Exhibit 2. Instruction manual

Crestron **CNRFHT-15A/30A & CNIRHT-15A/30A**
Hand-Held Wireless Transmitters

Operations Guide

A supplement to the Cresnet II Technical Manual

CRESTRON
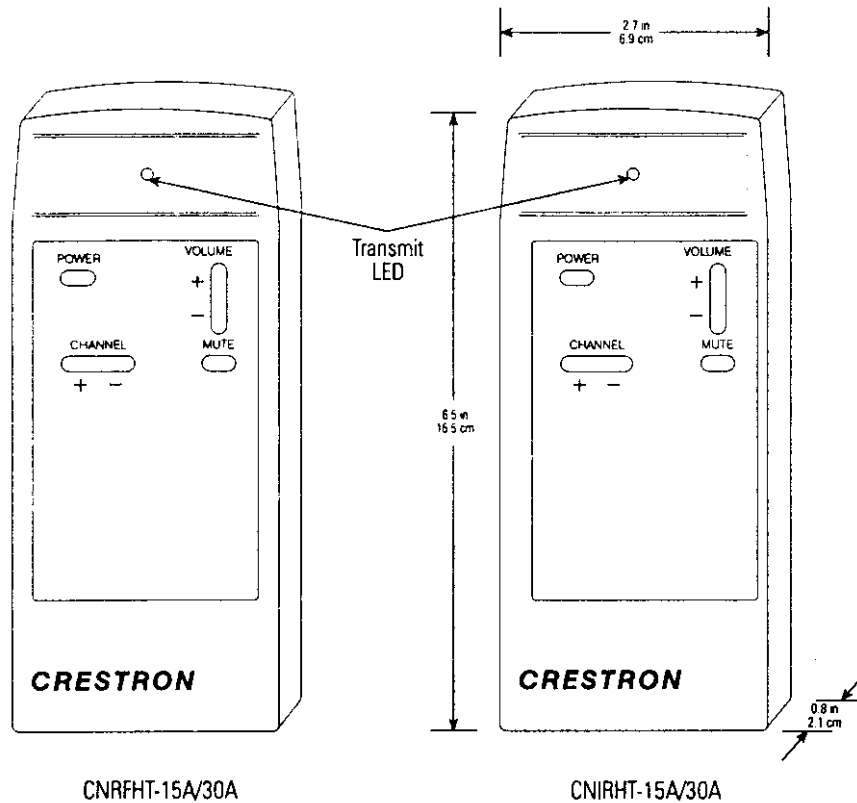REMOTE CONTROL SYSTEMS

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Figure 1. CRESTRON Hand-held Wireless Transmitters

DESCRIPTION:

The CNRFHT-15A/-30A and CNIRHT-15A/-30A are a new improved version of CRESTRON's hand-held wireless transmitters. The new "A" units are functionally identical to the non-"A" units, but the newer units have been completely redesigned for greater ease of installation and maintenance. The eight-position SIP switch for ID code setting has been eliminated and replaced by a software utility program available from CRESTRON's Workshop. The radio-frequency (RF) code packets have been updated to include error detection for higher reliability reception. The new improved hand-held wireless transmitters must be used with CRESTRON's new CNRFGWA or CNIRGWA receiver. The standard, high-quality non-"A" version transmitters must continue to use the CNRFGW or CNIRGW.

Functional Description

CNRFHT-15A/30A

The CNRFHT-15A/30A, illustrated in figure 1, is a hand-held RF transmitter. The unit is designed to operate with the CRESNET II remote control system (herein referred to as the CRESNET II system) via a RF wireless receiver, CNRFGWA Wireless Gateway. The hand-held transmitter is available with 15 or 30 button controls. Depression of any button on the customized 15- or 30-button panel initiates a RF signal transmission to the CNRFGWA.

CNIRHT-15A/30A

The CNIRHT-15A/30A, illustrated in figure 1, is a hand-held infrared (IR) transmitter. The unit is designed to operate with the CRESNET II system via an IR wireless receiver, CNIRGWA Wireless Gateway. The hand-held

transmitter is available with 15 or 30 button controls. Depression of any button on the customized 15- or 30-button panel initiates an IR signal transmission to the CNIRGWA.

Sleep Mode

Both hand-held transmitters have a power-saving mode, known as sleep mode, to extend battery life. Units are continually in sleep mode until a button is depressed. The unit activates immediately. It is not necessary to hold down a button.

Physical Description

NOTE

CRESTRON does not recommend designing large button caps for single functions. Depressing the center of a large button cap can cause the unit to transmit incorrectly which may result in the control system misinterpreting the user's intent. Therefore, design large button caps for dual functions, such as a volume up/volume down rocker-type button.

CNRFHT-15A/30A and CNIRHT-15A/30A electronic hardware is housed in a slim, high-impact molded ABS black plastic enclosure (refer to figure 2). A 30-button array on the printed circuit board is covered by a customized button panel. All button panels include custom engraving, colored button caps, choice of button configurations, and panel finishes. Small and large button caps are available. A small button cap covers one button. A large button cap covers two buttons. Refer to the latest version of the CRESNET II Engraving Worksheet for the hand-held transmitters (Doc. 5344) to design a unique button panel. Omission of unused buttons is standard. A red Transmit LED is located above the button panel cover.

A standard nine-volt battery is included with all units. Access to the battery is permitted after the battery cover, located on the underside of the unit, is removed. A sensor (photo transistor) used to program an identity code is also located in the battery compartment.

Configuration Differences

The RF and IR hand-held transmitters have two different configurations based on the number of buttons on the customized panel. They are depicted in table 1.

Table 1. CNRFHT-15A/30A and CNIRHT-15A/30A Configurations

CONFIGURATION			DESCRIPTION
CNRFHT-15A	&	CNIRHT-15A	15 buttons on a customized panel
CNRFHT-30A	&	CNIRHT-30A	30 buttons on a customized panel

Battery cover removed to show sensor location.

Front View
(Customized button panel removed
to reveal 30 button array.)
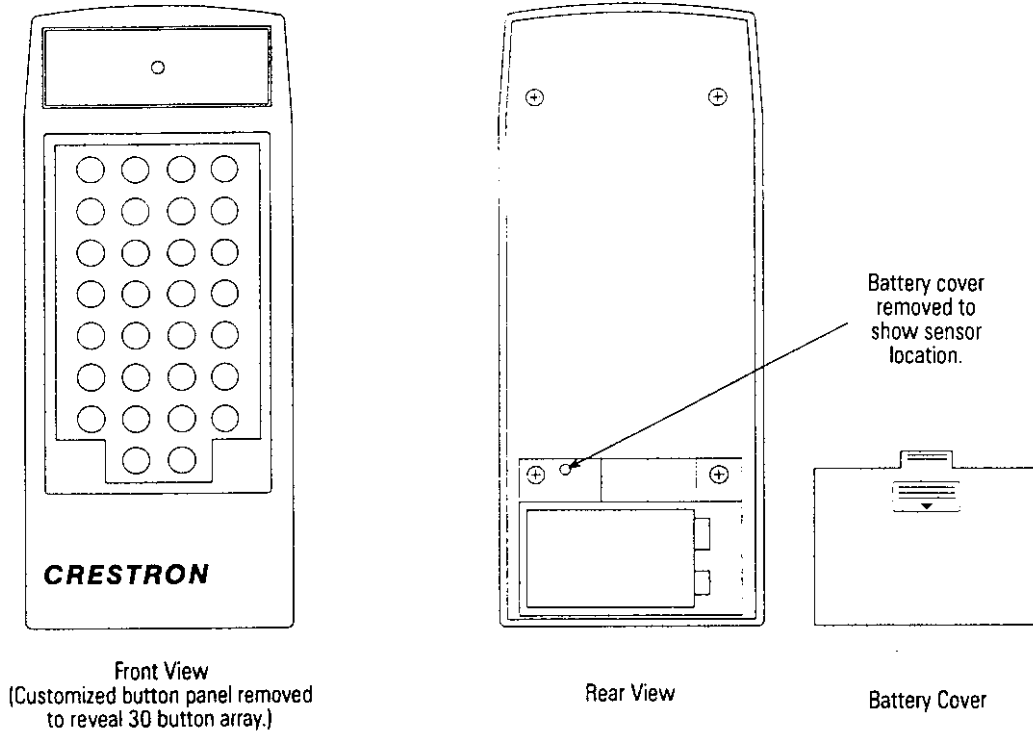
Rear View

Battery Cover

Figure 2. Physical Views of CNRFHT-15A/30A and CNIRHT-15A/30A

LEADING SPECIFICATIONS:

Table 2 provides a summary of leading specifications for the hand-held transmitters. Dimensions and weight are approximations rounded to the nearest tenth unit.

Table 2. Leading Specifications

SPECIFICATION	DETAILS
Battery	9V DC
CRESNET II Workshop	Version 5.0 or later
CRESNET II Operating System	3.11.18 or later
Dimensions & Weight	Height: 6.5 in (16.5 cm)
	Width: 2.7 in (6.9 cm)
	Depth: 0.8 in (2.1 cm)
	Weight: 0.3 lb (0.2 kg)

NOTE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does

cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*

- *Increase the separation between the equipment and receiver.*

- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*

- *Consult the dealer or an experienced radio/TV technician for help.*

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

As of the date of manufacture, the unit has been tested and found to comply with specifications for CE marking.

$$C\epsilon$$

CONTROLS AND INDICATORS:

Controls

Button controls are custom designed. The hand-held transmitters are available with 15 to 30 functional buttons. Function definition is determined by application of the unit within the CRESNET II system. The customized button controls correspond to signal names that are defined in the SIMPL program.

Indicators

There is only one indicator located on the hand-held transmitters. The indicator is a red LED and resides on the face of the unit above the button panel cover. The Transmit LED indicates IR/RF transmission and illuminates when a button is depressed. It also has the auxilliary function of illuminating when a new transmitter RF/IR ID code is programmed into the unit.

INSTALLATION/SETUP:

Every hand-held wireless transmitter communicating with either the CNRFGWA or CNIRGWA requires a unique identity code (ID CODE). For RF devices the ID CODE is referred to as RF ID. For IR devices the ID CODE is referred to as IR ID. There are 254 possible two-digit hexadecimal alphanumeric codes ranging from 01 to FE. To maintain code diversity within the CRESNET II system, use codes between 10 and FE for the transmitters.

NOTES

1. *The ID CODE on the hand-held transmitters is factory set to 11.*

2. *Do not use 00 or FF as an RF/IR ID.*

3. *Do not confuse RF/IR ID with network (NET) ID.*

To set an ID CODE the following items are required:

- PC running CRESNET II Workshop, version 5.0 or later.

- CNIDC - Identity Code Cable.

Complete the following steps in the order provided to ensure proper ID CODE assignment of the unit.

1.   Start up the CRESNET II Workshop with the following DOS commands.
     CD\CN2 (depress ENTER)
     CNWS (depress ENTER)

2.   The Workshop commences with an opening screen. Depress any key to open the MAIN MENU, illustrated in figure 3.

3.   From the MAIN MENU, highlight Utilities and depress ENTER. The UTILITY MENU, illustrated in figure 4, appears on the display.
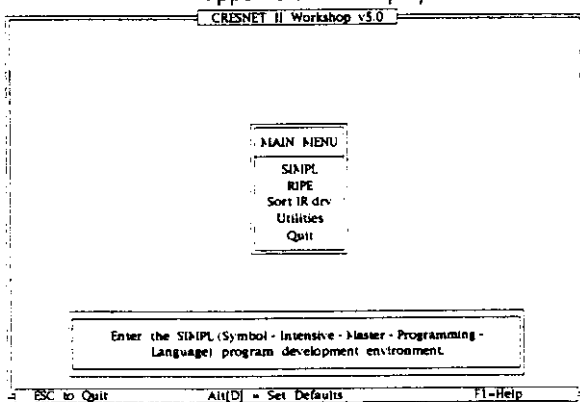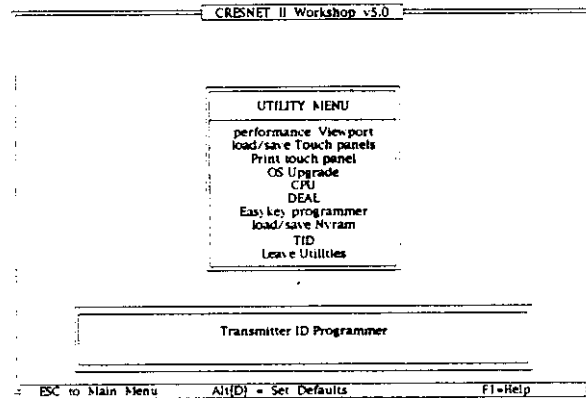

Figure 3. MAIN MENU, Workshop

Figure 4. UTILITY MENU, Workshop

4.   From the UTILITY MENU, highlight TID and depress ENTER. The Transmitter ID Programmer, illustrated in figure 5, appears on the display.
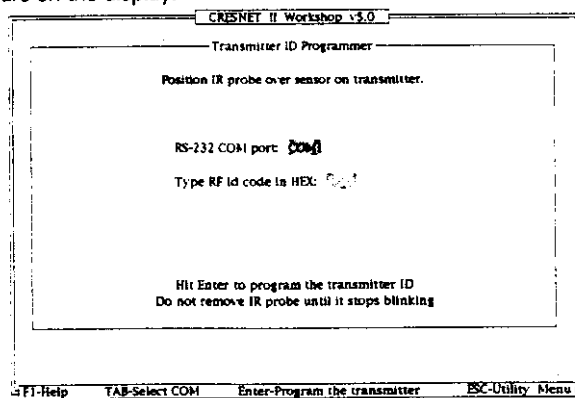

Figure 5. Transmitter ID Programmer, Workshop

5.   From the Transmitter ID Programmer screen, specify the PC's COM port with the TAB key.

6. Connect the 9-pin DIN connector from the CNIDC to the proper COM port on the back of the PC. Use the same port as that assigned in the previous step.

7. Position the transmitter button-side down so the battery compartment is accessible.

Probe should cover sensor as shown below.

8. Remove the battery cover to expose the battery compartment. Refer to figure 2.

9. Place LED probe from the CNIDC over the exposed sensor (photo transistor) as shown in figure 6. The probe should rest in the corner of the battery compartment so that it completely covers the sensor.
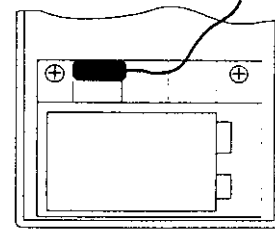
Figure 6. Probe Placement

10. With a finger over the probe to hold it in place, lift and rotate transmitter so that the red LED located above the button panel is visible.

11. From the PC, type the two-digit ID CODE.

12. Depress the ENTER key and observe the flashing red LED on the front of the transmitter.

13. When the red LED stops flashing, remove the probe from the back of the unit. The ID CODE is programmed into the transmitter.

14. Secure the battery cover over the battery compartment.

15. Disconnect the CNIDC from the PC.

PROGRAMMING:

A 30-button array is located beneath the custom button panel of each hand-held transmitter. Refer to figure 7 for an illustrative layout of transmitter button numbers beneath a sample button panel. The numbering for each button is constant. For each button input, a signal name must be defined in the SIMPL program. Unused buttons need not be assigned signal names. An example following figure 7 illustrates button definition in the CRESNET II Workshop. Access the following tables from the "Define Network" section of the SIMPL-I Menu. An example of SIMPL-C programming for the same custom button panel design is shown in the Appendix.
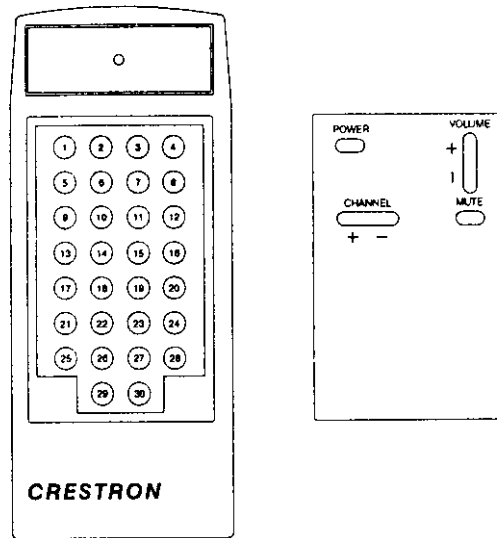
Customized button panel removed.
Each button is illustrated with its corresponding number.

Figure 7. Button Number Layout

NOTE

CRESTRON does not recommend designing large button caps for single functions. Depressing the center of a large button cap can cause the unit to transmit incorrectly which may result in the control system misinterpreting the user's intent. Therefore, design large button caps for dual functions, such as a volume up/volume down rocker-type button.

System PF: 4.5   Net PF: 3.0

Net ID	Net Device	Description	P.F.
03:	CNRFGW	CNRFGW/CNIRGW Receiver	3.0
04:			
05:			
06:			
07:			
08:			
09:			
0A:			
0B:			
0C:			

TAB to select entries   PgUp/PgDn to find ID

F2-Detail   F3-Display Signals

ESC to Def Equip   Define Network   F1 = Help

Net ID: 03

CNRFGW
CNRFGW/CNIRGW Receiver

RF ID	Transmitter	Description
12	CNRFHT	
14	CNIRHT	

F2-Detail   TAB - Select Transmitter   to Enter ID

ESC to Define Rack   Module Detail   F1 = Help

CNRFGW Net ID: 03

RF ID	12	CNRFHT	
		CNRFHT-15/30 DEFINITION	

BUTTON SIGNAL NAMES

1: POWER
2:
3:
4: VOL_UP
5:
6:
7:
8: VOL_DOWN
9: CHANNEL_UP
10: CHANNEL_DOWN
11:
12: MUTE

F2-Detail   F3-Display Signals   F4 -Auto-Increment

ESC to Define Net   Panel Detail   F1 = Help

CNRFGW Net ID: 03

RF ID	14	CNIRHT	
		CNIRHT-15/30 DEFINITION	

BUTTON SIGNAL NAMES

1: POWER
2:
3:
4: VOL_UP
5:
6:
7:
8: VOL_DOWN
9: CHANNEL_UP
10: CHANNEL_DOWN
11:
12: MUTE

F2-Detail   F3-Display Signals   F4 -Auto-Increment

ESC to Define Net   Panel Detail   F1 = Help

TEST/TROUBLESHOOTING:

Table 3 provides corrective action for possible trouble situations. If further assistance is required, please contact a CRESTRON technical support representative.

Table 3. Troubleshooting Guide

TROUBLE	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
LED on unit does not illuminate.	No battery in unit or battery is dead.	Install new battery.
	Unit is in sleep mode.	Depress and hold any button until unit transmits.
Intermittent response during transmission.	Refer to causes when LED does not illuminate.	Refer to corrective action when LED does not illuminate.
	Receiver is blocked or moved.	For IR unit, verify direct line-of-sight. For RF unit, verify that heavy metal is not in vicinity of transmission.
	CNRFGWA is in vicinity of metal.	Verify that large amount of metal is not blocking transmission.
No response from CRESNET II system.	Refer to causes when LED does not illuminate and intermittent response during transmission occurs.	Refer to corrective action when LED does not illuminate and intermittent response during transmission occurs.
	NET ID of receiver is incorrectly set.	Enter Performance Viewport in the CRESNET II Workshop. Depress the F4 key to poll the network. Verify that the NET ID for the receiver is properly set to match the SIMPL program. ***NOTE:*** After changing the CNRFGWA/CNIRGWA identity code, disconnect and reconnect the network connector.
	RF ID or IR ID is incorrectly set.	Verify that the RF ID or IR ID for the transmitter is properly set to match the SIMPL program. ***NOTE:*** NET ID and RF ID or IR ID are separate parameters. ALT-R in Workshop (v5.0) shows RF or IR transmitter button presses.
	Program does not match hardware.	Verify correct program is loaded in system via Performance Viewport Workshop.
	Receiver is unplugged (no power).	Verify power to the receiver.
	Two or more receivers are too close together.	Verify that multiple receivers are properly spaced ($\geq$50 feet) from each other.
	Wrong transmitter in use.	If multiple transmitters are accessible, verify proper unit is used.

DOC. 8092A

FURTHER INQUIRIES:

If after reviewing this Operations Guide you still have additional questions, please contact a CRESTRON technical support representative by dialing (888) CRESTRON [(888) 273-7876] or (201) 894-0660.

SYNTAX:

The following syntax codes are provided for compatibility purposes only.

NOTE

The hand-held transmitters are defined as CNRFT in SIMPL-C.

NET.ID < 03 to FE > : CNRFGW   \ Codes received by a CNRFGWA

TRANSMITTER < RF IDCODE > : CNRFT
i1 = <signal name>   \ Independent button.
i2 = <signal name>
i3 = <signal name>
" "   "   "

APPENDIX:

The following is a sample of SIMPL-C programming for the hand-held transmitters that were illustrated in figures 1 and 7.

NET.ID 10: CNRFGW   \ CNRFGWA is at NET ID CODE 10.

TRANSMITTER 20: CNRFT   \ CNRFHT-30A is at ID CODE 20.
i1 = POWER   \ Small button
i4 = VOL_UP   \ Rocker with two functions is treated
i8 = VOL_DOWN   \ as two pushbuttons.
i9 = CHANNEL_UP   \ Long horizontal keys are treated like
i10 = CHANNEL_DOWN   \ large vertical keys.
i12 = MUTE   \ Small button.

Exhibit 3. Photographs of transmitter