

RTTY - 1

RTTY TUNE

Tuning Indicator for Radio Data Signals

OPERATOR'S MANUAL

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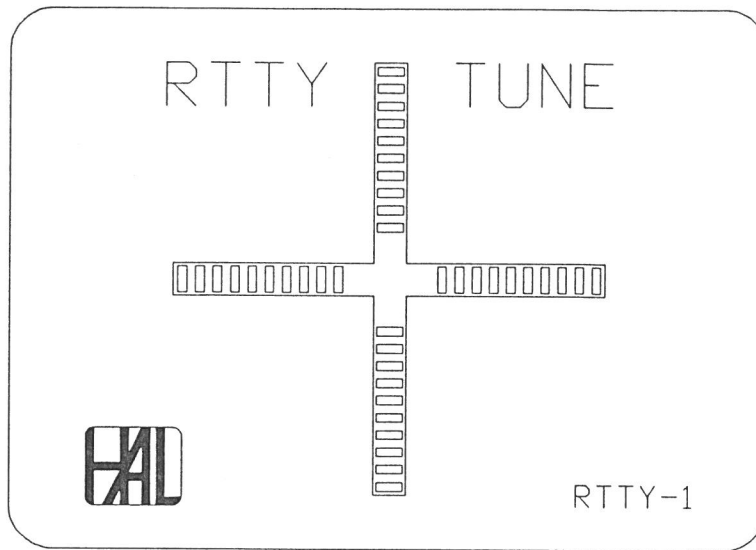


Figure 1. RTTY-1 RTTY TUNE

1. Introduction

The HAL RTTY-1 is a tuning indicator device that may be used with virtually any FSK radio modem. By using the RTTY-1, the radio operator can quickly and accurately tune his HF (high frequency) receiver for optimum reception of radio data signals. The RTTY-1 may be used when receiving radio teleprinter (RTTY) signals, and most common "TOR" data signals (AMTOR, SITOR, P-Mode (*), and Packet Radio).

The RTTY-1 uses an X-Y cross of LED bars to provide a Mark and Space tuning display that is very similar to the display of the popular crossed-ellipse oscilloscope tuning indicator. However, unlike the oscilloscope display, the RTTY-1 is low-cost, light in weight, and does not require a high voltage power supply. The RTTY-1 is very easy to use and high tuning accuracy is quickly achieved.

*The word "P-Mode" is the HAL designation for a communications protocol that may also be known as "Pactor", a registered trademark of the Spezielle Communications Systeme GmbH (SCS) firm in Hanau, Germany.

2. Unpacking and Inspection

When unpacking the RTTY-1, carefully inspect the shipping carton and the cabinet for shipping damage. Any evidence of shipping damage should be immediately reported to your shipping carrier. If damage is found, be sure to save all packing materials for inspection by your carrier.

Before discarding the carton and packing materials, be sure that you have located all parts and accessories listed below. Please contact HAL Communications if any of the following items are missing:

- | | | |
|---|-----------|---|
| 1 | 900-00011 | RTTY-1 RTTY TUNE |
| 1 | 870-00011 | Operator's Manual for RTTY-1 (this booklet) |
| 1 | 310-16032 | DC Power Plug |

2. Installation

The RTTY-1 is a simple device that may be used with practically any HF radio FSK modem that uses demodulator tones centered near 2200 Hz. While the filters of the RTTY-1 are tuned to 2125 Hz (Mark) and 2295 Hz (Space), the indicator may also be used with signals and equipment that use wider shift, such 200 Hz shift used for some ARQ modes.

Typical connections to the RTTY-1 are shown in Figure 2.

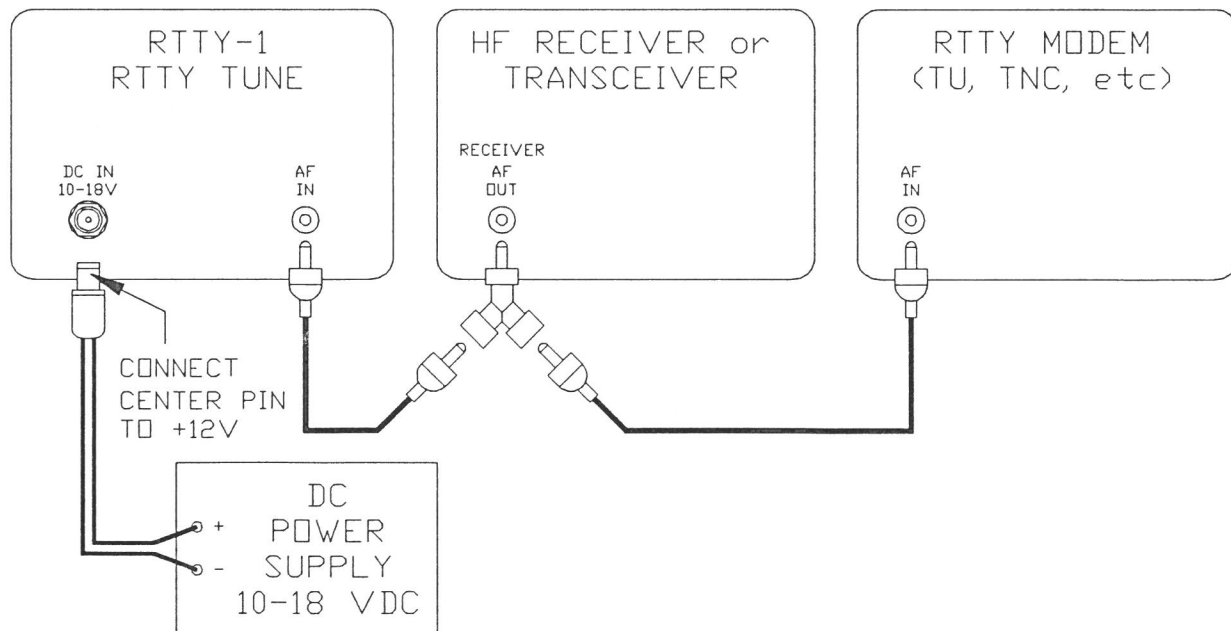


Figure 2. RTTY-1 Connections

2.1 DC Power

The RTTY-1 requires DC power from an external source. The circuitry is designed to operate from a nominal 12 VDC power supply but will also give good results when powered by a stable source from 10 to 18 VDC. The DC voltage provided to the RTTY-1 should be moderately stable ($\pm 10\%$) and free from hum or noise. Depending upon the displayed signal, RTTY-1 requires from 100 to 250 ma of current (@12 VDC). A wall-plug-in DC supply is available from HAL at extra cost (HAL P/N 800-00011; \$15.00 ea).

NOTE: A DC power plug is provided with each RTTY-1. Be sure to use this plug or one that is identical. There are many variations of this connector available, many that look correct but do not provide reliable connection. Additional DC plugs are available from HAL (HAL P/N 310-16032; \$2.50 ea).

Be sure to make the power connections so that the positive terminal of the power supply connects to the center pin of the DC plug. The RTTY-1 is protected internally against reverse power connection - but it will not work at all until the correct voltage polarity is provided.

2.2 Audio Input Connection

Audio output from the radio receiver or receiver section of the transceiver connects to the "RCA-style" phono connector on the RTTY-1's rear panel. The audio output signal may be obtained from the receiver speaker output, "phone patch output", "recorder output", or other "AF OUT" connection that may be provided. Consult the manual of your receiver / transceiver for more details. The audio input impedance of the RTTY-1 is 10,000 ohms and voltage levels of 0.10 to 1.0 V rms are desired.

NOTE: The RTTY-1 connects directly to the receiver audio output and *not* to "Mark", "Space", or "Scope" connections that may be included on your RTTY demodulator. The RTTY-1 and demodulator input are wired in *parallel*.

2.3 Location

The RTTY-1 is housed in a very light and small cabinet. Place it wherever the front panel may be easily seen. Adhesive backed mating strips of Velcro® are provided that you may use to attach the RTTY-1 to the preferred location in your station. While the RTTY-1 is not very sensitive to heat or cold, avoid placing it where it may be exposed to extremely high temperatures, such as on top of a high powered amplifier cabinet. Also, the RTTY-1 is not exceptionally sensitive to RF (radio frequency) fields, but do not place it near the antenna coupler, feedline, or the antenna itself.

3. How it Works

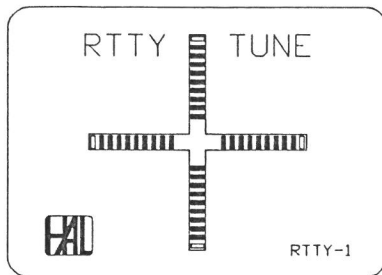
The RTTY-1 is a LED bar-graph indicator that provides visual tuning information that is much like that of the crossed ellipses of the long-popular RTTY tuning oscilloscope. However, the RTTY-1 includes its own internal Mark and Space filters rather than obtaining filtered Mark and Space signals from the RTTY demodulator. This allows the RTTY-1 to be used with *any* RTTY demodulator, including those that do not have "RTTY Scope" output connectors. The RTTY-1 is a particularly useful accessory to DSP modems that do all Mark/Space filtering in software and therefore do not have any connections that might be tapped to drive an X-Y tuning indicator.

Audio into the RTTY-1 is first passed through an amplitude limiter stage. The audio voltage or level provided to the RTTY-1 is therefore not critical. Adjust the receiver volume to a level that works well with your receive demodulator. This should provide sufficient audio drive to the RTTY-1. The internal limiter also allows the RTTY-1 to be used on very weak signals and during fading of Mark and/or Space tones. The amplitude limited audio signal then drives separate Mark and Space filters. The Mark filter is tuned to 2125 Hz and the Space filter to 2295 Hz. These are the standard FSK frequencies used in North America. A European version, the RTTY-1E, may also be provided that has the tone filters set to 1275 and 1445 Hz (often called "low-tones"). While the M/S filters are tuned for optimum performance with 170 Hz shift FSK signals ($2295 - 2125 = 170$), 200 Hz shift FSK signals may also be tuned with little or no degradation of accuracy. Some "TOR" modes as well as HF packet radio use 200 Hz shift. These modes may be accurately tuned using the standard RTTY-1.

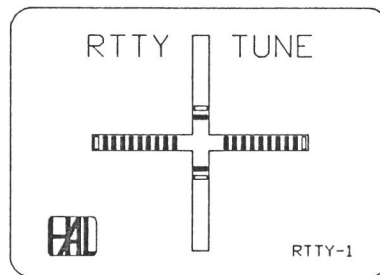
IMPORTANT: The RTTY-1 has its own internal Mark and Space filters. The center frequencies of the RTTY filters **MUST** be the same or close to the same frequency used in the RTTY modem. The RTTY-1 will work well with demodulators that have 2125/2295, 2100/2300, and 2110/2310 Mark/Space filters. The standard RTTY-1 is *not* compatible with demodulators that have filters tuned to other tone frequencies or signals that have shifts other than 170 or 200 Hz. Contact HAL for further information regarding special tones or shifts.

The audio signals from the Mark and Space filters are detected and displayed on the front panel LED tuning bars. The X-Y cross display follows the normal oscilloscope convention, showing Mark on the horizontal row and Space on the vertical column. The "spread width" of bar segments illuminated from the center out is proportional to how closely the tone frequency of the received RTTY signal matches that of the RTTY-1's internal filters.

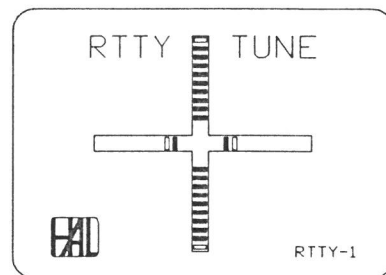
The RTTY-1 has no external controls. Two internal potentiometers provide adjustment of the Mark and Space filter center frequencies. Do not adjust these controls unless you have access to a well calibrated audio signal generator.



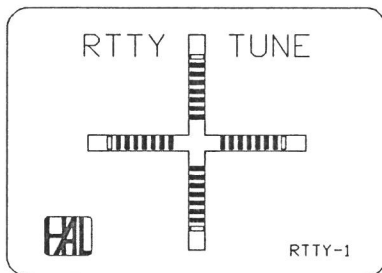
CORRECT TUNING
170 HZ SHIFT
M/S RTTY SIGNAL



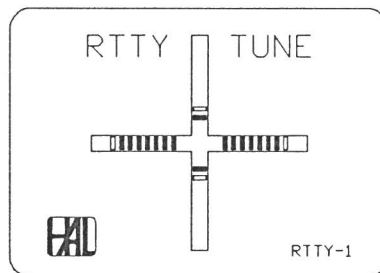
CORRECT TUNING
170 HZ SHIFT
STEADY MARK TONE



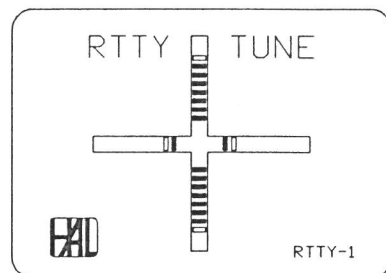
CORRECT TUNING
170 HZ SHIFT
STEADY SPACE TONE



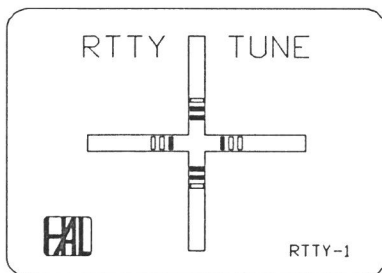
CORRECT TUNING
200 HZ SHIFT
M/S RTTY SIGNAL



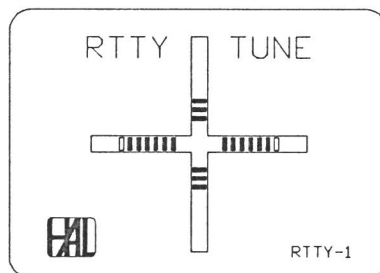
CORRECT TUNING
200 HZ SHIFT
STEADY MARK TONE



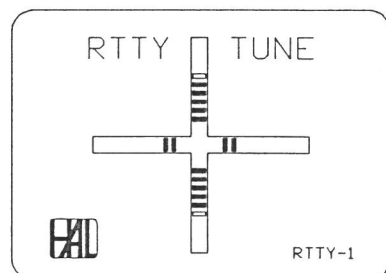
CORRECT TUNING
200 HZ SHIFT
STEADY SPACE TONE



CONNECTION OK
NO RTTY SIGNAL
(NOISE)



INCORRECT TUNING
FAVORS MARK
TUNE UP



INCORRECT TUNING
FAVORS SPACE
TUNE DOWN

Figure 3. Typical RTTY-1 Displays

4. Use of the RTTY-1

The RTTY-1 is very easy to use. Connect it to the DC power source and receiver audio output as shown in Figure 2. Turn the DC supply, receiver, and demodulator on. Adjust the receiver volume control until you see the bottom few LED bar segments flash on and off with noise. Tune to a RTTY or other FSK data signal while watching the RTTY-1 display. Typical tuning situations are shown in Figure 3. When a RTTY or other FSK signal is correctly tuned, both the horizontal (Mark) and vertical (Space) bars will show maximum deflection. This is true even if the signal does not use exactly the same shift (170 Hz) as the RTTY-1. As shown, correct tuning of a 200 Hz shift FSK signal also shows maximum X and Y deflection, but not as great as if it were a 170 Hz shift signal. Experiment with tuning above and below the correct frequencies. Notice how the display favors Mark or Space when tuning is not correct. With very little practice, you will be able to quickly tune exactly to the other station's frequency.

5. In Case of Difficulty

The RTTY-1 is a very simple device and should give years of trouble-free operation. If it has worked but suddenly fails, always check the cables first. It's very easy to bump and loosen cable plugs. If the RTTY-1 does not seem to work when first tried, be sure that the DC power supply is wired with the correct polarity. The positive lead from the DC supply *must* be connected to the *center* pin of the power plug. The RTTY-1 is protected against reverse polarity connection but will not work if the polarity is incorrect.

6. Specifications

Input:	Impedance:	10,000 ohms
	Audio Voltage:	0.1 to 1.0 V rms
Filters:	Standard:	2125 Hz Mark (horizontal bar) 2295 Hz Space (vertical bar)
Power:	Voltage:	10 to 18 Volt, DC
	Current:	100 -2 50 ma DC
	Connector:	HAL 310-16030 (included)
	Power Supply:	HAL 800-00011 (optional, extra cost)
Physical:	Size:	5.50"W x 3.75"H x 1.25"D (14.0x9.5x3.2 cm)
	Net Weight:	0.5 lb (0.23 kg)
	Shipping Wt:	1.0 lb (0.45 kg)
	Color:	Black cabinet, white front panel labeling

LIMITED WARRANTY

HAL Communications Corp. of Urbana, Illinois hereby warrants to the purchaser that the product herein described shall be free from defects in materials and workmanship, and from failure of operation from ordinary use, for a period of one year from the date of sale to the purchaser.

In the event of a defect in materials or workmanship during the warranty period, HAL Communications Corp. will, at its own expense, repair the defective unit and replace any defective parts. Cost of shipping the unit to HAL Communications Corp. as well as costs of removal and reinstallation of the unit shall be paid by the purchaser. HAL Communications Corp. will pay the shipping cost incurred in returning the unit to the purchaser.

To obtain warranty service, the customer should:

1. Notify as soon as possible, the Customer Service Department of HAL Communications Corp., Box 365, Urbana, IL 61801.
2. At the time of notification, identify the serial number and the defect.
3. HAL Communications will issue a Return Authorization Number.
4. Return the unit, freight prepaid. Include inside the carton, a reference to the Return Authorization Number and a brief description of the problem.

Correct installation, use, maintenance, and repair are essential for proper performance of this product. The purchaser should carefully read the equipment manual. The purchaser will be billed for labor and shipping charges on any unit determined by HAL to be in working order when received for repair.

This warranty does not apply to any defect which HAL Communications Corp. determines to be due to any of the following:

1. Improper maintenance or repair, including installation of parts or accessories that do not conform to the quality and specifications of the original parts.
2. Misuse, abuse, neglect, improper installation, or improper operation including improper AC power and RF grounding techniques.
3. Accidental or intentional damage.

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