5.1 TRANSMITTER DESCRIPTION

The crane control transmitters are housed in a rugged case molded from a modified polymer plastic that stands up to extremely rugged use. A key feature is Remtron's patented switch assembly for control inputs. This long life elastomeric keypad is ergonomically designed to provide easy operation over long periods of time with exceptional reliability.

All the transmitter functions are controlled by a microprocessor with a special memory for configuration information. This offers a great degree of capability and versatility while at the same time providing simplicity of operation and maintenance.

The antenna is internal to the transmitter case, protecting it from damage. An indicator LED provides a quick visual check of the transmitters status.

The crane control transmitters are designed to be very efficient. Only three AA batteries are needed to provide power for the transmitter for two month's normal use. An additional feature automatically shuts the transmitter off after a preset time interval of inactivity to further extend the battery life.

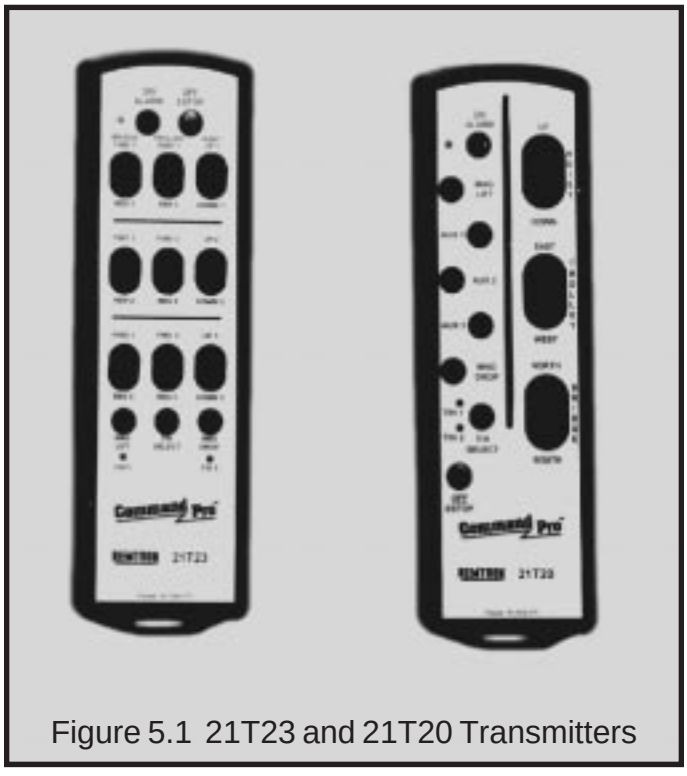

Figure 5.1 21T23 and 21T20 Transmitters

Two transmitter packages are available. The 21T23 has separate rocker switches for each speed allowing positive control of each speed. The 21T23 is also used for special applications where individual commands are required.

The 21T20 employs two speed rocker switches allowing convenient one handed operation for two speed cranes and for cranes equipped with variable speed drives.

The microprocessor contains a nonvolatile memory that retains the frequency, address and particular operating parameters for the system. It is programmable by means of PC compatible computers equipped with an RS-232 serial port (RAC17) or by an independent programming unit (RAC16).

5.2 TRANSMITTER FUNCTIONS

WARNING

Do not operate the system until you are familiar with radio controlled crane operation. If you are not familiar with radio controlled crane operation, contact your supervisor before attempting to use the radio control system.

AVERTISSEMENT !

Ne pas faire fonctionner le système avant de bien connaître le fonctionnement d'une grue par téléguidage. Contacter le superviseur avant de faire toute tentative de mise en marche par téléguidage, si le fonctionnement n'est pas connu.

The following describes the functions, operational features and characteristics of the 21T20 and 21T23 transmitter. Refer to Figure 5.2 and Figure 5.3.

ON/ALARM. Puts the system into the active mode. The transmitter will remain active until the OFF/ESTOP is pressed or the transmitter turns itself off (see Auto Off). Sends an ALARM command to the receiver while the button is depressed.

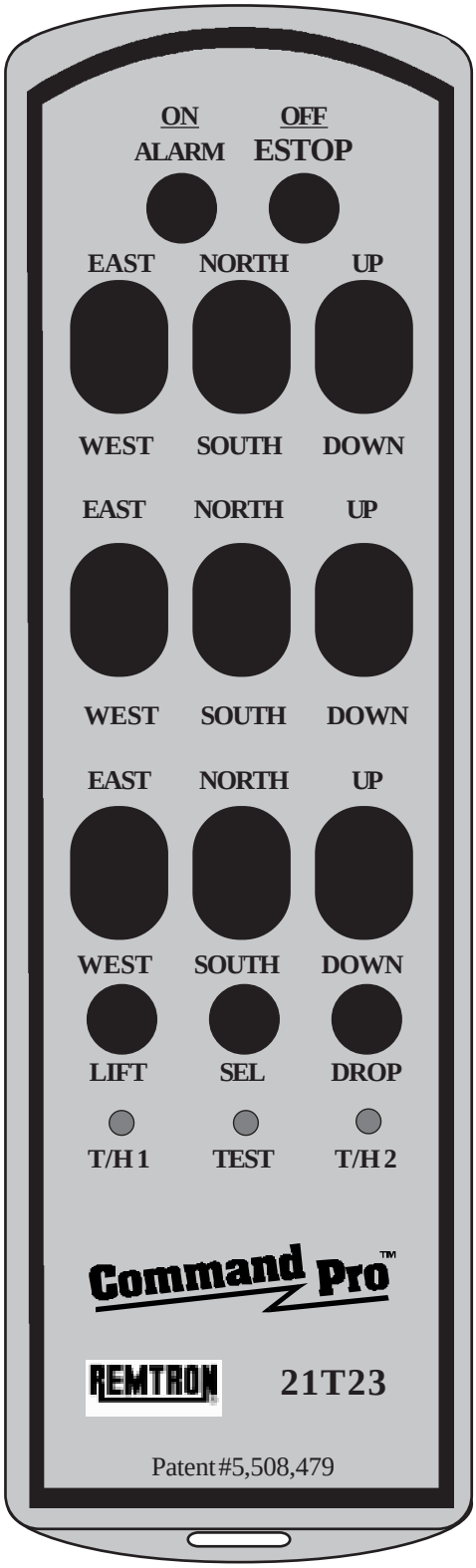

Figure 5.2 21T23 Transmitter

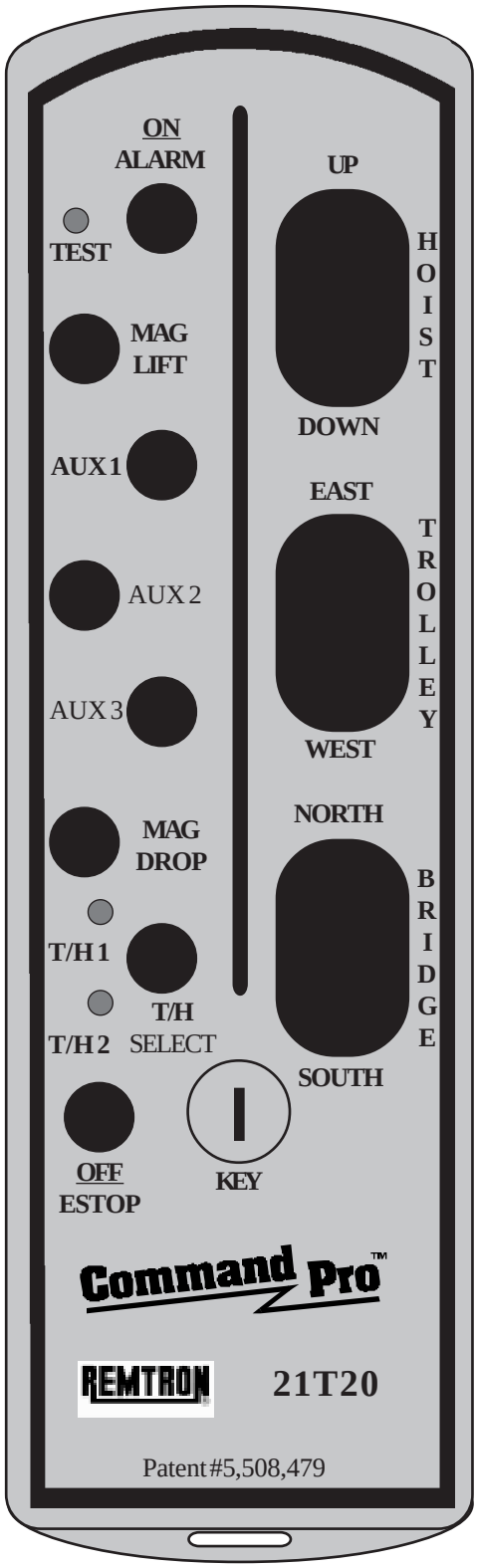

Figure 5.3 21T20 Transmitter

OFF/ESTOP. While depressed, sends an Emergency Stop command to the receiver. The transmitter does not need to be in the active mode to send this command.

After this button is released the transmitter will be turned off.

TEST LEDs. The Test LED provides an indication of the transmitter operation.

When the transmitter is OFF the TEST LED will be off.

When the transmitter is ON, the TEST LED will flash at a low rate when no command is being sent and at a high rate when a command is being sent.

If the batteries are getting low, the TEST LED will flash on-off. (1/2 second on and 1/2 second off) while the transmitter is ON. The transmitter may still be used, however the batteries should be changed at the next convenient opportunity.

If the TEST LED remains on continuously there is either a switch activated at the time the transmitter is turned on, or a general failure that requires factory service. If the TEST LED remains lit continuously on power-up, insure that no other switches are pressed while attempting to turn the transmitter on.

INDICATOR LEDs. Two LEDs indicate the active crane in dual mode operation (see Selecting Cranes below).

Auto Off. The transmitter will turn itself off if no commands have been sent for a predetermined time. Normally this time is set to 15 minutes, however it may be programmed for other times.

Selecting Cranes. On cranes that have multiple hoists or multiple trolleys, a selector switch is provided that selects crane 1, crane 2 or both crane 1 and crane 2.

On transmitters with a single button selector switch, momentarily pressing the selector switch will cycle the selection between functions. If crane 1 LED is lit, pressing the selector switch causes crane 1 LED to go out and crane 2 LED to light. Pressing the switch again will cause crane 1 LED to light in addition to the crane 2 LED. Pressing the switch again will cause crane 2 LED to go out.
On transmitters with a rotary selector switch, position the switch to the crane 1, crane 2 or crane 1 and 2 position.

Command Switches. The command switches are labeled according to their function. The switches are active only while depressed. Releasing the switch stops a motion or function. The following points apply to the use of the command switches on the transmitter:

1. If opposing commands are attempted, i.e., two commands that conflict with each other, no movement will result.

2. If more than one speed command is sent for the same function, the lower speed will predominate.

3. Maintained on or off functions require separate commands for on and off.

5.3 TRANSMITTER OPERATION

IMPORTANT

The EMERGENCY STOP button for the system is the "OFF/ESTOP" button. Press and hold this button to stop all functions.

IMPORTANT !

Le bouton d'arrêt d'urgence (EMERGENCY STOP) pour ce système est le bouton OFF/ ESTOP. Appuyer et maintenir le bouton pour arrêter toutes les fonctions.

1. Press and release the ON/ALARM button. Verify that the test LED starts flashing at a low rate. If equipped, the Alarm on the crane should sound.

2. Press the required switches to operate the desired crane motion. Note that more than one motion can be controlled at any time.
4. To stop any function, release the switch.

5. To turn the transmitter off, press the OFF button. Note that the transmitter will turn itself off if no commands are changed for a predetermined time.

5.4 OPTIONS

First Come-First Serve (FCFS). The FCFS option allows one receiver to be controlled by more than one transmitter, but only one at a time.

When all the transmitters in the system are off, the receiver will scan (look for) the frequency of each of the transmitters in the system. When the receiver detects the signal of a valid transmitter, it will stop scanning and lock on to that transmitter. So long as it continues to receive signals from that transmitter, it will not scan. If another transmitter or transmitters are turned on, their signals will not be detected by the receiver.

If your transmitter is the first one turned on, it will take control of the receiver. If another transmitter was turned on prior to yours, your transmitter will have no effect on the system until the other transmitter is turned off. When the other transmitter is turned off, the receiver will automatically resume scanning and lock on to the frequency of the next transmitter that comes on. If it's yours, then you will then have control until you turn your transmitter off.

Pitch and Catch. Pitch and Catch is similar to First Come-First Serve. There are two significant differences between the two. First, with Pitch and Catch when the transmitter that has control is turned off, the receiver will NOT scan, looking for another transmitter. It will remain locked on to that transmitter. Second, when a transmitter wishes to give up control of the receiver, it must send a Release command to the receiver. This tells the receiver to begin scanning and immediately lock on to the next transmitter whose frequency it detects. If another transmitter is on, or is turned on, it will assume control. If no other transmitters are on, the receiver will wait 10 seconds from the time it received the Release command then revert to the FCFS mode.

Magnet Control. Additional safety is built into systems that use a lifting magnet. Two methods are used for the magnet control buttons.

The **two button** design uses one button marked MAG LIFT and the second button marked MAG DROP. Pressing the MAG LIFT energizes the magnet. To de-energize the magnet and drop the load, MAG LIFT and MAG DROP must be pressed at the same time. A time delay is built into the circuit so that the buttons must be held for nearly a second before the magnetic controls are activated.

The **three button** design uses a safety button marked MAG and separate buttons for LIFT and DROP. In order to energize the magnet, MAG and LIFT switches must be pressed at the same time. To de-energize the magnet and drop the load MAG and DROP must be pressed at the same time. A time delay is built into the circuit so that the buttons must be held for nearly a second before the magnetic controls are activated.

An additional switch may be provided for fan drop of the load. Labeled FAN, or MAG FAN, pressing this switch along with MAG or MAG LIFT as appropriate, will activate the fan drop function. Again, a time delay is built into the circuit so that the buttons must be held for nearly a second before the magnetic controls are activated.

5.5 TROUBLESHOOTING

The transmitter has a TEST LED to aid in troubleshooting.

Due to the rough treatment it may be subjected to, most problems are likely to occur in the transmitter. The transmitter should be thoroughly diagnosed before proceeding to the receiver.

WARNING

When testing the transmitter, the receiver may become active resulting in system operation. Always assume the system is working and will respond when testing a transmitter.

AVERTISSEMENT !

Lors d'essais de fonctionnement du transmetteur, le récepteur peut être activé et provoquer la mise en marche du système. Toujours considérer que le système fonctionne et qu'il répondra aux essais du transmetteur.

When the transmitter is OFF the LED should be off.

Press and release the ON/ALARM button. The LED should flash at a low rate. Press a command switch. The LED should flash at a high rate.

If the batteries are getting low, the LED will flash on-off. (1/2 second on and 1/2 second off) while the transmitter is ON. The batteries should be changed at the next convenient opportunity.

If the LED remains on continuously there is either a switch activated at the time the transmitter is turned on, or a general failure that requires factory service. If the LED remains lit continuously on power-up, insure that no other switches are pressed while attempting to turn the transmitter on.

If the test LED does not light at all, replace the batteries. If this does not fix the problem, the transmitter is inoperable and must be repaired.

5.6 TRANSMITTER REPAIRS

Refer to figure 5.4.

CAUTION

The transmitter electronic components are exposed when the back of the case is removed. Take caution to prevent dirt or other contaminants from entering the case. Do not allow the circuit to be scraped or damaged in any way.

AVERTISSEMENT !

Lorsque l'endos du boîtier est enlevé, les composants électroniques sont à découvert. Prendre soin d'éviter de laisser la saleté ou tout autre contaminant entrer dans le boîtier. Éviter d'érafler ou d'endommager le circuit de quelque façon que ce soit.

Battery Replacement.

1. Remove the four screws in the back of the transmitter and remove the back of the case.
2. Replace with two AA Alkaline or Lithium (Eveready Energizer L91, 1.5V) batteries.
3. Replace the back of the case and the screws. Tighten the screws snugly.

Changing the Transmitter Keypad.

1. Remove the six screws in the back of the transmitter and remove the back of the case.
2. Remove the batteries from the holder.
3. Remove the four screws holding the printed circuit board assembly and remove it from the case.
4. Remove the rubber keypad from the metal backing plate.

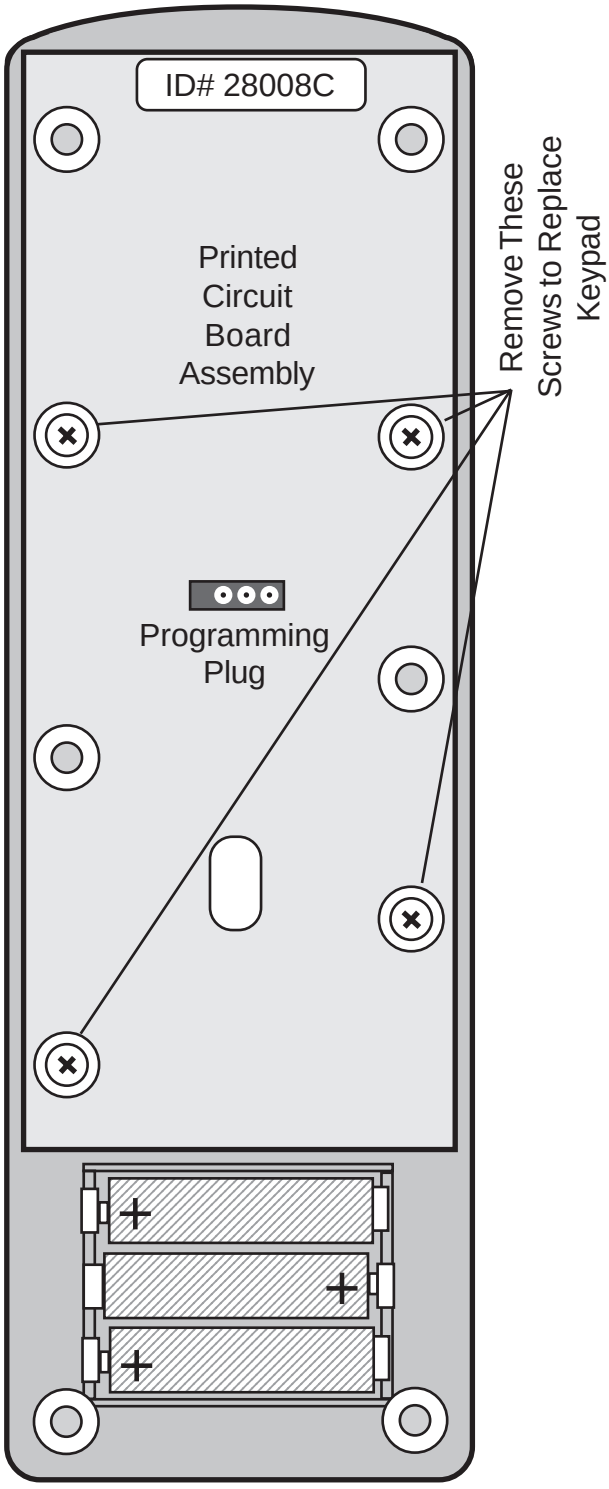

Figure 5.4 Transmitter with Back Removed

5. Install the new rubber keypad onto the backing plate making sure the tabs are pulled through each slot.

6. Reassemble the transmitter in reverse order.

Changing the Transmitter Identity Code

1. Remove the six screws in the back of the transmitter and remove the back of the case.

2. Attach the programming plug to the four pin connector on the circuit board.

3. Load the Identity Code (see section 4.3, PROGRAMMING).

3. Replace the back of the case and the screws. Tighten the screws snugly.

5.7 TRANSMITTER SPECIFICATIONS

Operating frequency band	902 - 928 MHz
Channel spacing	300 KHz
Modulation	Digital Frequency Modulation based on Manchester Code. Contains 16 bit address plus 16 bit CRC check
Command functions	Up to 24
Power, input	3 AA cell batteries. Alkaline or Lithium recommended
Output power	Meets FCC part 15 requirements for license free operation
Antenna	Internal circuit board
Switch Type	Patented Elastomeric Keypad
Indicators	Self test LED indicator Two Crane Select indicators
Transmitter case dimensions	3.5" x 11.5" x 1.0"
Transmitter Weight	1 1/4 lb.
Ambient Operating Conditions	- 20^{O} F to +160^{O} F

Table 5.1 21T20 and 21T23 Transmitter Spare Parts List

ITEM	PART NUMBER
Spare transmitter (complete)	21T20 21T23
Shoulder Strap	620008
Leather Holster	620009
Rubber Key Pad	
21T20	920043-01
21T23	920043-02