

FalconRR

High Resolution Radar

OPERATOR'S MANUAL

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INTRODUCTION

The Kustom Signals' FalconRR high-resolution directional radar system is based on the FalconHR law enforcement traffic radar and comes from a long-standing commitment to provide quality, state-of-the-art speed measuring equipment. The FalconRR offers a wide range of features on this stationary handheld K-Band radar system, yet allows easy operation and simple one-button mode changes.

FalconRR units have the newest directional features; **Dual Channel Microwave** antenna and **Directional Digital Signal Processing (DSP)**. This allows Kustom Signals to add features such as high-resolution tenths units target speeds, fastest target detection, and mode selection that allow the operator to choose approaching only, receding only, or all targets identification.

All these features and performance standards are packed into this small, lightweight, corded or battery-operated unit, providing the most flexibility for the operator.

The FalconRR sets a new standard for low current operation. This will be appreciated by long battery run times.

2. SPECIFICATIONS

2.0 GENERAL

Type: One-piece, Directional Stationary, Doppler radar system.

Frequency: K-Band 24.125 GHz \pm 100 MHz

Speed Resolution: Stationary 0.1 mph (0.1 km/h)

Operating Voltage: Corded: 10.0 to 16.5 VDC, 300 mA max.

The FalconRR will operate normally and not display a low voltage alert to at least 10.0 VDC. Typically it will continue to operate even when the external battery voltage drops substantially below the specified 10.0 VDC.

Cordless: 6.5 to 9.0 VDC
7.2 VDC nominal NiMH

Low Voltage Threshold: Corded: Typically 9.0 VDC
Cordless: Approximately 6.5 VDC

Nominal Power Requirements: Voltage (VDC) Current (mA)

No target present: 13.6 140

With target present:
Audio = Max 13.6 230
Backlight = Off

With target present:
Audio = Max 13.6 240
Backlight = On

Standby (HOLD): 13.6 60
After 30 seconds 24

SECTION 2--SPECIFICATIONS

Reverse Voltage Protection:	Diode protection. No damage if supply leads reversed.
Electronic Components:	100% solid state; integrated circuits, and Digital Signal Processor.
Operating Temperature:	-22°F to +140°F (-30°C to +60°C) 90% relative humidity at 37°C, non-condensing.

Dimensions:

Unit:

Height:	3.56" (9.04 cm)
Width:	3.0" (7.62 cm)
Depth:	6.75" (13.58 cm)
Weight:	1.3 lb. (.59 kg)

Handle:

Height:	5.75" (14.6 cm)
Width:	2.17" (5.51 cm)
Depth:	3.61" (9.16 cm)
Weight:	
Cordless:	13 oz (.37 kg)
Corded:	6 oz (.17 kg)

2.1 OPERATIONAL

Speed Processor:	Digital Signal Processing (DSP) performs all operational functions and signal analysis.
Manual Test:	All display segments are tested; checks internal system calibration.
Automatic self-test:	Internal system calibration tests are completed periodically (5 minutes maximum) upon every mode change and at the time of lock. "Err" is displayed if an error is found.
Lock Time:	Instantaneous.
Target window:	Displays strongest target speed in tenths units.
Lock/Fast Window:	Displays truncated locked strongest target speed or fastest target in fastest operating mode.
Display Type:	High contrast, static Liquid Crystal Display (LCD).
Back Lighting:	Fiberoptic, single Light Emitting Diode (LED).
Speed Range:	Spec: 0.5 to 99.9 mph or km/h. Typical: 0.2 to 99.9 mph or km/h.

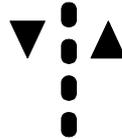
SECTION 2--SPECIFICATIONS

Indicators:

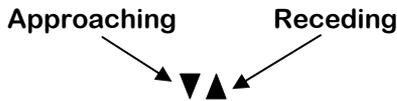
- Strongest Target: “TARGET” label above current strongest target speed is displayed.
- Low Battery: (Warning) Flashing “BATT” is displayed and an audio warning tone sounds every 2 minutes when internal voltage falls below approximately 6.6 VDC. Approximately 30 minutes of transmitter operation remains.
- Low Voltage: (Error) Steady “BATT” is displayed when internal voltage falls below approximately 6.0 VDC. The transmitter is disabled, but locked speeds will remain. At approximately 5.4 VDC, the FalconRR shuts itself off.
- Radio Frequency Interference: “rFi” is displayed in the target window during strong radio frequency interference. Active speed displays are blanked during this condition. Locked speeds will remain.
- Error: “Err” is displayed when an internal error in the operating system is detected. Active speed displays will blank. Locked speeds will remain.
- Hold: “HOLD” is displayed when the system is not transmitting. Transmitter is controlled by the trigger in handheld mode or remote control in mounted mode.

SECTION 2--SPECIFICATIONS

Lock:	“LOCK” label is displayed and flashing indicating locked strongest target speed.
Fastest:	“FAST” label is displayed above fastest target speed.
Test:	“TEST” label flashes when the unit is in tuning fork test mode.
Km/h:	“Km/h” label is on when the unit is displaying speeds in km/h.
Mode Graphic:	These indicators are used to show the mode of operation and current strongest target direction.



Fastest Graphic:	These indicators are used to indicate the direction of the fastest target speed.
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Microwave Freq:	24.125 GHz.
Beam Width: (Horizontal)	$12^\circ \pm 1^\circ$.
Polarization:	Linear.
Power Density:	Less than 1 mW/cm^2 at aperture.
Source Power:	8 mW max.

3. INSPECTION AND INSTALLATION

3.0 INITIAL INSPECTION

Before using your FalconRR, please take a moment to carefully inspect the shipping carton for damage. Contact the shipping carrier at once if you notice any damage.

Remove the unit from the shipping carton and check the packing list against your original purchase order. If the shipment is incomplete or parts are missing, please contact Kustom Signals' Customer Service Department at (800)-835-0156, or (620) 431-2700.

3.1 MATERIALS SUPPLIED

The following equipment is normally included:

- Antenna/Display Unit
- Operator's Manual
- Corded Handle
- 35 mph Tuning Fork

OPTIONAL

- Fastest Target Mode Feature
- Mounting Pod
- Wired Remote Control
- Battery Handle
- 110V Trickle Charger
- Fast Charger with 12VDC Charging Cord
- AC Adapter for Fast Charger (110V or 220V)
- Heavy Duty Carrying Case

3.2 RADAR INSTALLATION

1. The FalconRR is shipped with the handle (corded or cordless) attached. With the handle attached, the user can operate the unit in the handheld or mounted mode. In the handheld configuration, the transmitter is only active when the trigger is pulled.
2. For mounting, the unit can operate with the handle attached placed in the handle-on mount, or with the pod attached and mounted on the pod bracket. When the unit with a handle is placed in the mount, the trigger is inoperable and the remote control is used to control the unit. To attach the pod, remove the handle by pressing the blue release button (latch) on the bottom of the indicator and sliding the handle backwards. Locate the dash bracket and mounting pod. Fasten the mounting pod to the dash bracket, and then slide the FalconRR onto the pod by placing it in front of the pod and sliding it backwards. The mounting pod may be turned 90° on the mount and the FalconRR slid onto it from the side.
3. Position the radar and mount in a suitable location.
4. Connect the FalconRR's power cable to the proper power source.

SECTION 3—INSPECTION AND INSTALLATION

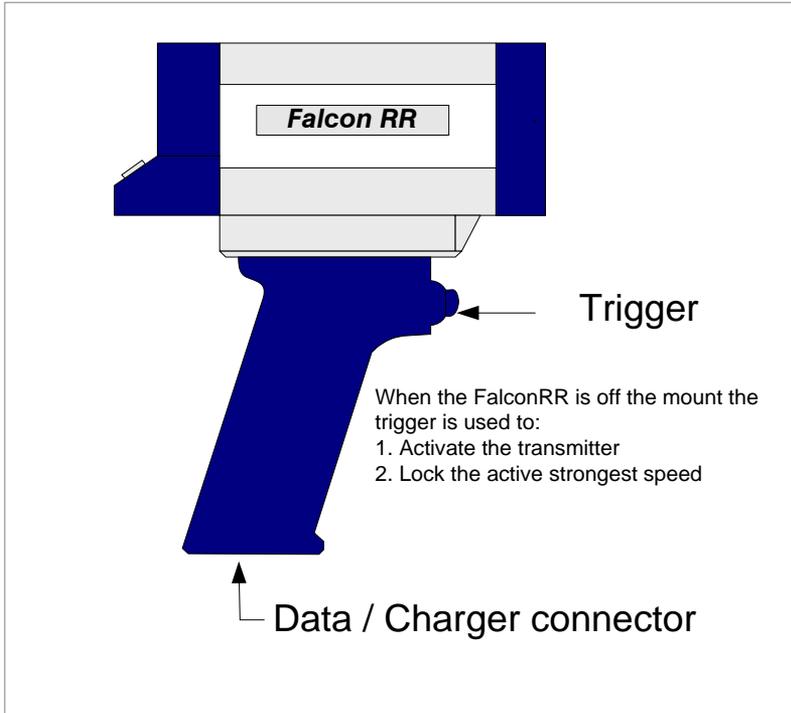
5. Momentarily press the PWR switch on the rear panel of the FalconRR. (Refer to Section 4.1 for location and function of the switches.) The FalconRR will proceed through an indicator test, internal test and several other reliability tests. Select the Stationary “ALL” mode of operation by pressing the MODE switch, if required. “TARGET” will be displayed with both directional arrows in the target and fastest mode graphic.



6. Momentarily press the AUD (audio) switch. The TARGET window will display “Aud” and a number from 0 to 5 indicating the audio level will be displayed in the lower right. With “Aud” displayed, press the up (↑) or down (↓) switch to set the audio at the desired level. Also, with “Aud” displayed, pressing the MODE switch will toggle the audio between squelch or unsquelch.
7. Position of the antenna: The unit may be operated on the mount or handheld. To achieve maximum performance, point the antenna directly toward the target being monitored.

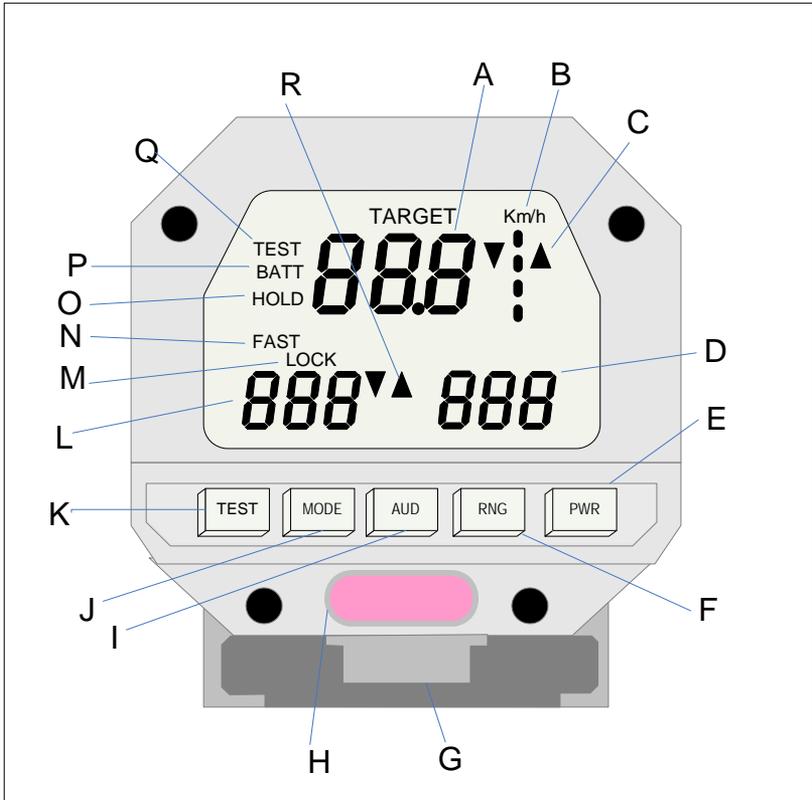
4. UNIT DESCRIPTION

4.0 SIDE VIEW



NOTE: The FalconRR can connect to video systems, remote control systems, or have the operating software updated through the data connector.

4.1 REAR PANEL



- A. TARGET Displays the current strongest target speed in tenths units.
- B. Km/h Indicates when the target speed readings are in kilometers per hour, km/h.
- C. Target Graphic Indicates Mode of operation: approaching only, receding only, or all. Indicates target direction: approaching or receding.

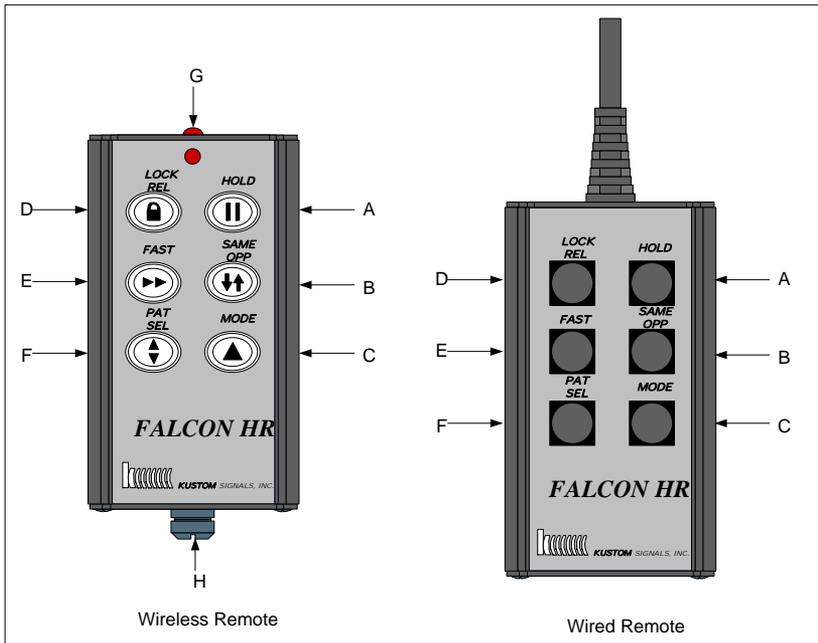
SECTION 4--UNIT DESCRIPTION

D. Target Mode	Displays “ALL”, “Apr”, or “rEC” to indicate current mode of operation.
E. PWR	Turns the unit on or off.
F. RNG (Range)	Puts the unit in the range set mode. Secondary function is the increment (up) control.
G. Latch	Press to unlatch radar from handle.
H. IR Detector	Receiver for the IR remote control.
I. AUD (Audio)	Puts the unit in the audio set mode. Secondary function is the decrement (down) control.
J. MODE	Rotates through the three modes of operation: <ol style="list-style-type: none">1. “All” Targets in both directions tracked.2. “Approaching Only”3. “Receding Only”
K. TEST	Puts the units in the test mode indicated by the flashing TEST indicator. Also used to access the Backlight control. See Section 7.1.7.
L. FAST/LOCK Display	In active mode, displays fastest target speed. In Locked mode, displays the locked truncated strongest speed.
M. LOCK	Indicates the FAST/LOCK display is showing a locked truncated strongest speed.
N. FAST	Indicates the FAST/LOCK display is showing the fastest target speed.
O. HOLD	Indicates the radar transmitter is turned off.

SECTION 4--UNIT DESCRIPTION

- P. BATT Indicates when the battery or external power source is below the minimum operating voltage.
- Q. TEST Indicates the unit is in TEST mode.
- R. Fastest Indicators Indicates the direction of travel of the fastest target speed.

4.2 REMOTE CONTROL



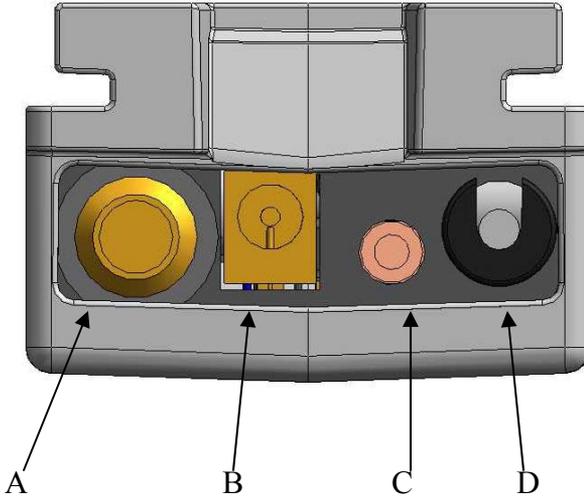
When the FalconRR has a handle attached and is placed in the mount, certain functions can be controlled with the Wireless/Infrared (IR) remote. If the unit is attached to the optional pod, a wired or IR remote can be used.

SECTION 4--UNIT DESCRIPTION

The remote controls the following functions:

- | | |
|-------------------|---|
| A. HOLD | Turns the radar transmitter on and off. |
| B. SAME/OPP | Toggles between approaching only and receding only modes. |
| C. MODE | Rotates through the modes of operation. <ol style="list-style-type: none">1. ALL, targets both directions.2. Approaching only targets.3. Receding only targets. |
| D. LOCK/REL | Alternately Locks and Releases the current strongest target speed. |
| E. FAST | Turns fastest target mode on or off. |
| F. PAT SEL | Not used in the FalconRR. |
| G. IR Transmitter | Two IR transmitter LEDs. |
| H. Screw Release | Screw fastener to allow access into the battery compartment. |

4.3 MOUNTING POD (OPTIONAL)



- | | |
|----------------------|--|
| A. Data Port | RS232 I/O port provides information to video systems or for updating operating software. All operations of the FalconRR can be controlled via this port. |
| B. Speedometer Input | This connection is not used with the FalconRR model. |
| C. Remote Control | Accepts the wired remote control jack. |
| D. Power Cable | Permanently attached to the pod. |

5. GENERAL THEORY OF OPERATION

5.0 GENERAL

The FalconRR radar system transmits a K-Band radio frequency in compliance with the Federal Communications Commission (FCC) regulations.

Antenna Description: The FalconRR employs a Doppler RF Transceiver Module (integrated antenna element and electronic transceiver) that is assembled into the front-end of the FalconRR. The antenna element is a **MicroStrip Patch Antenna** array (MSPA). The Transceiver Module antenna element is not a phased array. The MSPA antenna is fabricated with microstrip patch elements printed onto the top surface of a flat substrate. The bottom surface of the substrate allows for the integration of the electronic transceiver. The antenna has one transmit and one receive array each consisting of thirty-two (32) common connected patch elements. The total physical size of the Transceiver Module is (65 x 65 x 11) mm. The MSPA itself is (65 x 65 x 2.5) mm.

Antenna Function: The Transceiver Module functions as the only means of K-Band transmission and detection on the FalconRR. The MSPA serves a dual purpose as both K-Band sensor and K-Band radiator. The electronics of the Transceiver Module provides a K-Band source used to radiate from the MSPA and to down convert the MSPA sensed return K-Band to be used by the processing electronics of the FalconRR. The Transceiver Module does not have beam steering capability.

Antenna Operation: The Transceiver Module MSPA transmit array of patch elements convert electrical current from a **Dielectric Resonator Oscillator (DRO)** to **Linear Polarized (LP) Electro-Magnetic (EM)** energy. The MSPA array of patch elements convert LP EM energy to electric current fed to a **Low Noise Amplifier (LNA)**.

Antenna Specification: The Transceiver Module is specified at +5VDC, CW operation, 12k ohm load, and +25C. Maximum Radiated Power and Spurious Emission are +20dbm and -30dbm respectively. Typical 3db Antenna Beam-widths are 12 degrees Azimuth and 24 degrees Elevation. Typical Antenna Side-lobes and Sensitivity are -18dbm and -110dbm respectively. The total Transceiver Module weight is typically 75gm.

5.1 MICROWAVE RF EMISSIONS

Radar operators may have some questions about the biological effects of exposure to the microwave energy produced by the radar devices. According to all credible evidence, the emission levels resulting from radar use pose no threat whatsoever, either to the radar operator or to nearby personnel.

One widely recognized authority for safe limits of nonionizing radiation exposure is the American National Standards Institute, which recommends maximum exposure levels for the frequencies on which Kustom traffic radar systems operate (ANSI/IEEE C95.1-1999, "Standard for Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz"). These exposure levels, expressed in terms of power density, are 10 mW/cm² for K-band and Ka-band radar units. Similarly, the Occupational Safety and Health Administration (OSHA), a division of the U.S. Department of Labor, recommends a 10 mW/cm² exposure limit for both frequency bands ("Radiation Protection Guide", 29 CFR, Chapter XVII, Subpart G, Part 1910.97). This limit is clearly accepted by most reputable scientific and medical authorities.

Kustom radar systems utilize microwave transmitters that produce aperture power densities, measured directly at the face of the antenna, in the range of approximately 0.1 to 2.3 mW/cm². Typical levels for the vast majority of units are in the 0.4 to 1.0 mW/cm² range, which is but a small fraction of the recognized safe limits. Bear in mind that these are level measurements taken directly in the main beam of the antenna,

and that the power densities produced at the sides and rear of the unit are typically at least one hundred times lower than in the main beam.

Another reference document on this topic is a DOT publication entitled "Field Strength Measurements of Speed Measuring Radar Units" (NHTSA Technical Report #DOT-HS-805 928). This report documents a series of tests performed by the National Bureau of Standards on twenty-two commonly used models of traffic radar units, from six different manufacturers including Kustom. Aperture power density levels measured were from 0.25 to 2.82 mW/cm², while back-lobe power density values ranged from 0.001 to 0.02 mW/cm². These measurements were obtained with the radars mounted inside vehicles, as in normal operating conditions. Since the NBS study, other laboratories have duplicated these types of measurements, producing consistently similar results.

For a free copy of the latest information regarding the safe human exposure standards, please call or write Kustom to request the "RF Emissions Packet." You may contact us at our corporate headquarters:

Kustom Signals, Inc.
9652 Loiret Blvd.
Lenexa, KS 66219-2406
(913) 492-1400

While traffic radar devices do emit microwave energy, the levels are so low that there are no probable harmful effects. You may use your Kustom radar unit with complete confidence in its safety, as well as in its accuracy.

6. TESTING PROCEDURES

6.0 GENERAL

The tuning fork tests explained below can be conducted to ensure the accuracy and functionality of the unit. The internal circuit and antenna tests are periodically performed automatically while the unit is in use.

6.1 POWER ON

Press and release the PWR switch. The unit will turn on all the LCD segments and perform internal self-tests to verify the accuracy of the speed processing circuitry.

If these tests pass, the unit will display “PAS” in the TARGET display window. This will remain for approximately one (1) second. The displays will clear and the unit will be operational.

6.2 AUTOMATIC SELF-TEST

As long as the unit is turned on, the FalconRR performs an internal accuracy test every five (5) minutes or whenever the unit’s mode of operation is changed, and each time the target speed is locked.

This test is automatic and will not interfere with any radar speed readings being taken. The test passing does not appear in the displays, but if an error is detected during this test, the TARGET window will indicate “Err” and further speed-readings are prohibited.

6.3 MANUAL TEST

The operator can manually perform the indicator and internal tests at any time during normal radar operation--just press and release the test switch. The indicator test will be performed followed by the display of “PAS” in the TARGET window.

NOTE: The unit will remain in the test state for 30 seconds after releasing the Test switch, indicated by the flashing TEST indicator. Due to the ability of the unit to reject non directional signals, the operator must place the unit in this Test mode to read tuning forks.

6.4 TUNING FORK TESTING

Supplied with the FalconRR is a 35 mph tuning fork. This tuning fork will simulate a target.

The tuning fork tests should be conducted in an area with no targets present. If this is not possible, point the FalconRR away from targets to avoid reflections.

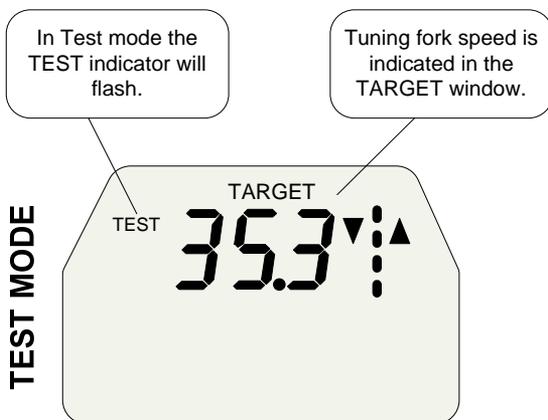
**** Due to the ability of the FalconRR to reject non-directional signals, the operator must place the unit in the Test mode to read tuning forks. Momentarily depress the Test switch. The FalconRR will complete the internal tests and enter the tuning fork Test mode.**

The unit will remain in the Test mode for 30 seconds, indicated by the flashing TEST indicator. Tuning fork tests may be performed while in this mode. Pressing the Test switch again, while in the Test mode, will exit the Test mode immediately.

6.4.1 TUNING FORK TEST

1. Place the FalconRR in the “ALL” mode of operation.
2. Verify the range level is set to maximum. Press the RNG switch to display “rnG”, and then use the UP arrow to increase the range level to maximum.
3. Momentarily press the Test switch to enter the Test mode. The TEST indicator will be flashing while in the Test state.

4. Lightly strike the lower speed tuning fork on a hard, nonmetallic surface. Place the fork in front of the antenna and pull the trigger, if the unit is handheld. If it is dash mounted make sure it is not in HOLD. Verify a target speed display of the value stamped on the tuning fork, ± 1 mph (± 1 km/h).



NOTE: Since the FalconRR can determine these fork signals are non-moving targets, the speeds displayed during the fork tests cannot be LOCKED.

6.4.2 TUNING FORK TEST FAILURE

If the proper speed readings are not obtained during the previous tests, check the following:

1. The FalconRR cannot test tuning forks if the system is not in Test mode as indicated by the flashing Test indicator.
2. Verify that the tuning forks are the proper tuning forks supplied with the unit.

SECTION 6—TESTING PROCEDURES

3. Striking the tuning fork too hard or on a metallic surface will cause spurious overtones from the tuning fork. This may cause the speed readings to be double the specified speed. Also, moving the tuning fork while in front of the antenna may cause the speed reading to be slightly lower or higher than specified. These readings are only momentary and the proper readings should appear as the false overtones dissipate.

NOTE: Do not move the tuning forks after they have been placed in front of the antenna.

4. Ensure that the FalconRR is in the Transmit mode and the range control is set to maximum.

7. OPERATION

7.0 OPERATING MODES

The FalconRR radar system offers the operator one of the most versatile radar systems available today. It can be used in handheld or dash-mounted in 3 different operating modes:

1. Stationary ALL
2. Stationary Approaching Only
3. Stationary Receding Only

7.1 OPERATIONAL SETUP

For handheld operation, use the corded or battery handle. The corded handle requires external power from a portable battery pack or a vehicle's cigarette lighter receptacle. For complete portability, use the optional battery handle.

For mounted operation, the FalconRR can use the corded or battery handle, or the optional mounting pod. Mounted units with a handle use the wireless IR remote. Units with the optional mounting pod can use either the wireless or the wired remote.

7.1.1 BATTERY CHARGING

For cordless operation, the FalconRR battery handle must be charged before use. The battery may be charged while attached or removed from the unit. To remove the battery handle, turn the unit upside down, press the blue handle release button (latch) located directly behind the handle, and slide the handle off the unit. Connect the battery charging cable to the input connector on the bottom of the handle.

The standard charger supplied with units sold in the United States is a trickle (timed) charger, which will recharge the FalconRR's battery in 14-16 hours then shut itself off. The charging time will vary depending upon the amount of discharge, but typically overnight will completely charge

the FalconRR's battery. Please note--any interruption in the 110V power supplied to the charger will cause it to reset and begin the charging cycle again.

The optional fast charger allows charging directly from the vehicle's cigarette lighter receptacle. When using this charger, the FalconRR may be operated with no decrease in the radar's effectiveness. Charging will take less than 2 hours, even with the radar in normal use. The optional AC adapter allows charging from standard AC current (110V or 220V). Charging will take approximately 1 hour, and is shown by a steady green LED. Full charge is shown by a flashing green LED. Once full charge has been reached, the charger ceases charging and goes into a maintenance mode, protecting the battery against overcharging. A red LED indicates the battery is out of temperature tolerance and cannot be charged until its temperature falls within the proper range.

7.1.2 BATTERY OPERATION

The FalconRR has an onboard battery monitor that notifies the operator when battery voltage (internal or external) is approaching or has fallen below the FalconRR regulation threshold. First, the monitor senses the condition where 30 minutes of transmitting battery life remains. A flashing "BATT" indicator and an audio warning tone every two minutes notifies the operator that battery life is limited. Speed data can still be taken until the internal battery voltage level drops below the minimum operating level. When minimum operating voltage is sensed, the transmitter is disabled, last locked speed is preserved and the "BATT" indicator becomes steady. When the voltage falls further, the FalconRR shuts off to prevent complete discharge of the battery.

7.1.3 LOCATION

1. For operation, select an area that provides a good view of the targets to be monitored.
2. Check the immediate area for potential interference sources, such as large reflecting surfaces in the direct path of the radar's microwave beam, power lines and other potential sources of electrical interference.

NOTE: Cosine effect, the angle between the target's direction of travel and the path to the radar, will reduce the target speed readings.

7.1.4 ADJUSTING AUDIO

Adjust the Doppler audio for the desired listening level. Press the AUD switch. The TARGET window will display "Aud" and the current audio level will be displayed in the lower right display area. This display will remain for approximately two (2) seconds unless another switch is pressed.

While "Aud" is displayed, press either the down arrow (Audio) or up arrow (Range) to decrease or increase the audio level. The displays will return to their normal mode two (2) seconds after the last switch is released.

7.1.5 AUDIO UNSQUELCH

To unsquelch the audio, press AUD then press MODE while "Aud" is showing in the TARGET window. "Un" will be displayed, and the audio will be unsquelched. To return to squelched audio, repeat this step.

7.1.6 RANGE

Set the range control to the desired level. Press the RNG switch and “rnG” will be displayed, along with the current level (1-5). The range can be increased or decreased by pressing the UP arrow (Range) or DOWN arrow (Audio). The FalconRR will return to normal operation with the new range level approximately two (2) seconds after the last switch activation.

Range level 5 is the maximum range, and range level 1 reduces the target detection range to its minimum distance.

7.1.7 BACKLIGHT

For low light operation, the FalconRR has a low-power fiber-optic backlight. To turn the backlight on, press the TEST switch, then while all the LCD segments are on, press the MODE switch. Repeat to turn off the backlight.

7.2 OPERATION - HANDHELD

7.2.1 SETUP

1. Attach the corded or battery handle. Turn the unit on. Place the system in “ALL” mode with the transmitter in HOLD.
2. Set the range and audio levels as needed.
3. Point the FalconRR at the intended target, pull and hold the trigger to take the transmitter out of HOLD.
4. Complete a tracking history on the target.
 - A. Observe the target.
 - B. Estimate the speed of the target.
 - C. Listen to the audio pitch and compare the pitch to the estimate of speed in B.

SECTION 7—OPERATION

- D. Observe the speed-reading shown on the TARGET window. It should correspond with B and C above.

7.2.2 TARGET LOCK

1. To lock the strongest target speed reading, release the trigger. A short audio alert tone will be heard in the speaker; the truncated target speed will be locked and flash in the LOCK window.
2. To release a locked speed, pull and release the trigger. The LOCK window will blank. No speeds can be recalled.

7.2.3 FASTEST TARGET MODE - (OPTIONAL FEATURE)

FalconRR units that have the optional fastest feature will power up with fastest turned on. To toggle this feature on and off, quickly double click the trigger. Fastest is on when the FAST indicator is displayed.

The fastest target will be displayed in the FAST/LOCK window. The arrow graphic indicators adjacent to the window show the direction of travel (approaching or receding) of the fastest target. Both fastest direction indicators will remain on solid until a fastest target is found. When a fastest target is found, only the indicator representing the targets direction of travel will be visible and flashing.

7.3 OPERATION - MOUNTED

7.3.1 SETUP

For mounted stationary operation, the FalconRR can use the corded or cordless handle or the optional mounting pod.

Units with the optional mounting pod can use either the wireless or the wired remote. The following steps describe connecting the mounting pod.

1. Turn unit off; unplug power cord. Remove the handle from the FalconRR by pressing the handle release button (latch) on the bottom of the indicator.
2. Slide the indicator unit onto the mounting pod; pushing rearward until the release button clicks, indicating the unit is securely in place.
3. Connect the remote control cable as required. Plug the unit in, turn on.

Mounted units with a handle use the wireless IR remote and must use the Kustom Signals provided handle mount. This specialized mount allows the unit to detect if it is handheld or mounted. While mounted, the trigger is inoperable and the IR remote is active. While handheld, the remote is inoperable, and the trigger must be pulled to activate the transmitter.

1. Set the range and audio levels as needed; select operating mode.
2. Aim the antenna directly at targets being monitored.

7.3.2 STATIONARY MODE

There are three (3) modes of stationary operation:

- Approaching Only (Apr), receding targets not displayed.
 - Receding Only (rEc), approaching targets not displayed.
 - All (ALL), targets from both directions are displayed, and the direction of travel is indicated.
1. Complete a tracking history as described in Sec. 7.2.1 Step 4.
 2. To lock a speed, press LOCK/REL on the remote control. To release a locked-in speed, press again. See Sec. 7.2.2 for details.
 3. To shut off the transmitter, press HOLD on the remote. The HOLD indicator will light, and the TARGET display will blank (locked speeds will remain). To return to normal radar operation, press HOLD again.
 4. When the fastest mode is activated, the FAST indicator will light. The fastest speed will be displayed in the LOCK window, and the strongest signal speed will be displayed in the TARGET window.

7.4 MAINTENANCE MODE

The FalconRR has a maintenance/configuration mode that can be used for diagnosis and configuration. Holding the PWR switch depressed for three (3) seconds or longer during power up accesses this mode. Press the Test switch to advance through the configuration screens. Turning the unit off and back on again will exit this mode.

7.5 TEST SCREEN MODE

The Test Screen mode is not for normal operations but is to augment troubleshooting and test lab operations.

Pressing a combination of buttons can enter the Test Screen mode. First press and release the TEST button. During the test sequence, while all display segments are on, press the RNG button. The unit will enter Test Screen mode, and the TEST indicator will be on solid.

To exit Test Screen mode, press the Mode or Test switch or cycle power on the unit.

8. INFLUENCES AND INTERFERENCE

Interferences from external sources may affect the standard operation of any radar device, including the FalconRR. These influences can be natural or man-made, however, the Digital Signal Processing circuitry will eliminate most of these influences and a knowledgeable operator should be able to determine the nature of the influences and their effect, if any, on the performance of the FalconRR.

8.0 NATURAL INFLUENCES

1. Heavy rains and blowing dust can cause a scattering effect, which may reduce the effective range of the FalconRR.
2. Terrain can affect the range of the FalconRR. Improper aiming of the antenna can cause the radar to appear to have short range.

8.1 MAN-MADE INFLUENCES

1. Radar units may display incorrect speed readings from various sources. These include electrical and fan interferences.
2. The FalconRR has an onboard battery monitor to alert the operator when internal voltage nears the minimum operating voltage. See Sec. 7.1.1 for details.
3. Radio Frequency Interference (RFI) exists when there are strong RF transmitters in the immediate area of the radar unit, such as a transmitting radio, high power radio or television stations. Normally these signals are processed as non-moving and not displayed as targets. However, if the RFI signals are strong enough, the FalconRR will detect these sources of interference, the TARGET window will display “rFi” and all speed-readings will be blanked, except for locked speeds, until the source of interference is reduced or eliminated.

4. Fan motors can cause a radar unit to display the fan's speed as a target speed. A trained operator should not be confused by intermittent fan readings and the distorted audio. Proper antenna mounting, placement, and aiming will eliminate most of the potential fan interferences.

8.2 GROUNDSPPEED

The FalconRR unit is intended for used in a stationary mode. If the unit is on a moving platform, the groundspeed of the platform will be displayed as the target speed. If there are any targets moving toward or away from the platform their relative speed to the platform will be displayed as the target speed.

9. CARE OF THE FALCON RR

The FalconRR radar system is designed for long reliable use. Following basic care guidelines will ensure the unit gives many years of trouble-free service.

9.0 ROUTINE CARE

1. Use a damp cloth to clean the outside of the radar unit if it becomes dirty. **DO NOT** use excessive water or any cleaners or sprays on the outer surface of the unit, mounting pod or remote control.
2. As with all electrical or electronic equipment, protect the unit from water. While the FalconRR is weather resistant, the radar unit, the mounting pod and remote control are not waterproof. If any liquid should get inside, remove power immediately and send the unit in to a repair facility. Prompt action can minimize any damage.
3. If the FalconRR is used outside in rain or snow, it should be wiped dry with a clean cloth as soon as practical.
4. There are no user serviceable parts in the FalconRR. The internal battery handle is over-current protected by an automatically resetting fuse. The fuse for the corded handle and mounting pod is located in the end of the cigarette lighter plug. Simply unscrew the tip and replace with the same size fuse.
5. Do not pick up or carry the FalconRR by the power or remote control cables. Broken power and remote control cables are a common cause of intermittent operation.

9.1 EQUIPMENT REPAIR/RETURN

Should the FalconRR need repair or calibration from Kustom Signals Customer Service, please visit our website (www.kustomsignals.com), click on the “parts & returns” tab and follow the instructions on the Returns Form to receive a Return Material Authorization (RMA) number. If you do not have access to our website, please call our Customer Service Department at (800) 835-0156 or (620) 431-2700 to obtain your RMA number before returning your unit.

The following information will be needed:

1. Serial number of unit, department name, return shipping address, contact name at owning department, and phone number.
2. Complete description of the failure or problem with the unit. Please describe in detail what the failure is and when it is observed.
3. Method of return shipment.

NOTE: Kustom Signals will return the unit via ground transportation unless otherwise directed.

9.2 BATTERY DISPOSAL

It is a violation of Federal regulations to dispose of rechargeable batteries in a landfill. They must be recycled at an appropriate facility, disposed of in accordance with local ordinances, or shipped back to Kustom Signals for disposal. For more information on disposal facilities near you, contact the Rechargeable Battery Recycling Corp. (RBRC) at 1-800-8-BATTERY, email rbrc@rbrc.com, web page www.rbrc.com.

10. FCC INFORMATION

FCC IDENTIFIER
Name of Grantee

IVQFAL-HR
Kustom Signals, Inc.

The FalconRR has been tested and found to comply with the limits pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warning: Changes or modifications to this device not expressly approved by Kustom Signals, Inc. could void the user's authority to operate the equipment.

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

11. TROUBLESHOOTING

If an operating difficulty is encountered, check the following list of possible problems and solutions before returning the unit to the factory or local Service Center.

<u>Problem</u>	<u>Possible Solution</u>
No Power Indication	<p>Corded handle: Check for proper voltage at cigarette plug. Reseat cigarette plug in the socket. Check fuse in power plug.</p> <p>Battery handle: Ensure battery is charged.</p>
Unit will not complete test cycle or shows ERR	<p>If the ERR message indicator is lit, power the unit off, then back on.</p> <p>If the problem persists, remove unit from service and record the error code.</p>
No target speed-reading during tuning fork test.	<p>Verify that unit is in Test mode.</p> <p>Verify that the unit is in maximum range setting.</p> <p>Verify unit is not in HOLD.</p> <p>Unsquench audio. Listen for Doppler tone. Lightly strike tuning fork to avoid harmonics.</p>

SECTION 11—TROUBLESHOOTING

No target readings in normal operation.

Verify unit is not in HOLD.

Verify range control is set properly.

Verify unit is aimed properly and the target is within range of the radar.

Unsquench audio and verify that a Doppler tone is heard when targets are present. If no Doppler tone is heard, remove unit from service.

Short range

Verify the unit is aimed properly.

Verify there are no obstructions between the unit and the target.

Weather conditions (heavy rain, snow and fog) may affect the unit's range.

Check for electrical interferences. Strong fan interference will reduce the operating range of the unit.

12. DIRECTIONAL OPERATIONAL SUPPLEMENT

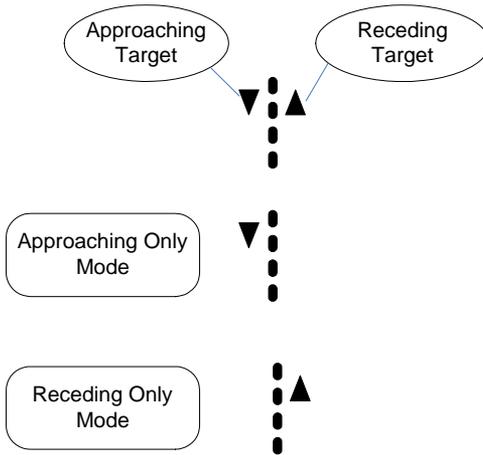
12.0 DIRECTIONAL OPERATION

The FalconRR uses state-of-the-art electronic processing to determine the direction of travel of target object. This additional information aids the operator in better target identification. This can be done by displaying the direction of travel with the target speed or by selecting the direction of targets to be displayed.

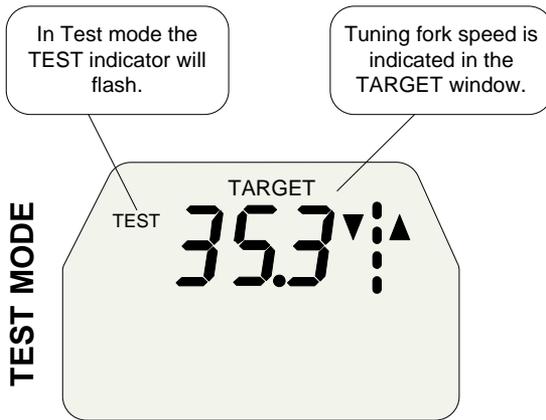
Definition of Terms:

ALL Mode:	Detects both approaching and receding targets. The direction indicators in the mode graphic will show the direction of target travel.
APr Mode:	Detects approaching targets only.
rEC Mode:	Detects receding targets only.
Strongest Target:	Displays speed of strongest target reflected signal regardless of speed.
Fastest Target:	Displays speed of fastest target speed, which is not the strongest reflected signals.

12.1 TARGET GRAPHIC



12.2 TEST MODE

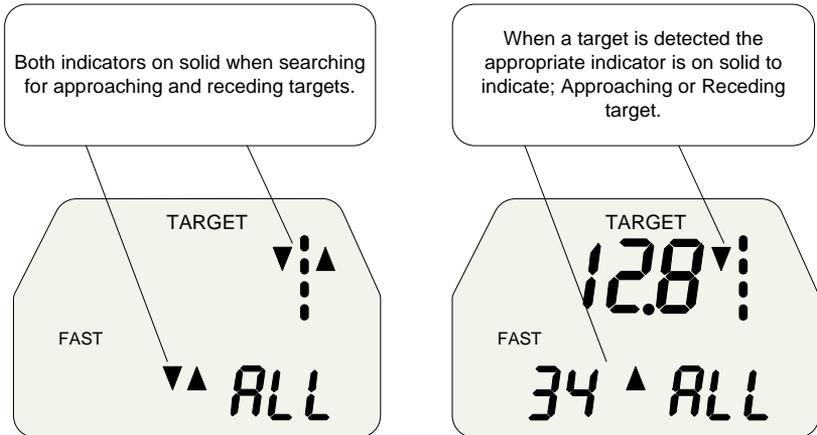


Pressing the TEST button places the radar in Test mode, which is indicated by the flashing TEST indicator. While in Test mode, the radar will display all speeds, both moving targets and non-moving targets such as tuning forks. The unit will remain in Test mode for 30 seconds.

NOTE: Pressing the TEST button while in Test mode will turn off Test mode immediately.

12.3 OPERATION

12.3.1 ALL DIRECTIONS MODE

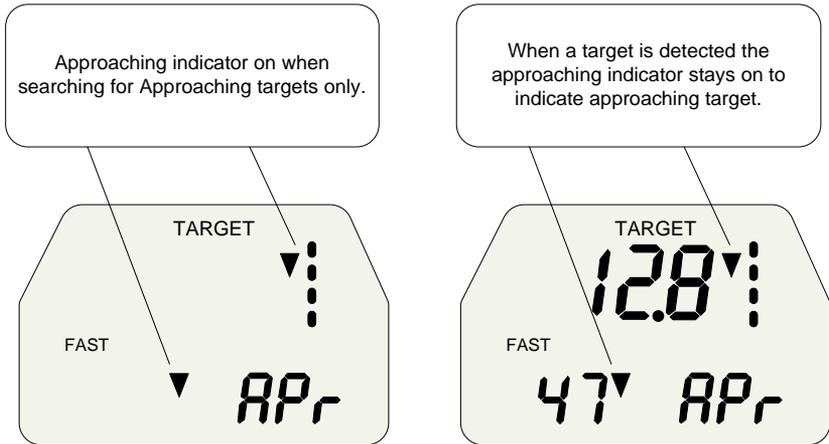


To monitor targets in both directions (the FalconRR will automatically indicate which direction the strongest and fastest targets are traveling), repeatedly depress the MODE switch until “ALL” is displayed in the lower right window.

When the radar is operated in the “ALL” mode, the target graphic will light the appropriate direction LED, indicating the displayed target’s direction of travel. Both approaching and receding indicators will be on solid until a target is detected. After a target is detected, the appropriate direction indicator (approaching or receding) will be on solid.

If the “Fastest” function is activated, both the approaching and receding “fastest” indicators will be on solid until a target faster than the strongest target speed is detected. The appropriate fastest indicator will flash to indicate the direction of the fastest target; approaching or receding.

12.3.2 APPROACHING ONLY MODE

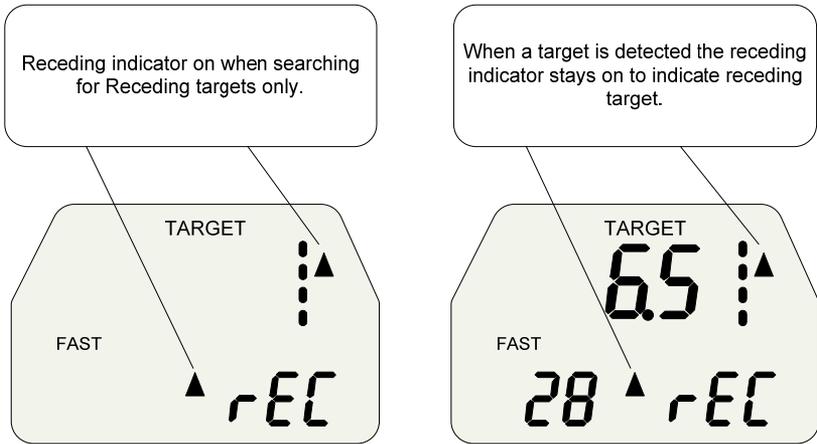


To activate the Approaching Targets Only mode, repeatedly depress the MODE switch until “APr” appears in the lower right window window.

When the radar is operated in the Approaching Only mode, the TARGET window will indicate the strongest approaching target speed. The target indicator for approaching targets will be on solid.

If the “Fastest” function is activated, the approaching fastest indicator will be on solid until a faster approaching target is detected. At that time, the approaching fastest indicator will flash and the fastest speed will be displayed in the FAST window.

12.3.3 RECEDING ONLY MODE



To activate the Receding Targets Only mode, repeatedly press the MODE switch until “rEc” is displayed in the lower right window.

When the radar is operated in the Receding Only mode, the TARGET window will indicate the strongest receding target speed. The target indicator for receding targets will be on solid.

If the “Fastest” function is activated, the receding fastest indicator will be on solid until a faster receding target is detected. At that time, the receding fastest indicator will flash and the fastest speed will be displayed in the FAST window.

13. OPTIONS

13.0 OPTIONS SETUP

The FalconRR radar unit allows the operator to change certain operating parameters of the unit. The following is a list of the available parameters. Each has a number after the option. An example will be given to instruct the operator how to change the unit.

NOTE: The Track through Lock and push/hold Fastest options are not allowed in the FalconRR.

<u>Option</u>	<u>Add</u>
No AUTO UNLOCK	0
Automatic UNLOCK	1
Minimum audio level 0	0
Minimum audio level 1	4
Low power savings enabled	0
Low power savings disabled	8
Kustom Signals Video Output	0
Gateway Output (F)	32
Gateway Output (R)	64
Common Radar Output	96
MPH	0
km/h	128

13.1 OPTIONS DESCRIPTION

The following is a description of the function of each one of the Options the operator can set.

13.1.1 AUTOMATIC UNLOCKING OF LOCKED SPEEDS

The FalconRR defaults to not automatically unlocking speeds the operator has locked. If automatic unlocking is required, add 1 to the Options total.

13.1.2 MINIMUM AUDIO SETTING

The FalconRR defaults to allowing the audio level to be set to 0. If preferred the minimum audio level can be set to 1, add 4 to the Options total.

13.1.3 LOW POWER SAVINGS

The FalconRR defaults to using very low power after 30 seconds in HOLD with no targets locked. The unit will also turn off after 30 minutes in HOLD and no operator activity. The power saving operation can be disabled by adding 8 to the Options total.

13.1.4 INTERFACE OUTPUT PROTOCOL

The FalconRR defaults to allow the radar unit to interface with the Kustom Signals Eyewitness[®] video or giant display equipment. Contact Kustom's Customer Service Department at (800)-835-0156 or (620) 431-2700, before changing the output protocol option.

13.1.5 SPEED READING UNITS

The FalconRR defaults to displaying the speed readings in miles per hour. If kilometers per hour readings are required, add 128 to the Options total.

13.2 OPTIONS EXAMPLES

Using the above options list, add all the numbers for the options you want active. Note that default options, such as MPH, have a value of zero (0). To enter the Options Menu mode, power the unit off, then press and hold the POWER switch until the power-on sequence stops at the configuration 'Cnf' display. Press the TEST switch two (2) times to advance through the maintenance screens, until options 'Opt' display appears in the TARGET window and a number appears in the FAST/LOCK window.

CnF screen	= configured features value
SFt screen	= software version value
Opt screen	= users selectable options value

Using the UP and DOWN arrows (AUDIO and RANGE switches), increase or decrease the number for the value needed. To make these changes permanent (until changed again), depress the MODE switch once. When the options have been accepted, the unit will automatically return to radar mode.

EXAMPLE: The operator wishes to permanently change the operation of the unit to the following: Minimum Audio Level 1 = 4, Speed measurements in km/h = 128. These numbers are added for a total of 132. After the menu function is entered (see above), use the UP and DOWN arrows to adjust the number shown in the FAST/LOCK window until 132 is shown. The operator would then depress the MODE switch and the changes would be accepted and used every time the radar is powered up.