



Stevens® Type A/F Encoder

For Stand-Alone Encoder Part # 90043
AND Encoder Attachment Part # 44903

INSTRUCTION 90044

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Safety and Equipment Protection

WARNING!

ELECTRICAL POWER CAN RESULT IN DEATH, PERSONAL INJURY OR CAN CAUSE DAMAGE TO EQUIPMENT.

If the instrument is driven by an external power source, disconnect the instrument from that power source before attempting any repairs.

WARNING!

BATTERIES ARE DANGEROUS. IF HANDLED IMPROPERLY, THEY CAN RESULT IN DEATH, PERSONAL INJURY OR CAN CAUSE DAMAGE TO EQUIPMENT.

Batteries can be hazardous when misused, mishandled, or disposed of improperly. Batteries contain potential energy, even when partially discharged.

WARNING!

ELECTRICAL SHOCK CAN RESULT IN DEATH OR PERSONAL INJURY.

Use extreme caution when handling cables, connectors, or terminals; they may yield hazardous currents if inadvertently brought into contact with conductive materials, including water and the human body.

CAUTION!

Be aware of protective measures against environmentally caused electric current surges. In addition to the previous warnings and cautions, the following safety activities should be carefully observed.

Children, Adolescents

NEVER give batteries to young people who may not be aware of the hazards associated with batteries and their improper use or disposal.

Jewelry, Watches, Metal Tags

To avoid severe burns, NEVER wear rings, necklaces, metal watch bands, bracelets, or metal identification tags near exposed battery terminals.

Heat, Fire

NEVER dispose of batteries in fire or locate them in excessively heated spaces. Observe the temperature limit listed in the instrument specifications.

Charging

NEVER charge "dry" cells or lithium batteries that are not designed to be charged. NEVER charge rechargeable batteries at currents higher than recommended ratings.

NEVER recharge a frozen battery. Thaw it completely at room temperature before connecting charger.

Unvented Container

NEVER store or charge batteries in a gas-tight container. Doing so may lead to pressure buildup and explosive concentrations of hydrogen.

Short Circuits

NEVER short circuit batteries. High current flow may cause internal battery heating and/or explosion.

Damaged Batteries

Personal injury may result from contact with hazardous materials from a damaged or open battery. NEVER attempt to open a battery enclosure. Wear appropriate protective clothing, and handle damaged batteries carefully.

Disposal

ALWAYS dispose of batteries in a responsible manner. Observe all applicable federal, state, and local regulations for disposal of the specific type of battery involved.

NOTICE

Stevens makes no claims as to the immunity of its equipment against lightning strikes, either direct or nearby.

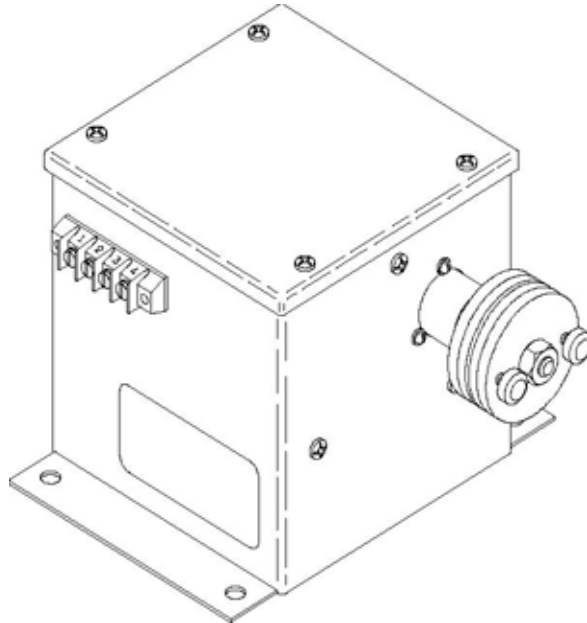
The following statement is required by the Federal Communications Commission:

WARNING - This equipment generates, uses, and can radiate radio frequency energy and, if not installed in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

USER INFORMATION

Stevens makes no warranty as to the information furnished in these instructions and the reader assumes all risk in the use thereof. No liability is assumed for damages resulting from the use of these instructions. We reserve the right to make changes to products and/or publications without prior notice.

1 Introduction



Stevens A/F Encoder

1.1 GENERAL DESCRIPTION

The Stevens[®] Type A/F Encoder is an input device sensor for the primary purpose of encoding water level or shaft position. The Encoder can be supplied in a standalone enclosure with a float pulley input shaft, where there is no associated chart recorder (see Figure 1, page 8). Housed in a protective metal enclosure supplied with mounting brackets for mounting directly to the input shafts of existing Stevens Type A or Type F chart recorders. The Encoder input shaft accepts standard Stevens float pulleys for either beaded float line or perforated tape, and would normally be installed in a gage house over a float well. Installation of the standalone version of the Encoder is described in Section 2.1 of this manual. Installation of Encoder Attachment is described in section 2.2 and 2.3 of the manual.

1 Introduction

The basic encoding device is an incremental optical encoder, which transforms the rotating mechanical input to a quadrature type of electrical output signal. This signal is brought out of the enclosure through a 4-conductor cable which is retained by a weather-tight cable clamp. Connections to the cable wires are easily made to the screw-clamped type of barrier strips on the Loggers, using only a flat-bladed screwdriver. Other receiving instruments may be used, if their inputs can be scaled to the Encoder output.

The Type A/F Encoder generates a “quadrature” signal, which means there are four (4) states that this device can be in. Transitions from one state to the next is well defined so that the pulses can be translated into rotation movement.

1.2 SAFETY INFORMATION

Before performing any procedure in this manual, read all applicable warnings and cautions.

1.3 FLOAT WELLS AND INSTRUMENT SHELTERS

Information on suitable float wells and instrument shelters can be found in the Stevens Water Resources Data Book, any edition.

1.4 TYPE A/F ENCODER SPECIFICATIONS

Input, Standalone: Shaft, supported by ball bearings and threaded for Stevens float pulley clamping hardware; the shaft drives the internally-mounted encoder; the pulley, float, float tape or line and clamping hardware are optional.

Type A/F Encoder, basic: Incremental optical disc and electronics assembly in sealed enclosure; encoder input shaft is threaded onto recorder input shaft; float pulley load is not transferred to encoder.

Output: Two 5 volt signals in quadrature, with 100 states (400 transitions) per input shaft revolution.

The output of a quadrature encoder is a two-bit gray code, specifically it has the sequence 00 01 11 10 00.

More specifically, if the output is 00 and it goes to 01, you know that the encoder has moved one “tick” clockwise. If it is 00 and goes to 10 then you know it moved one tick counter clockwise. If it goes from 00 to 11 you know you missed an intermediate tick. It can be useful to flag this case so that you know your input isn’t accurate, but generally it is safe to ignore it as if the knob didn’t move.

1 Introduction

Power: 5 volts direct current \pm 10% at 17 mA typical in continuous power mode; 3.5 mA typical when sampled by Stevens Logger.

Cable: Power and signal output connections are made to a 4 conductor, shielded 5.5 foot cable; conductor size #22 AWG stranded wire.

Acceleration: 250.000 rad/sec²

Shaft Speed: 10,000 RPM max, continuous

Shaft Torque: 0.05 inch-ounce max.

Enclosure Standalone (Part # 90043): Aluminum, protected by polyurethane paint; 5.4 in high x 7 in wide x 7.4 in deep (137 x 178 x 188 mm), exclusive of float pulley.

Enclosure, A/F Encoder Attachment (Part # 44903): Aluminum, protected by polyurethane paint; 2.45 in high x 2.2 in wide x 1.3 in deep (62.23 mm x 55.9 mm x 33 mm), exclusive of cable, cable clamp or input shaft bearing assembly.

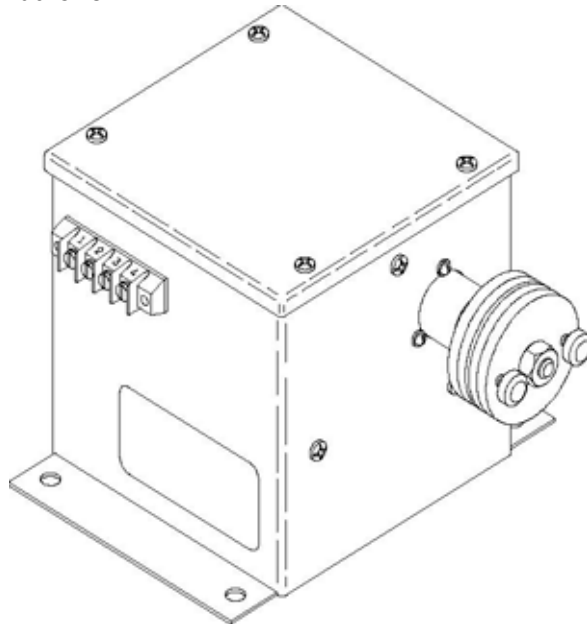
Weight, Standalone: 2 lb (0.91 kg).

Weight, basic encoder: 0.5 lb (0.23 kg).

Operating Temperature: -40 to +160° F (-40 to +71° C).

2 Installation

2.1 Type A/F Encoder, standalone



Reference: Figure 1

2.1.1 Recommended equipment and tools:

- Standalone A/F Encoder
- Float pulley, float and counterweight
- Float tape or beaded float line with end hooks
- Screwdriver or wrench, as required to install Encoder on mounting surface
- Flat-bladed screwdriver for connecting wires to data logger connector
- 1/2 inch socket wrench for hex nut on float pulley shaft
- Tools required for cutting clearance holes in mounting surface for float tape or line, and for cutting stainless steel float tape or line
- Guide pulley and mounting hardware, if used
- Four 1/4 inch (6 mm) diameter mounting screws or machine screws and nuts
- Associated Logger and recommended tools for installation

2.1.2 Installation procedure

a. Mount the float pulley on the Encoder. Remove the clamping hardware from the input shaft and install parts in the following order:

- The float pulley
- The cupped washer (cupped side toward the Encoder)
- The clamping disc; tighten the right and left-hand clamping screws evenly against the cupped washer in the directions indicated by the stamped arrows
- The hex nut; tighten moderately with a socket wrench

b. Position the Encoder so that when the float tape or line is connected to the float and counterweight, they will freely pass each other and the sides of the stilling well throughout the operating range.

c. Mark the locations of the mounting hardware on the mounting surface, through the (4) holes in the mounting flanges. Also mark the (2) clearance holes on the mounting surface where either float tape or line would hang straight down off the sides of the float pulley. This will work for small pulleys, such as 18 inch or 375 mm. With larger pulleys, it may be necessary to cut a slot to clear the float pulley. Also determine the location of the guide pulley, if used.

2 Installation

d. Remove the Encoder and cut or drill the appropriate holes or slots. Place the Encoder back in position and mount it firmly with 1/4 inch (6 mm) hardware. Mount the guide pulley, if used.

e. Cut the float tape or line to the appropriate length and mount a float hook on each end. Connect the float to one hook and the counterweight to the other. Hang the float tape or line over the float pulley, engaging the tape with spines or the beaded line with depressions in the pulley. This completes the physical installation.

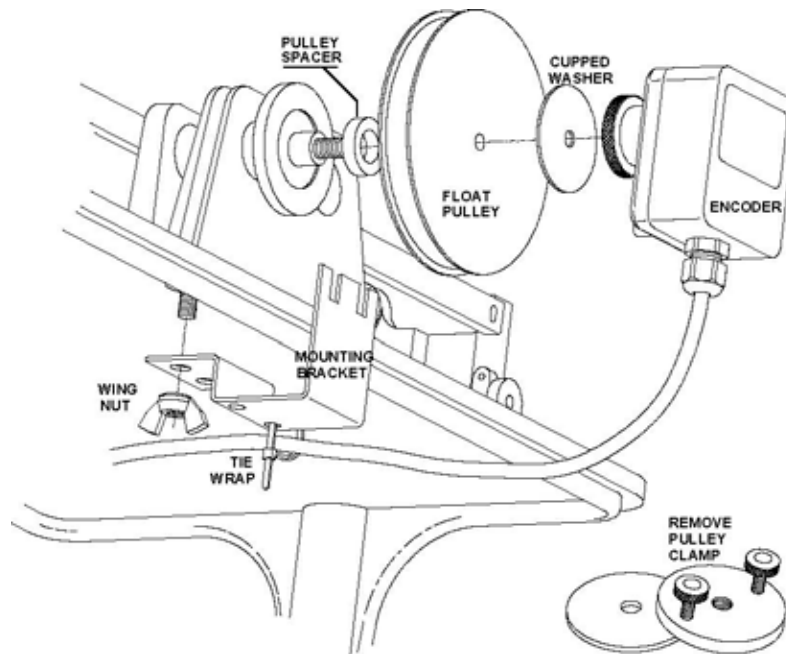


Figure 2 Installation on the Type A Recorder

2.2 Type A/F Encoder on Type A Recorder

Reference: Figure 2

2.2.1 Recommended equipment and tools:

- Basic A/F Encoder installation kit for Type A Recorder

2.2.2 Installation Procedure:

- Remove the cable/tape from the float pulley on the Recorder.
- Remove the float pulley nut, float pulley clamp, cupped washer and float pulley. You may wish to save the nut and washer for future use.
- Remove the wingnut from beneath the Recorder (under the pulley shaft). Install the Encoder bracket and replace the wing nut.
- Install the pulley spacer provided in the kit.
- Position the float pulley on the Recorder pulley shaft; the pulley actually fits inside the installed bracket.
- Install the new cupped washer from the kit (cup towards Recorder).
- Begin threading the Encoder onto the Recorder pulley shaft.
- Engage the lock pin at the base of the Encoder in the slot of the mounting bracket.

2 Installation

- i. Use only your fingers to firmly tighten the knurled aluminum disk of the Encoder onto the Recorder pulley shaft.
- j. Secure the cable from the Encoder to the bracket with a tie wrap. Leave a little slack between the tie wrap and the Encoder. The cable may be fastened to a Recorder leg for additional strain relief.
- k. Re-install the float cable/tape on the Recorder float pulley. This completes the physical installation.

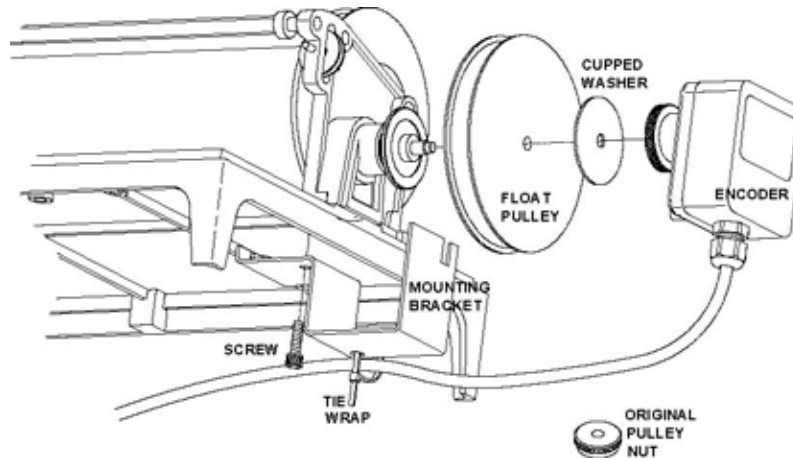


Figure 3 Installation on the Type F Recorder 6 90044

2.3 Type A/F Encoder on Type F Recorder

Reference: Figure 3

2.3.1 Recommended equipment and tools:

- Basic A/F Encoder installation kit for Type F Recorder

2.3.2 Installation Procedure:

- a. Remove the cable/tape from the float pulley on the Recorder.
- b. Remove the float pulley nut, cupped washer and float pulley. You may wish to save the nut and washer for future use.
- c. Remove the screw from beneath the Recorder (under the pulley shaft), using the Allen wrench in the installation kit. Install the Encoder bracket and replace the screw.
- d. Position the float pulley on the Recorder pulley shaft; the pulley actually fits inside the installed bracket.
- e. Install the new cupped washer from the kit (cup towards Recorder).
- f. Begin threading the Encoder onto the Recorder pulley shaft.
- g. Engage the lock pin at the base of the Encoder in the slot of the mounting bracket.
- h. Use only your fingers to firmly tighten the knurled aluminum disk of the Encoder onto the Recorder pulley shaft.

2 Installation

- i. Secure the cable from the Encoder to the bracket with a tie wrap. Leave a little slack between the tie wrap and the Encoder. The cable may be fastened to a Recorder leg for additional strain relief.
- j. Re-install the float cable/tape on the Recorder float pulley. This completes the physical installation.

2.4 Electrical Installation

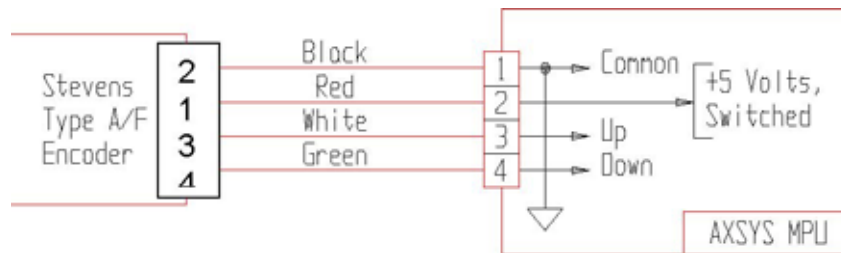
2.4.1. If not already done, remove approximately 2 inches (50 mm) of the outer electrical cable insulation, taking care not to damage the insulation on the individual wires. Strip 1/4 inch (6 mm) of insulation from each wire.

2.4.2. There are four insulated wires and a bare shield wire on the available end of the cable. The wire colors, the barrier strip reference numbers for the stand alone unit, and their functions are as follows:

- (1) Red: +5 volts direct current power input to Encoder
 - (2) Black: Power and signal common
 - (3) White: Signal (1) output
 - (4) Green: Signal (2) output
- Shield: To Logger ground or common connection

2.4.3. Disconnect the power source of the associated Logger, insert each wire into the appropriate wire tunnel on the Logger input connector and tighten the associated screw. For the Stevens AxSys, the input cable from the AxSys can connect directly to the terminals on the stand alone unit, or be spliced using white 5 position barrier strip for the chart recorder attachment unit. Check the pulley size settings on the Logger, and set them to the size of pulley that is used with the system; generally, this will be one foot, 18 inch or 375 mm circumference.

2.4.4. Apply power and follow the Logger instruction to place the system in operation. If the direction of water level change is not correct, disconnect system power. Exchange the positions of the white and green signal wires and apply power again to place the system in operation. This completes the electrical installation.



3 Maintenance and Troubleshooting

3.1 MAINTENANCE

There is little regular maintenance required for the Type A/F Encoders. The area around the Encoder should be kept reasonably clean and dry to avoid entry of dust or moisture into the bearings. If condensation is present, it is recommended that the top cover for standalone Encoders be removed and fresh desiccant installed in the enclosure; replace the cover. The desiccant should be recharged or replaced on a regular basis, depending on the severity of operating conditions.

3.2 TROUBLESHOOTING CHART

SYMPTOM	PROBLEM OR ACTION
<ul style="list-style-type: none">• Signal missing or intermittent	<ul style="list-style-type: none">• Power voltage low or missing; check Logger fuse• Signal, power or ground connection
<ul style="list-style-type: none">• No level change or level errors	<ul style="list-style-type: none">• Check encoder output• Level rate of change exceeds receiving device capability• Ensure that pulley is tight• Increasing level causes a decreasing reading; reverse encoder signal leads• Set Logger Scale switches to correct position (power off)• Check float for binding
<ul style="list-style-type: none">• Shaft hard to turn	<ul style="list-style-type: none">• Check encoder support bracket• Check bearings (standalone)

3.3 FACTORY ASSISTANCE

If there is an Encoder problem, call and ask for a Stevens Customer Technical Representative. The direct dial number is 1-800-452-5272, and the call is free from Canada or the USA. An alternative number is (503) 469-8000. Please provide an equipment description and serial number, when possible. Many questions can be answered by telephone, or you may obtain authorization for return of the equipment, should that be necessary. If no one is available, you can leave a message at any time on an excellent phone mail system; just clearly tell us your name, location, telephone number and how to reach you.

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