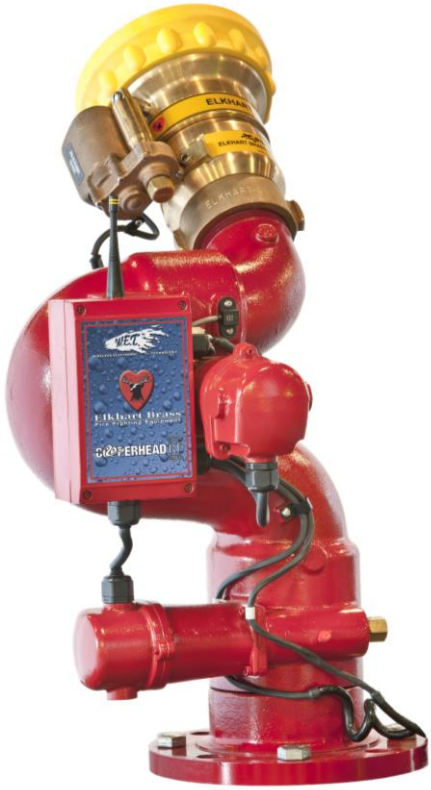
ELKHART BRASS MFG. CO., INC.
1302 WEST BEARDSLEY AVENUE • P.O. BOX 1127 • ELKHART IN 46515 • (574) 295-8330 • FAX (574) 293-9914

Installation, Operating, & Maintenance Instructions



Model 8500-01, 8500-01 EXT, 8593-01 and 8593-01 EXT

VULCAN RF

and

COPPERHEAD RF

98282000 Rev. L

System Information:

Monitor Serial Number: _____

Monitor Accessories (nozzle gallonage and type, types of transmitters, Etc.) :

_____

_____

_____

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_____

Table of Contents

I. PRODUCT SAFETY

Important:

Before installing and operating this equipment, read & study this manual thoroughly. Proper installation is essential to safe operation. In addition, the following points should be adhered to in order to ensure the safety of equipment and personnel:

1. All personnel who may be expected to use this equipment must be thoroughly trained in its safe and proper use.

2. Before flowing water from this device, check that all personnel (fire service and civilian) are out of the stream path. Also, check to make sure stream direction will not cause avoidable property damage.

3. Become thoroughly familiar with the hydraulic characteristics of this equipment, and the pumping system used to supply it. To produce effective fire streams, operating personnel must be properly trained.

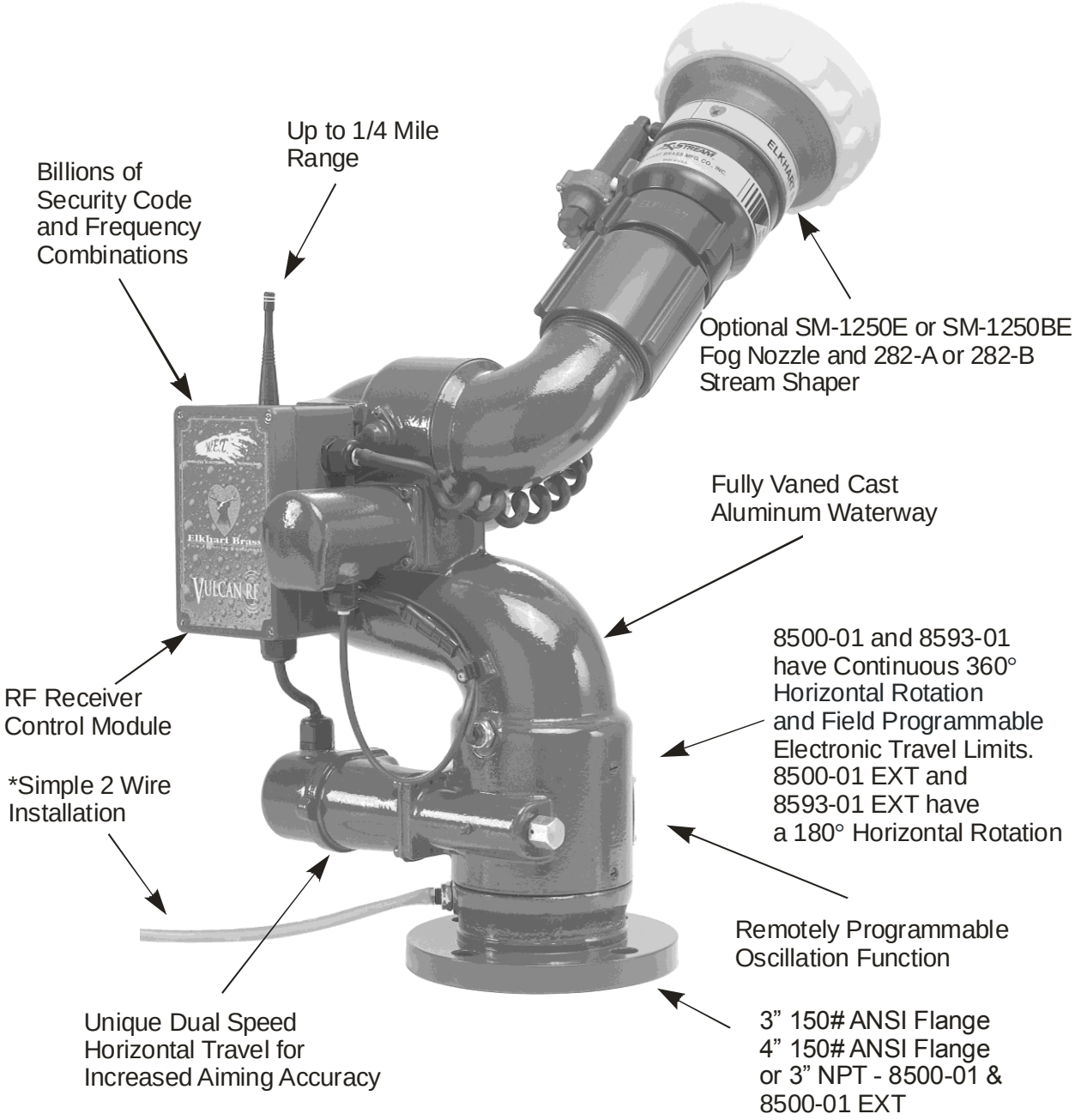
4. Whenever possible, this equipment should be operated from a remote location. Do not needlessly expose personnel to dangerous fire conditions.

5. Open water valve supplying this equipment slowly, so that the piping fills slowly, thus preventing possible water hammer occurrence.

6. After each use, and on a scheduled basis, inspect equipment per instructions in section VII.

7. Any modifications to the enclosure will destroy the NEMA 4 rating and void warranty coverage of the enclosure and all components within.

II. SYSTEM FEATURES



*3rd wire provided for optional customer provided stow indicator lamp.

VULCAN RF and COPPERHEAD RF

Figure 1
8500-01 VULCAN RF w/282-A Stream Shaper and SM-1250E Nozzle

Figure 2
81282001 Handheld Transmitter Features

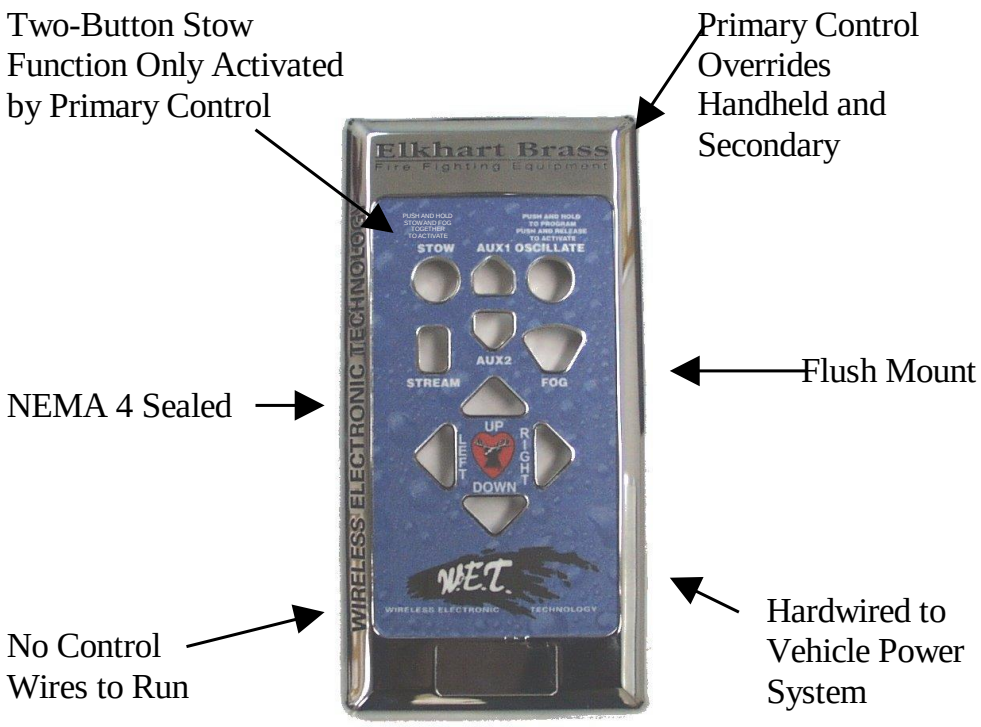


Figure 3
81327101 Primary Panel Mount
Transmitter Features

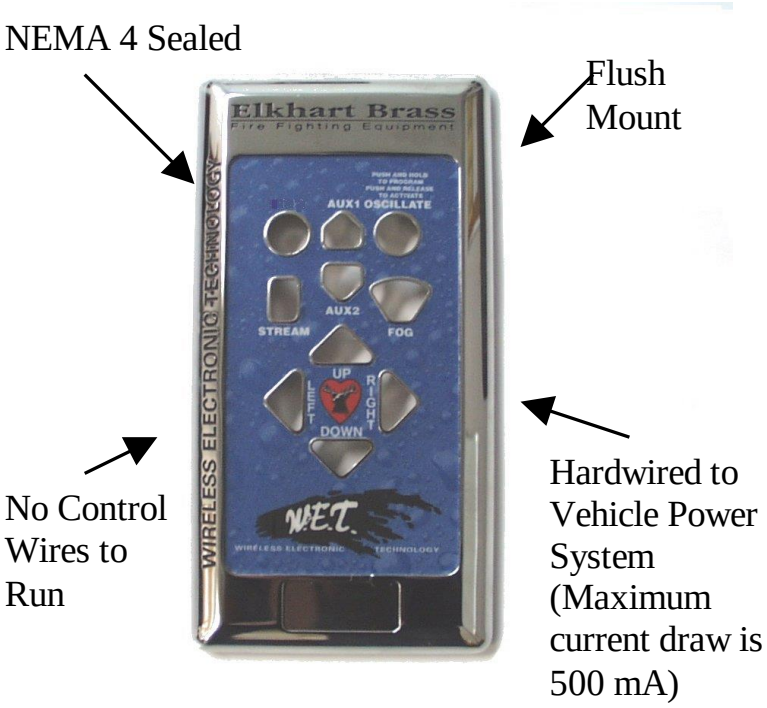


Figure 4
81327201 Secondary Panel Mount Transmitter Features

Figure 5
81549001 Secondary Switch Box Control

III. SYSTEM COMPONENT DESCRIPTIONS

A. 8500-01 Vulcan RF and 8593-01 Copperhead RF Monitor

(Figure 6) The 8500-01 Vulcan RF Monitor is a cast aluminum monitor with a highly efficient waterway, while the 8593-01 Copperhead RF Monitor is brass. The waterway contains a central vane to minimize large-scale turbulence and provide superior fire streams. Monitor water supply is provided through the monitor base by either an 3" 150# flat faced flange, a 3" NPT (Vulcan RF), or a 4" 150# flat faced flange. The discharge nozzle connection is a 2½" National Hose Thread. Nozzle stream direction is controlled by two permanent magnet type gear motors, one controlling rotation about the axis of the water inlet, and the other controlling nozzle elevation and depression.

Figure 6
8500-01 Monitor
with 282-A and ST-194

The monitor flow capacity is 1250 gallons per minute. Monitors are normally supplied with the SM-1250E or SM-1250BE XSTREAM constant pressure (automatic) type master stream nozzle. This nozzle has a flow range of 300 to 1250 gallons per minute at 75 psi, and has an electric drive mechanism for control of the spray pattern from a straight stream to wide fog. For optimum straight stream performance, stream shapers are provided as part of the monitor and nozzle system. Solid stream nozzles are also available for use with this monitor.

The 8500-01 and 8593-01 models have a unique rotating electrical connection between the inlet base and the body of the monitor gives the monitor the ability to rotate around the base continuously without twisting any wires. This eliminates any "dead zone" and allows the operator to take the shortest route to the target.

A hall effect sensor provides the vertical motion feedback. Magnets provide stop locations at 90º above and 45º below the horizontal plane.

Monitor Features:

- Fully vaned, rugged cast aluminum waterway
- 1250 GPM flow
- Rotating connector for unlimited travel in the horizontal direction

B. 8500-01 EXT Vulcan RF and 8593-01 EXT Copperhead RF Monitor

(Figure 7) The aerial Vulcan and Copperhead has the same highly efficient waterway and flow capacity as the Vulcan RF monitor. The monitor waterway is supplied through a 4" 150# or 3" 150# flat faced flange base. The 8500-01 EXT and 8593-01 EXT monitors have a mechanical stop to allow 180° for added protection in an aerial application.

The aerial Vulcan RF and Copperhead RF have special features to optimize performance as an aerial master stream device when used on a straight aerial ladder with pinnable waterway. The pinnable waterway feature allows the waterway to be pinned to the second fly section of the ladder (egress position), thus keeping the monitor and nozzle away from the end fly section when it is necessary to place the ladder tip at a window sill or roof parapet.

The aerial Vulcan contains a special wiring harness connection at the inlet flange to allow attachment of an OEM provided proximity sensor. The proximity sensor is used to tell the monitor controller which position the waterway and monitor is. As a result, the monitor discharge Up-Down travel range differs for the two waterway and monitor positions as indicated in Table 1.

Waterway/Monitor Position	Up-Down Travel Range
Master Stream	+30° to -135°
Egress	0° to –135°

Table 1

The 0° position is when the nozzle is aimed parallel to the ladder.

As a further enhancement, the left-right motor direction of rotation automatically reverses when the monitor discharge is in the range of 0° to +30°. Without this feature, when the discharge travels above 0°, "left" would functionally become "right" and vice versa.

If the proximity sensor changes state while the monitor is in the "master stream" position and the monitor discharge is in the 0° to 30° "up" range, the monitor controller will automatically lower the discharge to 0° to prevent possible interference with the ladder, or impingement of stream upon personnel.

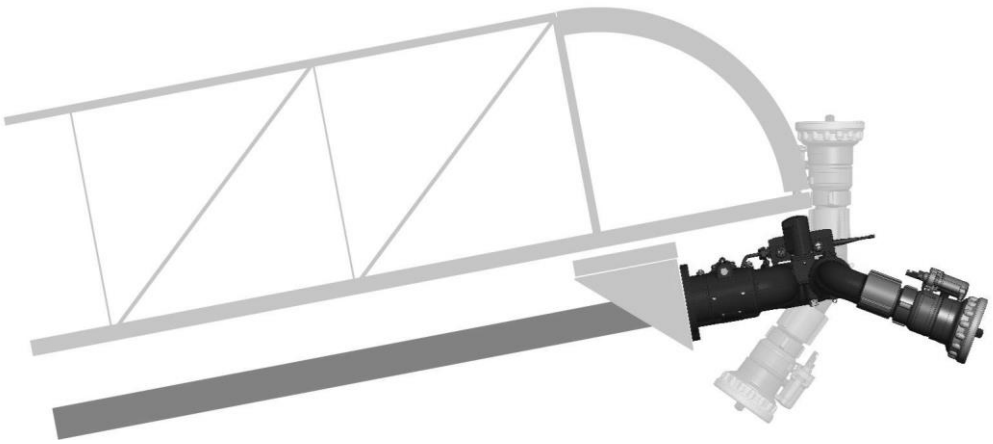


Figure 7
8500-01 EXT Monitor

C. RF Receiver/Control Module

The RF Receiver/Control Module uses a state-of-the-art PIC (Programmable Integrated Circuit) chip design. This device allows numerous control features while keeping circuit board size to a minimum. Relays within this box provide motor reversing control for the Up/Down, Left/Right and Straight Stream/Fog functions.

All functions are sent to the RF Receiver/Control Module via an encoded radio frequency link. The radio link reduces the number of control wires down to just the two power leads, dramatically simplifying the installation procedure. The link also allows wireless control from up to ¼ mile away using a battery powered handheld transmitter.

An encoder, part of the horizontal motor, provides horizontal motion control feedback. The encoder allows the user to set limits at any combination of angles on the Vulcan RF monitor. The counter in combination with the PIC controller enables the monitor to oscillate between limits that are set directly from the remote transmitter. No mechanical stops to adjust. The Vulcan RF aerial monitor does not have field programmable travel limits.

The encoder enables the PIC controller to remember a home or stow position. This stow position can be used as a storage position for the monitor during transport. Once the "Stow" feature is activated, the monitor will automatically return to the home or stow position.

The control system also provides secondary motor protection with the use of electronic current sensing circuitry. If the monitor encounters an obstruction before reaching a limit, this circuitry quickly senses motor stall current and automatically shuts off power to the motor. As soon as the control switch is released, the circuit resets to allow subsequent operation of the monitor.

⚠ Caution:
Any modification of the enclosure will destroy the NEMA 4 rating and will void the warranty coverage of the RF Receiver/Control Module.

The following additional functions/features are provided in the RF Receiver/Control Module:

Reverse Polarity Protection: If battery connections are reversed, this feature prevents power from being applied to circuits, and prevents damage to electronic components.

Circuit Board Moisture Protection: The circuit board and circuit components are protected from moisture by an acrylic resin conformal coating. All relays have sealed covers.

DC to DC Converter Function: An optional 24 to 12VDC converter board can be added to the RF receiver control module to allow 24 VDC power to the monitor. The converter will supply enough 12VDC power to the monitor to run all motors simultaneously. It is reverse voltage protected and meets SAE J1113-11 (Immunity to Conducted Transients on Power Leads) requirements.

D. RF Transmitters

The monitors use W.E.T. (Wireless Electronic Technology), an innovative wireless radio link, to send all commands from the RF transmitters to the RF Receiver/Control Module. With conventional electrically controlled monitors, the operator is forced to aim the discharge stream from directly behind the monitor or from the pump panel. An expensive and seldom used option is a tethered remote control. Here wires impede the maneuverability of the operator. This new wireless link gives the operator the ability to view the discharge stream and target from virtually any point of view from up to ¼ mile away from the monitor.

1. 81282001 Handheld Transmitter

(Figure 8) A sealed handheld remote contains all the controls necessary for operation of the monitor. The handheld remote allows the operator to direct the monitor from a significantly improved point of view. With the wireless remote, the operator can view the stream from the side and confirm that the stream is hitting its target. Separate push button switches are provided for up, down, left, right, fog, and stream functions. The handheld remote has user selectable frequency and security codes that allow multiple monitors to be operate on the same fire ground at the same time without interference. The remote has an automatic power down feature that will shut down the power after 5 minutes of no activity. As an additional power saving feature the radio signal is only transmitted while a button is pushed. The handheld remote case has a NEMA 4 rating.

Figure 8
81282001 Handheld Transmitter

2. 81327101 Primary Panel Mount Transmitter

(Figure 9) The fixed transmitter sends signals to the monitor via an encoded radio signal, requiring no wires between the transmitter and the monitor. It is powered by the vehicle electrical system. The faceplate is intended for a flush mount onto the pump or aerial ladder control panel. Separate sealed push button switches are provided for up, down, left, right, fog, and stream functions. This fixed transmitter provides a two-button Stow feature. It will override any secondary transmitters, allowing the apparatus operator to retain ultimate control over the monitor. Comes with 10 foot coax antenna cable and (1) 90° antenna and (1) straight antenna.

Figure 9
81327101 Primary Panel Mount Transmitter

3. 81327201 Secondary Panel Mount Transmitter

(Figure 10) The fixed transmitter sends signals to the monitor via an encoded radio signal, requiring no wires between the transmitter and the monitor. It is powered by the vehicle electrical system. The faceplate is intended for a flush mount onto the pump or aerial ladder control panel. Separate sealed push button switches are provided for up, down, left, right, fog, and stream functions. Comes with 10 foot coax antenna cable and (1) 90° antenna and (1) straight antenna.

Figure 10
81327201 Secondary Panel Mount Transmitter

4. 81353101 OEM Primary Transmitter

(Figure 11) The OEM transmitter allows the monitor installer to use their switching arrangement while still having the benefit of the W.E.T. It has all of the same features of the Primary Panel Mount Transmitter, but has a wiring harness for the installer to connect to the switches. Comes with 10 foot coax antenna cable and (1) 90° antenna and (1) straight antenna.

5. 81353201 OEM Secondary Transmitter

(Figure 11) The OEM transmitter allows the monitor installer to use their switching arrangement while still having the benefit of the W.E.T. It has all of the same features of the Secondary Panel Mount Transmitter, but has a wiring harness for the installer to connect to the switches. Comes with 10 foot coax antenna cable and (1) 90° antenna and (1) straight antenna.

Figure 11
81353101 and 81353201 OEM Transmitter

6. 81549001 Secondary Switch Box Control for Aerial Applications

(Figure 12) This component is a surface mount type switch box with controls for operation of the monitor for use with the OEM transmitter. Separate sealed toggle switches are furnished for up-down, left-right, and strt-fog functions. The box has a NEMA 4 rating. It is generally installed at the tip of the aerial ladder or in the bucket of the aerial platform. A terminal strip inside the enclosure allows for connection of the control cable, and a watertight strain relief fitting provides for sealing around the cable entry.

Figure 12
81549001 Secondary Switch Box Control

7. 81492001 Auxiliary Battery Pack

(Figure 13) A 12-volt, 12 amp-hr. sealed lead-acid battery pack is available to allow operation of the monitor in case of vehicle electrical system failure. A diode is included for protection. These battery packs are also used as a means to minimize the required size of conductors routed up aerial ladders and towers. This is accomplished by mounting the battery pack near the monitor, with a small trickle-charge conductor to the battery from the vehicle system.

Figure 13
81492001 Auxiliary Battery Pack

⚠ Caution:
Any modification of the enclosure will destroy the NEMA 4 rating and will void the warranty coverage of the Transmitter.

⚠ Caution:
Do not pinch wires when attaching back panel to front panel of enclosure of handheld control. Ensure all O-ring and gaskets are properly installed when closing receiver or controller enclosures.

IV. CONTROL SYSTEM SPECIFICATIONS

Handheld Transmitter Specifications

- Input power — 2 AA batteries (Lithium recommended)
- Output power — Meets FCC part 15 requirements for license free operation
- Transmitter dimensions — 6" x 3 1/4" x 1 3/8"
- Transmitter weight — 10 ½ oz.
- Operating temperature range — -40°F to 150°F (-40°C to 65°C)
- FCC ID — QT8PTSS2011

Transmitter Specifications

- Input power — 12/24 VDC (11VDC to 30 VDC)
- Output power — Meets FCC part 15 requirements for license free operation
- Transmitter dimensions — 7 5/8" x 3 7/8" x 2 3/8"
- Operating temperature range — -40°F to 150°F (-40°C to 65°C)
- FCC ID — QT8PTSS2011

Receiver Specifications

- Power requirements — W/O Converter Assembly 12VDC (11 to 14VDC)
With Converter Assembly (11-30VDC)
at the controller under full load
- Control current — 0.07 A*
- Operating temperature range — -40°F to 150°F (-40°C to 65°C)

Table 1
Motor Current Specifications

Monitor	Left/Right	Up/Down	Nozzle
Run I	3 A	3 A	0.5 A
Stall I	12 A	14 A	NA
Current Trip Point	12.5 A	8.0 A	4 A

Shock:

- 30 G's (55 Hz. @ .2 inch double amplitude)

Vibration:

- 15.5 G's (55 Hz. @ .05 inch double amplitude) continuous operation

Drop Test:

- The handheld transmitter must meet operating specifications after drop from 1-meter height onto concrete surface.

Environmental:

- All enclosures have a NEMA 4 rating (must withstand a 1 inch stream of water (65 gpm) from a distance of ten feet for five minutes, with no water entering the enclosure).

* All current ratings are at 12 volts

V. INSTALLATION INSTRUCTIONS

A. Component Mounting

1. Monitor

a) 3" NPT Base: Apply an appropriate thread sealant to the 3" NPT nipple. Thread the monitor base onto the nipple. Alignment of the base is not critical for the monitor, which is capable of 360º continuous motion for Vulcan RF's.

b) 3" 150# Flat Faced Flange: Attach a 3" 150 lb. class ANSI pattern companion flange to the water supply pipe. Elkhart Brass recommends using the 81315001 Companion Flange Kit. Attach the monitor inlet flange to the companion flange on the water supply pipe with four (4) 5/8-11 UNC grade 5 carbon steel or stainless steel bolts, 2-1/2 inches long, with nuts. Seal the flange joint with a gasket, or suitable flange sealant. Apply Loctite® #242 to the bolt threads, then thread on the nuts, and torque them to 60-70 ft-lbs uniformly in increments of approximately 20 ft-lbs.

c) 4" 150# Flat Faced Flange: Attach a 4" 150 lb. class ANSI pattern companion flange to the water supply pipe. Attach monitor inlet flange to companion flange on water supply pipe with eight (8) 5/8-11 UNC grade 5 carbon steel or stainless steel bolts, 2-1/2 inches long, with nuts. If a wafer type butterfly valve is installed between the monitor and the companion flange, required bolt length will be 4-1/2 inches. Seal flange joint with gasket, or suitable flange sealant. Most wafer type butterfly valves have seats that serve as flange gaskets, and separate gaskets or sealant is not required. Apply Loctite® #242 to bolt threads. Then, thread on nuts and torque to 60-70 ft-lbs.

Warning: The piping must be able to withstand a horizontal reaction force of at least 900 lbs at the height of the discharge elbow and from any angle of rotation that the monitor is capable of turning. Serious injury to personnel and equipment can result from improper installation.

Warning: When installing monitor on a raised face companion flange it is critical that bolts be tightened uniformly to prevent cocking of the monitor relative to the flange or valve. If the monitor becomes cocked, (see Figure 14) the monitor cast flange base will fracture and fail when the bolts on the "high" side are tightened.

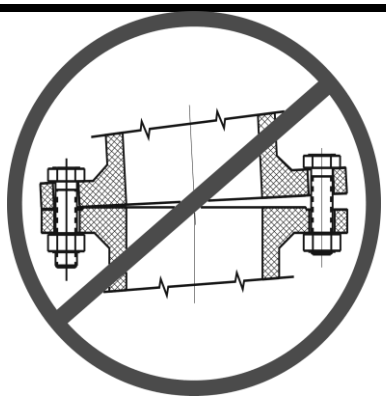


Figure 14
Improper Flange Installation

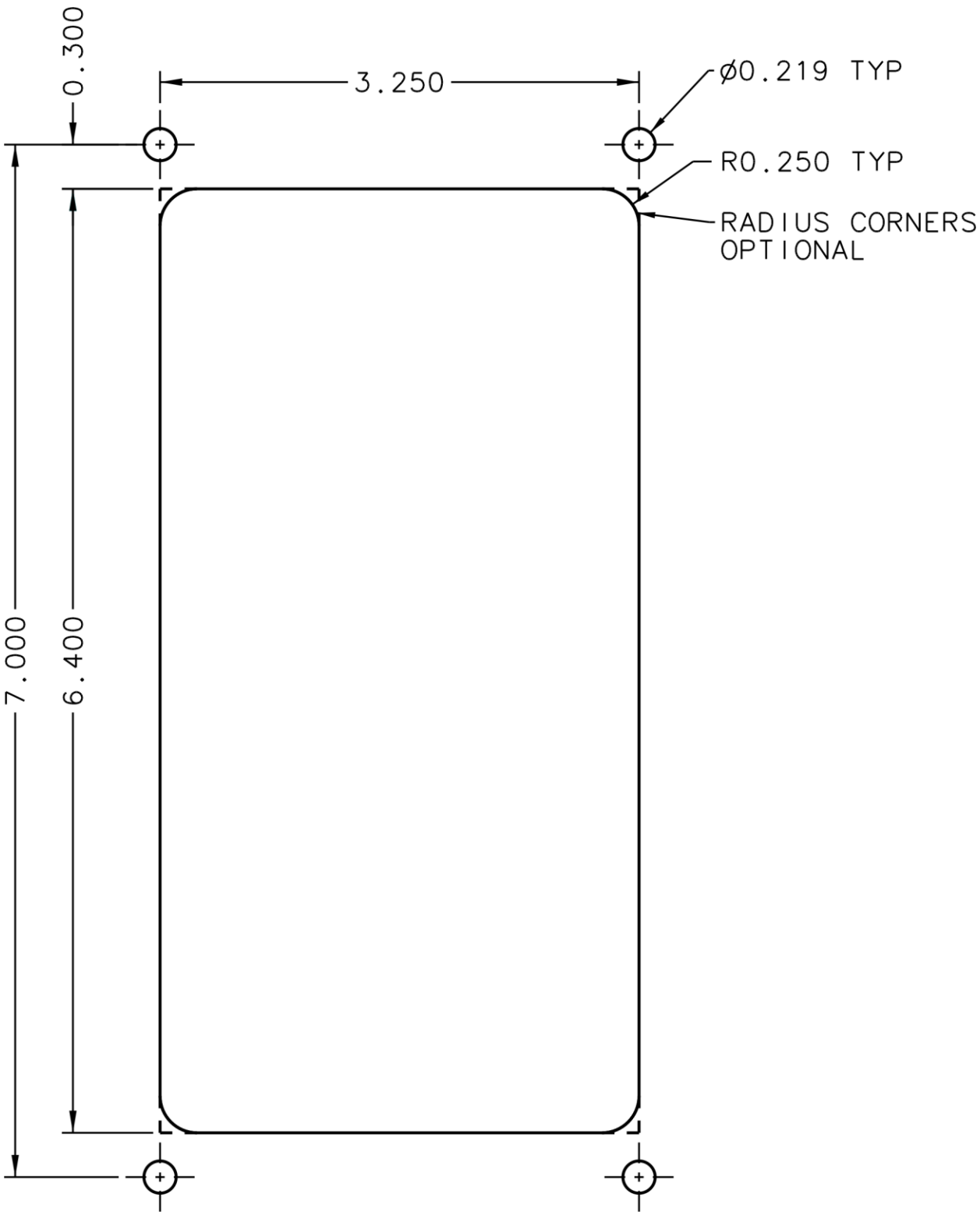


Figure 15
81327001 and 81327011 Fixed Transmitter Panel Template

2. Monitor Wiring

a) Place a 10A fuse between the red lead (Pin C)of the monitor and a switched positive power lead on the vehicle. Attach the black lead (Pin A) from the monitor base to the vehicle ground.

b) The white lead (Pin B) is for an optional "Stow indicator" which could be attached to a relay or LED supplied by the OEM. The circuit switches in a ground and is limited to 250 mA of current when the monitor is in a non-stowed position.

c) All control functions are sent to the monitor via an encoded RF signal from the transmitter; no control wiring is needed.

d) The 8500-01 EXT and 8593-01 EXT have a proximity sensor. The red wire (Pin C) supplies power. The black lead (Pin A) is ground. The white lead (Pin B) is a signal for the proximity sensor to show master stream versus an egress position.

3. 81327101 and 81327201 Panel Mount Transmitter

a) Mark the panel cutout and mounting screw pattern per dimensions in Figure 15

b) Cut a rectangular clearance opening and drill four ∅0.219" (7/32" drill) holes.

c) Insert fixed transmitter case through panel cutout. Secure the unit to the panel with four #10-32 screws. The length of the screws should be the panel thickness plus 3/16". The screws supplied are ¼" in length. Apply Loctite #242 to the threads of the screws before tightening them.

d) The transmitters antenna is to be mounted using the 10 foot antenna cable provided to locate one of the antennas outside the vehicle compartment in a position that provides the least obstructed line of sight to the monitor's antenna.

e) Place a 1A fuse between the red lead of the transmitter and a switched positive power lead on the vehicle. Attach the black lead from the monitor base to the vehicle ground.

f) All control functions are sent to the monitor via an encoded RF signal from the transmitter.

4. 81353101 And 81353201 Fixed Remote for Use with OEM Supplied Switches

a) Place a 1A fuse between the red lead of the transmitter and a switched positive power lead on the vehicle. Attach the black lead from the monitor base to the vehicle ground.

b) Connect all of the switch commons to the Ground (Black) connection.

c) Connect each function to a corresponding switch. To operate the function close the function switch to ground. Any combination of pushbuttons or toggle switches can be used.

d) Power indication can be created by attaching an LED and proper resistance between the VCC (+3 V) and Ground connections. Max rating for the VCC connection is 250 mA.

e) The transmitters antenna is to be mounted using the 10

Function	Wire Color
Ground	Black
VCC (+3 V) (Output only)	Red
Right	Brown
Down	Orange
Up	Yellow
Left	Green
Stream	Blue
Fog	Violet
Aux2	Gray
Oscillate	White
Aux1	White/Black
Stow	White/Brown

Table 2

foot antenna cable provided to locate one of the antennas outside the vehicle compartment in a position that provides the least obstructed line of sight to the monitor's antenna.

5. 81549001 Secondary Switch Box Control for Aerial Applications

a) Mark mounting holes on panel or bracket per dimensions in Figure 16.

b) Drill two 9/32" diameter holes in panel or bracket.

c) Remove 1/4-20 screws and lock washers from back of box. Insert screws with lock washers through backside of panel or bracket into mounting holes in box. Tighten screws.

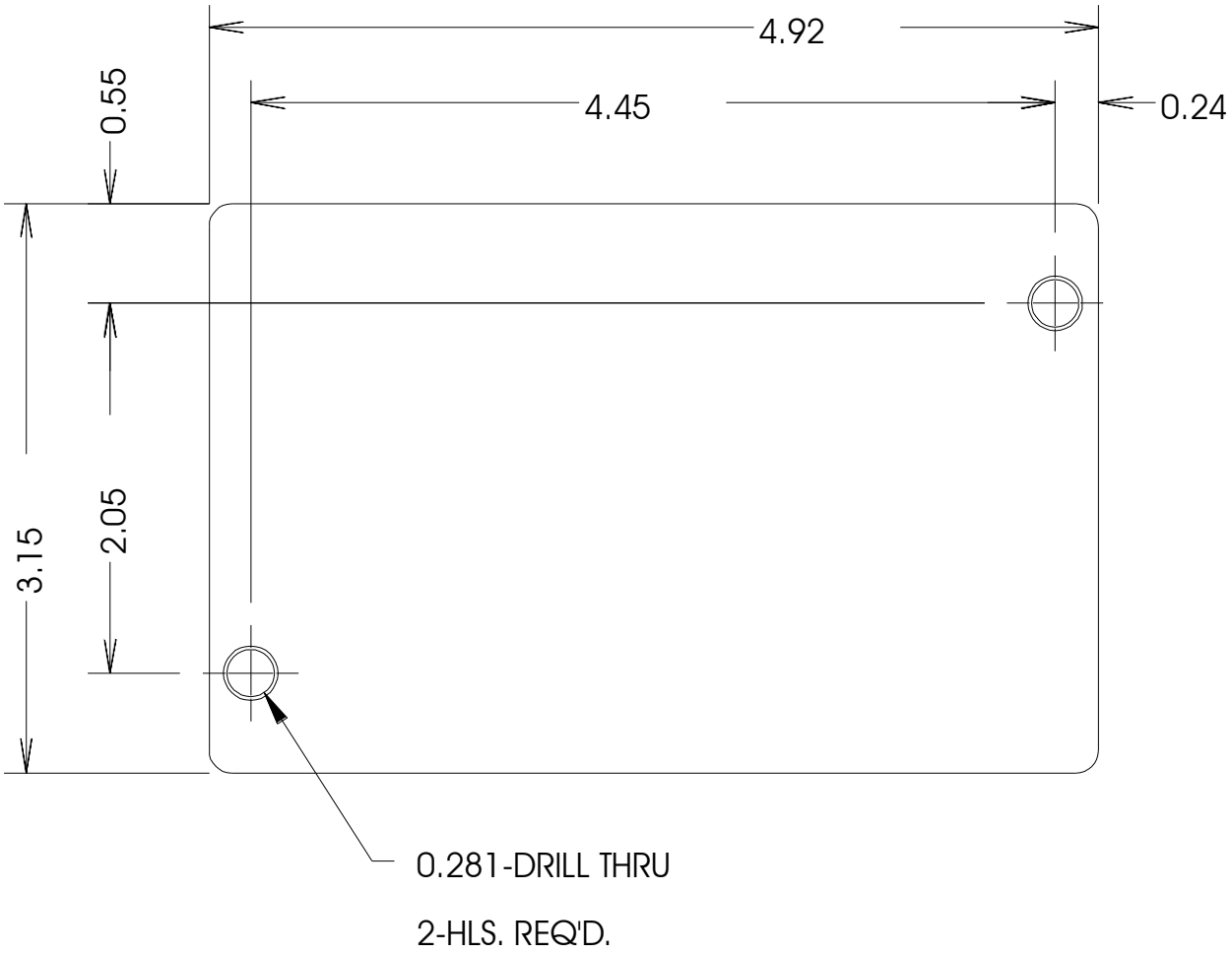


Figure 16
81549001 Secondary Control Switch Box Mounting Bolt Pattern

6. 81492001 Auxiliary Battery

a) Mark locations of mounting holes on mounting surface or bracket per Figure 17

b) Drill four (4) 21/64" diameter mounting holes.

c) Open hinged cover of battery enclosure by loosening the four screws. Insert one 5/16-18 UNC socket head cap screw from the inside of the enclosure through each of the four (4) mounting holes of the enclosure and into the corresponding holes in the

mounting surface or bracket. Assemble nuts and lock washers to each mounting screw then tighten.

d) The harness has the same wiring configuration as the monitor. See section V.A.2 Monitor Wiring.

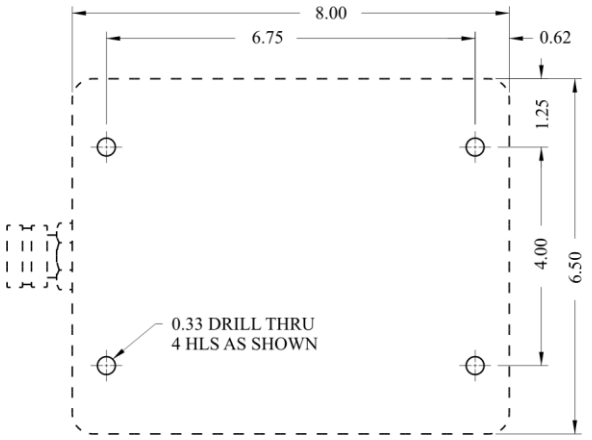


Figure 17
Mounting Hole Pattern

B. Communications Address Setup

A RF transmitter controls one 8500-01, 8500-01 EXT, 8593-01 or 8593-01 EXT monitor. The transmitter is digitally encoded with a 15-bit security code to ensure that it does not accidentally control the wrong monitor. The receiver decodes the incoming signal and instantaneously decodes and interprets commands provided the security codes match. The security code is a 15-bit selectable code that is set on both the remote transmitter and the receiver.

The monitors are tested and shipped with a security code based upon the monitor serial number, ensuring each monitor leaves the factory with a unique code assigned to it. The security settings will normally not need to be changed. In the case of a lost transmitter or replaced control board, contact Elkhart Brass.

Danger: Using two W.E.T. monitors with the same security code will cause the inadvertent control of the wrong monitor, resulting in possible property damage and injury to personnel. Using the factory specified codes will prevent this problem.

Caution:
Do not pinch wires when attaching back panel to front panel of the handheld enclosure. Ensure all O-ring and gaskets are properly installed when closing receiver or transmitter enclosures.

C. RF Settings

Caution: The RF Receiver/Control Module and all transmitters' communication addresses have been set at the factory. They should not require any additional address settings.

1. RF Receiver/Control Module Settings

Remove the cover from the RF Receiver/Control Module. SW4 (Figure 18) allows this board to be used in different product applications. In order for it to properly operate the RF monitors, it must be set to:

E	8500-01 Vulcan RF, 8593-01 Copperhead RF – Blink – Dash Panel Indicator Application
F	8500-01 Vulcan RF, 8593-01 Copperhead RF – NonBlink – Interlock Application
0	8500-01 EXT, 8593-01 EXT - Aerial Vulcan RF, Copperhead RF

If it is set to a value that is not yet programmed, the status LED, DS5 (Figure 18), will blink rapidly until a valid setting is selected and power is cycled off and back on. If SW4 is set to a valid setting but not one of the above positions, unpredictable results will occur.

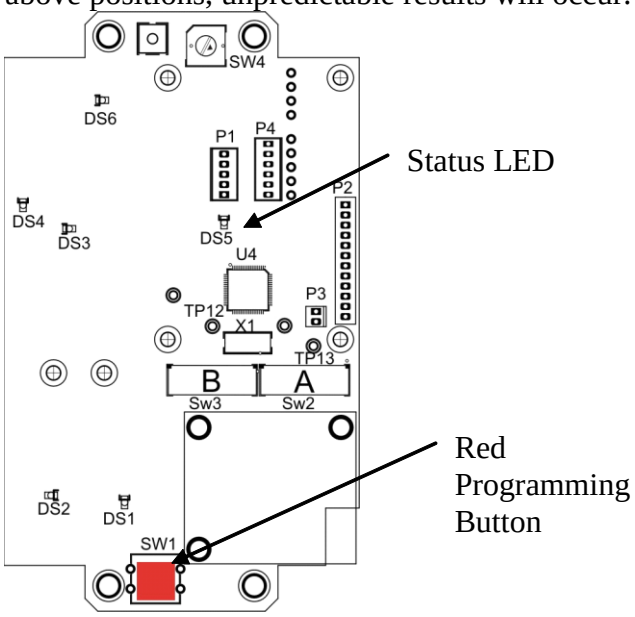


Figure 18
24263001 RF Receiver/Control Module Circuit Board Layout

2. 81282001 Handheld Transmitter Settings

a) Remove the battery cover from the handheld Transmitter. Remove the four screws holding the two halves of the cover together using a #1 size Pozidriv® screwdriver (use caution with a standard Phillips screwdriver as it may eventually strip the heads of the screws).

b) Locate the security code switches on the transmitter circuit board (see Figure 19).

c) Change the switches to match the settings of the RF Receiver/Control Module except switch A1. One incorrect setting will prevent the system from working.

d) Ensure the battery lead connector is securely fastened to the transmitter circuit board.

e) Check that no wires will be pinched, close the cover halves, and replace the screws. The screws should just be snug, do not over tighten the screws, or the plastic enclosure could strip

Caution: Do not change the switch A position 1 on any transmitter. This switch is used to set the priority setting of the transmitter and changing this switch may remove override capabilities.

Caution: While reassembling the handheld remote, ensure both battery and antenna leads do not become pinched.

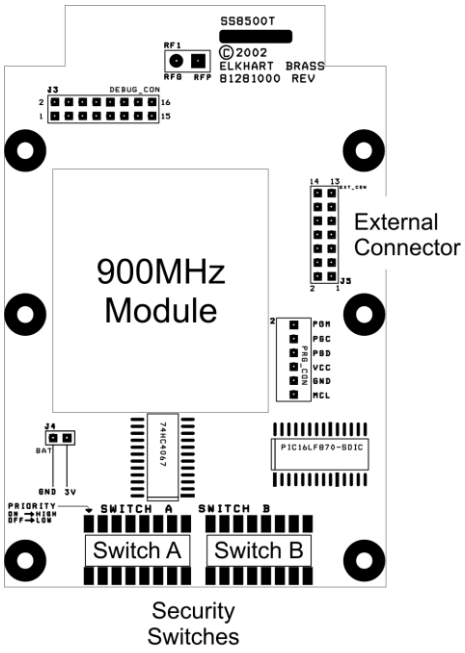


Figure 19
Transmitter Security Settings

3. 81327101, 81327201, 81353101 and 81353201 Secondary, Primary, Panel Mount, and OEM Transmitters

a) Disconnect the power connector to the transmitter.

b) Open the back cover of the transmitter after loosening the screws.

c) Remove the red and black power leads from the power conversion board and place the cover to the side.

d) Locate the security code switches on the transmitter circuit board (see Figure 19).

e) Change the switches to match the settings of the RF Receiver/Control Module except switch A1. One incorrect setting will prevent the system from working.

f) Reconnect the power leads. The Red lead is attached to the Positive (+) terminal; the black lead is attached to the Negative (-) terminal.

g) Close the transmitter cover and replace the screws.

h) Reconnect the power connector.

Keep this Installation Manual in a secure place so the settings can be retrieved if needed.

D. Limit Setup and Stow Position Programming

1. 8500-01 EXT, 8593-01 EXT

Left-right travel limits are not programmable in the 8500-01 EXT and 8593-01 EXT monitors. Monitor can be rotated 90E left or 90E right of straight ahead. Stops are mechanically fixed by a stop screw and milled slot in base. Stop screw must remain in place in monitor base.

The red programming button on the main control circuit board, normally used to program left-right stops and stow position, does not provide any function on the extended travel monitors.

The 8500-01 EXT and 8593-01 EXT monitors does not allow for user selectable stow position. Activating the stow function causes the monitor to rotate to the straight-ahead position with the discharge at 0E elevation.

2. 8500-01, 8593-01

The 8500-01 and 8593-01 monitors can be operated with or without limits. The monitor is shipped from the factory with the horizontal limits cleared from memory and oriented to the stow position. The vertical limits are provided by magnets placed in the monitor at assembly and are not adjustable.

Caution: To prevent damage to the monitor controller, keep all metallic objects away from the control module circuit board while it is energized. Ensure all O-ring and gaskets are properly installed when closing receiver or controller enclosures.

a) Open the controller enclosure that is mounted on the monitor.

b) Supply power to the monitor.

c) To program the stow position with limits, perform the following six steps

Caution: When setting the limits on a top-mount pumper, keep the monitor's range of motion away from the control area. A firefighter with the handheld transmitter could inadvertently cause the monitor to strike the pump operator.

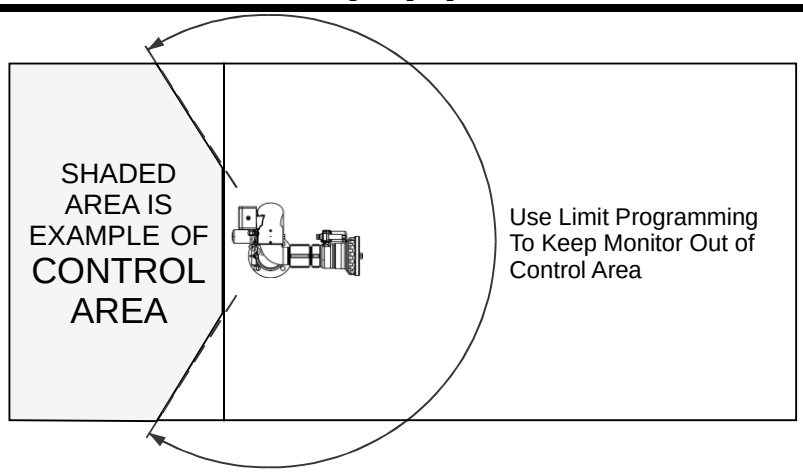


Figure 20
Top Mount Pumper

NOTE – All six programming steps must be completed otherwise the changes will not be stored to permanent memory!

(1) Hold the Red Programming Button (see Figure 18) on the controller board until the programming LED flashes on (approx 5 seconds).

(2) To set the left hand limit run the monitor left until it has reached the desired position. Quickly press and release the Red Programming Button. The programming LED will flash once to acknowledge the new limit position.

(3) To set the right hand limit run the monitor right until it has reached the desired position. Quickly press and release the Red Programming Button. The programming LED will flash twice to acknowledge the new limit position.

(4) To set the left/right stow position of the monitor, move the monitor to the desired position. (Note – The stow position must be between the right and left limits that were just programmed in the previous two steps.) Quickly press and release the Red Programming Button. The programming LED will flash rapidly several times to acknowledge the new stow position.

(5) To program the vertical stow position set switch A position 1 to "ON" for stow up or to "OFF" for stow down (<u>Receiver only</u>). NOTE: The up/down stow position will either be all the way up or all the way down, nowhere in between.

(6) Remove power from the monitor for a minimum of 5 seconds. Reapply power and operate the monitor to verify that the travel limits are at the correct positions and that the monitor stows correctly.

Caution: Limits should be verified to be correctly set after the limits have been programmed. If the monitor does not stop at the programmed limit positions then re-program the limits. Checking limits should be part of normal truck maintenance.

d) To set the stow position without limits perform the following six steps (Note: – Do not move the monitor at all while performing these steps. Doing so may inadvertently program limits!)

NOTE – All six programming steps must be completed otherwise the changes will not be stored to permanent memory!

(1) Move the monitor to the left/right stow position. Hold the Red Programming Button (see Figure 18) on the controller board until the programming LED flashes on (approx 5 seconds).

(2) Press and release the Red Programming Button on the controller board again. The programming LED should flash once.

(3) Press and release the Red Programming Button again. The programming LED should flash twice.

(4) Press and release the Red Programming Button a fourth time. The programming LED should flash rapidly several times. (NOTE - There are no limits stored in memory at this time and the monitor is capable of rotating 360º)

(5) To program the vertical stow position set switch A position 1 to "ON" for stow up or to "OFF" for stow down (Receiver only). NOTE: The up/down stow position will either be all the way up or all the way down, nowhere in between.

(6) Remove power from the monitor for a minimum of 5 seconds. Reapply power and operate the monitor to verify that the monitor will rotate 360º continuously and stows correctly. (If the unit does not perform correctly repeat steps 1 through 6.)

Keep this Installation Manual in a secure place so the settings can be retrieved if needed.

VI. OPERATING INSTRUCTIONS

A. Normal Operation

The 8500 RF and 8593 RF Monitors use the standard Left/Right, Up/Down, and Fog/Stream commands to provide stream direction and pattern adjustments. The controller provides an automatic speed adjustment to allow the user better directional control. During normal operation, the left-right motor will move slowly for about two seconds before accelerating to full speed. This allows the user to be able to position the monitor quickly but also gives the fine control needed to aim the monitor accurately at a distant target.

a) To move the monitor left or right, press and hold the left or right button until the monitor discharge is in the correct position or a programmed limit is reached. The motors will begin to turn the monitor slowly and then accelerate to full speed after a couple of seconds. If any of the vertical or nozzle buttons are selected while the horizontal motion is in slow speed or if a horizontal button is pressed simultaneously with them, the left/right motor will immediately go to high speed until the monitor stops moving. Then the unit will revert to normal operation.

b) To move the monitor up or down, press and hold the up or down button until the monitor is in the desired position or a hall sensor is reached.

c) To adjust the stream pattern, press and hold the fog or stream button until the desired stream pattern is reached. Elkhart electric nozzles have a unique ball screw drive which when it reaches the extents of travel will continue spinning until the button is released.

Any combination of left or right and up or down can be used to achieve motion in both horizontal and vertical directions simultaneously. If the left and right buttons are pressed at the same time, the monitor will stop all motion. To continue motion, release both buttons and repress the desired direction button. This is also true for the up/down and fog/stream commands.

The handheld remote transmitter has a power saving feature that turns the transmitter power off if no signal is sent for 5 minutes. Press and hold the "ON/OFF" button until the Power LED illuminates to reactivate the transmitter. The "Low Battery" LED will flash slowly when the battery voltage drops below a predetermined level. When the low battery LED flashes rapidly, the batteries are nearly discharged and should be replaced immediately.

B. Oscillation Function

The monitors have an automatic left/right oscillation function, which can be used to provide continuous exposure protection with no operator input. The oscillation limits are set using the handheld or truck mount transmitters. The motor two-speed feature is turned off during oscillation and the monitor will oscillate back and forth at full speed.

a) Position the monitor at either the left or the right limit of oscillation.

b) Press and hold the oscillate button.

c) Move the monitor to the other limit of oscillation. Release the direction button

d) Release the oscillate button.

e) Press and release the oscillate button to engage the oscillation function.

f) The monitor will oscillate between the limits until the oscillation button is pressed again. Pressing the left or right button on one of the controls will also stop the oscillation.

For safety reasons, once oscillation has stopped the oscillation limits need to be reprogrammed before it can be re-engaged. The nozzle fog, stream, and discharge elevation functions can be operated while the monitor is oscillating.

C. Manual Override

In the event of power failure to the monitor, the motors may be manually activated. To operate a function manually, simply apply a ¾" ratcheting type wrench (either socket type or ratcheting box end type) to the hex fitting on the motor shaft.

⚠ Warning:

Using the horizontal override nut when the power to the control module is off or the horizontal motor is disconnected will move stow position from its original programmed position. See section titled Limit Setup and Stow Position Programming to realign stow position even if stow feature is not utilized.

⚠ Caution:

Do not use impact drivers to operate manual override nuts. Serious damage to motor gear heads will result.

***Note:** The SM-1250E and SM-1250BE nozzles have a unique ball screw drive that allows the motor to "free wheel" at the end of pattern travel in either the straight stream or wide fog positions. No slip clutch or current limiting feature is used with the nozzle drive.

D. Storing the 8500 and 8593 Monitor

Elkhart Brass recommends that a stow position be set and the stow routine be utilized to place the monitor in it stowed position after each use.

The monitors have a user selectable stow position (see V.DLimit Setup and Stow Position Programming for setting instructions). After the water supply to the monitor has been turned off, the operator can simultaneously press the "Stow" and "Fog" buttons on the primary panel mount Transmitter (buttons must be held down for a minimum of 3 seconds). The monitor will automatically rotate to the stow position previously programmed and either lower or raise the discharge to 45° below or 90° above horizontal (depending on the position of switch A position 1 on the receiver board). The optional "stow indicator" will turn off after monitor reaches stow position. The OEM primary transmitter will operate using the same inputs as listed for the primary panel mount transmitter provided the necessary switches are wired.

The 8500-01 EXT and 8593-01 EXT monitors do not allow for user selectable stow position. Activating the stow function causes the monitor to rotate to the straight-ahead position with the discharge at 0E elevation

Warning:

Never activate the "Stow" feature while water is flowing. Serious injury to personnel and damage to apparatus could result.

Any directional command (left, right, up, or down) will cancel the "stow" command. To continue the command, reactivate the "Stow" feature.

VII. MAINTENANCE & INSPECTION

A. Monitor

1. Preventative Maintenance

The complete monitor and control system should be inspected during each apparatus check. Careful inspection for damage to the monitor or nozzle is especially important after use in emergency operations.

a) Operate each function (left-right, up-down, stream-fog, stow) with each of the transmitters.

b) Remove nozzle and check for debris lodged between the nozzle stem and body, or in the stream shaper inlet. Remove debris.

c) During nozzle flow test, inspect monitor swivel joints for leaks.

d) With the water off, operate the stow function, looking for any possible obstructions and check the final stow position.

e) Inspect all exposed wiring for signs of damage.

Note: Although grease fittings are provided for the up-down and left-right gear cases, routine greasing should not be necessary. If the monitor is exposed to a high level of radiant heat for a prolonged period, it may be possible for the factory grease to thin and run out of the gear cases. In such an event, fresh grease should be applied.

Caution: Always check stow position after any repairs to the monitor. It is possible that during repair work stow position could be moved or lost and will need to be reprogrammed. If necessary, reprogram stow position by following the instructions in Section V.D.

2. Understanding the Controller LEDs

LED Notations
DS1 (Figure 18) - Lights when either nozzle direction is engaged.
DS2 (Figure 18) – Lights when either of the AUX buttons are pushed.
DS3 (Figure 18) – Comes on when the UP or the DOWN button is depressed.
DS4 (Figure 18) – Comes on with any horizontal movement.
DS5 (Figure 18) – See Table 3
DS6 (Figure 18) – Lights when power is applied.

Table 3
DS5 Status Indicator LED (Indication VS. Meaning)

Reference	Indication	Meaning
1	Light comes on for 1 second when monitor stops	Motor has reached stall current and performing normal shutdown
2	Blinks three times after pressing and holding red programming button for >5 seconds	Limit/stow programming sequence initiated. Note: This must be completed before normal monitor operation is allowed.
3	Blinks 3 times at 1 second rate during startup	Visual indication that the controller is initializing – normal operation
4	Blinks 2 times at 1 second rate during startup then blinks at ¼ second rate continuously	SW4 (Figure 18) in wrong position – must be in position E for proper Vulcan RF, Copperhead RF operation or 0 for Vulcan RF EXT, Copperhead RF EXT
5	Blinks at ½ second rate	Truck battery voltage <8 volts - light will blink until power is lost or is restored – early power fail (EPF) indication

B. Handheld Transmitter

1. Battery Type

The handheld transmitter uses two AA batteries. Lithium batteries are recommended. The low battery light will illuminate with approximately two hours of transmission time remaining before the batteries are completely discharged. Due to the time-voltage characteristics of rechargeable batteries, this time could be drastically reduced if rechargeable batteries are used.

2. Replacing the Battery

The batteries can be replaced with any standard fresh AA lithium batteries.

a) Turn the transmitter power off.

b) Remove two screws and the battery cover.

c) Remove the old AA batteries.

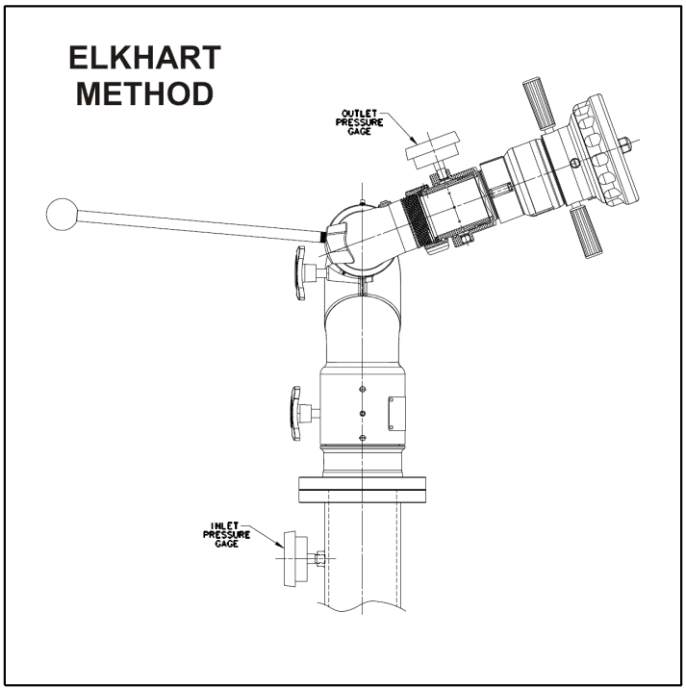
d) Insert the new AA lithium batteries.

e) Replace the battery cover using the screws.

VIII. MONITOR & STREAM SHAPER

1. Interpreting Flow Data

The following graphs offer the pressure losses for the monitor (and other devices) in terms of Total Static Pressure Drop. This Total Static Pressure Drop can be found by measuring the difference between the static inlet pressure and the static outlet pressure. The static pressure at either of these points can be found using a simple pressure gauge. An illustration of this method can be seen below.



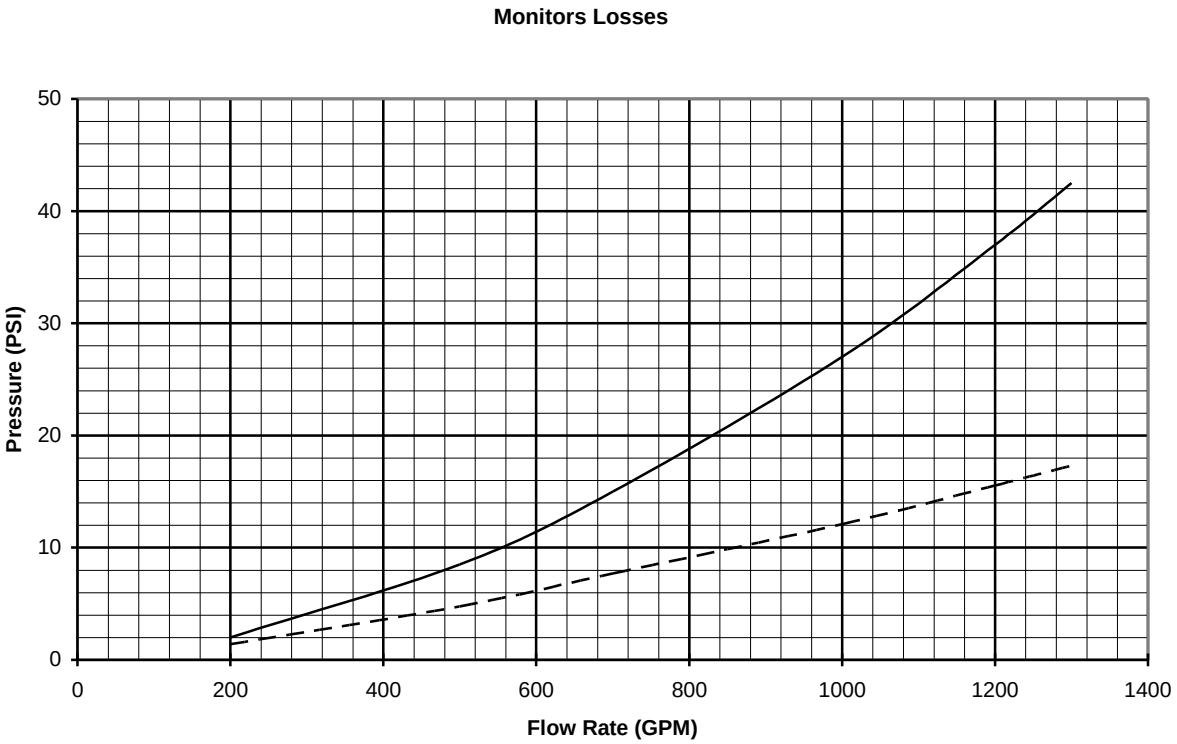
In mathematical terms, the Total Static Pressure Drop is the change in Velocity Pressure plus Friction Loss. The change in Velocity Pressure results from the change in velocity of water caused by the change in the cross section of a waterway. Friction Loss results from the drag and sidewall interference of the water through a device. A simple equation can be seen below.

$$\Delta P_S = H_F + \Delta P_V$$

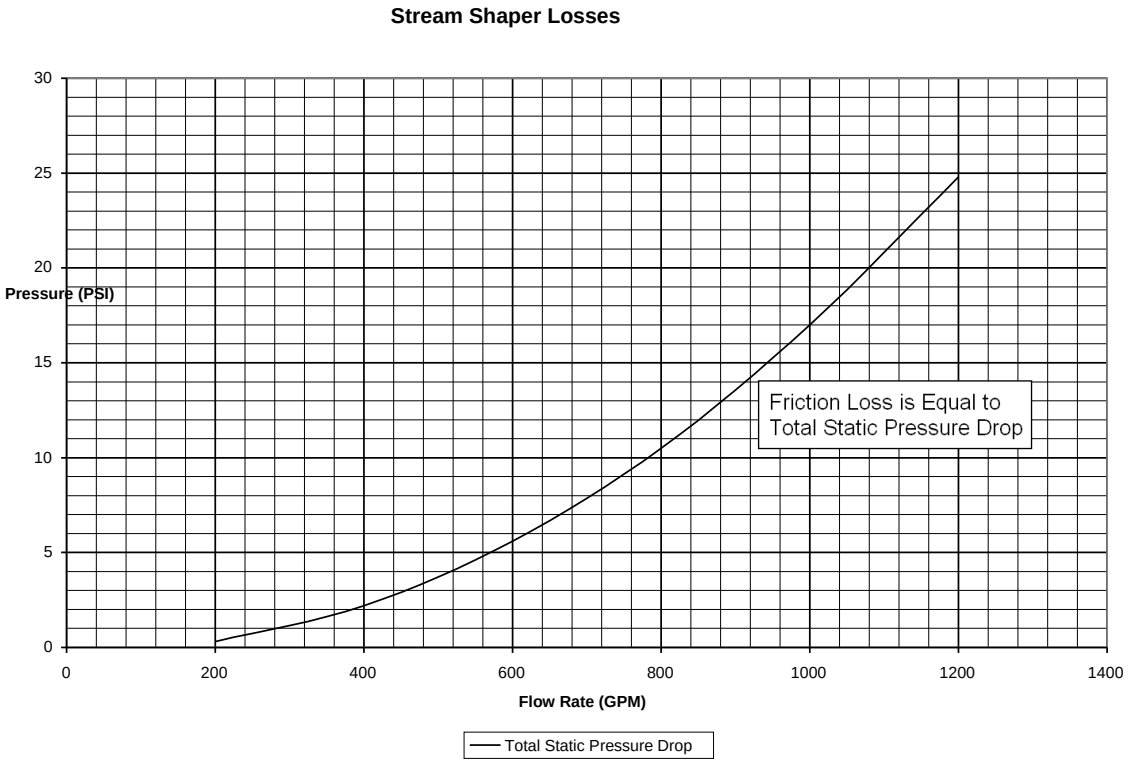
ΔP_S = Total Static Pressure Drop
H_F = Friction Loss
ΔP_V = Velocity Pressure Loss

In the firefighting industry, the terms Total Static Pressure Drop and Friction Loss tend to be used interchangeably. However, these are significantly different measurements. This misconception could ultimately lead to lower than anticipated performance from equipment. **When designing a system and determining performance, Total Static Pressure Drop is the value that should always be used.** The Friction Loss curve is also supplied in order to make a comparison with competitor products that may only supply Friction Loss curves. If there are any further questions regarding this matter, please contact Elkhart Brass.

2. Monitor and Stream Shaper Hydraulic Data



Friction Loss for Monitor



Elkhart Brass Mfg. Co., Inc.
Mailing Address:
P.O. Box 1127
Elkhart, IN 46515 USA
Shipping Address:
1302 W. Beardsley Ave.
Elkhart, IN 46514 USA
Tel. 1-574-295-8330
1-800-346-0250
Fax 1-574-293-9914
e-mail: info@elkhartbrass.com

www.elkhartbrass.com