



DIGITAL VOICE SYSTEMS, INC.

The Speech Compression Specialists



VC-20™ ATC-10B

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vocoder board

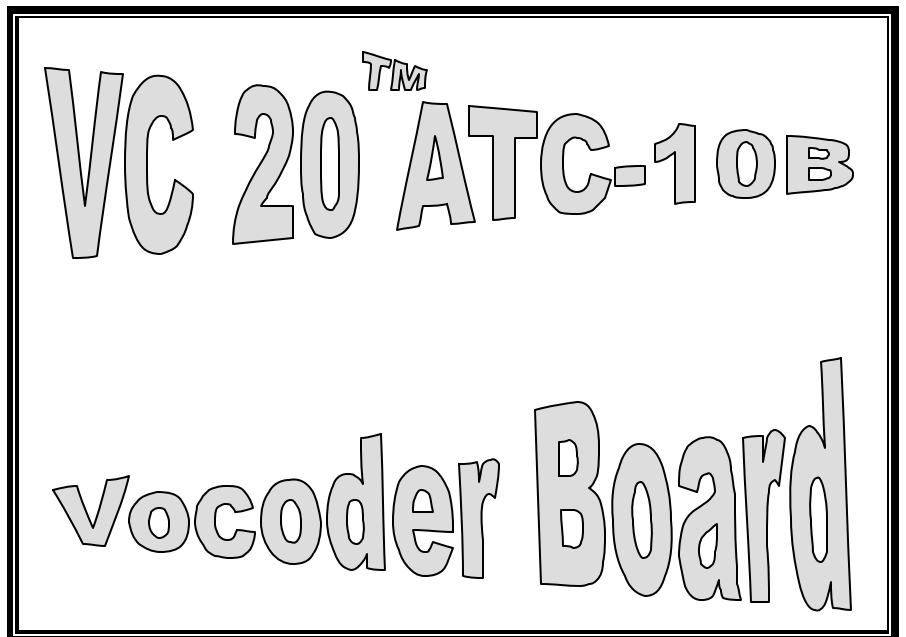


USER's MANUAL



DIGITAL VOICE SYSTEMS, INC.

The Speech Compression Specialists



**VC-20™ ATC-10B Vocoder Board
USERS MANUAL
Version 1.0
August, 1999**



VC-20™ ATC-10B Vocoder Board User's Manual

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Digital Voice Systems, Inc
234 Littleton Road
Westford, MA 01886

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VC-20™ ATC-10b Vocoder Board END USER License Agreement

1.0 Preliminary Statements and Definitions

1.1 "Voice Codec" shall mean the hardware, software and associated documentation referred to in the invoice or shipping papers accompanying this agreement for which END USER has requested a license, and any derivative works thereof, including modifications, enhancements and extensions made by or for Digital Voice Systems, Inc. (DVSI) and including circuit diagrams, timing diagrams, programmable logic software, logic diagrams, layouts, operating instructions and user manuals.

1.2 "AMBE™ Software" shall mean the speech coding software and/or firmware provided as part of the Voice Codec. This software is contained in the Read Only Memories (ROMs, EPROMs, EEPROMs, etc...) which are included as part of the Voice Codec. This software includes any derivative works which have as their source the software contained in the Read Only Memories, and it includes the software contained in any future Read Only Memories which DVSI may provide END USER for use in the Voice Codec.

1.3 "Designated Site" shall mean the location of the Voice Codec.

1.4 "Proprietary Information" shall mean the information which DVSI desires to protect against unrestricted disclosure or competitive use and which is designated as such in writing by DVSI or is disclosed orally and within thirty (30) days thereafter is reduced to tangible form pursuant to this License.

1.5 DVSI represents that it owns certain "Proprietary Rights" in the Technology and the AMBE® Voice Compression Software, including patent rights in the Technology, and patent rights, copyrights, and trade secrets in the AMBE® Voice Compression Software.

2.0 License Granted

2.1 Subject to the conditions herein and upon initial use of the AMBE™ Software within the VC-20™ ATC-10b Vocoder Board, DVSI hereby grants to END USER a non-exclusive, limited license to use the AMBE® Voice Compression Software in machine readable form solely on the VC-20™ ATC-10b Vocoder Board. Title to the AMBE® Voice Compression Software remains with DVSI. No license is granted for use of the AMBE® Voice Compression Software on other than the VC-20™ ATC-10b Vocoder Board. No license, right or interest in any trademark, trade name or service mark of DVSI is granted under this Agreement.

2.2 END USER shall not copy, extract, de-compile, reverse engineer or disassemble the AMBE® Voice Compression Software contained in the VC-20™ ATC-10b Vocoder Board.

2.3 Transfer of License

(a) END USER may transfer the AMBE™ Software and all rights under this agreement to a third party together with a copy of this Agreement provided that END USER provides DVSI with a written notification of the transfer and provided that the third party agrees in writing to accept all the terms and conditions of this agreement. Upon any such transfer, END USER's rights under this Agreement shall terminate pursuant to Section 3.0.

(b) END USER may relocate the Voice Codec, and the subsequent location shall then be considered the Designated Site.

(c) Except as provided in this Section 2.2, this Agreement, the AMBE™ Software and any other information provided by DVSI to END USER and any licenses and rights granted hereunder, may not be sold, leased, assigned, sublicensed or otherwise transferred, in whole or in part, by END USER.

2.4 END USER shall not de-compile, reverse engineer or disassemble the AMBE™ Software.

3.0 Term and Termination

3.1 This Agreement is effective upon initial use of the AMBE™ Software on the Voice Codec and shall remain in effect until terminated in accordance with this agreement.

3.2 This Agreement shall terminate automatically without notice from DVSI if END USER fails to comply with any of the material terms and conditions herein. END USER may terminate this Agreement at any time upon written notice to DVSI certifying that END USER has complied with the provisions of Section 3.3.

3.3 Upon termination of this Agreement for any reason, END USER shall: (i) have no further rights to the AMBE™ Software; (ii) discontinue all use of the AMBE™ Software; and (iii) destroy or, at DVSI's option, return all copies of the AMBE™ Software.

4.0 Payments

4.1 In consideration of the hardware, software, and associated materials provided as part of the VC-20™ ATC-10b Vocoder Board, and in consideration of the license and rights in the AMBE™ Software granted by DVSI, and in consideration of DVSI's performance of its obligations hereunder, END USER agrees to pay to DVSI the fee specified in DVSI's invoice.

4.2 In consideration of the materials provided as part of VC-20™ ATC-10b Vocoder Board, and in consideration of the license and rights in the AMBE® Voice Compression Software granted by DVSI, and in consideration of DVSI's performance of its obligations hereunder, END USER agrees to pay to DVSI the fee specified in DVSI's invoice.



5.0 Proprietary Notices

5.1 END USER shall not remove any copyright or proprietary notice on the on the AMBE[®] Voice Compression Software or VC-20[™] ATC-10b Vocoder Board.

6.0 Proprietary Information

6.1 The parties agree that the AMBE[®] Voice Compression Software shall be considered Proprietary Information.

6.2 Except as otherwise provided in this Agreement, END USER shall not use, disclose, make, or have made any copies of the Proprietary Information, in whole or in part, without the prior written consent of DVSI.

6.3 END USER shall make reasonable efforts to notify and inform its employees having access to the Proprietary Information of END USER's limitations, duties and obligations regarding nondisclosure and copying of the AMBE[™] Software. Proprietary Information shall be used only by employees of END USER and only at the Designated Site, except as provided under this agreement.

6.4 END USER shall have no obligations for disclosure or use of Proprietary Information which: (i) is already known to END USER, at time of disclosure by DVSI; (ii) is or becomes publicly known through publication, inspection of product or otherwise through no wrongful act of END USER; (iii) is received from a third party without restriction and without breach of this Agreement; (iv) is independently developed by END USER; (v) is disclosed to a third party by or on behalf of DVSI without restriction; or (vi) is approved for release or use by written authorization of DVSI.

6.5 Notwithstanding any termination pursuant to Section 3.0, the obligations set forth in this Section 6.0 shall survive termination of this Agreement.

7.0 Limited Warranty

7.1 DVSI warrants the VC-20[™] ATC-10b Vocoder Board and the AMBE[™] Software to be free from defects in materials and workmanship under normal use for a period of ninety (90) days from the date of delivery. DVSI further warrants that the VC-20[™] ATC-10b Vocoder Board and the AMBE[™] Software operate in accordance with the written specifications delivered to END USER with the Voice Codec.

7.2 Except as stated in Section 7.1, the VC-20[™] ATC-10b Vocoder Board and AMBE[™] Software are provided "as is" without warranty of any kind. DVSI does not warrant, guarantee or make any representations regarding the use, or the results of the use, of the Voice Codec or AMBE[™] Software with respect to its correctness, accuracy, reliability, currentness or otherwise. The entire risk as to the results and performance of the VC-20[™] ATC-10b Vocoder Board or AMBE[™] Software is assumed by the END USER. After expiration of the warranty period, END

USER, and not DVSI or its employees, assumes the entire cost of any servicing, repair or correction of the Voice Codec or the AMBE[™] Software.

7.3 DVSI warrants that it has the right to enter into this Agreement and to grant a license to use the AMBE[™] Software to END USER.

7.4 Except as specifically set forth in this Section 7.0, DVSI makes no express or implied warranties including, without limitation, the warranties of merchantability or fitness for a particular purpose or arising from a course of dealing, usage or trade practice, with respect to the Voice Codec or AMBE[™] Software. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to END USER. No oral or written information or advice given by DVSI or its employees shall create a warranty or in any way increase the scope of this warranty, and END USER may not rely on any such information or advice. The limited warranties under this section 7.0 give END USER specific legal rights, and END USER may have other rights which vary from state to state.

8.0 Limitation of Liability

8.1 In no event shall DVSI be liable for any special, incidental, indirect or consequential damages resulting from the use or performance of the Voice Codec or VC-20[™] ATC-10b Vocoder Board whether based on an action in contract, tort (including negligence) or otherwise (including, without limitation, damages for loss of business profits, business interruption, and loss of business information), even if DVSI or any DVSI representative has been advised of the possibility of such damages.

8.2 Because some states do not allow the exclusion or limitation of liability for consequential or incidental damages, the above limitations may not apply to END USER.

8.3 DVSI's maximum liability for damages arising under this Agreement shall be limited to 20% (twenty percent) of the fees paid by END USER for the particular Voice Codec or VC-20[™] ATC-10b Vocoder Board which caused the damages or that is the subject matter of, or is directly related to, the cause of action.

9.0 Taxes

9.1 All payments required under Section 4.0 or otherwise under this Agreement are exclusive of taxes and END USER agrees to bear and be responsible for the payment of all such taxes (except for taxes based upon DVSI's income) including, but not limited to, all sales, use, rental receipt, personal property or other taxes which may be levied or assessed in connection with this Agreement.

10.0 Export

10.1 United States export laws and regulations prohibit the exportation of certain products or technical data received from

DVSI under this Agreement to certain countries except under a special validated license. As of May 20, 1996 the restricted countries are: Libya, Cuba, North Korea, Iraq, Serbia, Montenegro, and Iran. The END USER hereby gives its assurance to DVSI that it will not knowingly, unless prior authorization is obtained from the appropriate U.S. export authority, export or re-export, directly or indirectly to any of the restricted countries any products or technical data received from DVSI under this Agreement in violation of said United States Export Laws and Regulations. DVSI neither represents that a license is not required nor that, if required, it will be issued by the U.S. Department of Commerce. Licensee shall assume complete and sole responsibility for obtaining any licenses required for export purposes.

11.0 Governing Law

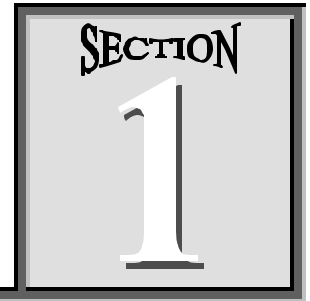
11.1 This Agreement is made under and shall be governed by and construed in accordance with the laws of the Commonwealth of Massachusetts, except that body of law governing conflicts of law. If any provision of this Agreement shall be held unenforceable by a court of competent jurisdiction, that provision shall be enforced to the maximum extent permissible, and the remaining provisions of this Agreement shall remain in full force and effect.

12.0 Notices

12.1 Any notices to DVSI which may be given hereunder shall be in writing and sent to: Digital Voice Systems Inc., 234 Littleton Road, Westford, MA., 01886, U.S.A.

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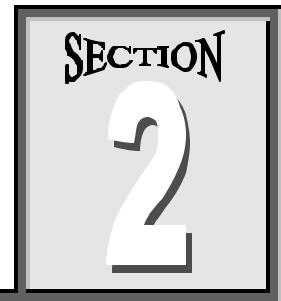
VC-20™ - ATC-10b Introduction

1.1 General Information

The Digital Voice Systems, Inc. (DVSI) VC-20™ - ATC-10b voice codec is a full-duplex real-time voice processing board. The VC-20™ - ATC-10b contains **proprietary** software which implements the Advanced Multi-Band Excitation™ (AMBE™) voice coding algorithm. DVSI grants a licence to its customers to use this software according to the terms established in the attached **AMBE™ Software END USER License Agreement**. Use of the VC-20™ - ATC-10b, or any portion thereof, signifies acceptance of these licensing terms.

The VC-20™ - ATC-10b operates by digitizing an analog speech signal using an on-board A-to-D converter. This digitized speech is then processed by the encoder and converted into a data bit stream. This bit stream is output to a modem or similar device. Simultaneously, the VC-20™ - ATC-10b receives a data bit stream from a modem or similar device. This received bit stream is processed by the decoder and converted into a synthetic speech signal which is then converted into an analog signal using the on-board D-to-A converter. The encoder and decoder are fully asynchronous.

The 4.8 kbps data stream consists of 3.6 kbps of Speech data and 1.2 kbps of Error Correction Code data. This version of the VC-20™ - ATC-10b software produces high quality speech at bit error rates up to 4%.



VC-20 AMBE™ Vocoder Board Overview

2.1 Advanced Multi-Band Excitation (AMBE^â Vocoder)

The Advanced Multi-Band Excitation (AMBE[®] Vocoder) technology is based on the Multi-Band Excitation (MBE) speech model. This speech model provides a unique speech coding framework which results in a number of advantages over linear prediction based speech coders such as CELP, RELP, VSELP, MELP, ECELP, MP-MLQ, and LPC-10, etc. .⁽¹⁾

The AMBE[®] voice coder (vocoder) was first developed in the mid 1990's by Digital Voice Systems, Incorporated. The vocoder maintains speech intelligibility and naturalness at rates as low as 2.4 kbits/sec. The AMBE[®] Vocoder system is less complex than either CELP or VSELP, and therefore, it is easily integrated into low-cost, low-power, communication integrated circuits.

2.2 VC-20^Ô -ATC-10b Vocoder Board Basic Operation

Connections are made to the VC-20™ - ATC-10b using the attached DIN 41612 connector which is described in Sections 4 and 5. The user must supply the VC-20-MTR with a 5v digital power supply and a +/-5v analog power supply. It is preferable to decouple the analog supply from the digital supply by using separate power supplies.

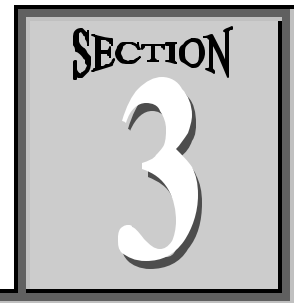
The VC-20™ - ATC-10b can be connected to a modem or similar device as shown in Figure 3. The modem or the VC-20™ - ATC-10b can generate the clock and framing signals TXCK, FMEN, RXCK and FMDE. The modem reads the data from the encoder on the data lines TXD3-0. Simultaneously the decoder reads data from the modem on data lines RXD3-0. The frame signals FMEN and FMDE are used to signify the beginning of each data frame for the encoder and decoder, respectively. The required timing relationship between these signals is shown in Figure 5. In order to operate in this mode, jumpers 5-14 should be disconnected. If the VC-™ - ATC-10b is generating the clocks and frames, then jumpers 1-4 should be connected, otherwise, they should be disconnected.

The VAD signal should be held low to enable the onboard Voice/Silence detection and Adaptive Comfort Noise features. When enabled the ENSLNCE signal is switched to indicate the presence of Voice. If the VAD signal is held high or left disconnected, both Voice/Silence detection and Adaptive Comfort Noise are disabled, and the ENSLNCE signal always indicates voice.

Note that for proper operation any background noise present in the speech must be short term stationary and have a level less than -25 dBm0.

2.3 Special Handling and Storage Precautions

CAUTION
<p>Handling Instructions</p> <p>Although the VC-20 AMBE™ Vocoder Board incorporates input protection circuitry, to avoid damage from the accumulation of a static charge, industry standard electrostatic discharge precautions and procedures must be employed during handling and installing.</p>
<p>Storage</p> <p>To insure maximum shelf life in long term storage, VC-20 AMBE™ Vocoder Board should be kept in a moisture controlled package at <40°C and <90% RH.</p>



Board Set-up & Configuration

3.1 Connection Specifications

Connector type

Physical: 100 mm (Single Euro-card [3U]) height (see Figure 6)
DIN 41612 Connector (male)

Analog Input:	Type	single-ended
	Impedance	600 ohm
	Sensitivity	0 dBm0 = 0 dBm
	Sinusoidal Overload	+3.17 dBm0
	Nominal Level	-23 dBm0 (average speech level)
	Dynamic Range	+/- 10 dB (relative to Nominal Level)
	Noise Level	-72 dBm0
	Bandwidth	0 - 3700 Hz.

Analog Output:	Type	single-ended
	Impedance	low impedance output, capable of driving a 600 ohm load
	Sensitivity	0 dBm0 = 0 dBm
	Sinusoidal Overload	+3.17 dBm0
	Nominal Level	-23 dBm0 (average speech level)
	Dynamic Range	+/- 10 dB (relative to Nominal Level)
	Noise Level	-72 dBm0
	Bandwidth	20 - 3700 Hz.

Digital Interface: TTL compatible

Power: 2 watts @ 5v digital, .2 watts @ +/- 5v analog

3.2 DIN41612 96-pin Connector Specifications

Pin No.	ROW C		ROW B	ROW A	
	Function	Name		Function	Function
1	Dig. Pwr.	VCC	Rsvd.	Dig. Pwr.	VCC
2	Dig. Pwr.	VCC	Rsvd.	Dig. Pwr.	VCC
3	Gnd.	GND	Rsvd.	Gnd.	GND
4	Output	TXD3	Rsvd.	Output	TXD0
5	Rsvd.		Rsvd.	Input	TXCK
6	Input	FMEN	Rsvd.	Output	RUN
7	Rsvd.		Rsvd.	Output	RESX
8	Gnd.	GND	Rsvd.	Gnd.	GND
9	Input	RXD3	Rsvd.	Input	RXD0
10	Rsvd.		Rsvd.	Input	RXCK
11	Input	FMDE	Rsvd.	Rsvd.	
12	Rsvd.		Rsvd.	Rsvd.	
13	Gnd.	GND	Rsvd.	Gnd.	GND
14	Rsvd.		Rsvd.	Rsvd.	
15	Output	TXD2	Rsvd.	Input	DINRS
16	Output	TXD1	Rsvd.	Rsvd.	
17	Rsvd.		Rsvd.	Output	DTMF_DET
18	Input	RXD2	Rsvd.	Rsvd.	
19	Input	RXD1	Rsvd.	Rsvd.	
20	Gnd.	GND	Rsvd.	Gnd.	GND
21	Rsvd.		Rsvd.	Output.	DTMF_DAT
22	Rsvd.		Rsvd.	Input	VAD
23	Rsvd.		Rsvd.	Input	ECHO
24	Input	GO	Rsvd.	Rsvd.	
25	Rsvd.		Rsvd.	Rsvd.	
26	Gnd.	GND	Rsvd.	Gnd.	GND
27	Anlg Pwr.	+5v analog	Rsvd.	Anlg Pwr.	+5v analog
28	Anlg Pwr.	-5v analog	Rsvd.	Anlg Pwr.	-5v analog
29	Output	VFRO	Rsvd.	Input	VFXI
30	Anlg Gnd	AGND	Rsvd.	Anlg Gnd	AGND
31	Gnd.	GND	Rsvd.	Gnd.	GND
32	Gnd.	GND	Rsvd.	Gnd.	GND

Note: Pwr. = POWER
 Input = INPUT to the VC-20-MR2
 OUTPUT = OUTPUT from the VC-20-MR2

Rsvd. = RESERVED (Leave Unconnected)

Note: Many Reserved signals are used to monitor the internal state of the VC-20™ - ATC-10b. To ensure proper operation all reserved signals must be left unconnected.

3.3 VC-20-ATC-10B Connector Signals

	<u>Name</u>	<u>Dir</u>	<u>Description</u>
	VCC	Pwr.	Digital +5v +/- 5%
	GND	Pwr.	Digital Ground
	+5v	Pwr.	Analog +5v +/- 10%
	-5v	Pwr.	Analog -5v +/- 10%
	GND Anlg	Pwr.	Analog Ground
	TXD3	O	Transmit data channel
	TXD2	O	Transmit data channel
	TXD1	O	Transmit data channel
	TXD0	O	Transmit data channel
	TXCK	I	Transmit data bit clock (4.8kHz.)
	FMEN	I	Encoder frame flag (Active High)
	RXD3	I	Receive data channel
	RXD2	I	Receive data channel
	RXD1	I	Receive data channel
	RXD0	I	Receive data channel
	RXCK	I	Receive data bit clock (4.8 kHz)
	FMDE	I	Decoder frame flag (Active High)
	VFRO	O	Analog speech output signal
	VRXI	I	Analog speech input signal
	RUN	O	Run Status Signal (Active High)
	RESX	O	Internal Reset Status (Active Low)
	DINRS	I	Reset Signal (Active High)
	VAD	I	Voice/Silence Detection Enable (Active Low)
	DTMF_DAT	O	DTMF Tone Data
	DTMF_DET	O	DTMF Tone Detected Flag (Active High)
	GO	I	Encoder Voice Mode (Active High)

3.4 VC-20-ATC-10b Connector Signals

TXD3-0 TXD3-0 are the voice data signals from the VC-20™ - ATC-10b encoder. These signals change state on each rising edge of TXCK. The 96 voice bits of each 20 ms voice frame are transmitted in 24 TXCK cycles (TXCK = 9.6 kHz), resulting in an effective data rate of 4800 bps. The first TXCK cycle of each frame is setup to allow the VC-20™ - ATC-10b to operate in loopback mode (the decoder reads the first 4-bit word as a control word). The first TXCK word contains 0000 binary, and then the next 24 TXCK cycles contain the 96 voice bits.

TXCK This is the encoder data clock which controls the transfer of the channel data out of the encoder. This signal must be 9.6 kHz +/- .05%. TXD, FMEN, GO, and RUN are synchronous with the rising edge of this clock signal to within 500 ns.

RXD3-0 RXD3-0 are the voice data signals input to the VC-20™ - ATC-10b decoder. These signals are each clocked into the VC-20- ATC-10b on each falling edge of RXCK. The 96 voice bits plus 4 control bits of each 20ms voice frame are input in the first 25 RXCK cycles (RXCK = 9.6 kHz). The first RXCK cycle contains a 4-bit control word, and the remaining 24 RXCK cycles contain the voice bits, resulting in an effective data rate of 4.8 kbps. The four bits of the control word are organized as follows: RXD3 = LOST, RXD2 = PARAMINIT, RXD1 = DESLNCE, and RXD0 is not currently used. LOST signifies a lost frame of data (active high), PARAMINIT re-initializes the voice coder parameters (active high), and DESLNCE signifies a frame of silence (active high).

RXCK This is the decoder symbol clock which controls the transfer of the channel data into the decoder. This signal must be 9.6 kHz +/- .05%. RXD3-0, FMDE, and DESLNCE are synchronous with the rising edge of this clock signal to within 500 ns.

FMEN This is the encoder frame flag which identifies the frame boundary of the channel output data. FMEN must be active for one clock period of TXCK every 20 ms.

FMDE This is the decoder frame flag which identifies the frame boundary of the channel input data. FMDE must be active for one clock period of RXCK every 20 ms.

VRXI VFXI is the analog speech input which is filtered with a 100 Hz. - 3600 Hz. bandpass filter and then input to the encoder via a 16 bit linear codec. In order to avoid clipping VRXI must not exceed +/- 1.5 volts.

- VFRO VFRO is the analog speech output produced by passing the decoder output through a 16 bit linear codec. VFRO has an analog bandwidth of 100 Hz. - 3600 Hz., and it is constrained to be within +/- 1.5 volts.
- RUN RUN is a status signal that signifies that the VC-20™ - ATC-10b is encoding and decoding speech. This signal drives the green LED. Each data frame is divided into an encoder window and a decoder window. The RUN signal is active within each respective window when the VC-20™ - ATC-10b is encoding or decoding speech (see figure 6). RUN is synchronous with TXCK.
- RESX RESX is the reset status output signal. It is active when the VC-20-MTR is being reset. The VC-20™ - ATC-10b is reset under three conditions: during power-up, as a result of DINRS being asserted, or as a result of a Watch-Dog Timer reset. This signal is an active low output. RESX is the VC-20™ - ATC-10b 's actual hard-reset signal; whereas, RESET is a software flag that is synchronous with TXCK.
- DINRS DINRS is a VC-20™ - ATC-10b reset signal. An active high level on DINRS for a duration of at least 300ns will reset the VC-20™ - ATC-10b. DINRS will generate RESX and RESET. The VC-20™ - ATC-10b will pull this signal to its inactive state (low) when it is not being driven by an external source (it may be left unconnected if not being used).
- VAD The VAD signal must be held low to enable the onboard Voice/Silence detection and comfort noise generation. This signal is sampled on the falling edge of the first clock cycle of each 20 ms encoder frame. If left unconnected, this signal is pulled internally to the disabled state (high).
- DTMF_DET The DTMF_DET flag is activated by the encoder if it detects a DTMF tone on VRXI. The DTMF_DET is brought high on a rising edge of TXCK and held high for four clock cycles. During this time the DTMF data is output on DTMF_DAT. The DTMF_DET flag is only output once for each continuous DTMF tone that is detected. DTMF_DET can only be active during the first four clock cycles of a 20 ms data frame.
- DTMF_DAT If the VC-20™ - ATC-10b detects a DTMF tone, it outputs four bits of data identifying the tone on the DTMF_DAT signal (see Section 3.7). The data is output during the four clock cycles when DTMF_DET is high. The data is synchronous with the rising edge of TXCK. This signal should be ignored when DTMF_DET is inactive.

GO The GO signal must be active to place the encoder in voice mode. This signal is sampled every 20 ms when FMEN is high. If this signal is active then the encoder outputs voice data on TXD during the next 20 ms frame. Otherwise, if this signal is inactive then the encoder resets itself internally and outputs a silence frame on TXD during the next 20 ms frame. The relationship between FMEN, GO and TXD is shown in Figure 1. If left unconnected, GO is pulled to its active state (high).

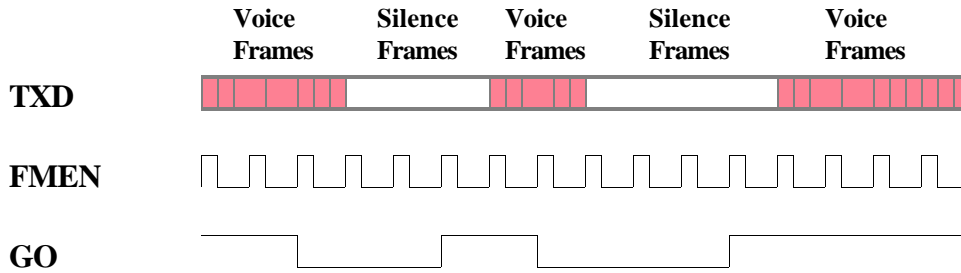


Figure 1: Voice/Silence Mode Selection

GND, AGND GND is the digital ground signal and AGND is the analog ground signal. These signals are connected on the VC-20™ - ATC-10b.

3.5 Silence Frame Designation

The VC-20™ - ATC-10b encoder continually outputs a silence frame whenever the GO signal is inactive (see Figure 1). If the decoder receives this signal it outputs a low level (-75 dBm) noise signal on VFRO

3.6 VC-20-ATC-10B On-board jumpers Connector Signals

<u>Jumper</u>	<u>Signal</u>
1	Connects on-board 9.6 kHz data clock to TXCK
2	Connects on-board 9.6 kHz data clock to RXCK
3	Connects on-board 20 ms frame clock to FMEN
4	Connects on-board 20 ms frame clock to FMDE
5	reserved
6	reserved
7	reserved
8	reserved
9	reserved
10	reserved
11	reserved
12	reserved
13	reserved (leave unconnected)
14	reserved (leave unconnected)

3.7 VC-20-ATC-10b DTMF Tone Data

The VC-20-ATC-10b supports DTMF detection, transmission, and generation. The encoder detects and transmits DTMF tones, and the decoder decodes and generates DTMF tones, in support of standard telephony requirements

In addition, if the VC-20™ - ATC-10b encoder detects a DTMF tone it activates the DTMF_DET signal for four clock cycles of TXCK and simultaneously outputs (LSB first) four bits of data on DTMF_DAT which identify the DTMF tone which was detected. The DTMF_DET flag is only output once for each continuous DTMF tone that is detected. The correspondence between the data bits and DTMF tone is shown in Table 1.

DTMF_DAT			
Keypad Character	MSB...LSB	Freq #2	Freq #1
1	0000	1209 Hz.	697 Hz.
4	0001	1209 Hz.	770 Hz.
7	0010	1209 Hz.	852 Hz.
*	0011	1209 Hz.	941 Hz.
2	0100	1336 Hz.	697 Hz.
5	0101	1336 Hz.	770 Hz.
8	0110	1336 Hz.	852 Hz.
0	0111	1336 Hz.	941 Hz.
3	1000	1477 Hz.	697 Hz.
6	1001	1477 Hz.	770 Hz.
9	1010	1477 Hz.	852 Hz.
#	1011	1477 Hz.	941 Hz.
A	1100	1633 Hz.	697 Hz.
B	1101	1633 Hz.	770 Hz.
C	1110	1633 Hz.	852 Hz.
D	1111	1633 Hz.	941 Hz.

Table 1: DTMF Tone Data

SECTION
7

DVSI Services and Support Solutions

4.1 Technical Support

If you have any problems with the VC-20™ - ATC-10b or have questions about its operation, please contact:

Digital Voice Systems, Inc.
234 Littleton Road
Westford, MA 01886 USA
Phone: (978) 392-0002
Fax: (978) 392-8866
email: info@dvsinc.com
web: www.dvsinc.com

4.2 Additional Manuals

Additional manuals may be downloaded for DVSI's web sit www.dvsinc.com

NOTES

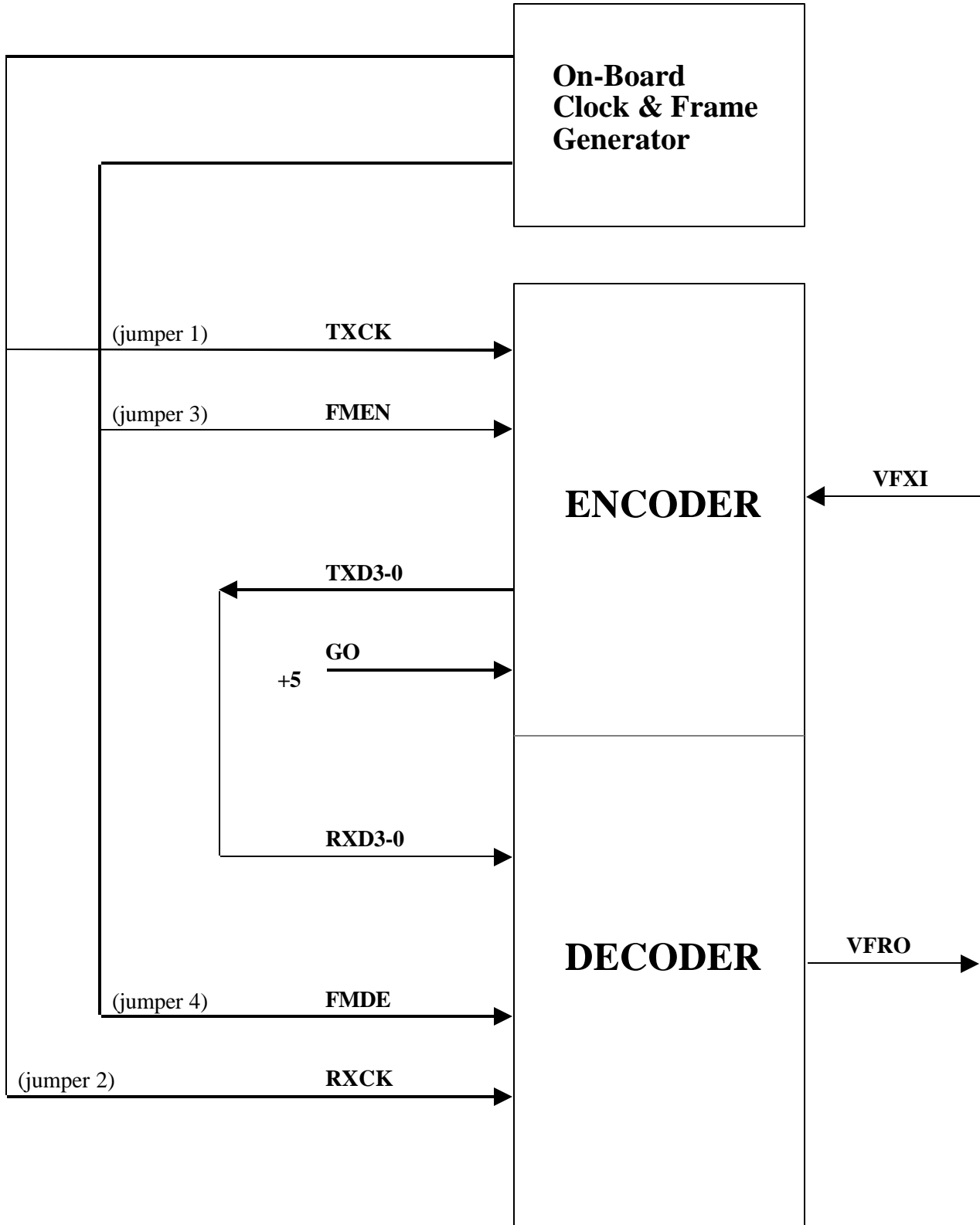


Figure 2: VC-20™ ATC-10b Connections In Loop-back

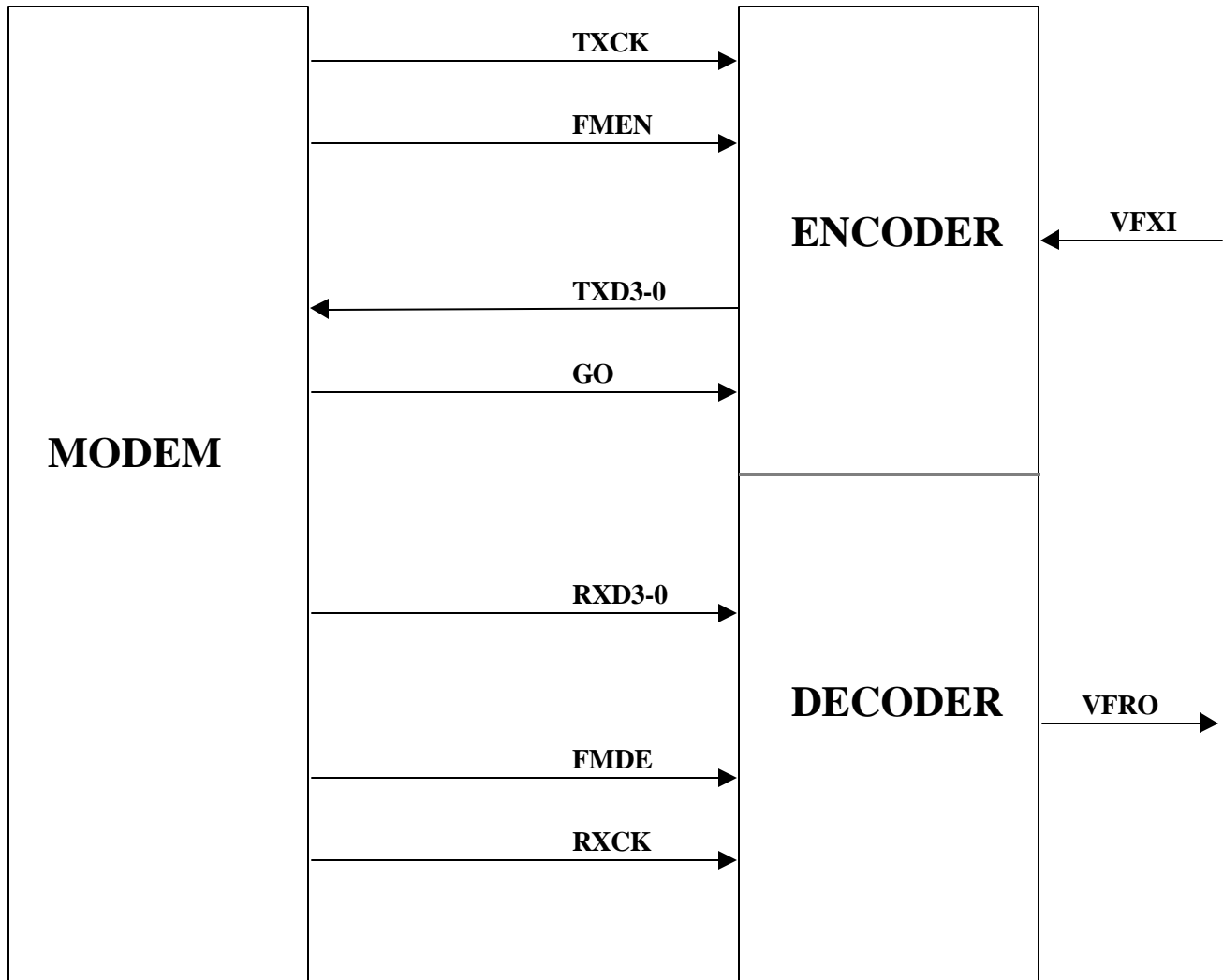


Figure 3: Connections between VC-20™ ATC-10b and a Modem

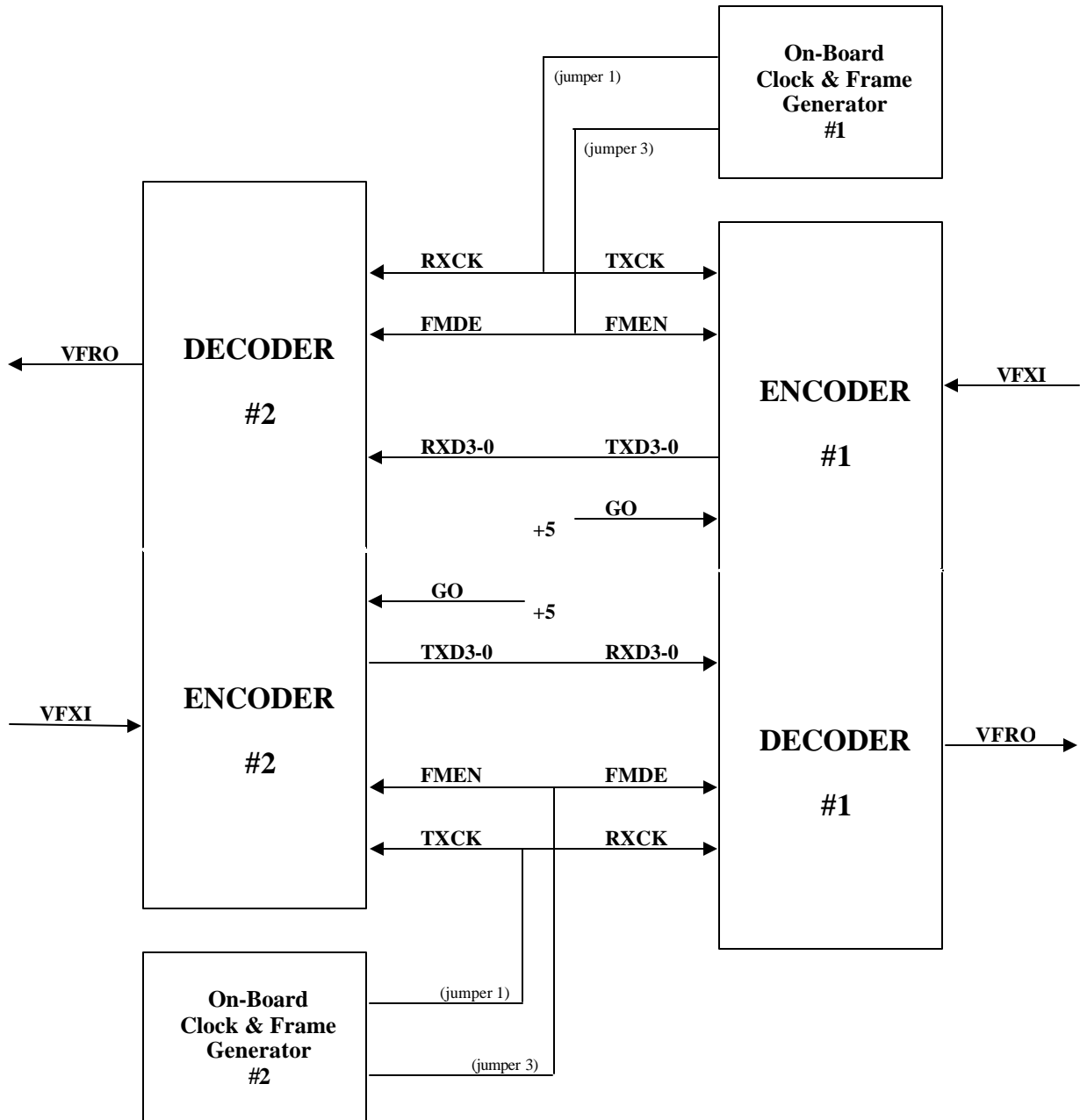


Figure 4: Dual VC-20™ ATC-10b

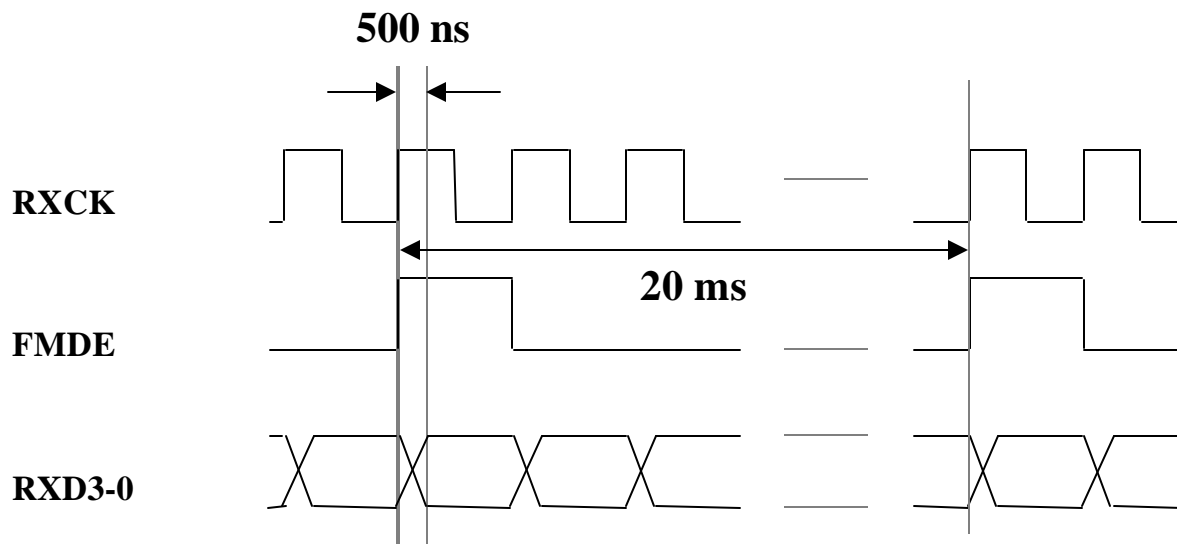
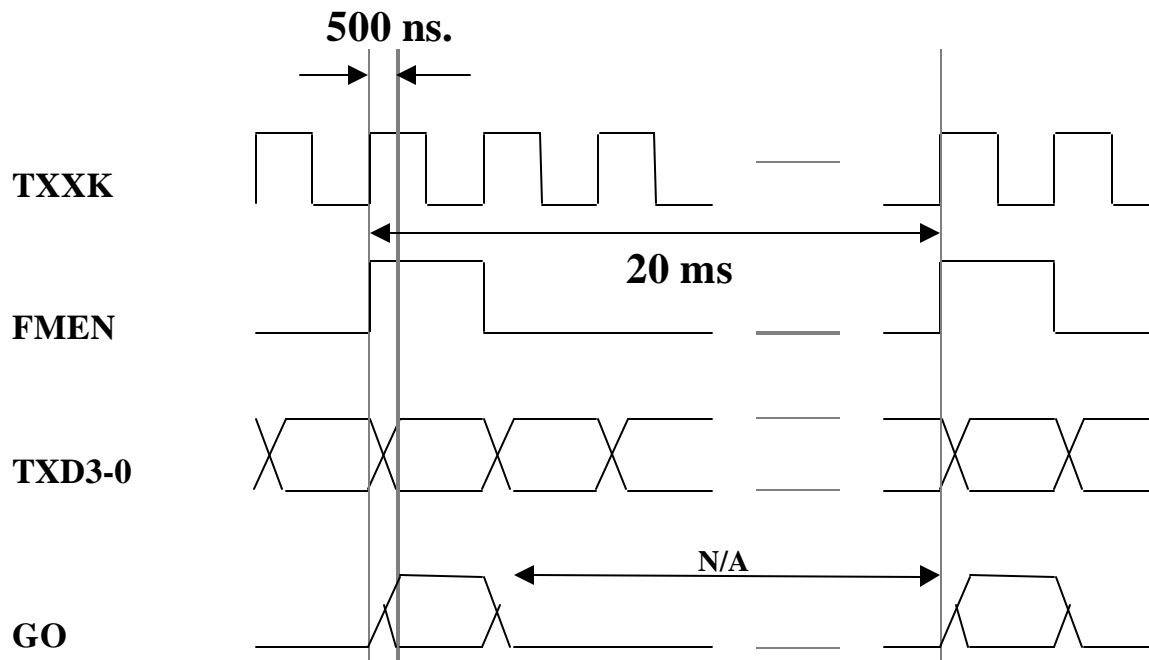


Figure 5: VC-20™ ATC-10b Signal Timing

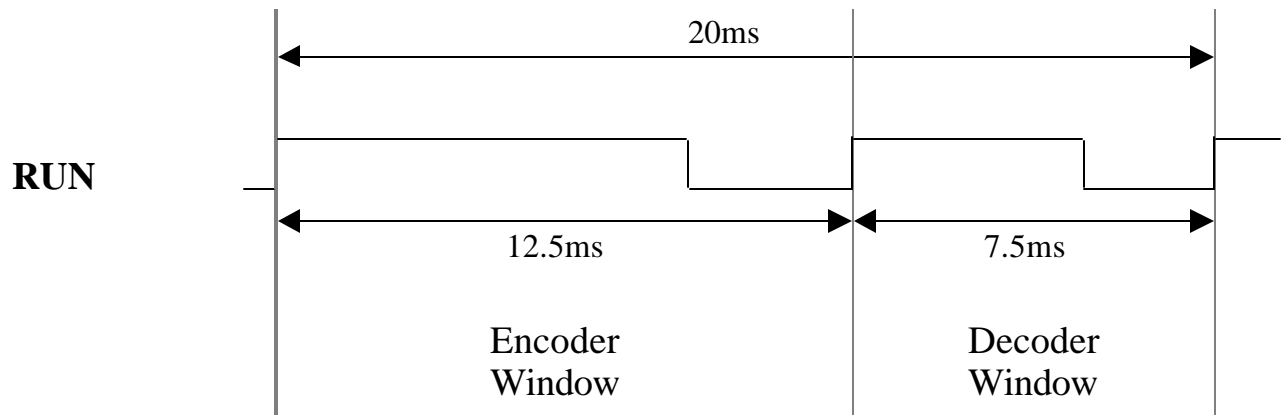
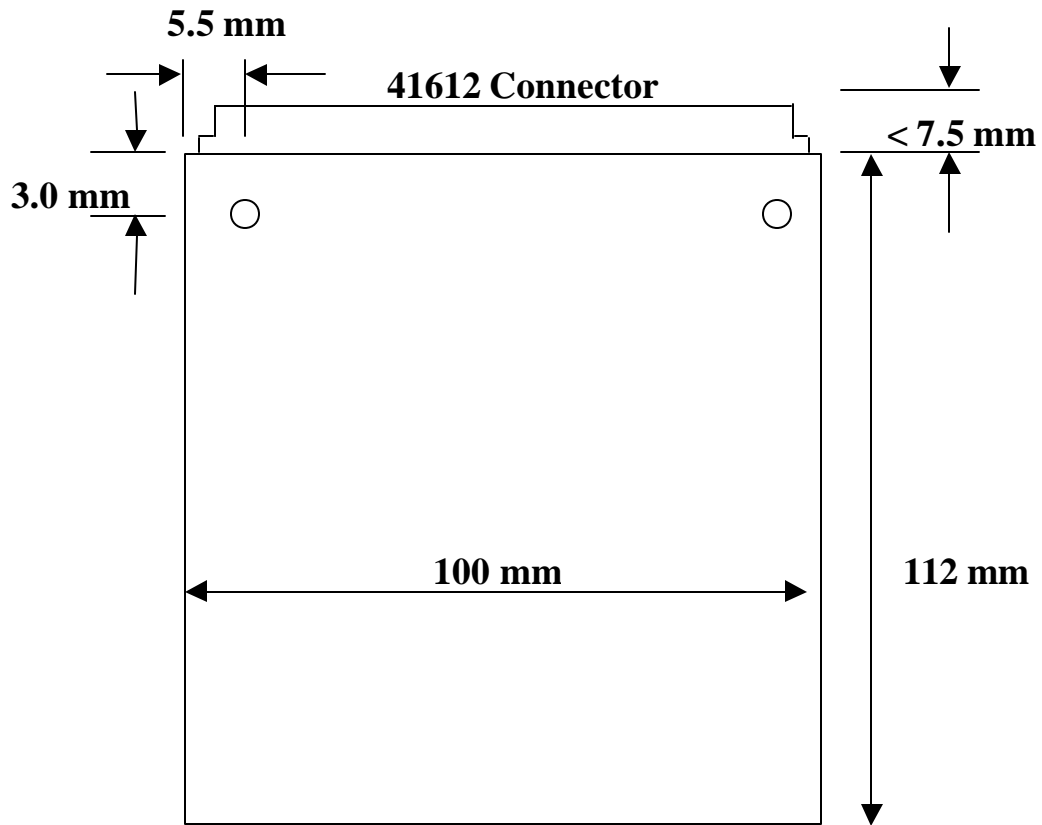
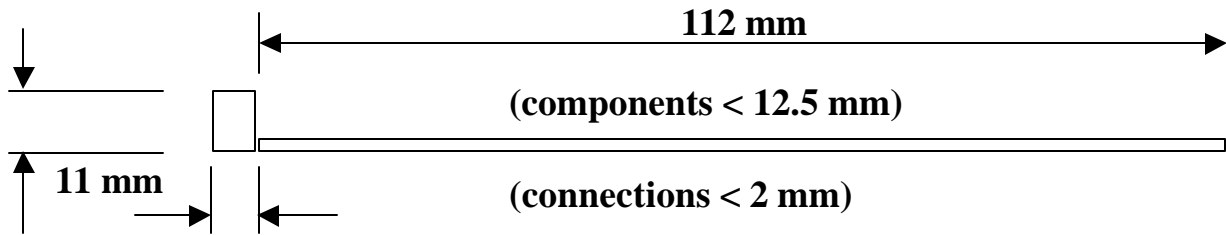


Figure 6: RUN Signal Timing



(bottom view)



(side view)

Figure 7: VC-20™ ATC-10b Physical Dimensions

