



Owners Manual and Detailed Operating Instructions

Ver. 42126 R1

Software version 1.x

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 **ULTRA** is a full-featured memory/automatic antenna controller which tune the resonant frequency of a screwdriver/motorized antenna. TuneMatic **ULTRA** 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 **ULTRA** is independent of radio make and model and will support any HF radio with a PTT control line and switched power. It also contains an amp relay bypass feature for use with external RF amplifiers.

A- INSTALLATION CONNECTIONS:

REMOTE HEAD



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

UP ARROW- Allows antenna to move up in direction.

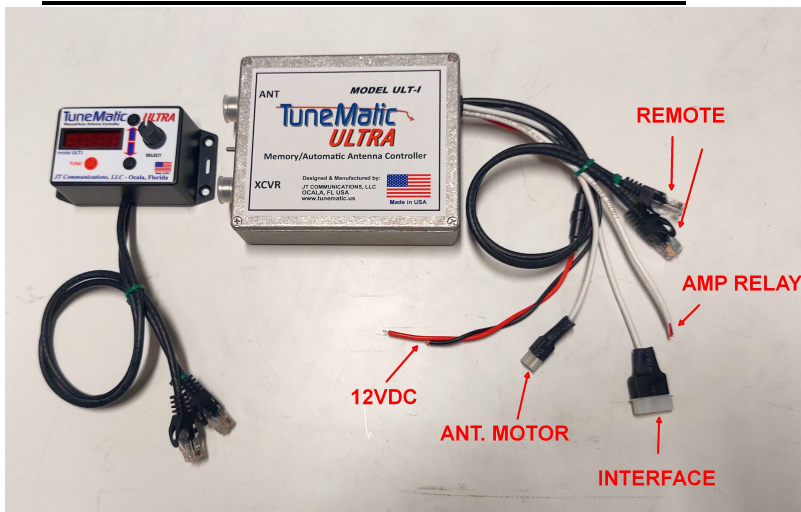
DOWN ARROW- Allows antenna to move down in direction.

TUNE BUTTON (RED) - Performs autotune mode. See section 6 for further instructions

SELECT KNOB- This knob rotates through the memories and selections, as well as depression action to select various operations.

DISPLAY- This 4-digit RED LED display shows antenna position, as well as other system and operational messages.

MAIN UNIT CONNECTIONS/CABLES



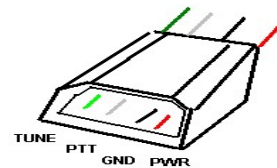
1) 12v power leads: These leads can be paralleled with radio power if desired, as they draw no current until TuneMatic is powered up by Radio Control cable. **NEGATIVE GROUND SYSTEM ONLY!**

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 to this connection, TuneMatic turns on, as well as Remote Head. 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 pin toggles low, it places TuneMatic in a TUNE mode.

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.

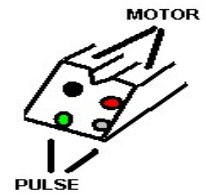
ANT - Connect this to either the antenna, or input of amplifier if using the amp option- then connect amplifier output to antenna lead.

4) Remote / RJ-45 couplers(2)- This set of cables/connections mate with the remote head. Although the factory jumpers supplied are 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.**

NOTE: EACH CABLE NEEDS TO BE MATCHED TO THE CORRESPONDING TAGGED CONNECTOR-

However, if reversed, the green power LED on the rear of the remote will illuminate red, and illuminate green if normal when power is applied. Reversing the connections will not cause damage if accidentally swapped.

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)



NOTE: IF YOU ARE USING A THIRD-PARTY ANTENNA (Scorpion or HI-Q), It is advisable to contact the factory for the pigtail motor cable (no charge). That eliminates the need to cut off any connectors on the TuneMatic. DO NOT CONNECT ANY EXTERNAL DC TO THE MOTOR LEADS, THIS WILL DAMAGE THE TUNEMATIC AND VOID THE WARRANTY.

6) AMPLIFIER RELAY CONNECTION:(red/black paired)- These normally-closed lines connect 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. Max rating 1A 50v, and is timed as to open the AMP keyline before keying the rig, and unkeying the rig before the AMP keyline is enabled

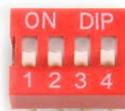
RIG INTERFACE:

The rig interface is the communications between the TuneMatic and your specific radio (*refer to the interface supplement*) for wiring information and details). The 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 instructions on how to connect to your specific rig. **Some rigs (ICOM) will work with the radio TUNE button with the TuneMatic IC1 interface.**

B) INSTALLATION:

- a) Plug motor control cable from motor to TuneMatic Antenna Motor connector.
- b) Connect 50 ohm RF coax jumper from HF radio to RF connection labeled RADIO of TuneMatic,
- c) 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.
- d) Connect remote head with the RJ-45 couplers (and/or RJ-45 extension cables if needed). ***NOTE the RJ-45 connection that is tagged must connect to main unit tagged cable. If reversed, the remote will not operate, and the red LED on the back of the remote will illuminate when power is applied. Correct connection will show a green LED when power is applied.***
- e) Connect interface connector from TuneMatic to TuneMatic interface, and associated cables from interface to radio (**review interface supplement for specific radio connections**).
- f) If using Amp relay option, connect optional Amp bypass cable- **See the amp option supplement sheet (supplied) for details.**
- g) Connect DC power leads to **12-14V** DC ignition battery line-OBSERVE POLARITY! **NEGATIVE GROUND ONLY!** A good frame ground connection can be used alternately to the vehicle chassis for added RF shielding from the 6-32 threaded screw with a heavy braided lead.
- h) 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	NOTE: DIP SWITCH #4 NOT USED
Switch number		1 2 3 4	
Lowest setting	200mA	0 0 0 -	
LittleTarheel/Little PRO	250 mA	1 0 0 -	*FACTORY DEFAULT SETTING
Diamond SD330	300 mA	0 1 0 -	
*Hi-Q/TarHeel Designs	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 -	



*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.

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 remote will send "K" (-.-) in Morse code tone. The remote will then display the antenna current setting, then display the default count (00 first time setup).

On the remote head, the display will count up as the UP button is pressed, and count down in the down direction when the DOWN button is pressed Note that different models of antennas may have different count rates, and power supply voltage can have some effect on the speed of the count on the display. Note that the up/down switches are dual-speed, starting in slow speed (for fine tuning), then switching to normal speed after 4 seconds of continuous pressing and holding the motor direction button.

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, and display "CLCL". **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 / PARK

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

Since the TuneMatic **ULTRA** operates as both a memory AND/OR automatic device, you can operate the unit solely as a memory controller, or as both. However, once you 'initialize' the unit in the automatic mode, it will also work in the memory-only mode. *You must initialize the antenna for automatic use.*

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 'K' in Morse tone and display the current setting before proceeding.

FOR MEMORY ONLY MODE:

- 3) Rotate the select knob until "MM P" is displayed, then depress the knob. TuneMatic will then move the antenna to the lowest (park) position until complete, then when the antenna stops, display 'PPPP', indicating unit is parked. After parking, it sets the low limit to 3 counts from the base.

FOR AUTO MODE (which also enables memory mode use):

- 4) Rotate the select knob until "inlt" is displayed, then depress the knob. While the display flashes, the antenna will move to the lowest position, current limit will trigger, and flash 'inSt', then move all the way to the top (highest/longest) position of travel until it reaches the upper motor current limit position. It will then flash "InCP" and stop flashing.
- 5) 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 display will count down to 0.
- 6) Once current limit is reached, antenna will stop moving, display PPPP, indicating Initialization is complete.
- 7) The antenna will move to the low soft limit, and display 'LLLL', indicating that the antenna is at the lowest operating limit, and initialization is completed.

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

Once initialization/manual parking is complete::

- 1) The Automatic tuning and storing features will be available for use (if initialization step is performed first).
- 2) When either upper or lower limit is reached, TuneMatic will display 'HHHH' (higher limit), or 'LLLL' (lower limit), and stop further movement, preventing the antenna from traveling beyond these soft limits.
- 3) 'Park' antenna, **by rotating the memory knob until 'M P' is displayed, and momentarily depressing the memory select button.** 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.** The park position is at the lower soft limit point, which assures bottom of travel, and proper re-set of pulsecount calibration.
- 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 display "pULS". 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 (PuIS) MESSAGE, CHECK THE WIRING BETWEEN TuneMatic AND ANTENNA. YOU CAN ALSO PERFORM THE SENSOR CONTINUITY TEST, AS DETAILED IN SECTION D.

MANUAL TUNING ONLY:

Alternately, if you choose not to wish to use the automatic features, you can simply 'park' the antenna as described in step (3) above, and this will allow you to manually store a memory in any of the 20 manual memory positions. This process can be accomplished as follows (after parking antenna):

- 1) Move antenna to desired position,
- 2) Rotate selector knob to desired memory number (1-20),
- 3) Press and hold the select button for at least one second, display will indicate MEMO, indicating memory is stored properly.
- 4) To recall a memory, rotate selector knob to desired memory, then press (but do NOT hold) select knob. Display will then show the stored memory count, and begin to move antenna to that value.

Note that the STORE or TUNE functions will not operate, as the ULTRA is in a memory only mode.

C-2 RE-INITIALIZATION:

The TuneMatic depends on accurate feedback information from the antenna. If the pulse counting sequence is interrupted for a period of time (15 seconds), 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.

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. This does not cause the memories to be lost.***

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) Rotate the selector knob until INIT is displayed, and hold memory select button for at least 3 seconds; TuneMatic will repeat the initialization process as indicated in (2) above.

NOTE- Reinitializing antenna does NOT erase any stored memories. To erase all memories, see section (D-Factory Reset) below. ALTERNATELY, You can re-calibrate the position of the antenna by performing a park routine.

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/AUTO ANTENNA TUNING AND STORAGE:

Once you know the operational frequency limits, you can manually store frequencies in any/all of the 20 preset memories. If using the auto mode, it is recommended that **at least one** frequency is stored in each band that the system (antenna and radio) is capable of covering. Make sure radio is turned on and operational, and that your antenna is capable of *at least* a 1.4:1 SWR on the frequency you are transmitting on. **Remember: TuneMatic will NOT work properly if the antenna cannot provide a sufficient match on the transmit frequency of operation.** 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 10-20 watts output. TuneMatic will display HIPwr, LoPwr, or NORf if power is out of range. *Note that the following steps only work AFTER the antenna has been initialized.*

For MANUAL MEMORY STORAGE ONLY, use the instructions at the end of section C-1

FOR STORAGE OF MEMORIES IN AUTO MODE:

- 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 the position of the antenna to the a designated memory 'window'. 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.

Remember to initialize the antenna first before attempting to press the TUNE button. Otherwise, the remote will beep twice, and display 'Noti', indicating the unit is not yet initialized.

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 send a BLAn message 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 stored position. If the transmit frequency is already stored, TuneMatic will display SE-S message, indicating that this frequency was previously stored. This gives you an aural indication that the antenna was already stored at the transmit frequency. If the transmit frequency is outside a stored window, it will display SE-C, indicating a close match.

If not on a previously stored memory, TuneMatic will then automatically enter the SWR tune phase. TuneMatic will key the radio, and begin moving the antenna towards the transmit frequency. 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 sweep through an VSWR 'null'. Once the fine tune null is found, and the SWR is satisfactory ($\leq 1.5:1$), the antenna position is stored for the selected transmit frequency memory 'window', in the same way the MANUAL STORE mode operates (with the 'M M' Morse message), and will also display MEMO, indicating a completed tune.

In the event TuneMatic is unable to find a tune at or below 1.5:1, it will find the lowest 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 display TInC once the motor stops, and the radio unkeys, indicating the tune is incomplete, stopping at 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, unkey rig, and stop.

If the frequency was already previously stored, TuneMatic will display "SE-S" indicating that the antenna has successfully moved to a stored memory. If on a stored memory, pressing Tune a second time will simply key the rig momentarily and remain where it is.

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. 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 are satisfied with the new match. Then 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 TUNE 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.

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.

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, **minimum 1 count/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 **a minimum of 1 count/second.**
- 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 / SPECIAL FUNCTIONS:

If you want to clear ONLY the 20 manual memories:

- 1) Press and hold both rotary Select and UP buttons then apply power, hold until TuneMatic displays FACT.
- 2) Display will display a short count, then display 'FaCt', indicating the 20 memories are now erased. You will have to park the antenna *at a minimum* to allow storage of the 20 memories.

If you want to clear everything back to factory settings:

- 1) Press and hold the red Tune and rotary Select buttons, then apply power. During the reset process, a the display will count in increments of 1000, until 8000 is reached, then display 'FaCt', indicating all settings are reset back to factory.

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

Pulse sensor test- If you are experiencing regular "PE" errors, you may have issues with the pulse sensor circuitry or the antenna. To perform a continuity test on the sensor circuit in the TuneMatic, perform the following:

- 1) Turn power off from rig
- 2) Disconnect motor cable from TuneMatic and hold female connector so that the notch in the connector FACES UP, The pins on the BOTTOM side of the connector are the pulse sensor leads. Locate a wire or metallicclip so that you can insert into the pulse sensor pins without excessive force.
- 3) While holding the TUNE button on the remote, apply power to the rig, then release the STORE button when you see the display indicate '9999'.
- 4) Short the pulse sensor pins with the wire, and the TuneMatic should start beeping approx every half-second,
- 5) Re-connect motor cable at TuneMatic, and repeat step 4 at the antenna. If there is an open, then there will be no beeping sound, and if you hear beeps, then your motor cabling sensor circuitry is connected properly.

- 6) If you disconnect the antenna, you can use the display as an SWR meter, which will display Standing Wave Ratio as 3 digits, where 250 indicates 2.50:1 SWR.

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) Display messages –listed by priority and operation:

note: the messages marked with “*” are the main messages to remember

Power-up messages:

0000-9998 Pulse count- displays pulse count (varies during antenna movement).

9999 test mode- used to troubleshoot antenna sensor (see special functions section above).

Initial movement and initialization:

IN Initializing: TuneMatic entering initialization mode. This message is heard after pressing the Initialization (IN) button.

nOtl Not initiazed: No autotune functions if TuneMatic is not yet initialized.

CLCL 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.

PuIS 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.

PPPP Park complete: Antenna in park position/

PA Parking: Antenna parking. Message will be heard any time TuneMatic is placed into a park mode, either manually or automatically.

LLLL Low limit: Antenna at lowest “soft” antenna limit position.

HHHH 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:

m1-m20 Memory number: Displays current manual memory number between 1-20.

MEMO Memory write: Valid memory store in progress. This message will be heard upon any successful write to memory once a successful STORE 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.

FrEq 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.

HiSW High SWR: 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.

LorF/HiRf RF Pwr range: Either transmit power is too low or too high (5-30w range) for proper tuning/storing operations.

PuLS Pulse count error: Indicates TuneMatic is not counting pulses. Note that display should always count when antenna is in motion.

Tuning operations:

SE-S Memory in window: Found memory is in stored window.

SE-C Memory beyond window: Found memory is outside stored window.

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 tune or completion of movement on existing memory.

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.

CAnC Tune Cancelled: Tune canceled 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.

b) Troubleshooting:

1) Unit will not power up-

a) Check in-line fuse (**3 or 3.15 A standard** GMA 5x20mm fuse, **not SLO-BLO**). **DO NOT USE LARGER RATING!!**

- b) Check power connections. Poorly crimped connectors is a common fault.
- c) Make sure radio is supplying power through radio interface cable. If the remote keypad is NOT lit, this indicates no power to the TuneMatic interface connection.
- 1a) No motor movement when UP or DN buttons are pressed (pulse error may also occur).
 - a) check antenna motor leads
 - b) check RJ45 connections on remote
- 1b) No pulses detected (PULSE LED not flashing when antenna moves)-
 - a) Check wiring from antenna to TuneMatic.
 - b) Check motor sensor leads and sensor.
- 2) 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.
- 3) Unable to find a good VSWR or get a frequency to store ("SWR" error message)-
 - a) Check all antenna connections. (use radio VSWR meter to verify)
 - b) Make sure antenna system is designed/resonant for the operating frequency.
 - d) Make sure antenna installation is satisfactory, including grounding, counterpoise, etc.
- 4) STORE or TUNE not working-
 - a) Make sure TuneMatic is initialized
- 5) TuneMatic is not stopping at stored presets-
 - a) Re-park antenna and try again.
- 6) 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
 - b) If increased current setting still results in "CL", check for excessive load or shorts on antenna.

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) Perform Park function to allow manual memory storage,
- 5) Start storing frequencies from high-frequency end of antenna to low, rotating the memory selector knob, and press and hold until MEMO is displayed.

At this point, you can recall the stored frequencies by rotating the memory select knob to desired memory, then tap (**but to not hold**) the selector knob, and the display will indicate the stored value of the memory, then move the antenna to that position.

Initialization will be necessary to use the autotune features of the TuneMatic ULTRA.

H- GENERAL SPECIFICATIONS:

Operating Frequency range:	1-60MHz
Insertion loss:	typ. <0.2 dB @ 50MHz
Max power rating:	200W PEP
Operating voltage range:	10-24v DC (motor dependent)
Max. motor load:	1.2A (software limited, plus 3A safety fuse)
Max. PTT load :	0.5a (internally limited)

Operating Temp. range:

-10 to +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 re manufactured 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 re manufactured 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 per-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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