



Owners Manual and Detailed Operating Instructions

Ver. 092020 R10

Software version 5.4x

NOTICE TO CONSUMER:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules, as of date of manufacture. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio electronics technician for help.

ABOUT THIS MANUAL:

This manual is divided into chapters which are arranged in logical, operational order. The items in **Bold** are important notes, ***Italicized bold*** are even more important, and ***Italicized bold underlined*** notes are critical informational statements. Section "G" contains a quick start guide for users already familiar with the product.

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PRODUCT DESCRIPTION:

TuneMatic is a self-contained antenna controller which will automatically adjust the resonant frequency of a screwdriver/motorized antenna. TuneMatic operates over a frequency range between 1 and 60 MHz, and supports a wide variety of screwdriver-type tunable antennas. TuneMatic utilizes frequency, antenna current, VSWR, and pulse position measurements of the antenna to perform the proper tuning, and keeps track of the parameters of the antenna by storing the tuning data in a series of internal reserved memory banks, based on frequency. TuneMatic is independent of radio make and model and will support any HF radio with a PTT control line and switched power

A- INSTALLATION CONNECTIONS:

REMOTE HEAD

The remote head allows you to control the functions of TuneMatic from a remote location. The buttons are identified as follows:

UP ARROW- Allows antenna to move up in direction.

DOWN ARROW- Allows antenna to move down in direction.

UP/DOWN (both) – resets current limit when not initialized, and “parks” antenna (moves to lowest position) after TuneMatic has been initialized.

BOX (STORE)- Stores memories after a good VSWR tune. See Section 5 for further instructions.

CIRCULAR ARROWS (INIT) - Performs system initialization. See section 3 for further instructions. This button also doubles as a tune cancel feature. See section 6 on the cancel feature.

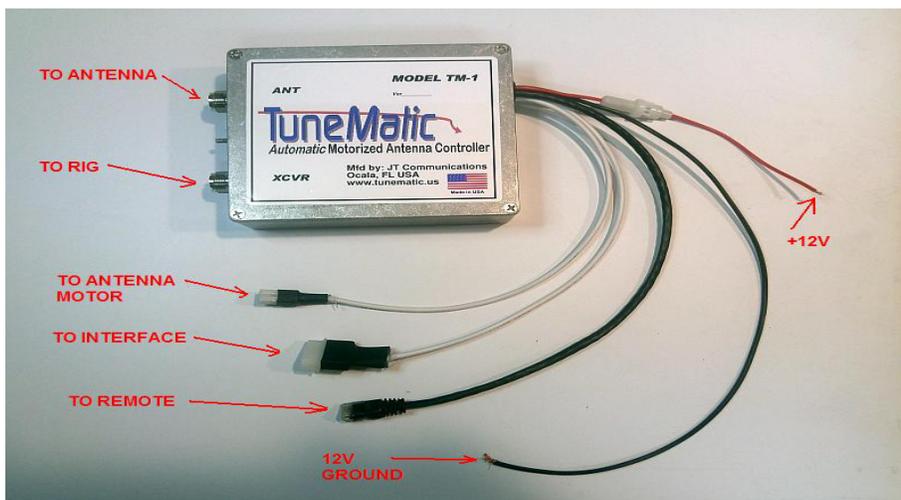
STORE/INIT (both)- During power up, pressing and holding both buttons performs factory reset. See section 7 for further instructions.

ANTENNA WITH DOWN ARROW (TUNE)- Performs autotune mode. See section 6 for further instructions

SUN SYMBOL- This LED flashes during antenna movement. See section 1, FIRST TIME OPERATION section for further instructions. When power is applied, the buttons will illuminate.



MAIN UNIT CONNECTIONS/CABLES

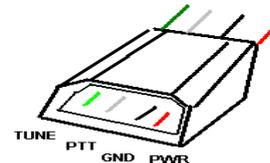


1) 12v power leads: These leads can be paralleled with radio power if desired, as they draw no current until TuneMatic is powered up by Radio Control cable. **NEGATIVE GROUND SYSTEM ONLY!**

RED (with fuse): +12-15VDC- connect to +12v power capable of 3 amps of current.

BLACK- Ground- connect to negative ground source.

2) Interface: There are four (4) leads on this 4 pin male connector. It connects through the radio interface box for the specific radio you are using. The color code is as follows:



GND (BLACK [pin 2]) connects to radio ground or common.

PWR(RED[pin 1])- When this line goes between 8-14v, it turns on TuneMatic. Typically it is connected to the switched 12V DC from radio. When power is applied from radio TuneMatic turns on, as well as Remote Head backlights. The current requirement for this connection is less than 0.1 A at 12-14 DC.

PTT (YELLOW [pin 3])- This line goes low (within 0.7v of ground) when TuneMatic requires radio to be keyed. This lead will sink up to 0.5A of current, thermally limited.

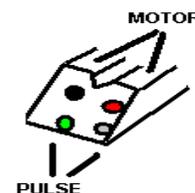
TUNE (BLUE or GREEN [pin 4])- When this is low, it places TuneMatic in a TUNE mode. Not used.

3) Coax connections- The two SO-239(UHF) connections are identified as follows:

RIG - Connection for the radio through the supplied 3' PL-259 jumper.

ANT - Connect this to either the antenna, *or input of amplifier if using the amp option- then connect amplifier output to antenna lead.*

4) Remote / RJ-45 couplers(2)- These cables/connections mate with the remote head. Although the factory jumper supplied is 12' in length, other lengths can be used, however lengths over 50 feet should be avoided. The female couplers on each end allow conventional RJ-45 CAT5/6 cabling **straight-thru** connections between connections. All 8 leads need to be wired end to end. **DO NOT USE A CROSSOVER CABLE.**



5) Motor/pulse control- Contains the bi-directional motor leads (floating from ground) and pulse counter connections to the antenna motor. ***Be sure to follow the antenna manufacturers directions with regard to RF isolating this line at the antenna. If using other than TarHeel antenna, a factory-supplied pigtail can be used to wire to your specific antenna. RED/BLACK are the motor leads, and the other remaining leads (not polarity sensitive) are the motor pulse leads. Observe connection to motor leads so that antenna moves to LOWER frequency when pressing UP on remote. (+V on BLACK lead [pin 1]when pressing "UP" button on remote)***

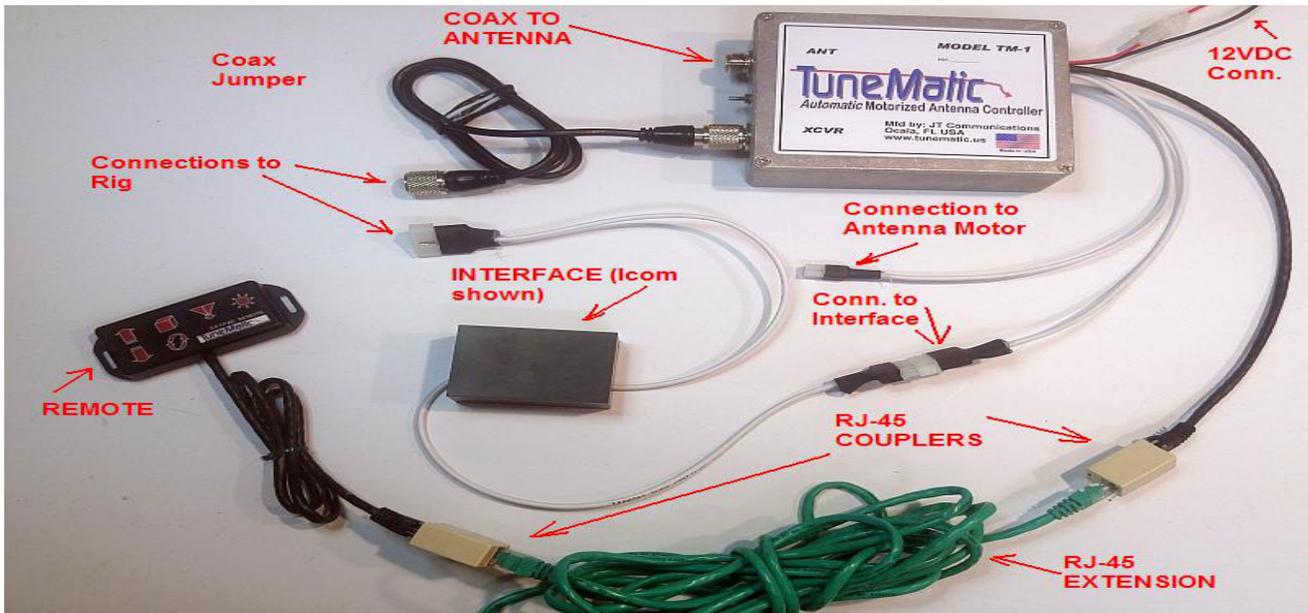
AMPLIFIER RELAY OPTION (if installed):

Amplifier keyline(paired and labeled)- This line connects in SERIES with the Radio and external amplifier keyline. There is no polarity on this normally closed connection. It opens when TuneMatic begins TUNE mode, then closes after tune is completed. See ***amplifier supplement sheet***, supplied with units containing this option.

RIG INTERFACE:

The rig interface is the communications between the the TuneMatic and your specific radio (*refer to the interface supplement) for wiring information and details*). The factory-supplied interface controls the keying and control for the specified radio, using a keyline and switched 12v. Each manufacturer is unique in the communications, and the interface allows TuneMatic to work universally with multiple rig makes and models. Some rigs do not contain a 'tune' feature (or the complication of communications is not compatible directly with the TuneMatic interface models), and those rigs will operate in AM mode (10-25w) when using tuning or storing functions of the TuneMatic. Any rig with switched 12v (low current) and a ground-enabled PTT keyline with operate with TuneMatic. Contact the factory if you have a rig that is not listed in the TuneMatic interface materials for instructions on how to connect to your specific rig.

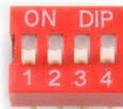
B) INSTALLATION:



- Plug motor control cable from motor to TuneMatic Antenna Motor connector.
- Connect 3' RF coax jumper from HF radio to RF connection labeled RADIO of TuneMatic,
- If applicable, connect HF amp to RF connection labeled ANT of TuneMatic and HF amp RF OUTPUT to antenna. If you do not have an HF amplifier, connect antenna lead to this connection of TuneMatic.
- Connect remote head with RJ-45 couplers (and/or RJ-45 extension cable if needed).
- Connect interface connector from TuneMatic to TuneMatic interface, and associated cables from interface to radio (**review interface supplement for specific radio connections**).
- If using Amp relay option, connect optional Amp bypass cable- **See the amp option supplement sheet (supplied) for details.**
- Connect DC power leads to **12-14V** DC ignition battery line-**OBSERVE POLARITY! NEGATIVE GROUND ONLY!** A good frame ground connection can be used to the vehicle chassis for added RF shielding from the threaded stud with a heavy braided lead.
- Remove TuneMatic enclosure cover and locate motor current limit DIP switches on the PC board, Set switches for antenna manufacturer's recommended current limit setting. These switches select the antenna stall current, and are set as follows- **note that 1=ON (UP) and 0=OFF(DOWN).**

Antenna	current	setting
Switch number		1 2 3 4
Lowest setting	200mA	0 0 0 -
LittleTarheel	250 mA	1 0 0 - *FACTORY DEFAULT SETTING
Diamond SD330	300 mA	0 1 0 -
*Hi-Q	500 mA	1 1 0 -
*Scorpion	700 mA	0 0 1 -
*Tarheel Models 75 to 400,	900 mA	1 0 1 -
*Tarheel Models 1000 – 1200	1100 mA	0 1 1 -
Highest setting	1300mA	1 1 1 -

NOTE: DIP SWITCH #4 NOT USED



*Most of the larger antennas can be set from 500- 1100 mA, depending on operating temperature.

NOTE: IT IS IMPORTANT TO SET THIS LIMIT PROPERLY, as damage can occur to the antenna motor if set too high, or will prematurely trip if setting is too low.

Keep in mind, current draw is dependent on supply voltage, and current may not reach trip point with lower supply voltage. These are recommended settings, and the actual setting may vary slightly.

C) OPERATION:

Apply power to radio. TuneMatic will automatically power on. Upon power-up, TuneMatic will spell out "OK" (--- --) in Morse code tone. The backlighting on the remote button panel will also illuminate.

On the remote head, locate the sun symbol on the upper right. When the motor moves, this LED will indicate contact closures of the motor sensor, and will blink on and off during antenna movement (*note- it may remain on or off depending on where the antenna pulse sensor stops, and this is normal*). On the remote head locate the UP and DN buttons, and press the UP button to assure the antenna is moving up, DN button for downward movement of the antenna. If either the motor does not move, as indicated by a blinking sun symbol when the either button is pressed, re-check wiring from TuneMatic to the antenna. Note that different models of antennas may have different blink rates.

At this point, you can manually move the antenna up and down. If you reach either end of the antenna travel, the antenna motor current will increase dramatically, and the TuneMatic will current limit as determined by the DIP switch settings in step 1(h) above. Once TuneMatic senses over-current, it will stop the motor, and spell out "CL" in Morse code tone. **You have to press both UP and DN buttons to clear the current limit condition when in manual mode.** Once cleared, you will be able to move antenna again. **DO NOT CONTINUE TO MOVE ANTENNA IN CURRENT LIMIT POSITION EACH TIME YOU CLEAR THE LIMIT, AS CONTINUED FORCED MOVEMENT IN THE LIMIT DIRECTION MAY CAUSE MOTOR WEAR OR DAMAGE.**

C-1 INITIALIZATION

NOTE: IF YOU SKIP THE INITIALIZATION STEP, YOU WILL BE UNABLE TO MANUALLY OR AUTOMATICALLY STORE ANY MEMORIES, OR USE ANY OF THE TUNE FEATURES OF TuneMatic!

To initialize the antenna to the TuneMatic:

- 1) Make sure you have properly installed and tested wiring of TuneMatic as indicated in the INSTALLATION step above.
- 2) Apply power to TuneMatic. Allow unit to spell out 'O K' in Morse tone.
- 3) Press (INIT) button once. TuneMatic will spell out 'I N' in Morse tone, indicating unit will start the initialization process.
- 4) Antenna will move all the way to the top (highest/longest) position of travel until it reaches the upper motor current limit position. The sun symbol on the remote will flash on and off during antenna movement.
- 5) Once current limit is reached, antenna will stop moving, and the TuneMatic will spell out 'C L' in Morse tone.
- 6) Antenna will move all the way to the bottom (lowest/shortest) position of travel until it reaches the lower motor current limit position. During this time, the TuneMatic is counting pulses.
- 7) Once current limit is reached, antenna will stop moving, and the TuneMatic will spell out 'C L' in Morse code, followed by 'I C', indicating Initialization is complete.
- 8) After the "I C" message, antenna will move to the low soft limit, and spell out 'L L', indicating that the antenna is at the lowest operating limit. .

If you force an antenna stall, disconnect antenna motor cables, or turn off power while in the Initialization process, the TuneMatic will stop the initialization. If the entire initialization process does not successfully complete, then the initialization process must be restarted.

Once initialization is complete, TuneMatic will:

- 1) Allow you to manually move the antenna up/down in two speeds. When corresponding UP/DN button is pressed and held, antenna will move slowly, and if the button is held down more than four seconds, it will move rapidly. This will allow you to make small adjustments during fine tuning of the antenna. Each time up/down is released, it resets the speed to slow, which allows you to 'bump' the motor in either direction, allowing an exact tune.
- 2) Enable the variable (internal) adjustment pot to increase the medium and slow motor speeds, and sets the 'soft' limits, so that movement of the antenna will not reach the motor current limit points. When either upper or

lower limit is reached, TuneMatic will spell out 'H L' (higher limit), TuneMatic will spell out 'L L' (lower limit), and stop further movement, preventing the antenna from traveling beyond these soft limits.

3) 'Park' antenna, by pressing both UP and DOWN arrow buttons at same time. This is useful when antenna height needs to be lowered to its minimum position during specific driving conditions. Parking the antenna also re-calibrates the pulsecount to the initialized settings. Note that you can only park the antenna AFTER initialization, NOT in autotune mode, and NOT if you is moving the antenna up or down (antenna must be STOPPED to park it). The park position is at the lower soft limit point, which assures bottom of travel, and proper re-set of pulsecount calibration. Note that parking the antenna also re-calibrates the pulse count.

4) Manually store frequency presets (see section 5).

5) Automatically operate the TuneMatic (see section 6).

6) Re-Initialize TuneMatic if necessary. *NOTE: RE-initializing antenna will not disturb memory settings (see section 3).*

7) Sense lack of pulses within several seconds after start of any motor movement, If the missing pulse detector trips, it will stop the motor, and spell out "P E" in Morse code tone. It will automatically de-initialize the TuneMatic (without losing memories), and require you to re-initialize.

IF MOTOR DOES NOT MOVE DURING INITIALIZATION, AND YOU RECEIVE A PULSE ERROR (PE) MESSAGE, CHECK THE WIRING BETWEEN TuneMatic AND ANTENNA.

C-2 RE-INITIALIZATION:

The TuneMatic depends on precise feedback information from the antenna. If the pulse counting sequence is interrupted for any reason the TuneMatic may need to be re-initialized. As the antenna is used and antenna characteristics may change or other physical changes occur, it may cause errors. This condition will necessitate a re-initialization. If it becomes necessary to re-initialize the unit, stored memories will be retained unless a full factory reset is performed.

TuneMatic also reverts back to an un-initialized state during some failure conditions, such as:

1) Missed pulses during antenna movement after initialization- This can happen if the connection between the antenna pulse switch (internal to the antenna) either fails, or the wiring becomes disconnected.

2) Motor fails during antenna movement, or antenna current DIP switches are set incorrectly

3) Antenna current limit is reached (when NOT in park mode)- This can happen if there is a catastrophic failure in the TuneMatic software, major pulse count error, or other software failure.

4) Power to TuneMatic is interrupted during antenna movement – If the TuneMatic power is disconnected while the antenna is moving, it will cause the pulse count to lose track of where it was last. TuneMatic detects this loss of power, and automatically puts TuneMatic into the uninitialized state. This process assures you that the antenna pulse count integrity is maintained through all operations.

You will know the initialized state of TuneMatic upon power up. If you don't hear the "I I" Morse message on power up immediately after the 'OK' message, TuneMatic is NOT initialized.

It would also be necessary to re-initialize if you disassemble the antenna for servicing. ***'De-initialization' only occurs after antenna has been initialized the first time, and any occurrence of antenna/pulse error.***

To perform re-initialization if already initialized:

1) Make sure TuneMatic is powered up, and the motor is not in motion, or in Autotune, and wait for start-up messages.

2) Press and hold (INIT) button for at least 3 seconds; TuneMatic will repeat the initialization process as indicated in (2) above. Once you hear the Morse message; you can then release the INIT button.

NOTE- Reinitializing antenna does NOT erase any stored memories. To erase all memories, see section (D-Factory Reset) below.

C-3 TESTING ANTENNA OPERATIONAL LIMITS:

You may manually tune the antenna, by using an external VSWR meter, or radio-provided internal VSWR meter. This will give you a good indication as to the operational frequency range of the antenna, and will help you determine the expected performance of the system. The make and model of the antenna, and its physical properties, ground system, and overall installation will determine the usable operational range of the TuneMatic. It is advisable to check the limits of the antenna system, so that you will know what to expect during operation. Otherwise the TuneMatic may attempt to tune a frequency that is outside the operational parameters of the system with little or no success, or not even tune properly.

Using the external VSWR meter, use *low levels* of RF power (10 watts in AM mode) so that you do not cause interference on the air, or damage to radio and antenna. While adjusting the UP/DN buttons, check the parameters of the system, by alternately moving the antenna, and spot-checking the VSWR, by keying the rig. Start at the highest band, and work down to the lowest. This check will assure you that the system will tune properly, and to what frequency range it will perform over.

NOTE: You can conduct these tests when TuneMatic is either initialized or not initialized. Remember: **you cannot use any of the automatic tuning or storing features until the antenna has first been initialized.**

C-4 - MANUAL ANTENNA TUNING AND STORAGE:

Once you know the operational frequency limits, you can manually store frequencies. It is recommended that you store **at least one** frequency in each band that the system (antenna and radio) is capable of covering. Make sure radio is turned on and operational, You will be manually keying radio at a low power level at various frequencies for this step. When using legacy radios, be sure radio is in AM or CW mode, set between 10-30 watts output. TuneMatic will send a PWR message if power is out of range. *Note that the following steps only work AFTER the antenna has been initialized.*

- 1) Start at the highest band of operation (lowest/shortest antenna position).
- 2) Manually move antenna UP while testing VSWR of desired frequency until VSWR is minimized.
- 3) Press (STORE) button. Radio will automatically key for one second, and measure power 'window', frequency, and VSWR.
- 4) If power is too low or high, TuneMatic will spell out 'PWR' in Morse tone, indicating power is out of range. The range is 5-35 watts, with 10-20w as the optimal setting. If you get this error, readjust power to within the specified parameters. If you are using a legacy radio, make sure radio is in CW or AM mode, and power is set within 10-20w. *Radios connected to the factory interface will automatically set the power level for tuning.*
- 5) If you are attempting to operate the radio outside the frequency limitations of the TuneMatic (between 1 and 60 MHz), it will spell out 'FR' in Morse tone, indicating the radio is out of the operational frequency range. This error message will also spell out if it is unable to read frequency due to low/no power.
- 6) The TuneMatic will measure the VSWR. If it is too high, it will spell out 'SWR' in Morse tone. You will need to readjust the antenna position (up or down) until VSWR is no greater than 1.5:1 VSWR. It is best to adjust the position of the antenna so that a 'dip' of the VSWR reading before pressing STORE for accurate results.
- 7) If memory is successful, TuneMatic will spell out 'M M' in Morse code, indicating successful store of the desired frequency to memory.
- 8) Repeat steps 1-7 for each band, one at a time. On 40M and below, store top, middle and bottom of band.
- 9) If STORE is pressed additional times without changing frequency, TuneMatic will simply re-write the memory that corresponds to the transmit frequency, as long as the VSWR is satisfactory.
- 10) The more frequencies stored at this point, the quicker the AutoTune feature will work, and the faster the antenna tuning will become.

C-5 AUTOTUNING

The autotuning feature of the TuneMatic allows the unit to automatically tune the antenna, and save to the corresponding memory slots. The autotune feature is somewhat dependent on what is already stored in memory,

and operates more efficiently as more memories are filled. The storage process is based on frequency, which utilize more "windows" per kHz, as frequency decreases, due to antenna bandwidth.

It is *recommended* that you manually store *at least one* memory in each band of operation; pick a frequency in the band close to your normal area of operation, (as explained in step C-4 above), as it will simplify the auto-tuning process and reduce the needed time to tune new frequencies, starting from the highest desired band to the lowest. **YOU MUST STORE AT LEAST ONE MEMORY FOR THE AUTOTUNE FEATURE TO FUNCTION. Otherwise TuneMatic will park the antenna if no memories are stored. Some radios may time-out if the tuning process takes too long. TuneMatic will stop tuning if the RF signal from the transmitter is interrupted, so it is recommended to store at *least one memory* in each band of operation.**

The Autotune process is a two-step operation, and is initiated by the TUNE button. When pressed, TuneMatic will start the Memory Tune phase. The radio will key for a moment, measure power and frequency parameters, and search the memories for the desired or closest frequency. TuneMatic will move the antenna to move *as close as possible* to the desired frequency (based on the stored memory, or the corresponding memory to any previously stored frequency), then stop at the selected pulsecount. If the transmit frequency is already stored, TuneMatic will send the Morse "A S" message, indicating that this frequency was previously stored. This gives you an aural indication that the antenna was already tuned at the transmit frequency. If TuneMatic finds a memory that is close to the transmit frequency, and moves to the memory position, it will send the Morse "N S", indicating that the transmit frequency is not stored.

TuneMatic will now automatically enter the SWR tune phase. In the case of a memory that is not previously stored, TuneMatic will key the radio, and begin moving the antenna towards resonance. As the antenna moves, the speed of the antenna will reduce in speed as the SWR decreases. TuneMatic will then search for the lowest VSWR, and move until it finds VSWR 'null'. Once the fine tune null is found, the corresponding memory is stored for the selected transmit frequency, in the same way the MANUAL STORE mode operates (with the 'M M' Morse message), and will also send the Morse message "T C" indicating a completed tune.

In the event TuneMatic is unable to find a tune at or below 1.5:1, it will find the best VSWR match possible. If the VSWR null is at or below 2:1, it will stop at the lowest VSWR point, however TuneMatic will NOT store the lowest VSWR for this frequency. It will send the Morse "T I" message once the motor stops, and the radio unkeys, indicating this is the LOWEST VSWR Tunematic is able to find at the transmit frequency. If a null of at least 2:1 cannot be reached, TuneMatic will continue to search until it reaches the antenna soft limit, then it will unkey the radio, and park the antenna, as well as send the Morse message "N T", meaning there is NO TUNE possible for the selected transmit frequency.

If the frequency was already previously stored, it will key the radio for a moment, check the SWR, and re-store the memory with an 'M M' message, if the SWR is acceptable (at or below 1.5 VSWR). If the VSWR is above 1.5, TuneMatic will enter a "retune" phase, by sending an "RT" message, and attempt to retune the transmit resonant point within a window plus and minus several pulsecounts. It will find a null, and either store or stop on the null as explained above. If for some reason it is unable to achieve a satisfactory VSWR of 1.5 or better after retune attempt, a series of "E" 's will be sent, indicating a mistune, and park the antenna. In this case, it would be suggested to check the antenna system for proper tuning and alignment, or try the tune process again. This same error will be generated if the auto-tuning of the SWR is very erratic. You can try autotuning a second time after parking, as this will re-calibrate an antenna that has lost pulsecounts, and re-align previously stored frequencies.

You should be aware that the best tune is dependent directly on the antenna performance; if there are dropouts, antenna installation issues, or any outside parameters that can cause false/multiple nulls in the tuning process, etc, it may affect how TuneMatic adjusts the match.

As more satisfactory memories are stored, future auto-tunes will be easier when moving from position to position, and the less time it will take for the second step of the autotune process.

Once memories have been stored, you will only have to press the TUNE button after selecting your transmit frequency, and TuneMatic will automatically move to the stored memory frequency, and if necessary, auto-adjust for best match if unsatisfactory. You always have the option of 'fine-tuning' the VSWR at any time AutoTune is not in operation, measure the VSWR in AM mode, and move the antenna up and down until you is satisfied with the new

match. Then press STORE, and TuneMatic will over-write the old antenna position into memory with the newly found tune.

If at any time you want to stop TuneMatic while autotuning, you can press the INITIALIZE button, or remove RF power from the radio. In some cases, Radios may time-out during extended tune times, which will also cancel the TuneMatic tune step. If this happens, you can select an already stored frequency in memory, and simply press TUNE to recall it. TuneMatic will simply move to that selected memory position. If you turn off the rig while antenna is in motion, it will force TuneMatic into an de-initialized state, and you will have to re-initialize the antenna.

You can override the automatic SWR tune portion of the autotune function. This can be useful when wanting to simply stop at the memory tune, without further tuning by TuneMatic. By holding the INIT button at power-up, until the "B Y" Morse message (**which reverts back to full auto mode on power cycle**) indicating semi-auto tune mode. When in this mode, TuneMatic will stop at the memory tune, and wait for you to press the TUNE button within 3 seconds to initiate the second phase SWR tune function. If you do not press, TuneMatic will simply time out with a 'TO' message in Morse code.

If DC power is removed from the radio during any motor movement, it will force TuneMatic to revert to an uninitialized state- because the antenna is moving, and does not store the pulse count until the motor is stopped by software.

Manual Re-tune

If you want/need to re-tune an existing memory after pressing TUNE, you can press TUNE a second time, and TuneMatic will perform an auto-retune sequence, finding and storing the lowest null on an existing memory.

Internal motor speed adjustment compensation control

Located on the main PC board inside the TuneMatic control unit (just behind the socketed microprocessor) is a variable adjustment, which will adjust the factory slow/medium speeds. This adjustment is used when the drive signal to the motor does not have sufficient energy to physically move the antenna due to colder weather conditions, or when the antenna moves too fast or slow during fine-tuning. This is a potential issue on the larger antenna designs with higher voltage motors (Scorpion) and HI-Q antennas (less pulses per rotation). Clockwise rotation of the control increases the speed. The factory setting is 9 o'clock position.

To test for this condition:

- 1) Initialize antenna,
- 2) move antenna up and make sure there is actual movement in slow mode (when direction button is first depressed, antenna should move slowly, **approx. 1-2 flashes per second on display**),
- 3) If antenna does not move up in the first few seconds, rotate speed adjustment control potentiometer clockwise, then re-cycle power to TuneMatic. If you change the setting after power-on, **the new setting does not take effect until TuneMatic is power cycled again.** Adjust this control for **approx 1-2 flashes per second**, which can be seen with the sun LED symbol on remote panel.
- 4) Larger antennas may need a greater amount of compensation than smaller antennas, and if you change the antenna model, it may be necessary to re-adjust this setting.

D- FACTORY RESET:

If you want to clear all memories and settings, and return unit to factory default condition:

- 1) Press and hold both 'STORE' and 'INIT' buttons then apply power, hold until TuneMatic responds in step (2).
- 2) TuneMatic will send out 'M R M R', indicating a master reset, and start the memory erase process. Release the 'STORE' and 'INIT' buttons at this point.
- 3) Allow unit one(1) full minute to clear all memories. During the reset process, a beep will be heard every few seconds until fully cleared. There will be eight (8) beeps in sequence as the memory clears.
- 4) When complete, unit will spell out 'O K' in Morse tone, indicating factory reset is complete.

It is required to factory reset the TuneMatic controller if you change antenna make/model, as the operational parameters will be different from previous.

E- SAFETY FEATURES:

The safety features of the TuneMatic keep the antenna protected against catastrophic and accidental conditions. These safety features include:

- a) **Antenna current limiting**- This forces all movement to stop once current limit is reached. You can move the antenna in the opposite direction from the current limit position to resume operation. Once the TuneMatic is initialized, the current limiting only operates in case one of the other safety devices fails. **This current limit must be properly set prior to operation. Otherwise damage to antenna could occur, including damaging the motor windings.**
- b) **Pulse 'soft' limits**- Once TuneMatic is initialized, the soft limit detection prohibits the antenna from traveling beyond these limits, which provides a safety point in case you forget to release the UP or DN buttons, and antenna moves close to the ends of travel.
- c) **Missing pulse detection**- Once initialized, this detector keeps track of pulses during movement. If the antenna is moving, and the pulses stop, TuneMatic will stop the motor, and spell out 'P E' in Morse tone, indicating pulse detection has failed. It will also force TuneMatic to un-initialize.
NOTE- If the sensor switch for the pulse detector fails, you will still be able to move the antenna up and down, but will not have the TuneMatic auto-tune features available. This allows you to move the antenna manually with the UP or DN buttons during sensor failure.
- d) **Reverse DC power polarity protection**- contains internal circuitry to protect TuneMatic from voltage spikes or momentary reverse DC polarity. Reversed polarity will cause the 3A in-line fuse to fail. **DO NOT REPLACE FUSE WITH LARGER THAN 3A, OR WARRANTY WILL BE VOIDED SHOULD DAMAGE OCCUR.**

F- APPENDIX:

a) Morse code messages –listed by priority and operation:

note: the messages marked with "*" are the main messages to remember

Power-up messages:

- * **OK** **startup message:** Sent on power-up and re-set- This will be heard each time TuneMatic is powered up, and after memories have been cleared.
- BY** **autotune bypass:** TuneMatic in auto tune bypass mode, disabling automatic SWR tune function.
- * **II** **unit initialized:** TuneMatic has been initialized. This message will be heard after the "OK" startup message, and after TuneMatic has gone through the initialization process.

Initial movement and initialization:

- IN** **Initializing:** TuneMatic entering initialization mode. This message is heard after pressing the Initialization (IN) button.
- * **CL** **Current limit:** Antenna reached current limit. This message will be heard if antenna is moved into the ends of travel for the motor, and motor has reached the current limit point, as determined by the current limit DIP switch settings inside the TuneMatic chassis. It is also heard when the upper and lower limits have been reached during initialization.
- * **PE** **Pulse error:** No pulses detected during motor movement. This message will be heard if TuneMatic fails to detect any motor pulses during movement after initialization. This error will force TuneMatic to de-initialize.
- IC** **Initialize complete:** TuneMatic has completed the initialization process.
- RI** **Reinit:** TuneMatic is reverting back to un-initialized state. Typically created if pulsecount or current limit failure has occurred after TuneMatic has been initialized, or if TuneMatic lost power during antenna movement.
- PA** **Parking:** Antenna parking. Message will be heard any time TuneMatic is placed into a park mode, either manually or automatically.

- * **LL** **Low limit:** Antenna at lowest “soft” antenna limit position.
 - * **HL** **High limit:** Antenna at highest “soft” antenna limit position.
- Either message indicates antenna has reached travel limit. It will not travel past these limits once TuneMatic has been initialized.

Storing and memory operations:

- * **MM** **Memory write:** Valid memory store in progress. This message will be heard upon any successful write to memory once a successful STORE or autotune event occurs.
- PWR** **Power error:** RF power out of range/no power. This message will be heard if you are attempting to store or autotune TuneMatic with too little/no or too high power (5-35w). Make sure radio RF power is within this range.
- FR** **Freq error:** Transmit frequency out of range or no frequency read. This message will be heard if you are attempting to either store or tune TuneMatic outside the operational frequency range (1-60 MHz), or no frequency data is read.
- ***SWR** **SWR error:** VSWR too high. This message will be heard if you are attempting to store a frequency with an unsatisfactory VSWR, typically above 1.5:1.

Tuning operations:

- NS** **Not Stored:** TuneMatic has completed the memory tune phase, but the transmit frequency is not a match to what is in memory.
 - AS** **Already Stored:** TuneMatic has completed the memory tune phase, and the found antenna position in memory that is an exact memory window match for the transmit frequency.
- TO** **Timeout:** (only heard when autotune is bypassed) Memory tune (step 1) timeout. This message will be heard once starting the autotune process, and antenna has moved to the initial position, and you did not press the tune button a second time to activate Autotune (step 2) within the 3 second timeout period.
- PS** **Park Set:** No memories found in memory tune, antenna will park.
- TC** **Tune Complete:** Autotune is completed. This will be heard after a successful autotune.
- TI** **Tune Incomplete:** Unsuccessful full autotune. This will be heard when TuneMatic is able to find an SWR between 1.5 AND 2.0, AND TuneMatic did NOT store a memory at this antenna position.
- TS** **Tune Stopped:** Tune cancelled by user or rig power interrupted...See section 6 for this feature.
- NT** **No Tune:** Unable to autotune across entire antenna range; TuneMatic is unable to find a VSWR below 2.0 at the selected frequency.
- RT** **ReTune:** TuneMatic is re-calibrating and re-tuning the stored memory by re-tuning.
- * **EEEEEE** **Stored Tune error** Heard if TuneMatic is unable to tune an previously stored memory after the re-tune attempt. It may be necessary to check antenna system if this message is heard, or attempt to tune again.

b) Troubleshooting:

1) Unit will not power up-

- a) Check in-line fuse (**3A standard** GMA 5x20mm fuse, **not SLO-BLO**). **DO NOT USE LARGER SIZE!!**

- b) Check power connections.
- c) Make sure radio is supplying power through radio interface cable.
- 2) No motor movement when UP or DN buttons are pressed (pulse error may also occur).
 - a) Check antenna motor leads
- 3) No pulses detected (PULSE LED not flashing when antenna moves)-
 - a) Check wiring from antenna to TuneMatic.
- 4) Unit tunes erratically or not on best VSWR null-
 - a) Check antenna internal connections, contacts, reed switch, oxidation, etc.
 - b) Check for loose/intermittent coax connections, or connector contamination.
 - c) Check for good RF and DC grounding.
 - d) Antenna may be tuning on a harmonic, store a manual frequency and re-try.
- 5) Unable to find a good VSWR or get a frequency to store (VSWR error message)-
 - a) Check all antenna connections. (use radio VSWR meter to verify)
 - b) Make sure antenna is designed to cover operating frequency.
 - d) Make sure antenna installation is correct.
- 6) STORE or TUNE not working-
 - a) Make sure TuneMatic is initialized
- 7) TuneMatic is not stopping at stored presets-
 - a) Re-park antenna and try again.
- 8) TuneMatic stops at top of antenna movement during initialization, and gives "P E" error-
 - a) current limit may be set too high- check DIP switch settings.
- 9) Antenna sends current limit ("C L") message with any movement-
 - a) Antenna DIP switch current setting too low, set to lower setting

There are additional troubleshooting techniques on the tech support portion of the website.

G- QUICK START GUIDE: Perform these steps as a minimum.

- 1) Connect unit per manual,
- 2) Set antenna current limit DIP switches correctly for the antenna,
- 3) Apply power, test antenna up & down (UP/DN arrow buttons),
- 4) Initialize by pressing "INIT" on remote, wait until complete,
- 5) Start storing frequencies from high-frequency end of antenna to low, using "ST" button, if it tunes it will spell "MM" in code, if not, it will spell "SWR".

At this point, you can recall the stored frequencies by setting radio to stored frequency, press TUNE button, and TuneMatic will recall stored frequency, and move antenna to set point. The more that is stored, the more presets will be filled up (or overwritten).

H- GENERAL SPECIFICATIONS:

Operating Frequency range:	1-60MHz
Insertion loss:	typ. <0.2 dB @ 50MHz
Max power rating:	200W PEP
Operating voltage range:	10-28v DC (motor dependent)
Max. motor load:	3A (in-line fused)
Max. PTT load :	0.5a (internally limited)
Operating Temp. range:	-10 - 50 degrees C

ONE-YEAR LIMITED WARRANTY ON PARTS AND LABOR-

Covers Product purchased as new only.

JT COMMUNICATIONS LLC provides a warranty to the original purchaser of new Products against defects in materials and workmanship for a period of **One (1) year** of normal consumer (non-commercial) usage.

This warranty is not transferable.

If a Product covered by this warranty is determined to be defective within the warranty period, JT COMMUNICATIONS LLC will, unless otherwise required by applicable law, either repair or exchange the Product at its sole option and discretion.

How to Obtain Warranty Service

(An RMA required) To obtain warranty service, contact JT COMMUNICATIONS LLC Technical Support via email: TechSupport@jtcomms.com or by telephone at 352-236-0744(USA) from 8:00AM to 6:00PM Monday through Friday (holidays excluded), Eastern Time zone.

PRE-AUTHORIZATION MUST BE OBTAINED BEFORE SENDING PRODUCT TO A JT COMMUNICATIONS LLC SERVICE CENTER. Proof of purchase in the form of a purchase receipt or copy thereof is required to show that a Product is within the warranty period.

Exchange: Should JT COMMUNICATIONS LLC elect to exchange a Product due to a covered defect during the warranty period, the replacement unit may at JT COMMUNICATIONS LLC's Sole option and discretion, be new or one which has been recertified, reconditioned, refurbished or otherwise remanufactured from new or used parts and is functionally equivalent to the original Product.

Repair: Parts and Labor There will be no charge for parts or labor to repair a Product for a covered defect during the warranty period. Replacement parts may, at JT COMMUNICATIONS LLC's sole option and discretion, be new, used, reconditioned, refurbished or otherwise remanufactured or recertified as functionally equivalent replacement parts.

Remaining Warranty: Repaired or exchanged units are warranted for the remaining portion of the Product's original warranty or for ninety (90) days from warranty service or exchange, whichever is longer. Any upgrade to the original Product will be covered only for the duration of the original warranty period.

Returning a Product for Warranty Service: After obtaining pre-authorization from JT COMMUNICATIONS LLC Technical Support (see above), defective Products within the warranty period must be sent to a JT COMMUNICATIONS LLC service center to obtain warranty service. JT COMMUNICATIONS LLC is not responsible for transportation costs to the service center, but JT COMMUNICATIONS LLC will cover return shipping to the customer. Products returned to JT COMMUNICATIONS LLC's service centers must be shipped in either the original carton box and shipping material or packaging that provides an equal degree of protection. JT COMMUNICATIONS LLC Technical Support will provide instructions for packing and shipping the covered Product to the JT COMMUNICATIONS LLC service center.

Exclusions- This warranty does not cover, for example: abuse, accident, acts of God, and protective coatings, cosmetic damage (e.g. scratches, dents, cracks), odor, damage caused by misuse with other products (e.g. accessories, housing, parts or software), damages from shipping, improper installation or operation, failure to follow installation/operation instructions, improper voltage supply or power surges, operating with higher than rated fuse, lack of reasonable use, misuse, modifications or alterations, normal wear and tear or aging, as well as installation and set-up issues or any tampering. Product repairs attempted by anyone other than by a JT COMMUNICATIONS LLC authorized service center. Products with unreadable or removed serial numbers or requiring routine maintenance are not covered.

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THIS LIMITED WARRANTY IS SUBJECT TO CHANGE WITHOUT NOTICE.

In the event that any term or provision contained in this limited warranty is found to be invalid, illegal or unenforceable by a court of competent jurisdiction, then such provision shall be deemed modified to the extent necessary to make such provision enforceable by such court, taking into account the intent of the parties. The invalidity in whole or in part of any portion of this limited warranty shall not impair or affect the validity or enforceability of the remaining provisions of this limited warranty.

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