

**ERA Mk2 MICROREADER**  
**OPERATING INSTRUCTIONS**

THANK YOU FOR PURCHASING THE Mk2 MICROREADER. YOU SHOULD FIND IT BOTH EASY TO SET UP AND OPERATE. TO OBTAIN MAXIMUM PERFORMANCE FROM YOUR NEW READER IT IS IMPORTANT TO UNDERSTAND HOW IT WORKS, EVEN IF YOU HAVE USED OTHER MORSE/RTTY READERS BEFORE. WE SUGGEST THEREFORE THAT YOU TAKE THE TIME TO READ THESE INSTRUCTIONS BEFORE PROCEEDING.

E.R.A.  
Unit 26, Clarendon Court  
Winwick Quay  
Warrington  
Cheshire, WA2 8QP  
England

Tel: (0925) 573118

Mk2 MICROREADER SPECIFICATION

DISPLAY	16 character reflective liquid crystal display (LCD), right to left scrolling.
MODES	CW, RTTY, AMTOR, SITOR (FEC B, NAVTEX) & MORSE TUTOR
FILTERS	Independent analogue mark/space bandpass filters. The 20dB bandwidth is 300Hz. Two fixed notch filters plus one 5th order biquad elliptic lowpass on input.
INDICATORS	One 10-element three colour bargraph LED frequency indicator. Step size is 50Hz. Centre green is 1275Hz. Three red RTTY shift LEDs. Note that centre LED is also used to show signal trigger level in CW mode.
CW SPEED	SLOW: 5-20 WPM, AUTO: 5-45 WPM, FAST: 15-80 WPM.
CW EDIT	Word recognition and auto space insertion.
BAUD RATES	Receives 45,50,75 and 100 Baud (auto only), normal or reversed.
SHIFTS	Target frequency (green on bargraph LED) = 1275Hz 170Hz shift, 1445Hz = bottom LED 425Hz shift, 1700Hz = middle LED 850Hz shift, 2125Hz = upper LED
RTTY EDIT (LCD only)	Repeat spaces removed. Limits repeated characters to four. Has full reverse correction on detection of missed letter shift.
RS232 O/P	Speeds provided are: 600, 1200, 2400 and 4800 Baud. Protocol: 1 start bit, 8 data bits, 1 stop bit, no parity, no handshaking. Default is 4800 Baud.
MORSE TUTOR	Sends letters, figures, letters and figures mixed, punctuation and procedural codes. 10 groups of 5 characters per session. Speed 8-26 WPM, calculated for normal spacing. Additional character spacing may be selected from 0-9 dot periods between characters.
TUTOR KEYING	By normal contact closure up to 30 WPM. Sidetone is fixed at 1275Hz. Editing, other than punctuation OFF.
POWER REQUIREMENTS	13.8V DC nominal, accepts supplies from 12 to 16V DC Current consumption less than 200mA. Reverse polarity protection. Over-current and thermal shutdown. Fused internally with 500mA slow blow.
SIZE	135mm wide, 110mm deep and 50mm high (incl. feet). Weighs less than 750 grammes.

INITIAL SETTING UP PROCEDURE

The Mk2 Microreader needs a nominal power supply of 12V DC at about 200mA. This should preferably be a regulated supply but as the Microreader has its own internal regulators, the only requirement is that the voltage be in the range between 12 to 16V **"NOT MAINS SUPPLY"** and reasonably smooth. A 13.8V DC supply is ideal, which can be used to power the Microreader and other equipment at the receiving station. If this is the first time with the Microreader set the mode switch to CW SLOW before powering on and this will cause the switch action to be slow until you become familiar with its operation.

Connect the red wire to the positive of the supply and the black to ground. Set the rear panel switch to on and observe the display. Immediately on switch on there should be a short beep from the tutor sounder and the display should show the revision of the software briefly followed by the mode. It is important to remember that in order for the two microprocessors to reset or start up correctly, the power switch on the rear should be used. You may at this point like to vary the contrast on the LCD to choose your viewing angle. Use a small screwdriver and adjust the preset control for the best contrast.

Position the Microreader where it will be used. Avoid high temperatures or places of high reflected light that may spoil the readability. Connect a short screened lead from one of the audio IN/OUT jacks on the rear to the headphone or speaker socket on the receiver. With this arrangement the majority of sets cut off the internal speaker so it will be necessary to plug an extension speaker or headphones to the second IN/OUT socket on the rear of the Microreader. Take care not to plug the speaker lead into the RS232 output socket.

Find a good strong Morse station. Now switch the reader to CW AUTO and fine tune the set near the signal. The LED bargraph tuning indicator will show when the signal is exactly on tune ie. center green LEDs are flashing. These indicators are extremely fast and it is quite normal for them to show poor frequency stability (chirps) or appear to show several background signals simultaneously. The intensity of these LEDs is partially governed by the signal strength to improve readability. When a signal is above a certain threshold it will be accepted for reading by the processor. This threshold is shown by the center shift LED. Experiment a little to find the best setting of the sets volume control consistent with a good flashing rhythm with the signal and little or no flashing with only background noise. You may adjust the gain of the Microreader if you find that best results occur with the sets volume too high or too low. This adjustment on the rear is not critical and needs only to be done once.

CW OPERATION

When using Morse code set the receiver to either CW or SSB. You may be surprised to find that the Microreader may work better on SSB than CW. The reason for this is excessive filtering of the signal. This causes the signal to ring or look 'blurred' with the effect that the microprocessor does not see the element spaces between dots and dashes. Some signals may have this effect already due to an incorrectly set up transmitter. As all sets are different in their performance the best set up will be found by experimenting. Use the CW AUTO position unless you specifically want to listen to very high or very low speed Morse. Although the reader may well read the signal in all three positions, these other two positions provide optimum conditions.

For those who never have decoded Morse before, the initial results may at first appear a little confusing but don't worry all will become clear after a while. If you choose to start with a commercial station such as a ship-to-shore station sending out the weather forecast, the reader will probably read this type of Morse without any error all day given good conditions. The reason for this is that the Morse is either machine sent or it is being sent by a professional operator and as such is of higher quality. Should you decide to try the amateur bands, be ready for less than perfect decoding, in fact some signals may give almost no decoding.

When sending Morse, most amateurs use abbreviations to speed up their messages and with a little practice you will soon become familiar with the common ones.

For example: MNI TNX FER QSO  
means: Many thanks for the QSO (contact)

The problems start when the sender, in trying to be quick, fails to send any spaces between the words.

For example: MNITNXFERQSOURRST559

Imagine for example, reading a newspaper, if all the words were joined together. Not impossible but difficult. Now into this equation, add the possibilities of errors in sending or those caused by interference. Fortunately the Microreader is powerful enough to search the resulting text for known words. Missed spaces are re-inserted at the correct location and common mistakes in sending are corrected. Occasionally the word search process will find a word and insert spaces incorrectly. This is difficult to prevent on some words but on the whole the system works very well. For instance, the word 'namely' would appear as 'name ly'. The word search can be disabled via C.W. options.

RTTY OPERATION

For those who are unfamiliar with radio teletype or RTTY, the best procedure is to try amateur RTTY first. This eliminates the possibility of finding a scrambled transmission. The 20m amateur band is normally quite active especially during the evening. The frequencies to listen to are between 14.08 Mhz and 14.09 Mhz on USB. With the Microreader set first to CW, tune around this section of the band while observing the tune indicator. Each time you tune through an amateur RTTY station you should notice that the two alternating FSK tones that make up the RTTY signal should be clearly visible as a pair of bright lines. The gap between these lines is an indication of the shift being used. Tune the set to put the left hand tone on the centre green LED, the other should be over at the right and quite dim.

Set the mode switch on the Microreader to RTTY OPTIONS. When the prompt to SELECT appears rotate the switch one position clockwise. This manually selects 45 Baud normal reception which is the correct condition for this mode and band. The screen will now prompt you to select the shift which for amateurs is 170Hz. The reader should immediately start to read the signals and the lower shift indicator should flicker indicating a shift of 170Hz. When the station stops transmitting you may need to re-tune slightly for the reply. Note, When using manual selection in this way, the decode routine will accept intermittent stop start sending and signals where the Baud rate is not quite accurate. The amateur RTTY performance should give a good idea of the systems capability.

To try the Microreader on a commercial signal such as a press agency, you will ideally need to know if the station you are tuned into is in fact readable. You can of course go through all the permutations to find one that may work but the best way is to obtain a frequency list of stations. Books listing the frequencies, shifts and Baud rates of signals are helpful but are very soon out of date. Magazines often publish more current information about what stations can be heard.

The REV 4.2 firmware fitted to your Microreader allows for automatic selection of the Baud rate and polarity. This is done by setting the mode switch first to RTTY OPTIONS. then, when the prompt to SELECT appears, rotating the switch anti-clockwise for the desired shift. This auto mode uses a synchronous decoding routine that gives improved reception under poor conditions but is only suitable where the Baud rate is accurately defined. Errors occur if the signal is too noisy or interrupted during the Baud finding routine. If the Microreader is unable to find the polarity of the signal, then this is normally an indication that the transmission is encrypted however setting manually sometimes may result in a partial decode.

SITOR MODES (AMTOR, FEC B, NAVTEXT)

SITOR B or FEC B is an error correcting code for general broadcast or for calling CQ prior to an AMTOR contact. This is transmitted using 170Hz shift and sounds very similar to 100 Baud RTTY. To decode Sitor, simply use the Microreader in its auto mode as you would for RTTY or alternatively the mode can be selected by the following sequence. CW OPTIONS then after SELECT one turn anticlockwise. When the display shows SELECT 170 SHIFT one more click anticlockwise puts you into the correct mode.

This second method of setting Sitor mode is quicker and prevents the code from being mistaken as 100 Baud RTTY. Although some of the initial characters may get garbled, once locked, the decoding should be very good even in noise and fading. Listen for FEC anywhere especially on the ham bands (14.07-14.08MHz). Navtext transmissions are also sent using this mode on @ 516 KHz USB giving weather reports and general shipping information. Transmissions occur several times at set intervals each day.

Mode A or Amtor is a mode that provides error free communication between two stations and is characterised by a repetitive "chirp chirp" sound about twice per second. If the receiving station detects an error, it requests a re-transmission of the last block of data. Because the Microreader has no means of asking for a repeat, corrupted characters will be shown as   . Tuning Amtor type signals requires a little practice, the trick is to tune into the longer bursts and ignore the short ones. The Microreader may also take a little time to phase lock onto the signal correctly. To enter this mode, set to CW OPTIONS then after select set to the 170 shift position.

Transmitter	Code	Transmission Time (UTC) GMT.	Full Area Weather Forecast Times
Reykavik, Iceland	R	0318, 0728, 1118, 1518, 1918, 2318	Gale warnings only
Scheveningen, The Netherlands	P	0348, 0748, 1148, 1548, 1948, 2348	Gale warnings only
Stockholm, Sweden	J	0330, 0730, 1130, 1530, 1930, 2330	0730 & 1930
Oostende, Belgium	T	0248, 0648, 1248, 1848, 2248	0648 & 1848
Bodo, Norway	B	0018, 0418, 0900, 1218, 1618, 2100	0018 & 1218
Rogoland, Norway	L	0148, 0548, 0948, 1348, 1748, 2148	0148, 0948, 1348, 2148
Vardo, Norway	V	0200, 0500, 1818, 1100, 1700, 2018, 2300	1100 & 2300
Tallin, USSR	U	0030, 0430, 0830, 1230, 1630, 2030	0830 & 2030
Haernoessand, Sweden	H	0000, 0400, 0800, 1200, 1600, 2000	0800 & 2000
Cullercoats, UK (East)	* G	0048, 0448, 0848, 1648, 2048 +12:49	0848, 2048
Portpatrick, UK (West)	* O	0130, 0530, 0930, 1330, 1730, 2130	0930 & 2130
Niton UK (South)	* S	0018, 0418, 0918, 1218, 1618, 2018	0818, 2018

### MORSE TUTOR

Before using the tutor function remove all audio leads from the rear of the Microreader, otherwise the loudspeaker will be mistaken for a Morse key. With the mode switch, select the TUTOR position. This takes you into the TUTOR MENU which allows you to send or receive.

### RECEIVING PRACTICE

In this mode, the Microreader will send 10 groups each of 5 random characters for you to write down. The type of characters, the speed and spacing are all adjustable. If you select receive practice and make no changes to the switch, then the Microreader will set itself to letters at twelve words per minute with normal spacing between each letter. To make changes, simply rotate the switch when the display prompts you for it.

The only thing you may find out of the ordinary are the procedural codes. These are special Morse characters often used to indicate certain conditions and are displayed on your Micro-reader by lower case letters. These codes, although used extensively on the air, are not a requirement for the Morse test. Consequently, many having just passed this test may be surprised to find quite a few characters they don't understand. These codes are mixed in with the punctuations and are as follows:

- (b)(BK)Used in break-in operation
- (c)(CL) Closing down station
- (e)(AR) End of message
- (f)(SK) Finish work with station
- (k)(KN)Only station called to reply
- (s)Start of message/transmission
- (w)(AS)Please wait
- (←)Error
- (ä)Continental letters
- (ö)     - " - - -"
- (ü)     - " - - -"

When learning Morse, most people would advise to have the characters sent at the normal speed but with large gaps between each letter. The minimum speed setting for the Microreader is 8 words per minute (WPM) which some may say is fast but this of course is only the character speed. When set to give longer gaps between letters, the actual speed in WPM is considerably reduced.

**SENDING PRACTICE**

Insert your Morse key into one of the audio IN/OUT sockets on the rear panel. Incidentally, it should not be fitted with any spark suppression capacitors as this will affect the performance. When first switched to sending practice, it will be necessary to let the Microreader become familiar with your sending. This is best achieved by keying a series of repeated letters such as VVVs until correct reading results. Any letter sent repeatedly must contain both dots and dashes otherwise the memory of the reader will fill with dots or dashes only and errors will result.

Try to send normally, avoiding the temptation to watch and wait for each letter. Only check occasionally, looking for errors in spacing. A dot between words or in the middle of a word occurs when the space could have been either a word space or a letter space.

- (a) T H E Q U I C K B R O W N F O X ..letter spaces too long
- (b) T-H-E Q-U-I-C-K B-R-O-W-N F-O-X ..Better, but still long
- (c) THE-QUICK-BROWN-FOX.....Word spaces slightly short
- (d) THEQUICKBROWNFOX.....Word spaces much too short

All of the above examples are problems associated with spacing that result in the letters still being displayed correct. If the space between each letter is made too short then strange things start to happen.

- (e) 6E QUICK BR\_N FOX...

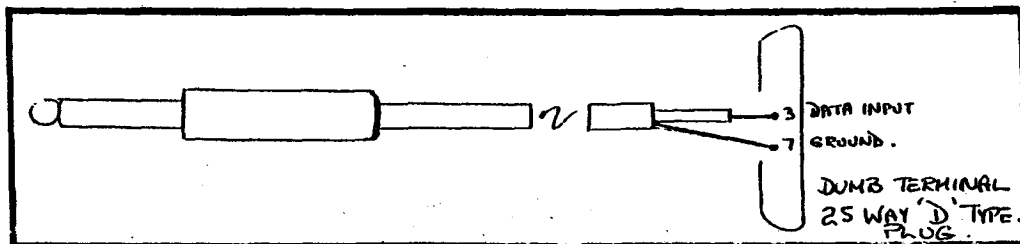
In this example, the 'T' and 'H' have joined together due to an insufficient character space between them. This forms a perfect figure '6', which the Microreader then displays. If the 'O' and 'W' join together a none existent character is created which is displayed as '\_' (underline), a none existent character.



RS232 OUTPUT

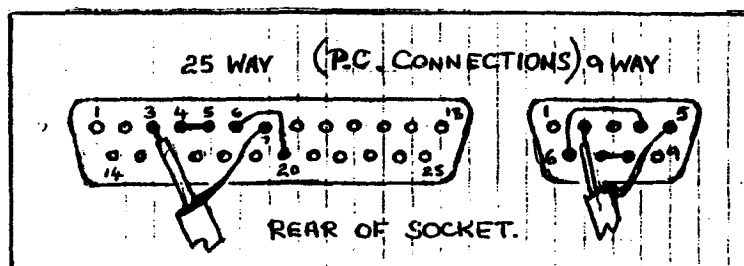
The Microreader can output data to external equipment via the RS232 serial interface. This might be to a computer, serial printer, or dumb terminal. Only two wires are required, data and ground, making the connection simple. A screened lead should be used for minimum interference. Handshaking procedures will not be needed with this system. The Mk2 Microreader will not directly interface to domestic TV sets, monitors or parallel printers.

The Microreader defaults at switch on to 4800 Baud and the external equipment should ideally also be set to match this speed. If for some reason the speed of the external equipment is fixed at something other than 4800 Baud, the Baud rate can be changed on the Microreader. To do this first switch to BAUD RATE SELECT. Once into the menu, simply select the desired speed. If the external device doesn't respond correctly, you may need to change some of the settings to match that of the Microreader (See specification on page 2).

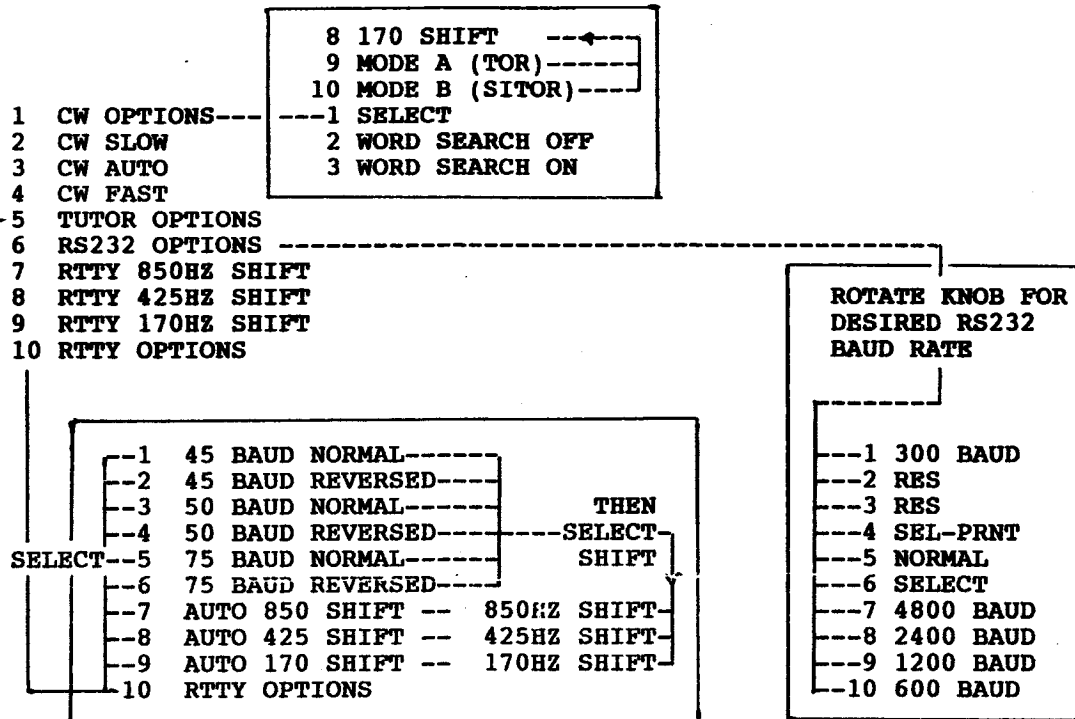


If the Microreader is connected to a PC or terminal unit the characters will be displayed on the screen will be sixteen characters behind for RTTY, and around 6 characters behind for CW. The reason for this delay is to allow text editing on the screen since it is not possible to correct any errors once the data has been sent out. The output is formatted to wrap around on any eighty column display or printer, by automatically inserting a CR/LF or carriage return line feed sequence.

The RS232 options also has a selective output facility that disables the RS232 if an end of transmission (NNNN) is found. The output is turned on again when a start sequence (ZCZC) is found. This can be usefull for RTTY to prevent garbage being printed after the end of a transmission.



Rotating the switch selects the mode required. If the switch is left in any one of the four option positions, then a 'k'-tone will sound before the unit jumps to one of the four option menus shown below. Turning the knob through these option positions at normal speed will not select them. Setting the mode switch to CW SLOW prior to turn on slows the switch action down. CW FAST on the other hand speeds things up for the experts!



FIRST SELECT TUTOR THEN TO CHANGE THE SPEED (WPM) ROTATE THE KNOB OPTION REQUIRED WHEN THE DISPLAY SHOWS SPEED (WPM)

1 RES	1 PUNCT---	8 WPM	8 EXTRA SPACES
2 SENDING PRACTICE	2 LET+NUM	10 WPM	9 EXTRA SPACES
3 RECEIVING PRACTICE---	3 - LETTERS	12 WPM	0 EXTRA SPACES
4 EXIT TUTOR	4 NUMBERS	14 WPM	1 EXTRA SPACES
5 TUTOR OPTIONS	5 CANCEL	16 WPM	2 EXTRA SPACES
6 RES	6 RES	18 WPM	3 EXTRA SPACES
7 RES	7 RES	20 WPM	4 EXTRA SPACES
8 RES	8 RES	22 WPM	5 EXTRA SPACES
9 RES	9 RES	24 WPM	6 EXTRA SPACES
10 RES	10 RES	26 WPM	7 EXTRA SPACES

Note RES = Reserved for future use.

WPM = Words per minute