

INSTALLATION, OPERATOR'S & TROUBLESHOOTING  
MANUAL  
PAT ANTI-TWO-BLOCK



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## 1. GENERAL INFORMATION

The PAT Anti–Two-block System has been designed to warn the crane operator of a two-blocking condition of the crane. If a two-blocking condition is approached, the system will warn the operator by sounding an audible alarm, lighting a warning light and locking out those functions which may aggravate the crane's condition, whenever applicable.

**NOTE:** The term "two-block" is a crane term that refers to a condition when the load handling device comes in contact with the boom head. This condition, if not prevented, may cause the wire rope to break, allowing the load to fall. Either raising the load into the boom head, or telescoping the boom without paying out hoist line can cause a "two- block" condition.

## 2. WARNINGS

The PAT Anti-Two- Block System is an operational aid, which warns a crane operator of approaching two-block conditions, which could cause damage to equipment and personal injury.

This device is not, and shall not be a substitute for good, sound operator judgment, experience and use of accepted safe crane operating procedures.

The responsibility for the safe operation of the crane remains 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 this manual to ensure that he or she knows the operation and limitations of the system and the crane.

Proper functioning is dependent upon proper daily inspection and observations of the operating instructions set forth in this manual. Refer to Section 4 of this manual.

### 3. OPERATION

#### SYSTEM DESCRIPTION

The PAT Anti-Two-block System consists of an operating console, a cable reel, two-block switches and all applicable wiring.

The anti-two-block switch(es) is (are) mounted at the head of the boom and boom extensions if available. When the hook block contacts the weight, which means a two-block condition is approaching, the hoist limit switch contacts open sending a signal that locks out the hoist up, boom up, and tele out functions.

The cable reel, which is mounted on the boom base section, serves as an electrical conductor for the anti-two-block switch signal.

The operating console is located in the operator's cab in front of the operator. This unit contains different controls, which are described in the following picture.



1. Buzzer
2. Alarm light button
3. By-pass key switch

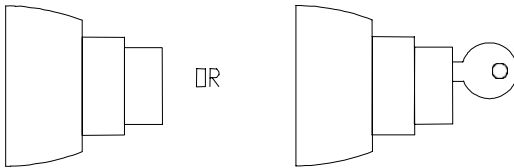
#### IDENTIFICATION

#### CONTROL

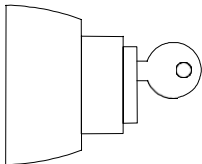
Figure 1 illustrates the controls of the PAT Anti-two-block System. The numbers of the illustration correspond to the numbers in the following list, which describes the function of each control.

1. **Buzzer:** The BUZZER (1) is an audible alarm that sounds during an approaching two-block condition of the crane. At the same time, the Anti-two-block Alarm Light (2) illuminates. The following crane movements will be stopped concurrently; hoist up, telescope out and boom down. (Whenever applicable) The audible alarm can be silenced temporarily by pushing the Alarm light button (2).

2. **Anti-Two-block Alarm Light and Alarm Stop Button:** The ALARM LIGHT BUTTON serves a dual purpose. First, a red warning light illuminates when the anti-two-block limit switch contact opens. This indicates that a two-blocking condition is approaching. At the same time, the BUZZER (1) will sound and the following crane movements will be stopped concurrently: hoist up, telescope out and boom down. (Whenever applicable) Second, it acts as an alarm stop button, which allows the buzzer to be silenced temporarily.
3. **By-Pass Key Switch:** The BY-PASS KEY SWITCH (3) can deactivate the cut off function of the anti-two-block momentarily to allow the crane operator to override the control lever lockout. This function can only be engaged by using the matching key. The BY-PASS SWITCH has 2 positions, which are more specifically described as follows:
- The neutral position is engaged when the plunger is out and the key can be removed, as shown below. In this position, the by-pass key switch does not influence the anti-two-block control lever lockout.



- This position bypasses the anti-two-block control lever lockout. This function can only be engaged by using the matching key. In this position, the cut off function of the system is deactivated. To activate the switch, the key has to be turned clockwise for about 45 degrees and plunger push in, then turned back to the middle position to lock it in place (as shown below). After activating the by-pass key switch, the alarm light will constantly blink, indicating that the cutoff function has been deactivated. During this operation, with the anti-two-block switch activated, the alarm light will blink with a higher frequency. The BUZZER (1) for approaching two-block conditions will be illuminated at all times.



 **WARNING**

**Since this switch deactivates the cut-off function of the anti-two-block system, the following instructions shall be adhered to:**

**The by-pass key shall be used with discretion, because unwarranted use to override the control lever lockout system can result in harm to the crane and endanger property and/or person.**

**Never use the by-pass key to either overload or operate the crane in a range that is not permissible.**



## PRE-OPERATION INSPECTION

Prior to operating the crane, the following checks must be made:

1. Check the cabling connections to the various parts of the system for physical damage.
2. Check the spring-loaded cable reel to ensure it is free to rotate, has proper tension and is spooled properly.
3. Check the anti-two-block switches and weights for freedom of movement.
4. Check the anti-two-block switch weight for proper installation on the hoist load line. The hoist line runs through the A2B weight. With even parts of hoisting line, the weight shall be attached to the dead-end line. With odd parts of hoisting line, the weight shall be attached to the line of lowest speed.
5. Check the A2B conditions for main/auxiliary hoist operation with the following instructions:
  - 1) If the crane works with only the main boom, the by-pass plug must be installed in the main boom junction box.
  - 2) If the crane works with an extension:
    - a) If the boom extension is not in the operating position, the by-pass plug must be installed in the main boom junction box. The weight shall be installed on the main hoist anti-two-block switch.
    - b) If the boom extension is in the operating position and the load line is being used on the main boom, the connecting cable must be installed between the junction boxes on the main boom and extension. Weights must also be attached to the anti-two-block switches on both the main boom and boom extension.
    - c) If the boom extension is in the operating position and no load line is being used on main boom, to prevent injury or damage to equipment, the weight shall be removed from main boom switch. In that case the anti-two-block switch has to be locked with the red Anti-two-block Retainer (See number 6 in this section).

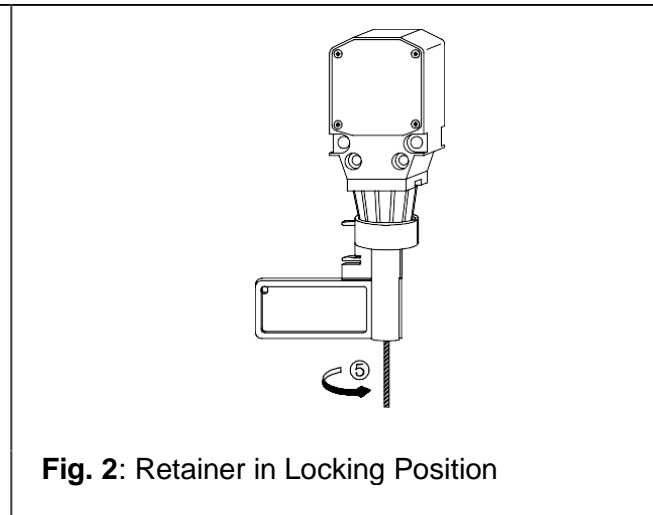
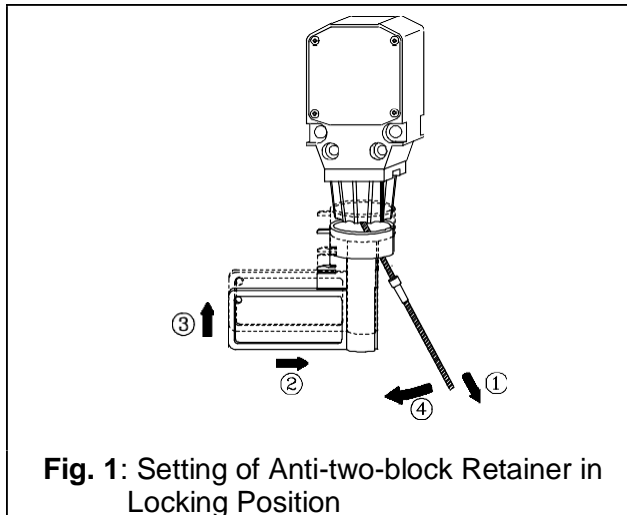


**Failure to re-position the anti-two-block switch weight will prevent the system from functioning properly. No weight shall be on the main hoist anti-two-block switch when the boom extension is being used.**

6. Check the installation of the A2B retainer when applicable. - See Numbers 4 and 5 of Pre-Operation Inspection, above.

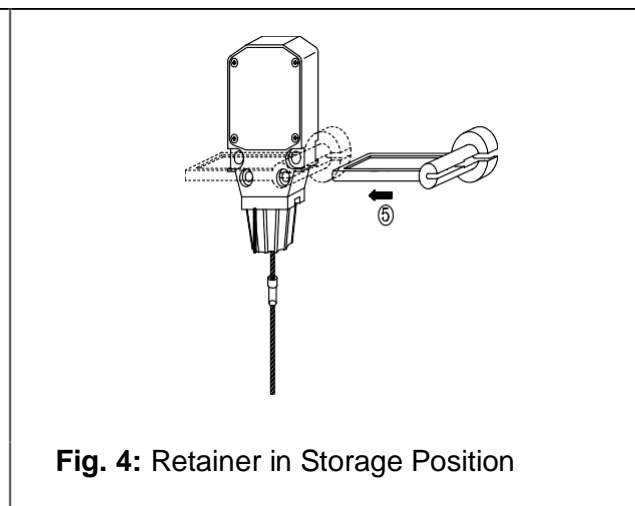
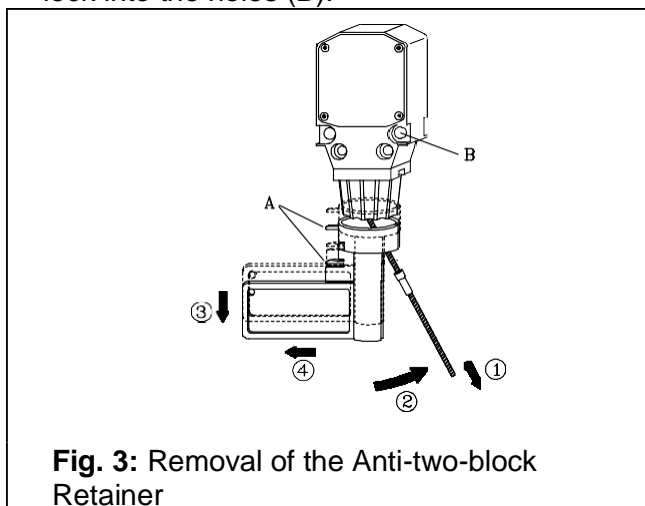
### Installation of Anti-two-block Retainer in Locking Position (Figures 1 and 2)

1. Pull the cable out of the switch and bend back parallel to the boom and hold ①.
2. Slide the retainer from left side with its slot over the cable between the crimped stop and the switch ②. Push it firmly straight onto the cable guide of the Anti-two-block switch ③.
3. Straighten the cable completely into the slot and release the cable ④.
4. Turn the flag of the retainer for the operator's best visibility. ⑤.



### Removal and Storage of Anti-two-block Retainer (Figures. 3 and 4)

1. Pull the cable out of the switch ① and bend back parallel to the boom and hold ②.
2. Move the retainer down ③ and then left ④ to remove it from the Anti-two-block switch. Release the cable.
3. For storage, slide the retainer from the right side ⑤ over the Anti-two-block switch until the clips (A) lock into the holes (B).



## OPERATIONAL TESTS

The operation test will test and verify the anti-two-block switch(es) is (are) functioning properly. This test should be completed periodically or any time there is an indication of uncertainty for operation.

 **WARNING**

**The following tests must be performed carefully to prevent personal injury or damage to the machine. Proper system functioning requires successful completion of these tests before operating the machine.**

**If the operator cannot clearly see the hook block approaching the boom head, an assistant must watch the hook block.**

**The operator should be prepared to stop the machine immediately, if the system fails to function properly by lighting the red warning light and /or sounding the audible alarm.**

1. Start the crane in accordance with crane operator's manual.
2. Verify that the anti-two-block indicator and audible alarm function properly by manually lifting the weight attached to the A2B switches on the crane. When the weight is lifted, the audible alarm should sound, and the anti-two-block alarm light should light. (See SAE J1305 for two-block warning and limit system operation)
3. Slowly raise the main boom hook block to bring it into contact with the A2B switch weight.

**NOTE:** If the operator cannot see the load handling device approaching the boom nose, he shall have an assistant (signal person) watch the load handling device. The operator shall be prepared to stop the machine immediately **if the system fails to function properly** by lighting the red warning light, sounding the audible alarm and locking the hoist up function.

When the hook block contacts the weight, the red anti-two-block indicator should light and the audible alarm should sound. **NOTE:** The hoist up function of the crane will be disabled. Lower the hook block to eliminate the two-block condition.

 **WARNING**

**If the light and audible alarm do not function as described and the crane movements are not stopped, the system is not working properly. The malfunction must be corrected before operating the crane.**

## 4 INSTALLATION

### SYSTEM KITS

This Installation Manual shows the approximate location of components and wiring diagrams required for system operation. This manual has two different system component and wiring diagrams; therefore, use the drawings that match your system, as shown below:

#### 1. 031-300-100-432 SYSTEM, A2B HYDRAULIC MAINBOOM

Component Item	Qty	Component Description
• 031-300-100-653	1.0	KIT, A2B CONSOLE
• 031-300-100-654	1.0	KIT, A2B MAINBOOM
• 031-300-100-443	1.0	KIT, A2B MAINBOOM MOUNTING (15R)
• 031-300-100-201	1.0	MANUAL, A2B SYSTEM RETROFIT INSTALLATION

#### 2. A2B LATTICE MAIN & EXT BOOM KITS

Component Item	Qty	Component Description
• 031-300-101-224	1.0	KIT, A2B MAIN BOOM LATTICE RETROFIT
• 031-300-101-225	1.0	KIT, A2B JIB LATTICE RETROFIT
• 031-300-100-201	1.0	MANUAL, A2B SYSTEM RETROFIT INSTALLATION

**NOTE:** Prior to starting the installation, it is advised to review the drawings and define the component locations on the crane. The Anti-two-block System must be tested after completing installation. Complete Section 3.3 Pre-Operation Inspection and Section 3.4 Operational Tests in the Operator's portion of this manual, Section 3. Operation.

3) Prior to operating the crane, the operator must carefully read and understand the information in Section 3. Operation, in order to know the operation and limitations of the Anti-two-block System.

### INSTALLATION, HYDRAULIC CRANE

Select the correct section for your crane and use the anti-two-block system drawings for component installation and wiring system.

#### 031-300-100-432 SYSTEM, A2B HYDRAULIC MAINBOOM

Drawing 1. 031-300-060-653 A2B Console Installation Kit - Parts List

Drawing 2. 031-300-100-654 A2B Main Boom Installation Kit - Parts List

Drawing 3. 031-300-100-443 A2B Mounting Kit - Parts List

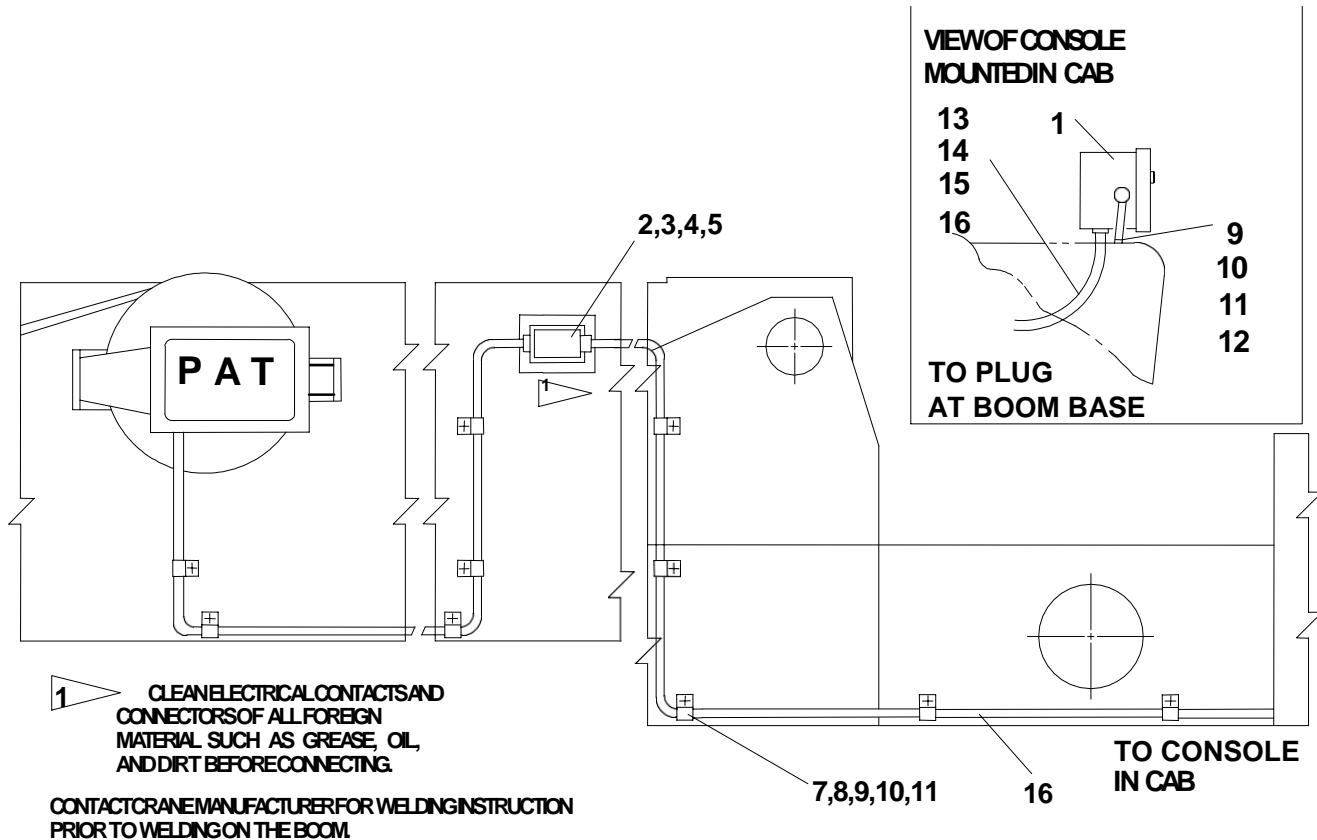
Drawing 4. 031-300-060-653 A2B Console Installation Kit - Electrical Diagram

Drawing 5. 031-300-100-654 A2B Main Boom Installation Kit - Electrical Diagram

Optional jib kits are not shown on parts list. (The additional components are available upon request.)

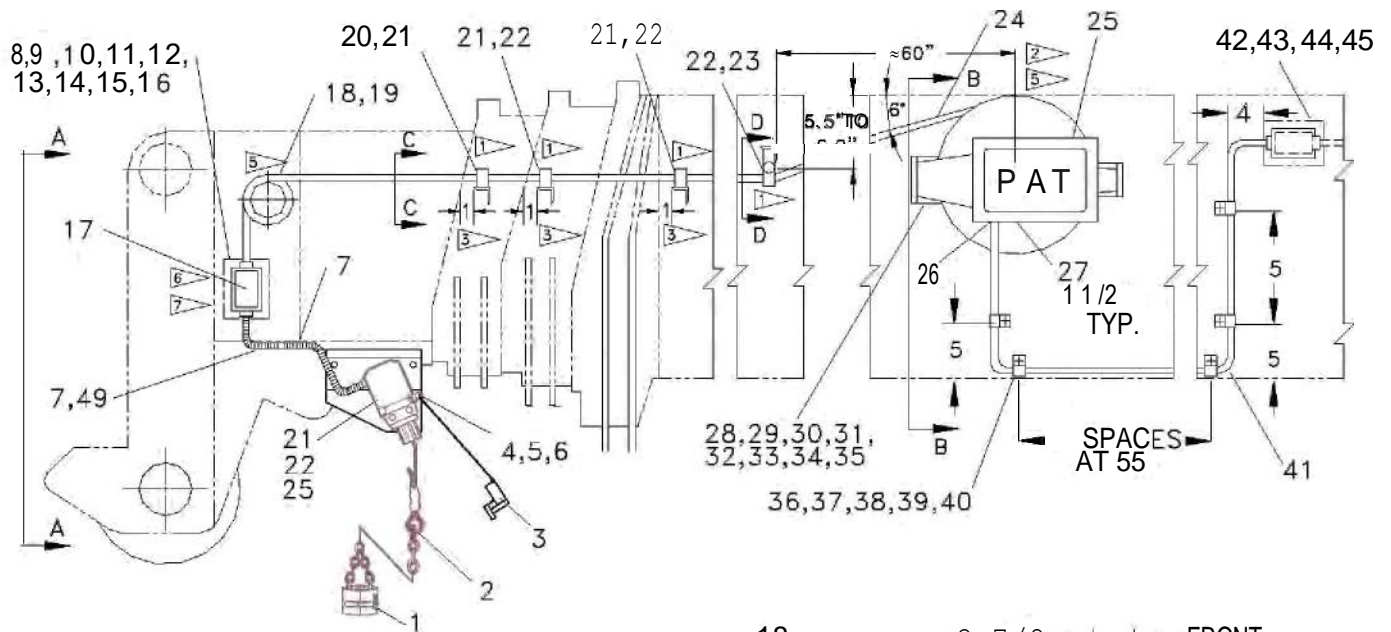
**NOTE:** CONTACT CRANE MANUFACTURER FOR WELDING INSTRUCTIONS PRIOR TO WELDING ON BOOM.

**DRAWING 1. 031-300-060-653 A2B CONSOLE INSTALLATION KIT - PARTS LIST**

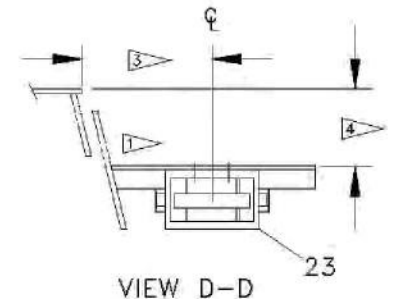
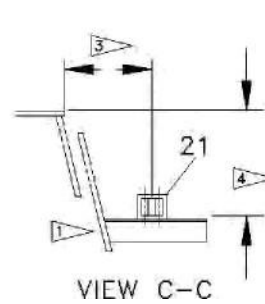
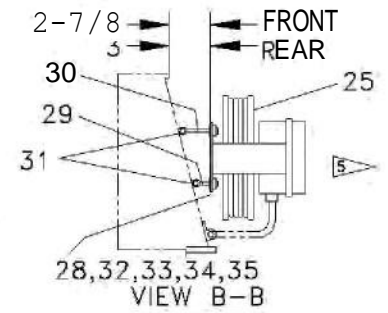
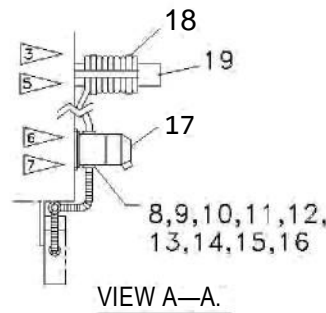


NO.	PART NO.	QTY	DESCRIPTION
01	050-000-060-100	1	A2B CONSOLE, 12V W/ LOCKOUT KEY SWITCH
02	000-301-022-100	1	PLUG, 10 PIN
03	000-301-025-102	1	INSERT, 10 PIN FEMALE
04	000-214-261-613	1	REDUCER, PG16-13.5
05	021-441-131-013	1	STRAIN RELIEF, PG13.5 W/ RED/WHT INSERT
06	000-610-020-371	5	TIE WRAP, VINYL
07	000-325-040-916	5	CABLE CLAMP, 9/16"
08	002-350-207-250	5	STUD, 1/4-20 X 7/8 WELD
09	000-207-010-070	7	FLAT WASHER, 1/4
10	000-208-040-070	7	LOCK WASHER, 1/4
11	002-060-100-705	7	NUT, 1/4-20 HEX
12	002-051-107-255	2	SCREW, 1/4-20 X 1 HEX HEAD
13	031-010-100-153	2	TERMINAL, MALE .250 DC/MI 14-16 AWG
14	031-010-100-154	4	TERMINAL, FEMALE .250 DC/FI 14-16 AWG
15	031-300-100-146	14'	CABLE, 4 X 1.5 S.S.
16	031-300-100-148	22'	CABLE, 7 X 0.5 D.S.

DRAWING 1. 031-300-060-654 A2B MAIN BOOM INSTALLATION KIT - PARTS LIST



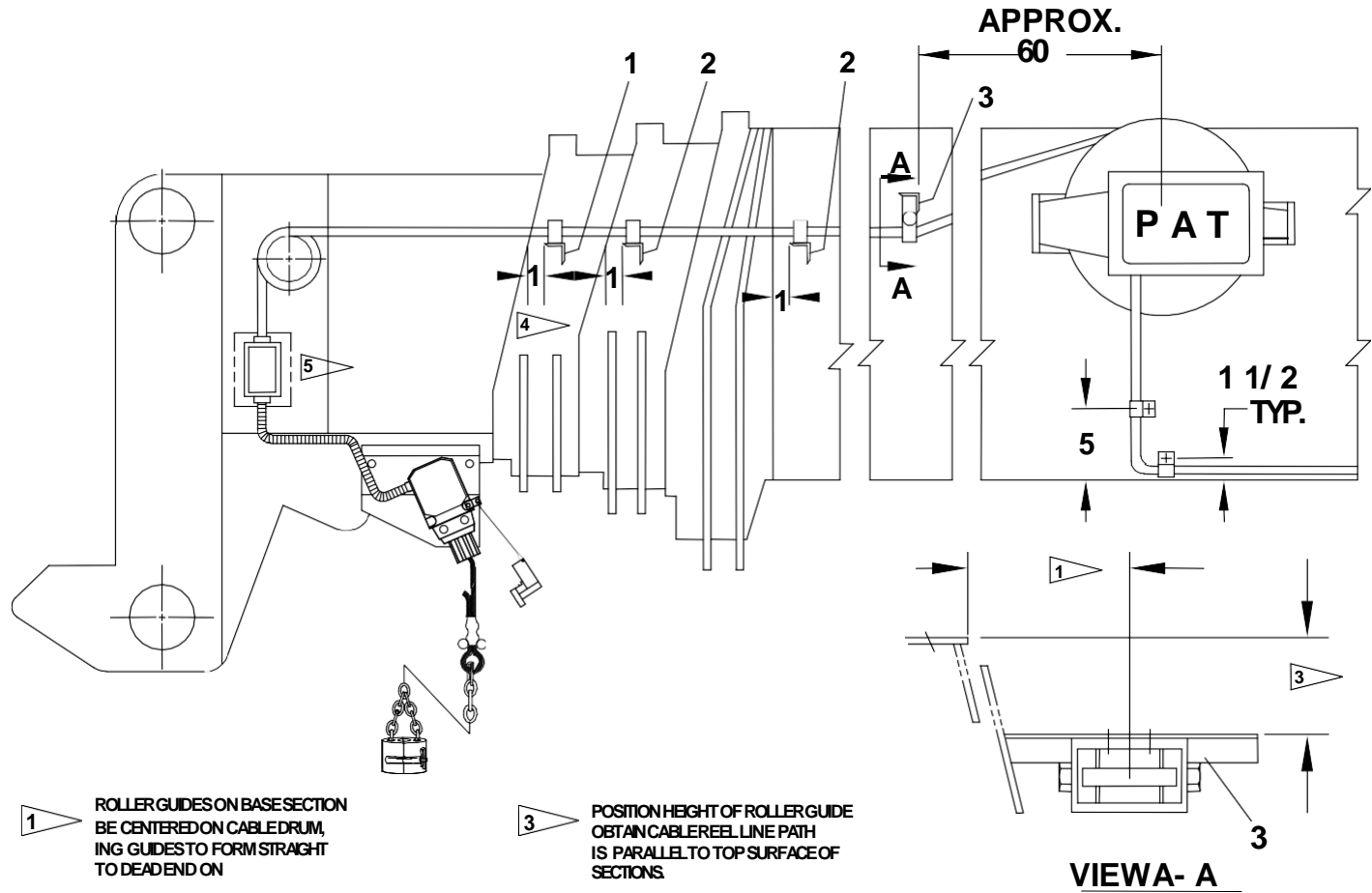
- 1 ALL WELDS MUST BE APPROVED BY THE CRANE MANUFACTURE.
- 2 CABLE REEL SHOULD NOT BE THE TOP OF THE BOOM.
- 3 POSITION THE BASE SECTION ROLLER GUIDE, A DISTANCE FROM THE BOOM SO THAT THE ROLLER GUIDE CENTER LINE ALIGNS WITH CENTER LINE OF THE CABLE DRUM. THE ROLLER GUIDES FORM STRAIGHT LINE PATH TO THE DEAD END ON THE BOOM.
- 4 POSITION HEIGHT OF BASE SECTION ROLLER GUIDE, ROLLER GUIDE, AND CABLE REEL. THE TABLE WILL HAVE AN ANGLE OF APPROXIMATELY 5°.
- 5 WITH NO TENSION ON THE LENGTH CABLE, PRE-LOAD THE CABLE REEL BY TURNING THE THE DRUM COUNTER-CLOCKWISE 5 TO 8 TURNS, THEN PULL THE CABLE THROUGH THE CABLE GUIDES AND ATTACH AT BOOM NOSE ANCHOR PIN. WRAP LENGTH CABLE AROUND THE ANCHOR PIN 6 TO 8 WRAPS AND SECURE.
- 6 CUT A2B SWITCH CABLE AND CONDUIT TO DESIRED LENGTH.
- 7 WHEN EXTENSION IS NOT IN USE INSTALL BYPASS PIPE WHEN EXTENSION IS IN USE INSTALL JUMPER CABLE FROM MAIN BOOM NOSE TO EXTENSION BASE JUNCTION BOXES.





NO.	PART NO.	QTY	DESCRIPTION
01	068-000-050-078	4	HOOK BOLT, 3/8-16 X 4
02	068-000-050-077	2	HOOK BOLT, 3/8-16 X 2 3/4
03	000-207-010-105	12	FLAT WASHER, 3/8
04	000-208-040-100	12	LOCK WASHER, 3/8
05	002-060-101-005	8	NUT, 3/8-16 HEX
06	002-051-110-255	4	SCREW, 3/8-16 X 1 HEXHEAD
07	002-350-207-255	15	STUD, 1/4-20 X 1 WELD
08	002-060-100-705	15	NUT, 1/4-20 HEX
09	000-208-040-070	15	LOCK WASHER, 1/4
10	000-207-010-070	15	FLAT WASHER, 1/4
11	000-301-023-100	1	RECEPTACLE, 10 PIN
12	004-000-050-011	1	MOUNTING PLATE, 10 PIN RECEPTACLE
13	002-053-904-127	8	SCREW, #10-24 X 1/2 ROUND HEAD
14	000-208-040-053	8	LOCK WASHER, #10
15	000-301-025-101	1	INSERT, 10 PIN MALE
16	000-214-340-016	2	HOLE PLUG, PG16
17	006-820-006-002	1	CABLE REEL, KT200 STANDARD
18	031-300-100-148	20'	CABLE, 7 X 0.5 D.S.
19	031-002-100-053	1	A2B RETAINER FLAG W/ METAL INSERT
20	031-300-100-269	1	DECAL "WARNING" A2B SWITCH
21	031-002-060-011	1	A2B SWITCH, (NEW STYLE) W/ CRIMP
22	031-300-100-105	2	SCREW, 5/16-18 X 1 1/2 SOCKET CAP, STAINLESS
23	031-000-050-004	1	PLATE, A2B SWITCH, ADAPTER (PRIMERED)
24	002-070-100-805	2	FLAT WASHER, 5/16
25	000-208-040-080	4	LOCK WASHER, 5/16
26	000-051-106-185	2	SCREW, 5/16-18 X 3/4" HEX
27	031-300-100-110	10'	CONDUIT, 1/4" BLACK FLEX
28	000-325-040-916	12	CABLE CLAMP, 9/16"
29	004-000-050-010	1	MOUNTING PLATE, 6 PIN RECEPTACLE
30	000-301-022-296	1	RECEPTACLE, 6 PIN
31	000-301-022-060	1	PLUG, 6 PIN
32	000-301-025-061	1	INSERT, 6-PIN MALE
33	000-301-025-062	1	INSERT, 6-PIN FEMALE
34	000-214-340-013	1	HOLE PLUG, PG13.5
35	000-214-261-609	2	REDUCER, PG16-9
36	021-441-060-409	1	STRAIN RELIEF, PG9 YELLOW/WHITE
37	068-000-050-072	1	PLATE, CABLE REEL MOUNTING (PRIMERED)
38	021-441-090-909	1	STRAIN RELIEF, PG9, 3mm WHITE
39	000-214-261-613	1	REDUCER, PG16-13.5
40	031-004-100-028	4	CABLE GUIDE, SMALL, MAINBOOM
41	031-004-100-033	1	CABLE GUIDE, LARGE, MAINBOOM
42	000-610-020-371	5	TIE WRAP, VINYL, 1/4 X 13"
43	000-401-024-470	1	RESISTOR, 4.7K
44	021-441-131-013	2	STRAIN RELIEF, PG12.8, RED/WHITE
45	031-300-100-064	4	BUSHING, FOR HOOK BOLT
46	031-002-100-048	1	LANYARD, RED
47	031-300-100-037	1	CHAIN CONNECTOR, QUICK LINK, 2 7/16"
48	003-100-210-012	1	WEIGHT & CHAIN, A2B W/ SHACKLE

**DRAWING 3. 031-300-100-443 A2B MOUNTING KIT - PARTS LIST**



1 ROLLER GUIDES ON BASE SECTION BE CENTERED ON CABLE DRUMMING GUIDES TO FORM STRAIGHT TO DEAD END ON

2 WHEN OPTIONAL SWINGAWAY SECTION OR ROOSTER SHEAVE IS NOT IN USE, STOW EXTENSION CORD AND STALL JUMPER PLUG IN BOOM NOSE RECEPTACLE. WHEN OPTIONAL AWAY EXTENSION OR ROOSTER IS IN USE, REMOVE AND STOW PLUG, INSTALL JUMPER CORD, BOOM NOSE RECEPTACLE AND AWAY EXTENSION OR ROOSTER RECEPTACLE.

3 POSITION HEIGHT OF ROLLER GUIDE OBTAIN CABLE REEL LINE PATH IS PARALLEL TO TOP SURFACE OF SECTIONS.

4 CUT A2B SWITCH CABLE AND TO DESIRED

5 CLEAN ELECTRICAL CONTACTS CONNECTORS OF ALL FOREIGN MATERIAL SUCH AS GREASE, AND DIRT BEFORE

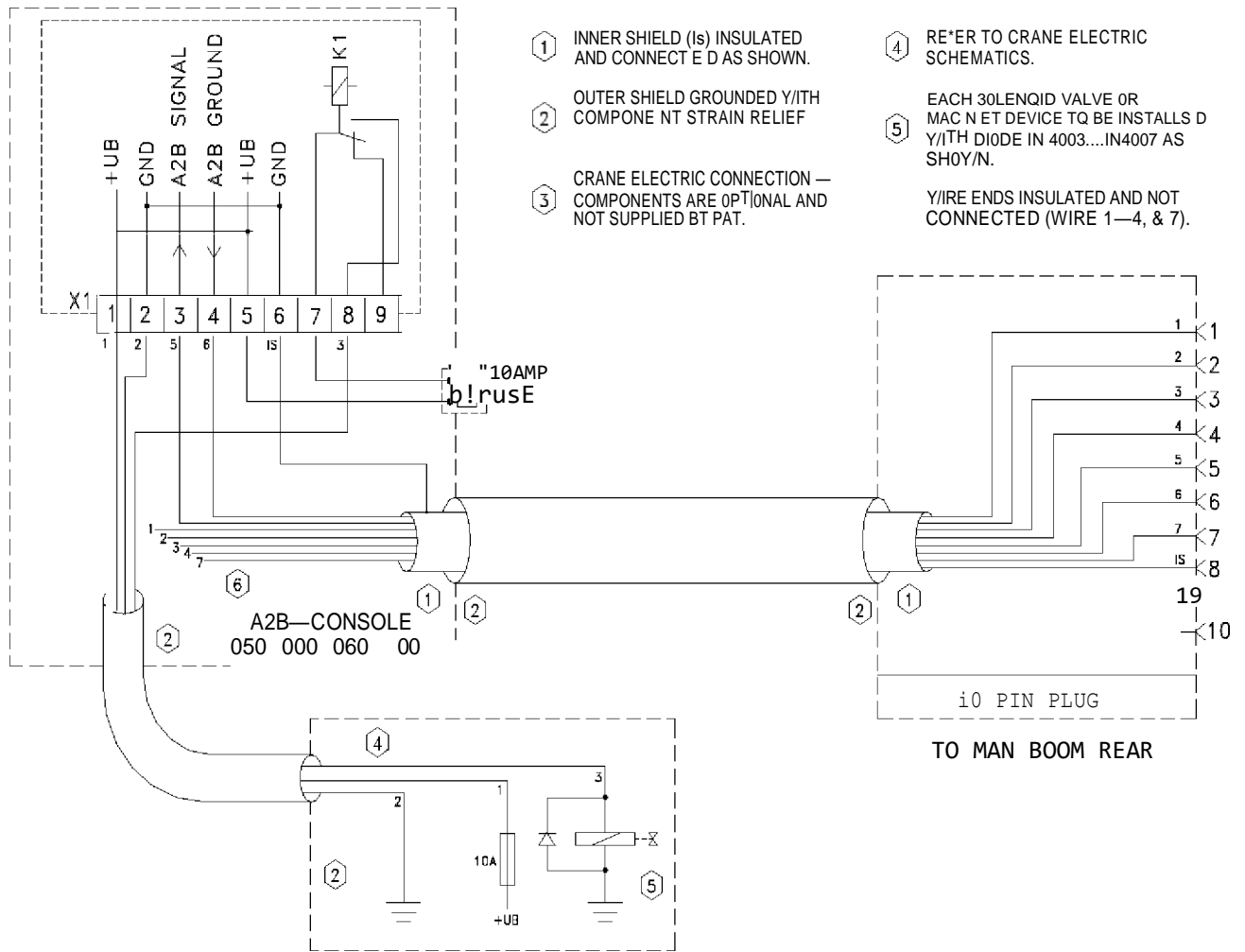
CONTACT CRANE MANUFACTURER FOR WELDING PRIOR TO WELDING ON THE

**VIEW A - A**

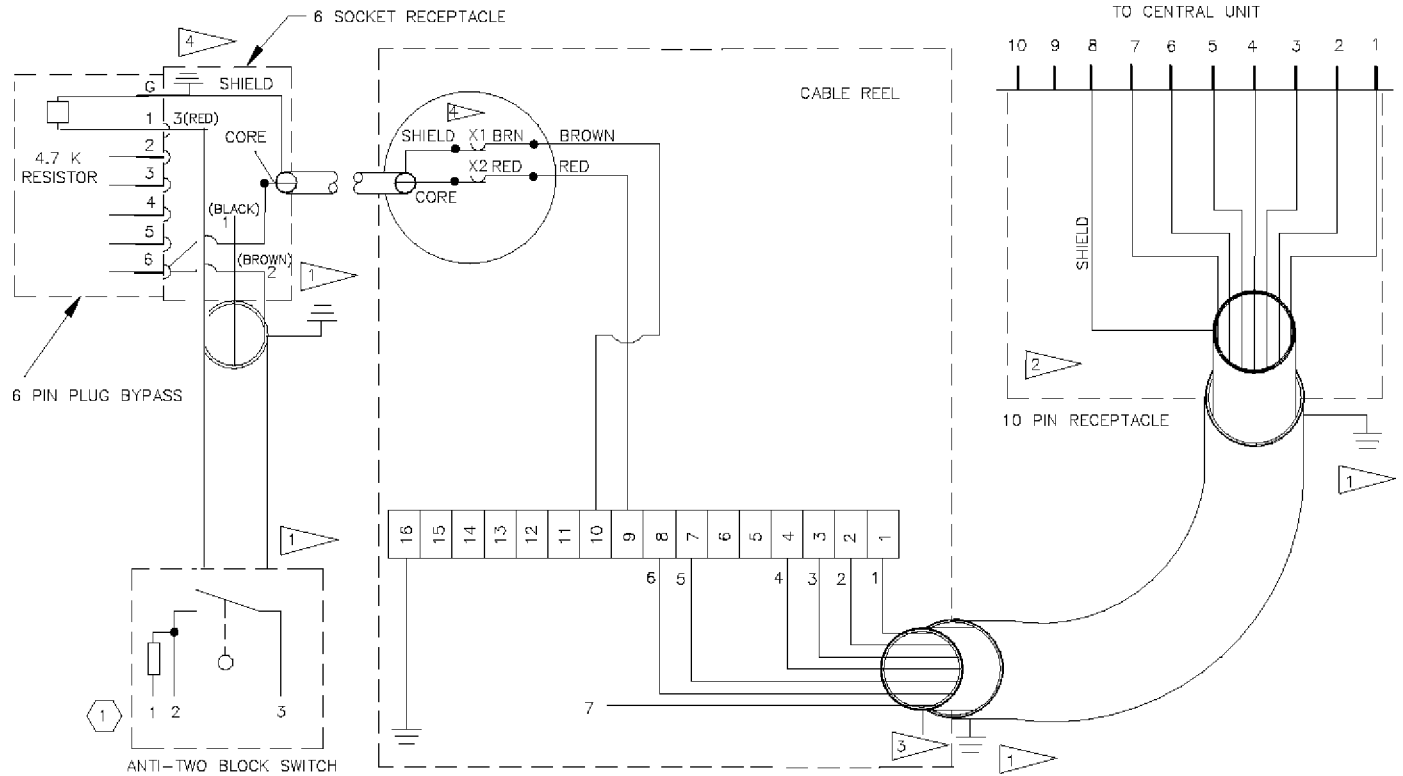
NO.	PART NO.	QTY	DESCRIPTION
01	031-004-050-037	1	BRACKET, CABLE GUIDE ANGLE (7.5')
02	031-004-050-047	4	BRACKET, CABLE GUIDE ANGLE (7.5' X 8")
03	031-004-050-057	1	BRACKET, LENGTH CABLE 1" ID X 1/8" WL X 8 1/2"



**DRAWING 4. 031-300-060-653 A2B CONSOLE INSTALLATION KIT - ELECTRICAL DIAGRAM**



**DRAWING 5. 031-300-100-654 A2B MAIN BOOM INSTALLATION KIT - ELECTRICAL DIAGRAM**



**NOTES :**

- 1. OUTER SHIELD GROUNDED AT STRAIN RELIEF CONNECTION
- 2. INNER SHIELD INSULATED AND CONNECTED AS SHOWN  
INNER SHIELD CUT OFF AND TAPED
- 3. OUTER SHIELD INSULATED AND CONNECTED AS SHOWN
- 4. SWITCH PREWIRED AND POSTED

INSTALLATION, LATTICE CRANE

SYSTEM, A2B LATTICE MAIN & EXT BOOM KITS

Drawing 6. 031-300-101-224 Kit, A2B Main Boom Lattice Retrofit - Parts List and  
031-300-101-225 Kit, A2B Jib Lattice Retrofit - Parts List

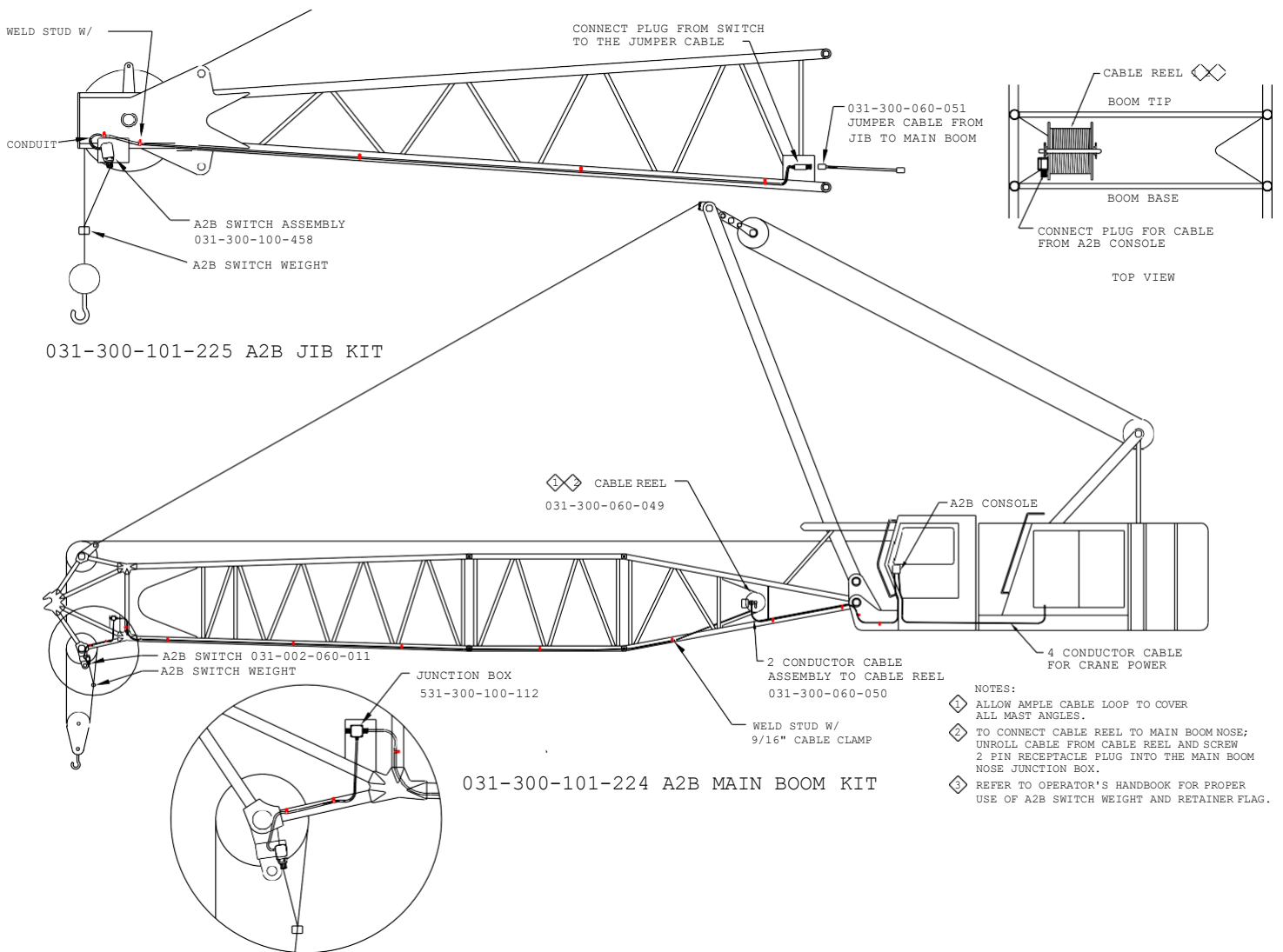
Drawing 7. 031-300-101-224 Kit, A2B Main Boom Lattice Retrofit - Electrical Diagram  
and 031-300-101-225 Kit, A2B Jib Lattice Retrofit - Electrical Diagram

Optional jib kits are shown on parts list (the additional components available upon request)

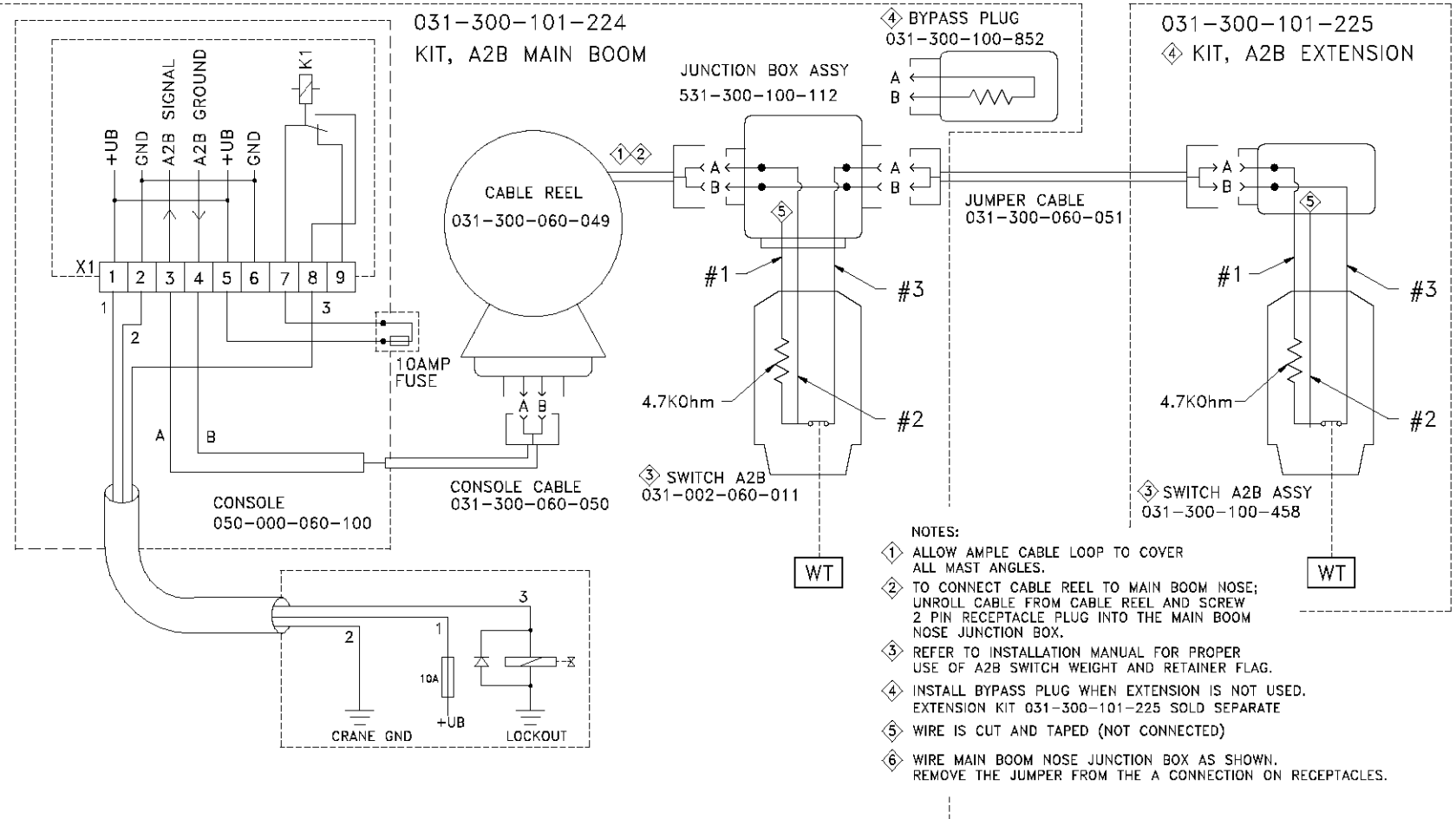
**NOTE:** CONTACT CRANE MANUFACTURER FOR WELDING INSTRUCTION PRIOR TO WELDING ON BOOM.

**DRAWING 6. 031-300-101-224 KIT, A2B MAIN BOOM LATTICE RETROFIT - PARTS LIST**

**031-300-101-225 KIT, A2B JIB LATTICE RETROFIT - PARTS LIST**

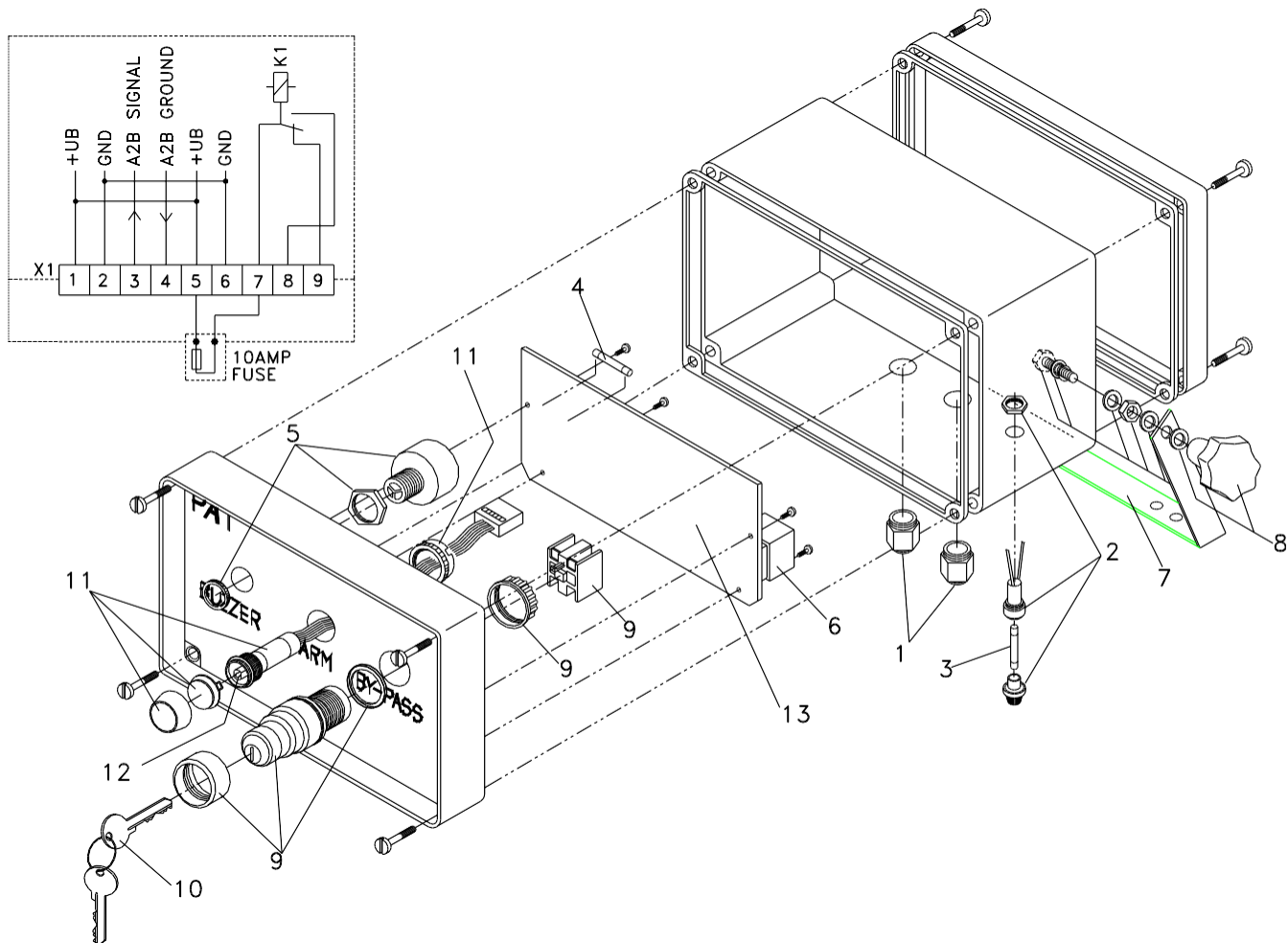


**DRAWING 7. 031-300-101-224 KIT, A2B MAIN BOOM LATTICE CRANE RETROFIT - ELECTRICAL DIAGRAM AND 031-300-101-225 KIT, A2B JIB LATTICE RETROFIT - ELECTRICAL DIAGRAM**



**DRAWING 8. CONSOLE, A2B, W/LOCKOUT KEY SWITCH PARTS LIST**

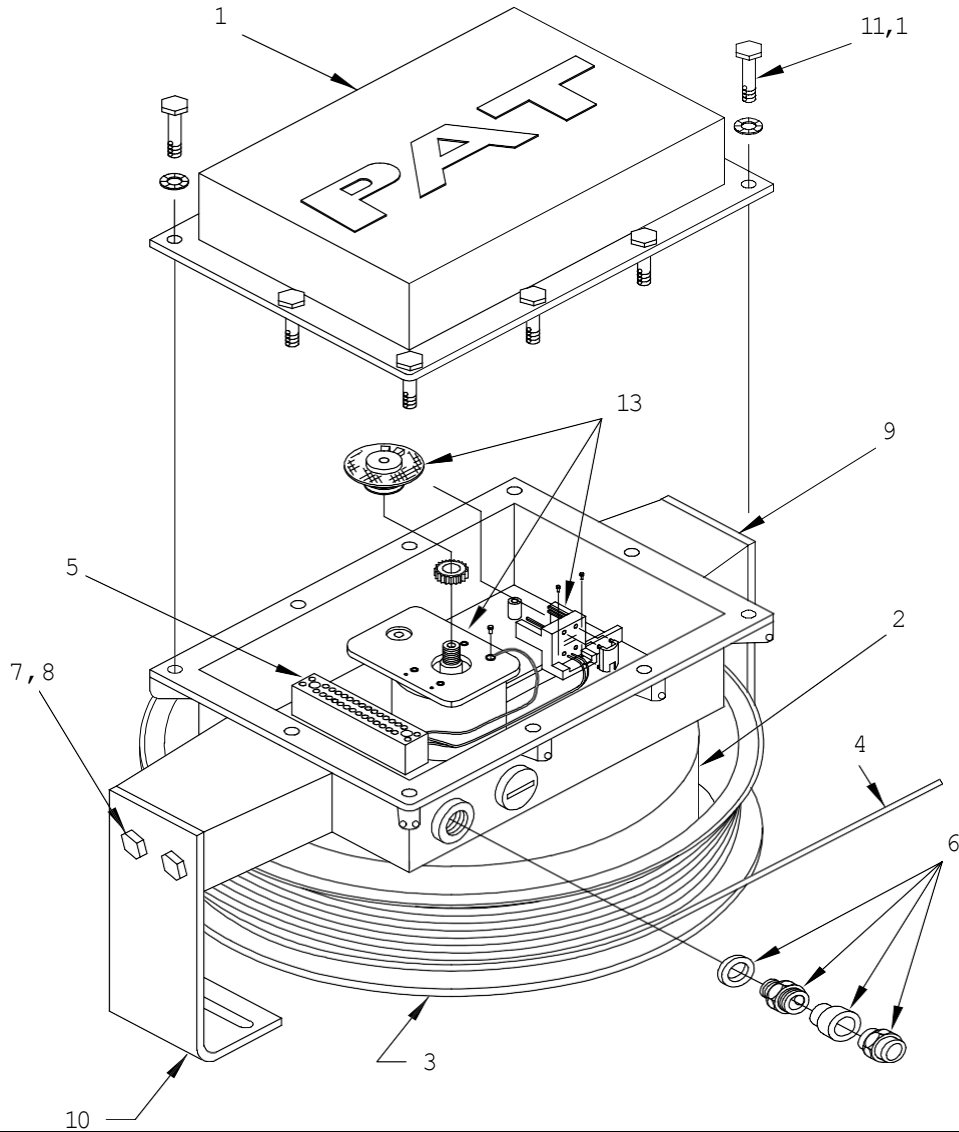
12V Console  
24V Console



NO.	PART NO.	QTY	DESCRIPTION
01	021-441-131-011	2	STRAIN RELIEF, PG11, 8MM, RED+WHITE INSERT
02	000-314-022-012	1	FUSE HOLDER, A2B
03	000-313-062-002	1	FUSE, 10 AMP 1/4 x 1 1/4, 250V FAST ACTING
04	000-313-061-001	1	FUSE, 1 AMP 1/4 x 1 1/4, 250V
05	000-323-010-525	1	ALARM, A2B, EI10, EI20
06	000-304-140-122	1	RELAY, SHUT-OFF 12 V
07	000-304-140-241	1	RELAY, SHUT-OFF 24 V
08	005-600-005-006	1	BRACKET, MTG. A2B CONSOLE, COMPLETE SET
09	005-600-011-004	1	KNOB, ADJUSTING,(ALL)
10	024-350-100-661	1	KEY SWITCH
11	031-300-101-131	1	KEY
12	558-000-110-006	1	SWITCH, PUSH-BUTTON, A2B, EI
13	000-311-020-012	1	LAMP, 12V (A2B,EI CONSOLES)
14	000-311-020-024	1	LAMP, 24V (A2B,EI CONSOLES)



**DRAWING 9. 006-820-006-002 CABLE REEL, KT200 PARTS LIST**



NO.	PART NO.	QTY	DESCRIPTION
01	005-682-000-001	1	COVER, HOUSING
02	068-000-110-010	1	ASSEMBLY, SPRING W/ HOUSING
03	068-000-110-011	1	REEL, CABLE DRUM
04	000-673-020-002	139'	CABLE, LENGTH SENSOR, 1 CORE
05	068-000-110-029	1	TERMINAL STRIP W/ HIGH FREQ. ATTENUATOR
06	021-441-131-013	1	STRAIN RELIEF, PG13.5 RED/WHITE
07	000-205-031-230	4	SCREW, 12mm X 30 HEX
08	000-208-020-012	4	LOCK WASHER, 12mm TOOTH
09	006-800-005-057	1	BRACKET, MOUNTING WITH TWO HOLES
10	006-800-005-058	1	BRACKET, MOUNTING WITH SLOT
11	068-000-110-031	10	SCREW
12	000-207-010-064	10	FLAT WASHER, 6mm





## LENGTH CABLE REPLACEMENT PROCEDURE

**WARNING**

The cable drum is under high tension. Do not let the length cable spool back without supporting the cable and leading it back on the drum. Pay attention and watch that the wraps do not pile up on one side. De-spooling of the length cable can cause damage to the length sensor. Spooling the length cable without additional support may result in injury or damage. Use caution and protection when working with the length cable under high tension.

Replace length cable using the following procedure:

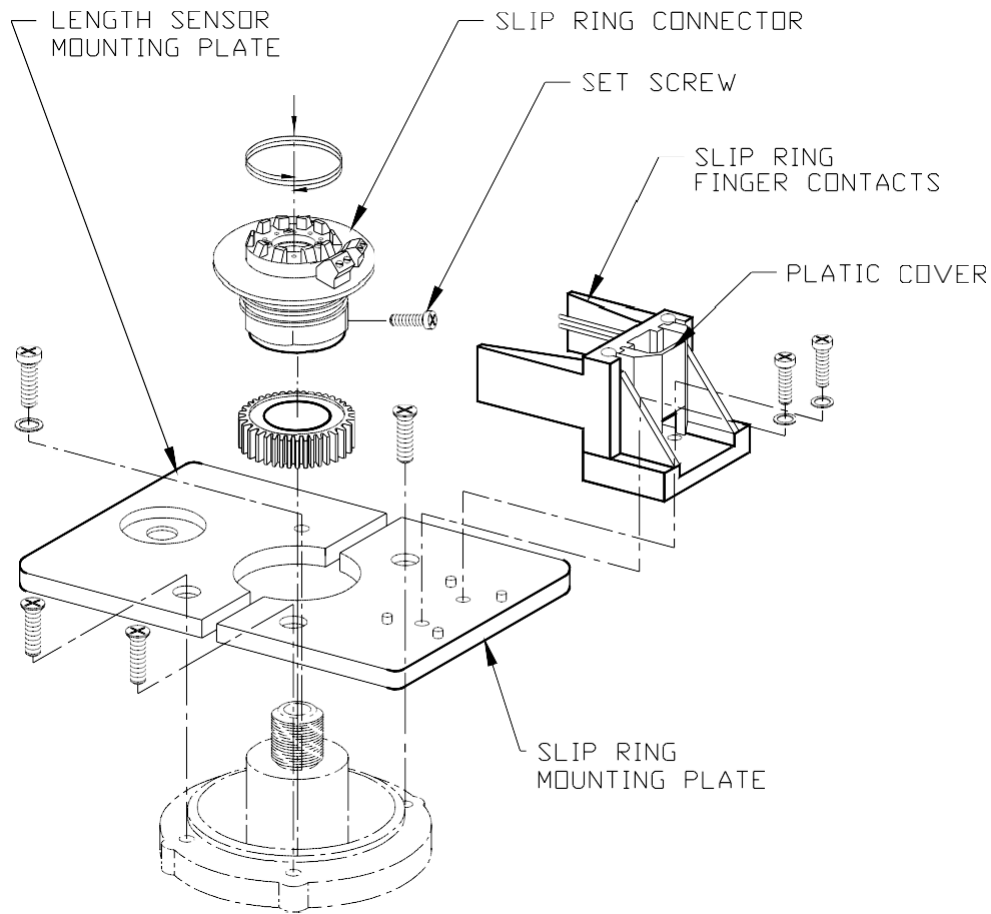
1. Retract the boom fully. Refer to the operators section in this manual and familiarize yourself with its operation and the LMI bypass. Lower the boom to gain access to the cable reel and boom tip.
2. Switch crane power off.
3. Disconnect damaged length cable from junction box at the boom nose.
4. Remove the cable reel cover face by loosening all 10 screws. The screws should remain secured to the lid.

**CAUTION: Use care and minimal force when removing the wire ends and terminals from the connections.**

5. Remove all connections located at X1:1, 2, 3, 4, 7, and 8. Check the wires to ensure they are numbered, this will allow an easier installation. (Note: X1:1, 2, 3 and 4 are upgrades for length and angle sensor and do not need to be reconnected if not used.)
6. Open the strain relief for the 7 conductor cable and pull the cables out of the cable reel.
7. Remove cable reel from mounting brackets.
8. Remove all conductors from X1 and X2 of the slip ring terminal. Refer to Drawing 5 in Section 4.
9. Cut old cable at the backside of the cable drum and remove cable.
10. On the backside of the cable reel, open the strain relief attached to the axle in the center of the drum. Pull existing length cable out of the cable reel.
11. Pull new length cable through the hole, pipe and strain relief and push it through the axle of the reeling drum. Tighten strain relief to ensure sealing.
12. Reconnect the length cable to the slip ring terminal. Refer to Drawing 5 in Section 4.
13. Remount cable reel to the boom.
14. Turn reeling drum clockwise to spool the new cable neatly onto the drum.
15. Set preload on cable reel by turning the drum counter-clockwise 5 to 8 turns.
16. Anchor cable at boom point.
17. Connect the length cable into the boom tip junction box. Refer to Drawing 5 in Section 4.
18. Verify A2B operation, Refer to Operator's section of this manual Section 3.4.

### SLIP RING REPLACEMENT PROCEDURE

This section explains the replacement of the slip ring in the cable reel. Refer to Drawing 9 in this section.

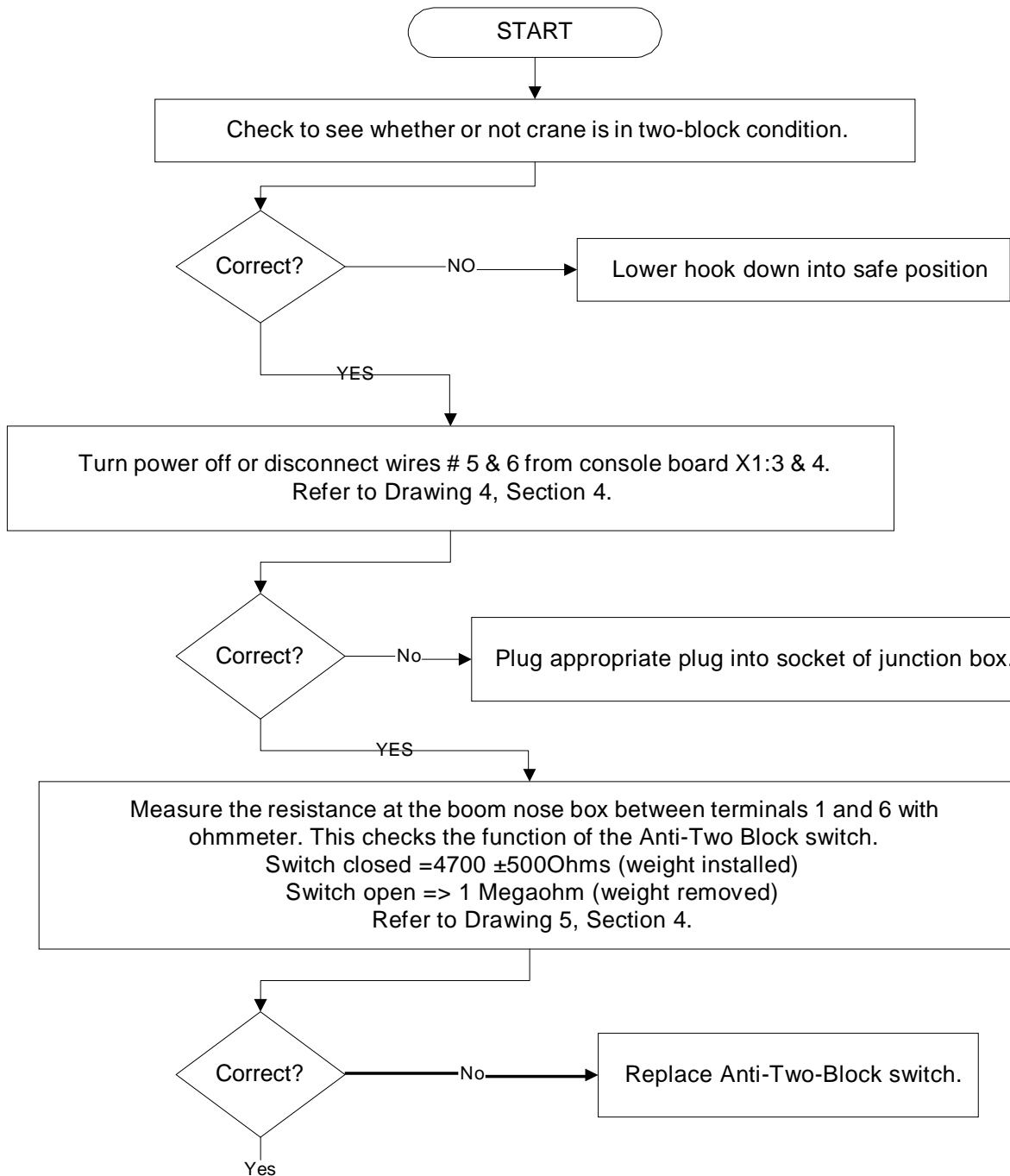


1. Retract the boom fully. Refer to the manufactures operators manual and familiarize yourself with its operation and the LMI bypass. Lower the boom to gain access to the cable reel.
2. Switch crane power off.
3. Remove the cable reel cover face by loosening all 10 screws. The screws should remain secured to the lid.
4. Remove all conductors from X1 and X2 of the slip ring terminal. Refer to Drawing 5 in Section 4. Mark the wires to will allow for easier installation.
5. Remove the 2 screws holding the slip ring fingers to the mounting plate.
6. Remove the 2 screws holding the terminal strip, unsoldered the wire from the slip ring fingers and solder the new slip ring finger wires to the terminal strip.
7. Loosen the set screw and screw out the slip ring connector and screw in the new slip ring connector and tighten set screw.
8. Connect X1 and X2 of the slip ring terminal. Refer to Drawing 5 in Section 4.
9. Install the slip ring fingers on to the mounting plate, insure the fingers a aligned correctly on the connector and insert the 2 screws.
10. Verify A2B operation, Refer to Operator's section of this manual Section 3.4.

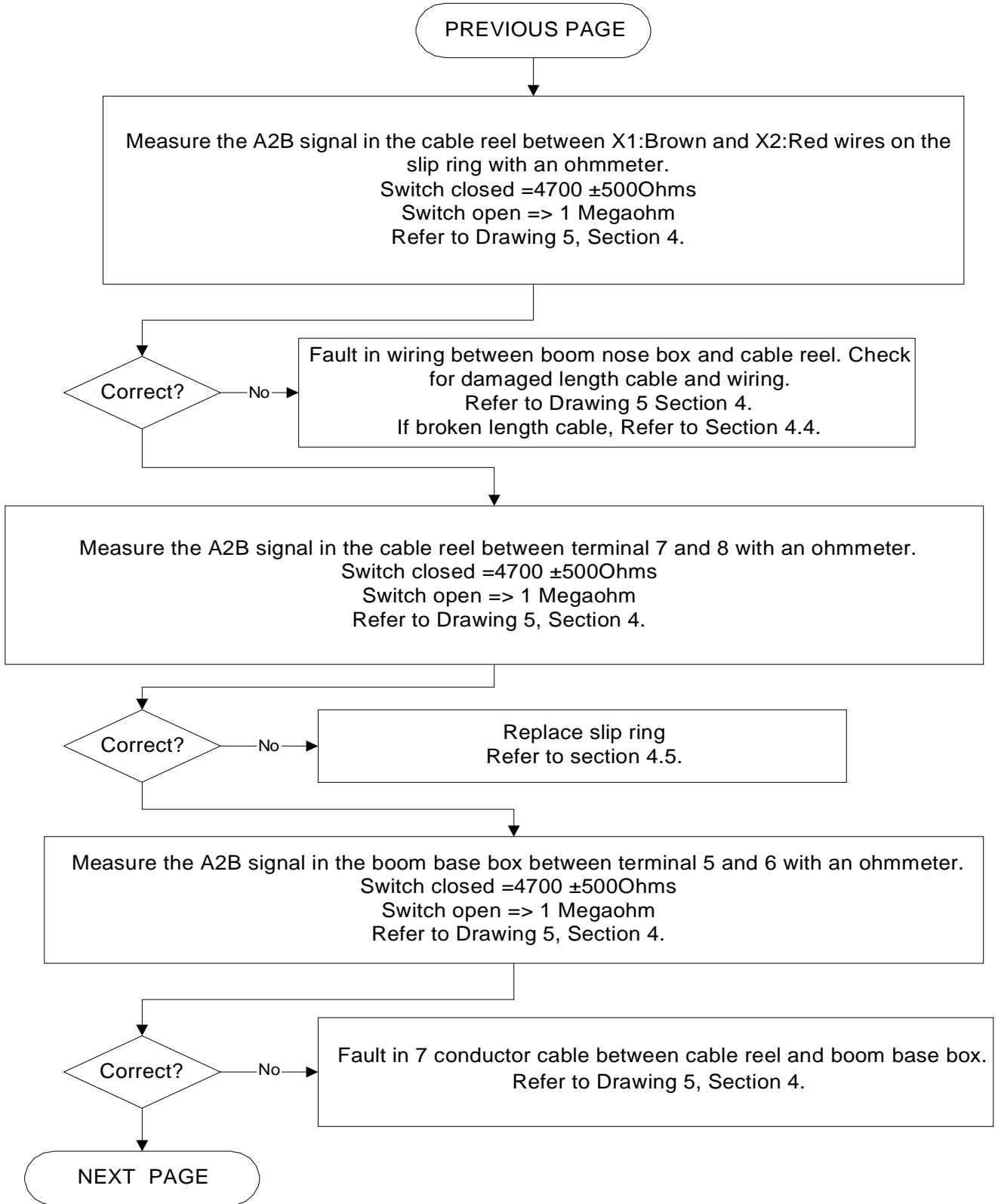
## 5 TROUBLESHOOTING

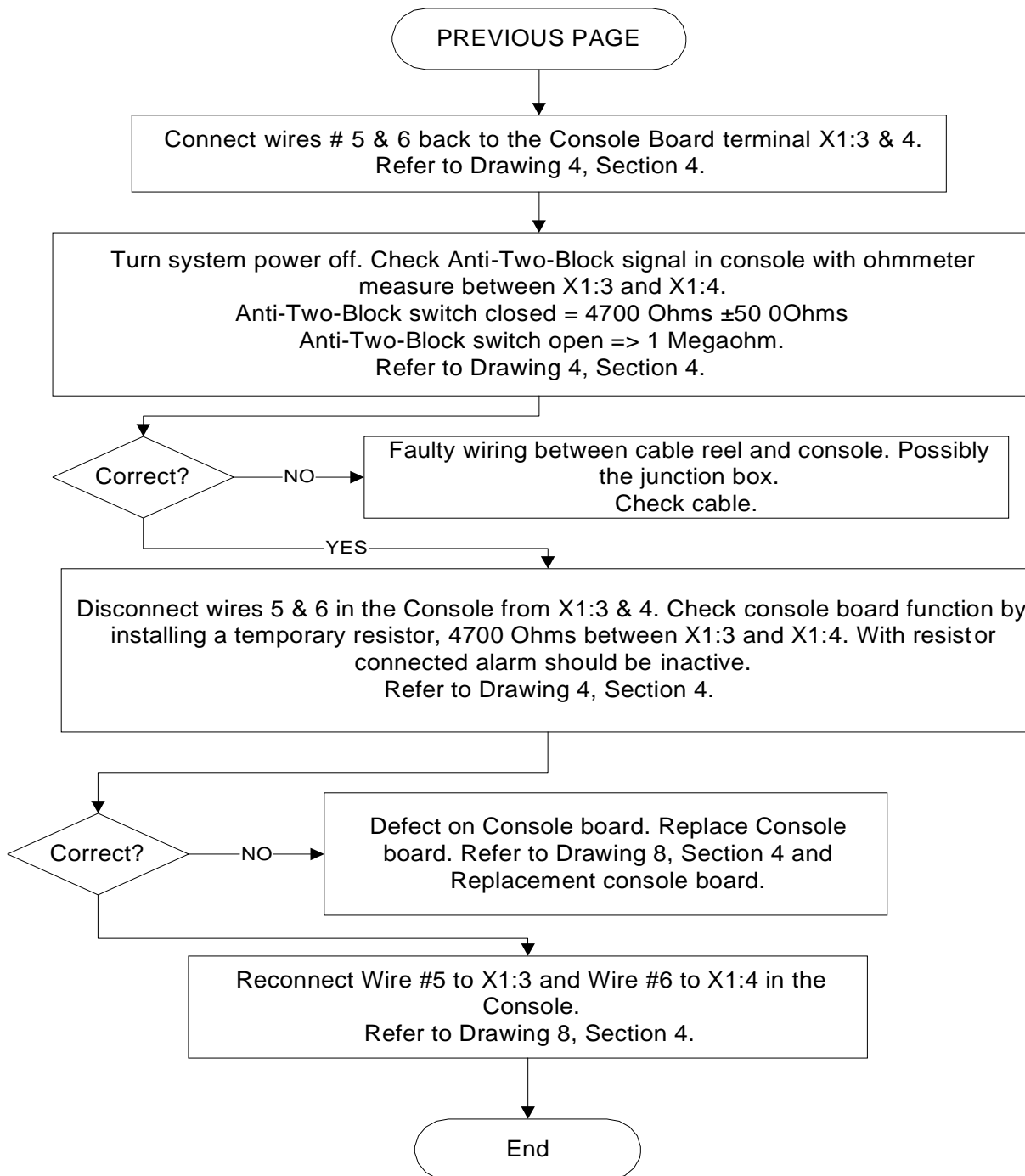
### ANTI-TWO-BLOCK PROBLEM

PROBLEM: Function of Anti-Two-Block System is faulty.



Next Page





5.2 Anti-Two-block Theory

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