensors (DAV, LWG)<br>• Electronic component is defective | • Check the voltages on the LMI main board (AGND = MP0). Check sensors, plugs and cable, replace, if need be.<br>• Replace LMI board |

## 5.4 Errors 31 and up

Miscellaneous Errors, most of them caused by electronics.

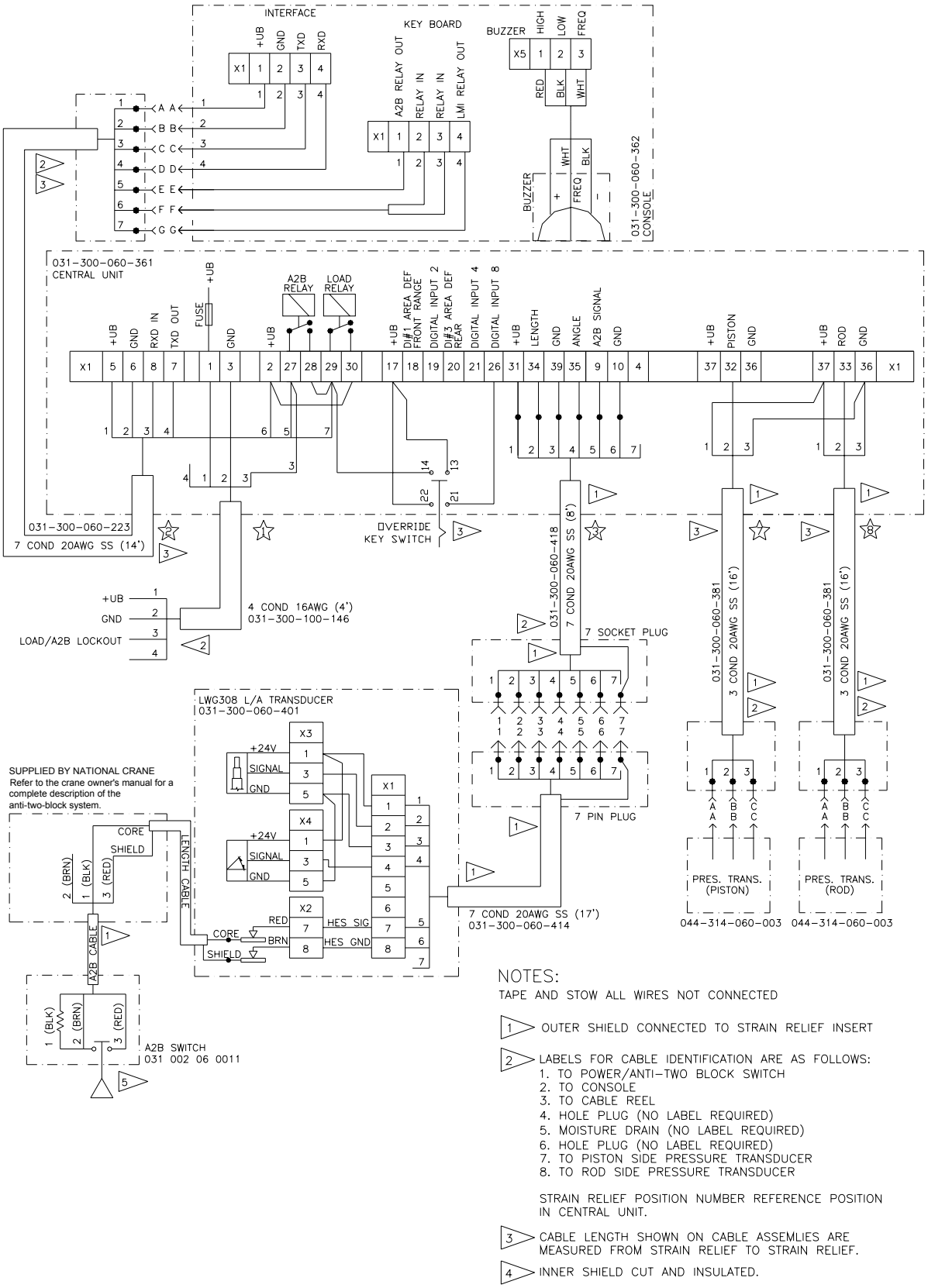
| Error Code | Error | Cause | Elimination |
|---|---|---|---|
| **E31** | Error in the system program | • The system program EPROM is defective. | • Replace system program PROM (D13) |
| **E38** | System program and data EPROM do not match. | • The system program in the LMI does not match to the programming in the data EPROM | • Replace the system program EPROM (D13) or the data EPROM (D1) |
| **E41** | Error in the internal write/read memory (RAM) of the computer component 80C537 | • Computer component 80C537 defective<br>• CPU module defective<br>• Processor board defective. | • Replace computer component 80C537.<br>• Replace CPU module.<br>• Replace processor board with CPU module. |
| **E42** | Error in the external write/read memory, 1st part (RAM) | • Write/read memory (CMOS RAM) or processor board defective. | • Replace processor board with CPU module. |
| **E43** | Error in the external write/read memory, 2nd part (RAM) | • refer to E42 | • refer to E42 |
| **E48** | Error in the internal write/read memory (RAM) | • Computer component 80C537 defective<br>• Processor board defective. | • Replace processor board (main board) |
| **E51** | Error in the data EPROM or EEPROM. | • No valid data in the data EEPROM.<br>• Memory module wrongly bridged.<br>• Crane data EPROM defective | • Load data EEPROM containing valid data.<br>• Bridge memory module acc. to memory type<br>• Replace crane data EPROM |
| **E52** | Error in load chart PROM. | • Memory module wrongly bridged.<br>• Load chart EPROM defective. | • Bridge memory module acc. to memory type.<br>• Replace load chart EPROM |
| **E56** | Error in the data EEPROM. | • Memory module wrongly bridged.<br>• Crane data EEPROM defective | • Bridge memory module acc. to memory type<br>• Replace crane data EEPROM |
| **E57** | Error in serial crane data EEPROM. | • Serial crane data EEPROM does not contain valid data.<br>• Memory module defective | • Write data on the serial crane data EEPROM (by means of test program or on-line function), then restart the LMI<br>• Replace memory module. |
| **E58** | Error in the serial analog data EEPROM. | • No valid data in the serial analog data EEPROM.<br>• LMI module(s) defective. | • Write data on the serial analog data EEPROM by means of the test program, then, restart the LMI<br>• Replace LMI module(s). |

| Error Code | Error | Cause | Elimination |
|---|---|---|---|
| **E82** | No pressure change sensed during boom down or telescope out | • Blocked velocity fuse<br>• No pressure change at piston transducer | • Verify correct operation of the velocity fuse. |
| **E83** | Error in Telecode | • The selected telecode is not available | • Select an available telecode |
| **E85** | Error in the radius determination | • The computed radius is too small (negative deflection) | • Check the programming in the data EPROM. |
| **E91** | No data trans-mission form the console to the central unit | • +UB supply voltage to the console is interrupted<br>• Interruption or accidental ground in the line between console electronics and central unit<br>• Transmitter/receiver module is defective | • Check +UB voltage at terminal X1 of the console electronics<br>• Check the connection console electronics - central unit. In case of an accidental ground, the transmitter module of the console electronics might be damaged.<br>• Exchange console electronics or LMI main board resp. |
| **E92** | Error in the data transmission from console to central unit | • Loose connection in the line between console electronics and central unit<br>• Transmitter/receiver module is defective | • Check the connection between console electronics and central unit<br>• Exchange console electronics or LMI main board resp. |
| **E93** | Error in the data transmission from the central unit to the console | • refer to E92 | • refer to E92 |
| **E94** | No data trans-mission from the central unit to the console | • Interruption or accidental ground in the cable between central unit and console<br>• 5 V supply of the computer in the central unit is missing<br>• 5 V supply is too low<br>• Transmitter/receiver module is defective<br>• Computer module is defective<br>• Electro-magnetic interferences (e.g. when switching contactors or valves) | • Check wiring to the console (in case of accidental ground, replace console electronics, too).<br>• Check connection to the power unit<br>• Exchange the LMI main board<br>• Replace console electronics or LMI main board<br>• Replace processor board.<br>• Eliminate the source of interferences by inverse diodes or varistors. |

| Error Code | Error | Cause | Elimination |
|---|---|---|---|
| **E95** | Error in the console EPROM | • The console EPROM is defective. | • Replace the console EPROM |
| **E96** | Error in the internal RAM of the console. | • The CPU of the console is defective.<br>• The console main board is defective. | • Replace the CPU of the console<br>• Replace the console main board. |

# 13 DRAWINGS

## 13.1 System Wiring Diagram




NOTES:

TAPE AND STOW ALL WIRES NOT CONNECTED

1. OUTER SHIELD CONNECTED TO STRAIN RELIEF INSERT
2. LABELS FOR CABLE IDENTIFICATION ARE AS FOLLOWS:
   1. TO POWER/ANTI-TWO BLOCK SWITCH
   2. TO CONSOLE
   3. TO CABLE REEL
   4. HOLE PLUG (NO LABEL REQUIRED)
   5. MOISTURE DRAIN (NO LABEL REQUIRED)
   6. HOLE PLUG (NO LABEL REQUIRED)
   7. TO PISTON SIDE PRESSURE TRANSDUCER
   8. TO ROD SIDE PRESSURE TRANSDUCER

   STRAIN RELIEF POSITION NUMBER REFERENCE POSITION IN CENTRAL UNIT.
3. CABLE LENGTH SHOWN ON CABLE ASSEMLIES ARE MEASURED FROM STRAIN RELIEF TO STRAIN RELIEF.
4. INNER SHIELD CUT AND INSULATED.

## 14.3 Calibration of Sensors Procedure

To access the calibration sensors screen use the following procedure.

1. From the operating screen, simultaneously press and hold  and  for approximately 5 seconds.
2. The screen show the following selections:

| |
|---|
| CALIBRATE SENSORS |
| EXIT |

3. Use the ‘UP’ and ‘DOWN’ arrows to high light (text flashes) calibrate sensors, and then press ‘OK’ to display a similar screen as shown below: Note: the displayed length indication is noted by XX.X in following step.

| | |
|---|---|
| PIS | 0.500V 000 PSI |
| ROD | 0.500V 000 PSI |
| LEN | 0.500V XX.X FT |
| ANG | 0.500V 90 DEG |

Go to the following selection for the pressure transducer, length, or angle procedure below to complete sensor calibration after confirming the following step.

4. Acknowledge the sensor selection by selecting yes or no.

| |
|---|
| CALIBRATE SENSOR? |
| YES |
| NO |

Proceed to the following sections for pressure transducer, length, and angle calibration procedures.

### 14.3.1 Pressure Transducer Calibration Procedure

After selecting ‘PIS’ or ‘ROD’ in steps 1 through 4 at the beginning of this section complete the following procedure. The zero setting consists of defining zero-point offset. The zero point offset is added to the transducer measurement to calculate the real physical pressure or force.
To define the zero-point offset the pressure transducer or force sensor must be in equilibrium (no load condition). Therefore the boom must be lowered all the way down (no rest pressure) and the hydraulic hoses disconnected from the pressure transducers.
**CAUTION**: Ensure there is no pressure in the hydraulic line when disconnecting the hoses from pressure transducers.

| |
|---|
| BOOM DOWN COMPLETELY |
| AND DISCONNECT HYDR |
| OK |
| EXIT |

Press the ‘OK’ button to zero the selected piston or rod side pressure transducer. The rod and piston side pressure transducers are zeroed individually; therefore, you must complete this procedure for both piston and rod side pressure transducers.

Press **EXIT** to leave calibration or select the ‘CALIBRATE SENSORS’ to calibrate another sensor.