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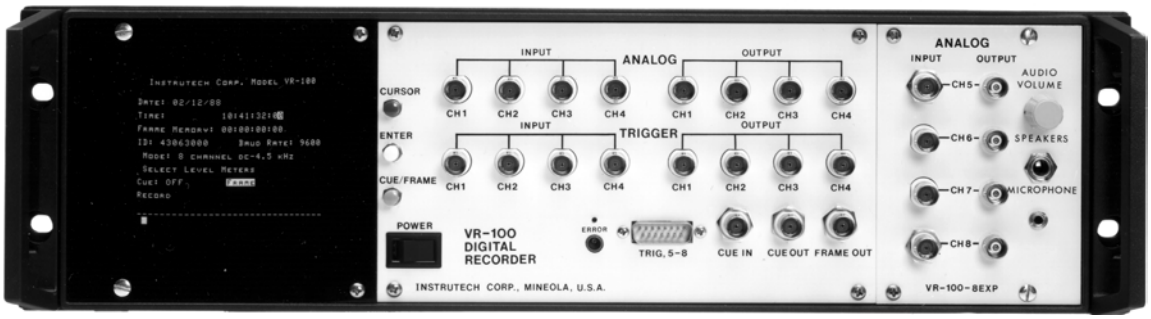
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USER'S MANUAL

Model: VR-100B
MULTIPLE SAMPLING RATE
DIGITAL DATA RECORDER



InstruTECH

Precision Instrumentation for Biological Research

20 Vanderventer Avenue, Suite 101E
Port Washington, New York 11050-3752 U. S. A.
Tel: (516) 883-1300 Fax: (516) 883-1558
sales@instrutech.com
support@instrutech.com
http://www.instrutech.com/

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1 Declaration of Conformity for the European Union

Declaration of Conformity

Manufacturer's Name: Instrutech Corporation

Manufacturer's Address: 20 Vanderventer Ave., Suite 101E
Port Washington, NY 11050-3752
The United States of America

Declares that the product:

Name: Digital Data Recorder

Model number: VR-100B

Conforms to the following Product Specifications:

Safety: EN61010-1/A2: 1995

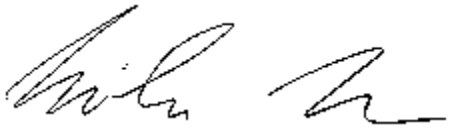
EMC: EN55011/22 Class A

EN50082-1: 1992
IEC 801-2: 1984
IEC 801-3: 1984
IEC 801-4: 1988

Model VR-100B herewith complies with the requirements of the Low Voltage Directive - 73/23/EEC and the EMC directive - 89/336/EEC and carries the CE mark. The product was tested in a typical configuration.

Port Washington, NY, October 14, 1997

Milan Kesler
President



European Contacts:

Heka Elektronik
Dr. Ing. P. Schulze GmbH; Wiesenstraße 71; D-67466 Lambrecht/Pfalz; Germany; Phone: +49 63 25 / 80 36; Fax: +49 63 25 / 80 39

Digitimer Ltd.
37 Hydeway; Welwyn Garden City; Hertfordshire, AL7 3BE; United Kingdom; Phone: +44 (0) 1707 328347; Fax: +44 (0) 1707 373153

2 General Information

2.1 Product intended usage

The Instrutech VR-100B is intended for research use only in a laboratory by persons trained in its use. Users are expected to be able to properly operate the VR-100B and associated instruments.

The Instrutech VR-100B is not intended for medical use. The Instrutech VR-100B is not intended for use in life support situations, or in situations were improper operation or failure of the VR-100B can result in personal injury.

Instrutech Corporation makes no representation that the design, implementation, testing, or manufacture of the VR-100B meet reasonable standards for use as a medical product.

As stated in the Instrutech Limited Warranty Statement, supplied with each product, "Instrutech Corporation expressly disclaims all warranties to buyer except the limited warranty set forth above, including without limitation to any and all implied warranties of merchantability and fitness for a particular purpose."

2.2 Safe Environmental Conditions

This equipment is designed for use indoors at altitudes up to 2000 m. The mains supply voltage should not have fluctuations that exceed ±10% of the nominal voltage. The normal operating temperature of this equipment is between 5° C and 40° C. This equipment is intended for use in a clean, dry laboratory setting. Use of this equipment in wet or damp environments is dangerous and not recommended.

2.3 Power requirements



This equipment is rated for use with 100-240 VAC 50/60 Hz. Maximum current at 100VAC is 1.6A and at 200VAC is 0.8A. Use the included IEC power cord to connect the VR-100B to a ***grounded*** receptacle.

2.4 Changing the fuse

The VR-100B uses a 5 x 20mm type F3A fuse. This fuse should not fail in normal operation. If the fuse should fail, check all connections and look for possible causes.

To replace the fuse:

1. Disconnect the power cord.
2. Use a screwdriver or other similar tool to rotate the cover of the fuse holder counterclockwise while pushing the cover in slightly. Remove the cover with the fuse from the holder.

3. Replace the fuse with another fuse of the exact same rating.
4. To reinstall the fuse use a screwdriver or other similar tool to rotate the cover of the fuse holder clockwise while pushing the cover in slightly
5. Reconnect the power cord.

2.5 Cleaning

Should the case or front panel of the VR-100B require cleaning first disconnect the power cord from the unit. Wipe the case with a damp cloth. Do not use any strong cleaners or solvents as this may damage the case. Reconnect the power.

2.6 Explanation of symbols

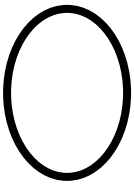
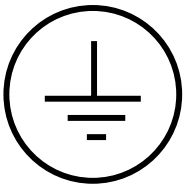
Symbol	Description
	Alternating current Currant alternatif Wechselstrom Corriente alterna Corrente variabile
	On (Supply) Allumé (alimentation) An (Netz) Encendido (suministro) Sotto tensione
	Off (Supply) Éteint (alimentation) Aus (Netz) Apagado (suministro) Fuori tensione
	Caution Attention Vorsicht Cuidado Cautela
	Protective conductor terminal Borne du conducteur de protection Schutzleiterpol Terminal de conductor protector Morsetto di filo di protezione

Figure 1. Explanation of symbols

2.7 Accessories

The following items should have been packed with your *VR-100B Digital Data Recorder*:

1 Power cord, 110 volt or 220 volt type depending on application

1 Microphone

1 Operator's manual

1 VR-100B multiple sampling rate digital data recorder

1 Set of Audio cables for connection to the video cassette recorder

2 Video cables for connection to the video cassette recorder

If any of these items are missing please contact Instrutech Corporation immediately.

2.8 Unpacking

After unpacking the *VR-100B* and accessories from the shipping carton, please inspect each piece for any signs of shipping damage. Please contact the delivering carrier and Instrutech Corporation immediately if any damage is found. Do not dispose of the shipping carton. The insurance company will want to examine the carton to process a damage claim. Instrutech Corporation insures all shipments to cover shipping damage.

2.9 Purchase Information

Take the time now, while getting started, to record some purchase information here. This will make it easier to locate this information should this become necessary in the future.

Date of purchase: ....._____.

Dealer:....._____.

Dealer telephone number:....._____.

Dealer fax number: ....._____.

Dealer email address:....._____.

Contact name at dealer:....._____.

Serial number:....._____.

2.10 Technical Specifications

Analog channels:

Channel mode:	Analog frequency response:	Sampling rate:
1 channel mode:	1 @ DC - 37 kHz	94.4 ksamples/s
2 channel mode:	2 @ DC - 18.5 kHz	47.2 ksamples/s per channel
3 channel mode:	1 @ DC - 18.5 kHz	47.2 ksamples/s
	2 @ DC - 9 kHz	23.6 ksamples/s per channel
4 channel mode:	4 @ DC - 9 kHz	23.6 ksamples/s per channel
5 channel mode:	1 @ DC- 18.5 kHz	47.2 ksamples/s
	4 @ DC - 4.5 kHz	11.8 ksamples/s per channel
6 channel mode:	2 @ DC - 9 kHz	23.6 ksamples/s per channel
	4 @ DC - 4.5 kHz	11.8 ksamples/s per channel
7 channel mode:	1 @ DC - 9 kHz	23.6 ksamples/s
	6 @ DC - 4.5 kHz	11.8 ksamples/s per channel
8 channel mode:	8 @ DC - 4.5 kHz	11.8 ksamples/s per channel

Analog input range: ±10 V

Absolute maximum input levels:

- Input current: 15.8 mA
- Power on: ±30 volts peak
- Power off: ±15 volts peak

Resolution: 14 bits

Signal to noise ratio: 84 dB

Linearity error: 1/2 LSB

Anti-aliasing filters: 4 pole true Bessel response

Trigger timing channels:

channel mode	resolution	min. width	range
1 channel mode:	1 @ 10.6 us	24 us	TTL
2 channel mode:	2 @ 21.2 us	48 us	TTL
3 channel mode:	4 @ 42.4 us	96 us	TTL
4 channel mode:	4 @ 42.4 us	96 us	TTL
5 channel mode:	4 @ 84.4 us	192 us	TTL
6 channel mode:	4 @ 84.4 us	192 us	TTL
7 channel mode:	4 @ 84.4 us	192 us	TTL
8 channel mode:	4 @ 84.4 us	192 us	TTL

TTL compatible inputs

Absolute maximum input levels:

- Input current: 20.0 mA
- Power on: -0.5 volts to 6.0 volts
- Power off: -1.0 volts to +1.5 volts

Cue in:

TTL compatible input
Absolute maximum input levels:

Input current:	20.0 mA
Power on:	-0.5 volts to 6.0 volts
Power off:	-1.0 volts to +1.5 volts

*Computer interfaces: Parallel for direct data transfer:

- 14 bit data
- 1 bit trigger
- 1 bit CRC code
- data strobe signal

RS-232 control interface:

- TxD / RxD / ground, no control signals
- Baud rate: 9600

Display: CRT monitor displays all VR-100B setup information including real time clock, mode status and signal level meters.

Dimensions:	Width: 19" (standard rack)
Height:	5.5"
Depth:	16"
Weight:	25 Lbs.

Power requirements:

Voltage:	100 - 240VAC
Frequency:	47 - 440 Hz
Power:	60 Watts
Maximum current:	1.6A @ 100 V~
	0.8A @ 200 V~

Recording format: RS170 comp. video, NTSC or PAL format

* CE compliant VR-100B units sold within the European Community do not have the parallel computer interface or the serial control interface.

All technical specifications are nominal conditions and are subject to change without notice.

2.11 Description

The *VR-100B* in conjunction with a video cassette recorder becomes a high performance digital recording system. A unique digital PCM tape encoding technique, together with state of the art microprocessor and digital signal processing technology provides for stable low noise recordings superior to that of analog FM devices.

The *VR-100B* can record in eight distinctly different modes. The basic four modes are a single DC - 37 kilohertz analog channel with one timing channel, two DC - 18.5 kilohertz analog channels with two timing channels, four DC - 9 kilohertz analog channels with four timing channels or eight DC - 4.5 kilohertz analog channels with four timing channels. The sampling rate for single channel mode is 94.4 kilosamples per second, for two channel mode is 47.2 kilosamples per second per channel, for four channel mode is 23.6 kilosamples per second per channel and for eight channel mode is 11.8 kilosamples per second per channel. The resolution for these channels is fourteen bits. The default input range for all analog channels of the *VR-100B* is plus or minus ten volts. In addition to these four basic modes the *VR-100B* has four additional enhanced modes of operation. In these modes the analog channels do not all sample at the same rate. The first of these modes is the three channel mode. In this mode the first analog channel samples at 47.2 kilosamples per second, providing an analog bandwidth of DC - 18.5 kilohertz. Channels three and four sample at 23.6 kilosamples per second, providing an analog bandwidth of DC - 9 kilohertz. Channel two is unused. The first analog channel in five channel mode is the same as it is in three channel mode. Channels three, four, five and six are sampled at 11.8 kilosamples per second per channel resulting in an analog bandwidth of DC - 4.5 kilohertz per channel. Again channel two is unused. Six channel mode samples channels one and two at 23.6 kilosamples per second each, and channels three, four, five and six at 11.8 kilosamples per second each. This results in two channels with a bandwidth of DC - 9 kilohertz and four channels of DC - 4.5 kilohertz. The last additional mode is the seven channel mode. This mode samples channel one at 23.6 kilosamples per second and channels three through eight at 11.8 kilosamples per second. This results in one channel with an analog bandwidth of DC - 9 kilohertz and six channels with bandwidths of DC - 4.5 kilohertz. Again, in this mode, channel two is not used.

The trigger channels have four basic sampling rates. These are the same as the analog channel sampling rates in one, two, four and eight channel modes. In the three channel enhanced mode the trigger channels will behave exactly the same as they would in the four channel mode. In the five, six and seven channel enhanced modes the trigger channels will behave exactly as they would if the *VR-100B* was in the eight channel mode. These channels accept TTL input levels. Care must be taken to ensure that the pulses being recorded meet the specifications for the minimum pulse width, if they do not some of the pulses may not be recorded properly.

Recorded on the tape with each frame of data is a unique time mark. Since there are sixty frames of data per second in NTSC format, this makes location of a section of data on the tape accurate to within sixteen milliseconds. In PAL format there are fifty frames per second making data location accurate to within twenty milliseconds. This makes it possible to locate an exact position on the tape during playback. On each subsequent tape playback the frame compare signal will occur at the same exact position. This greatly simplifies such tasks as multiple pass signal averaging. The time mark is a sequential number that is reset to real time each time the *VR-100B* is powered on or changes from playback to record. It is approximately real time plus the elapsed time that the *VR-100B* has been in record. During playback, the frame memory marker uses this time mark to provide a TTL output signal that a specific tape position has been reached.

The *VR-100B* also records on the tape the date that the tape was recorded and a tape ID number. This is any eight digit number that the user enters that will help identify the tape during playback.

The *VR-100B* has a cue tape marker to identify events of interest while recording. During playback the cue marks appear as TTL high level pulses at the cue output connector, and as an indication on the CRT display.

The built-in CRT displays the time, date, and the ID number. It also displays the frame number stored in the frame memory, the channel mode that the *VR-100B* is operating in, the status of the frame match and cue outputs as well as the record/playback status indicator. The bottom line of the display shows information that is being transmitted or received by the serial port. In record these settings are determined by the user while in playback the display indicates the appropriate information as derived from the recorded tape.

The *VR-100B* provides a level meter screen to enable the user to quickly see the amplitude of the analog signals. This screen displays an analog level meter for each of the channels. Indicators show the peak voltage levels for any active channels. A digital readout of the peak voltage is also displayed. Markers on this screen also indicate activity on the trigger channels.

The *VR-100B* has a parallel data interface to allow for the direct transfer of data to a computer system. When connected to a computer with an Instrutech computer interface, the *VR-100B* will transfer data from video tape storage or real time into a computer. This eliminates the need to use the recorder digital to analog converter and another analog to digital converter in the computer. Transferring data in this way could result in unnecessary degradation of your analog data. Instrutech's direct digital transfer system will completely avoid the possibility of this type of degradation.

A built in RS-232 interface enables a host computer or terminal to control some functions of the *VR-100B*. By using control functions, the computer can read, reset, store the current, or write a new frame number into the *VR-100B* memory. It can also switch the cue on or off. In addition to the control functions, any ASCII text can be stored on the tape. During playback, this text will be replayed

on the computer or terminal, as well as on the bottom line of the *VR-100B* CRT. This text may be any information that the user desires such as experiment identification, or a description of the experiment.

2.12 Video Cassette Recorders

The *VR-100B* recorder digitally encodes all of its information onto the video track of the video cassette recorder at a very high data density. It is therefore necessary to use a video recorder that is in well-maintained condition. The video cassette recorder and video tapes play an important role in the quality of the recordings.

The *VR-100B* will operate properly with any consumer quality VHS format video cassette recorder that uses HQ circuitry. Beware of the "special features" that are added to some video cassette recorders that will be of no use in this application. Some of these features are freeze frame, slow motion, and other special effects. These features will not work with the *VR-100B*. One special feature that must be paid attention to is on screen programming capability. This feature must be avoided. If the video cassette recorder superimposes any data on the video image it will distort the data recorded on that image. If a video cassette recorder without on screen programming can not be located, then try to find one that has a switch to disable this feature. Most video recorders have this as a button on the remote or a selection in one of the menus. The final option is a video cassette recorder that will display the information on the screen for several seconds after a mode change, and then clear the screen. The data during this period will be unusable, however, after the screen clears the data will play back normally. In this case, to allow for this delay, the recordings should start several seconds before any valuable data collection begins.

The *VR-100B* uses one audio track of the video cassette recorder for the audio channel. If a stereo video cassette recorder is used, then the extra audio channel remains unused. This extra audio channel on the video recorder is available to the user if desired.

The video format of the video cassette recorder can be PAL or NTSC. It is advisable to use the commonly accepted standard for the country that this equipment will be used in. Unless otherwise requested, Instrutech will ship all *VR-100B* Digital Data Recorders using this rule. The *VR-100B* requires the changing of the internal firmware to change the video format. This involves replacing two PROMs inside the unit. If this must be done please contact Instrutech Corporation for more details.

2.13 Video Tapes

The video tape is the media that the *VR-100B* uses to store data. A failed video tape means a loss of valuable data. It is therefore recommended that the best video tapes available be used for this purpose.

Video tapes should be stored carefully. Care must be taken to keep them away from magnetic fields and sources of heat. This includes electronic devices with

transformer power supplies and video monitors. Although damage to the tape may not be immediately apparent, there will be tape quality degradation, and long term exposure to these adverse conditions will destroy the data stored on the tape. When using new tapes, it is advisable to fast forward the tape to the end and then rewind the tape. This repositions the tape on the reels, allowing it to move more easily when making recordings.

2.14 Recording Speed

The performance of the *VR-100B* multiple sampling rate digital data recorder is best when the video cassette recorder is used in the standard play (SP) mode. The *VR-100B* will operate when faster tape speeds (EP, LP) are used. However, Instrutech Corporation will not guarantee the data reliability at speeds other than standard play mode as the reliability of recordings at these speeds is very dependent upon video recorder maintenance, tape quality, and the quality of the video cassette recorder itself. It is therefore recommended that all recordings be made in the standard play mode.

3 Controls and Functions

3.1 Front Panel Controls

The numbers reference the numbers on the diagram of the front panel seen in figure 3 at the end of this section.

❶ (ANALOG) INPUT:

These four BNC connectors are for channels one, two, three, and four. This is the analog signal input for recording. These connectors have no function in playback.

NOTE: With the power to the VR-100B on the absolute maximum voltage to prevent damage to the VR-100B is ±30 volts peak. With the power to the VR-100B off the maximum voltage to prevent damage is ±15 volts peak.

❷ (TRIGGER) INPUT:

These four trigger channel TTL inputs are used to input digital signals for recording. These are channels one, two, three, and four.

NOTE: The absolute maximum input current on all of the TTL timing channels on the VR-100B is 20.0 mA. With the power to the VR-100B on the maximum voltage to remain within this current specification is -0.5 volts to 6.0 volts. With the power to the VR-100B off the maximum voltage to remain within this current specification is -1.0 volts to +1.5 volts

❸ (ANALOG) OUTPUT:

These four BNC connectors are for channels one, two, three and four. In playback the analog signals recorded on these channels are output at these connectors.

In record the appropriate input signal as digitized and filtered by the internal circuitry of the *VR-100B* is available at this connector.

❹ (TRIGGER) OUTPUT:

In playback these channels output the digital TTL trigger signals that are recorded on the tape.

During record these connectors will reflect what is being input to the appropriate **(TRIGGER) INPUT** connector.

❺ VOLUME:

In all modes this will adjust the volume of the audio from the audio amplifier.

❻ CRT DISPLAY:

The CRT display of the *VR-100B* shows all of the necessary information to determine the status of the instrument. There are two different screens that can be displayed. The main information screen, seen in figure 1, displays the current status of the *VR-100B*. The level meter screen, seen in figure 2,

displays a set of level meters for each of the analog channels. The screen that is seen when the *VR-100B* is powered on is the main information screen The top line of this display screen shows the internal firmware revision and the video system that the *VR-100B* is programmed for (NTSC or PAL). The **DATE:** and **TIME:** lines of this screen show the current date and time when the *VR-100B* is in record, and the date and time from the recorded tape when in playback. The **FRAME MEMORY:** line shows the current contents of the frame comparator memory. To the right of the **FRAME MEMORY:** number is the frame match indicator. This displays the word "FRAME" in inverse video if the current time (in playback or record) equals or exceeds the time stored in the frame memory. If the time is less than the time stored in the frame memory, the displays reads "FRAME" in normal video. The **FRAME OUT** BNC connector of the *VR-100B* will go to a TTL low level when the word "FRAME" is displayed in inverted video. The next line of this screen is the **ID:** line. This line allows you to enter an eight digit number that will be recorded on the tape. This can be used to store any numerical information that may be useful when playing back the tape. The two lines beneath the **ID:** line indicate the mode that the *VR-100B* is in. When recording, this will display the mode that the *VR-100B* is recording in. When playing back, these two lines will indicate the mode that the tape currently being played was recorded in. The display will indicate the active channel numbers and the analog frequency range that they are set for. The **SELECT LEVEL METERS** line allows users to select the level meters screen for viewing. The following line displays two status messages, the playback/record status and the CUE status. In record the playback/record indicator will read "RECORD" and in playback it will read "PLAYBACK". The CUE indicator will normally display "OFF" and will display an inverse video "ON" in record if the CUE button is depressed, the cue input is active or the serial port has been used to turn the CUE on. In playback the indicator will turn "ON" if there is a CUE mark recorded on the tape using one of these methods. The CUE output BNC will go to a TTL high level when this indicator is "ON". The next line of the display shows the operating status of the *VR-100B*. There are several messages that can be displayed here. These messages will be discussed in further detail in section 4.6. The bottom line of the display shows the printable characters in the data that the *VR-100B* serial port is receiving. In playback it will display any printable characters in the data that was recorded onto the tape using the serial port.

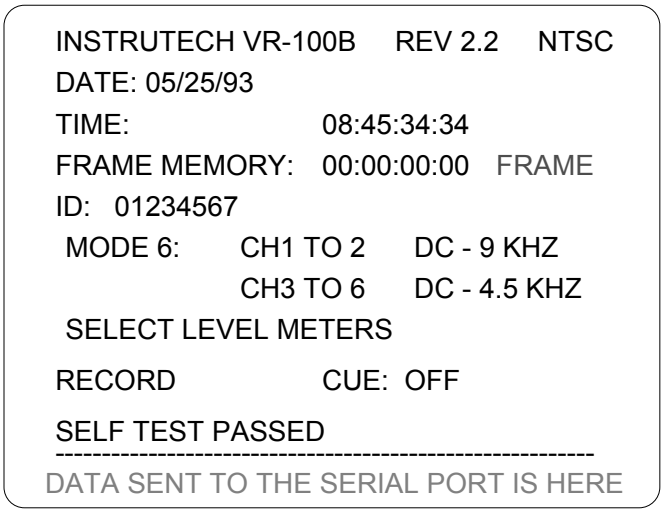


Figure 2. CRT display - Information display screen

Figure 2 shows the CRT level meter screen. This screen shows eight bar meters that represent voltage. The left side of each meter is minus ten volts, the center is zero volts and the right side is plus ten volts. There are tic marks along each meter that represent one volt increments. Along the left side of each meter is the number for the channel that it represents. Along the right side of each meter is the trigger indicator. The abbreviation TR will appear here if the trigger input for a given channel is high. Bringing the channel low will cause the letters to disappear. Above each meter there are two digital voltage readouts, one positive and one negative. These voltages are the peak positive and negative values for each channel. The analog meter shows this voltage by two hollow cursors, one positive and the other negative. A delayed response on these cursors and the digital meter help to catch short pulses. There are also two solid cursors per channel. These solid cursors show the peak voltage of the analog channels and update every sixteen milliseconds. This combination results in a meter that displays the instantaneous voltage and still makes it possible to see short events. In all but eight channel mode the unused channels will still have a meter scale, but the digital voltage readout will be blank. This will enable users to tell the active channels from the inactive channels while viewing the level meter screen.

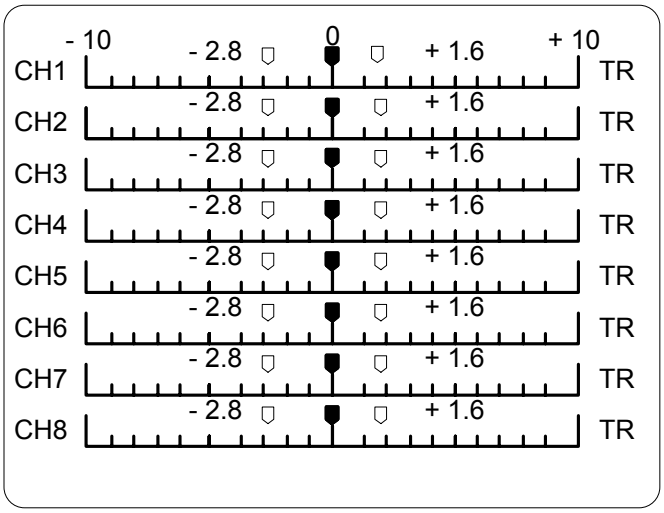


Figure 3. CRT display - Level meter screen

❼ **CURSOR** switch:

This switch moves the highlighted cursor around the CRT screen. Each activation of this button moves the cursor to the next valid screen position.

❽ **ENTER** switch:

This switch activates the selection that the cursor is highlighting.

❾ **CUE/FRAME** switch:

Activating this switch while in record will record a CUE mark on the tape. In playback, depressing this switch causes a transfer of the current frame number into the frame memory for future frame comparison.

❿ **POWER** switch**:**

This switch controls the line voltage to *VR-100B* power supply. It also has an indicator light to show when the switch is on.

⓫ **ERROR** LED:

In playback, detection of an error in the data word from the video tape will cause the ERROR LED to flash. The data appearing on the analog outputs will hold the previous data sample value when this occurs. If the LED is continuously on, this could indicate a break between recording segments on the tape, or a problem with the video cassette recorder or tape. This could also indicate the presence of on screen programming from the video cassette recorder.

Illumination of this LED in record indicates a major malfunction with the *VR-100B*. Please contact Instrutech Corporation for assistance.

⓬ **ERROR** ADJUSTMENT CONTROL:

This control adjusts for the video level coming from the cassette recorder that is being used with the *VR-100B*. Adjustment of this control is necessary after initial installation, after changing video cassette recorders and when playing back video tapes recorded on a different video cassette recorder. See section 4.2 for more information on this control.

⓮ **CUE IN** BNC Connector:

Bringing this input to ground will place a CUE marker on the tape being recorded.

NOTE: The absolute maximum input current on all of the TTL timing channels on the VR-100B is 20.0 mA. With the power to the VR-100B on the maximum voltage to remain within this current specification is -0.5 volts to 6.0 volts. With the power to the VR-100B off the maximum voltage to remain within this current specification is -1.0 volts to +1.5 volts

⓯ **CUE OUT** BNC connector:

This BNC connector will go to a TTL high level when the CUE is active.

⓰ **FRAME OUT** BNC connector:

This BNC connector will be at a TTL low level when the actual frame number is lower than the frame number stored in the frame memory. When the frame number equals or becomes greater than the number stored in the frame memory this output will go to a TTL high.

⓱ **(ANALOG) INPUT:**

These four BNC connectors are for channels five, six, seven, and eight. This is the analog signal input for recording. These connectors have no function in playback.

NOTE: With the power to the VR-100B on the absolute maximum voltage to prevent damage to the VR-100B is ±30 volts peak. With the power to the VR-100B off the maximum voltage to prevent damage is ±15 volts peak.

⓲ **(ANALOG) OUTPUT:**

These four BNC connectors are for channels five, six, seven and eight. In playback these connectors output the analog signals recorded on these channels.

In record the appropriate input signal as digitized and filtered by the internal circuitry of the *VR-100B* is available at this connector.

⓳ **MIC:**

This is the microphone jack for the audio amplifier. The *VR-100B* accepts most standard low cost condenser microphones.

⓴ SPKR:

This is the speaker or headphone output for the audio amplifier. A standard one quarter inch monaural or stereo plug will fit this jack. If a stereo plug is used here. only the tip and the shield are connected. If a pair of stereo headphones are used, the audio will be heard out of only one of the two speakers.

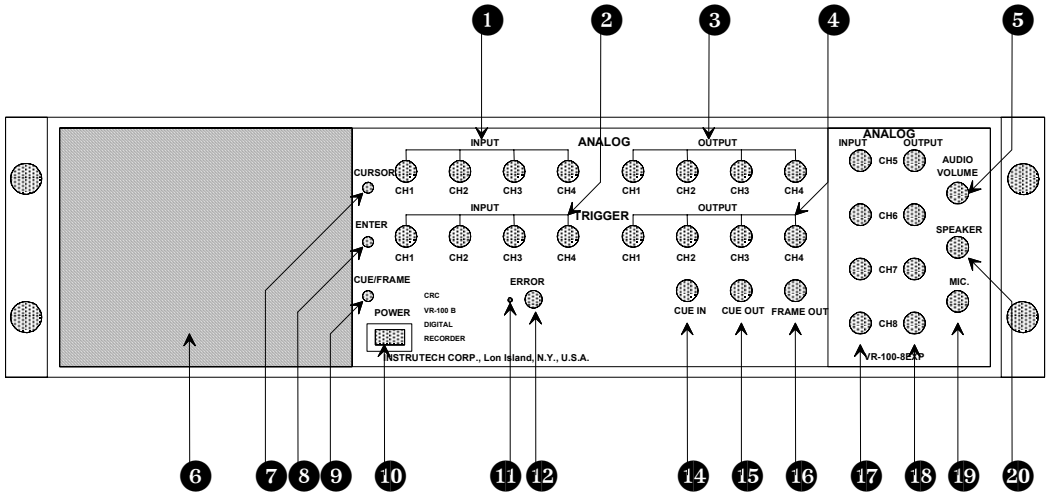


Figure 4. Front Panel

3.1 Rear Panel Controls

The numbers reference the numbers on the diagram of the rear panel seen in Figure 5 at the end of this section.

❶ FUSE:

Replace fuse with a standard 3AG (1.5 inch) 3 amp fuse only.

❷ AUDIO OUT terminal:

A standard RCA type jack connects to the audio input connector of the video cassette recorder.

❸ VIDEO OUT terminal:

A standard RCA type jack connects to the video input connector of video cassette recorder.

❹ COMPUTER CONNECTOR:

Parallel, serial, and control interface connector. For more details on this connector see section 5.1. *Note: CE compliant VR-100B units sold within the*

European Community do not have the parallel computer interface or the serial control interface.

❺ **VIDEO IN** terminal:

A standard RCA type jack connects to video output connector of the video cassette recorder.

❻ **AUDIO IN** terminal:

A standard RCA type jack connects to the audio output connector of the video cassette recorder.

❼ **POWER** Connector:

Accepts standard three wire IEC female type power cords. The appropriate power cord has been provided with the *VR-100B*. The *VR-100B* will function with a line voltage of 100 volts AC to 240 volts AC. Acceptable line frequencies are from 47 hertz to 440 hertz. There is no switching necessary to change the line voltage input to the *VR-100B*, the power supply will automatically adapt to input voltages within the specified range. The maximum power used by the *VR-100B* is sixty watts.



WARNING: To avoid a shock hazard, the VR-100B <u>must</u> be plugged into a grounded receptacle.

❽ **Serial number** and **Video** system:

The serial number of the *VR-100B* along with the video system (PAL or NTSC) that the unit is programmed for is indicated in this location.

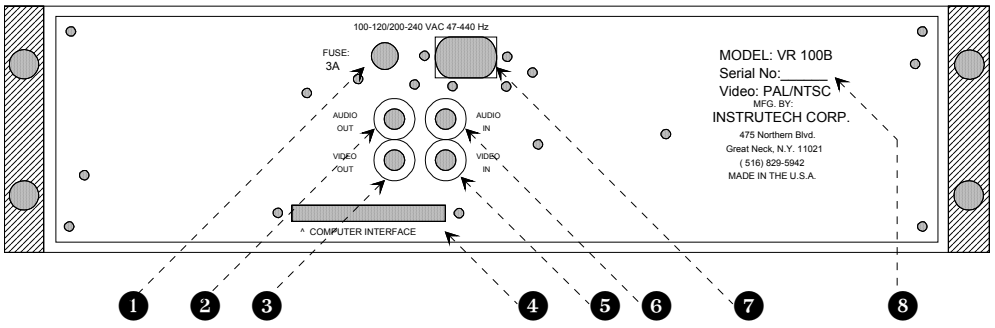


Figure 5. Back Panel

4 Operating the VR-100B

4.1 Initial connection and setup

Installing the VR-100B:

The *VR-100B* can be installed into a standard nineteen inch instrument rack or used as a table top instrument. Do not use the *VR-100B* as a shelf to support the video cassette recorder. The *VR-100B* case was not designed to do this and damage to the instrument will result if this is attempted. Do not block the ventilation holes in the top and bottom covers of the instrument. Doing this could result in overheating and malfunction.

Making the proper connections:

The *VR-100B* requires four connections to a video cassette recorder. These connections are VIDEO IN, VIDEO OUT, AUDIO IN and AUDIO OUT. The VIDEO IN on the *VR-100B* connects to the video out on the video cassette recorder. The VIDEO OUT on the *VR-100B* connects to the video in on the video cassette recorder. The AUDIO IN and AUDIO OUT on the *VR-100B* respectively connect to the audio out and audio in on the video cassette recorder. See figure 6, below.



Plug the *VR-100B* and the Video Cassette Recorder into properly grounded outlets. ***WARNING: To avoid a shock hazard, the VR-100B must be plugged into a grounded receptacle. Never use an adapter plug, unless it is properly and securely grounded.***

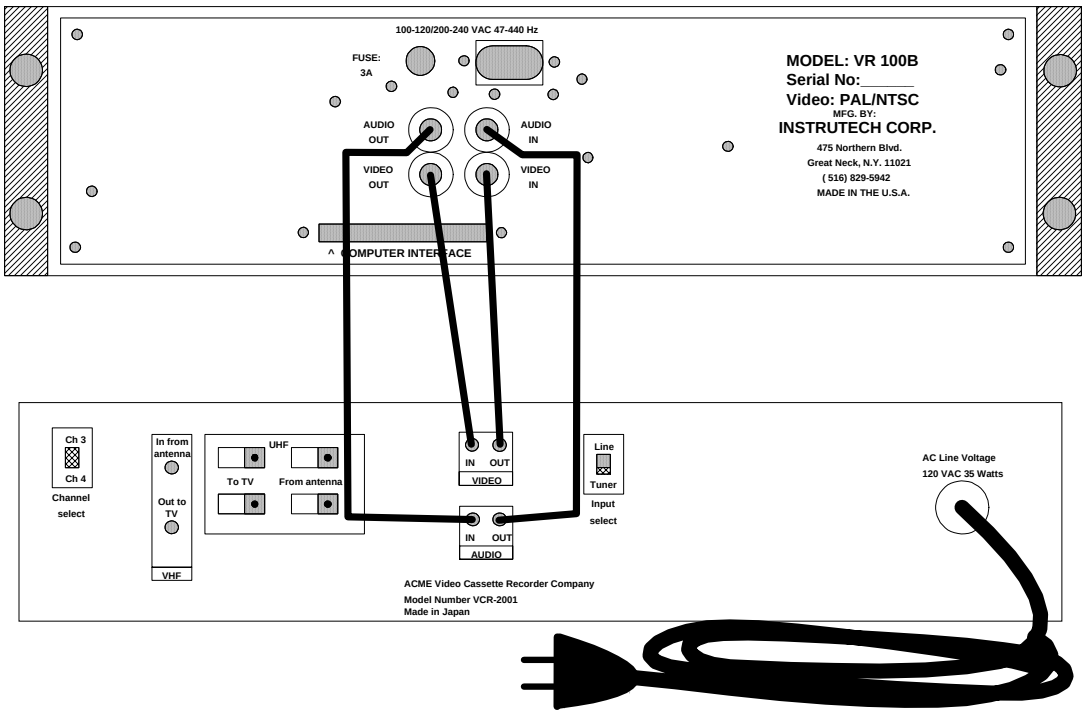


Figure 6. VR-100B to video cassette recorder connections

Setting up the video cassette recorder:

The tracking and the sharpness controls (if available) on the video cassette recorder must be set to the center of their range. After the proper connections to the video recorder and power have been made, turn the power switches of the *VR-100B* and the video recorder to their on positions. If available, set the PCM switch on the video recorder to the PCM position. If the video recorder has a tuner/line select switch this should be set to line position. Some video recorders do not have this switch but still must have the external video input, and output enabled. This is often done through the remote control unit. Sometimes the remote has an "AV" button to do this, while other video cassette recorders require stepping the channel to the "AV" position (usually below channel one). Consult your video recorder manual for further details. The information on using the line inputs for the video recorder is most often in the section of the manual entitled "Dubbing (or Copying) Video Tapes."

When the *VR-100B* is properly connected, and the video cassette recorder is properly set up, the *VR-100B* should display the message "Self Test Passed" on the line below the RECORD indicator. If there is a message that says "No Video - Check VCR Connectons" on this line then something is incorrectly set up. Go back and check your connections and the set up of the video recorder. *This is very important as proper recordings can not be made when the VR-100B is displaying a "No Video" message.*

The message line on the *VR-100B* could also display a message that says *"On screen display -- check VCR"*. This is an indication that the VCR may be

displaying information on the video image. This information display from the VCR must be turned off before continuing. Under certain conditions it would be possible for the *VR-100B* to display this message even though the VCR is not providing on screen information. If you are absolutely certain that the VCR is not providing on screen information, this display can be ignored. It will not effect operation.

Setting the clock:

It is necessary to set the clock after powering up the *VR-100B* for the first time. The real time clock on each *VR-100B* is set to Eastern Standard Time or Eastern Daylight Time (depending on the time of year) before shipping. To set the time the *VR-100B* must first be powered off. While the *VR-100B* is off, depress the **CURSOR** and **ENTER** buttons simultaneously, and while depressing them turn on the *VR-100B* power. The highlighted cursor should be on the first digit of the date. To change a digit press the **ENTER** button. It will count up one digit for each actuation of the button. When the value is set to its proper magnitude, advance the cursor by depressing the **CURSOR** button. Enter each digit one at a time. Upon pushing the **CURSOR** button, the cursor will automatically jump to the next character to be set . After the date is set, the cursor will go through the digits in the time. The time will begin counting after changing the last time information digit. If the time is set to 12:15:00:00, and the cursor is not advanced past the last zero, the time will still be running. After advancing the cursor out of the time field, the time will jump up in value an equal amount of time since changing the last digit. If this was thirty seconds, the time will jump to 12:15:30:00. After the cursor is moved out of the time field it will no longer go into the time and date fields without following this startup procedure again.

4.2 Making Recordings

Setting VR-100B parameters:

All parameters of the *VR-100B* are set in the same fashion. To change a particular parameter move the cursor to the position that is to be changed by pressing the **CURSOR** button. Each actuation of the **CURSOR** button will advance the cursor one position on the screen. Parameters that can not be changed will be passed over automatically. When the cursor is in the correct position change the value by pressing the **ENTER** button. With each actuation of this button the value will change to the next higher option. When the value of the parameter reaches the desired value, that parameter has been set. It is not necessary to advance the cursor after setting the value, unless it is desired to do so.

Selecting the record mode:

It is necessary to select the desired channel mode before making recordings. The display will show the analog frequency ranges for the channels available in each mode. Set this to the mode that you wish to use. In single channel mode only channel one and trigger one will be active. In two channel mode, the channel one and channel two analog and trigger channels are active. In three channel mode,

channel one will be the higher sampling rate channel, and channel three and four will be the lower rate channels. In four channel mode, channels one through four will be active. In both of these modes trigger channels one through four will be active. In five channel mode, channel one will be the higher sampling rate channel, with channels three, four, five, and six sampling at the reduced rate. In six channel mode, channels one and two sample at the higher rate while channels three, four, five, and six sample at the reduced rate. In seven channel mode, channel one samples at the higher rate, and channels three through seven sample at the reduced rate. Eight channel mode uses all the channels for equal sampling rates. In these last four modes all eight trigger channels are active. In all modes the output from any unused channel will be approximately zero volts.

Recording:

After selecting the desired mode it is possible to make recordings. Connect the signal sources to be recorded to the proper inputs. Put the video cassette recorder into record. The frame number recorded on the tape will be a sequential number starting at the real time that the recording began. This is approximately the real time plus the elapsed time that the *VR-100B* has been in record. This, for all practical purposes, is real time. The only time that this should differ is when the *VR-100B* runs past midnight. In this case the time will continue to count twenty-four hours up to ninety-nine hours ninety-nine minutes before it resets to all zeros again. The clock does not reset at midnight to maintain continuity of experiments that run past this time. The date also remains unchanged. The *VR-100B* defaults to record if it is not playing back, therefore, when the *VR-100B* and video cassette recorder are on, but the tape is not recording, the *VR-100B* is in record. This is due to the inability of the video cassette recorder to signal back to the *VR-100B* that it is in record rather than in standby or stop. The frame counter will reset to real time each time the *VR-100B* is powered on. It will also reset each time the *VR-100B* switches from record to playback. If a number other than the default frame number is desired, it is necessary to have a computer or terminal connected to the *VR-100B* serial port. For more information on this see section 4.4 of this chapter.

The analog signals being input to the *VR-100B* are reproduced on the respective analog output for each channel. This is the signal as it is filtered by the record Bessel filters, processed by the analog to digital and digital to analog converters, and passed through the playback reconstruction filters.

The *VR-100B* will continue to record data onto the video tape as long as the video cassette recorder is recording.

4.2 Playing back recordings

The error adjustment:

It is necessary to set the **ERROR** adjustment when playing back tapes with the *VR-100B* for the first time. In most instances, this adjustment will only have to be done when installing the instrument. The only other times that this may have to

be done are: when changing the video cassette recorder or when playing back tapes recorded with a different video cassette recorder. This adjustment is preset before each instrument is shipped. Although it is necessary to fine tune this adjustment, it should not be necessary to turn this control more than one or two turns in either direction to provide proper playback.

To set this control it is first necessary to make a recording. This recording could be made without analog inputs to the *VR-100B* or it may contain any valid analog data. Please read the section on making proper recordings before attempting this. This recording should be at least five minutes in length. It will be necessary to have a small screwdriver to set this adjustment. Start the video cassette recorder to play back the previously created recording. It is imperative at this time to be sure that the video cassette recorder being used is not placing any information on the video screen. The on screen programming features of the video cassette recorder must be disabled before proceeding. It will be impossible to proceed properly with this adjustment without doing this. The status indicator on the CRT display should change from RECORD to PLAYBACK. This indicator must be showing PLAYBACK constantly. If this is the case look at the ERROR LED indicator. This LED should be predominantly off, with random flickering. This LED, when properly adjusted, could flicker on as often as once every several seconds, or less frequently. This is very dependent upon the video cassette recorder being used, the type of video tape, and the maintenance of the equipment. It will probably be necessary to adjust this control when installing the instrument. Using the screwdriver turn the small screw inside the holder on the front panel very slowly. If the ERROR LED gets brighter, or flickers more often, stop and turn the screen in the opposite direction. There should be a distinct null between areas of high LED activity. When turning this adjustment also watch the status indicator on the CRT screen. If this changes back to the RECORD indication, then you have turned the screw too far. If this happens, back the screw up and try again. When the *VR-100B* is playing back properly, the status indicator will say PLAYBACK, the time, date, ID and mode will be showing the time, date, ID and mode from the recording, the ERROR LED will be off, and the recorded data will be available at the analog outputs. If, when playing back a valid recording, the status indicator on the CRT screen changes back and forth between RECORD and PLAYBACK, then the ERROR control is grossly misadjusted. In this case, turn the control all the way to one end of the range. This should take no more than twenty turns. When the end of the control is reached a slight clicking should be heard as the screw continues to turn. With a valid recording playing back, start turning this screw. At this time watch the status indicator. After each half turn wait several seconds. At some point the status indicator should go to PLAYBACK and remain there. When this point is reached, continue the adjustment as described above.

Playback:

After the desired data is recorded, stop the video cassette recorder, rewind the tape to the start of the recording, and put the video cassette recorder into the play mode. The *VR-100B* will now play back the signals that were recorded onto the

tape. Initially, after the start of the playback, the analog outputs of the *VR-100B* will be muted. This should last for approximately five seconds and then the analog output channels will become active. When playing back correctly, the digital samples for the recorded data will be present on the parallel computer connector, and the analog reconstructed signal will be present on the analog outputs. The TTL trigger pulses recorded will be present on the trigger channels.

The *VR-100B* will also play back tapes recorded on the Instrutech Corporation *VR-10A*, *VR-10B,* or *VR-100A*. When playing back tapes recorded on a *VR-10* the date and ID fields on the screen will contain random characters. This is normal because the *VR-10* does not make use of these fields. The main analog and trigger channels will play back normally on the *VR-100B*. When playing back tapes from the *VR-10B* the additional four low speed analog channels on the *VR-10B* will not be accessible using the *VR-100B*.

4.3 The Audio Amplifier

The *VR-100B* has built into it an audio amplifier. There is a speaker inside the *VR-100B*. However, due to space limitations, it is small. It may be difficult to hear, especially when the *VR-100B* is mounted in an enclosed rack. In these cases it may be preferable to use an external speaker or a set of headphones. The audio output jack on the *VR-100B* is a standard ¼ inch jack. This will accept most standard headphones, or any four or eight ohm speaker. If stereo headphones are used, the audio will be heard out of only one of the two speakers. The *VR-100B* comes with the microphone necessary to use the audio amplifier. If a replacement microphone is necessary, any standard condenser type microphone can be used.

To use the audio amplifier the audio connections to the video cassette recorder must be correct. While in record, the amplifier will monitor the audio being recorded. The volume control adjusts the volume of this audio monitor. If monitoring the recording audio is undesirable or causing feedback, the volume control can be turned down completely. On playback the volume control will adjust the volume of the audio being amplified from the tape.

4.4 Applications

The *VR-100B* multiple sampling rate digital data recorder, in conjunction with a standard video cassette recorder, can be used in a typical electrophysiology laboratory environment to capture and store real time data for future computer analysis. Analog signals are connected to the analog inputs. For example: physiological signal on channel one and command voltage on channel two. Timing signals, such as stimulus timing pulses or processed responses could be connected to the digital inputs of the *VR-100B*. An oscilloscope or chart recorder may be connected to the analog outputs to observe the signal being recorded. Both the analog and digital outputs reflect the inputs during recording.

If events of interest are observed during recording, a cue mark may be inserted and recorded on the tape by depressing the **CUE/FRAME** button. Connecting pin five of the interface connector to a TTL source or a switch closure to ground

will accomplish the same task as depressing this switch. If a computer or terminal is connected to the *VR-100B* via the RS-232 interface, the above procedure can be accomplished using <CTRL> Q and <CTRL> O functions (Refer to section 5.2 for more information on the serial port). During playback, the cue marks recorded on the tape will appear as TTL high level pulses on the **CUE OUT** terminal. The CUE indicator on the CRT will turn on for visual indication. The **CUE OUT** terminal may be connected to an oscilloscope, chart recorder, or a computer logic input.

Video frame numbers are recorded on the tape. The frame numbers increase at approximately sixty hertz (16.6 milliseconds) for standard NTSC format, and at approximately fifty hertz (20 milliseconds) for PAL format. When power is turned on, the frame number displayed on the CRT is set to the real time and immediately starts counting. When a section of the tape is recorded, the frame number is physically written on the tape. While this section is played back, the CRT displays the frame number as it was recorded. If a number other than the real time is desired you may use a computer or a terminal connected to the RS-232 interface of the *VR-100B*, and load the proper initial frame number using the serial control function <CTRL> S. Using the terminal send <CTRL> S to the *VR-100B*. The *VR-100B* will respond with HHMMSSFF. At this time send the frame number that you want to count from to the *VR-100B*. This number is sent as a continuous eight digit number. The *VR-100B* will now count starting at this number.

In playback the *VR-100B* will continuously compare the frame number on the tape with the frame number in the frame memory. This feature is used to trigger an external device, such as a computer, to execute various tasks when the frame number reaches a specific point. Typically this is achieved by observing data from a recorded tape and depressing the **CUE/FRAME** switch at the onset of an event of interest. This will store the frame number corresponding to that event in the frame memory. A specific frame number can be loaded into the frame memory by advancing the cursor to the frame memory field on the screen. The number of the frame of interest can then be set. This same task can be accomplished using <CTRL> L, assuming a computer or terminal is connected to the *VR-100B*. The *VR-100B* will respond to the serial command with the prompt HHMMSSFF. Enter the eight digit frame number after this prompt. The number sent will then be transferred to the frame memory. On any subsequent playing back of the tape, the **FRAME OUT** terminal will go high at that point, with a visual indication on the CRT display. The external device to be triggered connects to the **FRAME OUT** terminal.

The frame compare feature of the *VR-100B* is also active while recording. The frame memory can be loaded using the cursor and enter buttons or the serial port while in record. This can be useful to use as a timer or to control other instruments during an experiment. For example: if a specific instrument is to be activated at a point five minutes into an experiment, then the frame match can be set to five minutes into the future. The frame output can be used to trigger the instrument.

4.4 Optional Computer Interface

The *VR-100B* can be used as a real time laboratory data acquisition system by connecting an optional computer interface.

The *VR-111* interface currently available for the IBM PC/AT allows the transfer of digital data from tape onto the computer disk. The same task can also be accomplished with an ITC-16 and the ACQUIRE software. This combination supports both MacOS and Windows systems. Both options also allow real time data to be digitized by the *VR-100B* and transferred into the computer while recording.

The Instrutech Corporation *VR-112* computer playback interface allows direct playback of tapes recorded on the *VR-100A, VR-100B, VR-10A,* and *VR-10B* into a computer. This interface plugs into the computer and connect directly to a video cassette recorder. It allows data to playback directly into the computer without the digital data recorder. This eliminates the need to have a second digital data recorder if separate recording and analysis stations are desired. This board is a cost effective way to free the data recorder for recording and still be able to playback data into a computer for analysis. This board is available for IBM AT compatible computers.

For information on how to use these interfaces consult the user's manual supplied with the interface.

Note: CE compliant VR-100B units sold within the European Community do not have the parallel computer interface or the serial control interface.

4.5 Replacing the Batteries

The internal clock of the *VR-100B* is powered by two AA type alkaline batteries. If the *VR-100B* loses the time when it is turned off or if it starts acting erratically, the batteries may be weak. To replace the batteries it is necessary to remove the top cover of the *VR-100B*. Disconnect the power cord from the *VR-100B* before the cover is removed. To remove the cover remove the two screws on each side. Lift the cover straight up and off the instrument. Use caution not to pull on or break the wires that power the fan mounted to the top cover. These wires should be long enough to allow the cover to flip over the back of the instrument to move it out of the way. Behind the CRT monitor there is a battery holder for the two AA batteries. Remove the old batteries. Install the new batteries taking care to install them in the correct direction. There are no markings on the battery holder for the polarity of the batteries. There are two wires coming from the battery holder, one red and one black. The red wire should go to the positive side of one battery and the black wire should go to the negative side of the other battery.

4.6 VR-100B Error Messages

The *VR-100B* can display several error messages on the main display. These messages will be displayed on the second line from the bottom of the screen. This line will normally display the message "SELF TEST PASSED" when all of

the features of the *VR-100B* are operating properly. The message "CALIBRATION CORRECTED - BOARD OK" can also be displayed. This message indicates that the *VR-100B* detected a problem with the internal calibration constants stored within the memory. This problem was correctable, and there should be no particular concern for the user. Another message that can appear is "ERROR - DEFAULT CALIBRATION USED." This message indicates that the *VR-100B* calibration constants stored in the memory have been lost and are not recoverable. If this occurs, the *VR-100B* will substitute default values for these constants. This could result in the analog channel gains and offsets being slightly off, however, the *VR-100B* will still be usable. If this message is seen, the *VR-100B* should be recalibrated as soon as possible. Instrutech corporation would like to be notified if this error message is displayed. The message "ANALOG BOARD NOT WORKING", indicates a major failure of the analog processor board. It is normal for this message to appear for several seconds when switching modes on the *VR-100B,* but it should quickly be replaced by the message "SELF TEST PASSED." If this message is displayed and does not clear please contact Instrutech Corporation for further instructions.

5 Interfacing Connections

5.1 Parallel Interface Connector

(mates with 3M P/N: 3318-0000 or equivalent)

PIN #	FUNCTION	SIGNAL	DESCRIPTION
1	output	CHMD 0	These two signals will output
2	output	CHMD 1	a code depending on the number of channels the VR-100B is using. See Table 1 for the code used here.
3	output	CHMD 2	This signal is not used
4	output	Analog reset	Pulses low with channel 1 sample
5	TTL input	CUE/FRAME in	Grounding is the same as depressing the CUE/FRAME switch
6	output	CUE out	Same function as the front panel CUE BNC terminal
8	output	FRAME OUT	Same as the front panel FRAME OUT BNC terminal
12	output	TxD	RS-232 port
13	input	RxD	RS-232 port
17	output	PLAY/RECORD	TTL high in playback, TTL low in record.
20	power	GND	
21	power	GND	
22	output	Bit 0	Parallel data, least significant bit.
23	output	Bit 1	Parallel data
24	output	Bit 2	Parallel data
25	output	Bit 3	Parallel data
26	output	Bit 4	Parallel data
27	output	Bit 5	Parallel data
28	output	Bit 6	Parallel data
29	output	Bit 7	Parallel data
30	output	Bit 8	Parallel data
31	output	Bit 9	Parallel data
32	output	Bit 10	Parallel data
33	output	Bit 11	Parallel data
34	output	Bit 12	Parallel data
35	output	Bit 13	Parallel data, most significant bit.
36	output	CRC bit	Parallel data CRC bit
37	output	CONVERT	TTL high pulse when the data on the parallel port is valid
38	output	TRIGGER OUT	TTL high when parallel data sample contains a trigger signal

Pin numbers 7, 9, 10, 11, 14, 15, 16, 18, 19, 39, and 40 are unused.

Mode	CHMD0	CHMD1
1 channel	low	low
2 channel	high	low
3 channel*	low	high
4 channel	low	high
5 channel*	high	high
6 channel*	high	high
7 channel*	high	high
8 channel	high	high

The only way to determine if the *VR-100B* is in an enhanced mode is to use the serial port command <CTRL> W. See section 5.2 for more information on this.

Table 1. Channel mode signal values

Note: *CE compliant VR-100B units sold within the European Community do not have the parallel computer interface or the serial control interface.*

5.1 TTL levels

There are many references to TTL levels in this manual. The actual valid values for TTL signals are as follows:

TTL low or TTL zero: 0 volts ≤ low ≤ 0.8 volts
TTL high or TTL one: 5.25 volts ≥ high ≥ 2 volts



Note: *The maximum input current for each TTL input is 20.0 mA. The voltage levels that will exceed this rating depend upon the status of the VR-100B. With the power on the maximum voltage range is -0.5 volts to 6.0 volts. With the power off the maximum voltage range is -1.0 volts to +1.5 volts. These are absolute maximum ratings and care should be take to avoid approaching these limits. Do not exceed these limits under any conditions or damage to the unit will result.*

5.2 The Serial Port

The serial port is used to communicate the frame number and pertinent information between the *VR-100B* and either a computer or terminal. To connect the *VR-100B* to a computer connect RxD of the computer to pin twelve, TxD to pin thirteen and ground to pin twenty or twenty-one of the forty pin interface connector on the rear of the *VR-100B*. A typical IBM compatible serial port cable with a DB9 connector is shown in figure 7, below.

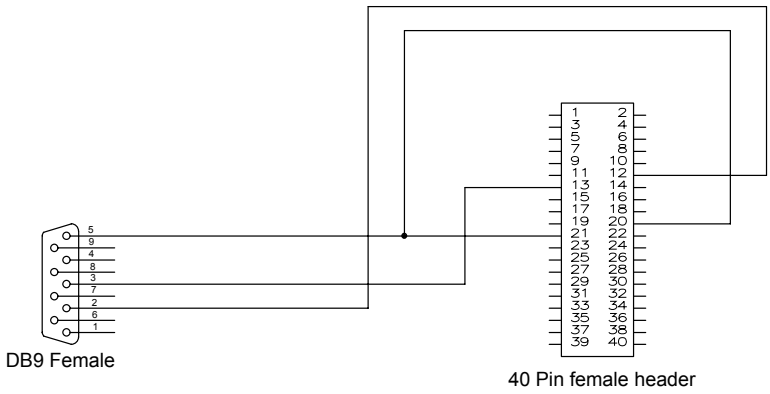


Figure 7. VR-100B serial communication cable

The baud rate for the *VR-100B* is set to 9600 baud. The data format is one start, eight data, one stop bit and no parity.

Any ASCII text can be stored on the tape during recording and played back into the computer or terminal during playback.

The *VR-100B* will recognize certain control functions that can be used to perform the following:

CTRL	FUNCTION
<CTRL> S	Load initial frame number into the frame counter. <CTRL> S will respond with HHMMSSFF. When this is received send eight digits indicating the frame number desired. This is a temporary change, the frame number will revert to real time when the *VR-100B* is powered off then on again.
<CTRL> L	Load a value into the frame memory. <CTRL> L will respond with HHMMSSFF. When this is received send eight digits indicating the contents of the frame memory that are desired.
<CTRL> R	Resets frame number to zero. This command is similar to the <CTRL> S command in that the change is temporary, reverting to real time when the *VR-100B* is powered off then on again.
<CTRL> T	Sending this control code returns the frame number being recorded on the tape during record, or frame number being played from the tape during play. The format returned to the terminal is HH:MM:SS:FF followed by a carriage return and a line feed.
<CTRL> Q	Turns the cue on.
<CTRL> O	Turns the cue off.
<CTRL> W	Returns the channel mode that the *VR-100B* is operating in. This is a single digit (1 - 8) followed by a line feed and a carriage return.

Note: *CE compliant VR-100B units sold within the European Community do not have the parallel computer interface or the serial control interface.*

6 Calibration

6.1 Calibration - When is it necessary?

The calibration of the *VR-100B* should not have to be changed in normal use. If the *VR-100B* calibration appears to be off, or the *VR-100B* is giving a calibration error message, it can be calibrated by using this procedure.

6.2 Necessary Equipment

To perform a calibration of the *VR-100B* it is necessary to have the following objects at hand:

- A serial terminal or a computer that can be used as a terminal.
  The baud rate should be set at 9600. The data format is one start, eight data, one stop bit and no parity.
- A calibrated positive ten volt DC source.
- Seven BNC female-male-female 'T' connectors.
- Eight BNC male to BNC male cables.
- A BNC male grounding cap.
- The serial cable to connect between the *VR-100B* calibration port and the terminal. This cable is available from Instrutech Corporation. It can also be made by using the diagrams shown in figure 8. Use the appropriate connector, DB9 or DB25, depending on the serial port connection to the terminal or computer.

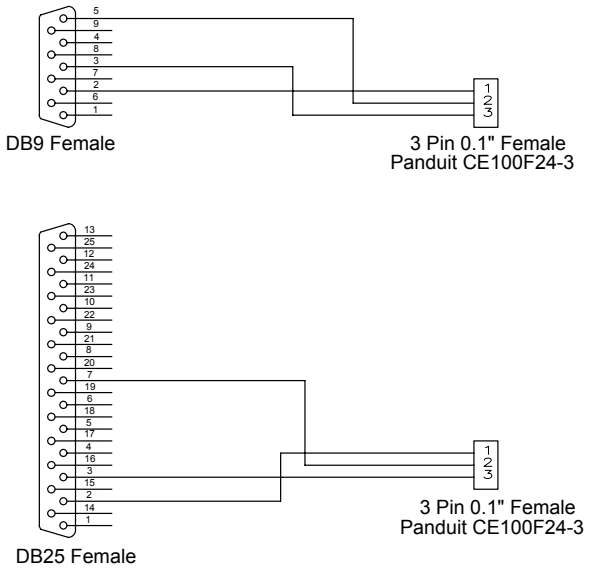


Figure 8. VR-100B calibration cable

6.3 Calibration of the VR-100B

The *VR-100B* calibration mode is entered by using the terminal to communicate directly with the microprocessor that controls the analog data. First this connection must be established. Remove the top cover of the *VR-100B*. The exposed top printed circuit board is the analog board. Just to the left, rear of the center of this circuit board is a connector labeled "P1", and "INT CAL". This is the connector that the calibration serial cable should be connected to. The pin closest to the label "P1" is pin one. Connect the serial cable here and to the terminal. Turn on the *VR-100B*. If the enter key on the terminal is pressed, the *VR-100B* should send back a list of valid commands. If the *VR-100B* does not respond there is a communication problem between the *VR-100B* and the terminal. First check the jumper just to the right of the serial port connection. This is labeled "P2". There should be a jumper block connecting the rear two pins (EXT). If this is correct check the setup of the terminal. There are no control signals with the data so these lines on the terminal must be disabled. The last procedure to try is to simply reverse the three pin connector going to the *VR-100B*. This will reverse the transmit and receive lines of the serial port. Proper communications must be established before proceeding.

To enter the calibration mode enter <CTRL> D on the terminal. The *VR-100B* will respond with instructions for the next step. In this step each of the analog input channels must be grounded. This can be done by using eight grounding BNC connectors, or by using the 'T' connectors and BNC cables to connect all of the input channels together and grounding the last 'T' connector. This effectively shorts all of the inputs to ground. After this is done press the enter key on the terminal. The *VR-100B* will respond with a prompt for the next step. This step is to feed plus ten volts into all of the analog inputs. Again this is done with the BNC cables and the BNC 'T' connectors. When this is set up properly, press the enter key on the terminal. The *VR-100B* will respond with a prompt for the final calibration step. Here the analog output for each channel is connected to the analog input for the same channel. For example: channel one input is connected to channel one output, channel two input is connected to channel two output, etc. When these connections are made press the enter key on the terminal. There will be a pause of about thirty seconds. The *VR-100B* should then respond with a "Done with calibration" message. At this time turn off the power to the *VR-100B* and disconnect the serial cable. When the *VR-100B* is powered back on, the new calibration will be in effect. If the calibration was done properly, all of the offsets and gains should be correct.

There are other options available when the *VR-100B* analog board is connected to a serial terminal. These options allow the displaying and altering of the calibration constants in the memory. It is not recommended that any of these options be utilized without the guidance of the technical staff at Instrutech Corporation. Improper use of these options could result in the loss of the calibration, and the necessity to recalibrate the *VR-100B*.

7 Trouble shooting Guide

• *VR-100B* will not turn on.	• Check power switch. • Check power cord for proper connections on both ends. • Check outlet for power. • Check *VR-100B* fuse on rear panel.
• *VR-100B* loses time when turned off.	• Check and replace batteries if necessary.
• Serial communication is not working.	• Check baud rate of terminal or computer, must be 9600 baud. • Check parity and data format. • Check connections to computer, reverse TxD and RxD if necessary. • Check ground connection between *VR-100B* and terminal or computer.
• Audio not working.	• Check volume level. • Check audio connections to the video cassette recorder. • Check audio cables. • Check speaker and microphone.
• The *VR-100B* keeps changing between record and playback when trying to record.	• Check to be sure that the video recorder is on. • Check the video connections between the video recorder and the *VR-100B*. • Check to be sure that the video recorder line inputs and output are enabled.
• The *VR-100B* keeps changing between record and playback when trying to play back recorded tapes.	• The *VR-100B* is out of adjustment. Read and follow the instructions in section 4.2.
• Error message "ANALOG BOARD NOT WORKING" is displayed.	• Major malfunction of the analog control circuitry, contact Instrutech Corporation for assistance.
• Error message "ERROR – DEFAULT CALIBRATION USED" is displayed.	• The calibration values stored in the *VR-100B* memory have been lost and the default values have been used. Recalibrate the *VR-100B* as soon as possible. The *VR-100B* is usuable, but the gains and offsets of the analog channels may be slightly off. Please notify Instrutech Corporation if this occurs.

• Error message "CALIBRATION CORRECTED – BOARD OK" is displayed.	• The calibration values stored in the *VR-100B* memory have been altered but were recoverable. The *VR-100B* should be operating normally, and this message should not concern the user. Please notify Instrutech Corporation if this occurs.
• Playback error rate is excessive.	• The *VR-100B* is out of adjustment. Read and follow the instructions in section 4.2. • The video recorder tape head needs to be cleaned. • A bad video tape, try another recording. • A video cassette recorder problem, have video recorder serviced.

8 Warranty Information

8.1 Limited Warranty

Instrutech Corporation warrants to the first purchaser, for a period of two years from the date of purchase, that this Instrutech Instrument (hereafter referred to as the "Product") will be free from defective workmanship and materials, and agrees that it will, at its option, either repair the defect or replace the defective Product or part thereof at no charge to the purchaser for parts and labor. The Product must be returned to Instrutech Corporation, postpaid and insured. Instrutech Corporation will return the Product, postpaid and insured, in the most appropriate method as determined by Instrutech Corporation.

This warranty does not apply to shipping damage. Instrutech Corporation fully insures all shipments and any claims of damage upon receipt must be filed with the carrier and Instrutech Corporation.

This warranty does not apply to any exterior appearance item of the Product which has been damaged or defaced, which has been subjected to misuse and abuse, abnormal service or handling, or which has been altered or modified in design or construction.

This warranty does not apply to any interconnection cables supplied with the Product.

This warranty does not apply if any unauthorized repairs, modifications or alterations have been made to the Product.

This warranty applies to software products only to the extent of maintenance release software to correct improper operation of the Product. Software updates to increase the capabilities of the present product are not necessarily to be provided under the terms of this warranty.

No sales organizations, other than Instrutech Corporation itself, are authorized to make any warranties other than those described above, or to extend the duration of any warranties beyond the time period described above on the behalf of Instrutech Corporation. If Instrutech Corporation agrees to such a modification of this warranty, Instrutech will furnish a modified copy of this agreement, which must be presented if a claim is being made under these modified terms.

8.2 Obtaining Warranty Service

Warranty service of this Product can be obtained by returning the Product, post paid and insured, to Instrutech Corporation, or one of its sales agents. Prior authorization before shipping the product is advised for the most expedient service.

9 Other Products available from Instrutech Corporation

VR-10B Digital Data Recorder	Two channel VCR based digital data recorder with built in programmable stimulator.
VR-111 Interface for VR10/100	IBM PC AT plug in card for direct digital transfer of data to the computer hard disk for video tape or in real time.
ITC-16 computer interface	4 D/A, 8 A/D, plus 16 digital I/O channels. Available with interfaces for the ISA, PCI and NuBus computers.
ITC-18 computer interface	True 16 bit interface with 4 D/A, 8 A/D, 32 digital output channels and 16 digital input channels. Available with interfaces for the ISA, PCI and NuBus computers.
DVP-32/PCI interface	Digital video processing system for PCI bus. 40 Mhz 12 bit A/D with multistage processing pipeline and 32 bit DSP. Includes acquisition software.
EPC-9 Patch Clamp	Computerized patch clamp amplifier. Available for MacOs or 32 bit Windows.
IGOR software	Graphing and data analysis for the Macintosh, Windows95, and WindowsNT .
* ACQUIRE	Transfer software for the ITC-16 and VR-10/100 to transfer data to the computer digitally. Requires both devices.
TAPEPLAY	Optional AxoTape based display software for the VR-111 interface board for the IBM PC AT.
WinClamp packages	Complete data acquisition and analysis systems for Windows. Available with ITC-16, ITC-18, EPC-9 or EPC-9/2.
STIM-10B Control Panel	IBM PC AT software that will give full access to the stimulation features of the VR-10B Stimulating Digital Data Recorder.

Call Instrutech Corporation at (516) 883-1300 or email sales@instrutech.com for more detailed information, new products and prices.

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