ROBINSON
ENGINEERING COMPANY

Operation & Maintenance Manual

Crane Boss®

Digital Radio Remote Control

Model 200
Series D

January, 1996

1914 Silver Street Garland, Texas 75042 Telephone (972) 272-2001 Facsimile (972) 276-0705

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DRAWING LIST

SECTION 1

GENERAL INFORMATION

1.1 SCOPE

This manual contains information necessary to install, operate and maintain Crane Boss 200 Radio Remote Control Systems. The information is generally applicable to all Crane Boss 200 systems manufactured by Robinson Engineering Company.

1.2 SYSTEM DESCRIPTION

1.2.1 General – The "200" 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:

On/Off/Emergency Stop/Indicating Light

'B' - Forward / Reverse, Two speed

'T1' - Forward / Reverse, Two speed

'T2' - Forward / Reverse, Two speed

'H1' - Down / Up, Two speed

'H2' - Down / Up, Two speed

'Aux 1' / 'Aux 2' *

* See "Options" Appendix

1.2.4 Transmitter – The transmitter is a portable unit, which is carried by the operator. A shoulder harness and belt clips are provided to enable the operator to conveniently carry the unit while leaving hand free to operate controls. Switches on the transmitter control all functions as labeled.

The portable transmitter weight is approximately 3 ½ pounds. The transmitter

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 "Power key removed.*

2.3 OPERATING PROCEDURE

To place the unit in operation, proceed as follows:

1. Suspend transmitter on the operator by means of shoulder harness or belt clips, or on it mounting bracket. Make sure all attachments are secure to prevent accidental dropping the unit.

2. Operator should position himself so as to have a clear view of the motions and actions.

3. If multi-crane unit is being used, make certain proper selection is made.

4. Insert "Power" key and turn on (clockwise).

5. With all operating controls in neutral position, push "Start/Reset, On, Off", Toggle to "Reset" position, and let it (spring) return to "On". Master indicating light will flash. Master relay and main line contactor are energized.

6. Machinery can now be moved by operating desired control operators. All motion controls are spring loaded to neutral.

* See "Options" Appendix.

SECTION 3

PRINCIPLE OF OPERATION

3.1 RADIO CONTROL SYSTEM

The Crane Boss system is simple to operate. The transmitter unit incorporates a large, easily-operated control lever for each crane motion. Moving the lever in either direction from the neutral position moves the crane in that direction.. A "Start/Reset, On, Off" Toggle energizes the master circuits and, hence, the main line contactor. All function control levers return to an neutral (dead-man action) when released, and motion stops. Fail-safe features are used throughout the circuitry. All crane motion stops in case of malfunction.

The transmitter(s) in your Crane Boss system transmit unique digital crane address codes to each crane. This prevents any mix-up in crane response. Only one crane responds to one special code when transmitted. Hundreds of these address codes are available. For added protection, operating frequencies of each transmitter in the same area can be staggered within the frequency band to prevent interference. The proper selection of digital address codes and operating frequencies relative to physical separation permits control of an unlimited number of cranes in the same plant, area or city.

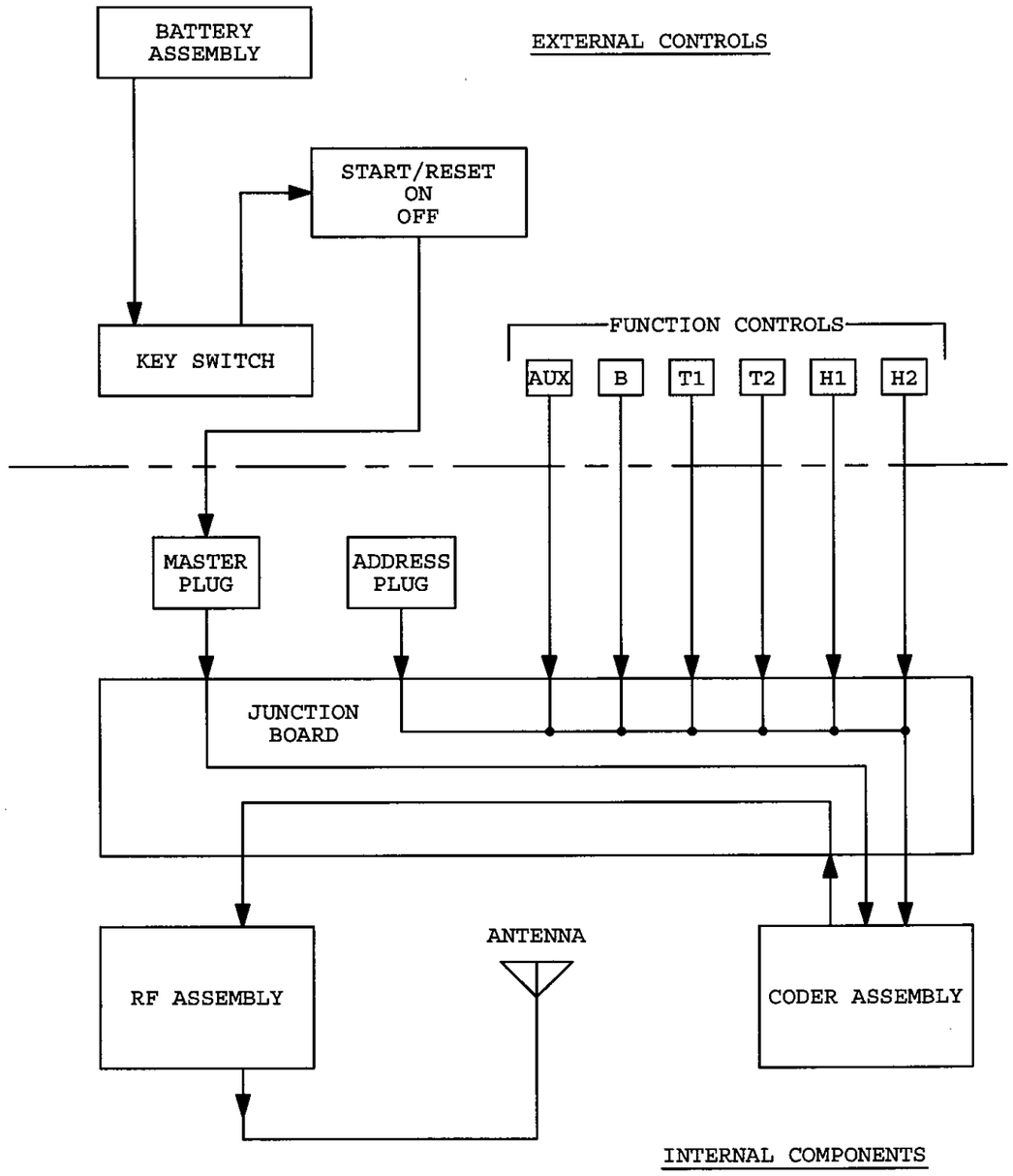


FIG. 3-1: BLOCK DIAGRAM, TRANSMITTER

3.3 RECEIVING EQUIPMENT

Figure 3-2 shows a block diagram. The radio signal from the transmitter is received by the antenna, which is connected to the Receiver by coaxial cable. Receiver data output is fed to the Decoder, where it is decoded and signals suitable for operation of the output relays are generated. The output relays provide heavy-duty control circuits to the basic machine electrical controllers.

3.3.1 Antenna - The Antenna is pre-tuned for the frequency band used.

3.3.2 Receiver - The Receiver amplifies and detects the frequency modulated pulse code signal and includes filtering and shaping circuits to process the signal. Data output consists of rectangular pulses of 5 volts amplitude which are a replica of the transmitter coder output.

The Receiver is a synthesized frequency controlled scanning type receiver which continuously scans all selected channels until a signal is received which contains the proper address code. When proper address code is received, scanning stops and, the receiver remains "locked-on" that channel for as long as the code remains. Channels can be turned "Off" or "locked-out" when unused or turned "On" when other equipment is added.

A "VOLUME" control is provided to permit audio monitoring, via internal loudspeaker, of the received signal for test and maintenance purposes. This control has no effect on the control function of the system and should be left in the full (CCW) off position during normal operation.

SECTION 4

INSTALLATION INFORMATION

4.1 SCOPE

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

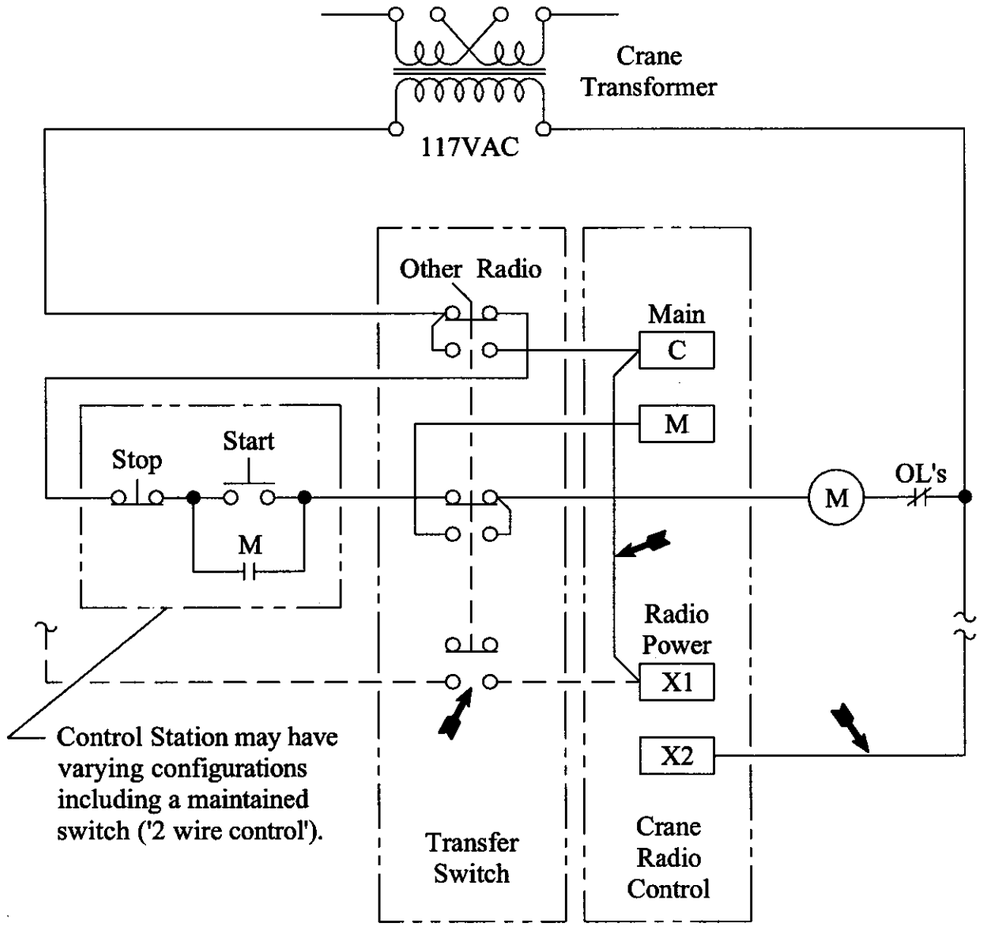
The installer is cautioned to assure that requirements of applicable Codes and Ordinances are complied with.

4.2 MOUNTING - RECEIVING EQUIPMENT

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

4.2.2 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 as noted on the Outline Drawing.

4.2.3 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 IL and X2 are used for the Indicating Light.



➡ If Radio Power is to be separate from Main Power, omit jumper from C (Main) to X1 and add Transfer Switch contact with dashed line connection as shown. X2 must be connected to the same power source as X1.

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. 4-1:
TYPICAL TRANSFER SWITCH & MAIN LINE CONTACTOR CIRCUIT

4.4 OUTPUT CIRCUITRY

4.4.1 Main circuit – connect Main Contactor (M) in a manner similar to Fig. 4-1. The circuit should provide for the Main Contactor to be energized when the circuit from "C" (Main) 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 "Stop" terminals, is available to unlatch a latching main contactor or similar applications.

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

4.4.2 The output of Crane Boss 200 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. 4-2 and Output Circuits Drawing for logic of internally, pre-wired circuits.

4.4.3 Motion Circuits - Each motion switch on the transmitter (B, T1, T2, H1, H2) has respectively labeled output circuitry which 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. These open at full-throw.
4. Separate 'Hi' contacts for each direction. These close at full-throw.

4.4.4 Auxiliary circuits - 'Aux 1 & Aux 2' are set up as a single speed reversing switch. They share one common (X1), having separate output contacts and terminals.

4.4.5 Magnets, Vacuum Lifts, Grabs, etc. - These types of controls require safeties such as mechanical-latch relays not provided. But assistance is available by consulting the factory.

* See 'Options' Appemdix.

4.6 START-UP PROCEDURE

4.6.1 Before Power-up Check List:

☐ 1. Cabinet mounted per Outline Drawing and Manual paragraph 4.2.

☐ 2. All conduit entry thru bottom of cabinet, away from Antenna.

☐ 3. Receiving Antenna must be visible from operating area, in all directions and over entire range of operation. *

☐ 4. Internal components and connections are tight and secure.

☐ 5. Channel(s) for transmitter(s) to operate unit are selected on the Scanning Control Receiver. See tag(s) on transmitter(s) for frequency & channel.

☐ 6. Transfer Switch, if used is in "Radio"

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

☐ 1. With "On/Off" Rocker Switch on Controller in "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 Rocker Switch to "On" position. Neon Indicator, next to Rocker Switch, lights and Control Receiver scans thru all selected channels continuously.

☐ 3. Airwave Check: With squelch full clockwise, turn up volume on Control Receiver. Listen for any signals present on selected operating channels. Pure "hissing" is a welcome sound! Anything else indicates possible competition on that frequency.

* See "Options" Appendix.

SECTION 5

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 costs; or at no cost under warranty. Federal Communications Commission Rules and Regulations require that tuning adjustments on the radio frequency (RF) portion of the transmitter be made only by a properly licensed person.

5.1 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.

5.2 CORRECTIVE MAINTENANCE

5.2.1 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.

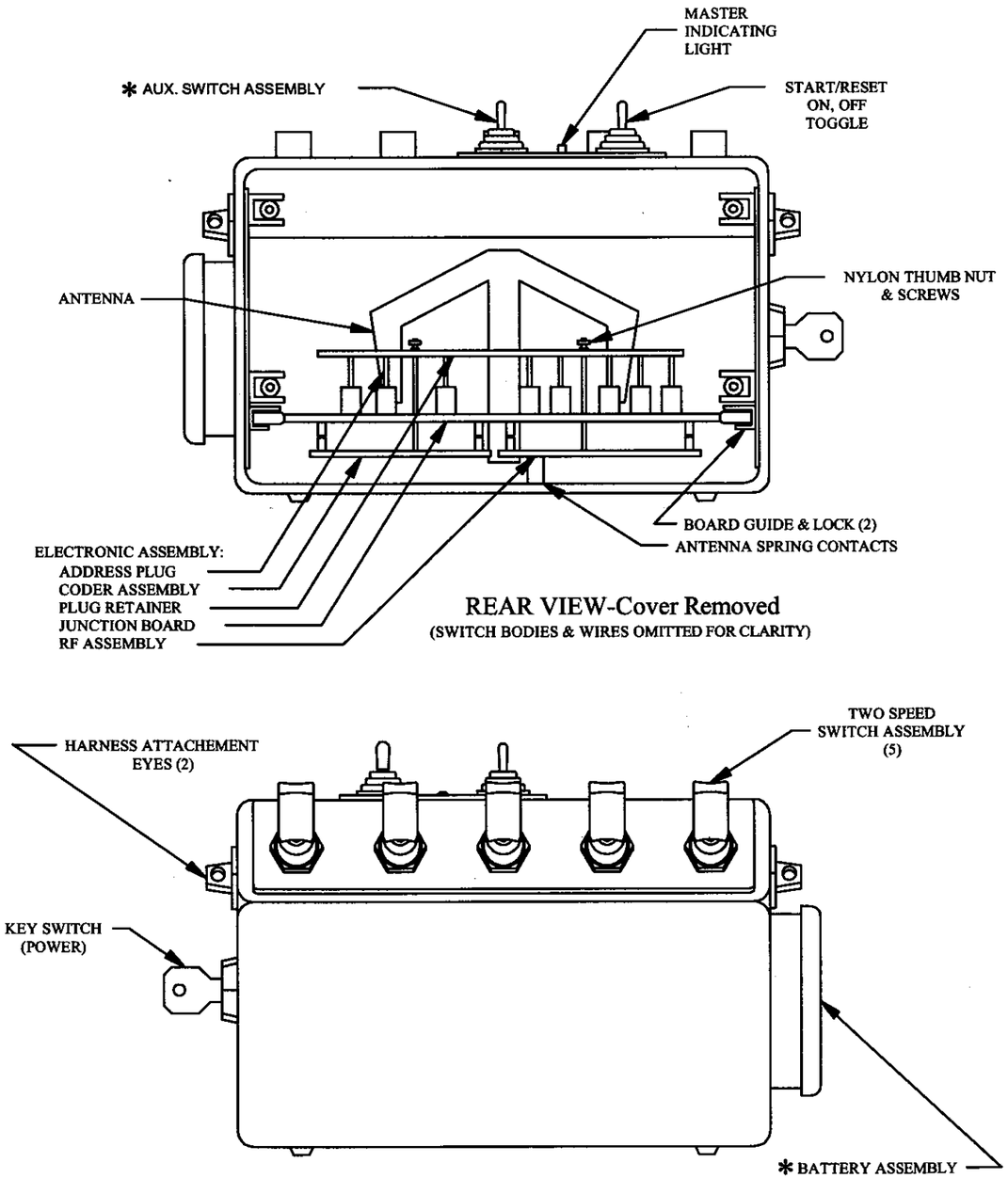


FIG 5-1: TRANSMITTER COMPONENTS
(SHOWN WITHOUT SWITCHGUARD ATTACHED)

* SEE OPTIONS APPENDIX

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.

Refer to Block Diagram, Fig. 3-2 and Schematic Controller, to assist in tracing trouble.

5.2.3.1 System Functional Test -

CAUTION: REMOVE MASTER RELAY 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).

Action	Anticipated Result
1. Turn Transmitter "ON" (Key Switch and "Start/ Reset, On, Off" Toggle)	Address and Enable relays will operate (observe indicators). Master relay indicator will light. See note below.
2. Operate "Aux" switch to "1" and "2" in turn.	"Aux" "1" and "2" relays will operate. Master relay indicator will be off when any function is on (with relay removed)*.
3. Operate motion switches. Forward (down) and Reverse (up) in turn.	Each function relay is energized in turn. "Hi" relay is energized at full throw of the switch in either direction.

If any relay and its LED indicator fails to operate, replace the Decoder. (See "CAUTION", above.)

This test provides an opportunity to observe the relays operated 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.

Note: If step 1 does not provide any of the indications noted and all voltage checks of para.5.2.3.5 are correct, replace the Address and Enable relays. (See Safety Circuit, page 5-10). (See "CAUTION" above.)

* See "Options" Appendix.

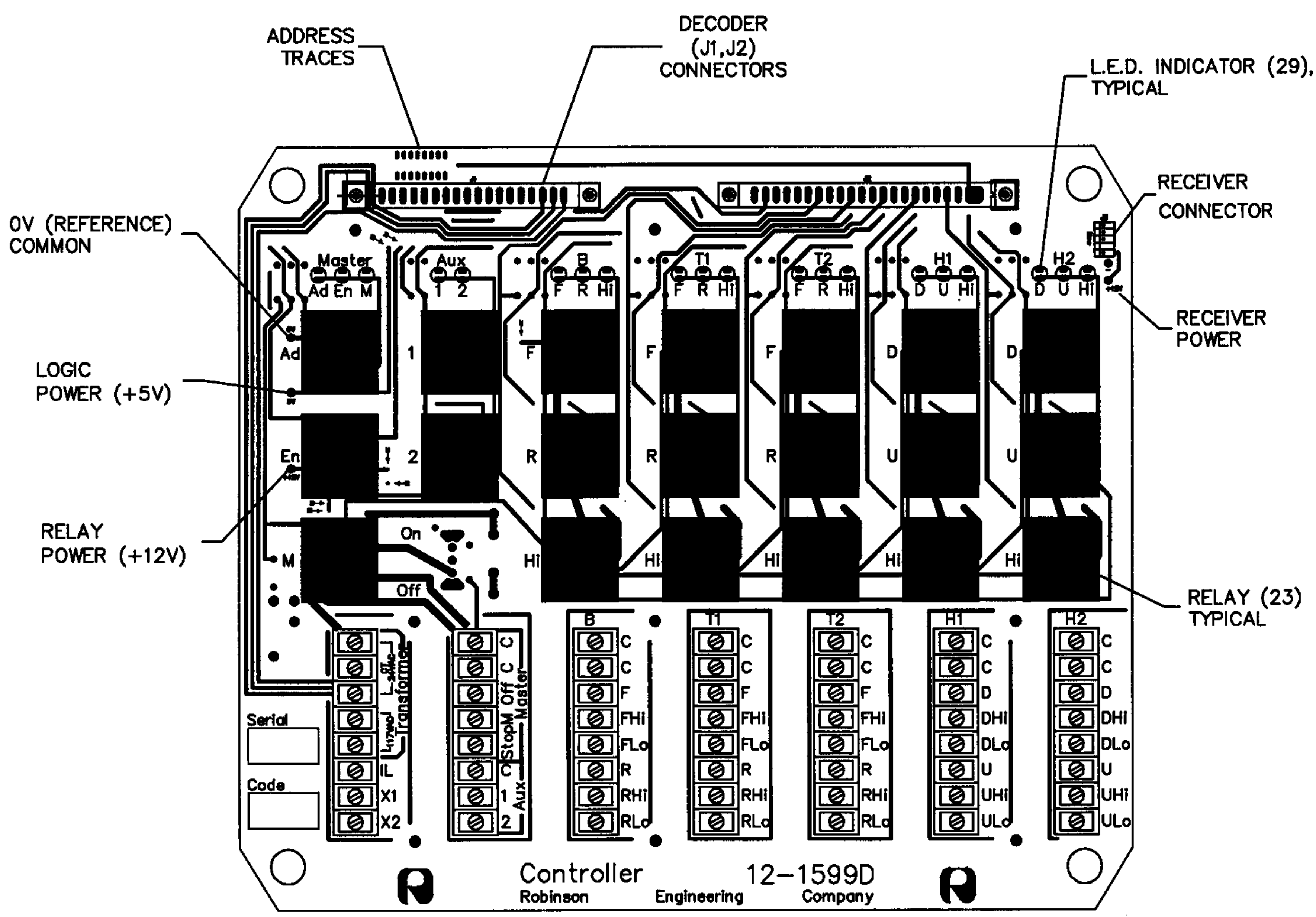

ADDRESS TRACES
DECODER (J1,J2) CONNECTORS
L.E.D. INDICATOR (29), TYPICAL
RECEIVER CONNECTOR
RECEIVER POWER
0V (REFERENCE) COMMON
LOGIC POWER (+5V)
RELAY POWER (+12V)
RELAY (23) TYPICAL
Master
Ad En M
Aux
1 2
B
T1
T2
H1
H2
F R HI
D U HI
On
Off
Serial
Code
Transformer
IL
X1
X2
Stop
Off
Master
Aux
C
F
FHI
FLo
R
RHI
RLo
D
DHI
DLo
U
UHI
ULo
Controller 12-1599D
Robinson Engineering Company

FIG. 5-2

5.2.3.6 Receiver – use the Transmitter qualitative test, paragraph 5.2.2.2 to check the Receiver. If receiving range appears to be reduced, check antenna for defects and proper connections. Make certain that the "Squelch" is set at wide open, its max clockwise position, for maximum range.

NOTE: The cable connecting the Receiver to the Controller should not be ignored. A continuity test may be appropriate. (See "CAUTION", top of Page 5-5).

5.2.3.7 Decoder – The only check for a suspected defective Decoder is substitution of a spare module.

5.3 REPLACEABLE PARTS

When purchasing parts from the factory, please provide the Serial Number of your equipment (see nameplate on Transmitter or Receiving Equipment).

	Quantity/ System	Recommended Spare Parts	Quantity/ Spare Parts Kit
5.3.1 Transmitting Equipment:			
Transmitter, Model 200 D	1	1	
Shoulder Harness	1		
Battery Cover Assembly	1	1	
Two Speed Switch Assembly	5		
with Boot and Knob			
Boot Assembly			
Knob only			
Aux Switch Assembly*	1		
with Boot			
Boot only			
5.3.2 Receiving Equipment:			
Control Receiver	1	1	1
Receiver Cable	1		
Antenna Cable	1		
Antenna	1	1	
Decoder	1	1	1
Relay, 12 VDC, Mini 10A	20	3	3
Retainer	20	3	3
Fuse, 8AG-2A (not instrument rating)	1	5	5
Transformer, 117/24V (CT)	1	1	1
Controller (Relay PC Assembly) w/Relays*	1		

* See "Options" Appendix.

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II. (EN)CODING & DECODING

ADDRESS: 1.2.3(7.), 2.3(3.), 3.1, 3.2, 3.3.2, 3.3.4, 5.2.2.3, 5.2.3.3, 5.2.3.8

"DRY RUN": 5.2.3.4

DECODING: 3.3.3, 5.2.3.7

III. SAFETY & SEQUENCE

OPERATION: 2.3(5.), 2.4

SIGNAL(S): 3.3.5, 5.2.3.8

MASTER: 2.3(5.), 2.4, 5.2.3.8

IV. INPUTS & OUTPUTS

SWITCHES: 2.3(5. & 7.), 5.2.3.4

RELAYS: 3.3.5, 4.4.2, 4.4.3, 4.5, 5.2.3.4 & FIG. 5-2

RELAY CIRCUITS: 1.2.3(5.), 1.2.4, 4.4, 4.5, 5.2.3.8

OUTPUT CIRCUITS: FIG. 4-1 & 4-2

OPTIONS

Available Options:

3-Position Aux, "#1/Both/#2": A 3-position Maintained switch replaces the standard 3-position spring-return-to-center switch on Transmitter. Also, Master Relay circuit on Controller is revised accordingly.

There are two options of this option:

Center Position = Both 'Aux 1' & 'Aux 2' "On", or "Off"

2-Position Aux, "#1/#2": Similar to 3-position Aux, but 2-position maintained switch: Either 'Aux 1' is "ON", or 'Aux 2' is "ON". Also, Master Relay circuit on Controller is revised accordingly.

Multi-Crane: Allows one Transmitter to operate up to six (special cases, eight) cranes, each one-at-a-time. This variable address switch is a key lock. Note that the Transmitter does not change its frequency!

Special Labeling: Any functions & directions can be labeled per supplied sketch, i.e.: "Rotate, CW/CCW"; "Grab, Open/Close"; "Bridge, North/South"; "East Hoist"; "Forks, In/Out & Up/Down"; ....only limitation is space!

OPTIONS

Remote Antenna Kit:

Mounting of the Receiving enclosure should allow for the Antenna to be:

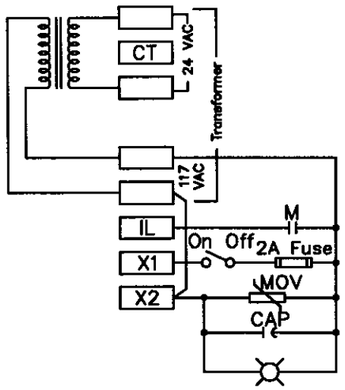
1. Clear of large metal objects, being greater than one foot away from bridge girders, hoist mechanism, etc;

2. In view from the entire operating area, in all directions;

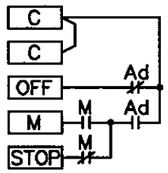
3. And not in close proximity to crane electrification, like runway conductors, bridge cross conductors, festooning, conduit or wireway.

If any of these conditions cannot be met, a Remote Antenna Kit should be used.

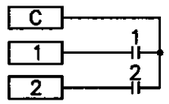
The Kit includes 15 ft. of add-on cabling with Antenna mounting plate attached and base for the plate.



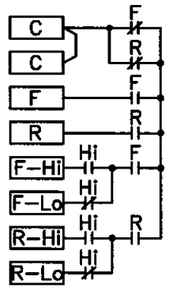
Master



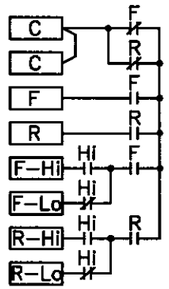
Aux



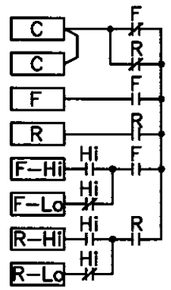
B



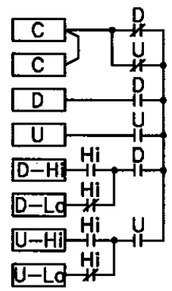
T1



T2



H1



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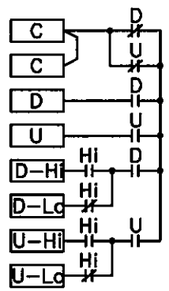

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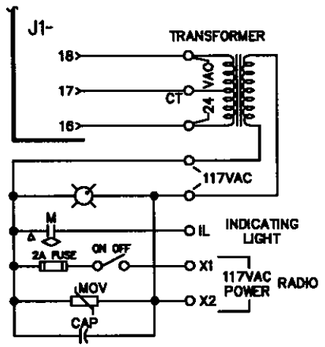
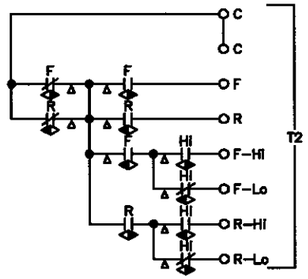
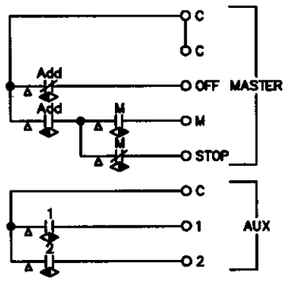
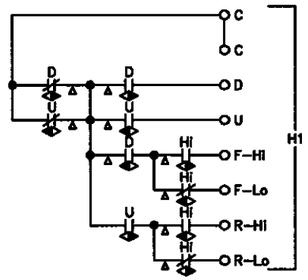
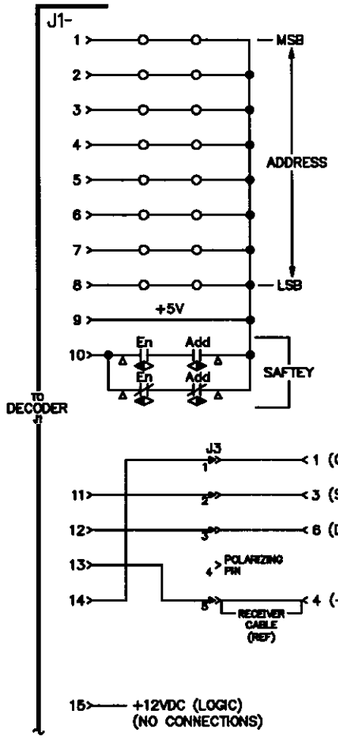
			Crane Boss 200
DRAWN Scott Booker			DWG. NO. 12-1606
DATE 7-21-98			SHEET 1 OF 1

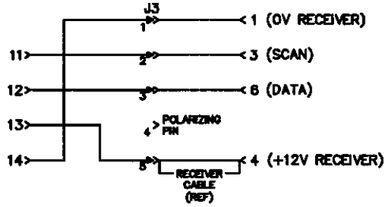




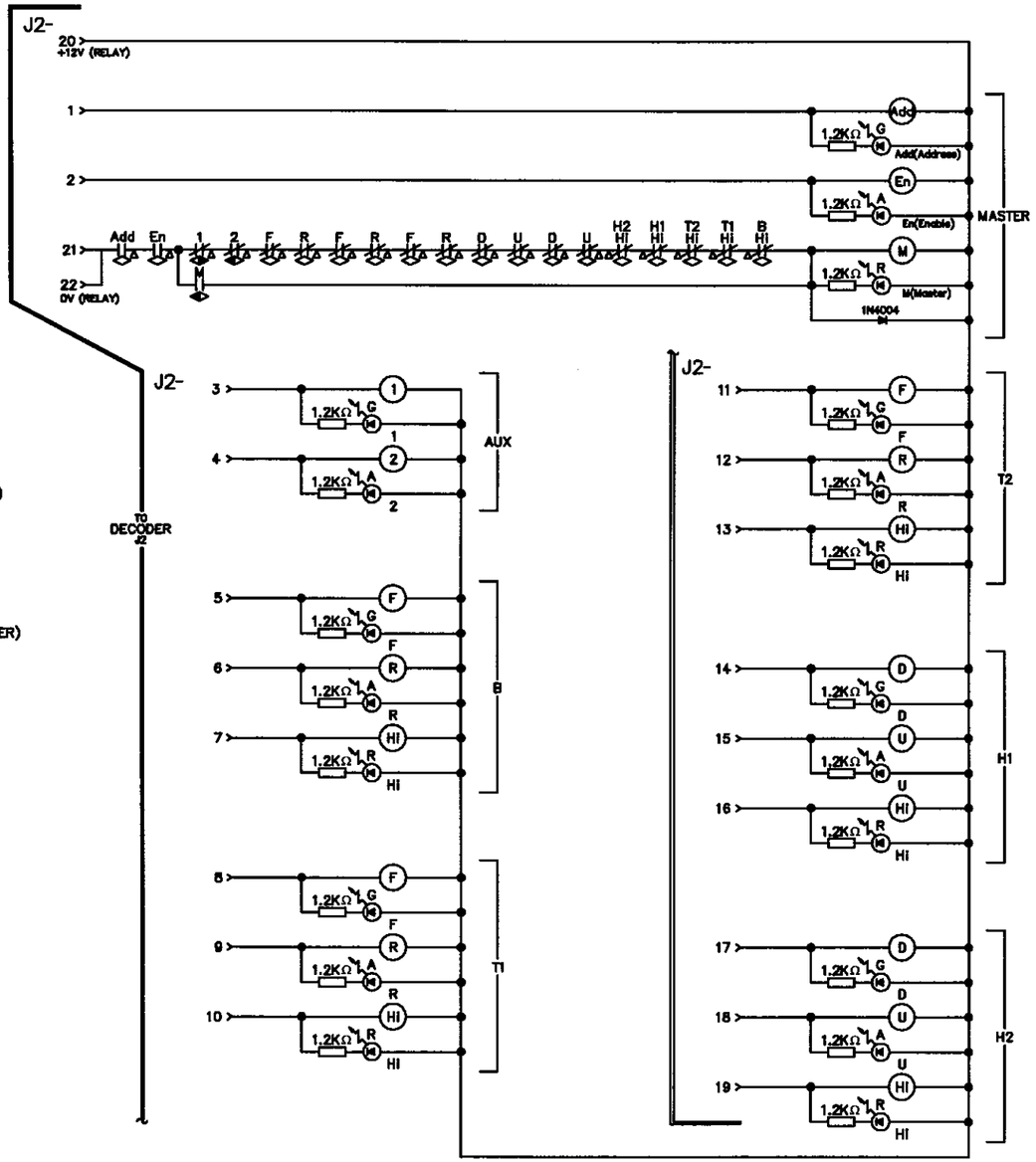


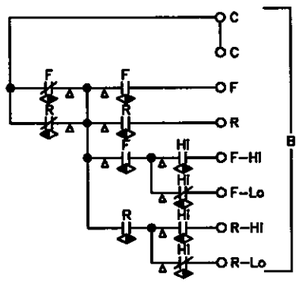


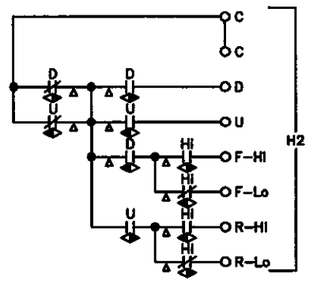


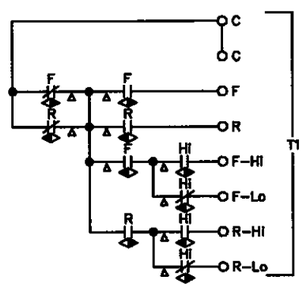


15> +12VDC (LOGIC)
(NO CONNECTIONS)

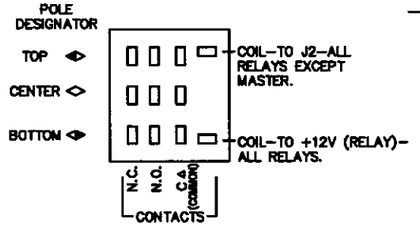




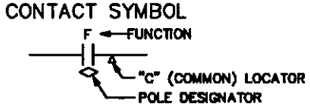




CONTACT LOCATOR
(FACE VIEW OF SOCKET)



CONTACT SYMBOL



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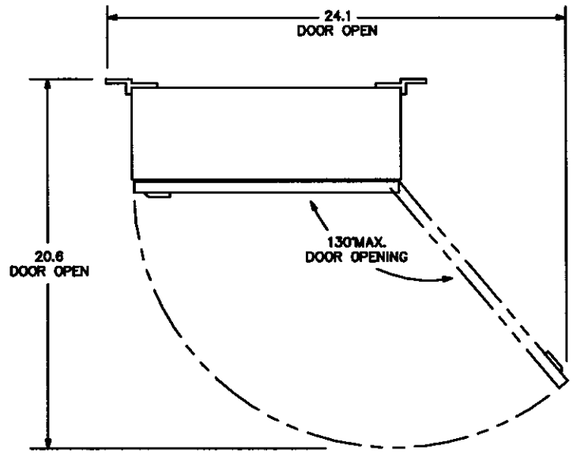
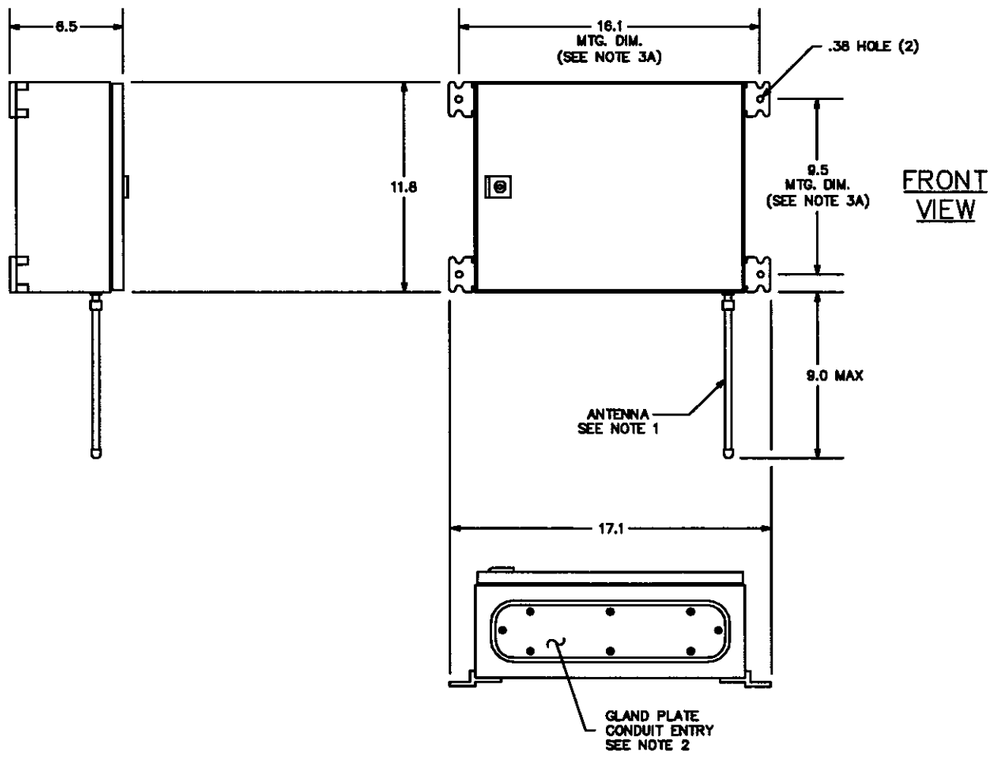
DRAWN Scott Booker	DATE 7-21-98	DWG NO. 12-1607	REV.
		SHEET 1 OF 1	





FRONT VIEW

BOTTOM VIEW

NOTES:

1. ENCLOSURE SHOULD BE LOCATED SO THAT ANTENNA IS VERTICAL AND CLEAR OF LARGE METAL OBJECTS AND CRANE ELECTRIFICATION. FOR ANTENNA LOCATED REMOTELY, CONTACT ROBINSON ENGINEERING COMPANY FOR REMOTE ANTENNA INSTALLATION KIT. PREFERABLY, ANTENNA SHOULD BE IN VIEW OF OPERATOR.
2. CONDUIT ENTRY MUST BE CONFINED THRU GLAND PLATE ON THE BOTTOM AND NO CONDUCTORS SHOULD BE ROUTED ABOVE THE TERMINAL STRIP AREA.
3. STAINLESS STEEL OPTION (NEMA 4X):
   A. MOUNTING DIMENSIONS ARE 8.15 x 16.45
   B, GLAND PLATE IS OMITTED.

REV.	DESCRIPTION	DATE
C	REVISED & REDRAWN	8-2-99
B	ADDED NOTE 3	10-9-91
A	REVISED NOTES	5-22-90

FILE NO. | SCALE 1/4"
DATE 8-2-99
ASSY NO.
RELEASE
WORK NO.
DRAWN Scott Booker
DATE 8-2-99

ROBINSON ENGINEERING COMPANY
Garland, Texas

OUTLINE
CRANE RADIO CONTROL

STANDARD TOLERANCES EXCEPT AS NOTED:
XXX DECIMALS ± .010 FRACTIONS ± 1/32
.XX DECIMALS ± .030 ANGLES ± 1°
ALL DIMENSIONS IN INCHES

DWG. NO. 12-1608
REV. C
SHEET 1 OF 1