

ROBINSON
ENGINEERING COMPANY

Operation & Maintenance Manual

Crane Boss®

TITAN 2000

UHF
Digital Radio
Remote Control System

September, 2011

SECTION 1

GENERAL INFORMATION

1.1 SCOPE

This manual contains information necessary to install, operate and maintain TITAN 2000 Radio Remote Control Systems. The information is generally applicable to all TITAN 2000 systems manufactured by Robinson Engineering Company.

1.2 SYSTEM DESCRIPTION

- 1.2.1 General – The TITAN 2000 system is equipped with controls and accessories required for reliable electrical operation of a crane or other machinery from a portable wireless control transmitter.

1.2.2 Control functions provided:

Mainline Contactor/Horn

| | | |
|---------|---|----------------------|
| ‘B’ | - | 2-step reversing |
| ‘T’ | - | 2-step reversing |
| ‘H’ | - | 2-step reversing |
| ‘Aux 1’ | / | ‘Aux 2’ (Maintained) |

1.2.3 Characteristic features are:

1. Each system consists of a portable control transmitter which operates in conjunction with receiving equipment installed on the machinery structure and electrically connected to the magnetic controllers and/or variable frequency drives.
2. “Fail-safe” circuits are used throughout the system.
3. The command link is capable of handling all motions simultaneously.
4. The system uses digital pulse code frequency modulation. It was developed specifically for industrial control.
5. The system utilizes fully solid state electronic circuits, with heavy duty relay contact output circuits.
6. Maintenance requirements are greatly reduced by modular design and use of digital switching circuits. No special test equipment is required.
7. Radio control of several units in the same plant without interference is entirely practical. Each transmitter transmits a unique address code, which prevents response by other than the intended unit. In addition, the operating frequencies of different units are staggered within the frequency band to prevent interference. Proper selection of address codes and operating frequencies with respect to physical separation provides control of multiple installations with no practical limitation on the number at one location.

1.2.4 SPECIFICATIONS

Operating Range: 300 Feet

Operating Temperature: -40° F to 150° F

Frequency Band: 422.4 - 472.4 MHz

Transmitter Housing: Glass Filled Nylon

Transmitter Dimensions: 8 ¾” L x 2 ¾” W x 2” D

Transmitter Weight: 11oz (without Batteries)

Battery: Rechargeable Battery Pack.

Transmitter Automatic Power Down after 30 minutes of non use.

Maintained Aux 1 & Aux 2 Circuits

Receiving unit: Nema 12/4 (Indoor/Outdoor)

Relay Contact Rating: 10 Amp Maximum

Receiving unit: Maximum current draw 160mA.

FCC Certification (Part 15.231) USA & Canada

FCC ID: URLBRP64MS

IC: 6910A-BRP64MS

- 1.2.5 Transmitter – The transmitter is a portable unit that is carried by the operator. A shoulder strap is provided to enable the operator to conveniently carry the unit while leaving hands free to operate controls. Switches on the transmitter controls all functions as labeled.

The portable transmitter weight is approximately 11 ounces. The transmitter includes an internal antenna and includes a rechargeable battery pack.

- 1.2.6 Receiving Equipment – The receiving equipment cabinet is mounted on the machinery and contains the radio receiving unit, decoding equipment and relays to convert the radio signal from the transmitter to signals suitable for operation of (magnetic) controls' contactors and variable frequency drives.

1.3 GUARANTEE

Manufacturer warrants the delivered remote control system to be free of defective material and workmanship and agrees to remedy any such defect within two years of first party purchase at no charge to the purchaser upon return of defective parts to factory. Defects caused by improper installation, maintenance, misuse, tampering, neglect, accident, or use in violation of manufacturer's written instructions, shall not be covered by this warranty. Manufacturer guarantees that remote control system will perform as outlined in this manual.

Transferring of this warranty is acceptable and recommended. Please notify this factory of any and all transfers.

SECTION 2

OPERATION

2.1 RECEIVING EQUIPMENT

Normal operating procedures is to leave receiving equipment energized at all times. (Power switch “On”, neon indicator lighted). The unit can then be readily placed in operation by means of the portable control transmitter.

2.2 TRANSMITTER

The transmitter should be stored in a secure location when not being used, with the transmitter ‘Off’. (Transmitter LED’s off). Remove the Rechargeable Battery Pack for prolonged length of non use.

2.3 OPERATING PROCEDURE

To place the unit in operation, proceed as follows:

1. Suspend transmitter on the operator by means of shoulder strap. Make sure all attachments are secure to prevent accidental dropping of the unit.
2. Operator should position himself so as to have a clear view of the motions and actions.
3. Verify Battery Pack is installed properly, and press the ‘Start’ switch. A green LED will illuminate on the transmitter. Master indicating light will light and remain on. ‘EN’ light and ‘ADD’ light will remain on while ‘Start’ pushbutton is depressed. Master Relay and Mainline Contactor on Crane are energized.
4. Operating desired control, operators can now move machinery. All motion controls are spring loaded to neutral.
5. In the event of an emergency situation press the ‘Stop’ pushbutton and remove the Battery Pack.
6. Upon completion of use, replace transmitter in designated storage location with transmitter ‘Power’ off (Press ‘Stop’). Remove Battery Pack for prolonged length of non use.

2.4 MISCELLANEOUS OPERATING INFORMATION

Abnormal electrical conditions during operation will de-energize control circuits, stopping motion. This can be caused by any one of a number of abnormal conditions. Among these are:

1. Weak or improper radio signal.
2. Interruption of power to receiving equipment.
3. Radio interference.
4. Malfunction of radio equipment.
5. Malfunction of machine electrical equipment.

If the abnormal condition is temporary, control can be resumed by repeating steps 3 through 6 of paragraph 2.3. The exact sequence of operation must be followed to accomplish operation of safety circuits in the receiving equipment.

SECTION 3

INSTALLATION INFORMATION

3.1 SCOPE

This section is intended as aid to preparing for mounting and interconnection of the TITAN 2000 to crane or monorail. The examples and suggestions made as to mounting and interconnection are based upon typical uses and past experience; depending upon application, these may or may not be applicable or appropriate.

The installer is cautioned to assure that requirements of applicable Codes and Ordinances are complied with.

3.2 MOUNTING – RECEIVING EQUIPMENT

3.2.1 Refer to Outline Drawing for mounting dimensions and clearances required.

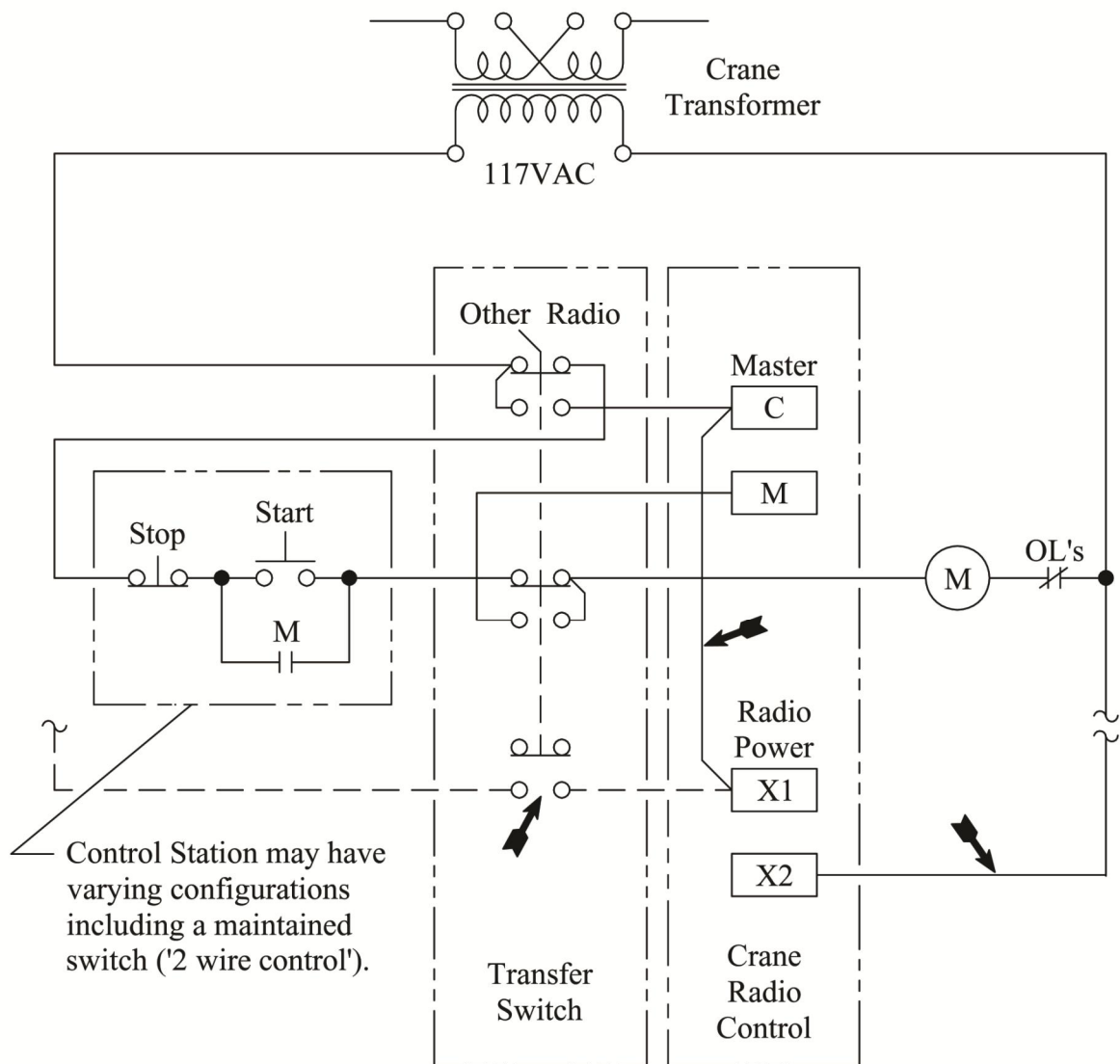
3.2.2 Rigidly mount, as for any control panel, the Receiving Cabinet to the structure of the equipment to be remotely controlled. Allow access for conduit entry.

3.2.3 Mounting of the Indicating Light (if used) is accomplished by normal electrical wiring procedures. Be sure of visibility from operating area. Also, that it be conveniently accessible for service (changing bulb, etc.). Terminals M and X2 are used for the Indicating Light (and Mainline Contactor).

- 3.2.4 The antenna is installed by screwing into the Receiver Module on the outside of the cabinet door.
- 3.2.5 Wherever the “other” means of control (console, pendant, etc.) is located (trolley, bridge) is probably the simplest wiring location for the radio control cabinet. The only distinct difference between pushbutton and radio control is that 117 VAC must be available for radio power supply. Pushbuttons will have as a common the “hot” lead. The other leg of the transformer (X2) must often be added by conductor bar, festooning, or by other means.

3.3 TRANSFER SWITCH

- 3.3.1 Mutually exclusive transferring of control modes is often used: “Pushbutton-Radio”, “Cab-Radio”, “Pendant-Radio”, “Console-Radio”, etc. The mutual exclusivity is most simply obtained by appropriately defeating the other mode’s power feed, as well as, opening any normally closed circuits. See Fig. 3-1.



➡ If Radio Power is to be separate from Main Power, omit jumper from C (Master) to X1 and add Transfer Switch contact with dashed line connection as shown. X1 and X2 must be connected to the same 110-120VAC Control Transformers' Secondary.

NOTE: This diagram is an example only. Equipment control circuits may vary greatly. Control connections should be carefully considered to provide proper operation and avoid feedback circuits.

FIG. 3-1:
TYPICAL TRANSFER SWITCH & MAIN LINE CONTACTOR CIRCUIT

3.4 OUTPUT CIRCUITRY

- 3.4.1 Main circuit - connect Main Contactor (M) in a manner similar to Fig. 3-1. The circuit should provide for the Main Contactor to be energized when the circuit from “C” (Master) to “M” terminals is closed. Be certain to use a Transfer Switch if any “other” control exists.

A “Stop” circuit (momentary), from “C” (Main) to “Off” terminals, is available to unlatch a latching main contactor or similar applications.

Safeties, such as N.C. master switch contacts in series between “M” terminal and Main Contactor coil should be employed whenever practical.

- 3.4.2 The output of the TITAN 2000 digital radio remote control is by heavy-duty relay contacts. One normally open circuit is available for each function direction and each speed output. See Fig. Output Circuits Drawing for logic of internally, pre-wired circuits.
- 3.4.3 Motion Circuits - each motion pushbutton on the transmitter provides:
1. Separate common (X1) for each motion.
 2. Direction outputs maintained through full-throw of switch in the respective direction.
 3. Separate ‘Lo’ contacts for each direction of Hoist. These open at 2nd step.
 4. Separate 2nd contacts for each direction of Hoist. These close at 2nd step.
- 3.4.4 Auxiliary circuits - ‘Aux 1’ & ‘Aux 2’ have separate commons (X1), having separate output contacts and terminals, for both normally open (N.O.) and normally closed (N.C.) contacts.

3.5 START-UP PROCEDURE

3.5.1 Before Power-up Check List:

- ☐ 1. Cabinet mounted per Outline Drawing and Manual paragraph 3.2
- ☐ 2. All conduit entry bottom of cabinet.
- ☐ 3. Receiving Antenna must be at least 3 feet from motors, power cables and variable frequency drives.
- ☐ 4. Internal components and connections are tight and secure.

3.5.2 Receiving Power-up Check List: (Transmitter off)

- ☐ 1. With “On/Off” Toggle Switch to “Off” position, turn on supply-power to radio (and control-voltages of crane). Measure 100 to 140 VAC between radio terminals ‘X1’ & ‘X2’.
- ☐ 2. Smoke Test: Press Toggle Switch to “On” position. (2) green LED’s, near the Transformer and Receiver Module, illuminate green and yellow LED’s.

3.5.3 Operational Check List:

- ☐ 1. Perform system Functional Test (4.2.3.3) on Manual page 16 using Operating Procedure (2.3 on Manual Page 5); ALL functions, even if not used on this application.
- ☐ 2. Range Test:
Employing proper safety precautions, operate from the extreme locations in the area.
- ☐ 3. Leave the Operation & Maintenance Manual on-site.

3.5.4 Problems

See Section 5 in the Operation & Maintenance Manual. If perplexed, call the Robinson Engineering factory from on-site. Have serial number of unit and Manual ready!

SECTION 4

MAINTENANCE

The system is of modular design, with plug-in type electronic sub-assemblies and readily replaceable electrical components. Trouble can be corrected by locating and replacing the defective part, using the substitution method. It is suggested that spare parts be obtained for replacement purposes. Field repair of electronic sub-assemblies is not recommended. Improper techniques can result in damage to components and voiding of warranty. The factory will provide prompt test and repair or replacement of returned defective or questionable parts, including the complete transmitter, at nominal cost, or at no cost under warranty.

4.1 PREVENTIVE MAINTENANCE

No preventive maintenance is required except for periodic inspection for security of hardware, harnessed internal wiring and to check for intrusion of dirt or foreign matter. Relay contacts may be checked for excessive arcing by cycling through all motions. Replace parts as necessary.

4.2 CORRECTIVE MAINTENANCE

4.2.1 General - In case of suspected Radio Remote Control System trouble, activate the back-up controls and check for normal machine operation. If back-up system operation is not normal, locate and correct trouble in basic equipment before proceeding to radio equipment.

4.2.2 Transmitter - See Transmitter External Components Fig. 4-1.

4.2.2.1 Replaceable Batteries - If the voltage is low with transmitter on (Start Pushbutton Depressed), a 'Low' 'Red' LED will light on the transmitter when any motion pushbutton is pressed, indicating the batteries need replacing. The transmitter will operate a short period of time before the transmitter will shut itself down. Do not continue using the transmitter without replacing the batteries.

4.2.2.2 Transmitter Test - A simple qualitative check of transmitter operation may be made by monitoring the receiver. With the transmitter On, (Start Pushbutton Pressed and Green LED Illuminated), the yellow LED on the Receiver Module will turn off and remain off while the transmitter is transmitting. The yellow LED will turn on when the transmitter is not sending a signal.

CAUTION: When the Master Relay (and Main Contactor) is energized, any energized motion relay will cause crane motion.

When the green LED is illuminated, the transmitter is sending an RF signal. After approximately 5 seconds of releasing any pushbutton, the green LED on the transmitter will turn off, signifying the transmitter is no longer transmitting an RF Signal and the yellow LED on the Receiver Module will illuminate.

4.2.3 Receiving Equipment – The receiving equipment consists of a Receiver Module, a Decoder/Controller and miscellaneous components (transformer, antenna, enclosure, etc.).

4.2.3.1 Receiver Module – The transmitter command signals transmitted to the Receiver are processed by the Receiver Module and are conducted to the Decoder/Controller via the Receiver Cable.

4.2.3.2 Decoder/Controller – The Decoder/Controller contains the DC power supplies and the logic processing circuits to convert the signals from the Receiver into output signals to drive the required relays. All of the relays on the Decoder/Controller except the Master Relay are operated directly from the Decoder/Controller. See Fig. 4-4, Page 17.

The Decoder/Controller contains the relays and terminal strips to provide isolation circuits to the Crane Controls. Each of the relays has an indicating light (LED and dropping resistor) parallel to its coil to provide an indication of the operation in progress.

WARNING: The set of DIP switches on the Receiver Module are used to set the Receiving equipment Frequency at the factory. DO NOT attempt any alteration!

CAUTION: Keep fingers off of the board!

CAUTION: Keep fingers off of the fuse!

CAUTION: Use extreme care when probing the board with voltmeter probes, etc.!

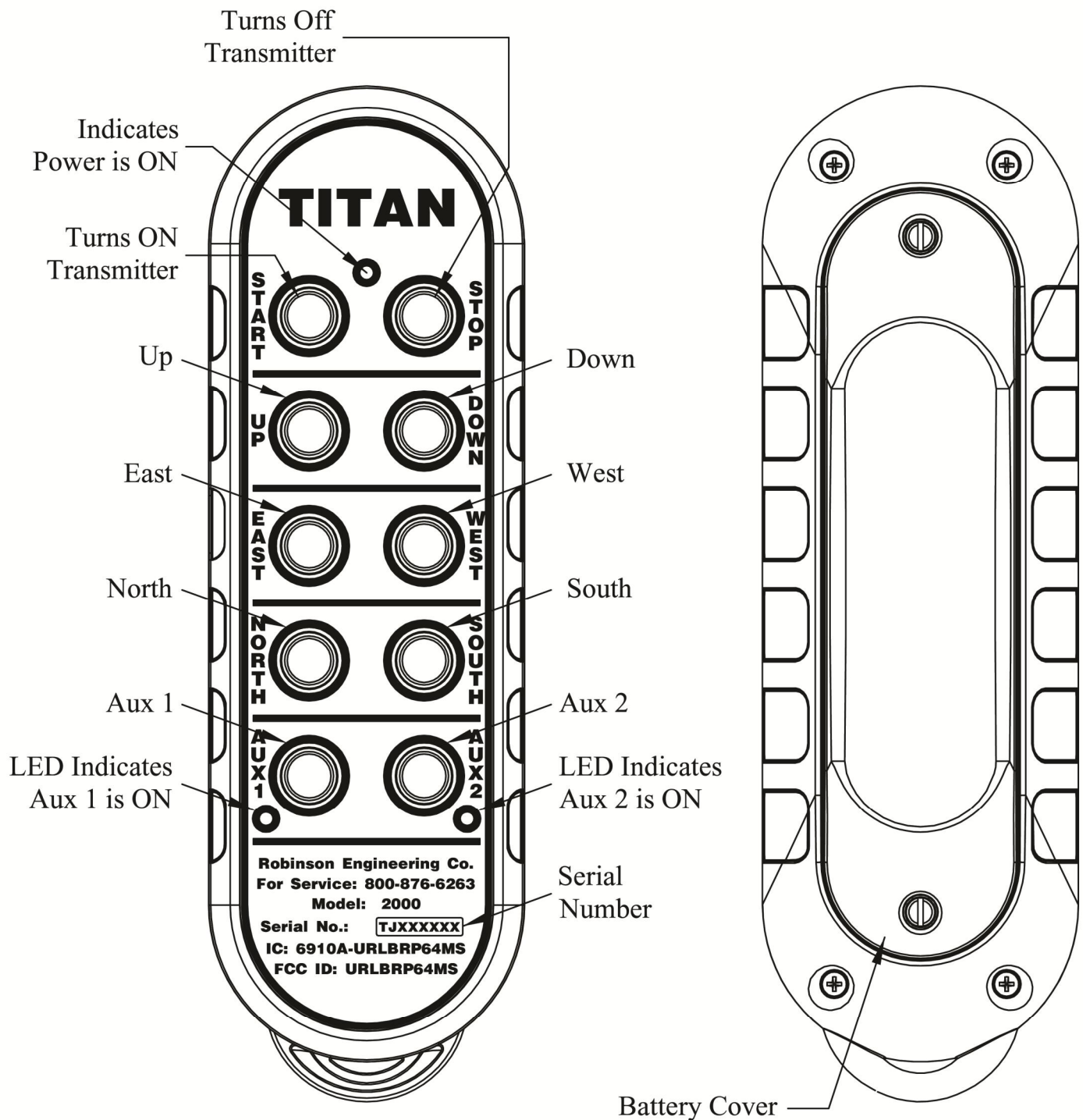


Fig 4-1: Transmitter External Components

MAINTENANCE CHECKS

CAUTION: MAKE CERTAIN THAT THE POWER SWITCH IS 'OFF' WHILE PLUGGING OR UNPLUGGING, CONNECTING OR DISCONNECTING ANY COMPONENT. Non-observance may result in damage and void the warranty.

CAUTION: When the Master Relay (and Main Contactor) is energized, any energized motion relay will cause crane motion.

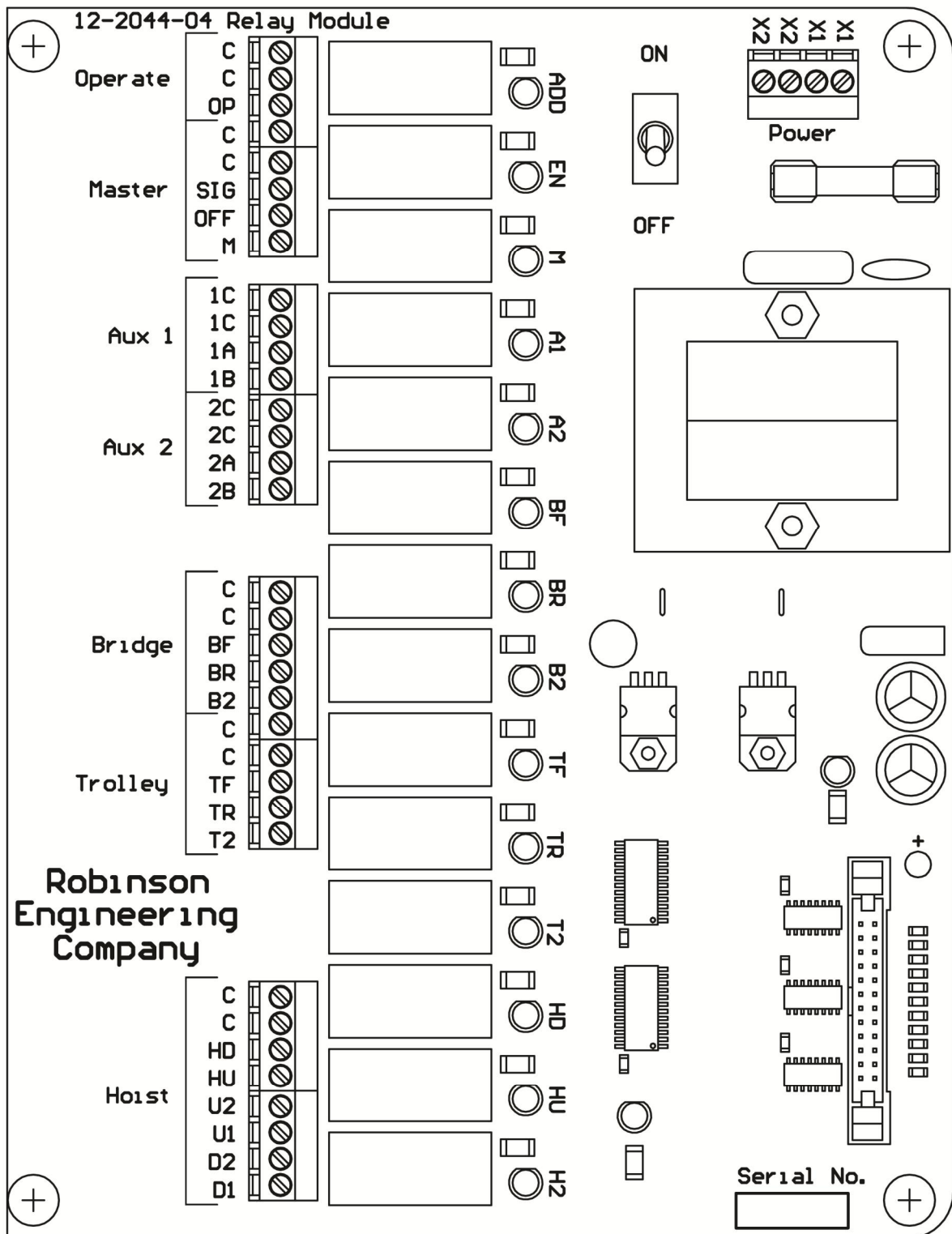
4.2.3.3 System Functional Test

CAUTION: REMOVE MASTER WIRING BEFORE PERFORMING THIS TEST TO AVOID INADVERTENT CRANE MOTION.

This test is performed with Transmitter in view of the Controller so that the LED indicators and relays may be observed. Have all modules in place, Transfer Switch in "Radio" and Power Switch "On" (Neon Indicator lit).

| | <u>Action</u> | <u>Anticipated Result</u> |
|----|---|---|
| 1. | Depress 'Start' pushbutton. | Address and Enable Relay, will operate momentarily until pushbutton is released. (observe indicators). Master relay will energize and remain energized. (indicator will light and remain On until the 'Stop' Switch is pressed). |
| 3. | Operate 'Aux' switches '1' and '2' in turn. | 'Aux' '1' and '2' relays will operate. |
| 4. | Operate motion switches | Each function relay is energized forward (down) and reverse (up) in turn. 2 nd step energizes in either direction for Bridge and Trolley. The Hoist has separate relays for Up 2 nd Step and Down 2 nd Step. |

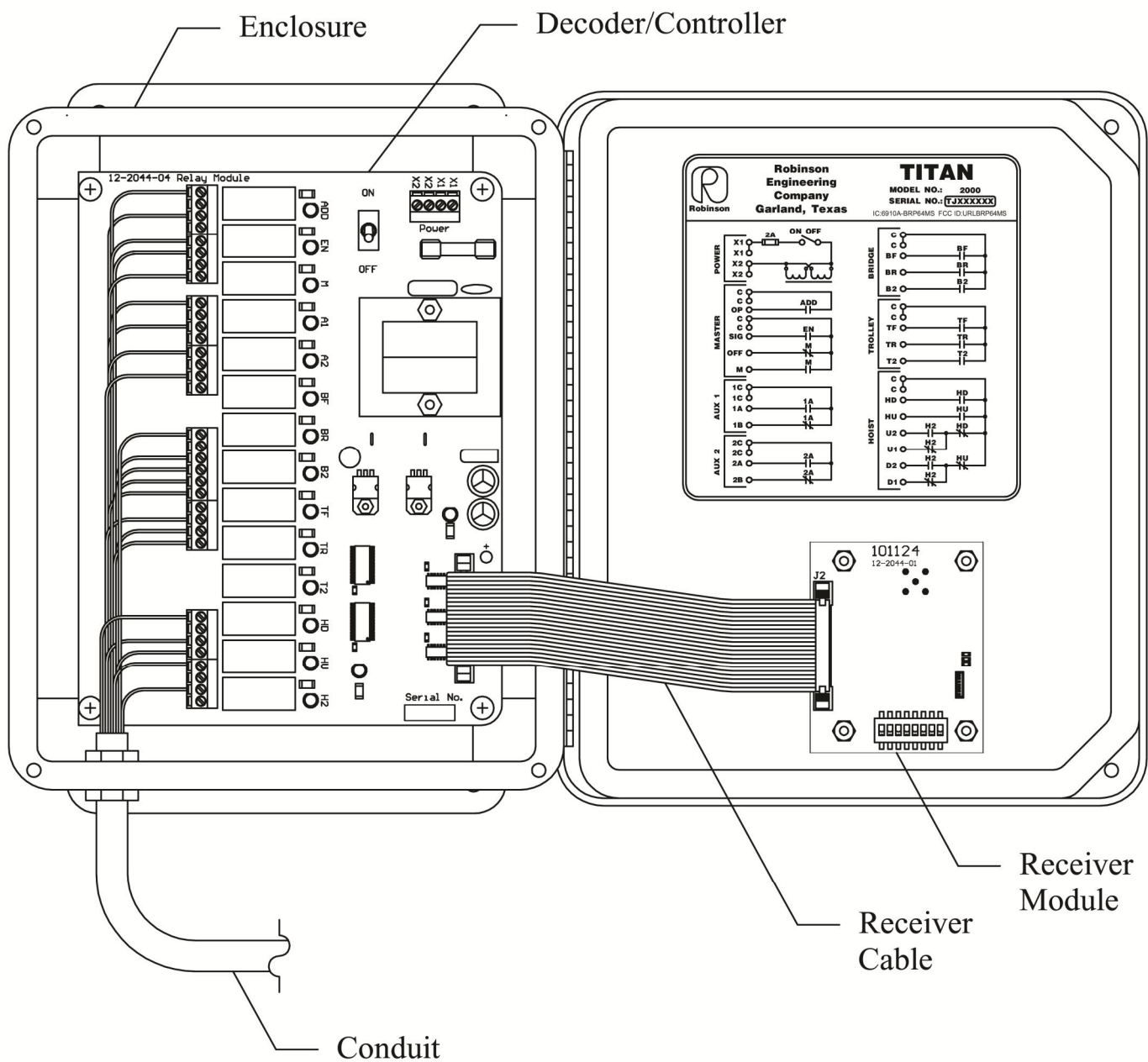
This test provides an opportunity to observe the relays operate mechanically and an opportunity to detect a defective relay. It may also be used as an aid in locating problems in the output circuits to the crane.

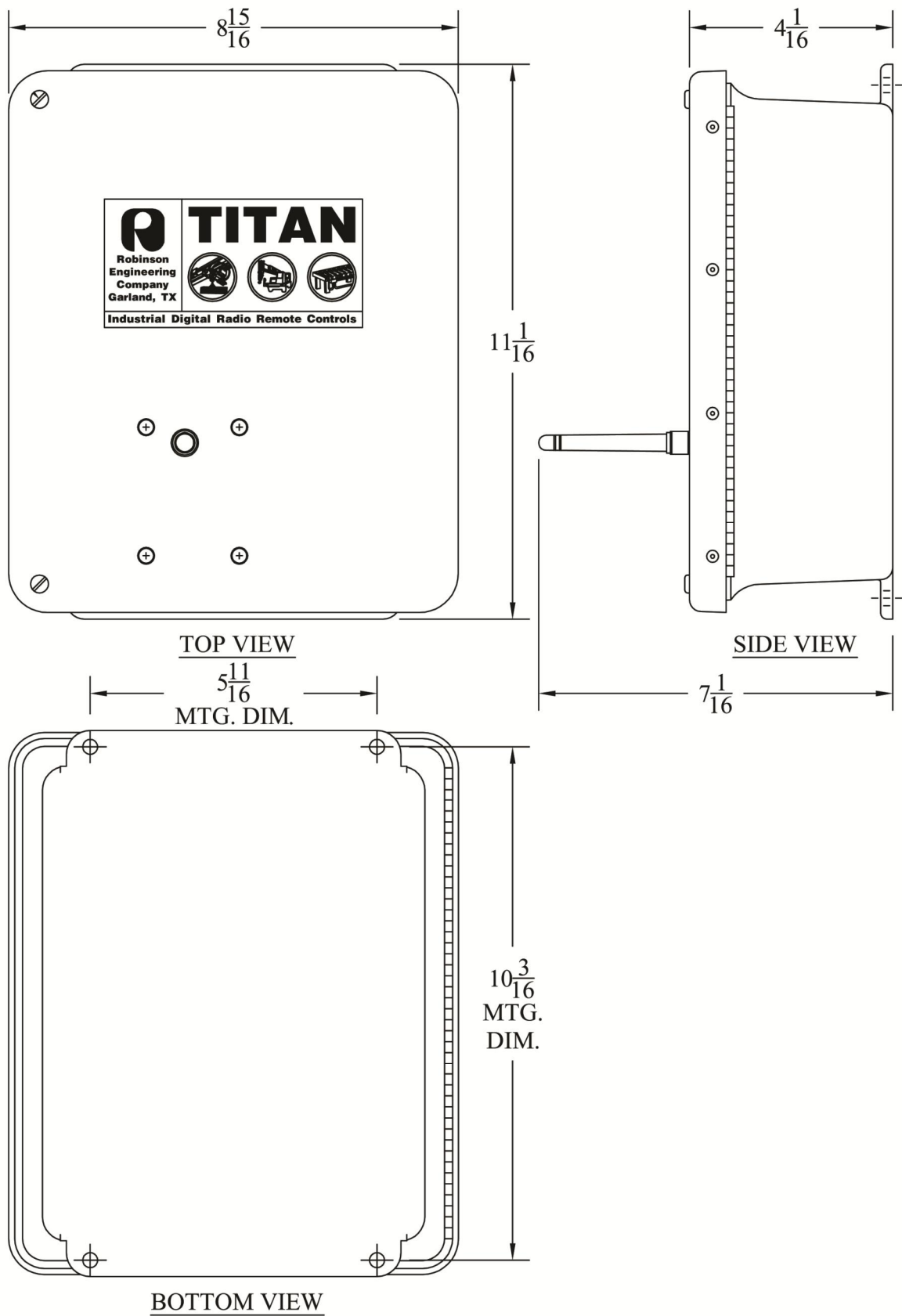


Decoder/Controller
Fig. 4-4

Note:

Mount Enclosure at least 3 feet away from Motors, Festooning, Control Panels or any other Crane Electrification.





OUTPUT CIRCUITS:



Robinson

**Robinson
Engineering
Company
Garland, Texas**

TITAN

MODEL NO.: 2000

SERIAL NO.: TJXXXXXX

IC:6910A-BRP64MS FCC ID:URLBRP64MS

