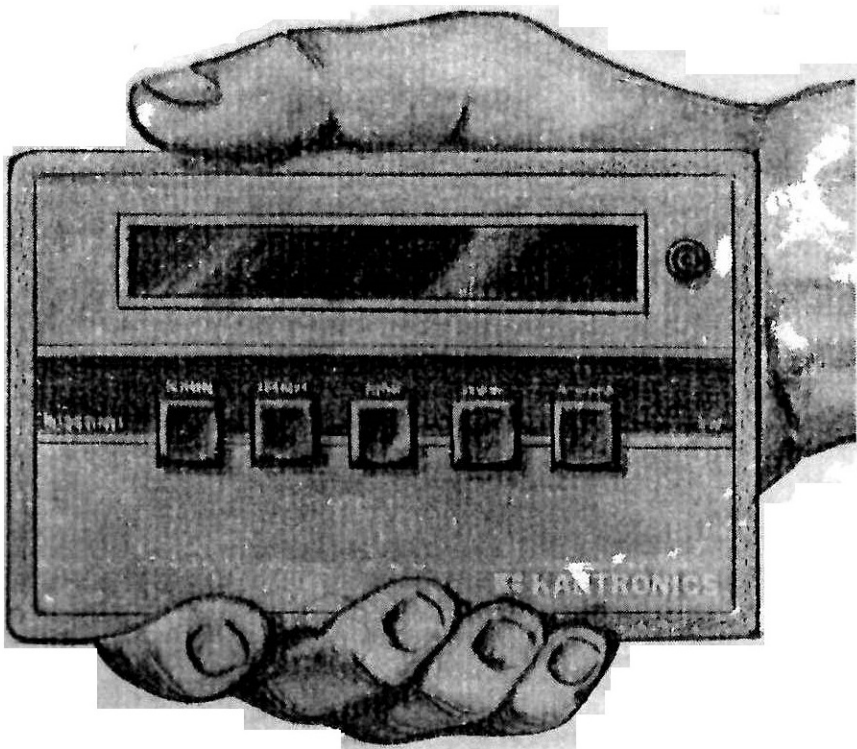


Mini-Reader[™]



Instruction Manual

Kantronics
(913) 842-7745
1202 E. 23rd Street
Lawrence, Kansas 66044

Precautions

PLEASE READ THROUGH your operator's manual.

You should read the instruction manual for this product before attempting to operate it. The warranty does not cover accidents incurred due to wiring not of Kantronics' installation, or to use in violation of instructions provided by Kantronics.

OPERATOR REPAIRS or modifications automatically void the Mini-Reader warranty.

Operator modifications or repairs to this product automatically void its warranty. Refer all repairs during the warranty period to Kantronics. Instructions for returning units to be repaired are included in this manual.

Features

- Morse copying ability
- 3 to 80 WPM Morse range
- Computer programs to improve sloppy Morse
- Radioteletype copying ability-60, 67, 75 and 100 WPM Baudot
- ASCII radioteletype ability-110 and 300 WPM baud*
- Copies any shift of RTTY or ASCII
- 24-hour Universal Time Coordinate clock
- Entire unit contained in one package
- Automatic code-speed tracking
- Full 10-character, large-size display area
- Accurate Morse code-speed computing program
- Tuning eye for easier tuning
- Full-year limited warranty
- Doesn't require TV set or other equipment for use
- Advanced demodulator circuits
- Internal 250 Hz bandwidth filter
- All letters, numbers and punctuation plus special characters for Morse, RTTY and ASCII
- Special self-test mode

- Audio frequency counter

* 300 WPM ASCII is too fast to read on the display face but is included for instances where code is being sent as it is typed and can be read at the typing speed.

What is code reading?

There are all kinds of coded information on the airwaves. In a way, even voice transmissions are coded. A voice transmitter takes information generated in the form of sound waves and alters it in frequency and form until it is regenerated again as sound by a receiver.

Other forms of coded information, however, are more complicated and require additional decoding as they are received. Some forms can be decoded by the human brain; others require machines to be decoded.

Radioteletype, for example, is one form of coded transmission that requires a machine for decoding. The information is put into as simple and exact a form as possible by one machine so it can be readily decoded by another.

Rather than working with words, sentences and languages, radioteletype (known hereafter as RTTY) works with individual letters, numbers, punctuation and other symbols. Each character is represented by a unique electronic pattern. Each pattern contains five coding elements and is transmitted from machine to machine in precise form. Any deviation from the exact pattern will not be recognized by another machine. The same is true for machines communicating with ASCII, (an acronym for American Standard Computer Information Interchange) a more complicated machine language with eight coding elements.

Morse code is an example of a non-machine code. It was designed as a simple method for peo-

ple to communicate by radio before voice transmission had been developed. Morse code, which uses short and long tones and spaces to stand for characters, still is used widely by amateur radio operators because it can be transmitted more efficiently than other modes. The code is sent and received by humans and, therefore, is not precise in the way machine-sent codes are.

What to expect from your Mini-Reader

Because the Mini-Reader is a computer, it understands and appreciates the precision language of machines. RTTY and ASCII communications are decoded flawlessly by the Mini-Reader when received correctly. Miscommunication between the Mini-Reader and RTTY or ASCII machines occurs only when more than one signal is being received at once, or when natural interference levels are so high as to soften the precision of the RTTY signal.

For that reason, the Mini-Reader has been equipped with a sophisticated electronic filter to help screen unwanted signals so they do not interfere with communication. The filter narrows what is being received even more than filters on many receivers. The filtering equipment used to help the Mini-Reader receive machine-sent code is also used in receiving Morse code.

Because man-sent Morse code is not as precise as RTTY or ASCII, however, a machine would not be able to understand it very well. Each person send Morse code in his or her own style. They are using the same coding method, but each varies according to his own rhythm and speed preference.

The variations among Morse code signals are a barrier to machine decoding. To make the job tougher, man-sent code also in-

cludes errors. Some of those errors the human brain can compensate for and still understand the message, but others it cannot. A machine cannot compensate for errors at all.

The Mini-Reader is a computer, however, and it has some very basic decision-making abilities similar to those of the brain. From its programming, the Mini-Reader can make decisions about Morse-code signals and allow for some variations in sending. Many variations that a machine would consider errors, the Mini-Reader can decode correctly.

The Mini-Reader actually has one advantage over the brain, because it can make its decisions at 10 words-a-minute and 80 words-a-minute with equal accuracy.

The Mini-Reader's computer programming that helps it decode man-sent code is called editing. The combination of editing and filtering features of the Mini-Reader help provide significantly more accurate reception of Morse code than that of machines without computer abilities or of machines with less-sophisticated programming.

Operation

The unit is turned on by plugging in the power plug.

When the unit is first turned on or TEST is pressed, the Mini-Reader will enter TEST mode. All characters, numbers, special characters and punctuation will be displayed in sequence.

When TIME is pressed, the 24-hour clock will be displayed. The clock is set by holding TIME to the in position and using MORSE, RTTY/ASCII and FUNC buttons as "fast forward," "forward" and "hold" controls, respectively. To zero the clock, press TEST and then press TIME. Until zeroed, the clock will display unintelligible information.

To copy Morse code, press the MORSE button. If "MORSE" appears on the screen, a special program is engaged to improve code copying.

If "PRACTICE" appears, the editing program is relaxed, making the Mini-Reader less receptive to poorly sent code. To switch between the two, press and release MORSE and then immediately press and hold FUNC until the mode you want appears.

To copy radioteletype, both Baudot and ASCII, press the RTTY/ASCII button. To change between the various speeds available, press and hold FUNC until the desired speed is displayed on the screen.

To activate the audio frequency counter, press FUNC after the unit is in TEST mode. A blinking zero with a slash will appear if there is no signal at the KEY IN jack.

Audio Frequency Counter

In AUDIO FREQUENCY COUNTER mode, the Mini-Reader can be used to test the frequency of audio signals

from 1 Hz to 79 KHz.

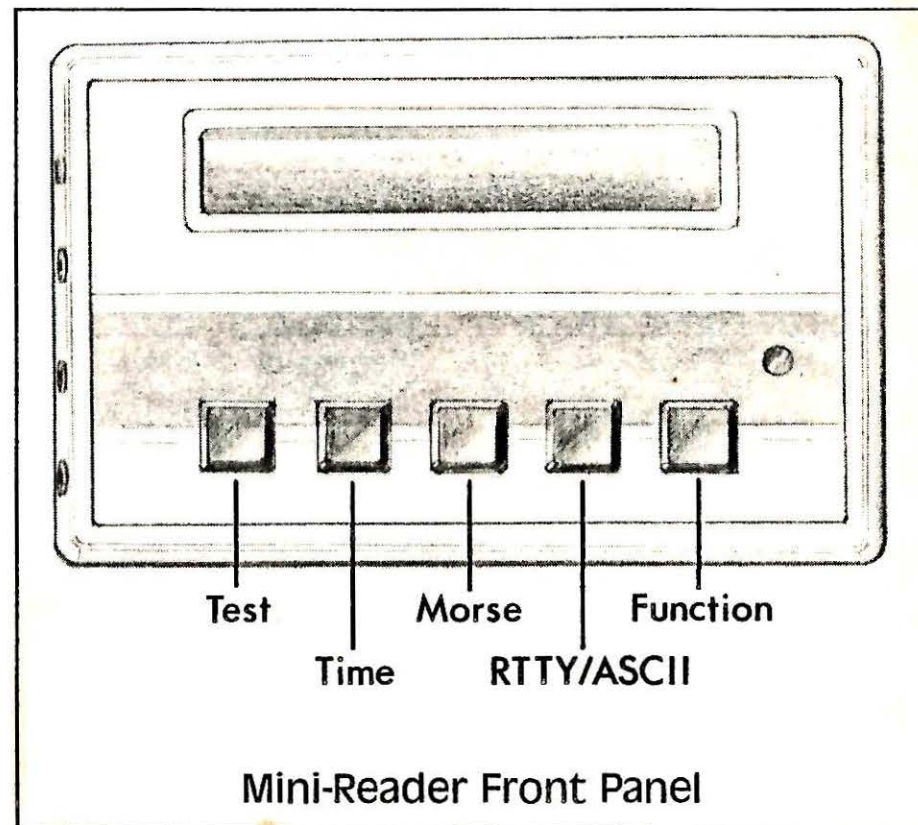
To apply a signal, use the KEY IN jack. The Mini-Reader counts the signal frequency and displays it at intervals of about 1.5 seconds. The signal must be constant for at least one of these intervals to be read correctly.

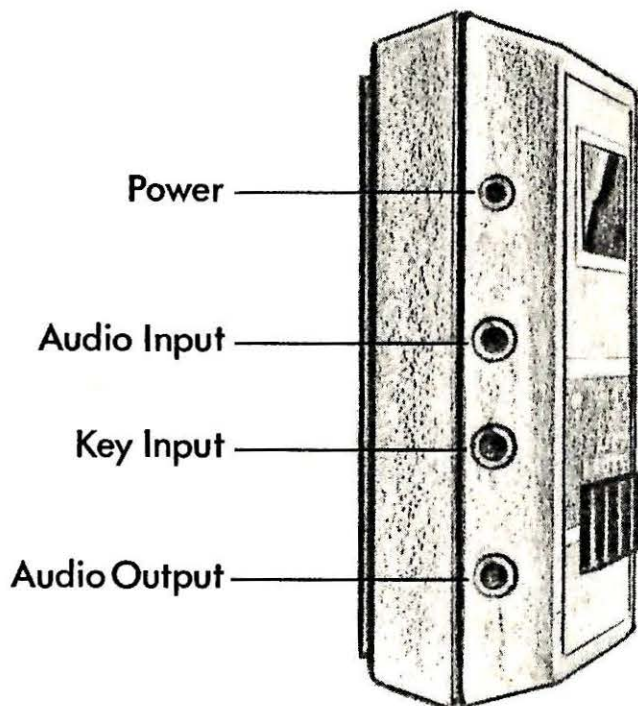
The operator should note that changing-frequency signals will produce a variety of unconnected readings.

One suggested use for the counter is to check line voltages. The KEY IN jack can be connected to the terminals of a standard 115 Vac line to determine its frequency. It is also possible to leave the unit hooked to the line in this manner for a period of several minutes to monitor changes in line frequency.

Voltages equivalent to ± 150 Vdc are accepted by the Mini-Reader. Voltages outside that range should not be applied.

Remember to exercise great care





Mini-Reader Side View

whenever checking the frequency of high voltages.

Hook-Up

The best way to hook up the Mini-Reader is also the simplest.

Power is applied by plugging an 8 Vdc to 18 Vdc source into the POWER jack on the side panel. Note that the labels for the side-panel jacks are given on the front panel so they can be seen at all times.

Kantronics offers a 12 Vdc wall adapter that supplies the correct current to the Mini-Reader. Ask your Authorized Kantronics Dealer to order one for you.

Audio Input

The signal comes to the Mini-Reader through the AUD IN jack on

the side panel. That jack, as well as the KEY IN and AUD OUT jacks are 3.5mm phone plug compatible. The POWER jack is 2.5mm phone plug compatible. Plugs to use with those jacks are included with the Mini-Reader.

Two wires connect to each phone plug. The plug used with the AUD IN jack must be connected through the wires to the external speaker or audio output jack of the receiver being used. If phone plugs are used on the receiver, simply hook ground to ground (sleeve to sleeve) and signal to signal (center plug to center plug). That connection will bring the signal from your receiver to the Mini-Reader.

Audio Output

For an audio output, connect two wires to the plug used with the AUD

OUT jack. Those wires can be connected to an external speaker. The Mini-Reader can silently read any code, however, if you choose to unplug your external speaker.

Key Input

For keying directly into the Mini-Reader, two wires must be connected to the plug used with the KEY IN jack. The wires should then be connected to the output of a keyer or the terminals of a hand key.

The Mini-Reader requires an audio input voltage of 70 mv RMS. Too low an input volume will not provide a copyable signal. Too high an input will distort the incoming signal with equally undesirable results.

If no external speaker output is available from the receiver being used, the Mini-Reader AUD IN jack can be hooked to the receiver headphones jack. That procedure, however, will probably result in requiring a higher volume level to be used.

Mini-Reader Passband

The center frequency of the Mini-Reader input filter is about 750 Hz with a bandwidth of about 100 Hz on both sides of center. If the incoming audio signal cannot be adjusted to fall in that frequency range, the Mini-Reader will not be able to copy it.

For transmitting purposes, the sidetone of the transceiver may be too high or low in frequency for the Mini-Reader to copy. In that case, an alternate method of copying outgoing code is to connect the key or keyer being used directly to the Mini-Reader. Refer to the diagram labeled "Specially Keyed Hook-Up."

To connect the key or keyer, two wires must be run to the KEY IN jack on the left side of the Mini-Reader. The wires run to the KEY IN are in addition to existing wires run to the transceiver.

The operator should also note that the diode included between the

key and the KEY IN is an important component. Without the diode, the signals fed to the Mini-Reader by the receiver may be passed through the key input (via the demodulator circuit) to the transmitter. If the current level was high enough in that case, the receiver might key the transmitter. With a transceiver, an oscillating effect might be produced.

For use with keyers utilizing a transistor output stage, a germanium diode or higher-current silicon diode may be required.

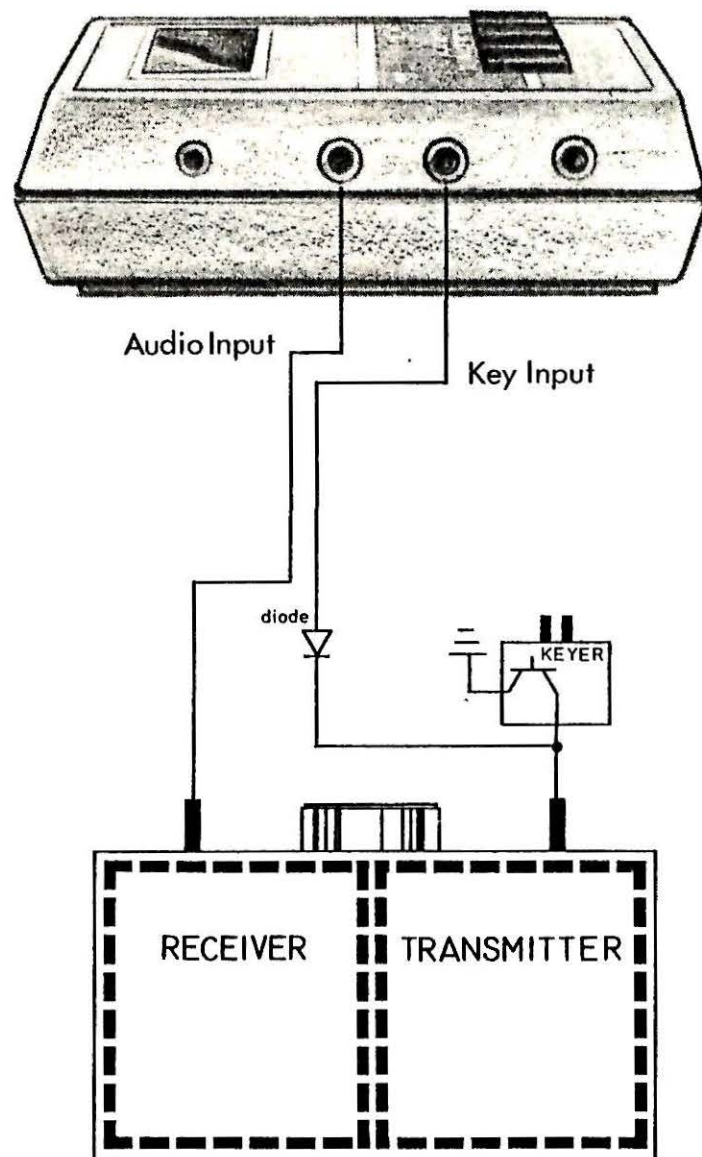
Receiver Tuning Procedures

One of the key elements to obtaining optimum results from the Mini-Reader is the method used to tune signals. A poorly tuned receiver will provide marginal results where a well-tuned receiver will provide better results.

In preparation for tuning signals, the operator may want to open up any special filters his receiver has to their widest settings. The 200 Hz filter of the Mini-Reader has proven to work best over a variety of band conditions. After gaining experience with the Mini-Reader, the operator may want to experiment with other filter settings for unusual band conditions.

In MORSE mode, the operator simply tunes his receiver until a desired signal is heard. Once the signal is found, the operator should then watch the tuning eye on the Mini-Reader front panel. While listening to the pattern of the incoming Morse signal, the operator should adjust his receiver tuning dial until the tuning eye begins to blink to the exact signal pattern being heard. Once the tuning eye is blinking with the signal, the operator should adjust his receiver until the Mini-Reader tuning eye blinks with maximum brilliance.

Tuning radioteletype on the Mini-Reader is similar to tuning



Specially Keyed Hook-Up

Morse code signals, but requires a slightly different method.

The operator should practice on a clean radioteletype signal that has little or no fading. The signal can be recognized by its rapid, 2-tone sound. The Mini-Reader should be set for RTTY 60 because that is the most common radioteletype speed.

The operator should first find the null side of the signal. That side is found by tuning the receiver until it is determined which is the lower-pitched side of the signal. On the low-pitch side, the operator will note that he can continue to tune until the signal disappears. That point is the null side.

After the null side has been found, the operator must tune upward in frequency very slowly while watching the Mini-Reader tuning eye. When the tuning eye first begins to blink with the radioteletype signal, the operator should stop. At that time, text should begin to appear on the Mini-Reader display. If the operator has just hit the edge of the copyable part of the signal, the eye will be blinking very dimly. To receive full copy, the receiver dial should be adjusted very slightly higher in frequency for maximum brilliance. This process may need to be repeated once or twice, particularly under crowded band conditions.

If the Mini-Reader does not decode the radioteletype, the operator should cycle through the various speeds to determine if it is being sent at a faster rate. The operator should also change between upper and lower sideband settings to determine if he is copying on the correct sideband.

If the signal is still not copyable, there are several possible barriers including too much interference for proper decoding, special coding of the signal by the transmitting station, inversion of the code and transmission of the code in a foreign language. In those cases, the operator should probably

try another signal.

Code Speed Calculating

There are a variety of methods of calculating code speed. Since the importance of exact speed calculation has been somewhat limited in the past, no standard is widely recognized.

Probably the most commonly used procedure involves averaging the speed of a selected set of characters so the desired number is sent within a minute. The result is given in words-a-minute with five characters constituting a word. The averaging method, however, varies with the weighting each operator gives to the character elements.

Long pauses or a high number of sentence breaks will require the characters to be sent faster to make up for lost time. The averaging method also has the disadvantage of being a "follow-up" process rather than one that can be used to judge speed as the code is sent. Accurate averages can only be figured after a given set of information has been presented.

The Mini-Reader uses a code-speed calculating program that figures only the speed of the characters as they are sent. If the speed increases, the Mini-Reader will immediately register the change. The process computes on the character speeds, leaving out pauses and transmission breaks.

The Mini-Reader program is based on a running dot average figured in milli-seconds. Instead of averaging a group of characters, the Mini-Reader computes an average as each character is decoded.

Each dash is considered as three dots, which means the dot-dash weighting given by a particular operator is also considered when figuring final code speed.

The Mini-Reader speed program takes the dot lengths it records and

instantly divides them into a constant figure calculated to give the correct code speed. This method works well at any code speed.

Other Uses

Monitoring News-Wire Services

News-wire services often use radioteletype to send news stories to subscribing newspapers and broadcast stations around the world. With the Mini-Reader, you can monitor this information as it is transmitted.

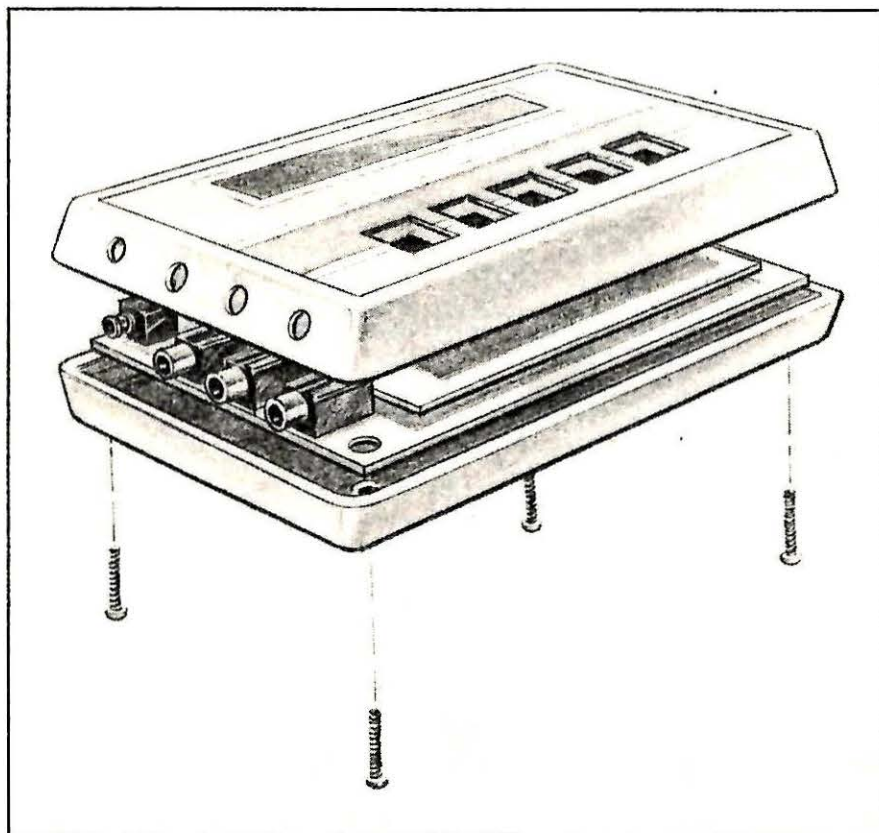
Syndicated broadcasts are found on many frequencies at any hour of the day. A good, general coverage

receiver can pick up many of them in the United States and abroad. Two frequencies that are good for copying wire services are listed below:

Frequency: 16.373.3 MHz
Service: United Press International
Speed: 60 WPM RTTY
Times: (Central Standard) 9 am, noon, 4 pm and later
Sideband: Lower

Frequency: 14.637.1 MHz
Service: Associated Press
Languages: English and Spanish
Times: (Central Standard) 1 pm, on and off during the day
Sideband: Upper

Box Disassembly



Here are some other frequencies you might try:

New York AP, 66 WPM, 19538, 15915, 10214, Daylight, English to Latin America
New York AP, 66 WPM, 23928, 19621, 14711, 10891, 6936
New York UPI, 60 WPM, 20796, 16371, 9326, Daylight hours, all English, to Latin America and Caribbean points
New York UPI, 60 WPM, 20986, 18485, 14661, Daylight hours, to Latin America and Caribbean
New York UPI, 60 WPM, 19580, 14695, 10825, 7769, English and Spanish, nearly all hours
New York Reuters, 66 WPM, 10754
New York Prewiny, 66 WPM, 14635, 10740, Spanish and English
San Francisco ITT, 66 WPM, 20807, 18562
San Francisco ITT, 66 WPM, 19470
London AP, 66 WPM, 14975, 10650
Tokyo AP, 66 WPM, 18048, 14592, 10975, 24 hours daily, to Far East points

Not all wire service transmissions are open to copy. Some may be specially coded. Additional shortwave listening will enable you to locate other wire-service frequencies that are copyable.

Use as a Training Aid

While the Mini-Reader is a great aid to copying Morse code effortlessly, it can also serve as a training- and speed-building aid.

One advantage the Mini-Reader offers for training purposes is its accurate computation of code speed. When a key is hooked directly to the Mini-Reader through the KEY IN jack on the left side, it can be used to measure the speed of copy being sent for practice purposes. Because the Mini-Reader is portable, it can easily be taken along to code classes.

For code-receiving practice, the Mini-Reader can be used to reinforce the connection between hearing the Morse character and mentally seeing the proper alphanumeric character.

For example, the output of a code-practice tape can be fed into the AUD IN of the Mini-Reader. By watching the far-right position of the on-board display, students can see the letter, number or punctuation displayed immediately after they hear it sent through the speaker being used.

By sending slightly faster code than the students can easily copy, the Mini-Reader can help to push them along and to reinforce their mental connection between the code and its proper alphanumeric characters.

For code-sending practice, the Mini-Reader can be used as a judge of well-sent code. For example, with the code editor disengaged, the Mini-Reader applies fairly strict Morse specifications to the code it reads. By hooking a straight key to the KEY IN jack on the left side, the student can see exactly what he is sending.

If the student is trying to learn the rhythm of the combination "CQ," and is sending it as "NNMA," it will be displayed as "NNMA." When the student sends "CQ" correctly, however, he will be immediately reinforced by the correct letter appearing on the display bank.

For home practice, The Mini-Reader can be used with a receiver not only to tell the student if the signals he hears are the speed for practice, but also if the code styles he hears are ones he should want to learn from.

Use in Contests

Because the Mini-Reader breaks down the barriers to code copying that normally exist, it can be used to help level out the abilities of CW operators during field day. The Mini-Reader can also let the public in on the fun during amateur radio demonstrations like field day and help visitors to the station visualize what the dots and dashes of Morse code do.

The Mini-Reader is a great attention-getter and can help show what

the excitement of a CW contact is like in a way explanations cannot. It also frees the control operator to devote his attention to the contact, even if no one else is free to entertain visitors.

Because the Mini-Reader is portable and does not demand the use of a television set, it can easily be set up with almost any station.

By allowing all operators to share in contest contacts, the Mini-Reader helps Novices effectively work with Extra-class operators. In doing so, it also increases the manpower available at any emergency or contest site. The Mini-Reader can also improve logging accuracy by providing a reference source for those calls and locations that no one can seem to agree upon.

For use during crowded conditions such as those that exist during contests and on traffic nets, it is helpful to have a variable filter to use in conjunction with the Mini-Reader. The internal filter of the Mini-Reader narrows the bandwidth of received signals to 250 Hz which has proven to work best for a wide range of uses. But in crowded band conditions, narrower filtering may be helpful. By using a good variable filter, such as the Kantronics Signal Enforcer or Varifilter, the Mini-Reader bandwidth can be narrowed when necessary and then opened up again when conditions are better so that stations do not "drift" out of the copyable bandwidth.

Return/Repair Procedures

United States

Consult the limited-warranty policy on the back cover of this manual for the service provisions offered by Kantronics at no charge. That warranty is considered to be in force only when the customer has submitted his completed warranty registration within 10 days of

purchase and when the stipulations of the warranty have been met. Violations of the warranty clauses will automatically void the warranty and service or repairs will be charged to the owner.

Service outside the warranty will be charged at the cost of parts, labor and return shipping. Payment for repairs must be received before the repaired unit can be returned. Money order or cashier's check payment will speed the return of the unit by at least 10 days over payment by personal check.

When service or repairs appear necessary, it may be wise to call or write to Kantronics to determine if the problem can be solved without returning the unit. When calling, report the product name and ask for the amateur radio service department. When writing, include a clear description of the problem.

Returns to the factory for refund or exchange are strictly regulated. Any return for refund or exchange must be approved and receive a return authorization number from Kantronics.

Kantronics will not approve the return of a product purchased from a dealership. Any return or exchange must be negotiated with the company the product was purchased from.

Foreign

Consult the limited warranty policy on the back cover of this manual for the service provisions offered by Kantronics at no charge. Foreign returns for any reason must be approved by Kantronics and receive a return authorization number. After Kantronics receives notification of the problem it will recommend instructions for further action.

For service information or repairs, write to:

Kantronics, Incorporated
ATTN: Service Dept. AR
1202 East 23rd Street
Lawrence, KS 66044

Information

For further information on amateur radio, we suggest you write:

The American Radio Relay League
225 Main Street
Newington, CT 06111

Specifications

Morse speed tracking:
automatic, 3-80 WPM

Filtering:
active, 250 Hz bandwidth, 750 Hz center frequency

Display:
10 alphanumeric, 14-segment units
three-eighths inch height

Modes:
Morse, Morse with speed display, Morse practice, RTTY 60, RTTY 67, RTTY 75, RTTY 100, ASCII 110, ASCII 300, Clock, Clock-setting, Test and Audio frequency counter

Audio frequency counter range:
0 to 79 KHz

Counter accuracy:
 $\pm .01$ percent

Audio input voltage:
70 mv RMS minimum

Input impedance:
8 ohms

Power requirement:
8 Vdc to 18 Vdc at approx. 240 ma

Characters and special prosigns:
The Mini-Reader acknowledges the following:

MORSE: alphanumeric characters, /, ?, (, ", hyphen, comma, period, colon, semicolon, AR, AS, BT, KN, SK, "understood," "attention," and "illegal character"

RTTY: alphanumeric characters, /, ?, (,), ", ', &, #, \$, %, !, hyphen, comma, period, colon, semicolon and bell

ASCII: alphanumeric characters, /, +, *, (,), ', ?, @, &, %, \$, #, ", !, hyphen, comma, period, colon, semicolon, less-than sign, greater-than sign, equals sign,

open bracket, close bracket, up arrow, left arrow and bell

Remember to disconnect power before removing cover!



Characters Common to all Modes

Input Codes				Character	Display
Morse	RTTY	ASCII Caps	ASCII Lower Case		
..	03	41	61	A	A
----	19	42	62	B	B
----	0E	43	63	C	C
---	09	44	64	D	D
.	01	45	65	E	E
----	0D	46	66	F	F
----	1A	47	67	G	G
....	14	48	68	H	H
..	06	49	69	I	I
----	0B	4A	6A	J	J
---	0F	4B	6B	K	K
----	12	4C	6C	L	L
--	1C	4D	6D	M	M

Figures Common to all Modes

Input Codes				Character	Display
Morse	RTTY	ASCII			
----	16	30	0	0	0
----	17	31	1	1	1
----	13	32	2	2	2
----	01	33	3	3	3
----	0A	34	4	4	4
....	10	35	5	5	5
----	15	36	6	6	6
----	07	37	7	7	7
----	06	38	8	8	8
----	18	39	9	9	9

Input Codes				Character	Display
Morse	RTTY	ASCII			
-----	1D	2F	/	/	/
-----	19	3F	?	?	?
-----	11	22	"	"	"
-----	0F	28	(	(	(
-----	0B	27	apostrophe	'	'
-----	03	2D	hyphen	--	--
-----	0C	2C	comma	,	,
-----	1C	2E	period	.	.
-----	0E	3A	colon	:	:
-----	1E	3B	semi-colon	;	;

Other Morse Characters

Input	Char	Display
---	attention	
....	BT	
....	AR	AR
....	AS	AS
....	understood	
....	SK	SK
illegal codes		

Other RTTY Characters

Input	Char	Display
00	NUL	space
02	LF	space
04		space
08	CR	space
1B	figures	ignored
1F	letters	ignored

Input	Char	Display
0D	!	
12	)	
14	#	
09	\$	
1A	&	
05	BEL	

ASCII Characters Continued

Input	Char	Display
0E	SO	ignored
0F	SI	ignored
10	DLE	ignored
11	DC1	ignored
12	DC2	ignored
13	DC3	ignored
14	DC4	ignored
15	NAK	ignored
16	SYN	ignored
17	ETB	ignored
18	CAN	ignored
19	EM	ignored
1A	SUB	ignored
1B	ESC	ignored

Input	Char	Display
1C	FS	ignored
1D	GS	ignored
1E	RS	ignored
1F	US	ignored
20		space
21	!	
23	#	
24	\$	
25	%	
26	&	
29	)	
2A	*	
2B	+	
3C	<	

Input	Char	Display
3D	=	
3E	>	
40	@	
5B	[	
5C	\	
5D	]	
5E	^	
5F	_	
60	`	ignored
7B	{	ignored
7C		ignored
7D	}	ignored
7E	ESC	ignored
7F	RUBOUT	ignored

Other ASCII Characters

Input	Char	Display
00	NUL	ignored
01	SOH	ignored
02	STX	ignored
03	ETX	ignored
04	EOT	ignored

Input	Char	Display
05	ENQ	ignored
06	ACK	ignored
07	BEL	
08	BS	ignored
09	HT	ignored

Input	Char	Display
0A	LF	space
0B	VT	ignored
0C	FF	ignored
0D	CR	space

continued

Limited Warranty Policy

Kantronics, Inc., warrants each new Mini-Reader to be free from defects in material and workmanship under normal use and service for a period of one year after delivery to the ultimate user. Kantronics will replace or repair the Mini-Reader, at our option, at no charge should it become defective and should our examination disclose the Mini-Reader to be defective and under warranty.

This warranty shall not apply to any Mini-Reader that has been subject to misuse, neglect, accident incurred due to wiring not of our own installation, or to use in violation of instructions furnished by Kantronics. This warranty will not be extended to units that have been repaired or altered outside our facilities.

This warranty does not cover broken cabinets, or any accessory used in connection with the Mini-Reader. This warranty is in lieu of all other warranties expressed or implied, and no representative or person is authorized to assume for Kantronics any other liability in connection with the sale of its products.