

STANDARD SR-C826M

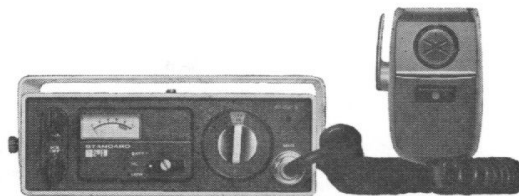
OPERATING INSTRUCTIONS



STANDARD

SR-C826M

2mFM 10W 12CH



STANDARD RADIO CORP.

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SPECIFICATION

GENERAL :

Frequency range.....	144~148 MHz
Number of channel.....	12 spot frequencies (band-spread within 2 MHz)
Power supply	13.8 V DC (Negative ground)
Power consumption.....	Stand by (SQL) Approx. 0.23 Amp.
	Receive " 1.0 Amp.
	Transmit " 2.4 Amp.
Speaker	Built-in 2-1/4 inch dynamic type; also includes provision for connecting external dynamic speaker (4 ohms).
Microphone	SR-CMP 14 dynamic push-to-talk microphone in hi-impact cyclac case, with retractable neoprene covered coiled cord and connector.
Metering	Illuminated front panel meter indicates relative received signal strength and transmitter RF output.
Dimensions	2-1/2 x 6-7/8 x 9-7/8 inches.
Weight	4.1 lbs.

TRANSMITTER

RF output.....	10 W (Nominal)
Frequency stability.....	$\pm 0.001\%$ ($-10^{\circ}\text{C} \sim +45^{\circ}\text{C}$)
Modulation	F 3 (phase modulation method)
Crystal multiplication	12 times
Deviation	± 5 KHz (Narrow band)
FM noise	At least 45 dB
Audio response	+1 dB, -3 dB of 6 dB/octave pre-emphasis between 300-2500 Hz ; greater than 18 dB/octave roll-off above 3000 Hz

RECEIVER

Sensitivity.....	0.4 μV or less (20 dB noise quiet method)
Squelch sensitivity	0.2 μV or less
Selectivity	60 dB down at adjacent channels
Audio output	5 watts minimum at 4 ohms, 3 watts minimum at 10% distortion.
Frequency stability.....	$\pm 0.001\%$ ($-10^{\circ}\text{C} \sim +45^{\circ}\text{C}$)
Circuitry	Double conversion superheterodyne
Intermediate Frequencies ...	11.7 MHz first, 455 KHz second.

* Specifications subject to change without notice.

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S E C T I O N I

DESCRIPTION

1-1 DESCRIPTION

The STANDARD RADIO CORP. MODEL SR-C826M VHF/FM Amateur Transceiver provides up to 12 channel operation within 2MHz portion of 144 to 148 MHz frequency. However, should operation be desired on frequencies outside of this bandwidth it may be accomplished without retuning, although a minor drop in sensitivity and output may occur. The Model SR-C826M is completely solid-state, and is designed to operate from a 12 volt DC (negative ground). The transceiver is enclosed in a splash-proof, weather resistant aluminum case for environmental protection, and is supplied complete for operation with a built-in loudspeaker, microphone, universal mounting bracket, and the crystals for some channels factory installed. For mobile operation it is only necessary to connect the transceiver to a source of 12 volt DC power and an antenna.

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S E C T I O N II

INSTALLATION

2-1 INSTALLATION SUGGESTIONS

Before starting the installation, spend some time considering the possible locations for the transceiver, the antenna, and the external speaker if one is to be included in the installation.

1. Transceiver

The transceiver should be located so the controls and microphone are visible and readily accessible. It may be mounted in any position without affecting performance and typical mountings include; under dash, desk top, vertical walls, or overhead. A universal mounting bracket suitable for any of the above installations is included with the equipment.

2. Antenna Considerations

The antenna installation must be considered carefully. Remember, one of the important factors in determining the range of reliable communications is the height of the antenna. Always mount the antenna as high and clear from metal objects as possible. The antenna base should be as close to the transceiver as practical to minimize the length of interconnecting coaxial cable required, and in mobile installations, choose a location furthest from the engine to minimize ignition noise. Maintain a minimum distance of 5 feet between your VHF and other antennas. Minimum VSWR must be achieved for maximum performance.

Your STANDARD RADIO "COMMUNICATIONS" dealer will be pleased to recommend the proper type of antenna for your installation. In the case of a base station installation information on other VHF antennas may be obtained from the "Radio Amateur's Handbook" and other publications.

2-2 INSTALLATION INSTRUCTIONS

Your SR-C826M has been factory pre-tuned for operation between 144 and 146 MHz and requires no adjustment for normal operation providing the antenna affords proper 50-ohm load.

1. Mobile Installation

Use the transceiver, microphone, and speaker (if an external speaker is desired) mounting brackets as templates to determine the mounting hole patterns. Use a #10 or 3/16-inch diameter drill for these holes. Be sure to allow ample clearance for the transceiver, its control knobs, microphone, and speaker.

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Included with the SR-C 826 M is an SR-CLF 03 line filter. Connect this filter into the supply voltage power lead by means of the connector provided before operating the unit. This filter inductor may be mounted in any position or in any location as long as it is at least 6 inches away from the SR-C 826 M.

This SR-CLF 03 is rated at 3.0 amps DC which is adequate for the SR-C 826 M.

The SR-C 826 M has 3-amp fuse in the positive lead, therefore additional fusing is not required and should be avoided. Be careful to connect the red wire to the positive terminal, and the black wire to the negative terminal (or ground to the frame). In some installations it may be necessary to extend the power leads. If this is required, use #16 gauge insulated copper wire. The SR-C 826 M contains protective circuits to prevent permanent damage if the polarity is inadvertently reversed; however, this will blow the 3-amp (3 AG) fuse.

Check that the voltage drop encountered in the power wiring is not so great that the DC voltage input to the transceiver when in transmit mode is less than 11.5 volts with the engine "off".

The SR-C 826 M may be operated from DC sources other than 12 volts, such as 24, or 32 volts DC, consult your dealer for information on a STANDARD RADIO DC Power Converter.

2. Base Station Installations

The SR-C 826 M may be mounted on a SR-C 12/120-5 AC Power Supply for convenient base station operation. In addition to providing a fully regulated 13.8 volts DC to operate the transceiver, mounting brackets (supplied with the SR-C 12/120-5) mate with the mounting holes in the case of the SR-C 826 M when the universal mounting bracket is removed.

The SR-C 12/120-2 Power Supply should be used when accessory items requiring additional power are used.

3. Antenna Cable

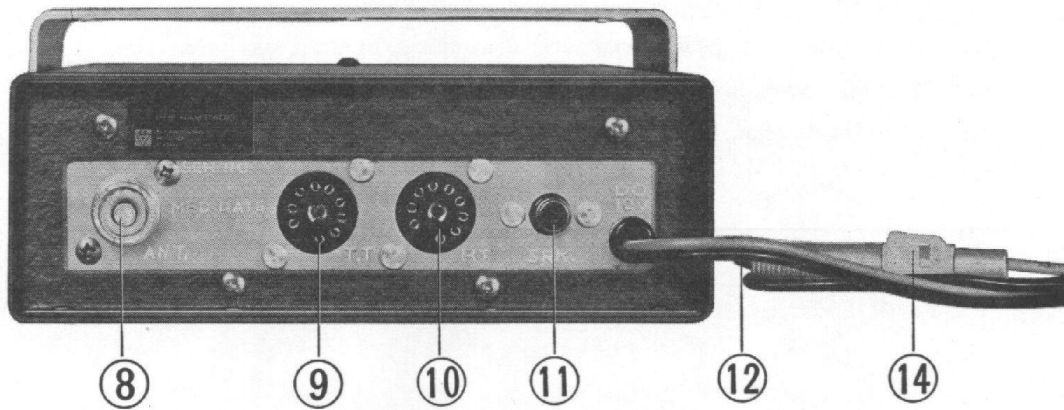
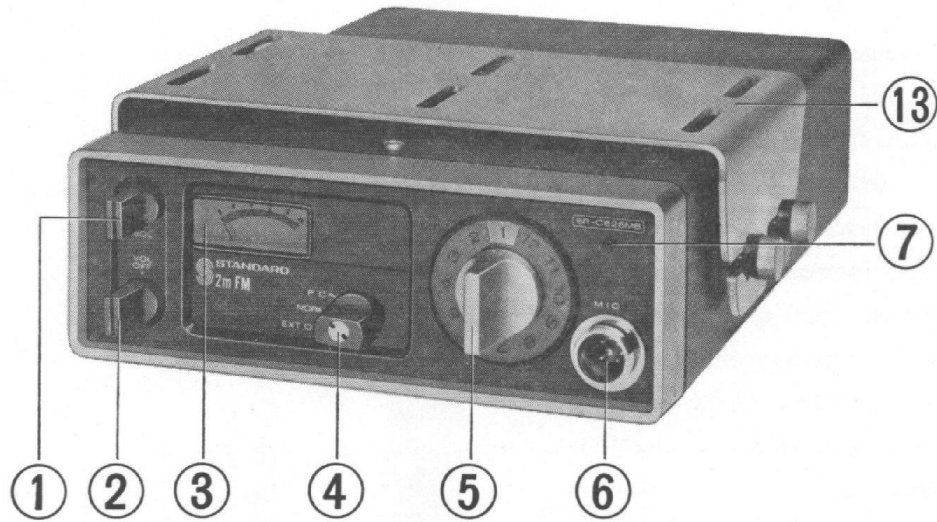
The antenna cable may be routed by the most convenient path to the transceiver in both mobile and base station installation. Type RG-8/U cable should be used for lengths of 25 feet or more to minimize losses. Type RG-58/U cable may be used for lengths less than 25 feet. Determine the cable length required, avoiding sharp angles or kinks. The cable should be formed into a radius not less than 10 times its diameter for any bends. Excess cable, which should be a minimum, may be coiled and secured with tape or other means, into an inconspicuous place.

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4. Input and Output Connections

- a. Connect the antenna cable to the ANT receptacle on the rear panel of the transceiver.
- b. Connect the microphone (supplied) to the MIC receptacle on the front panel.
- c. An external 4-ohm speaker (such as the SR-C 205 K) may be connected to the SPK receptacle on the rear panel if desired. This receptacle accepts a standard RCA type phone plug. The internal speaker will be automatically disconnected when the external speaker is connected.

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CONTROLS AND CONNECTIONS

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SR-C 826 M CONTROLS AND CONNECTIONS

1. Squelch (SQL) control-adjusts threshold point for "noise actuated" squelch circuit.
2. Volume (VOL) control-adjusts audio output level applies power when rotated clockwise past OFF position.
3. Meter-indicates transmitter power output, relative received signal strength, and battery voltage.
4. Function Selector switch selects desired function; EXT OSC, Normal OSC (interval crystal OSC), and PC (private channel with SR-C TN 3 or tone burst oscillator SP-CTN 5 for repeater station.)
5. Channel Selector switch-selects desired operating channel (illuminated when power applied).
6. Microphone (MIC) receptacle for connection of microphone or telephone handset.
7. Red "transmit" indicator illuminated in "transmit" mode.
8. 50-ohm coaxial antenna (ANT) receptacle.
9. 9-pin transmitter test (TT) receptacle; provides metering test points.
10. 9-pin receiver test (RT) receptacle; provides metering test points, remote control functions and EXT OSC connections.
11. External speaker (SPK) receptacle; disconnects internal speaker.
12. 12 V DC power input (use #16 wire if leads must be extended).
13. Mounting bracket.
14. Fuse, 3 A.

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S E C T I O N I V

THEORY OF OPERATION

4-1 TRANSMITTER

Refer to Figure 1 and the schematic diagram for the following description.

The oscillator, Q 801, is crystal controlled and generates the initial RF signal in the frequency range of 12.00 to 12.333 MHz. The RF signal is then applied to the phase modulator, Q332 together the audio modulation signal. The audio modulating signal varies the internal and input capacities of Q332, in turn causing the applied RF signal to be phase shifted at an audio rate.

The angular phase shift produced by Q332 without distortion is relatively small. Therefore, the oscillator frequency is multiplied 12 times to obtain the desired deviation at the output frequency of 144 to 148 MHz.

Two doubler stages, Q333 and Q335, and one tripler, Q334 provide the necessary 12 times frequency multiplication. A pre-driver, Q336, and driver Q388, then amplify the 144 to 148 MHz signal prior to application to the RF power amplifier. The RF power amplifier, Q339, develops the output signal applied to a five-section pi-network, and through the "transmit/receive" relay to the antenna. The pi-network in turn matches the output impedance of Q339 to the antenna.

The reflected RF current at the antenna is sampled by a directional coupler transformer, L318, rectified by D332, and applied through two DC amplifiers, Q340 and Q341, to control the gain of the pre-driver, Q336. This functions as an automatic drive control (ADC) to prevent damage to the final stage, as could occur if excess current is drawn due to a mismatched antenna. To prevent this circuit from acting to reduce the power output, the antenna must present a matched load.

The transmitter contains an instantaneous deviation control (IDC) circuit to prevent a higher than normal output level from the microphone from causing overdeviation in the output signal.

Under normal conditions the audio signal from the microphone is amplified by Q342 and Q343, and 6 dB/octave pre-emphasis is added. The signal is then applied through a peak limiter, D333 and D334, and lowpass filter to the integrator, Q344. At normal, or lower microphone output levels, the audio signal is not limited and Q344 applies a 6 dB/octave de-emphasis to offset the pre-emphasis from the amplifier.

This results in a "flat" output in the audio signal applied to the phase modulator, Q332. The Phase modulator in turn has an inherent 6 dB/octave pre-emphasis characteristic, resulting in a 6 dB/octave pre-emphasised output modulation from the transmitter.

When the microphone output level increases to a point where overdeviation could occur the positive and negative peaks of the waveform are clipped in the limiter, D333 and D334. This

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produces an essentially square wave constant amplitude output, removing the 6 dB/octave pre-emphasis applied to the signal in the amplifier. The limited signal is applied through the low-pass filter, which reshapes the audio waveform, to the integrator. The integrator applies the 6 dB/octave de-emphasis which then offsets the inherent 6 dB/octave pre-emphasis of the phase modulator. This results in a transmitter output frequency deviation that is essentially flat over the range of modulating frequencies.

4-2 RECEIVER

The 144 to 148 MHz input signal from the "transmit/receive" relay is amplified by two "FET" (field effect transistor) RF stages, Q101 and Q102, and applied to the first "MOS FET" mixer, Q103.

These input stages are "FET's" to minimize spurious and intermodulation responses, and provide low-noise conversion. The input signal is heterodyned with the output of the first local oscillator by Q802 and converted to the first IF, 11.7 MHz. The first local oscillator injection frequency is 11.7 MHz below the input signal frequency in all cases. The fundamental crystal frequency however is multiplied nine times to reach the injection frequency. The actual crystal operating frequency is in the 15 MHz range, and is determined from the equation :

$$f_c = \frac{f_i - 11.7}{9}$$

where: f_c fundamental crystal frequency in MHz

f_i receiver input signal frequency in MHz

The first local oscillator circuit comprises the crystal oscillator Q802 and two triple stages, Q109 and Q110. The resulting 11.7 MHz signal from Q103 is then amplified by Q104 and applied to a second mixer, Q105, where it is heterodyned with the 11.245 MHz output of the second local oscillator, Q111, and converted to the second IF, 455 KHz

NOTE

If interference is noted from stations operating 910 KHz below the input signal frequency the second local oscillator crystal frequency can be changed to 12.155 MHz. This places the injection signal below the 11.7 MHz first IF, moving the 2nd IF image 1.82 MHz higher in frequency. To obtain the proper crystal, order P/N XA111215505.

A 9-section ceramic filter provides the selectivity for the 455 KHz IF, and the signal is amplified by five cascade stages, Q106, Q107 and Q112 thru Q114, and applied to a limiter, Q115, and FM detector, D105 and D106. The limiter removes any vestige of amplitude variation from the signal, while the FM detector functions to produce an audio output in response to a corresponding frequency (or phase) shift in the 455 KHz IF signal. The detector output is then amplified by Q119 thru Q122 and applied to the built in speaker with an attenuator network and also to the SPK receptacle.

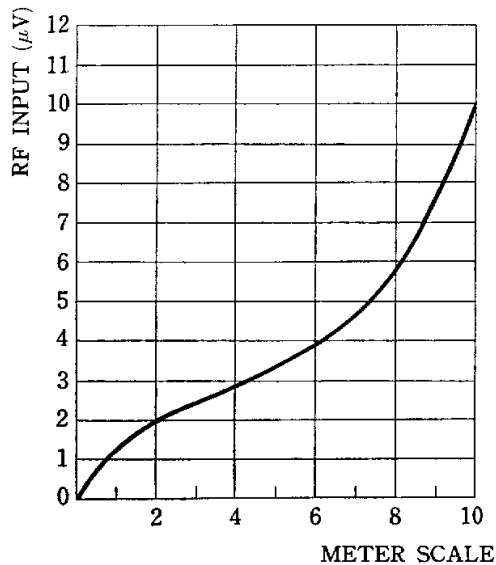
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A "noise-actuated" squelch circuit is included to "quiet" the receiver when no carrier is present. This is accomplished by applying the collector detected AM signal (noise) from Q115 through two stages of noise amplifier Q116 and Q117, and detecting the noise component with D109 and D110. This produces a DC voltage that controls the squelch amplifier, Q118, which in turn produces a DC voltage that cuts off the first audio amplifier, Q119, until a signal overcomes the "noise" and "open" the audio channel.

METERING CIRCUIT

The 455 KHz picked up at the base of Q112, and amplified by RC coupled 2 stage amplifier Q751, Q752 for the meter driving. The full scale is adjusted by R751 for $10 \mu\text{V}$ input. In the "transmit" mode a sample of the transmitted signal is detected by D801 in turn indicating relative RF power output on the meter.

METER SCALE VS RF INPUT



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S E C T I O N V

MAINTENANCE

5-1 GENERAL

The inherent life of solid-state components used in the SR-C 826 M will allow many years of continuous use without failure, provided the equipment is treated with reasonable care. Other than the routine maintenance procedures and precautions described in this section, it is not recommended that alignment and/or adjustments be performed unless degraded performance characteristics are noted.

The transceiver has been carefully aligned at the factory, using specialized test equipment that is not normally available to the average amateur owner. Therefore, in the event difficulty occurs, and your set is out of warranty, or if you elect to have repairs made in the field (not covered by factory warranty) rather than returning it to the factory, a qualified service facility with the proper test instrumentation and technical capabilities should be engaged. An authorized STANDARD RADIO "COMMUNICATIONS" service dealer, should perform any service work if possible.

5-2 PRECAUTIONS

Certain precautions should be observed to prevent damage to the transceiver. The following abnormal conditions should be avoided to realize the maximum inherent life capabilities.

1. Transmitter Load

Never "key" the transmitter unless an antenna or suitable dummy load is connected to the ANT receptacle: Failure to observe this precaution may result in serious damage to the RF power amplifier transistors.

2. Proper Supply Voltage

Avoid excessive supply voltage. The maximum DC voltage should not exceed 15 V DC for any appreciable period, nor should the set be operated when the supply drops below 11 V DC. Check your voltage with the engine running fast enough for the ammeter to indicate "charge", and with the transmitter "keyed" to provide maximum load.

3. Exposure to Water

Avoid direct exposure to water. If the set is accidentally subjected to heavy splash or immersion, permanent damage may be avoided by removing the set from its case and drying in direct sunlight, or the warmth of a heated room. A drying period of 4 hours

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should be sufficient.

If exposure was to salt water, carefully flush with clean fresh water before drying, then inspect for signs of salt deposits.

CAUTION

Avoid water contact with the internal loudspeaker ; the cone will be permanently damaged.

5-3 ROUTINE MAINTENANCE

The exterior of the transceiver should be cleaned periodically to preserve its appearance. Use a cloth moistened with water and household detergent, finishing with an overall wipe with a cloth moistened with alcohol.

If the equipment has been used in dusty environments the interior should be cleaned with a low-pressure air hose, or vacuum cleaner. Excessive dirt or other soil should be removed from the interior with a soft brush and alcohol. Be sure and dry thoroughly before operating.

5-4 ROUTINE PERFORMANCE CHECKS

The transmitter RF output and receiver 20 dB quieting and squelch sensitivities should be checked periodically to assure proper operation.

1. Transmitter

The transmitter RF output should be checked for all Channels. Connect a suitable power meter to the ANT receptacle and "key" the transmitter.

2. Receiver

The receiver 20 dB quieting and squelch sensitivity measurements require use of an accurately calibrated FM signal generator covering the 144 to 148 MHz range, and an AC VTVM. These measurements should be made for all Channels.

The 20 dB quieting sensitivity is measured by connecting the VTVM at the SPK receptacle (or between pins "1" and "7" of the RT receptacle) and noting the "noise voltage" output on the VTVM (no signal input, and "SQL" control adjusted for maximum noise). The unmodulated signal generator output is then applied at the ANT receptacle, set for the proper input frequency, and the output amplitude adjusted until the "noise voltage" on the VTVM drops to 1/10 of the previous reading (20 dB decrease). The signal generator output amplitude is then the 20 dB quieting sensitivity: The signal generator output should be 0.4 μ V maximum (closed circuit).

The squelch sensitivity is measured by adjusting the "SQL" control (with no signal input) until the speaker "noise" just cuts out (squelch threshold), then applying signal and adjusting the signal generator output amplitude until speaker "noise" is heard: The signal generator output amplitude should be 0.2 μ V maximum.

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5-5 TROUBLESHOOTING

Conventional signal tracing techniques can be utilized to locate a fault within the transceiver. The first step is to isolate the fault to a particular circuit within the transmitter, receiver, or associated wiring. An oscilloscope provides the simplest method of such signal tracing, as a circuit malfunction will be immediately apparent.

Once the malfunction has been isolated to a particular circuit, voltage and resistance measurements may be used to isolate a defective component. Reference to the schematic diagrams will assist in this operation. The diagrams show the circuit on the individual boards (transmitter and receiver), together with the associated peripheral components (controls, crystals, etc.) required to illustrate the complete signal path through the circuit. Appropriate voltage measurements are also shown on the circuit diagram to aid in locating a malfunctioning circuit or component.

5-6 TEST RECEPTACLES

The SR-C 826 M has two 9-pin test receptacles (RT and TT) on the rear of the chassis. These test receptacles provide access to test points on the receiver and transmitter circuit boards, and also provide voltage output and control functions for accessories. The test points, their functions in trouble shooting and/or alignment, the nominal meter indications for proper operation, and other functional connections at these receptacles are as follows :