

EXHIBIT 3

MANUAL

IMPORTANT!

Read through this information **BEFORE** you install the equipment. If the radio operation is to function reliably for a long period of time, it is **EXTREMELY IMPORTANT** that the radio receiver and antenna are properly installed.

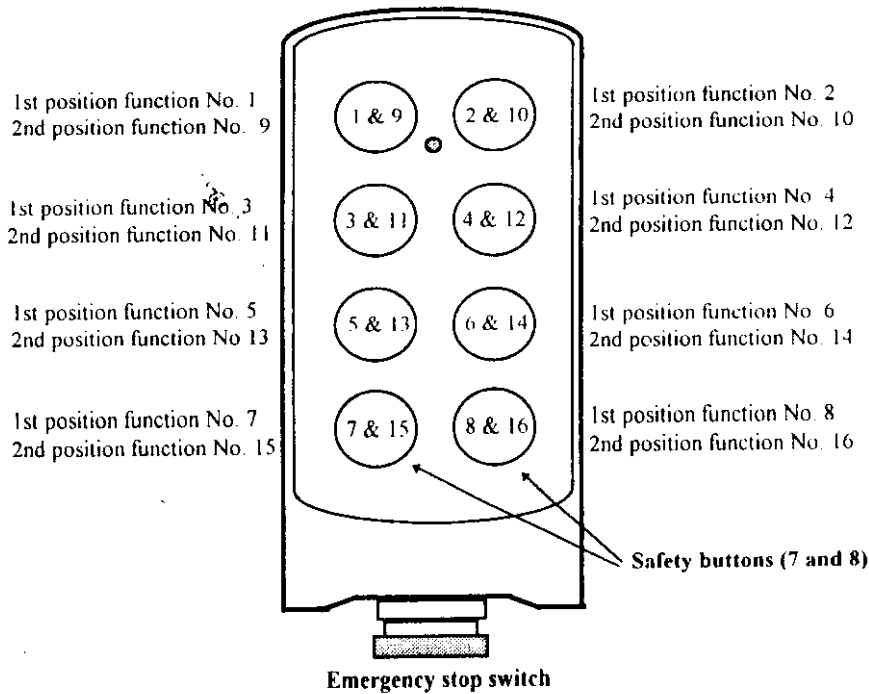
Correctly installed equipment not only provides a better transmission/reception range, but also a longer lifetime. Spending a few minutes reading through these instructions will reward you with a safe and reliable remote control system.

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TRANSMITTER

The standard transmitter has 8 two-step pushbuttons, 1 emergency stop switch, and 1 key power switch. The diagram below shows the location of the various buttons and the button steps that activate the relays (marked 1-16) in the receiver.



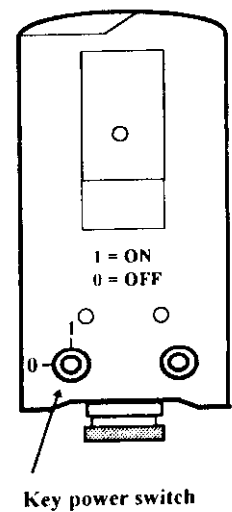
Starting-up the transmitter

1. Key power switch in the ON position
2. Emergency stop switch knob pulled out.
3. Depress both safety buttons (7 and 8) at the same time for at least one second.
4. Release the safety buttons.
5. The transmitter is in function status when the green LED light comes on.

The transmitter has a built-in safety function that prevents another function from involuntary cutting-in when the transmitter starts. The transmitter will not start if a button is stuck in the activated position. This is indicated by the red LED light coming on.

Shutting-down the transmitter

To shut-down the transmitter, push in the emergency stop switch.

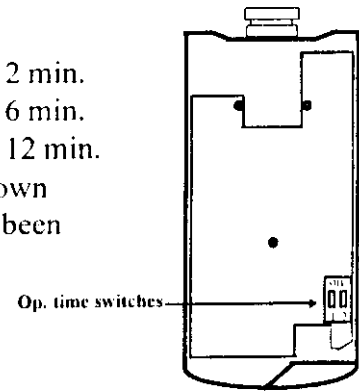


AUTOMATIC SHUT-DOWN

The transmitter has an automatic shut-down function in order to increase battery life. This means that the transmitter shuts down after a pre-set time from when the final command has been given.

The automatic shut-down function is programmed as follows:

Breaker 1 in position ON	=	Transmitter shuts itself down after 2 min.
Breaker 2 in position ON	=	Transmitter shuts itself down after 6 min.
Breakers 1 & 2 in position ON	=	Transmitter shuts itself down after 12 min.
Breakers 1 & 2 in position OFF	=	Transmitter does not shut itself down until the emergency stop knob has been depressed



The transmitter is delivered with the automatic shut-down function off, that is, Breakers 1 & 2 in position OFF

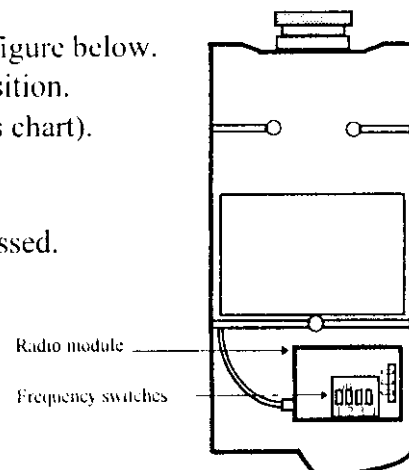
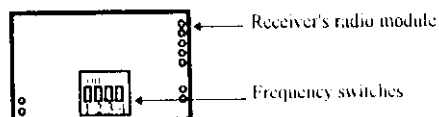
OTE! The transmitter can ALWAYS be shut-down by pushing in the emergency stop switch.

CHANGING THE FREQUENCY

With each CRANE CHIEF system you can choose to transmit on 32 different frequencies. The 32 different frequencies enable you to select a clear frequency, and also allow multiple units at the same location.

The frequency is changed as follows:

1. Make sure that the transmitter is switched off (key switch).
 2. Open the transmitter and the receiver.
 3. Carefully lift up the receiver's radio module from the circuit board.
 4. Place the units (receiver and transmitter modules) as shown in the figure below.
The frequency breakers on both units point upwards for the ON position.
 5. Alter the frequency switches to the desired frequency (see channels chart).
- NOTE:** The frequency **MUST** be the same in both units!
6. Start-up the system
 7. Check that the relays close when the transmitter buttons are depressed.
 8. Close up both receiver and transmitter.



Channels chart

Frequency switches

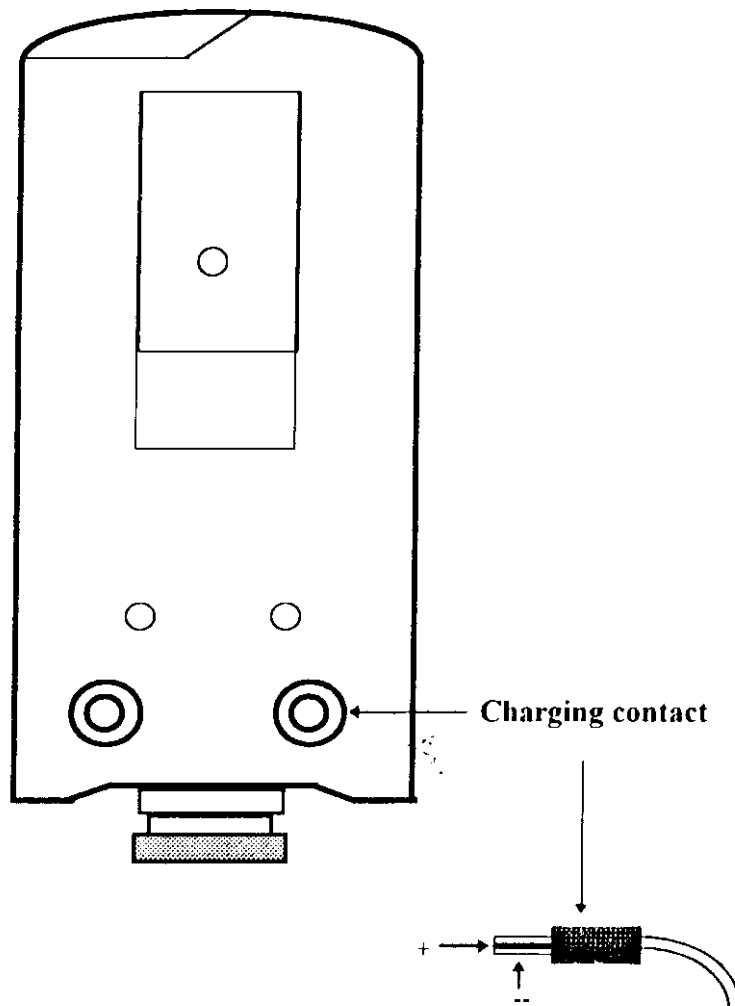
Jumper	1	2	3	4	Channel	Frequency
Open	OFF	OFF	OFF	OFF	1	434.650 MHz
Open	ON	OFF	OFF	OFF	2	434.600 MHz
Open	OFF	ON	OFF	OFF	3	434.550 MHz
Open	ON	ON	OFF	OFF	4	434.500 MHz
Open	OFF	OFF	ON	OFF	5	434.450 MHz
Open	ON	OFF	ON	OFF	6	434.400 MHz
Open	OFF	ON	ON	OFF	7	434.350 MHz
Open	ON	ON	ON	OFF	8	434.300 MHz
Open	OFF	OFF	OFF	ON	9	434.250 MHz
Open	ON	OFF	OFF	ON	10	434.200 MHz
Open	OFF	ON	OFF	ON	11	434.150 MHz
Open	ON	ON	OFF	ON	12	434.100 MHz
Open	OFF	OFF	ON	ON	13	434.050 MHz
Open	ON	OFF	ON	ON	14	434.000 MHz
Open	OFF	ON	ON	ON	15	433.950 MHz
Open	ON	ON	ON	ON	16	433.900 MHz
Closed	OFF	OFF	OFF	OFF	17	434.625 MHz
Closed	ON	OFF	OFF	OFF	18	434.575 MHz
Closed	OFF	ON	OFF	OFF	19	434.525 MHz
Closed	ON	ON	OFF	OFF	20	434.475 MHz
Closed	OFF	OFF	ON	OFF	21	434.425 MHz
Closed	ON	OFF	ON	OFF	22	434.375 MHz
Closed	OFF	ON	ON	OFF	23	434.325 MHz
Closed	ON	ON	ON	OFF	24	434.275 MHz
Closed	OFF	OFF	OFF	ON	25	434.225 MHz
Closed	ON	OFF	OFF	ON	26	434.175 MHz
Closed	OFF	ON	OFF	ON	27	434.125 MHz
Closed	ON	ON	OFF	ON	28	434.075 MHz
Closed	OFF	OFF	ON	ON	29	434.025 MHz
Closed	ON	OFF	ON	ON	30	433.975 MHz
Closed	OFF	ON	ON	ON	31	433.925 MHz
Closed	ON	ON	ON	ON	32	433.875 MHz

CHARGING

The transmitter is delivered with a built-in charger, rechargeable batteries and an adapter for charging. Battery charge status is indicated by the LED light in the transmitter: red = batteries need charging; green = batteries fully charged.

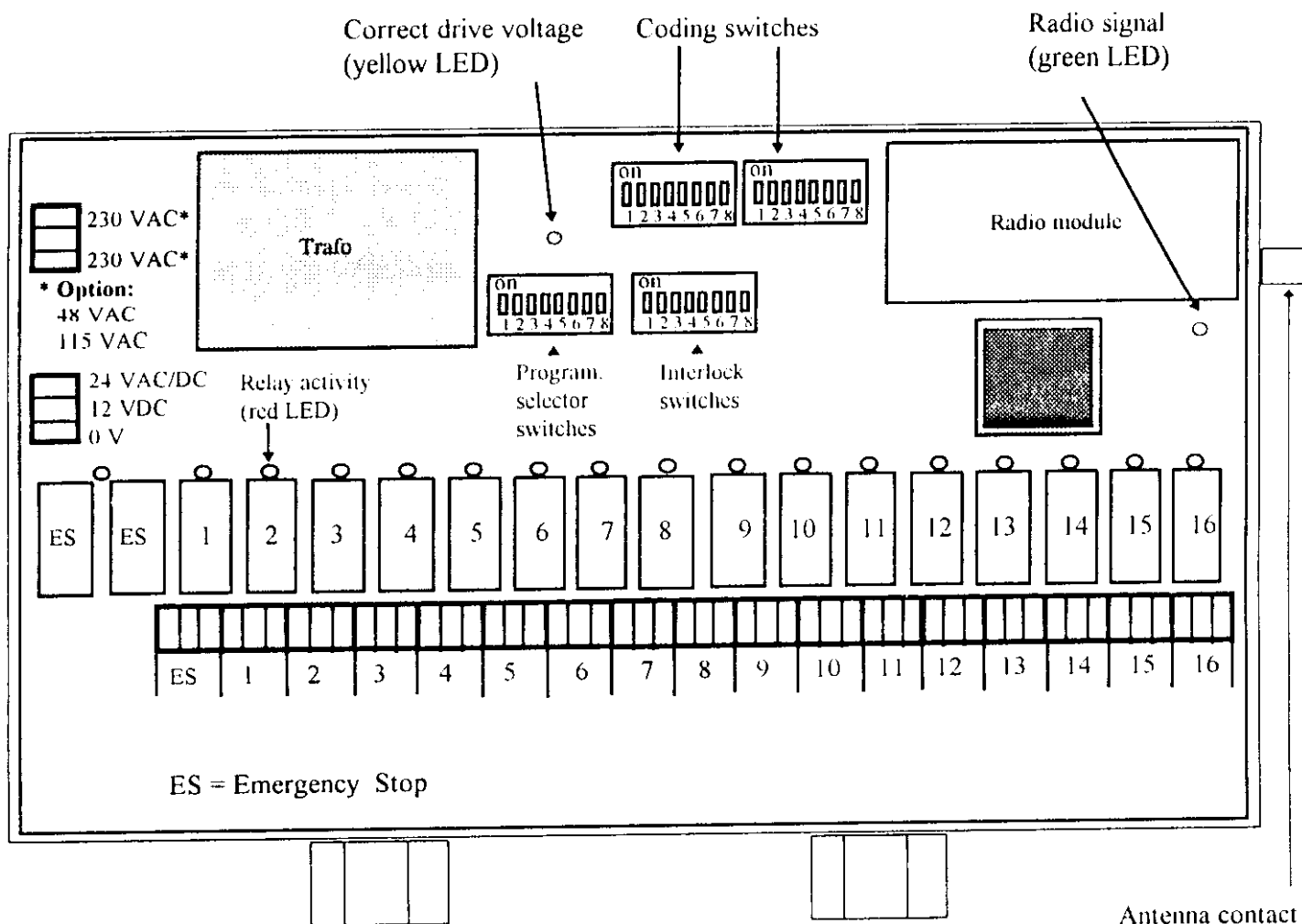
During the charging of the transmitter batteries, the LED lights red until the batteries are fully charged, at which time the light changes to green. The transmitter batteries cannot be overcharged. It takes about 1.5 hours to fully charge the batteries. The transmitter can run continuously for about 12 hours. The LED light changes from green to red when there is about 10% power left in the batteries (1 hour continuous operation remains). It is time to recharge.

NOTE: On/Off Switch
must be in the OFF
position for recharging!



RECEIVER

The receiver is delivered as standard with 18 relays, 2 of which are used for the emergency stop function.



Receiver's various LED indications

- Yellow LED lights when receiver has correct feed voltage.
- Green LED lights when receiver accepts radio signals.
- Each relay has a red LED that lights when relay is activated.

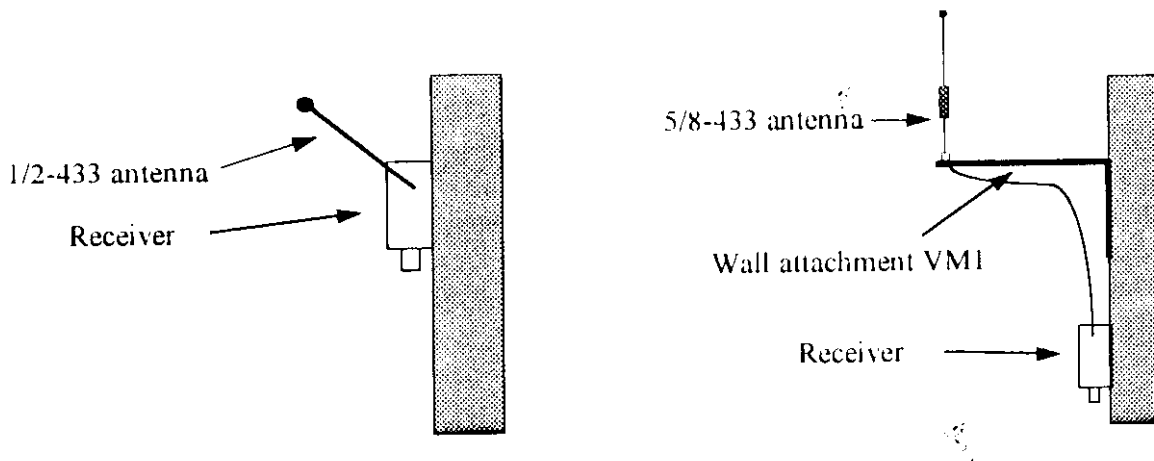
INSTALLING THE RECEIVER

If the radio operation is to function well for a long time, it is most important that the receiver and antenna are placed correctly. The location of the receiver will depend on the type of antenna used.

There are two different types of antenna to choose from. The <standard> is a 1/2 wave length and <as an option> a longer 5/8 wave length <is available>.

The standard 1/2 wave antenna is connected directly to the receiver enclosure with a BNC connector. A big advantage with the 1/2 wave antenna is that its location is not dependent on distance to ground surface. In other words, it can be placed where another antenna would not be suitable, such as a tin roof. If the receiver is mounted to a structure, the antenna should be angled (see fig.).

The 5/8 wave length includes a <10'> coaxial cable, which is of the low-loss type. With the coaxial cable you can place the antenna in a better position (high and clear). The coaxial cable makes it possible to place the antenna well above ground. For optimum range performance, the antenna should be mounted away from other metal objects on a tin roof. For wall mounting, the antenna should be bolted securely to a wall attachment (WM1). Vehicle attachment <VM1> is best for mounting the antenna on a vehicle.



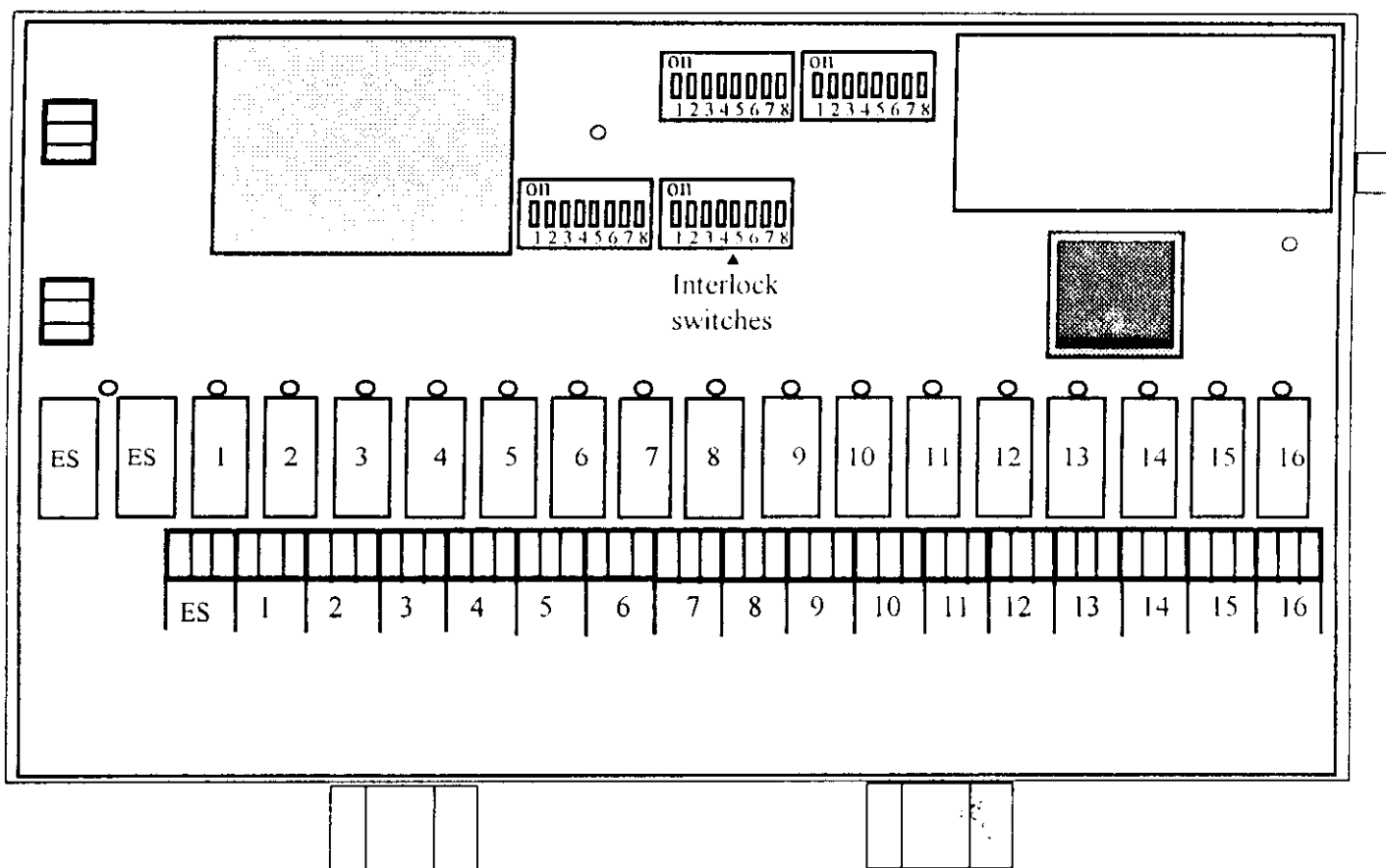
Note the following points when installing the radio equipment:

- Place the antenna high above the ground.
- Keep the antenna as far as possible away from other metal objects, e.g., girders, electric cables, and other antennas.
- Protect the receiver as much as possible from wind and weather.

INTERLOCKING

Interlocking is programmed in the receiver using interlock switches (1-8).
Interlocking is usable/necessary for applications with opposing functions.

**ON DELIVERY, THE INTERLOCKING IS DISCONNECTED, THAT IS, ALL
BREAKERS ARE IN POSITION OFF.**



Function 9 has priority over function 1.
Function 10 has priority over function 2.
Breaker 1 = ON, Breaker 2 = OFF



Function 9 has priority over function 1. Function 10 has priority over function 2.
Functions 1-2 and 9-10 are blocked when the respective breakers are depressed at the same time.
Breaker 1 = OFF, Breaker 2 = ON

Functions 1, 2 blocked when the respective breakers are depressed at the same time.
Functions 9, 10 blocked when the respective breakers are depressed at the same time.
Breaker 1 = ON, Breaker 2 = ON

Function 11 has priority over function 3.
Function 12 has priority over function 4.
Breaker 3 = ON, Breaker 4 = OFF



Function 11 has priority over function 3. Function 12 has priority over function 4.
Functions 3-4 and 11-12 are blocked when the respective breakers are depressed at the same time.
Breaker 3 = OFF, Breaker 4 = ON

Functions 3, 4 blocked when the respective breakers are depressed at the same time.
Functions 11, 12 blocked when the respective breakers are depressed at the same time.
Breaker 3 = ON, Breaker 4 = ON

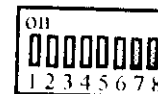
Function 13 has priority over function 5.
Function 14 has priority over function 6.
Breaker 5 = ON, Breaker 6 = OFF



Function 13 has priority over function 5. Function 14 has priority over function 6.
Functions 5-6 and 13-14 are blocked when the respective breakers are depressed at the same time.
Breaker 5 = OFF, Breaker 6 = ON

Functions 5, 6 blocked when the respective breakers are depressed at the same time.
Functions 13, 14 blocked when the respective breakers are depressed at the same time.
Breaker 3 = ON, Breaker 4 = ON

Function 15 has priority over function 7.
Function 16 has priority over function 8.
Breaker 7 = ON, Breaker 8 = OFF



Function 15 has priority over function 7. Function 16 has priority over function 8.
Functions 7-8 and 15-16 are blocked when the respective breakers are depressed at the same time.
Breaker 7 = OFF, Breaker 8 = ON

Functions 7, 8 blocked when the respective breakers are depressed at the same time.
Functions 15, 16 blocked when the respective breakers are depressed at the same time.
Breaker 7 = ON, Breaker 8 = ON

Example: We have a traverse where functions 1-2 and 9-10 must never be activated at the same time. Breakers 1 and 2 are then set in position ON. **On delivery, the interlocking is disconnected, that is, all breakers are in position OFF.**

RELAY FUNCTIONS

With CRANE CHIEF you can program the 16 relays fully individually.
Each relay works in two different ways:

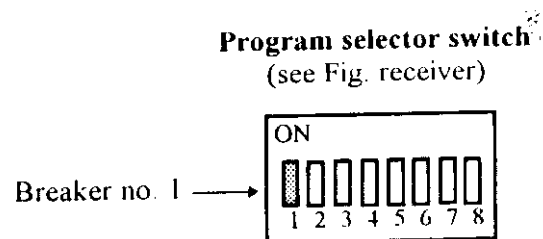
1. The relay is closed/activated only as long as the transmitter button is depressed.
This function is known as momentary relay function. **This is the standard setting.**
2. The relays position alters each time the transmitter button is depressed, but holds the new position when the button is released. This function is known as latching relay function. Latching relay function comes into use when operating lights, pumps, machines, etc.

On the receiver is a program selector switch (see Fig. ?). Only breaker No. 1 on the program selector switch is used for latching relay function. The other breakers must not be touched since they are reserved for coming features.

1. Start-up the system.
2. Set breaker No. 1 on the program selector switch to position ON.
This should switch off all the relays in the receiver and switch on the red LED light.
3. Operating the transmitter: depress those buttons with latching function.
4. Set breaker No. 1 to position OFF.
5. Latching function is set and can now be used.

If you decide that the relays should be set for standard (momentary) function, with NO latching function:

1. Start-up the system.
2. Set breaker No. 1 on the program selector switch to position ON.
3. Set breaker No. 1 to position OFF without using the transmitter.
4. The relay is closed/activated only as long as the transmitter button is depressed.



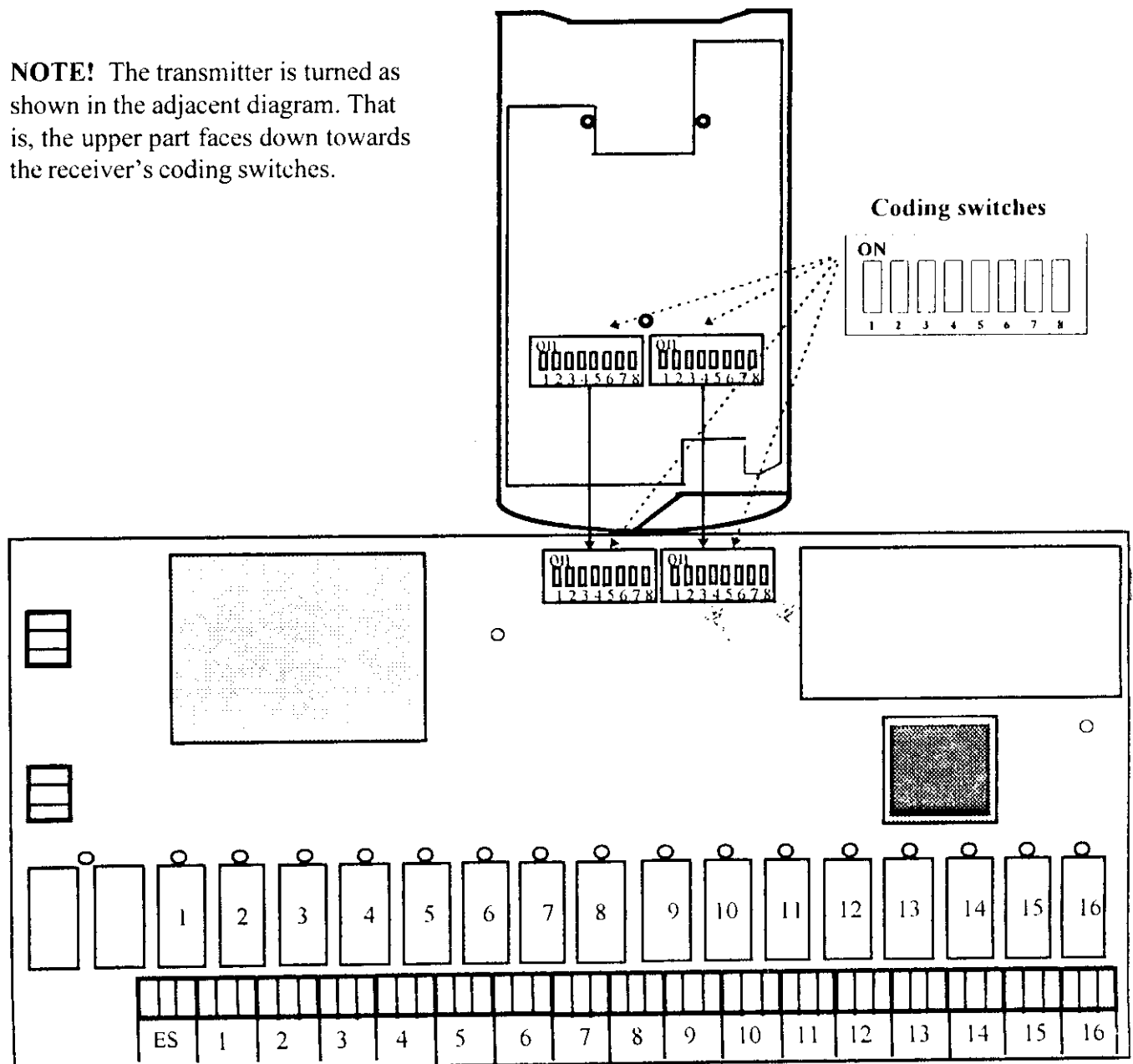
CODING

All systems are delivered factory coded. If you wish to re-code the equipment according to the 65,536 code combinations available, follow the instructions below.

Note that a transmitter and receiver that are intended to function together must have EXACTLY the same code set in the black code switches. In other words, a transmitter switch in the ON position = a receiver switch in the ON position

1. Make sure the transmitter is switched off.
2. Disassemble the transmitter and the receiver.
3. Set the desired code via the transmitter's black coding switches.
4. **Set exactly the same code via the receiver's black coding switches (see fig. below).**
5. Start-up the transmitter.
6. Verify that the relays activate when the transmitter buttons are depressed.
7. Re-assemble the transmitter and the receiver.

NOTE! The transmitter is turned as shown in the adjacent diagram. That is, the upper part faces down towards the receiver's coding switches.



TROUBLESHOOTING

If the equipment is not functioning as it should, please check the following points:

Faulty function	Possible causes	Corrective action
Receiver's yellow LED does not light.	Receiver has wrong drive voltage.	Check the drive voltage.
	Fuse failure in receiver	Change fuse*
Receiver's green LED does not light when you transmit.	Frequency in transmitter not the same as in receiver.	Set identical frequencies in transmitter and in receiver.
Receiver's green LED lights when you transmit but relays do not close.	Code in transmitter not the same as in receiver.	Set identical codes in transmitter and in receiver.
Receiver's green LED lights when you are not transmitting.	Someone else is transmitting locally on your frequency.	Change your frequency, both in transmitter and receiver.
Transmitter does not start when you depress buttons 7 & 8 at same time (at least 1 second) and then release them. Red LED lights.	Key power switch is in OFF position.	Unlock key power switch (ON).
	Emergency stop switch is depressed.	Pull out emergency stop switch.
	Dead battery.	Charge the transmitter.
	Faulty transmitter button.	Contact your dealer.
Range too short.	Antenna, and/or antenna cables damaged or improperly installed.	Check antenna, antenna cables.

* Fuse S1 1A marginal (receiver with feed voltage 48 VAC, 115 VAC and 230 VAC).
 Fuse S2 1A marginal

If you have gone through these instructions and in spite of this you are still having problems with your radio system, please contact your dealer.