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## Introduction

The PMT-228 Professor Morse is a microprocessor controlled device that can help a beginner learn Morse code or an experienced Ham to increase code speed. The Professor Morse contains words, names, and callsigns used in amateur radio, and a random QSO generator to simulate "on the air" contacts.

## Battery

The Professor Morse uses a nine-volt battery (not included). Vectronics recommends the use of alkaline (or rechargeable nicad) batteries to reduce the risk of equipment damage from battery leakage. Avoid leaving battery in this unit during periods of extended storage. Battery life will vary depending on usage, so always keep spares on hand. *Remove weak battery immediately!* When the display flashes or fades, your battery is weak and has only enough power to run a little while. Although the Professor Morse will still provide code practices, you need to replace the battery as soon as possible.

To install a nine-volt battery:

1. Turn off the power to the Professor Morse.
2. Slide battery cover from back of the unit.
3. Remove old battery (if one), and insert the new battery.
4. Slide battery cover back in place, then turn the unit ON.

**Important:** Always make sure the power is off before removing and installing the battery.

## Audio

The Professor Morse has an internal speaker at the back of the unit. A 3.5 mm jack for audio output is located on the control panel. A set of headphones can be used for privacy. This jack accepts both stereo and mono plugs. Use of headphones disables the internal speaker.

## Operation

When powered on, by turning the OFF/Volume control toward the buttons, one of the Professor Morse main menus is displayed. Seven menus are always available: Overall Speed, Farnsworth, Tone, Set, Interactive, New Play, and Repeat Play. The latter two are simple commands that start a session using the current settings. Two additional menus, Combine and Group, are only available when particular character set is active. Under each of these main menus, except New Play and Repeat Play, are submenus/settings you can adjust to your preferences. Pressing the Next or the Previous button steps through these main menus. Press the Select button to enter into the displayed menu to change the setting. A blinking block character appears at the right side of the display prompting you to change the setting. Now you can use the Next and the

Previous buttons to change the setting. Press the Select button again activates the displayed setting and the blinking block disappears. All mode settings are automatically saved into non-volatile memory, ready to use the next time. The description of these menus is discussed below.

To choose a main menu to set your preference:

- Next button Views next main menu.
- Previous button Views previous main menu.
- Select button Selects main menu to change setting (blinking block character appears).

**Important:** In this document, all references to the Select button mean press and release it *within* one second, unless otherwise specified.

### The Overall Speed Menu

The Overall Speed menu allows you to set the code speed in the range of 3 to 60 WPM. Word-per-minute speed is based on the standard word "PARIS" which is 50 units in length. For standard timing, dot = 1 unit, dash = 3 units, intra-character space = 1 unit, inter-character space = 3 units, and word space = 7 units. The word "PARIS" is sent 10 times in one minute if the code speed is 10 WPM.

To change the overall speed:

1. Press the Select button (blinking block character appears).
2. Press the Next button to increase speed; press the Previous button to decrease speed.
3. Press the Select button again to change the overall speed to what is displayed and go back to the main menu (blinking block disappears).

Code requirement is 5 WPM for the Novice and the Technician. Both General and Advanced levels have a code requirement of 13 WPM. Extra class has a 20 WPM requirement.

### The Farnsworth Menu

The Farnsworth menu allows you to disable or enable Farnsworth mode and set the Farnsworth speed (character speed) in the range of 10 to 60 WPM. When Farnsworth mode is enabled, characters (dots, dashes, and intra-character spaces) are sent at the Farnsworth speed, but the spacing between characters and words is increased to produce a slower overall speed. This technique is useful for helping the novice learn the sounds of the code characters and avoid the tendency of counting individual dots and dashes. The Farnsworth speed is always greater than the overall speed. As a result, Farnsworth mode (if enabled) is automatically disabled when the overall speed is changed to one that is greater

than or equal to the current Farnsworth speed. Also, Farnsworth mode cannot be enabled when the overall speed is at its maximum of 60 WPM.

To change the Farnsworth speed:

1. Press the Select button (blinking block character appears).
2. Press the Next button to increase speed; press the Previous button to decrease speed.
3. Press the Select button again to change the Farnsworth speed to what is displayed and go back to the main menu (blinking block disappears).

### The Tone Menu

The Tone menu allows you to set the sidetone pitch in the range of 305 to 1006 Hz. The sidetone is designed without harsh key clicks. It's a sine wave, instead of a harsh square wave. Every dot and dash has a rise and decay time of approximately 5 ms for smooth transition. This lets you concentrate on learning code without the distraction of harsh key clicks.

To change the sidetone pitch frequency:

1. Press the Select button (blinking block character appears).
2. Press the Next button to increase pitch frequency; press the Previous button to decrease pitch frequency.
3. Press the Select button again to change the sidetone frequency to what is displayed and go back to the main menu (blinking block disappears).

### The Set Menu

The Set menu allows the selection of characters, callsigns, words, QSOs, and custom sets. These sets are classified as Beginner, Advanced, and Custom sets.

To select the active set:

1. Press the Select button (blinking block character appears).
2. Press the Next button to view next set; press the Previous button to view previous set.
3. Press the Select button again to change the set to what is displayed and go back to the main menu (blinking block disappears).

The Beginner sets are designed for those who don't know code and need to learn the sounds of the characters. When combine mode (discussed later) is disabled, each Beginner character set is first sent three times as listed, with a word space after each character, then it goes into random practice. This allows the beginner to learn the sound of each character before sending random code.

Beginner Sets:

- EISHTMO                      letter1
- AWJNDB                      letter2

- UVGZKRPX                    letter3
- FCLQY                        letter4
- 12345                        number1
- 67890                        number2
- . , ? / + \* =                prosign1 †
- ; : ' " - \_ \$                prosign2 †
- ( ) & ! % @ # ^            prosign3 †

† For simplicity, punctuation characters are referred to in this manual as prosign characters. Refer to "Morse Code Character Set" section on page 11 for their meanings.

The Advanced sets are meant for those who want to increase code speed and are already familiar with all the characters. The FCC Char set generates the required characters for the FCC code exam--the 26 letters, the 10 numerals, and *prosign1* character sets. The Callsigns set generates random callsigns allocated to the United States of America. The Words set generates random words commonly used in amateur radio from its internal database of 500 different words. The QSOs set sends entire random QSOs (conversations between radio operators) which is the best way to study for a license test because it is the same format as the test!

#### Advanced Sets:

- LETTERS                    all letters
- NUMBERS                    all numbers
- PROSIGNS                    all prosigns
- LETTERS+NUMBERS        all letters & all numbers
- LETTERS+PROSIGNS        all letters & all prosigns
- NUMBERS+PROSIGNS        all numbers & all prosigns
- FCC CHAR                    FCC code test requirement †
- ALL CHAR                    all characters (letters, numbers & prosigns)
- CALLSIGNS                    random USA callsigns
- WORDS                        random words (500 words database)
- QSOs                         random QSOs

† FCC testing requirement consists the 26 letters, the 10 numerals, and *prosign1* set..

The Custom sets allow you extra practice on certain characters and words that you have trouble with. Using custom words, you can practice recognizing the entire word as a sound instead of individual letters. The procedures on how to build and save these custom sets will be discussed later.

#### Custom Sets:

- [CST CHAR]                custom characters (1 to 16 characters)
- [CST WORD]                custom words (10 words, 1 to 16 char. per word)

### The Combine Menu

The Combine menu allows selection of whether or not to combine Beginner sets together as one set. By combining sets, previously learned sets are combined with new sets to reinforce all that you have learned. When on, the current set is combined with all previous Beginner sets; a "+" character appears at the right side of the display in the Set menu. When off, *only* the current set is selected as the active set (no "+" character). This option is only available when the active set is a Beginner set, except the first one (letter1 set).

To toggle the combine mode:

1. Press the Select button (blinking block character appears).
2. Press either the Next or the Previous button to toggle on/off.
3. Press the Select button again to change the mode to what is displayed and go back to the main menu (blinking block disappears).

### The Group Menu

The Group menu adjusts the number of characters for a character group. The options are random length group or fixed length group ranging from one to eight characters per group. The random length generates variable length of up to eight characters per group. This option is only applicable to character sets, including the custom character set.

To change the group length:

1. Press the Select button (blinking block character appears).
2. Press the Next button to increase group length; press the Previous button to decrease group length.
3. Press the Select button again to change the group length to what is displayed and go back to the main menu (blinking block disappears).

### The Interactive Menu

The Interactive menu lets you set your own pace, especially useful for beginners. Enabling interactive mode allows you to control when the Professor Morse will send the next set of words/QSOs or repeat the previous set of words/QSOs (a callsign or a group of characters considers a word). For example, group length is set to "1-CHAR" and interactive mode is set to "EVERY 1 WORD", the Professor Morse will send one character then halt to await your instruction on what to do next ("HALT" appears). At this point, press the Next button to send a new character or press the Previous button to repeat the character. The interactive mode can be turned off or set to every 1 to 100 words/QSOs. The Professor Morse sends code continuously without halting if interactive mode is disabled.

To change the interactive interval:

1. Press the Select button (blinking block character appears).

2. Press the Next button to increase interactive interval; press the Previous button to decrease interactive interval.
3. Press the Select button again to change the interactive interval to what is displayed and go back to the main menu (blinking block disappears).

When halt for interactive feedback ("HALT" appeared),

- Next button Sends next set of words/QSOs.
- Previous button Repeats previous set of words/QSOs.
- Select button Sends next set of words/QSOs.

**Important:** The word "HALT" must appear on the display *before* pressing either the Next or the Previous button *once-and-only-once* to send another set of words/QSOs; otherwise, the overall speed will unintentionally be changed on-the-fly (if enabled).

### The New Play and Repeat Play Menus

The New Play menu starts a new session with the current settings by pressing the Select button. Selecting the Repeat Play menu replays the previous session. Repeating a session allows you to recopy the same code to check your accuracy, perhaps at a slower speed and/or with interactive mode enabled. The length of a session that can be repeated is limited only by the battery's life.

A short-cut to playback is by pressing and holding the Select button for one second from any *main menu* (no blinking block character). The short-cut playback is the same as the last playback. At any time during sending, pausing, or halting, press and hold the Select button for one second to stop ("STOP" appears) and return to the last-used main menu.

During sending, the three buttons take on different functions.

- Next button Increases overall speed on-the-fly.
- Previous button Decreases overall speed on-the-fly.
- Select button Pauses sending ("PAUSE" appears).

When changing speed on-the-fly, two numbers appear on line two of the display. The first number is the overall speed and the second one is the Farnsworth speed ("00" if disabled). Notice the speeds are not set until both the Next and the Previous buttons are released. The new speeds take effect after the element in progress is finished. Holding the button down scrolls the speed faster after the fifth change. This feature can be disabled in the Setup mode (discusses later) if you don't want the overall speed to change accidentally during playback.

When pausing ("PAUSE" appeared), press any button to resume.

- Next button Resumes sending.

- Previous button      Resumes sending.
- Select button        Resumes sending.

### Custom Characters

To build and save a custom characters set:

1. Go to the Set menu by pressing either the Next or the Previous button.
2. Press the Select button (blinking block character appears).
3. Go to the [CST CHAR] submenu by pressing either the Next or the Previous button.
4. Press and hold the Select button for one second until the blinking cursor moves to line two of the display.
5. At this point, do any of the followings:
  - Press the Next button to change the character under the cursor to the next character.
  - Press the Previous button to change the character under the cursor to the previous character.
  - Press both the Next and the Previous buttons to erase all remaining characters including the one under the cursor (the first custom character cannot be erased).
  - Press the Select button to set the character under the cursor and move the cursor to the next custom character; repeat above procedure for this character.
  - Press and hold the Select button for one second to end programming, remove blank characters, save custom characters set, and return to the main menu (blinking block disappears).

To erase a character, change it to a blank (space) character. To erase all remaining characters, including the current one, press both the Next and the Previous buttons. Notice the first custom character cannot be erased. The order of the characters is the 26 letters, the blank character, the 10 numerals, and the prosigns as listed under the Set Menu section. You can repeat a character to have it send more often than the others. This allows you to have more practice on those characters you have the most trouble with.

### Custom Words

To build and save a custom words set:

1. Go to the Set menu by pressing either the Next or the Previous button.
2. Press the Select button (blinking block character appears).
3. Go to the [CST WORD] submenu by pressing either the Next or the Previous button.
4. Press and hold the Select button for one second until [CST WORD] is replaced with [WORD XX] indicating you are now in the Word menu.
5. At this point, do any of the followings:

- Press the Next button to view the next custom word.
- Press the Previous button to view the previous custom word.
- Press the Select button to choose the displayed word for modification. The word is programmed exactly like programming custom characters, as explained in the previous section. When you are finished programming the word, press and hold the Select button for one second to save the word and go back to the Word menu instead of the main menu (blinking block moves to line one of the display). Repeat above procedure for other words.
- Press and hold the Select button for one second from the Word menu to end programming, save custom words set, and return to the main menu (blinking block disappears and [WORD XX] replaces with [CST WORD]).

Notice there are ten custom words since the first letter of each word cannot be erased. You can repeat a word to have it send more often than the others.

### Setup Mode

The Professor Morse provides options that affect the way the unit works. Two setup options are available: On-the-fly Speed and Play Format.

To enter the setup mode:

1. Turn off the power to the Professor Morse.
2. Press and hold *both* the Previous and the Select buttons while turning the power on ("ON-THE-FLY SPEED" appears).
3. Release the buttons to enter the setup mode.

To set the setup options:

- Next button Views next setup option.
- Previous button Views previous setup option.
- Select button Toggles the displayed setup option.

To exit the setup mode and save the setup options into non-volatile memory, press and hold the Select button for one second until "EXIT" appears. Release the button to resume with normal operation.

### **The On-the-fly Speed Option**

The On-the-fly Speed option lets you enable or disable the feature of changing overall speed on-the-fly as discussed earlier. This feature can be disabled to avoid unintentional overall speed changes during playback, especially when the Interactive mode is on.

- ON Enables on-the-fly speed feature.
- OFF Disables on-the-fly speed feature.

### The Play Format Option

The Play Format option lets you control the order of playback. Display the character first then play it over the speaker, or vice versa.

- DISPLAY → AUDIO Shows the character on the display, then plays it over the speaker.
- AUDIO → DISPLAY Plays the character over the speaker, then displays it.

### Factory Defaults

The Professor Morse is shipped with the following defaults:

- ON-THE-FLY SPEED ON
- PLAY FORMAT DISPLAY → AUDIO
- OVERALL SPEED = 13 WPM
- FARNSWORTH OFF
- TONE = 701 Hz
- SET [ADVANCED] FCC CHAR
- COMBINE OFF
- GROUP = 5-CHAR
- INTERACTIVE OFF
- NEW PLAY

To reset the Professor Morse to these defaults:

1. Turn off the power to the unit.
2. Press and hold *both* the Next and the Select buttons while turning the power on ("DEFAULTS RESET" appears).
3. Release the buttons to resume with normal operation, starting with the Overall Speed menu.

After performing the above operation, notice the Combine menu is not shown when scrolling through the main menus. This is because the combine mode does not apply to the defaulted FCC Char set. Also, the defaulted short-cut playback is New Play.

### Self Test

A Self Test is included to perform testing of the display, the buttons, the non-volatile memory (EEPROM) circuitry and integrity, and the audio circuitry. At any time, turn off the power to stop the Self Test; however, power should NOT be turned off during steps involving the non-volatile memory as it could corrupt the memory.

This test is initialized by:

1. Turn off the power to the Professor Morse.
2. Press and hold *only* the Select button while turning the power on. The Self Test starts by displaying the copyright message "POCKET MORSE CODE TUTOR...COPYRIGHT (c) 1996-199X MFJ ENTERPRISES, INC. VERSION X.XX" confirming the display is working properly. Release the button before the message is finished.
3. It then automatically tests the logic line Vpp (shown on the schematic).
4. Each button is automatically tested for shorts to ground.
5. Next, it prompts to press each button in the sequence of Next, Previous and then Select to test them for proper connections.
6. The non-volatile memory circuitry is then automatically tested. Notice this step resets the Professor Morse to its factory default settings.
7. The non-volatile memory integrity is automatically tested.
8. When all is okay, a repetitive message "PASS" is displayed and sent to the speaker. However, if something is wrong a repetitive message such as "EEPROM FAIL" is sent and displayed.
9. Turn off the power after confirming the audio has good quality.

Failure Message Meanings:

- VPP FAIL            Logic line Vpp is not pulled low by a resistor.
- NEXT FAIL        Next button is shorted or improperly connected.
- PREVIOUS FAIL   Previous button is shorted or improperly connected.
- SELECT FAIL      Select button is shorted or improperly connected.
- EEPROM FAIL     Non-volatile memory circuitry is improperly connected.
- MEMORY FAIL     Non-volatile memory is bad.

**Morse Code Character Set<sup>1</sup>**

A	di-dah	•—	N	dah-dit	—•
B	dah-di-di-dit	—•••	O	dah-dah-dah	— — —
C	dah-di-dah-dit	—•—•	P	di-dah-dah-dit	•—••
D	dah-di-dit	—••	Q	dah-dah-di-dah	—•—•
E	dit	•	R	di-dah-dit	•—•
F	di-di-dah-dit	••—•	S	di-di-dit	••••
G	dah-dah-dit	—••	T	dah	—
H	di-di-di-dit	••••	U	di-di-dah	••—
I	di-dit	••	V	di-di-di-dah	•••—
J	di-dah-dah-dah	•— — —	W	di-dah-dah	•— —
K	dah-di-dah	—•—	X	dah-di-di-dah	—••—
L	di-dah-di-dit	•—••	Y	dah-di-dah-dah	—•— —
M	dah-dah	— —	Z	dah-dah-di-dit	—•••
1	di-dah-dah-dah-dah	•— — — —	6	dah-di-di-di-dit	—••••
2	di-di-dah-dah-dah	••— — —	7	dah-dah-di-di-dit	—••••
3	di-di-di-dah-dah	•••— —	8	dah-dah-dah-di-dit	—••••
4	di-di-di-di-dah	••••—	9	dah-dah-dah-dah-dit	—•••••
5	di-di-di-di-dit	•••••	0	dah-dah-dah-dah-dah	— — — — —
Period	[.]	di-dah-di-dah-di-dah	•—•—•—	AAA	
Comma	[,]	dah-dah-di-di-dah-dah	—••— —	MIM	
Question Mark or Request for Repetition	[?]	di-di-dah-dah-di-dit	••—•••	IMI	
Fraction Bar	[/]	dah-di-di-dah-dit	—••••	DN	
End of Message or Cross	[+]	di-dah-di-dah-dit	•—•—•	AR	
End of Work	[*]	di-di-di-dah-di-dah	•••—•—	SK	
Double Dash, Pause or Break	[=]	dah-di-di-di-dah	—•••—	BT	
Semicolon	[;]	dah-di-dah-di-dah-dit	—•—••	KR	
Colon	[:]	dah-dah-dah-di-di-dit	—••••	OS	
Apostrophe	[']	di-dah-dah-dah-dah-dit	•— — — —	WG	
Quotation Mark	["]	di-dah-di-di-dah-dit	•—•—•	AF	
Hyphen or Dash	[-]	dah-di-di-di-di-dah	—••••—	DU	
Underline	[_]	di-di-dah-dah-di-dah	••—•—	IQ	
Dollar Sign	[\$]	di-di-di-dah-di-di-dah	•••—•—	SX	
Left Parenthesis	[ ( ]	dah-di-dah-dah-dit	—•—••	KN	
Right Parenthesis	[ ) ]	dah-di-dah-dah-di-dah	—•—•—	KK	
Wait	[&]	di-dah-di-di-dit	•—•••	AS	
Understood	[!]	di-di-di-dah-dit	•••—•	SN	
Starting Signal	[%]	dah-di-dah-di-dah	—•—•—	KA	
Error	[@]	di-di-di-di-di-di-dit	•••••••	HH	
Paragraph	[#]	di-dah-di-dah-di-dit	•—•••	AL	
Invitation to Transmit	[^]	dah-di-dah	—•—	K	

1. FCC test requirement consists the 26 letters, the 10 numerals, the period, the comma, the question mark, AR, SK, BT and DN.

**Some CW Abbreviations**

73	Best regards	NR	Number; near
88	Love and kisses	NW	Now
ABT	About	OM	Old man
AGN	Again	OP	Operator
ANT	Antenna	R	Are; received; roger
BK	Back; break	RCVR	Receiver
CPY	Copy	RIG	Station equipment
CQ	Calling any station	RITE	Right
CUL	See you later	RST	Readability, strength, tone report
CU	See you	SIGS	Signals
DE	From	SKED	Schedule
DEG	Degree	STN	Station
DX	Distance; rare station	TEMP	Temperature
ES	And; "&"	TKS	Thanks
FB	Fine business; excellent	TNK	Thank
FER	For	TNX	Thanks
FREQ	Frequency	UR	Your; you're; you are
GA	Good afternoon	U	You
GE	Good evening	WL	Well; will
GM	Good morning	WTS	Watts
GN	Good night	WX	Weather
HR	Hear; here	XCVR	Transceiver
HW	How	XMTR	Transmitter
K	Go ahead	XYL	Wife (ex-young-lady)
MSG	Message	YL	Young lady

**Meaning of Q Signals**

QRA	The name of my station is
QRL	Do not interfere, Frequency busy
QRM	Being interfered with
QRN	Static
QRO	Increase power, High power
QRP	Decrease power, Low power
QRQ	Send faster
QRR	I am ready for automatic operation
QRS	Send more slowly
QRT	Stop sending
QRU	I have nothing for you
QRX	I will call again at ..., wait
QRZ	Who is calling me, I am
QSB	Your signal is fading
QSD	Your keying is defective
QSK	I can hear you between my signals
QSL	I am acknowledging receipt
QSU	Reply on this frequency or mode
QSX	I am listening to ... on ... kHz
QSY	Change frequency, change to xmit on ... kHz
QTH	My location (home) is
QTR	The correct time is
QTS	I will send so my frequency can be measured
QUB	Here is the info you requested
QUM	The distress traffic has ended

Send a "?" after a Q signal to ask for information or an action.

Example: QRZ: station (call) is ....      QRZ?: what is your station (call)?

**Menus System Chart**

Main Menus:

OVERALL SPEED	FARNSWORTH	TONE	SET
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Sub Menus:

OVERALL SPEED = 3 WPM	FARNSWORTH OFF	TONE = 305 Hz	SET [BEGINNER] EISHTMO
OVERALL SPEED = 4 WPM	FARNSWORTH ON SPEED = 10 WPM	TONE = 335 Hz	SET [BEGINNER] AWJNDB
OVERALL SPEED = 5 WPM	FARNSWORTH ON SPEED = 11 WPM	TONE = 366 Hz	SET [BEGINNER] UVGZKRPX
OVERALL SPEED = 6 WPM	FARNSWORTH ON SPEED = 12 WPM	TONE = 396 Hz	SET [BEGINNER] FCLQY
OVERALL SPEED = 7 WPM	FARNSWORTH ON SPEED = 13 WPM	TONE = 427 Hz	SET [BEGINNER] 12345
...	FARNSWORTH ON SPEED = 14 WPM	TONE = 457 Hz	SET [BEGINNER] 67890
OVERALL SPEED = 60 WPM	...	TONE = 488 Hz	SET [BEGINNER] ., ? / + * =
	FARNSWORTH ON SPEED = 60 WPM	...	SET [BEGINNER] :: ! " - _ \$
		TONE = 1006 Hz	SET [BEGINNER] ( ) & ! % @ # ^

Word Menu:

SET [CST WORD]	SET [ADVANCED] LETTERS
SET [WORD 1] MFJ	SET [ADVANCED] NUMBERS
SET [WORD 2] MORSE	SET [ADVANCED] PROSIGNS
SET [WORD 3] CODE	SET [ADVANCED] LETTERS+NUMBERS
SET [WORD 4] TUTOR	SET [ADVANCED] LETTERS+PROSIGNS
SET [WORD 5] COPYRIGHT	SET [ADVANCED] NUMBERS+PROSIGNS
SET [WORD 6] (C)	SET [ADVANCED] FCC CHAR
SET [WORD 7] MFJ	SET [ADVANCED] ALL CHAR
SET [WORD 8] ENTERPRISES	SET [ADVANCED] CALLSIGNS
SET [WORD 9] INC.	SET [ADVANCED] WORDS
SET [WORD 10] 1997	SET [ADVANCED] QSOS
	SET [CST CHAR] MORSE-CODE-TUTOR
	SET [CST WORD] MFJ

Setup Options:

ON-THE-FLY SPEED	PLAY FORMAT
ON-THE-FLY SPEED ON	PLAY FORMAT DISPLAY → AUDIO
ON-THE-FLY SPEED OFF	PLAY FORMAT AUDIO → DISPLAY

COMBINE	GROUP	INTERACTIVE	NEW PLAY	REPEAT PLAY
---------	-------	-------------	----------	-------------

COMBINE OFF	GROUP = RANDOM	INTERACTIVE OFF
COMBINE ON	GROUP = 1-CHAR	INTERACTIVE ON EVERY 1 WORD
	GROUP = 2-CHAR	INTERACTIVE ON EVERY 2 WORDS
	GROUP = 3-CHAR	INTERACTIVE ON EVERY 3 WORDS
	GROUP = 4-CHAR	INTERACTIVE ON EVERY 4 WORDS
	GROUP = 5-CHAR	INTERACTIVE ON EVERY 5 WORDS
	GROUP = 6-CHAR	•••
	GROUP = 7-CHAR	INTERACTIVE ON EVERY 100 WORDS
	GROUP = 8-CHAR	

or

INTERACTIVE OFF
INTERACTIVE ON EVERY 1 QSO
INTERACTIVE ON EVERY 2 QSOS
INTERACTIVE ON EVERY 3 QSOS
INTERACTIVE ON EVERY 4 QSOS
INTERACTIVE ON EVERY 5 QSOS
•••
INTERACTIVE ON EVERY 100 QSOS

### **Troubleshooting**

**Q. Why is the display flashing or fading?**

A. The battery is weak, replace it with a new one.

**Q. Why is nothing shown on the display when the power is on?**

A. The battery is probably dead, replace it with a new one.

**Q. Why does the overall speed change after playing a session?**

A. When playing with the Interactive mode enabled, the overall speed might have accidentally changed on-the-fly when either the Next or the Previous button is pressed before "HALT" appears. If so, the on-the-fly speed feature can be disabled in the Setup mode.

**Q. Why can't I change the speed on-the-fly?**

A. This feature is disabled, go to the Setup mode and enable it.

**Q. Why can't I enable the Farnsworth mode?**

A. The overall speed is at its maximum of 60 WPM.

### **Technical Assistance**

If you have any problem with this unit first check the appropriate section of this manual. If the manual does not reference your problem or your problem is not solved by reading the manual you may call VECTRONICS at 601-323-5800. You will be best helped if you have your unit, manual and all information on your station handy so you can answer any questions the technicians may ask.

You can also send questions by mail to VECTRONICS, 1007 HWY 25 South, Starkville, MS 39759 or by FAX to 601-323-6551. Send a complete description of your problem, an explanation of exactly how you are using your unit, and a complete description of your station.

**Schematic**

**Notes**