V R C - 1 0 0 0

O P E R A T I O N A L

M A N U A L

GENTNER
RF PRODUCTS DIVISION

Table of Contents

Chapter 1

OVERVIEW

1.1 Introduction

The Model VRC-1000 Remote Control Unit is a microprocessor-based unit designed for the remote supervision and control of broadcast transmitters.

This Operational Manual is organized to present information in a natural progression. It is recommended that Chapters 2, 3 and 4 be read thoroughly before applying AC power to the unit. Unlike other broadcast transmitter remote control systems, the VRC-1000, with its extensive capabilities, must be initialized before proper operation will occur.

Chapter 2, Getting Started, provides information on Unit setup. It supplies details on establishing and using all the capabilities of the VRC-1000. Chapter 3, Installation, covers the specifics of connecting the VRC-1000. The actual operational modes are detailed in Chapter 4.

Appendix A provides a listing of the words stored in the VRC-1000 memory and is positioned at the rear of this manual. Work sheets to assist in setup of the Unit are in Appendix B. A summarization of the verbal output is presented in Appendix C.

The technical details of the VRC-1000, including schematic diagrams, servicing information, and circuitry descriptions are contained in the separate Technical Manual.

1.2 Description

The Model VRC-1000 Voice Remote Control Unit is a microprocessor-based unit designed for broadcast transmitter monitoring and control. It permits conventional remote control, as well as automatic transmission systems (ATS)

operation with external items.

The VRC-1000 is a single unit located at the remote or transmitter facility. It communicates over a standard dial-up telephone line or dedicated circuits. For the standard Unit any telephone instrument having a Touch-Tone (R) pad becomes the control or studio end of a system. An optional Modem permits the Unit to send serial ASCII digital data that can be received by a user supplied computer or displayed on the Optional Video Display Terminal and recorded by the companion printer. Up to five telephone numbers are stored in the Unit for outward dialing. Each of these five numbers has an election of requiring an access code or not requiring this code. This code, five digits long and user assignable, is used to insure the maximum security for the VRC-1000. It must be received before the Unit will respond in any way. No commands will be accepted by the VRC-1000 without the proper receipt of this code.

Communications with the VRC-1000 is accomplished in PLAIN ENGLISH and through the use of the Touch-Tone (R) or DTMF dial on the remote telephone. The VRC-1000 standard output is a synthesized male voice. Stored in the Units memory is the framework for all outputs. Appendix C details the framework outputs. The words that will be used for description of all functions are input by the user. This makes the VRC-1000 very "user friendly" and permits even the more inexperienced operator to accomplished desired tasks.

Two modes of operation are available with the VRC-1000. These are the standard synthesized voice output, and an optional serial digital data output. Either mode will function on a number of different interconnecting circuits. The principle interconnecting circuit is intended to be a standard dial telephone line, as is used for normal voice communications. Alternatives include dedicated telephone circuits, subcarriers multiplexed on radio or microwave systems, radio circuits, etc. Almost any voice-grade circuit will meet the needs of the VRC-1000.

The unit provides sixteen telemetry or Metering Channels that accept an analog voltage or current and convert it to a four digit presentation. Each Metering Channel maybe setup with four tolerance limits. Two whose value is greater then the nominal value, and two whose value is numerically below the nominal value.

Sixteen Status Channels inputs, or go no-go, are provided by the unit. Each Status Channel has two conditions or states. One state for an activated (closed or on) input, and the other for a deactivated (open or off) input. Each state of a Status Channel may be declared an Alarm Condition. By so designating an Alarm Condition the Unit will cause the presence of that condition to be reported. Setting of tolerance limits on a Metering Channel declares them to be an Alarm Condition. In addition, tolerance limits and the state of Status Channels may be used for activation of automatic control outputs.

Sixteen Command Channels, each having two outputs, for total of 32 outputs, are provided by the Unit. These may be established to function manually or

automatically. Automatically, command outputs may be activated from any of three different sources. These three are from any Status Channel alarm, any Metering Channel alarm, and from any of the twenty time-of-day functions available in the Unit.

Audio monitoring is also provided by the VRC-1000. A sensitive microphone built into the unit is manually commanded to provide an audio feed to the interconnecting circuit. This enables monitoring the sounds present in the vicinity of the VRC-1000.

1.3 Options

Standard Options for the VRC-1000 Unit are:

* VRC-1000 Internal Modem Option

* VRC-1000 Video Display Terminal / Printer Option
    (requires Internal Modem Option)

* VRC-1000 Fail-Safe Unit Option

* VRC-1000 Battery Pack Option

* VRC-1000 Command Relay Assembly Accessory

* VRC-1000 Screw Barrier Strip Panel Accessory

* VRC-1000 Flexiblock Interface Accessory

* VRC-1000 Punch Block Interface Accessory

* VRC-1000 Subcarrier Chassis Accessory

* Portable Auto Dialer

These option and accessories are provided with their own respective Instruction Manuals/Sheets and are not covered in detail in this manual.

The Internal Modem Option consists of two items. These are a Modem Subassembly that mounts within the VRC-1000 and additional firmware necessary for the Unit to provide a serial ASCII data output. This Option is necessary for use of the Video Display Terminal/ Printer Option. The Internal Modem will

function on the interconnecting circuits used by the standard VRC-1000. All automatic dialing and related functions continue in use. In order to use this option, at least one of the five stored outbound telephone numbers must be devoted to data use. See the instruction manual for the Option for details.

The Video Display Terminal / Printer Option consists of three items. These are the Video Display Unit with its companion keyboard, the Printer and the Modem with its related items. To use this Option, the Internal Modem Option must be installed in the VRC-1000. All items in this Option are manufactured by firms other than Gentner RF Products. The Video Display Terminal presents in a single page presentation all Status, Metering, and Command channel information. The keyboard is used to establish identification of each channel and its associated information. It is also used to issue Commands to the VRC-1000. The Printer records Metering and Status Channels as provided by the Internal Modem Option.

The Fail-Safe Unit Option provides a means of establishing absolute carrier control via the program audio feed to the transmitter site. This absolute carrier control is required by the FCC when the VRC-1000 is used as the primary remote control system, and the VRC-1000 is functioning on the dial telephone system. Under these conditions the FCC requires that a means exist for absolute carrier control that is not dependent upon the dial telephone system. This Fail-Safe Unit senses the presence of program audio at the transmitter site. It can be set to be activated up to 99 seconds or 99 minutes after the loss of program audio. Thus, the presence of program audio becomes the absolute carrier control mechanism, when this unit's output is interfaced to the plate off function of the transmitter.

The VRC-1000 Battery Pack Option is a separate 3.5" rack mounting unit that provides power to the VRC-1000 when AC power is interrupted. It will keep the VRC-1000 fully functional for up to 8 hours after the loss of AC power. A separate AC powered rapid battery charger is provided in this option.

The Command Relay Assembly Accessory provides relay contact closure outputs from the VRC-1000 in place of the standard open-collector outputs. This 3.5 " standard 19" rack mounting assembly provides a rely interface for one group of 8 Command Channels. Sixteen relays are provided. The output rating of these relay is 5 A, up to 240 VAC (non-inductive) or 100 VA. A four foot cable, with mating connector, is provided to the VRC-1000. Relay contact output connection is screw barrier.

The Screw Barrier Strip Panel Accessory provides an alternate interface capability from the standard connectors on the rear of the VRC-1000. As the name implies, this panel provides 32 screw barriers for the pins used in the connectors on the rear of the VRC-1000 for Metering, Status, and Command connectors. A four foot interconnecting cable with mating connector is provided.

The Flexiblock and Punch Block Interface Accessories are similar to the Screw Barrier Strip Panel, but provide for the use of stranded or solid wire

punch interface to the VRC-1000 connectors.   A four foot interconnecting cable with mating connector is provided

The   Subcarrier Chassis Accessory provides frequency modulated   (FM) subcarrier communications capability for the VRC-1000.   It   both   generates   and demodulates an FM subcarrier at a pre-established frequency in the 6 kHz to 200 kHz range.   This subcarrier typically is multiplexed on an existing microwave, STL, or broadcast transmitter to provide a communications interconnection path for the VRC-1000.

The Portable Auto Dialer permits the storage of telephone numbers, such as the transmitter site number, the five-digit access code, and various Unit setup information.   The Portable Auto Dialer in an easy-to-carry package that   will also function as the Touch-Tone (R) dial with telephones that have only pulse dialing (such as a pay telephone). Various stationary automatic dialers are also available for use with the VRC-1000.

WARRANTY

GENTNER RF PRODUCTS DIVISION, GENTNER ENGINEERING COMPANY, INC. (Manufacturer) warrants that this product is free of defects in both materials and workmanship. Should any part of this equipment be defective, Manufacturer agrees, at its option, to:

A.   Repair or replace any defective part free of charge (except transportation charges) for a period of 12 months from the date of the original purchase, provided the owner returns the equipment to Manufacturer at the address set forth below. No charge will be paid for parts or labor during this period.

B.   Replace or furnish replacement for any defective parts in the equipment for a period of one year from the date of original purchase. Replacement parts shall be furnished without charge except labor and transportation.

This Warranty excludes assembled products not manufactured by Manufacturer whether or not they are incorporated in a Manufacturer product or sold under a Manufacturer part or model number.

THIS WARRANTY IS VOID IF:

A.   The equipment has been damaged by negligence, accident, act-of-God or mishandling, or has not be operated in accordance with the procedures described in the operating and technical instructions; or,

B.   The equipment has been altered or repaired by other than manufactured or provided by authorized service representative of Manufacturer; or,

C.   Adaptations or accessories other than those manufactured or provided by Manufacturer have been made or attached to the equipment which, in the determination of Manufacturer, shall have affected the performance, safety, or reliability of the equipment; or,

D.   The equipment's original serial number has been modified or removed.

NO OTHER WARRANTY EXPRESS OR IMPLIED, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE, APPLIES TO THE EQUIPMENT, nor is any person or company authorized to assume any warranty for Manufacturer or any other liability in connection with the sale of Manufacturer products.

Manufacturer does not assume any responsibility for consequential damages, expenses or loss of revenue or property, inconvenience or interruption in operation experienced by the customer due to a malfunction in the purchased equipment. No warranty service performed on any product shall extend the applicable warranty period.

In case of unsatisfactory operation, the purchaser shall promptly notify Manufacturer at the address set forth below, in writing, giving full particulars as to the defects or unsatisfactory operation. Upon receipt of such notice, Manufacturer will give instructions respecting the shipment of the equipment, or such other manners as it elects to honor this warranty as above provided. This warranty does not cover damage to the equipment during shipping and Manufacturer assumes no responsibility for such damage. All shipping costs shall be paid by customer.

This warranty extends only to the original purchaser and is not assignable or transferable.

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1.4 Specifications

Type of System	Microprocessor-based, with time-of-day clock.
Type of Memory	Non-volatile CMOS Random Access Memory. Internal lithium battery maintains time-of-day clock and user memory.
Command Capability	32 outputs, configured in 16 channels of two commands each, open collector output, rated to 48 V DC at 250 mA, can be setup to function as internally latching.
Metering Capability	16 channels, resolution of one in 1024, four digit, overall accuracy of +0.5%, +0.25 V minimum for full scale, +1 V minimum recommended, -5 to +5 V, or 0 to +10 VDC maximum (selectable during system setup for each channel), or internally alterable for maximum of 10 milliamperes for full scale. Each channel has settable tolerance limits of two upper limits and two lower limits. Channels can be calibrated in a numeric value (linear) proportional to input, power-to-linear conversion of input, or indirect power (the multiplication of two consecutive channels, with the resultant appearing in the third channel as a new calibrated value). Input impedance 100k Ohm (non-current mode).
Status Capability	16 channels, TTL-compatible (+5 V DC switched by external contact). Each channel having two states (activated and deactivated). Each condition can be setup to be alarmed.
Automatic Commands	Automatically initiated commands can be established to occur from any of three sources. Any Status Channel condition (activiation or deactivation); Any Metering Channel tolerance limit being exceeded (four possible-two upper and two lower limits); and up to 20 time-of-day initiated functions.

Mute Capability   Any Status Channel can be assigned to any Metering Channel to override (defeat) the limit checking and if so associated Automatic Command capability. A total of 40 such assignments are possible.

Interconnecting Circuit   Standard toll-grade telephone circuit or dedicated two or four wire interconnection with toll-grade performance characteristics.

Modes of Operation   Automatic call initiation upon alarm condition presence (Status or Metering alarm) of up to five telephone numbers (Auto Dial) and automatic answer of incoming call (Auto Answer).

Audio Monitor   Built-in microphone, manually initiated, permits audio monitoring of area near the VRC-1000.

Temperature Range   0 to +50 degree C, operational -20 to +70 degree C.

Power Requirements   120/240 V AC, 50-60 Hz, 15W nominal.

Input/Output Connectors   Series D type, 37 pin, male. Mating, female, solder cup supplied.

Chassis Size   1.75" (4.45cm) high, 17" (43.2cm) wide, 10" (25.4cm) deep excluding connectors, mounting brackets provided to permit mounting in standard 19" rack configuration.

Chapter 2

SETUP

2.1 Unit Initialization

2.1.1 Unit Firmware Overview

The operation of the VRC-1000 is determined solely by the Unit's firmware. This firmware establishes the basic framework of all the functions of the Unit. Individual words, letters or numbers must be assigned to this framework for the Unit to speak. In this Section 2 the setup of all the various frameworks is presented.

All VRC-1000 functions are controlled by the programming or firmware that resides in the Unit's permanent memory. This firmware is not designed in a way that permits it to be changed. Gentner RF Products does not recommend attempting to alter the firmware supplied and any such attempt will void the warranty and prevent the supplying of any future firmware updates.   The Setup functions that are not controlled by the firmware will be discussed in Chapter 3 of this manual.

Two views of the firmware are necessary to understand the complete capabilities of the VRC-1000. These are the Setup and the Operational segments. In this chapter, the Setup segments will be addressed. Chapter 4 presents the Operational segments. An understanding of the setup requirements is presented first.   An understanding of these leads to an understanding of Unit capabilities and operation.

To setup the Unit, Touch-Tone (R) (or DTMF) is used to input all information. Memory locations exist for each segment of the setup and these memory locations are filled by inputting various DTMF numbers. As an example, all words that can be spoken by the Unit are contained in Appendix B. This appendix provides a three-digit code for each of these words. It is only necessary to provide the desired three-digit code to have a word spoken in a framework.

2.1.2 Firmware Updates

Gentner RF Products will, in the future, offer updates to the Unit's firmware to be described in this manual. Original purchasers of the VRC-1000 that have registered their Unit by returning the Warranty Card will automatically be advised by mail of any such updates. If a unit is purchased as a used unit, the purchaser should send their firm's name, address, Unit Serial number, and name of firm from whom the Unit was purchased to:

> Gentner RF Products
> P. O. Box 32550
> San Jose, CA 95152

2.1.3 Hardware Setup

There are only three setup functions internal to the VRC-1000. These are the AC line voltage from which the Unit is to operate, activation of the internal lithium battery, and selection of a current mode rather than a voltage mode operation for each of the 16 Metering Channels.

```
**************************************************
*                                                *
*     *********************************          *
*     *                               *          *
*     *                               *          *
*     *           C A U T I O N       *          *
*     *                               *          *
*     *                               *          *
*     *                               *          *
*     *********************************          *
*                                                *
**************************************************
```

BEFORE APPLYING POWER, VERIFY THAT UNIT IS SET

TO OPERATE FROM CORRECT LINE VOLTAGE ! ! !

To verify the voltage setting of the VRC-1000, refer to Chapter 3. Connection of the Unit to an AC voltage other than what the Unit has been setup to accept, can result in damage.

The two remaining internal settings will not cause damage to the unit at

power up if they are not done or are done incorrectly.

The enabling of the lithium battery is required to provide continuous power to those segments of the Unit's memory that will retain the time setting of the realtime clock and all setup information. THIS SHOULD BE DONE BEFORE ENTERING ANY SETUP INFORMATION, or such information will be lost when AC power is removed from the Unit.

The third setup is the establishment of any Metering Channel to accept a DC current input instead of a DC voltage input. See Section 3.10.

For all of these setup procedures, refer to Chapter 3.

2.1.4 Audio Monitoring

As this capacity of the VRC-1000 does not require setup, it is included here, rather than elsewhere in this Chapter.

Once the VRC-1000 has been placed in operation a particular code will energize the front-panel mounted microphone. This microphone is then feed to the output of the Unit, providing audio monitoring of the area near the Unit.

Mod TO

2.2 S T O P ! ! Play with the VRC1000

Before putting the Unit into service, STOP and listen to it.

To accomplish this some set up is necessary for the Unit to function in a realistically sounding manner. When first powered up, the Unit has only the default condition of the words that make up its frameworks. Some spaces that can be set up with words are left as works that are silences. Thus, to STOP and play, you will only get the outputting of these basic frameworks.

Following the hardware set ups listed above, it is recommended that the unit be placed on a bench, a Touch-Tone (R) telephone connected to the SET jack on the rear, and if possible an audio amplifier with speaker be connected to the AUDIO OUT BNC connector on the rear. These connections are outlined in Chapter 3, below.

With the connections made, depressing the SETUP switch on the front panel will cause the Unit to say -

"SETUP ENABLED

PLEASE ENTER SYSTEM ACCESS CODE"

Respond to this request by entering from the Touch-Tone pad on the telephone connected to the SET jack, the numbers -

1 2 3 4 5 6 7

This will be followed by the message -

"THANK YOU.

PLEASE SELECT FUNCTION FOR PROGRAMMING"

Should you enter the seven-digit code in error, it will be necessary to toggle the Setup switch to reinitiate the Unit. Where access codes are involved the VRC-1000 is very unforgiving. It does not permit repeated attempts to enter access codes. Only one attempt is permitted. This is done to increase the security of the Unit to attempts to break the codes and gain unauthorized access.

This simple accessing of the Unit has placed it in the SETUP MODE. It is suggested that this procedure be repeated a few times to become familiarized with the basic accessing of the VRC-1000, then proceed to the setup of the Unit.

2.3 Unit Setup

2.3.1 Unit Access

To enter the Setup Mode of the VRC-1000 it is necessary to have power applied to the Unit and a telephone with Touch-Tone (R) pad connected to the SET jack on the rear of the Unit.

With the above, remove the handset from the cradle (or if using an automatic dialer or similar equipment, place the equipment in an "off hook" condition).

Next, depress the SETUP switch on the front of the Unit.

The Unit will respond with this spoken message -

"SETUP ENABLED

PLEASE ENTER SYSTEM ACCESS CODE"

Respond to this request by entering from the Touch-Tone pad on the telephone connected to the SET jack, the numbers -

1 2 3 4 5 6 7

The Unit will respond -

"THANK YOU.

PLEASE SELECT FUNCTION FOR PROGRAMMING"

At this point the Unit will remain silent until given a setup command.

If no further Touch-Tone numbers are sent to the unit, AFTER ONE HOUR the Unit will automatically leave the setup mode and return to a normal operational mode.

The Unit will pause for approximately five seconds after sending a particular output of existing information stored in a framework. In many of these, upon initial startup, these are silences or no information. At the end of this time period the Unit will output a tone. This tone is sent to confirm that the allowed time to send information to the Unit has passed and the Unit will no longer accept an input for that location. If it is an ongoing setup, the next segment will then be outputted by the Unit, followed by the five seconds of silence, and then the tone to indicate the end of that segment.

2.3.2 Setup Overview

Before proceeding with an explanation of the Unit setup, a review of some basic points is in order. Appendix A contains a listing of all the codes to be used for the words, letters, numbers etc. that are in the Unit's memory.

2.3.2.1 Words - Appendix A

All words, letters, numbers, etc. that may be used within the Unit are represented by a 3-digit number. This number corresponds to three Touch-Tone (R) digits. As an example, the word "power" is "616". To enter the word "power" in a memory location, that location would be sent the digits "616".

2.3.2.2 Work Sheets - Appendix B

To allow the preplanning of the setup of the Unit, Appendix B contains Work Sheets with spaces to write in the information to be inputted to the Unit. It is STRONGLY recommended that these Work Sheets be used, as they outline the setups, and will permit an easy visual presentation of Unit operation. These Work Sheets contain areas to record all information needed by the Unit. In the case of word locations brackets are used to offset an area to record the 3-digit numeric identification of a word. It is suggested that words first be written in these locations. Then after all words have been recorded, use Appendix A to locate the numeric identification for those words.

The utmost in care should be used in completing these Sheets, as the successful operation of the Unit is directly dependent upon how it is setup.

PLEASE PREPLAN FOR YOUR COMPLETE USE OF THE VRC-1000 as this will enable the utmost from the Unit.

2.3.2.3 Frameworks - Appendix C

For an overview of all frameworks spoken by the Unit, refer to Appendix C. This appendix provides a verbatim listing of all verbal outputs from the Unit, both operational and setup.

2.3.2.4 End of Set Up - Tone/Flag

The Unit pauses for approximately 5 seconds after outputting stored messages, before proceeding to the next segment of the framework or setup. If, during this time, a new number is entered, the Unit accepts this as an indication that a change is desired. It will wait for all digits to be entered before proceeding. When an entry is changes, and that entry is accepted by the Unit, a double-tone is outputted to signify this acceptance. If an incorrect number is sent, the Unit will output an error message. Should this occur, it is necessary to begin, again, that setup from it's start.

2.3.2.5 Set Up - Recording

To save the set up of the Unit, a simple audio recording represents the simplest solution. Simply record the DTMF tones fed to the Unit at the Set jack. A telephone interface that permits recording from the two-line telephone line is all that is needed.

2.3.3 Access Codes

After entering the setup mode, sending the digits -

                    0 9 0

will place the Unit in the mode to setup the access codes. Two access codes exist with the VRC-1000. These are the five digit access code for normal operation, and the seven digit system or master (or setup) code.

Following the entry of "090", the Unit responds -

                    Operator Access 01234

            "USER ACCESS CODE IS (3 1 0 3 1)"   default 1 2 3 4 5   12345

            SYSTEM ACCESS CODE IS (_ _ _ _ _ _ 7)"   default 1 2 3 4 5 6 7

The Unit pauses after repeating the code stored in first the User Access position, before proceeding to the System Access position. If during this time a new number is entered, the Unit accepts this as an indication that a change is desired. It will wait for all five digits to be entered before proceeding. The same pause occurs at the System Access position, and the Unit will respond· in the same manner. For these codes the numbers 0 through 9, the "*" and "#", as well as A, B, C, and D Touch-Tone (R) keys may be used.

Thus, to review the codes currently stored, simply enter "090" and listen to BOTH codes WITHOUT sending a DTMF digit. To change a code, simply respond within 5 seconds of the current code being replayed with a new code, and the Unit will store the new code (s).

It is suggested that the default codes be first observed before attempting changes. After reviewing the stored information, it is necessary to again send "090" as this setup repeats only once.

2.3.4 Telephone Numbers

After entering the setup mode, sending the code -

1 0 1

will place the Unit in the mode to setup the telephone numbers that it will dial when an Alarm Condition exists.

In fact, four DTMF numbers must be sent -

1 0 1 *   or
1 0 1 #

to enter this mode. When the " * " suffix is attached that number is inhibited from functioning. This is the default mode, and when the Unit is received from the factory all outward telephone numbers are set with the " * " suffix. With this suffix, the number is not programmed and will not be dialed.

The " # " suffix tells the Unit to permit programming and to repeat any numbers stored in that location.

Five telephone numbers are provided by the Unit. These are -

1 0 1
1 0 2
1 0 3
1 0 4
1 0 5

When in the Repeat/Program mode, the Unit waits 5 seconds after repeating the number currently stored. During this period, if a new number is entered, the Unit will remain in that mode until told that the number is complete, or when all 30 locations have been filled.

If the number is less than 30 digits the " # " key must be inputted to end the number. As an example, if the number to be stored for location 101 is "9263400", the numbers sent would be -

1 0 1 #

at which time the Unit would respond -

"PHONE NUMBER 1 IS . . . .(verbal output of number present)"

to which, a response is inputted of -

9 2 6 3 4 0 0 #

If pauses are needed to access long distance services, computers, and the like, the " * " inserts in place of a number a 2 second pause. Up to 30 numbers or pauses can be stored in each of the five locations.

After accepting a number, the Unit next asks -

"MESSAGE ONLY FOR PHONE NUMBER [1 to 5]
          IS [ENABLED or DISABLED]

to indicate that this specific telephone number will function as a message only call, instead of having full command access possible. When dialing in this mode the Unit will send the message -

"HELLO THIS IS [followed by 15 words] PLEASE RETURN CALL"

and does not request an access code, but hangs up the line and goes to the next number and dials that number.

The response to this is -

*   for DISABLE
#   for ENABLE

where Disabled means normal operation (requesting access codes,etc.)   and Enabled means that the number will function as a Message Only number and will send the message displayed above.

If a digital paging service is to be accessed, it is suggested that the telephone number for that service be increased to include the message to appear on the pager. As an example, if 10 seconds of delay is required after dialing the paging service before it will accept an input, then that number could be set as -

9501212*****9263400#

where the paging telephone number is "950-1212" and the number to be displayed on the pager is "923400". If a time greater than 10 seconds is needed, the " * " function represents a two second delay for each one entered.

2.3.5 Telephone Interface Options

After setting the telephone numbers to be dialed by the Unit, it is recommeded that these Telephone Interface Options be selected. They are accessed using the Code -

0 7 0

which enables selecting the type of outward dialing that the Unit will use (pulse or DTMF) and the number of rings on which the Unit will automatically answer.

2.3.5.1 DTMF or Pulse

The first question asked by the Unit is -

"DIALING IS [PULSE or DTMF]"

to which the appropriate responses are -

```
*   if the Unit is to dial using PULSE, or
#   if the Unit is to dial using DTMF
```

where pulse is the interruption of the telephone line much as a rotary dial on earlier telephone instruments interrupted, and DTMF being Touch-Tone (R) signals.

2.3.5.2 Number of Rings - Answering

This is followed by the question -

"NUMBER OF RINGS BEFORE ANSWERING IS [1 to 9]"

where the default, the way the Unit is shipped from the factory, is 1 ring. The firmware will accept any digit from " 1 " through " 9 ". It will accept "0", but see below. This number represents the number of times the Unit will let the line ring before automatically answering the line.

2.3.5.3 Number of Rings - Answering - ALWAYS OFF HOOK

If it is desired to force the Unit into a condition where it is always off-hook, such as when dedicated circuits are to be used, the Number of Rings question can be answered with " 0 ". When in this state, the Unit will never attempt to outward dial. At first turn-on, it will request the User Acess code. Following the inputting of this code, the Unit will then function as it would during a normal telephone interconnection. Alarms are accessed using the code "0 0 0".

2.3.6 Unit Identifier

The Unit Identifier is the fifteen words stored in the Unit's memory that make up the initial message when the Unit dials out or answers an in-bound call.

This begins with -

"HELLO THIS IS . . ."

and is followed by fifteen words, numbers, letters, or silences.

All words, numbers, letters, silences etc. that are stored in all locations set aside for this purpose, must have these locations filled with a three-digit code that represents to the Unit that word. Appendix A contains a complete listing of all such codes.

To assist in assigning these codes, a Setup Work Sheet appears in Appendix B for this setup.

To access the Unit Identifier the code is -

0 8 0

which, after selection outputs the following message -

"UNIT IDENTIFIER IS [followed by 15 words]"

The Unit will pause for 5 seconds after sending the 15 words or silences. The default, that is the way the Unit is shipped from the factory is with -

"THE VRC-1000 VOICE REMOTE CONTROL"

During this period, if DTMF tones are send the Unit will clear its memory and store the new words.

Following the inputting, the code " 0 8 0 " must be sent again to listen to the message. Remember not to send any tones for 5 seconds after listening to the message or it will erase those words in place.

2.3.7 Time-Date Function

This function is the clock and calendar for the Unit.

2.3.7.1 Codes

To access the Time-Date function for setup, the code is -

0 6 0

This setup function establishes the time base for all time-tagged functions provided by the Unit. Because of the internal lithium battery this function is maintained even if AC power is not applied to the Unit for an extended period. Note that this battery must be enabled upon receipt from the factory to function. Refer to the Chapter 3 for this setup procedure.

2.3.7.2 Hours

The following exchange occures with the Unit after entering the above code. First the Unit asks for the time in hours by saying -

"TIME OF DAY HOURS ARE . . [current value]"

followed by the time in hours currently in the Unit's memory. The Unit is expecting two digits representing the time, based upon a 12 hour basis, to be entered. Thus a response of -

0 0 to 1 2

is expected to be sent to the Unit. If new numbers are not sent, the Unit will continue to use the time currently in place.

2.3.7.3 Minutes

Next, the Unit will present the time in minutes. Again, if new digits are not sent, it will continue with what is currently in memory. This output is -

"TIME OF DAY MINUTES ARE . . [current value]"

Like hours, this is a two digit entry, except they are -

0 0 to 5 9

2.3.7.4 Seconds

Next, seconds are addressed as -

"TIME OF DAY SECONDS ARE . . [current value]"

This value, is two digits -

0 0 to 5 9

2.3.7.5 AM / PM

This is followed by the establishment of AM or PM with the message of -

"TIME OF DAY IS [AM or PM, as current in memory]"

To change this, the following codes are used -

* = AM
# = PM

The inputting of one of these will establish the correct time of day.

2.3.7.6 Daylights Saving Time

The next question is one of daylight savings time. This is the daylight

saving time changes in effect in the United States at the time of Unit design.
On the last Sunday in April, the time increments from 1:59:59 AM to 3:00:00 AM.
On the last Sunday in October, when the time first reaches 1:59:59 AM it changes
to 1:00:00 AM. The Unit output for this is -

> "DAYLIGHT SAVINGS TIME IS [ENABLE or DISABLED as
>   is current in memory]"

The codes for this are -

> * = Disabled
> # = Enabled

As with the other functions, no inputting will leave that state currently in
memory unaltered.

2.3.7.7 Day of the Week

For the day of the week, the Unit outputs -

> "DAY OF WEEK IS . .[current day in memory]"

to which the following numberic code can be inputted to change this-

> 1 = Sunday
> 2 = Monday
> 3 = Tuesday
> 4 = Wednesday
> 5 = Thursday
> 6 = Friday
> 7 = Saturday

2.3.7.8 Date / Month / Year

And, the final exchange is to establish the day, month, and year. The Unit
presents this information in this format -

> "MONTH [month in memory]
> DATE IS [day of month in memory]
> YEAR [year in memory]"

which these are setup using the following -

> Month = two digits, 0 1 to 1 2, as appropriate
> Date = two digits, 0 1 to 3 1, as appropriate
> Year = four digits

It should be noted that the spaces shown above between numbers are shown for printing clarity, only, and do NOT represent purposeful pauses or similar delays.

2.3.8 Command Channel

The Command Channels are the easiest channels to setup, as they contain the least amount of information that must be inputted for any of the use channels.

2.3.8.1 Channel Codes

To access the setup of Command Channels the codes of -

> 2 0 1   to   2 1 6

are used. For these codes " 2 0 1 " represents channel 1, and " 2 1 6 " represents channel 16

After a Command Channel is selected, the Unit proceeds, as listed below, through the selected channel, waiting for 5 seconds after each segment for new input. If no new input is received, the Unit proceeds to the next segment of that channel, until the channel is completed. At that time, the Unit will wait for the next setup function to be inputted. If that is to be another Command Channel the appropriate "2XX" code must be sent.

2.3.8.2 Channel Identifier

Within the Command Channel the Unit outputs -

> "CHANNEL IDENTIFIER FOR COMMAND CHANNEL [1 to 16]
>   IS . .[two words in memory]"

When first received from the factory, only silence is in the memory locations provided for the two words that make up the name of the Command Channel. All words, numbers, letters, etc. that are stored in locations set aside for this purpose, must have these locations filled with a three-digit code that

represents to the Unit that word. Appendix A contains a complete listing of all such codes.

To assist in assigning these codes, a Setup Work Sheet appears in Appendix B.

2.3.8.3 Latching or Momentary

Next, the manner in which the Command Channel will function is reviewed. Each Command Channel will function with both outputs being momentary. Momentary means that an output of 250 milliseconds duration will be provided for each DTMF input. This is the case no matter how long the input exists, so long as it is not interrupted.

The Unit output is-

"COMMAND CHANNEL [1 to 16] IS [M or L]"

where the " M " and the " L " are -

L = Latching #
M = Momentary *

As a latching output one of the two outputs for a channel is energized at all times. In the momentary mode, one output is energized when commanded to do so. Two outputs on one channel can not be energized at one time.

2.3.8.4 Contacts A & B

In review, there are 16 Command Channels, each with two outputs. These output for setup purposes are referred to as " CONTACT A " and " CONTACT B ". In conventional remote control they have many times been refered to as raise and lower or up and down. With the latching cabability of the Unit, CONTACT has been used, as more appropriate to the actual function.

The Command Channel continues -

"CONTACT A IDENTIFIER FOR COMMAND CHANNEL [1 to 16]
        IS. . [two words in memory]"

When first received from the factory, the words -

"A ACTIVATED"

is in the memory locations provided for the two words that make up the name of this output. All words, numbers, letters, etc. that are stored in locations set aside for this purpose must have these locations filled with a three-digit code that represents to the Unit that word, etc. Appendix A contains a complete listing of all such codes.

The Command Channel continues on -

"CONTACT B IDENTIFIER FOR COMMAND CHANNEL [1 to 16]
        IS. . [two words in memory]"

When first received from the factory, the words -

"B ACTIVATED"

is in the memory locations provided for the two words that make up the name of this output. All words, numbers, letters, etc. that are stored in locations set aside for this purpose must have these locations filled with a three-digit code that represents to the Unit that word, etc. Appendix A contains a complete listing of all such codes.

2.3.9 Time-of-Day Command Functions

The Unit includes the ability to activate up to twenty of either the A or B contacts of any Command Channel. This is based upon a 24 hour clock, and can be considered much like twenty time clocks.

2.3.9.1 Codes

To access the setup of these twenty Functions, use the codes -

3 0 1 X   to   3 2 0 X

are used. The second two digits correspond to the channel number. The suffix, shown above as " X " represents the mode under which the selected Function is entered.

* = DISABLE/CLEAR ASSIGNMENT   *** C A U T I O N ***

= READBACK / PROGRAM ASSIGNMENT

When the " * " key is sent following the three digits of the code, what ever is stored in memory for that Function is erased, and the Unit proceeds to present the information below, waiting for the appropriate inputs. CAUTION in using this as there IS NO RECOVERY ! Once cleared, a new input must be given to reestablish that function.

The " # " key causes the Unit to proceed through the selected Function, waiting for 5 seconds after each segment for new input. If no new input is received, the Unit proceeds to the next segment of that Function, until the channel is completed. At that time, the Unit will wait for the next setup function to be inputted. If that is to be another Time-of-day Function, the "3XXX" code should be sent.

2.3.9.2 Hours

These Functions begin with -

> "TIME OF DAY HOURS FOR ENTRY [1 to 20, as selected]
> ARE . . [2 digit value in memory]"

At this time the digits " 0 0 " to " 1 2 " maybe entered for the hour that this Function is to occur.

2.3.9.3 Minutes

The next segment is -

> "TIME OF DAY MINUTES FOR ENTRY [1 to 20, as selected]
> ARE . . [2 digit value in memory]"

Now, the digits " 0 0 " to " 5 9 " maybe entered for the minute that the Function is to occur.

2.3.9.4 Seconds

The final time segment is -

> "TIME OF DAY SECONDS FOR ENTRY [1 to 20, as selected]
> ARE . . [2 digit value in memory]"

This time segment will accept the digits " 0 0 " to " 5 9" maybe entered for the seconds that the Function is to occur.

2.3.9.5 AM or PM

The next question is -

"TIME OF DAY FOR ENTRY [1 to 20, as selected] IS
[AM or PM as exists in memory]"

The keys to select this are -

* = AM
\# = PM

2.3.9.6 Associated Command Channel

The Function continues -

"COMMAND CHANNEL NUMBER FOR ENTRY [1 to 20,
as selected] IS . . [2 digit value in memory]"

with the expected response of " 0 1 " to " 1 6 " corresponding to the desired
Command Channel to be activated by this Function.

2.3.9.7 Associated Command Channel Contact

The last segment is to select the actual output of the Command Channel. This is
either the A or B contact of the selected Command Channel. The Unit outputs -

"ACTIVE COMMAND CHANNEL CONTACT FOR ENTRY [1 to 20, as selected] IS . .

where the words stored for the A or B contact identifier are the final segment
of this output.

To change this, the following is used -

* = A Contact
\# = B Contact

The Unit outputs the words stored for the selected contact. This completes
this Function setup.

2.3.10 Metering Channel

The Metering Channels contain the most amount of setup information, per channel, of any of the VRC-1000 use channels.

2.3.10.1 Overview

It must be remembered that each channel has the following characteristics -

Each channel is linear, power-to-linear conversion,
or calculates indirect power

Each channel can accept one of two inputs -5 V to +5 VDC
or 0 V to +10 VDC (same ranges for current mode input)

Each channel has a numeric presentation (value)

Each channel has an associated Command Channel

Each channel can have four tolerance limits

Each of these four tolerance limits can have an associated
Command Channel

When entering a Metering Channel in setup, the Unit pauses 5 seconds after each entry is outputted, to permit that entry to be changed. If no DTMF input is received, what ever is in that memory location is left unaltered, and the Unit moves to the next entry or segment.

2.3.10.2 Channel Codes

To access each of the Metering Channels, the codes used are -

6 0 1 to 6 1 6

with these numbers corresponding to the channel numbers.

2.3.10.3 Channel Identifier

Each channel begins -

"CHANNEL IDENTIFIER FOR METERING CHANNEL [1 to 16, as selected]
IS . .[two words in memory]"

When first received from the factory, only silence is in the memory
locations provided for the two words that make up the name of this channel. All
words, numbers, letters, etc. that are stored in locations set aside for this
purpose, must have these locations filled with a three-digit code that
represents to the Unit that word. Appendix A contains a complete listing of all
such codes.

2.3.10.4 Unit Identifier

This is followed by -

"UNIT IDENTIFIER FOR METERING CHANNEL [1 to 16, as selected]
IS . .[two words in memory]"

using two words, as above for the Channel Identifier. These are setup using the
three-digit word codes in Appendix A. Examples would be "KILOVOLTS" or "AMPERES"
as this is to place a unit of measure on the numeric value for the selected
channel. Note, it is not necessary to use both locations. One can be inputted
as a silence, if not needed.

2.3.10.5 Channel Configuration

Then the Unit follows with -

"CONFIGURATION FOR METERING CHANNEL [1 to 16, as selected] IS . .
[L for linear, P for power-to-linear, or I for indirect power]"

for the conversion that the Unit will do for that channel.

The linear presentation is a linear numeric conversion by the A/D
converter. With the power-to-linear conversion, the input voltage will undergo
a numeric conversion from that of a exponential factor of a power meter to a
linear presentation. Finally, the indirect power conversion takes the two
previous (lower in channel number) channels and multiplies them together to

produce a resultant numeric presentation. This is just as the power output of a transmitter would be manually calculated by multiplying plate voltage by plate current. This conversion is easiest to accomplished on Channel 03 to 16. If indirect is desired on Channels 01 and 02, information in Channels 16 and 15 will be used for 01 and information in Channels 16 and 01 will be used for 02.

To setup this segment use the following DTMF keys-

                    5 = Linear [the number 5 on the keyboard is also L]
                    7 = Power to linear [the number 7 on the keyboard is also P]
                    4 = Indirect [the number 4 on the keyboard is also I]

As received, each channel is established as a linear input.

2.3.10.6 Channel Range

The input range for the channel is now selected. This is -

          "RANGE FOR METERING CHANNEL [1 to 16, as selected] IS . .
                [MINUS FIVE TO PLUS FIVE or ZERO TO PLUS TEN]"

which tracks with the desired input voltage or current to this channel. When a channel is setup to function as a current input, the input current range is, as with a voltage input, -5 ma. to +5 ma. or 0 to + 10 ma.   If it is a voltage input, then this is - 5 V to +5 VDC or 0 to +10 VDC. To establish a channel as a current input refer to Chapter 3 for details on the internal setup.

With this the appropriate responses are -

                    * = -5 to +5
                    # = 0 to +10

As received, each channel is set for 0 to +10 operation.

2.3.10.7 Channel Calibration Constant

The next segment is the calibration or scaling of the numeric value or number presented by the Unit for the selected channel.

The segment presentation is -

"CALIBRATION CONSTANT FOR METERING CHANNEL [1 to 16, as
selected] IS . . [three digits plus decimal point]"

Take special note that this is a CONVERSION CONSTANT that is being setup.
Its numeric value and significance involves a number of factors. This is NOT
the final number that will be presented by the Unit, but is as the name implies
the numberic value of a conversion constant. While only three digits are used,
the Unit will still produce a four-digit numeric output for this channel.

In determing this constant, first consider the end numeric presentation
desired. With a verbal presentation, it may be desireable to have only a
limited number of digits presented as they relate to the unit identifier. As an
example, a plate voltage of 2850 volts, can be presented in a number of ways.

If the value is to be presented in "volts" then the number must be "twenty
eight hundred fifty". However, if the parameter were to be presented using
"kilovolts", the number would then be "two point (decimal)eight five zero".
Thus the positioning of the decimal point in conjunction with the unit of
measure to be used with a given channel must control the numbers to be
presented.

The decimal point inserted performs two functions. First, its position
places the relative value on the channel. Positions possible are -

        XXX.
        XX.X
        X.XX
        .XXX

Again, take special NOTE that the CALIBRATION CONSTANT is presented as a
THREE-digit number, even though the end numeric presentation is four digits.

Secondly, the key used as the decimal point controls the polarity of the
Calibration Constant. The two keys are -

        * = Decimal Point for Positive Calibration Constant
        # = Decimal Point for Negative Calibration Constant

In the above the "." represents the actual inputting of either the " * " or
" # " key.

In the example above, where 2.850 kV is desired, the value that would be
inputted must also be based upon the sample voltage being applied to this
channel, and the Range selected. As most plate voltage samples are positive DC
voltages in the range of 1 to 4 or 5 VDC, the range selected can be expected to
be "0 to +10".

Next the maximum numeric value presentation capability of the Unit must be considered. In the generation of a numeric value the actual value of the input available must be considered. In the 0 to +10 range the following table presents the minimum DC voltage to the input of the Unit that will produce the maximum numeric value.

Minimum Input Voltage	Maximum Numeric Presentation (X 999 =)	Minimum Numeric Presentation (X .001 =)
10.0	9990	.0100
7.5	7492	.0075
5.0	4995	.0050
2.5	2497	.0025
1.5	1498	.0015
1.25	1248	.0013
1.0	0999	.0010
0.5	0499	.0005

In this table, a value of 999 is the maximum numeric value that can be produced per volt of input.

Given the above, with a plate voltage of 2850 volts, it would be necessary to have an input of 2.85 VDC to give the numeric value of 2850.

If the input available were 1.25 VDC, then the practical value, to use would be 2.850 kilovolts, not 2850, for this input. As the verbal response of "kilo" and "volts" is available this is a most practical way of handling this value.

It is easiest to calculate the value that would be equal to an input of 1 VDC. If the actual input were 1.25 VDC and 2850 were desired -

1.25 VDC = 2850

then

1.00 VDC = 2280

From this the Calibration Constant is then determined only by the proper

positioning of the decimal point. When 2850 from an input of 1.25 VDC is to be displayed as 2.850 the CALIBRATION CONSTANT IS -

2 * 2 8

This calibration constant is derived by dividing 2.850 by 1.25 (2.850 / 1.25 = 2.28).

Remember that the " * " is the equivalent of the decimal point for a positive Calibration Constant. It is also necessary to insure that the unit of measure, for this example produce a verbal response or Unit Identifier of kilovolts to be accurate.

If the Range of -5 to + 5 is used, then the table presented above as to maximum numeric value that can be presented from a minimum DC voltage input would be -

Minimum Input Voltage	Maximum Numeric Presentation (X 999 =)
5.0	4995
2.5	2497
1.5	1498
1.25	1248
1.0	0999
0.5	0499
0.0	0000
-0.5	-0499
-1.0	-0999
-1.25	-1248
-1.5	-1498
-2.5	-2497
-5.0	-4995

See Table covering 0 to +10 for Minimum Numeric Presentation.

The simplest way to obtain the Calibration Constant is to calculate the value or numeric presentation of that for an input of one volt DC. This requires a measurement of the DC voltage being used with a given level of accuracy. The accuracy of this measurement will contribute to the overall accuracy obtained with the Unit. For this reason, it is suggested that an accuracy of two decimal points be attempted. It must also be recognized that such an accuracy may actually exceed that possible from the indicating instruments (meters) present on the device (transmitter) being monitored with the Unit. As an example, in the above plate voltage situation, if the meter used on the transmitter has a full scale indication of 3000 volts, and an accuracy of 2% of full scale, when it is indicating "2850", the actual plate voltage is in the range of 2790 to 2910. This is 2850 + 2 %. Where two percent (2%) represents a value of 60. And as this accuracy is ¯a plus(+), minus(-) number, the value is actually in the range of 2790 to 2910. The measurement of the sample voltage representing this value to two decimal points will provide an accuracy with the Unit above what then can be obtained from the indicating instrument. This must not be overlooked when comparing any variations in the numeric presentation from the Unit versus that of the indicating instrument.

As the Unit is received, its Range, Configuration, and Calibration Constant are such that each Metering Channel will function as a digital voltmeter.

THE NUMERIC PRESENTATION OF EACH CHANNEL IS 0 to + 10 VDC !

This permits the Unit, its self, to be the voltmeter used to read the DC sample voltage input.

By the use of a Calibration Constant, drift normally associated with the metering inputs of digital transmitter remote control systems is virtually eliminated. Because the VRC-1000 produces a given numeric presentation based upon a specific input, should internal drift occur, it is ignored in the resultant numeric presentation. This is the case as the Unit is producing a numeric output against a specific input. Thus it will follow only a change in input. However, each time all channels are passed through the A/D converter, an internal check is performed on this segment of the Unit against tolerance limits stored internally. If an error should occur, the Unit will produce an Alarm of a Metering System Failure. See Chapter 4 for Metering System Failure information.

With this concept, routine calibration of the Unit is eliminated, so long as the accuracy of the DC sample voltage remains within desired limits. For this reason, periodic verification of the numeric presentation against an indicating instrument is advisable and desirable. The Metering System Failure Alarm can be depended upon for routine verification of proper operation of the Unit, internally. Verification of the output of the Unit as compared to an indicating instrument (such as the meters on a transmitter) are for verification that the sample voltage has remained within acceptable tolerances.

As additional examples of the Calibration Constant, if -

2.25 VDC = 3.5 Amperes Plate Current

Then

1.0 VDC = 1.56 Amperes Plate Current

And CALIBRATION CONSTANT Would Be -

1 * 5 6

when all numbers and values are positive, with a Range of 0 to +10. Further, the Unit Identifier (unit of measure) is to be Amperes, as is the original reading.

In these examples, the constant is arrived at by taking the actual numeric presentation desired and dividing it by the sample voltage.

In the above -

3.5 / 2.25 = 1.5555 or 1.56.

And -

2.5 VDC = 120 Volts AC (ie.,one phase of AC power)

Then

1.0 VDC = 48 Volts AC

And CALIBRATION CONSTANT Would Be -

4 8 * 0

with the Range of 0 to + 10 and Unit Identifier (unit of measure) of volts.

For Indirect Power the two previous channels are multiplied together to obtain the selected channel value. As an example -

If Metering Channel 1 value is "2500"

And Metering Channel 2 value is "2.000"

The Indirect Power value for Metering Channel 3 is "5000"

If these represent plate voltage and plate current, the value produced is then

the arithmetic result, without consideration of the efficiency factor of the transmitter final amplifier. Should this efficiency factor be 70% and the actual output is 3500, the Calibration Constant would be "*700". Should it be desired to produce a value of "100.0", then the Calibration Constant would be "*020" The Calibration Constant is that which would produce the desired numeric value if the input were 1.000.

When the power to linear channel configuration is selected, the following formula can be used for calculating the Calibration Constant -

Desired Value / Input Voltage X Input Voltage = Calibration Constant

As an example, if the input voltage to the selected Metering Channel is 2.36 V DC, and the desired value is "850.0", then the Calibration Constant would be "153*", from the calculated value of 152.61419. While voltage has been used above, the relationship remains the same if a current input is used.

CAUTION - Be sure that a value NO GREATER than 9999 is to be produced in above modes.

If a negative number is involved then refer back to the table above for the maximum numberic presentation. As an example, if a sample of -1.5 to +1.5 VDC is representative of -2000 Hz to +2000 Hz, this table advises that the maximum whole numbers that could be produced is -1500 to +1500. Thus, a change in units, and a relocation in the decimal point is in order for proper presentation of this number. If this were a frequency measurement in Hertz, a change in units of measure to kilohertz is the obvious first consideration. Thus -1.5 to +1.5 VDC is to be presented as -2.000 kHz to +2.000 kHz. At the time of measurement of the sample voltage, it was verified that -1.5 VDC was equal to -2.000 kHz. With this example, the Calibration Constant thus is " 1 * 3 3 ". Note that the " * " indicates a positive number. As both of these numbers a negative, when divided they produce a positive number, thus the " * " is correct, NOT the " # " of a negative number.

If a current input instead of a voltage input is to be used, the Range of 0 to + 10 can be used to correspond to an input of 0 to +10 milliamperes. Milliamperes can be substituted in all the above in place of 0 to + 10 VDC actual inputs. Likewise, the -5 to +5 can be used as -5 to + 5 milliamperes.

2.3.10.8 Associated Command Channel

Next, a Command Channel is to be associated with the Metering Channel, and it is selected by -

"DEFAULT COMMAND CHANNEL FOR METERING CHANNEL [1 to 16,
as selected] IS . . [1 to 1 6, as selected]"

This defines the response that will be obtained, IN NORMAL OPERATION, from the " * " and " # " keys when this Metering Channel has been selected. It should be noted that the Unit will output, IN NORMAL OPERATION, the words that are stored for the A or B contacts in addition to the normal Metering Channel output. As with a Command Channel, these two keys select the A or B outputs for the preset Command Channel. They function as they do for the associated Command Channel. These words are not, however, outputted during this setup, only the number of the associated Command Channel is presented.

2.3.10.9 Upper and Lower Limits

The remainder of the Metering Channel setup is devoted to the setting of tolerance limits and associated information. For brevity, this manual will not present each of the four -

        Second Lower Limit
        First Lower Limit
        First High Limit
        Second High Limit

but will present the each section but with the " X " symbol replacing the words-

        "SECOND LOWER

        FIRST LOWER

        FIRST HIGH

        SECOND HIGH"

Thus these setups begin with -

" X LIMIT OF METERING CHANNEL [1 to 16, as selected]
IS . . [value, 4 digits, and signed decimal point]"

As above, the decimal point is a " * " for a positive value and an " # " for a negative value. The value is the actual numeric value where an Alarm is desired. The setting of any of these four possible tolerance limits AUTOMATICALLY declares that it is an ALARM, and will be reported, etc. The default number in these locations is " 9 9 9 9 ". To not have any or all of these four tolerance limits functional this value "9 9 9 9" MUST be stored in the appropriate location.

2.3.10.10 Limits Auto Command Channel

Having set a limit, it is next necessary to decide if an automatic command is to be initiated when this limit is exceeded. For this, the Unit presents -

"COMMAND CHANNEL FOR X LIMIT OF METERING CHANNEL [1 to 16,
as selected] IS . . [1 to 16, as selected]"

To have no Command Channel selected, enter " 0 0 ".

2.3.10.11 Limits Auto Command Channel - Contacts

The last selection is -

"ACTIVE COMMAND CHANNEL CONTACT FOR X LIMIT OF METERING
CHANNEL [1 to 16, as selected] IS . . [two words in memory]"

using two words stored in memory, as above for the Command Channel Identifier that has been associated with location.

To change this, the following keys are used -

* = A Contact
# = B Contact

And this completes this setup.

2.3.11 Status Channel

The Status Channel setup involves only the assignment of words, the selection of associated command channel, and a determination of alarm capability.

2.3.11.1 Channel Codes

The codes used to access Status Channels are -

7 0 1 to 7 1 6

with these numbers corresponding to the channel numbers.

2.3.11.2 Channel Identifier

Each channel begins -

"CHANNEL IDENTIFIER FOR STATUS CHANNEL [1 to 16,
as selected] IS . .[two words in memory]"

When first received from the factory, only silence is in the memory locations provided for the two words that make up the name of this channel. All words, numbers, letters, etc. that are stored in locations set aside for this purpose, must have these locations filled with a three-digit code that represents to the Unit that word. Appendix A contains a complete listing of all such codes.

2.3.11.3 Associated Command Channel

Next, a Command Channel is to be associated with the Status Channel, and it is selected by -

"DEFAULT COMMAND CHANNEL FOR STATUS CHANNEL [1 to 16,
as selected] IS . . [1 to 1 6, as selected]"

This defines the response that will be obtained, IN NORMAL OPERATION, from the " * " and " # " keys when this Status Channel has been selected. It should be noted that the Unit will output, IN NORMAL OPERATION, the words that are stored for the A or B contacts in addition to the normal Status Channel output.

As with a Command Channel, these two keys select the A or B outputs for the preset Command Channel. They function here just as they do for the associated Command Channel. These words are not, however, outputted during this setup, only the number of the associated Command Channel is presented.

2.3.11.4 Low Input Identifier

Next, the low input to the Status Channel is established. It begins -

"LOW INPUT IDENTIFIER FOR STATUS CHANNEL [1 to 16,
as selected] IS . .[two words in memory]"

When first received from the factory the words -

"INPUT CLOSED"

are stored in the memory locations provided for the two words that make up the name of this channel. All words, numbers, letters, etc. that are stored in locations set aside for this purpose, must have these locations filled with a three-digit code that represents to the Unit that word. Appendix A contains a complete listing of all such codes.

2.3.11.5 Low Input - Alarm

Each condition or input of a Status Channel can be declared an Alarm, and thus its activation will produce outward dialing by the Unit. For this the output is -

"ALARM ON LOW INPUT FOR STATUS CHANNEL [1 to 16,
as selected] IS . . [DISABLE or ENABLED]"

To Disable or Enable, the following keys are used -

* = DISABLED
# = ENABLED

2.3.11.6 Low Input - Auto Command Channel

This is followed by the selection of a Command Channel, if it is desired that an automatic command be initiated when the Status Channel is placed in this position.

The output for this is -

"COMMAND CHANNEL FOR LOW INPUT OF STATUS CHANNEL [1 to 16,
as selected] IS . .[1 to 1 6, as selected]"

where the desired response, IF TO BE USED, is " 0 1 " to " 1 6 " , as desired.
If NO automatic command is desired, enter " 0 0 ".

2.3.11.7 Low Input - Auto Command Channel - Contact

The final segment of the Low Input is -

"ACTIVE COMMAND CHANNEL CONTACT FOR LOW INPUT OF
STATUS CHANNEL [1 to 16, as selected]
IS . . [two words in memory]"

using two words stored in memory, as above for the Command Channel Identifier
that has been associated with location.

To change this, the following keys are used -

* = A Contact
# = B Contact

And this completes the Low Input setup.

2.3.11.8 High Input Identifier

Finally, the high input to the Status Channel is established. It begins -

"HIGH INPUT IDENTIFIER FOR STATUS CHANNEL [1 to 16,
as selected] IS . .[two words in memory]"

When first received from the factory the words -

"INPUT OPEN"

are stored in the memory locations provided for the two words that make up the
name of this channel. All words, numbers, letters, etc.   that are stored in
locations set aside for this purpose, must have these locations filled with a
three-digit code that represents to the Unit that word. Appendix A contains a
complete listing of all such codes.

2.3.11.9 High Input - Alarm

Each condition or input of a Status Channel can be declared an Alarm, and thus its activation will produce outward dialing by the Unit. For this the output is -

        "ALARM ON HIGH INPUT FOR STATUS CHANNEL [1 to 16,
            as selected] IS . . [DISABLE or ENABLED]"

To Disable or Enable, the following keys are used -

        * = DISABLED
        # = ENABLED

2.3.11.10 High Input - Auto Command Channel

This is followed by the selection of a Command Channel, if it is desired that an automatic command be initiated when the Status Channel is placed in this position.

The output for this is -

        "COMMAND CHANNEL FOR HIGH INPUT OF STATUS CHANNEL [1 to 16,
            as selected] IS . .[1 to 1 6, as selected]"

where the desired response, IF TO BE USED, is " 0 1 " to " 1 6 " , as desired. If NO automatic command is desired, enter " 0 0 ".

2.3.11.11 High Input - Auto Command Channel - Contact

The final segment of the high input is -

        "ACTIVE COMMAND CHANNEL CONTACT FOR HIGH INPUT OF
            STATUS CHANNEL [1 to 16, as selected]
            IS . . [two words in memory]"

using two words stored in memory, as above for the Command Channel Identifier that has been associated with location.

To change this, the following keys are used -

        * = A Contact
        # = B Contact

This completes the setup of a Status Channel. The Unit will wait at this point for the selection of another Status Channel, or other setup command.

2.3.12 Mute Function

The Mute Function involves both Status and Metering Channels. The purpose of this function is to permit the overriding of tolerance checking on a Metering Channel. A typical application would be a transmitter that is on the air for only a segment of the time. A day-time AM station could be such an example, or where main and standby transmitters are used, and only one transmitter can be on the air at one time.

In these situations it is desired to have the tolerance limits in use when the transmitter is actually on the air. When the transmitter is not on the air, the tolerance checking must be shut down, or the condition of a 0 meter readings would cause an Alarm Condition that would be invalid.

To prevent such occurances, the Mute Function has been included in the Unit. The condition of a selected Status Channel can be used to, while in that condition, to override or shutdown the tolerance checking of a specific Metering Channel. Forty (40) such assignments are available with the Mute Function.

Note that the Mute function must be applied and removed at times that permit the Metering Channel reading to reach normal before applying tolerance limit checking.   This may require external time delays for proper operation. These time delays would be applied to the Status Channel input.

2.3.12.1 Codes

To access the setup of the Mute Function, the following codes are used -

                4 0 1 X   to   4 4 0 X

The second two digits correspond to the number of the Mute Function. The suffix, shown above as " X " represents the mode under which the selected Function is entered.

                * = DISABLED / CLEAR ASSIGNMENT

                # = READBACK / PROGRAM ASSIGNMENT

When the " * " key is sent following the three digits of the code, what ever is stored in memory for that Function is erased, and the Unit proceeds to

present the information below, waiting for the appropriate inputs. CAUTION in using this as there IS NO RECOVERY!! Once cleared, a new input must be given to reestablish that function.

The " # " key causes the Unit to proceed, through the selected Function, waiting for 5 seconds after each segment for new input. If no new input is received, the Unit proceeds to the next segment of that Function, until the channel is completed. At that time, the Unit will wait for the next setup function to be inputted. If that is to be another Mute Function, the "4XXX" code should be sent.

2.3.12.2 Status Channel Selection

Following Function selection, the Unit begins -

"STATUS CHANNEL NUMBER FOR DISARM [1 to 40, as selected]
IS . . [01 to 16,as selected]"

where the "01" to "16" is the channel number of the desired Status Channel that will activate this Mute Function. Note, the Unit refers to the Mute Function as "DISARM".

2.3.12.3 Status Channel High/Low Selection

Next, the low or high condition of that Status Channel is selected. This permits either condition to initiate the Mute Function. The output for this is -

"STATUS CHANNEL CONDITION FOR DISARM [1 to 40, as selected]
IS . . [high or low identifier, as in memory]"

where the words stored for the High or Low identifier are the verbal output.

To change this, the following is used -

* = Low
# = High

2.3.12.4 Metering Channel to be Muted

Finally, the selection of the Metering Channel to be controlled by this Mute Function is selected -

"METERING CHANNEL NUMBER FOR DISARM [1 to 40, as selected]
IS . . [1 to 1 6, as selected]"

where the last two digits are the channel number of the desired Metering Channel. To change this number, only the two desired digits need be sent to the Unit.

At that time, the Unit will wait for the next setup function to be inputted. If that is to be another Mute Function, the "4XXX" code should be sent.

2.3.13 Setup - Complete

When the setup of the Unit is completed, exit the Setup Mode. To exit this mode, depress the front-panel switch. Verify that dial-tone from the outside line is present. Only silence will be present if no telephone line is connected to the Line jack. Return the telephone instrument connected to the Set jack to the on-hook position.

Should the front-panel switch not be toggled such that the Unit is returned to the normal mode, the Unit will after one hour return itself to an on-hook condition. This will occur one hour after the last DTMF tone is fed to the Unit. At that time the telephone instrument connect to the Set jack will not be functional.

Congratulations, this completes Setup.

Chapter 3

INSTALLATION

This Chapter is devoted to the Installations of the Unit and areas relating to that installation. It will not cover areas of operation, except as they may relate to installation.

3.1 Introduction

As with the set up of the VRC-1000, the installation is best accomplished when preplanning has been accomplished. This chapter will be devoted to the various segments of installing the Unit. In particular, special emphasis has been placed on the interconnection of the Unit to the various inputs and outputs that it must use to accomplish its function.

3.2 Unpacking the Unit

In unpacking the Unit, take special care to verify the contents of the shipping carton. Except for manuals, all other items are contained in an internal carton. These include the AC line cord, telephone input cord, rack-mounting ears and hardware, surface mounting ears, and mating input/output connectors with hoods.

Should discrepancies be found, report them immediately to Gentner RF Products.

Following this verification, inspect the exterior of the Unit for possible shipping damage. While the latest in packaging techniques have been used for the shipping carton, transit damage may result.

IF EXTERNAL DAMAGE IS NOTED IMMEDIATELY notify the carrier or shipping company. A damage claim MUST be filed with the carrier. Further, notify Gentner RF Products.

If the Unit is not damaged, next remove the top cover by loosening screws near the top edge of the top cover. It is NOT necessary to remove these screws, ONLY loosen them enough to permit the top cover to be removed. This cover is slotted, permitting its removal without the removal of these screws.

Inspect the interior of the Unit for any noticable damage. If apparent damage is found, as with the external inspection IMMEDIATELY contact the carrier and file a damage claim. Further, notify Gentner RF Products.

In this inspection be careful not to disturb components.

DO NOT USE METAL TOOLS (screw drivers, pliers, etc.) IN THE
         INTERNAL INSPECTION ! ! !

DO NOT TOUCH INTEGRATED CIRCUITS, TRANSISTORS, OR OTHER
         COMPONENTS ! ! !

The above precautions are to prevent damage from static discharge to the interior of the Unit. As with all advanced circuitry as used in the VRC-1000, static electical discharges can permanently damage components, requiring major repairs. Such DAMAGE will not occur in normal operation, with covers in place, but can occur if this discharge is applied directly to the component.


```
     ****************************************************************
     *  **********************************************************  *
     *  *                                              *  *
     *  *                                              *  *
     *  *                                              *  *
     *  *    D O    N O T    A P P L Y   A C    P O W E R    *  *
     *  *                                              *  *
     *  *    U N T I L   the procedures in 3.3, below, are    *  *
     *  *                                              *  *
     *  *                    completed                 *  *
     *  *                                              *  *
     *  *                                              *  *
     *  **********************************************************  *
     ****************************************************************
```

3.3 AC Power Operation

    The Unit may be operated from either 120 VAC or 230 VAC. It is important to note that setting of the Unit for operation from the correct AC voltage is MANDATORY !

IF CONNECTED TO THE INCORRECT VOLTAGE

DAMAGE TO THE UNIT MAY RESULT !

When received, the Unit will be established for 120 VAC operation, unless marked otherwise.

    The following drawing shows the internal connections for AC voltage selection.

3.3.1 AC Line Voltage Selection

FROM
TRANSFORMER

120 VAC OPTION   240 VAC OPTION

WHITE   RED

POWER CORD
SOCKET

FUSE

120/240 VAC OPTION
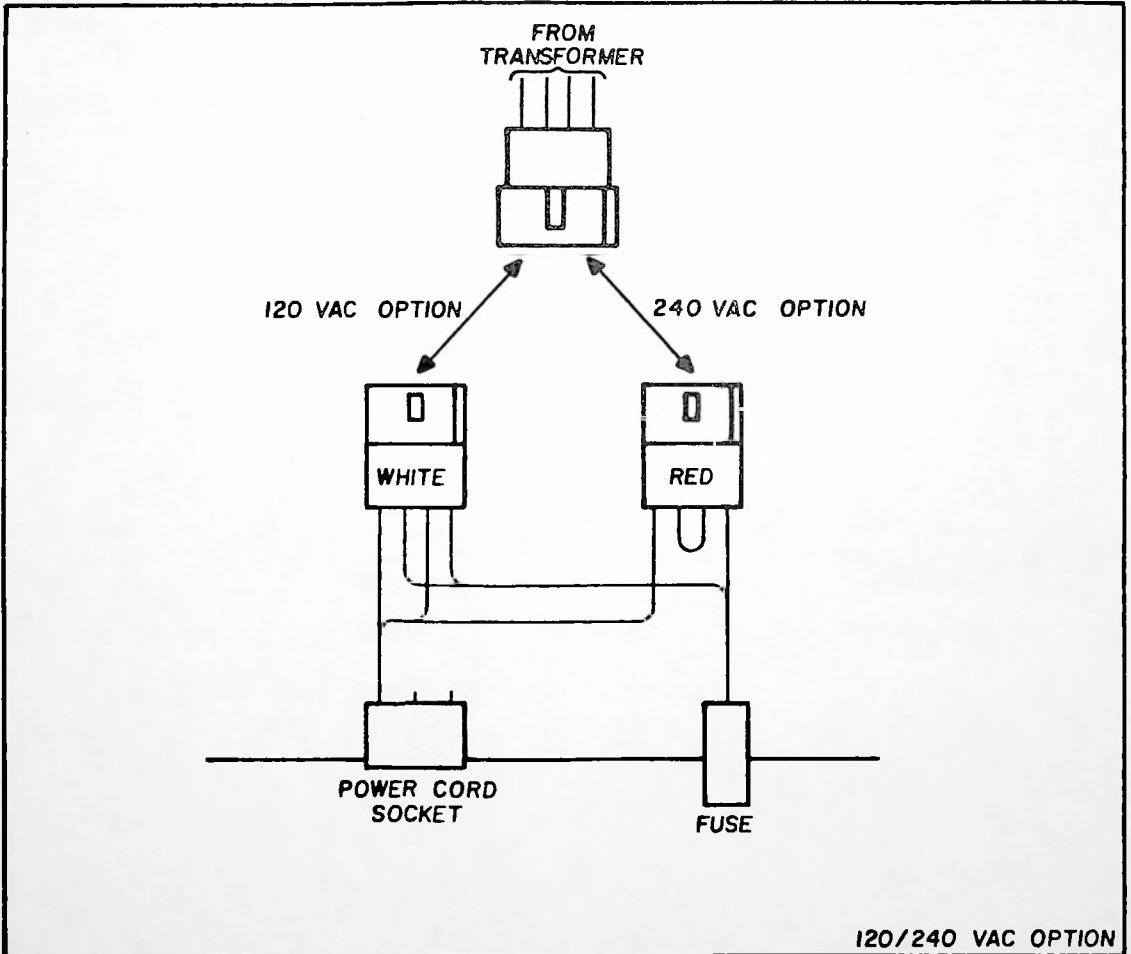
3.4 Chassis Configuration

The VRC-1000 is supplied with ears that permit it to be mounted in a standard 19" rack cabinet or rails. These ears are positioned at either side of the Unit near the front panel. If the ears are placed on the Unit such that they are flush with the front panel the Unit may be mounted in a rack cabinet. If they are reversed, then the Unit is more adaptable to rack rail mounting.

Optional surface-mount ears are also available. These mount on either side toward the rear of the chassis. Contact Gentner RF Products for information on these Optional mounts.

Captive threaded nuts in the chassis are used to attach the mounting ears. Install the ears on the Unit in accordance with the type of mounting desired.

3.5 DC Power OPTION Operation

If the Unit is to be operated with the Optional Battery Pack, it is necessary to install the connector on the rear apron of the chassis that connects to the main printed circuit board of the Unit. This connector and cabling with instructions are included with the Option.

DO NOT ATTEMPT INSTALLATION OF THIS OPTION UNTIL THE UNIT HAS BEEN VERIFIED!

3.6 Chassis Overview

The following shows the locations of jumpers to be installed internally -

BATTERY
JUMPER JMP 1

UI9   BATTERY

VRI

CURRENT INPUT JUMPERS

JMP 2   JMP 3

1/2 SCALE   JUMPER LOCATIONS
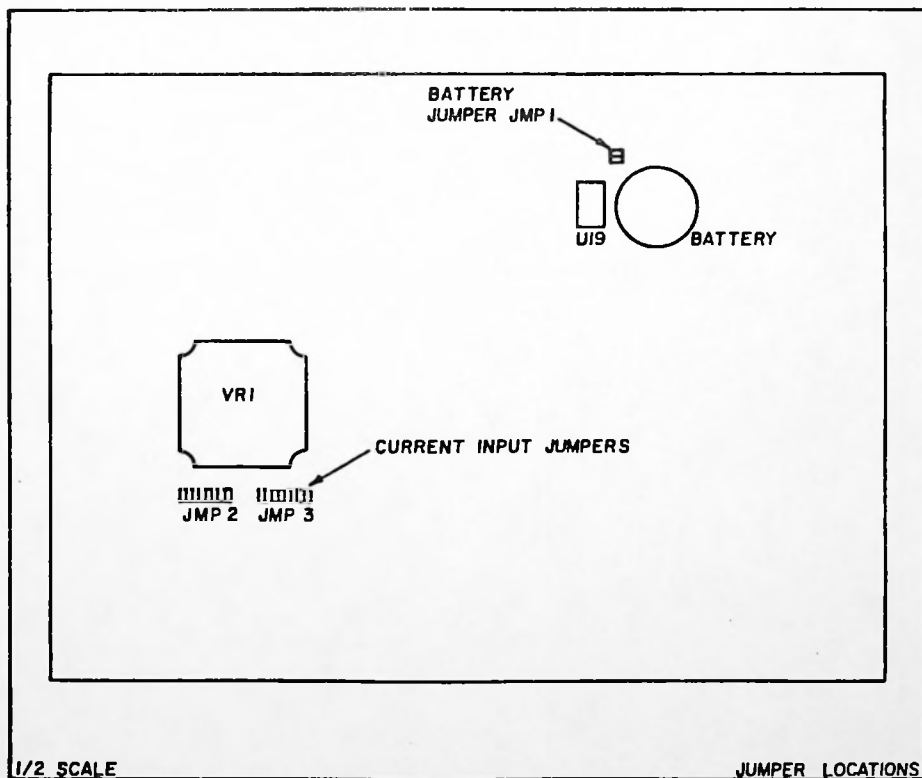
3.7 Lithium Battery Activation

Upon receipt of the Unit, the internal lithium battery is NOT in operation. A jumper must be installed to activate this battery. Note, a jumper is shipped in the "Off" position, and need only be moved to the "On" position. It is suggested that this jumper be installed when inspecting the interior of the Unit as listed in 3.2, above.

STANDBY JUMPER OFF ⟶ ▢ JMP I
STANDBY JUMPER ON ⟶ ▢

U19

BATTERY

2/1 SCALE

BATTERY JUMPER DETAIL
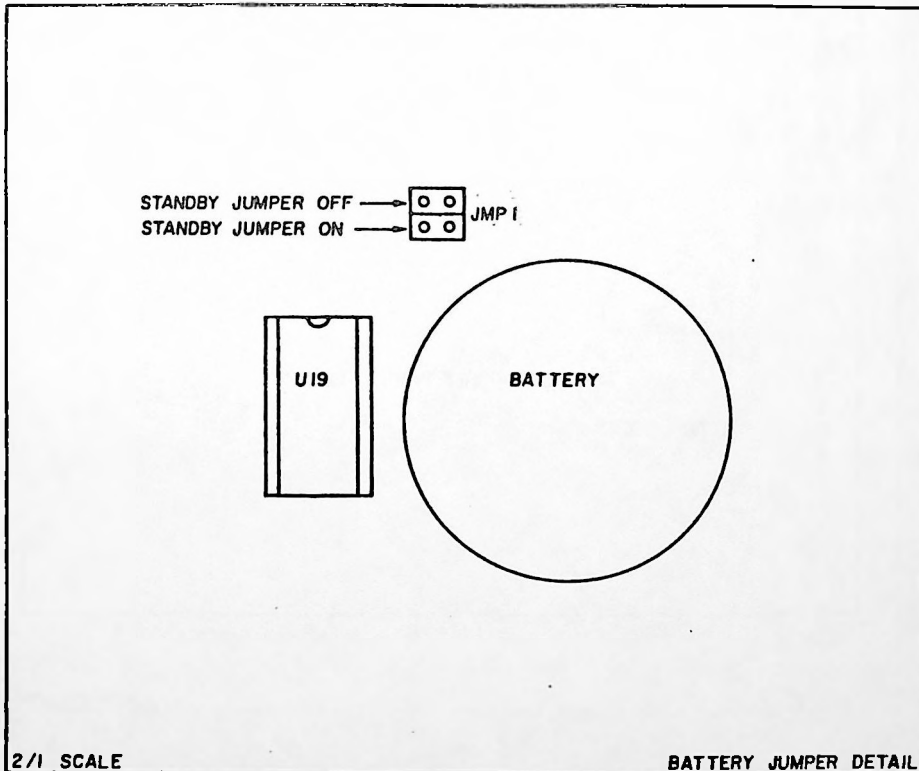
3.8 Current Input for Metering Channels

If a Metering Channel is to accept a current input instead of a voltage input, jumpers must be installed as shown below. Jumpers for this are shipped separately with the Unit.

VR1

RP 3
JMP 2

1 2 3 4 5 6 7 8
METERING CHANNEL

RP 5
JMP 3

9 10 11 12 13 14 15 16
METERING CHANNEL

JUMPER TO CONVERT EACH
CHANNEL FROM A VOLTAGE
SENSATIVE INPUT TO A
CURRENT SENSATIVE INPUT

2/1 SCALE   CURRENT INPUT JUMPER DETAIL
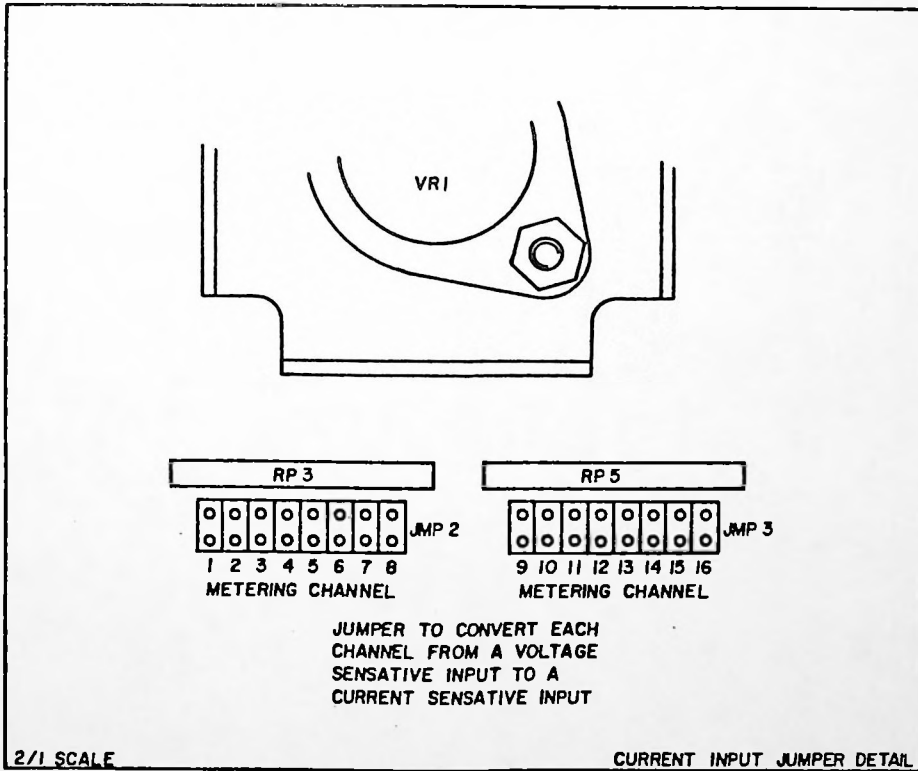
3.9 Initial Check-out

After unpacking the Unit, inspecting for damage and setting the Unit to function on the desired AC line voltage, the initial check-out of the Unit should be performed. To permit this check-out, connect the Unit as shown in the following drawing –

PROGRAMING HOOK-UP
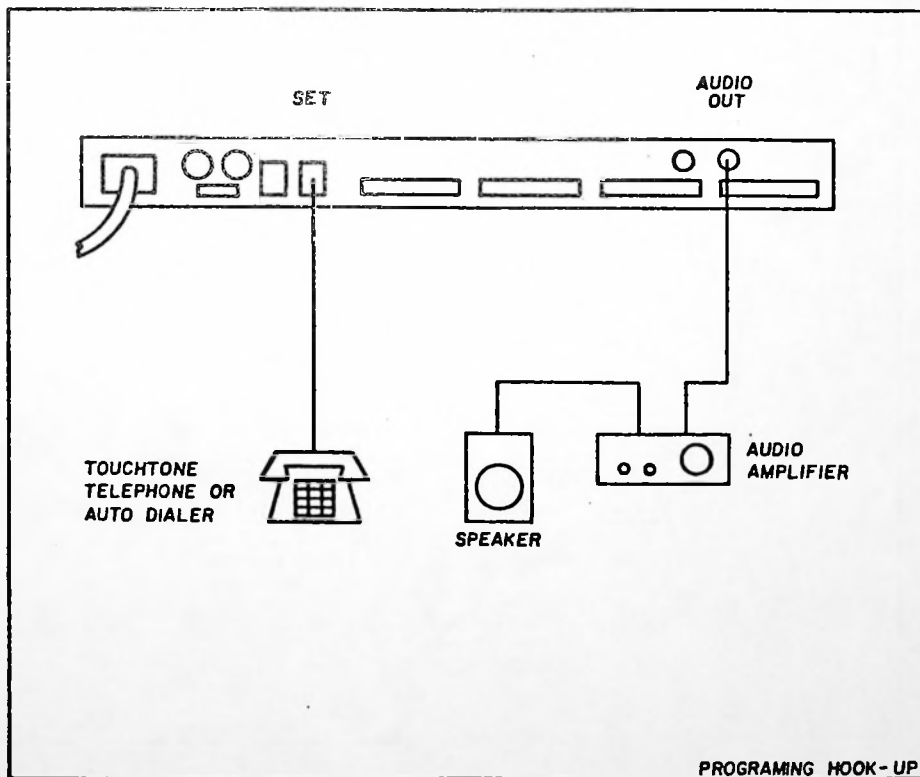
As shown, a telephone (or automatic dialer device) and AC power are all that is required for verifying that the Unit is functional. As an alternative, the BNC connector labled "Audio Out" may be connected to an audio amplifier for listening on an existing monitoring system. In the configuration, a telephone must still be connected to the "Set" jack on the rear to provide the DTMF codes to the Unit. Note that when the "Audio Out" connector is used, it does not provide an audio output of the input fed to the Unit from the telephone attached to the "Set" jack. It only provides an audio feed for output information.

To accomplish this task, the Unit is placed in the Setup mode. With the connections made, by depressing the SETUP switch on the front panel, the Unit will say -

"SETUP ENABLED

PLEASE ENTER SYSTEM ACCESS CODE"

Respond to this request by entering from the Touch-Tone pad on the telephone connected to the SET jack, the numbers -

1 2 3 4 5 6 7

This will be followed by the message -

"THANK YOU.

PLEASE SELECT FUNCTION FOR PROGRAMMING"

Should you enter the seven-digit code in error, it is necessary to depress the SETUP switch, again, to reinitiate the Unit. Where access codes are involved the VRC-1000 is very unforgiving. It does not permit repeated attempts to enter access codes. Only one attempt is permitted. This is to increase the security of the Unit to attempts to break the codes and gain unauthorized access.

This simple accessing of the Unit, has placed it in the SETUP MODE. It is suggested that this procedure repeated a few times to become familiarized with the basic accessing of the VRC-1000, before proceeding to setup the Unit.

If the Unit does not respond properly, verify that all connections have been made correctly. Verify that the telephone being used is functioning correctly by making an outside call that will use all three rows and all three columns of buttons. This is to verify that the DTMF pad is functioning correctly. Verify that the "Power" indicator on the front panel is illuminated to show the presence of AC power and the correct functioning of one of the internal power supplies.

If the Unit does not respond, refer to the Technical Manual before proceeding further.

PLEASE DO NOT ATTEMPT TO TROUBLESHOOT THE UNIT AT THIS TIME !

No further attempts to setup or install the Unit should be attempted until the Unit responds correctly.

3.10 Interconnecting Communications Circuits

Two basic methods of interconnection are possible with the VRC-1000. These are the dial telephone system, which is the primary method for which the Unit was designed. The other is the use of dedicated circuits. These may be wire or wireless (radio links, subcarriers, etc.) circuits.

3.10.1 Telephone - Dial System - FCC Part 68 Registration

For use on the dial telephone system, please take note of the following.

The VRC-1000 is registered with the Federal Communications Commission (FCC) regarding connection to the switched telephone network as regulated by FCC Rules & Regulations, Part 68. The FCC places three restrictions on its use:

1. The VRC-1000 cannot be connected to a party line or pay telephone.

2. The local telephone company must be notified that the VRC-1000, an automatic dialing device, is being installed. If the Unit is permanently removed further notice must also be given.

3. Gentner RF Products must make any necessary repairs to the Unit to maintain valid FCC registration.

The FCC registration and ringer equivalency numbers are on a label found on the chassis of the VRC-1000. The ringer equivalence is 1.1B, and FCC Registration number is FB15FU-7158-MD-T.

If you experience any problems on the telephone line, the telephone company

has the right to temporarily disconnect your service. They will notify you and give you a chance to have the problem corrected. They also have the right to make changes in their lines. If any changes are related to the VRC-1000, the telephone company will advise you in writing so that whatever steps are required can be taken to insure uninterrupted service.

3.10.2 Telephone - Dedicated Circuits

If the Unit is to be used with a dedicated telephone line it is necessary to interface properly. The BNC connectors labled "Audio In" and "Audio Out" can be used for this type of interconnection. If the circuit is a two-wire circuit, it will be necessary to use an external 2-wire/4-wire hybrid for this interface. Consideration must, also, be given to the audio levels present.

These BNC connectors have the following characteristics -

> Audio In   - 10,000 Ohms, -9 dBm, nominal level
>
> Audio Out - 600 Ohms, - 9 dBm, nominal level

and are unbalanced.

In addition, if the Unit is setup to be off-hook at all times (see 2.3.5 Telephone Interface Options) with answering on 0 rings, the ring and tip (red and green wires) leads in the modular Line Jack maybe used as an input/output. Note, "battery" voltage must be applied to "excite" this jack. See the VRC-1000 Technical Manual for a discussion of telephone system operation.

3.10.3 Dial AND Dedicated - TOGETHER

It is possible to operate the Unit on BOTH dedicated and dial system at the same time. The modular jack, "Line" and the BNC connectors "Audio In" and "Audio Out" can/are active at the same time.

The BNC connectors are always active, and permit the controlling of the Unit following the inputting of the Unit Access Code. The dial system functions as described elsewhere. If both connections are made, the audio present at the "Line" jack AND at the "Audio Out" BNC connector will be the same. It would be possible for two control inputs to be made in this mode of operation.

It is recommended that if such operation is considered, an external override capability be included in the system design to prevent dual control

functions from being attempted at one time.

Consult the factory for further information on such a mode of operation. Please provide specific details of the actual operation in contacting Gentner RF Products for this type of operation.

3.10.4 Other 2-Wire/ 4-Wire - Dedicated Circuits

The most common type of alternate interconnecting circuit is some form of radio link, be it subcarriers multiplexed on a microwave system or a land mobile-type system.

The impedances and typical levels for the the BNC connectors are -

        Audio In   - 10,000 Ohms, -9 dBm, nominal level

        Audio Out - 600 Ohms, - 9 dBm, nominal level

and are unbalanced.

When used with radio links, these BNC connectors provide the logical point of connection. As these are after all segments of the Unit that relate to dial telephone operation, dialing of telephone numbers, automatic answering and the like does not apply.

If the companion Subcarrier Chassis is used, these audio inputs and outputs will be connected directly to that unit.

3.11 Input / Output Connectors

All connections to the Unit are made with connectors. Telephone line ("Line") and telephone instrument ("Set") are modular RJ-11 and require the corresponding connector. BNC female connector provide audio in and out, in parallel with the "Line" modular jack.

The Command Output, Metering Input, and Status Input connectors are 37 pin, series D, male connectors. Solder cup female connectors are supplied with the unit for interconnection or various accessory interconnection options are listed in Chapter 1. Specific information on these can be found with the Accessory.

Shown below are the pin identification information for the three types of D connectors. Note that Command Outputs are divided between two connectors.

3.11.1 Command Output Connector Pin Out Information

COMMAND OUTPUT CONNECTORS

J3-PIN #	FUNCTION
1	COMMAND OUTPUT 1A
2	" " 1B
3	" " 2A
4	" " 2B
5	" " 3A
6	" " 3B
7	" " 4A
8	" " 4B
9	" " 5A
10	" " 5B
11	" " 6A
12	" " 6B
13	" " 7A
14	" " 7B
15	" " 8A
16	COMMAND OUTPUT 8B
17	+5 VDC THROUGH 220 OHMS
18	+5 VDC THROUGH 220 OHMS
19	RESERVED
20 - 37	GND (COMMON RETURN)

J4-PIN #	FUNCTION
1	COMMAND OUTPUT 9A
2	" " 9B
3	" " 10A
4	" " 10B
5	" " 11A
6	" " 11B
7	" " 12A
8	" " 12B
9	" " 13A
10	" " 13B
11	" " 14A
12	" " 14B
13	" " 15A
14	" " 15B
15	" " 16A
16	COMMAND OUTPUT 16B
17	+5 VDC THROUGH 220 OHMS
18	+5 VDC THROUGH 220 OHMS
19	RESERVED
20 - 37	GND (COMMON RETURN)

J3 COMMAND 1A-8B CONNECTOR PIN-OUT TABLE   J4 COMMAND 9A-16B CONNECTOR PIN-OUT TABLE

3.11.2 Metering Input Connector Pin Out Information

METERING INPUT CONNECTOR

JI-PIN #	FUNCTION
1	METERING CHANNEL 1
2	" " 2
3	" " 3
4	" " 4
5	" " 5
6	" " 6
7	" " 7
8	" " 8
9	" " 9
10	" " 10
11	" " 11
12	" " 12
13	" " 13
14	" " 14
15	" " 15
16	METERING CHANNEL 16
17	+5 VDC THROUGH 220 OHMS
18	+5 VDC THROUGH 220 OHMS
19	+5 VDC THROUGH 220 OHMS
20-37	GND (± 0 V REF)

JI METERING CONNECTOR PIN-OUT TABLE

3.11.3 Status Input Connector Pin Out Information

STATUS INPUT CONNECTOR

J2-PIN #	FUNCTION
1	STATUS CHANNEL 1
2	" " 2
3	" " 3
4	" " 4
5	" " 5
6	" " 6
7	" " 7
8	" " 8
9	" " 9
10	" " 10
11	" " 11
12	" " 12
13	" " 13
14	" " 14
15	" " 15
16	STATUS CHANNEL 16
17 - 37	GND (± 0V REF)

J2   STATUS CONNECTOR PIN-OUT TABLE

3.12 Metering Inputs

The Unit will accept either voltage or current as an input to each of the 16 Metering Channels. As shipped, all channels are established for voltage operation.

If a current input is desired, it is necessary to install jumpers as shown in the following drawing -

Current Operation of a Metering Channel

VR I

RP 3   RP 5

JMP 2   JMP 3

1 2 3 4 5 6 7 8   9 10 11 12 13 14 15 16
METERING CHANNEL   METERING CHANNEL

JUMPER TO CONVERT EACH
CHANNEL FROM A VOLTAGE
SENSATIVE INPUT TO A
CURRENT SENSATIVE INPUT

2/1 SCALE   CURRENT INPUT JUMPER DETAIL
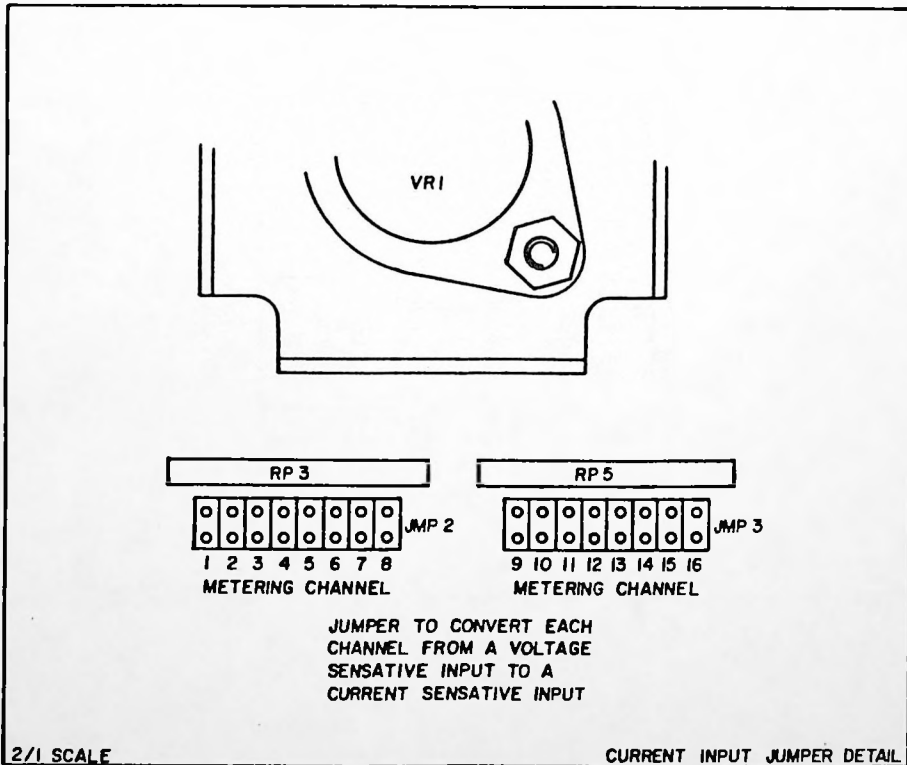
3.12.1 Typical Metering Channel

Below is a schematic representation of one Metering Channel. Note that each Metering Channel input is unbalanced and functions against ground or chassis. An extensive input filter is included on each input. For some samples that are balanced (those that do not function against ground), it will be necessary to either re-sample with a device designed to operate against ground, or install a DC isolation amplifier.

TYPICAL METERING INPUT CIRCUIT
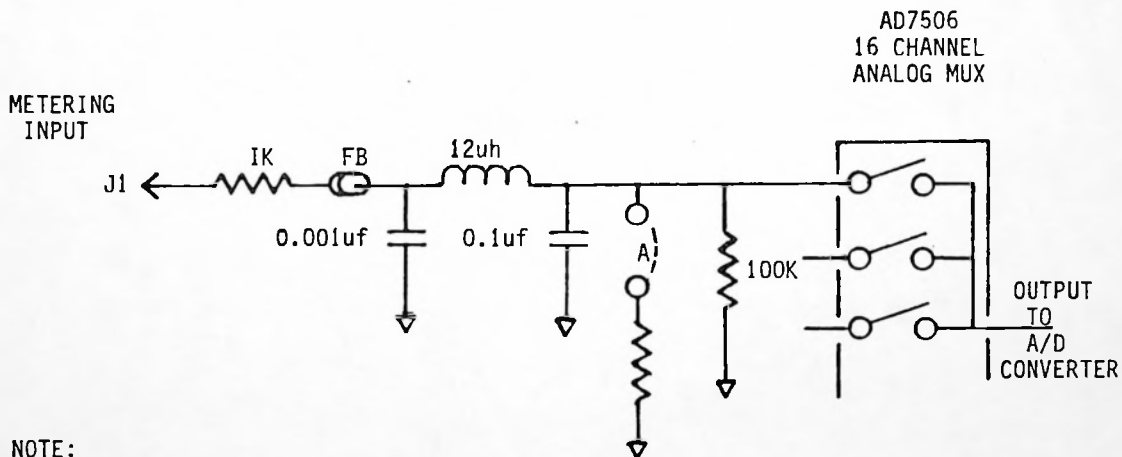
NOTE:
1. INPUT LEVELS
   A. VOLTAGE INPUT (OPERATING):
      0 TO +10 VDC OR -5 TO +5 VDC (FIRMWARE SELECTABLE).
      ABSOLUTE MAX. ± 12 VDC.
   B. CURRENT INPUT (OPERATING): INSTALL JUMPER "A"
      0 TO +10 mA DC OR -5 TO +5 mA DC. (FIRMWARE SELECTABLE).
      ABSOLUTE MAX. ± 12 mA DC
2. J1 (METERING INPUT CONNECTOR) IS A DC-37P (MALE PLUG)

3.13 Status Inputs

The Status Channel inputs are designed to accept either a TTL level input or a dry contact closure. Below is the schematic representation of one input.

TYPICAL STATUS INPUT CIRCUIT

+5V

STATUS
INPUT   FB   12uh   3K

J2 ←⊂◯   ∿∿∿

0.001uf   0.1uf   An   Yn

6.2K

OUTPUT
TO
DATA BUS

74HCT541
OCTAL LINE DRIVER
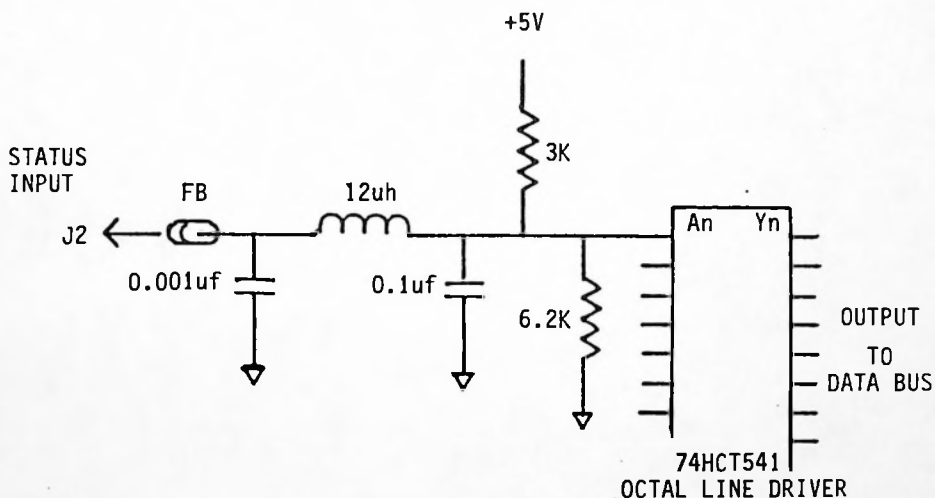
NOTE:
    1. INPUT LEVELS (OPERATING):
        A. 0 TO +0.8 VDC RECOGNIZED AS LOGIC "0".
        B. +2 TO +5 VDC RECOGNIZED AS LOGIC "1"
        C. ABSOLUTE MAX. INPUT -0.2 TO +5.2 VDC.
    2. J2 (STATUS INPUT CONNECTOR) IS A DC-37P (MALE PLUG).

3.14 Command Outputs

Command Outputs are designed to switch up to 48 VDC at up to 250 ma., non-inductive. Below is the schematic representation of one output.

TYPICAL COMMAND OUTPUT CIRCUIT

74HC574
OCTAL D-TYPE
FLIP FLOP

COMMAND
OUTPUT

1/8 UL N2803A

J3 AND J4

Qn   Dn

0.001uf

FROM
DATA BUS

1/8 ULN2803A EQUIVENT CKT

N/C

CLAMP DIODE

OUTPUT

INPUT

3K   7.2K
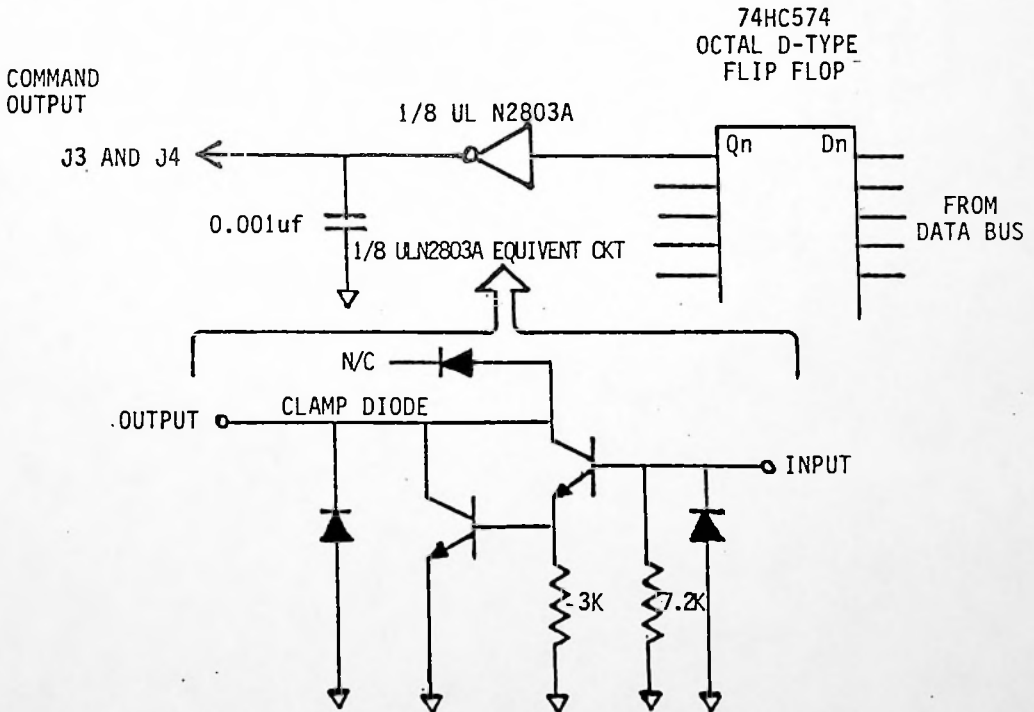
NOTE:
1. J3 and J4 OPEN COLLECTOR COMMAND OUTPUT MAX RATINGS:
   A. OPEN CIRCUIT VOLTAGE 0 - 48VDC.
   B. SINKING CURRENT 0 - 250 MADC.
2. J3 AND J4 (OUTPUT COMMAND CONNECTORS) ARE DC-37P (MALE PLUG)

It should be noted that the specification given on the previous page was for non-inductive loads. If relays are to be switched by the Unit, it is strongly recommended that diodes be placed across their coils for protection to the Unit.

When any sizeable load is to be switched by the Unit it is STRONGLY RECOMMENDED that external slave or repeating relays be used to interface the Unit. Such relays provide protection to the Unit.

Chapter 4

OPERATION

4.1 Introduction

The VRC-1000 Remote Control Unit is designed to function on the dial telephone system, as well as dedicated circuits. This Chapter will address the actual operation of the Unit. Emphasis will be placed on operation via the dial telephone system, with dedicated circuit operation included within the various sections below.

The Unit is addressed or instructed using Touch-Tone (R) or DTMF dial tones. These can be generated from an appropriate instrument. This maybe a standard telephone, automatic dialing device, speaker phone, or any similar device that suits the user. For operator convenience, some type of automatic dialing device simplifies operation, as it removes the need to remember the various commands or instructions that the Unit must receive to produce the desired action or response.

This Chapter is based on the assumption that the Unit has been successfully setup, and all desired functions are operational.

4.2 Answering a VRC-1000 Call - With Access

The Unit will initial a call to the selected telephone number or numbers, as outlined in Chapters 2 and 3. When the Unit calls, and receives an answer at a telephone number that is to have access, it begins with the message -

"HELLO, THIS IS [message of 15 words as stored in memory]
PLEASE ENTER ACCESS CODE".

At this time the Unit is expecting the five-digit User Access Code to be sent. If an incorrect code is sent, the Unit will hang up the telephone line. It allows only one attempt at entering this code. This is to prevent abuse by unauthorized persons and to heighten security.

If no number is sent, the Unit will also hang up, and in time proceed to its next dialing instruction.

Should an incorrect number be inadvertently sent to the Unit, the Unit waits for one minute before proceeding to the next dialing instruction. This time period is to allow redialing of the remote site by an operator that has made a mistake in entering the User Access Code.

Following the inputting of the User Access Code, the Unit responds -

"THANK YOU".

At this time the Unit will then send the following message -

"ALARM CONDITION DETECTED".

This message is always send when the Unit has initiated the call as it is necessary for an Alarm Condition to be present for the call to be placed. The Unit does not call with voice messages that are not alarms. See Alarm Messages below for the possible Unit outputs. Note that audio tones proceed the initial message.

4.3 Answering a VRC-1000 Call - Without Access

The other way that the Unit may place a call is to a number without access to the Unit. This Unit output is -

"HELLO, THIS IS [message of 15 words as stored in memory]
        PLEASE RETURN CALL".

After the Unit sends this message, it will hang up the telephone, without waiting for a response. If the User Access Code is send to the Unit during a telephone connection while this message is being sent, it will be ignored. Should an authorized operator be at a location that receives this message and desire to access the Unit, it is necessary to call the Unit. The Unit will wait

for one minute after having sent this message before proceeding with the next dialing instruction. This time period is to permit accessing the Unit. Note that audio tones proceed the initial message.

If the Unit is to call a digital paging system, see Chapter 2 for suggested setup.

4.4 Calling the VRC-1000

To call the Unit, it is necessary to know the remote site telephone number, and to successfully access the Unit once connected, the User Access Code must also be known.

4.4.1 Answering

The Unit will answer the call on the number of rings as setup. The first message is -

"HELLO, THIS IS [message of 15 words as stored in memory]
PLEASE ENTER ACCESS CODE".

After which the User Access Code must be sent within a given time period (10 seconds) or the Unit will hang up.

4.4.2 First Response

Following the inputting of the User Access Code, the Unit responds-

"THANK YOU".

If an incorrect User Access Code is sent, the Unit will hang up. It is necessary to redial the telephone number and begin the sequence over. Likewise, if too much time is spent in sending the User Access Code, the Unit will also hang up, and the call must be replaced.

Automatic dialing equipment can aid in sending the User Access Code without errors, and simplifies operation for the user.

4.4.3 Second Response

Having successfully accessed the Unit, one of two messages is then send by the Unit. The   determination of which message is whether any Alarms Condition exists in the Unit's memory that have not been cleared or acknowledged.

4.4.3.1 Alarms Present

If there are Alarm Conditions present in the Unit's memory, the response is -

"ALARM CONDITION DETECTED".

This message is followed by the listing of the actual alarm.   See Alarm Messages, below for details.

4.4.3.2 Alarms NOT Present

When no Alarm Condition exists, the Unit's response is -

"NO ALARMS PENDING".

When this message is send, the Unit pauses and waits for the selection of a specific request for a Metering, Status, or Command Channel. See below for selection of Channels.

4.5 Alarm Messages

When the Unit is accessed and an Alarm Condition exists the Unit responds with -

"ALARM CONDITION DETECTED".

This message is followed by the listing of the actual alarm.

4.5.1 Metering Channel Alarm Message

This message begins -

> "METERING CHANNEL . . [number of the channel with an alarm] . .
>
> > [Channel Identifier - two words in memory for
> > this channel] . .
>
> > [Numeric value of channel - four numbers] . .
>
> > [Unit Identifier of channel - two words in memory
> > for this channel] . .
>
> > BELOW [or ABOVE, as appropriate] ½one of the following -
>
> > > SECOND LOW LIMIT OF . . [value in memory]
> > > FIRST LOW LIMIT OF . . [value in memory]
> > > FIRST HIGH LIMIT OF . . [value in memory]
> > > SECOND HIGH LIMIT OF . . [value in memory]¼
>
> > [Unit Identifier of Limit, as stored in memory -two words]
>
> > TIME WAS . . [presentation of time Hours/Minutes, AM or PM,
> > Month/Day/Year]".

To make this more meaningful, the following is a sample message that fills
in all the variable areas shown above -

> "METERING CHANNEL 3 PLATE VOLTAGE 2.950 KILOVOLTS
> ABOVE FIRST HIGH LIMIT OF 2.900 KILOVOLTS
> TIME WAS 4 30 AM FEBRUARY 2 1986"

4.5.2 Status Channel Alarm Message

This message begins -

> "STATUS CHANNEL . . [number of the channel with an alarm] . .
>
> > [Channel Identifier - two words in memory for
> > this channel] . .
>
> > [Condition - High or Low - that caused Alarm
> > -two words in memory for this channel] . .

TIME WAS . . [presentation of time Hours/Minutes, AM or PM, Month/Day/Year]".

To make this more meaningful, the following is a sample message that fills in all the variable areas shown above -

"STATUS CHANNEL 6 INTRUDER SENSOR
ON
TIME WAS 3 30 AM MARCH 12 1986"

4.5.3 Metering System Failure Alarm Message

This is a system alarm that is not activated by any external input to the Unit. With each scanning of the Metering Channel inputs by the A/D converter segment of the Unit, the operation of the A/D segment is verified.   This verification is accomplished by using the A/D to measure internal DC voltages of the Unit. When these values exceed preset limits, much like anv of the sixteen Metering Channels exceeding any of the four tolerance limits, the Unit initiates a call and sends the following message -

"METERING SYSTEM FAILURE
TIME WAS . . [presentation of time Hours/Minutes, AM or PM, Month/Day/Year]".

This feature of the Unit provides a convenient way to automatically cover the current FCC requirement that remote control operation cease within three hours after a determination that the transmitter can not be observed correctly. The VRC-1000 reports its inability to produce accurate meter reading.

4.6 Responding to Alarm Messages

4.6.1 Choices of Action

After an Alarm Message has been sent, the Unit is expecting to have one of two actions taken.

These are -

> Exit the message
>
> Cancel / Clear the message

4.6.1.1 Exit the Alarm Message

To exit the alarm message, enter from the DTMF key pad the -

> " * "

If it is desired to repeat the message, see Re-Enter/Repeat, below.

4.6.1.2 CLEARING the Alarm Message

To clear the memory of the Unit of an Alarm Message send -

> " # "

> * * * * * C A U T I O N * * * * *
>
> * * * * * C A U T I O N * * * * *

Sending this key will CLEAR PERMANENTLY the Alarm Condition from the Unit's memory.

IT IS IMPOSSIBLE TO RECOVER AN ALARM ONCE CLEARED ! ! !

If left UNCLEARED an Alarm can be replayed, as shown below.

4.6.2 Alternate Actions, Before Clearing Alarms

It is possible to take action on an Alarm Condition, before clearing that alarm condition.

As an example, if it were desired to lower the plate voltage in the situation shown above under Metering Channel Alarm Message, that Metering Channel can be selected (see below, Channel Selection). Following the accessing

of that Metering Channel, commands could then be sent to correct the problem, if the condition still exists. After the correction, or when it is desired to clear the Alarm Condition, it is necessary to re-enter the Alarm Message before it is possible to clear the Alarm Message.

It is not possible to observe any further Alarm Conditions that might be present in the Unit until the Alarm Condition that has been reported is cleared.

Should the telephone connection be broken, for any reason, before the Alarm Condition is cleared, the Unit will begin automatic calling again to report the uncleared Alarm Condition, as well as any others in its memory.

4.6.3 Re-Enter/Repeat Alarm Messages

If the Alarm Message is not cleared, the Unit will either be commanded to exit, or it will automatically exit the message, as these are the only two possible actions. After exiting the Alarm Message, it can be re-entered. To do this, enter -

"0 0 0".

Following the sending of "0 0 0", one of two keys must also be sent. These are -

* = Exit

= Cancel / Clear

4.6.4 After Alarm is CLEARED

Following the clearing of the Alarm Condition that has been reported, one of two messages will then be sent by the Unit.

4.6.4.1 Multiple Alarms

If further more than one Alarm Condition exists the Unit, following the clearing of an Alarm Condition will respond -

"ADDITIONAL ALARMS PENDING".

After this message, the next Alarm Condition that the Unit had recorded will be sent as an Alarm Message. The order of Alarm Message presentation is determined by the time that the Unit first recognized each of multiple Alarm Conditions. This time-queuing is fixed in the Unit firmware and can not be changed. Note, 32 alarms maybe queued at one time.

4.6.4.2 All Alarms Cleared

If there are no further Alarms present, the Unit responds -

"NO ALARMS PENDING".

4.7 Channel Selection

To select Metering, Status or Command Channels, a specific code must be sent to the Unit in DTMF numbers.

This code first classifies or defines the type of Channel to be selected. The codes are -

```
601  to  616 = Metering Channels
701  to  716 = Status Channels
201  to  216 = Command Channels
```

These codes were selected because, from the DTMF keys the number " 6 " is also the letter " M ", the number " 7 " is also the letter " S ", and the number " 2 " the letter " C ". These were selected to make it easy to remember the codes as they are the first letter of the name of a channel. The numbers of " 01 " through " 16 " represent the specific channel number.

Two types of channels also have a suffix, or fourth key that must be sent when selecting a channel. Thus, four DTMF keys must be depressed to select a channel. This is -

```
601X  to  616X
701X  to  716X
```

This fourth key instructs the Unit on how the channel is to respond or be outputted. The keys " * " and " # " are used for this fourth key, represented above as " X ".

These keys produce the following output for Metering and Status -

        * = A Single Response, the selected Channel is output once

        # = Continuous Response, output repeated every 10 seconds

So the actual channel codes are -

            601* to 616* = Metering - Single Response
            601# to 616# = Metering - Repeat Response

            701* to 716* = Status - Single Response
            701# to 716# = Status - Repeat Response

4.7.1 Cancelling Repeat Response

To cancel a repeating channel, it is only necessary to send to the Unit the single response command -

            601* to 616* = Metering - Single Response

            701* to 716* = Status - Single Response

4.7.2 Metering Channels

The Metering Channels of the VRC-100 provide sixteen digital numeric presentation of an analog input.   Each channel must be selected via a Channel Code.

4.7.2.1 Channel Selection

To select a Metering Channel a specific code must be entered.

These are -

601X   to   616X

Where the X equals the keys -

* = A Single Response, the selected Channel is output once

= Continuous Response, output repeated every 10 seconds

4.7.2.2 Channel Response

Once a Metering Channel is selected it responds -

"METERING CHANNEL . . . [1 to 16, as selected]. .
[up to 2 words for channel identification or name] . .
[numeric value for this channel] . .
[up to 2 words for units of measure] . .
[ALARMS DISABLED - if this channel is Muted, otherwise
silence]

An actual example of a channel output could be something like -

"METERING CHANNEL 3 PLATE VOLTAGE 2.850 KILOVOLTS".

and if the Channel 3 were Muted (limit checking overridden) the output would be -

"METERING CHANNEL 3 PLATE VOLTAGE 2.850 KILOVOLTS ALARMS DISABLED".

If the channel had been selected with the " * " key as the fourth key, then this output will be sent once. If the " # " key had been used, the this output will occur approximately every 10 seconds till another command is sent, or the connection broken. To clear a repeat output, see above.

Once a Metering Channel is selected, the " * " and " # " keys may take on an additional function. See Command Activation, below.

4.7.2.3 Command Activation - If Applicable

At time of Unit setup it is possible to assign a preselected Command

Channel to be manually activated when a Metering Channel is being observed or outputted. When such a setup has been made for a Metering Channel, the " * " and " # " keys are used to activate the Command Channel outputs.

For this -

```
*  will activate the A Contact
#  will activate the B Contact
```

The verbal assignments that have been made of the A or B Contacts, as activated, will be presented. See Command Channel Response, below, for details of Contact outputting.

As an example, if the above sample Metering Channel had associated with it a Command Channel, and the Channel were first selected using the keys " 6 0 3 * ", signifying that only a single response were desired, the Unit would output -

"METERING CHANNEL 3 PLATE VOLTAGE 2.850 KILOVOLTS".

If then, the " * " key were sent to the Unit, and the A Contact of the associated Command Channel had this word assignment, the complete output to be received would be -

"RAISED".

Where the response "RAISED" is that stored in memory for the A Contact of the associated Command Channel. It is to be recognized that the order of outputting of the Contact response and the complete Metering Channel is determined by the timing of the input, and is affected by whether the Metering Channel is in the Repeat mode or Single mode. There are times when the order shown above may be reversed.

If the repeat response were selected the Metering Channel output would then be repeated. Should a single response be selected the Metering Channel output would be provided only once, while the Command Channel feedback would occur with each activation.

4.7.2.4 Channel Muting

It is possible to configure the Unit such that the limit checking is automatically shut down at certain times. To accomplish this override, a Muting capability is available within the Unit. Such Muting is accomplished by preassigning a Status Channel to be associated with a Metering Channel. When that Status Channel is either activated or deactivated, as determined at time of

setup, the limit checking of the Metering Channel is overridden.

This Muting does NOT prevent the Unit from sending a Metering Channel when manually requested to do so. Automatic Alarm reporting for that channel does NOT occur when that channel is Muted. So a Metering Channel may be observed, but limiting checking is not occuring.

To alert the operator to this Muting, when a Metering Channel can be Muted, and has been Muted, the following is the complete output of that channel -

> "METERING CHANNEL 3 PLATE VOLTAGE 2.850 KILOVOLTS
>   ALARMS DISABLED".

where the segment "ALARMS DISABLED" advises the operator that the channel is Muted.

4.7.3 Status Channels

The Status Channels of the VRC-1000 provide sixteen presentations of their inputs. Each channel must be selected via a Channel Code. Each channel has two conditions, a High input and a Low input. The High input means that the actual input to a Status Channel is open, or not closed or activated.   The Low input means that the Status Channel has an activated or closed input.   These may also be viewed as the condition of the Status Channel.

4.7.3.1 Channel Selection

To select a Status Channel a specific code must be entered. .These are -

> 701X to 716X

Where the X equals the keys -

> * = A Single Response, the selected Channel is output once

> # = Continuous Response, output repeated every 10 seconds

4.7.3.2 Channel Response

Once a Status Channel is selected it responds -

"STATUS CHANNEL . . . [1 to 16, as selected]. .
        [up to 2 words for channel identification or name] . .
        [up to 2 words for condition]"

An actual example of a channel output could be something like -

"STATUS CHANNEL 9 RECEIVER B ON"

If the channel had been selected with the " * " key as the fourth key, then this output will be sent once. If the " # " key had been used, this output will occur approximately every 10 seconds till another command is sent, or the connection broken. To clear a repeat output, see above.

Once a Status Channel is selected, the " * " and " # " keys may take on an additional function. See Command Activation, below.

4.7.3.3 Command Activation - If Applicable

At time of Unit setup it is possible to assign a preselected Command Channel to be manually activated when a Status Channel is being observed or outputted. When such a setup has been made for a Status Channel, the " * " and " # " keys are used to activate the Command Channel outputs. For this -

    * will activate the A Contact
    # will activate the B Contact

The verbal assignments that have been made of the A or B Contacts, as activated, will be presented. See Command Channel Response, below, for details of Contact outputting.

As an example, if the above sample Status Channel had associated with it a Command Channel, and the Channel were first selected using the keys " 7 0 9 * ", signifying that only a single response were desired, the Unit would output -

"STATUS CHANNEL 9 RECEIVER B ON"

If then, the " * " key were sent to the Unit, and the A Contact of the

associated Command Channel had this word assignment, the complete output to be received would be -

"OFF"

Where the response "OFF"is that stored in memory for the A Contact of the associated Command Channel. It is to be recognized that the order of outputting of the Contact response and the complete Status Channel is determined by the timing of the input, and is affected by whether the Status Channel is in the Repeat mode or Single mode. There are times when the order shown above may be reversed.

If the repeat response were selected the Status Channel output would then be repeated. Should a single response be selected the Status Channel output would be provided only once, while the Command Channel feedback would occur with each activation.

4.7.4 Command Channels

The Command Channels of the VRC-1000 provide 32 outputs for controlling various functions. In selecting a Command Channel, that Channel can then be activated manually.

These 32 outputs are configured in 16 channels of two outputs, each.   The two outputs can also be considered like contact closures. As such, during setup these are referenced as Contact A and Contact B.

Two modes of operation are possible on each Command Channel. These are Momentary and Latching.

With a Momentary output, the output is activated for 250 milliseconds for each input received, no matter what the length of the input.

The Latching output provides a continuous closure or output at either the A or B Contact, dependent upon the last command given to that channel.

4.7.4.1 Channel Selection

To select a Command Channel a specific code must be entered. These are -

201 to 216

To activate a command, depress either the "*" or "#", where -

* = Activation of Contact A

= Activation of Contact B

Unlike either Metering or Status Channels, this fourth key need NOT be sent at the time of Channel selection.   It maybe delayed until the Channel Response, see below, has been received.

For normal operation, it is RECOMMENDED that such be the mode of operation.   This means that an output occurs to allow verification that the desired channel has actually been selected BEFORE initiating a command output. If all four keys are sent, then immediately after the Command Channel is selected by the Unit the selected output will be activated.

4.7.4.2 Channel Response

Once a Command Channel is selected it responds -

"COMMAND CHANNEL . . . [1 to 16, as selected]. .
[up to 2 words for channel identification or name] . .
[up to 2 words for condition, IF channel is Latching,
otherwise silence]"

An actual example of a channel output could be something like -

"COMMAND CHANNEL 16 RECEIVER".

The example above would be for a channel that is NOT a Latching channel.
If it were setup to be Latching the output would include the A or B words. As an example -

"COMMAND CHANNEL 16 RECEIVER B ON".

4.7.4.3 Command Activation

To activate a command following selection of a Command Channel, the " * " and " # " keys are used. When sent, the Unit will activate the command and complete Command Channel including A or B contact words.

As an example -

"COMMAND CHANNEL 4 TRANSMITTER PLATE   ON".

would be the output that would be obtained after having first sent " 2 0 4 " and
the " * " .

<u>4.8 Time - Date Response</u>

The ability to obtain and thus verify the time and date that is present in
the Unit is provided. As with the others above, a code is used to select this
response.

4.8.1 Time - Date Code

To remotely obtain an output of time and date, the code -

0 6 0

is used. This code is input using the DTMF pad.

4.8.2 Time - Date Response

With the inputting of the code "060", the Unit outputs the following -

"TIME-DATE IS . .[2 digits for hours, two digits for minutes] . .
[AM or PM] . .
[day of week, month, day, year]

A typical output would be -

"TIME-DATE IS 3 05 AM MONDAY JANUARY 12 1986".

4.9 Sound Sensor Activation

The VRC-1000 includes a built-in microphone that maybe remotely activated to allow the aural monitoring of the area around the unit. This capability is accessed using a code.

4.9.1 Sound Sensor Activation Code

To begin using the microphone it is necessary to first place the Unit at a point in its operation where it is not outputting other information, or to activate this output after entering the Unit.

To activate the code is -

0 5 0 X

The " X " above indicates a selection, or command that must be given to the Sound Sensor. These are -

* = Disable
# = Enable

When Enabled, the microphone is opened or energized for a period of 30 seconds.

After 30 seconds elapses, the Unit disables the microphone. To listen for another 30 seconds, send the " # " key.

When the code "050#" is sent the Unit responds -

"SOUND SENSOR ENABLED . . .[microphone activated
for 30 seconds]".

When the " * " key is sent, following having been in this mode, the Unit responds -

"SOUND SENSOR DISABLED".

which provides confirmation that the Unit has turned off the microphone.

ALWAYS send "050*" after using the microphone, even if the time out has occured.

If it is found that the noise level is such that the Unit will not accept commands until the microphone has timed out, refer to the Technical Manual for modifications to lower this audio level. Should this condition exist, simply let the microphone time out, then send "050*" to insure the microphone has been turned off.

4.10 MASTER ALARM REMOTE OVERRIDE

As there are conditions that can cause alarms to reoccur frequently such that the continuous Alarm Reporting is annoying, the capability of remotely overriding this reporting is standard in the VRC-1000.

4.10.1 MASTER ALARM REMOTE OVERRIDE Code

The code that accesses this capability is -

0 3 0 X

The " X " above indicates the key that must be given or sent to the Unit. These are -

* = Enable

= Disable

4.10.2 MASTER ALARM REMOTE OVERRIDE Response

Following the inputting of the code "030*", the Unit responds -

"PLEASE ENTER SYSTEM ACCESS CODE".

and the Unit waits for the 7-digit System Access Code to be sent. If this is not sent in 10 seconds, the Unit ignores this code.

After entering the 7-digit System Access Code correctly (only ONE attempt is permitted), the Unit responds again -

"ALL ALARMS DISABLED".

and at this time ALL LIMIT CHECKING and ALL ASSOCIATED AUTOMATIC COMMANDS are overridden for one hour.

If it becomes necessary to extend the override for an additional hour, simply repeat the initiation procedure above by sending the code "030*".

4.10.3 MASTER ALARM REMOTE Enable

To re-initiate automatic dialing remotely, send the code "030#". When this code is send, the Unit responds -

"ALL ALARMS ENABLED".

and the Unit returns to normal operation.

4.11 Voice / Modem Selection - OPTION

As an Option the VRC-1000 has available an Internal Modem Option. This Option enables the Unit to send serial data, in addition to functioning with the standard voice output.

If the Unit is equipped with this option the following codes are used to switch between output modes -

        0 2 0 * = Voice Mode
        0 2 0 # = Modem Mode

and it is possible to switch between modes on any given connection as many times

as desired.

The verbal response to the above codes are -

```
    0 2 0 *  provides  "VOICE SELECTED"
    0 2 0 #  provides  "MODEM SELECTED"
```

For details on operation of the Unit with the Internal Modem Option installed, refer to the Manual provided with this Option.

Note, this message exists even if the Unit is not fitted with the Internal Modem Option.

4.12 Terminating Connection

When finished communicating with the Unit, there are two ways to terminate the connection.

First, simply hang up the telephone line at the remote end.

Alternately, there is a gracefully way to terminate the connection and at the same time confirm that the Unit recognizes that the connection is over.

This is to send the code -

```
    9 9 9
```

to which the Unit responds with -

```
    "GOODBYE".
```

4.13 Conclusion

And from the folks that built your VRC-1000, please let us know if we can help you in anyway with your Unit.

APPENDIX A
WORD CODE LIST

APPENDIX A - WORD CODE

#	WORD SPOKEN		#	WORD SPOKEN
			220	aircraft
100	a		221	adjust
101	b		222	alarm
102	c		223	alert
103	d		224	all
104	e		225	allied
105	f		226	alternate
106	g		227	altitude
107	h		228	am
108	i		229	amps
109	j		230	amperes
110	k			
111	l		231	an
112	m		232	and
113	n		233	angle
114	o		234	announcement
115	p		235	answer
116	q		236	antenna
117	r		237	approaching
118	s		238	are
119	t		239	area
120	u		240	armed
121	v			
122	w		241	arrival
123	x		242	as
124	y		243	ascend
125	z		244	ask
			245	assign
200	able		246	at
201	abort		247	attack
202	aborted		248	attention
203	above		249	audio
204	access		250	authorized
205	acknowledge			
206	activate		251	auto
207	activated		252	automatic
208	activating		253	auxiliary
209	active		254	available
210	additional		255	average
			256	back
211	adjust		257	bad
212	advise		258	bail-out
213	advisory		259	bang
214	affirm		260	bars
215	after			
216	afternoon		261	barometric
217	again		262	base
218	ahead		263	base-current
219	air		264	bath

#	WORD SPOKEN	#	WORD SPOKEN
265	battery		
266	baud	311	coil
267	be	312	cold
268	bearing	313	combiner
269	before	314	command
270	behind	315	common
		316	communication
271	bell	317	complete
272	below	318	composition
273	blank	319	compressor
274	blocking	320	computer
275	booster		
276	box	321	condition
277	brake	322	conductivity
278	bright	323	conference
279	building	324	configuration
280	burst	325	confirmed
		326	connect
281	busy	327	constant
282	button	328	consumption
283	buzzer	329	contact
284	by	330	control
285	calibrate		
286	calibration	331	converter
287	call	332	cool
288	calling	333	coolant
289	cancel	334	coordinates
290	cap	335	correct
		336	count
291	capacitance	337	crash
292	capacitor	338	cross
293	car	339	cubic
294	carrier	340	current
295	case		
296	caution	341	damage
297	celsius	342	danger
298	center	343	dark
299	centigrade	344	data
300	change	345	date
		346	day
301	channel	347	decimal
302	check	348	decrease
303	checkpoint	349	default
304	choice	350	degrees
305	circuit		
306	clear	351	delay
307	clock	352	delete
308	close	353	delta
309	closed	354	department
310	code	355	depth

#	WORD SPOKEN	#	WORD SPOKEN
356	descend	401	entry
357	detect	402	equal
358	detected	403	equipment
359	detector	404	erase
360	device	405	erased
		406	error
361	dial	407	escape
362	dialed	408	evening
363	dialing	409	exit
364	did	410	exterior
365	diesel		
366	dip	411	external
367	direct	412	extreme
368	direction	413	fade
369	disable	414	fahrenheit
370	disabled	415	failed
		416	failure
371	disarm	417	fan
372	discharge	418	farads
373	disconnect	419	fast
374	disengage	420	faster
375	display		
376	divide	421	fault
377	division	422	feet
378	do	423	field
379	door	424	filament
380	double	425	fire
		426	fire (excited)
381	down	427	first
382	drive	428	flash
383	dumb	429	flooded
384	dummy	430	floor
385	duplex		
386	earth	431	flow
387	east	432	for
388	echo	433	forward
389	efficiency	434	forwarded
390	elapsed	435	free
		436	freeze
391	electric	437	freezer
392	electricity	438	frequency
393	emergency	439	from
394	empty	440	front
395	enable		
396	enabled	441	fuel
397	end	442	function
398	energy	443	furnace
399	engage	444	fuse
400	enter	445	fused
		446	gallons

#	WORD SPOKEN	#	WORD SPOKEN
447	gas	492	interface
448	generator	493	interrupt
449	go	494	intruder
450	good	495	intrusion
		496	invalid
451	good-bye	497	is
452	grams	498	isolation
453	great	499	junction
454	greater	500	key
455	greater-than		
456	ground	501	kill
457	group	502	knots
458	half	503	large
459	hard	504	last
460	has	505	leak
		506	leakage
461	have	507	leave
462	head-end	508	left
463	heading	509	less
464	hello	510	less-than
465	help		
466	here	511	level
467	hertz	512	light
468	high	513	lights
469	higher	514	limit
470	hold	515	line
		516	line-feed
471	home	517	link
472	hook	518	listen
473	horizontal	519	load
474	hot	520	local
475	hours		
476	house	521	lock
477	identification	522	locked
478	identifier	523	logging
479	idle	524	long
480	if	525	loop
		526	loop-current
481	immediate	527	looped
482	in	528	low
483	input	529	lower
484	inactive	530	main
485	inbound		
486	inches	531	maintain
487	incorrect	532	mark
488	increase	533	marker
489	inductor	534	match
490	insert	535	mayday
		536	medium
491	instruction	537	message

#	WORD SPOKEN	#	WORD SPOKEN
538	meter	583	other
539	meters	584	out
540	metering	585	output
		586	outside
541	micro	587	over
542	microphone	588	over-range
543	microwave	589	page
544	mike	590	pair
545	miles		
546	minutes	591	pan
547	modem	592	panic
548	module	593	parallel
549	monitor	594	pass
550	mono	595	passed
		596	peak
551	more	597	pending
552	morning	598	per
553	motor	599	percent
554	move	600	period
555	music		
556	near	601	phase
557	negate	602	phase-angle
558	neutral	603	phone
559	next	604	pick
560	night	605	pickup
		606	place
561	no	607	plant
562	none	608	plate
563	normal	609	play
564	north	610	please
565	not		
566	notice	611	police
567	now	612	port
568	number	613	position
569	of	614	post
570	off	615	pounds
		616	power
571	oh	617	present
572	ohms	618	pressure
573	okay	619	priority
574	old	620	proceed
575	on		
576	only	621	program
577	open	622	pull
578	operator	623	pulse
579	optical	624	pulses
580	or	625	pump
		626	push
581	order	627	put
582	originate	628	quarter

#	WORD SPOKEN		#	WORD SPOKEN
629	question		674	send
630	radar		675	sensor
			676	sequence
631	radial		677	serial
632	radio		678	service
633	rain		679	set
634	raise		680	short
635	range			
636	rate		681	shut
637	reading		682	side
638	ready		683	signal
639	received		684	single
640	receiver		685	site
			686	slow
641	reconnect		687	slower
642	record		688	small
643	recorded		689	smoke
644	reflected		690	sorry
645	release			
646	relief		691	sound
647	remote		692	south
648	removed		693	space
649	repair		694	spare
650	repeat		695	speed
			696	square
651	report		697	standby
652	request		698	start
653	reset		699	state
654	resistance		700	station
655	resistor			
656	response		701	status
657	restore		702	stereo
658	restored		097	stl
659	resuming		703	stop
660	return		704	storage
			705	strobe
661	reverse		706	studio
662	right		707	subscriber
663	ring		708	supervisory
664	room		709	supply
665	running		710	surface
666	save			
667	screen		711	switch
668	search		712	switched
669	second		713	system
670	seconds		714	tank
			715	tape
671	secure		716	taping
672	security		717	temperature
673	select		718	terminate

#	WORD SPOKEN	#	WORD SPOKEN
719	terminated	764	vehicle
		765	vertical
720	test	766	very
721	thank-you	767	video
722	the	768	visual
723	thee	769	voice
724	therms	770	volt
725	thermal		
726	this	771	voltage
727	time	772	volts
728	today	773	wait
729	told	774	warm
730	tone	775	warning
		776	was
731	total	777	water
732	tower	778	watts
733	track	779	wave
734	tracking	780	way
735	traffic		
736	transfer	781	week
737	transferred	782	welcome
738	transformer	783	well
739	transmitter	784	west
740	trip	785	why
		786	wind (noun)
741	tripped	787	wind (verb)
742	true	788	window
743	trunk	789	wish
744	turn	790	with
745	turned		
746	type	791	within
747	unable	792	word
748	unattended	793	working
749	unbalance	794	wrong
750	unbalanced	795	yes
		796	you
751	understood	797	your
752	unit	798	yours
753	unknown	799	zone
754	unlock		
755	unlocked	000	0
756	untrue	001	1
757	up	002	2
758	use	003	3
759	user	004	4
760	used	005	5
		006	6
761	utility	007	7
762	vacuum	008	8
763	valve	009	9

#	WORD SPOKEN		#	WORD SPOKEN	
010	minus		053	thursday	
011	plus		054	friday	
012	point		055	saturday	
013	hundred				
014	thousand		056	[5 ms silence]	
015	million		057	[10 ms silence]	
			058	[20 ms silence]	
016	10		059	[40 ms silence]	
017	11		060	[80 ms silence]	
018	12		061	[160 ms silence]	
019	13		062	[320 ms silence]	
			063	[640 ms silence]	
020	14		064	[960 ms silence]	
021	15				
022	16		065	january	
023	17		066	february	
024	18		067	march	
025	19		068	april	
			069	may	
026	AM	(time)	070	june	
027	PM	(time)	071	july	
028	AC		072	august	
029	dB		073	september	
030	DC		074	october	
031	VA		075	november	
			076	december	
032	0				
033	10		077	[1.3 sec silence]	
034	20		078	[2 sec silence]	
035	30		079	[5 sec silence]	
036	40				
037	50		080	amber	
038	60		081	black	
039	70		082	blue	
040	80		083	brown	
041	90		084	gold	
			085	gray	
042	pico-		086	green	
043	nano-		087	orange	
044	micro-		088	pink	
045	milli-		089	purple	
046	centi-		090	red	
047	kilo-				
048	mega-		091	silver	
			092	turquoise	
049	sunday		093	violet	
050	monday		094	white	
051	tuesday		095	yellow	
052	wednesday		126	-ed	("id")

#	WORD SPOKEN		#	WORD SPOKEN
127	-ed	(short "id")	168	5000 Hz tone (500 ms)
128	-ed	("d")	169	5000 Hz tone (100 ms)
129	-ed	("t")		
130	-er	("dollar")		
131	-er	("after")		
132	-er	("lower")		
133	-er	("customer")		
134	-er	("lesser")		
135	-ing	("budgeting")		
136	-ing	("missing")		
137	-ing	("activating")		
138	-ly			
139	-s	("s")		
140	-s	("ez")		
141	-th			
142	-uth			
143	a-	("a")		
144	a-	(short "uh")		
145	a-	("uh")		
146	de-			
147	dis-			
148	in-	(short)		
149	in-	(rising)		
150	per-			
151	re-	("restore")		
152	re-	("replace")		
153	re-	("reset")		
154	re-	("receiver")		
155	sub-			
156	un-	("unlock")		
157	un-	("untrue")		
158	200 Hz tone (500 ms)			
159	200 Hz tone (50 ms)			
160	400 Hz tone (500 ms)			
161	400 Hz tone (50 ms)			
162	800 Hz tone (500 ms)			
163	800 Hz tone (50 ms)			
164	1000 Hz tone (500 ms)			
165	1000 Hz tone (50 ms)			
166	2000 Hz tone (500 ms)			
167	2000 Hz tone (50 ms)			

APPENDIX B
SETUP WORKSHEETS

SETUP OF ACCESS CODES
(CODE 090)

USER
ACCESS _ _ _ _ _   (DEFAULT IS 1 2 3 4 5)

SYSTEM
ACCESS _ _ _ _ _ _ _   (DEFAULT IS 1 2 3 3 5 6 7)

OUTBOUND TELEPHONE NUMBERS	TELEPHONE NUMBER [Length up to 30 digits, end entry with "#". Pause is "*" - 2 sec.]	MODE # = MESSAGE ONLY *= DISABLED
101X		____
102X		____
102X 102X		____
104X 103X		____
105X 104X		____
105X		____

X = Suffix

* = INHIBIT
# = REPEAT / PROGRAM

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TELEPHONE INTERFACE OPTIONS SETUP
(CODE 070)

MODEL VRC-1000
REMOTE CONTROL UNIT

DIALING   * = PLUS
METHOD   # = DTMF

ANSWER ON..answer 1 TO 9 RING
(DEFAULT is 1)

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```
┌─────────────────────────────┐
│  SYSTEM IDENTIFIER SET UP    │        MODEL VRC-1000
│      (CODE 080)             │        REMOTE CONTROL UNIT
└─────────────────────────────┘
```

	(WORD #)	WORD
"Hello this is ...		
Word # 1	116 ( )	_____
Word # 2	113 ( )	_____
Word # 3	122 ( )	_____
Word # 4	124 ( )	_____
Word # 5	632 ( )	_____
Word # 6	739 ( )	_____
Word # 7	279 ( )	_____
Word # 8	647 ( )	_____
Word # 9	330 ( )	_____
Word # 10	056 ( )	_____
Word # 11	( )	_____
Word # 12	( )	_____
Word # 13	( )	_____
Word # 14	( )	_____
Word # 15	( )	_____

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```
┌─────────────────────────────┐
│   TIME-OF DAY/DATE SETUP     │          MODEL VRC-1000
│        (CODE 060)            │        REMOTE CONTROL UNIT
└─────────────────────────────┘
```

```
┌─────────────────────────────────────────────────────────┐
│                                                           │
│   HOURS                    __ __  (2 digits)              │
│                                                           │
├───────────────────────────────────────────────────────────┤
│                                                           │
│   MINUTES                  __ __  (2 digits)              │
│                                                           │
├───────────────────────────────────────────────────────────┤
│                                                           │
│   SECONDS                  __ __  (2 digits)              │
│                                                           │
├───────────────────────────────────────────────────────────┤
│                            * = AM                         │
│   TIME OF DAY              # = PM                         │
│                                                           │
├───────────────────────────────────────────────────────────┤
│                                                           │
│   DAYLIGHT                 * = DISABLED                   │
│   SAVING                   # = ENABLED                    │
│                                                           │
├───────────────────────────────────────────────────────────┤
│                                                           │
│   DAY OF             1 = SUNDAY   4 = WEDNESDAY           │
│    WEEK              2 = MONDAY   5 = THURSDAY            │
│                      3 = TUESDAY  6 = FRIDAY             │
│                            7 = SATURDAY                  │
│                                                           │
├───────────────────────────────────────────────────────────┤
│                     __ __  (MONTH - 2 digits             │
│   DATE              __ __  (DAY OF MONTH - 2 digits)      │
│                     __ __ __ __  (YEAR - 4 digits)       │
│                                                           │
└─────────────────────────────────────────────────────────┘
```

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STATUS CHANNEL NO.	CHANNEL IDENTIFIER		MANUAL COMMAND CHANNEL ASSIGNMENT (for * and # use)	LOW INPUT			AUTOMATIC COMMAND CHANNEL
	(word #) WORD # 1	(word #) WORD # 2		(word #) WORD # 1	(word #) WORD # 2	ALARM * = No # = Yes	NUMBER / # or *
709	( ) _____	( ) _____		( ) _____	( ) _____	_____	____ / ____
710	( ) _____	( ) _____		( ) _____	( ) _____	_____	____ / ____
711	( ) _____	( ) _____		( ) _____	( ) _____	_____	____ / ____
712	( ) _____	( ) _____		( ) _____	( ) _____	_____	____ / ____
713	( ) _____	( ) _____		( ) _____	( ) _____	_____	____ / ____
714	( ) _____	( ) _____		( ) _____	( ) _____	_____	____ / ____
715	( ) _____	( ) _____		( ) _____	( ) _____	_____	____ / ____
716	( ) _____	( ) _____		( ) _____	( ) _____	_____	____ / ____

STATUS CHANNEL NO.	HIGH INPUT		ALARM	AUTOMATIC COMMAND CHANNEL
	(word #) WORD # 1	(word #) WORD # 2	* = No # = Yes	NUMBER / # or *
709	( ) _____	( ) _____	_____	____ / ____
710	( ) _____	( ) _____	_____	____ / ____
711	( ) _____	( ) _____	_____	____ / ____
712	( ) _____	( ) _____	_____	____ / ____
713	( ) _____	( ) _____	_____	____ / ____
714	( ) _____	( ) _____	_____	____ / ____
715	( ) _____	( ) _____	_____	____ / ____
716	( ) _____	( ) _____	_____	____ / ____

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MUTE FUNCTION	STATUS CHANNEL CAUSING MUTE	STATUS CONDITION FOR MUTING * = LOW INPUT # = HIGH INPUT	METERING CHANNEL TO BE MUTED	MUTE FUNCTION	STATUS CHANNEL CAUSING MUTE	STATUS CONDITION FOR MUTING * = LOW INPUT # = HIGH INPUT	METERING CHANNEL TO BE MUTED
401	___	___	___	421	___	___	___
402	___	___	___	422	___	___	___
403	___	___	___	423	___	___	___
404	___	___	___	424	___	___	___
405	___	___	___	425	___	___	___
406	___	___	___	426	___	___	___
407	___	___	___	427	___	___	___
408	___	___	___	428	___	___	___
409	___	___	___	429	___	___	___
410	___	___	___	430	___	___	___
411	___	___	___	431	___	___	___
412	___	___	___	432	___	___	___
413	___	___	___	433	___	___	___
414	___	___	___	434	___	___	___
415	___	___	___	435	___	___	___
416	___	___	___	436	___	___	___
417	___	___	___	437	___	___	___
418	___	___	___	438	___	___	___
419	___	___	___	439	___	___	___
420	___	___	___	440	___	___	___

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METERING CHANNEL NO.	CHANNEL IDENTIFIER		UNIT IDENTIFIER		A / D CONVERSION 5 = Linear 7 = Pwr/Linear 4 = Indirect	A / D RANGE * = -5 to +5 # = 0 to + 10	CALIBARATION CONSTANT (A / D VALUE)	MANUAL COMMAND CHANNEL ASSIGNMENT (201 - 216) [for * and #]
	(word #) WORD # 1	(word #) WORD # 2	(word #) WORD # 1	(word #) WORD # 2				
609	( ) _____	( ) _____	( ) _____	( ) _____	_____	_____	_____	_____
610	( ) _____	( ) _____	( ) _____	( ) _____	_____	_____	_____	_____
611	( ) _____	( ) _____	( ) _____	( ) _____	_____	_____	_____	_____
612	( ) _____	( ) _____	( ) _____	( ) _____	_____	_____	_____	_____
613	( ) _____	( ) _____	( ) _____	( ) _____	_____	_____	_____	_____
614	( ) _____	( ) _____	( ) _____	( ) _____	_____	_____	_____	_____
615	( ) _____	( ) _____	( ) _____	( ) _____	_____	_____	_____	_____
616	( ) _____	( ) _____	( ) _____	( ) _____	_____	_____	_____	_____

METERING CHANNEL NO.	SECOND LOW LIMIT		FIRST LOW LIMIT		FIRST HIGH LIMIT		SECOND HIGH LIMIT	
	SECOND LOW LIMIT	COMMAND CHANNEL ------------ NUMBER / # or *	FIRST LOW LIMIT	COMMAND CHANNEL ------------ NUMBER / # or *	SECOND HIGH LIMIT	COMMAND CHANNEL ------------ NUMBER / # or *	FIRST HIGH LIMIT	COMMAND CHANNEL ------------ NUMBER / # or *
609	_____	____ / ____	_____	____ / ____	_____	____ / ____	_____	____ / ____
610	_____	____ / ____	_____	____ / ____	_____	____ / ____	_____	____ / ____
611	_____	____ / ____	_____	____ / ____	_____	____ / ____	_____	____ / ____
612	_____	____ / ____	_____	____ / ____	_____	____ / ____	_____	____ / ____
613	_____	____ / ____	_____	____ / ____	_____	____ / ____	_____	____ / ____
614	_____	____ / ____	_____	____ / ____	_____	____ / ____	_____	____ / ____
615	_____	____ / ____	_____	____ / ____	_____	____ / ____	_____	____ / ____
616	_____	____ / ____	_____	____ / ____	_____	____ / ____	_____	____ / ____

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COMMAND CHANNEL NO.	CHANNEL IDENTIFIER		MODE * = MOMENTARY # = LATCHING	CONTACT A IDENTIFIER		CONTACT B IDENTIFIER	
	(word #) WORD # 1	(word #) WORD # 2		(word #) WORD # 1	(word #) WORD # 2	(word #) WORD # 1	(word #) WORD # 2
201	( )	( )		( )	( )	( )	( )
202	( )	( )		( )	( )	( )	( )
203	( )	( )		( )	( )	( )	( )
204	( )	( )		( )	( )	( )	( )
205	( )	( )		( )	( )	( )	( )
206	( )	( )		( )	( )	( )	( )
207	( )	( )		( )	( )	( )	( )
208	( )	( )		( )	( )	( )	( )
209	( )	( )		( )	( )	( )	( )
210	( )	( )		( )	( )	( )	( )
211	( )	( )		( )	( )	( )	( )
212	( )	( )		( )	( )	( )	( )
213	( )	( )		( )	( )	( )	( )
214	( )	( )		( )	( )	( )	( )
215	( )	( )		( )	( )	( )	( )
216	( )	( )		( )	( )	( )	( )

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APPENDIX C
VERBAL OUTPUT SUMMARY

APPENDIX C   VERBAL OUTPUT SUMMARY

GENERAL RESPONSE MESSAGES

HELLO, THIS IS ...(up to 15 words)...

    PLEASE ENTER ACCESS CODE
    (unit hangs up if entered code is incorrect)

    (or, if number is programmed for message only)
    PLEASE RETURN CALL

    THANK YOU

ALARM CONDITION DETECTED

METERING CHANNEL ...[number]... ,

...[up to 2 words for channel identifier]...,

...[value]... ...[up to 2 words for units]... ,

    BELOW SECOND LOW LIMIT OF
    (or)
    BELOW FIRST LOW LIMIT OF
    (or)
    ABOVE FIRST HIGH LIMIT OF
    (or)
    ABOVE SECOND HIGH LIMIT OF
    ...[value]... ...[up to 2 words for units]... ,
    TIME WAS ...[hours, minutes]... ...[am/pm]...,
    ...[month, day, year]...

ADDITIONAL ALARMS PENDING

STATUS CHANNEL ...[number]... ,
    ...[up to 2 words for channel identifier]... ,
    ...[up to 2 words for condition]... ,
    TIME WAS ...[hours, minutes]... ...[am/pm]... ,
    ...[month, day, year]...

ADDITIONAL ALARMS PENDING

METERING SYSTEM FAILURE
        TIME WAS ...[hours, minutes]... ...[am/pm]... ,
        ...[month, day, year]...

NO ALARMS PENDING

OPERATIONAL MESSAGES

VOICE/MODEM SELECT -- code 020X,
(X = * to select voice, X = to select modem)

        VOICE SELECTED

        MODEM SELECTED (modem auto answer mode enabled)

MASTER OVERRIDE OF ALARMS -- code 030X,
(X = * to disable, X = # to enable)

        PLEASE ENTER SYSTEM ACCESS CODE

        ALL ALARMS DISABLED
        (disabled for 1 hour maximum)

        ALL ALARMS ENABLED

SOUND SENSOR CONTROL -- code 050X,
(X = * to disable, X = # to enable)

        SOUND SENSOR ENABLED (for 15 seconds)

        SOUND SENSOR DISABLED

TIME-DATE RESPONSE -- code 060

    TIME-DATE IS ...(hours, minutes)... ...(am/pm... ,
               ...(day of week, month, day, year)...

HANG UP RESPONSE -- code 999

    GOODBYE

COMMAND CHANNEL RESPONSE -- codes 201X thru 216X,
(X = * for contact A closure, X = # for contact B closure)

    COMMAND CHANNEL ...(number)... ,
    ...(up to 2 words for channel identifier)... ,
    (if in latching mode or if executing command)
    ...(up to 2 words for condition)...

METERING CHANNEL RESPONSE -- codes 601X thru 616X,
(X = * for single response, X = # for response repeated every 8 seconds)

    METERING CHANNEL ...(number)... ,
    ...(up to 2 words for channel identifier)... ,
    ...(value... ...(up to 2 words for units)...
    (if this channel's alarms are muted)
    ALARMS DISABLED

STATUS CHANNEL RESPONSE -- codes 701X thru 716X,
(X = * for single response, X = # for response repeated every 8 seconds)

    STATUS CHANNEL ...(number)... ,
    ...(up to 2 words for channel identifier)... ,
    ...(up to 2 words for condition)...

SETUP MESSAGES

NORMAL/SET-UP MODE SELECT -- front panel switch

SET-UP DISABLED, GOODBYE (unit then reverts back to normal mode telco connection)

SET-UP ENABLED

PLEASE ENTER SYSTEM ACCESS CODE
(unit reverts back to normal mode (with response) if invalid master access code is entered of after 10 seconds has elapsed)

THANK YOU
(unit reverts back to normal mode if no DTMF tones have been entered for 60 minutes of after being switched (commanded back to normal mode)

PLEASE SELECT FUNCTION FOR PROGRAMMING

TIME-DATE FUNCTION -- code 060

TIME OF DAY HOURS ARE ...[value (2 digits)]...

TIME OF DAY MINUTES ARE ...[value (2 digits)]...

TIME OF DAY SECONDS ARE ...(value (2 digits)]...

TIME OF DAY IS ...[am (or) pm]...
                    (* = am, # = pm)

DAY LIGHT SAVINGS TIME IS ...[DISABLED (or) ENABLED]...
                    (* = disabled, # = enabled)

DAY OF WEEK IS ...[value (1 digit)]...

DATE IS ...[day of month (2 digits), month (2 digits),
                    YEAR (4 digits)]...

TELEPHONE INTERFACE OPTIONS -- code 070

    DIALING IS ...[pulse (or) DTMF]...
                      (* = pulse, # = DTMF)

    NUMBER OF RINGS BEFORE ANSWERING IS ...[number (1 digit)] ...

VRC-1000 UNIT IDENTIFIER -- code 080

    UNIT IDENTIFIER IS ...[1st word, 2nd word, 3rd word, ...
                    15th word] (undefined words are 5 mS of silence)

VRC-1000 ACCESS CODES -- code 090

    USER ACCESS CODE IS ...[5 digits]...   (default is 12345)

    SYSTEM ACCESS CODE IS ...[7 digits]...   (default is 1234567)

PROGRAMABLE OUTBOUND MESSAGE PHONE NUMBERS -- codes 101X thru 105X,
(X = * to inhibit dialing of phone number, X = # to repeat/program)

    PHONE NUMBER [1] IS ...[up to 30 digits/pauses]
                    (* = disabled, # = enabled)

    MESSAGE ONLY FOR PHONE NUMBER [1] ...[disabled (or) enabled]...

COMMAND CHANNEL FUNCTIONS -- codes 201 thru 216

    CHANNEL IDENTIFIER for command channel [1] IS ...[1st word,
                2nd word]...

    COMMAND CHANNEL [1] IS ...[m (for momentary) (or) 1 (for latching)]...
                [* = momentary, # = latching]

    CONTACT A IDENTIFIER FOR COMMAND CHANNEL [1] IS ...[1st word,
                2nd word]...

    CONTACT B IDENTIFIER FOR COMMAND CHANNEL [1] IS ...[1st word,
                2nd word]...

TIME OF DAY FUNCTIONS -- codes 301X thru 320X,
(X = * to clear entry, X = # to readback/program entry)

TIME OF DAY HOURS FOR ENTRY [1] ARE ...[value (2 digits)]...

TIME OF DAY MINUTES FOR ENTRY [1] ARE ...value (2 digits)]...

TIME OF SECONDS FOR ENTRY [1] ARE ...[value (2 digits)]...

TIME OF DAY FOR ENTRY [1] IS ...[am (or) pm]...
              (* = am, # = pm)

COMMAND CHANNEL FOR ENTRY [1] IS ...[number]...

ACTIVE COMMAND CHANNEL CONTACT FOR ENTRY [1] IS ...[1st word,
              2nd word]... (* = contact A, # = contact B)

MUTE FUNCTIONS -- codes 401X thru 440X
(X = * to clear assignment, X = # to readback/program assignment)

STATUS CHANNEL NUMBER FOR DISARM [1] IS ...[number]...

STATUS CHANNEL CONDITION FOR DISARM [1] IS [1st word, 2nd word]...
              (* = low, # = high)

METERING CHANNEL NUMBER FOR DISARM [1] IS ...[number]...

METERING CHANNEL FUNCTIONS -- codes 601 thru 616

CHANNEL IDENTIFIER FOR METERING CHANNEL [1] IS ...[1st word,
              2nd word]...

UNITS IDENTIFIER FOR METERING CHANNEL [1] IS ...[1st word,
              2nd word]...

CONFIGURATION FOR METERING CHANNEL [1] IS ...[1 (linear)
   (or) p (power to linear) (or) i (indirect power)].

RANGE FOR METERING CHANNEL [1] IS ...[minus five to plus five
   (or) zero to plus ten]... (* = -5 to +5, # = 0 to +10

CALIBRATION CONSTANT FOR METERING CHANNEL [1] IS ...
        [value (3 digits plus signed decimal point)]...
        (* = decimal point for positive value,)
        (# = decimal point for negative value)

DEFAULT COMMAND CHANNEL FOR METERING CHANNEL [1] IS ...[number]...

SECOND LOW LIMIT OF METERING CHANNEL [1] IS ...[value (4 digits
        plus signed decimal point)]... (* = decimal point for
        positive value,) (# = decimal point for negative value)

    COMMAND CHANNEL NUMBER FOR SECOND LOW LIMIT OF METERING CHANNEL
                    [1] IS ...[number]...

    ACTIVE COMMAND CHANNEL CONTACT FOR SECOND LOW LIMIT OF
            METERING CHANNEL [1] IS ...[1st word, 2nd word]...
                    (* = contact A,
                    # = contact B)

FIRST LOW LIMIT OF METERING CHANNEL [1] IS ...[value (4 digits
                plus signed decimal point)]
                (* = decimal point for positive value,)
                (# = decimal point for negative value)

    COMMAND CHANNEL NUMBER FOR FIRST LOW LIMIT OF METERING CHANNEL
                    [1] IS ...[number]

    ACTIVE COMMAND CHANNEL CONTACT FOR FIRST LOW LIMIT OF
            METERING CHANNEL [1] IS ...[1st word, 2nd word]...
                (* = contact A, # = contact B)

FIRST HIGH LIMIT OF METERING CHANNEL [1] IS ...[value (4 digits
                plus signed decimal point)]...
                (* = decimal point for positive value,)
                (# = decimal point for negative value)

    COMMAND CHANNEL NUMBER FOR FIRST HIGH LIMIT OF METERING CHANNEL
                    [1] IS ...[number]...

    ACTIVE COMMAND CHANNEL CONTACT FOR FIRST HIGH LIMIT OF
            METERING CHANNEL [1] IS ...[1st word, 2nd word]...
                (* = contact A, # = contact B)

SECOND HIGH LIMIT OF METERING CHANNEL [1] IS ...[value (4 digits
                plus signed decimal point)]...
                (* = decimal point for positive value,)
                (# = decimal point for negative value)

COMMAND CHANNEL NUMBER FOR SECOND HIGH LIMIT OF METERING CHANNEL
[1] IS ...[number]...

ACTIVE COMMAND CHANNEL CONTACT FOR SECOND HIGH LIMIT OF
METERING CHANNEL [1] IS ...[1] word, 2nd word]...

STATUS CHANNEL FUNCTIONS -- codes 701 thru 716

CHANNEL IDENTIFIER FOR STATUS CHANNEL [1] IS ...[1st word,
2nd word]...

DEFAULT COMMAND CHANNEL FOR STATUS CHANNEL [1] IS ...[number]...

LOW INPUT IDENTIFIER FOR STATUS CHANNEL [1] IS ...[1st word,
2nd word]...

ALARM ON LOW INPUT FOR STATUS CHANNEL [1] IS ...DISABLED
(or) ENABLED]... (* = disabled, # = enabled)

COMMAND CHANNEL NUMBER FOR LOW INPUT OF STATUS CHANNEL [1]
IS ...[number]...

ACTIVE COMMAND CHANNEL CONTACT FOR LOW INPUT OF STATUS
CHANNEL [1] IS ...[1st word, 2nd word]...
(* = contact A, # = contact B)

HIGH INPUT IDENTIFIER FOR STATUS CHANNEL [1] IS ...[1st word,
2nd word]...

ALARM ON HIGH INPUT FOR STATUS CHANNEL [1] IS ...[disabled
(or) enabled]...

COMMAND CHANNEL NUMBER FOR HIGH INPUT OF STATUS CHANNEL [1]
IS ...[number]...

ACTIVE COMMAND CHANNEL CONTACT FOR HIGH INPUT OF STATUS
CHANNEL [1] IS ...[1st word, 2nd word]...
(* = contact A, # = contact B)

APPENDIX   D

SETUP   SUMMARY

In the following summary, the code to access a specific setup routine will be listed as the Touch-Tone (r) digits to be sent to the VRC-1000. This is followed by the question(s) ask by the Unit and the acceptable answer(s).

A. Time-Date Function

Input - 0 6 0

Time of day hours are - 0 0 to 1 2

Time of day minutes are - 0 0 to 5 9

Time of day seconds are - 0 0 to 6 0

Time of day is - * = AM # = PM

Daylight savings time - * = disabled # = enabled

Day of week is - 1 = Sunday 4 = Wednesday
2 = Monday 5 = Thursday
3 = Tuesday 6 = Friday
7 = Saturday

Date is - 0 1 to 3 1 (day of month)
0 1 to 1 2 (month, 0 1 = January, etc.)
1 9 8 6 up (year)

B. Telephone Interface

Input - 0 7 0

Dialing is -   * = pulse   # = Touch-Tone (r)

Number of rings before answering is -   0 to 9   (0 = off-hook)

C. Unit Identifier Message

Input - 0 8 0

Unit identifier is -

    fifteen (15) groups of three-digits (see Appendix A)

D. Access Codes

Input - 0 9 0

User access code is -   five (5) Touch-Tone (r) digits

System access code is -   seven (7) Touch-Tone (r) digits

  (Note - * and #, plus A, B, C, and D keys can be used)

E. Outbound Telephone Number / Message

Input - 1 0 1 X   to   1 0 5 X

(Note - X is # = Repeat/program   * = last number/disabled)

Each of these five locations is accessed individually.

Phone number [1 to 5] is -   Each location can hold up to 30 digits.

NOTE - Each number must be ended with #, when less than 30 digits
        in length.
For PAUSE the * key is used and is a 2-second pause.

Message only for phone number [1 to 5] is - # = enabled * = disabled

    (enabled means this would be a message-only telephone number)

F. Command Channels

Input - 2 0 1   to   2 1 6

Channel identifier for command channel [1 to 16] is -

    two groups of three-digits (see Appendix A)

Command channel [1 to 16] is - L for latching M for momentary

    * = momentary   # = latching

Contact A identifier for command channel [1 to 16] is -

    two groups of three-digits (see Appendix A)

Contact B identifier for command channel [1 to 16] is -

two groups of three-digits (see Appendix A)

G. Time-of-day Functions

Input - 3 0 1 X   to   3 2 0 X

(Note - X is # = Repeat/program   * = Clear)

Time of day hours for entry [1 to 20] are -   0 0 to 1 2

Time of day minutes for entry [1 to 20] are -   0 0 to 6 0

Time of day seconds for entry [1 to 20] are -   0 0 to 6 0

Time of day for entry [1 to 20] is -   * = AM   # = PM

Command channel for entry [1 to 20] is -   0 1 to 1 6

Active command channel contact for entry [1 to 20] is -
        * = A contact   # = B contact

H. Mute Functions

Input - 4 0 1 X   to   4 4 0 X

(Note - X is # = Repeat/program   * = Clear)

This function defeats or disarms limit checking of a selected metering channel.

Status channel number for disarm [1 to 40] is -   0 1   to   1 6

Status channel condition for disarm [1 to 40] is -
      * = low input   # = high input

Metering channel number for disarm [1 to 40] is -   0 1   to   1 6

I. Metering Channels

Input - 6 0 1 to   6 1 6

Channel identifier for metering channel [1 to 16] is -

      two groups of three-digits (see Appendix A)

Units identifier for metering channel [1 to 16] is -

      two groups of three-digits (see Appendix A)

Configuration for metering channel [1 to 16] is -
      5 = linear   7 = power-to-linear   4 = indirect

Range for metering channel [1 to 16] is -
      * = -5 to +5   # = 0 to +10

Calibration constant for metering channel [1 to 16] is -

    A three(3)-digit number with decimal point, where
    * = positive value, # = negative value for decimal point.

    Numeric value is equal to numeric presentation desired with
    one-volt (or milliampere) input to channel. For power-to-linear
    use formula of -
    Desired Value / Input Voltage X Input Voltage =
        Calibration Constant

Default command channel for metering channel [1 to 16] is -
    0 1 to   1 6

Second low limit of metering channel [1 to 16] is -

    A four(4)-digit number with decimal point, where
    * = positive value, # = negative value for decimal point.

Command channel number for second low limit of metering
    channel [1 to 16] is - 0 0   to   1 6

Active command channel contact for second low limit of metering
channel [1 to 16] is -
    * = A contact   # = B contact

First low limit of metering channel [1 to 16] is -

    A four(4)-digit number with decimal point, where
    * = positive value, # = negative value for decimal point.

Command channel number for first low limit of metering
channel [1 to 16] is - 0 0 to   1 6

Active command channel contact for first low limit of metering
channel [1 to 16] is -
    * = A contact   # = B contact

First high limit of metering channel [1 to 16] is -

    A four(4)-digit number with decimal point, where
    * = positive value, # = negative value for decimal point.

Command channel number for first high limit of metering
channel [1 to 16] is - 0 0 to   1 6

Active command channel contact for first high limit of metering
channel [1 to 16] is -
    * = A contact   # = B contact

Second high limit of metering channel [1 to 16] is -

    A four(4)-digit number with decimal point, where
    * = positive value, # = negative value for decimal point.

Command channel number for second high limit of metering
channel [1 to 16] is - 0 0 to   1 6

Active command channel contact for second high limit of metering
channel [1 to 16] is -
    * = A contact   # = B contact

J. Status Channels

Input - 7 0 1 to   7 1 6

Channel identifier for status channel [1 to 16] is -

    two groups of three-digits (see Appendix A)

Default command channel for status channel [1 to 16] is -
    0 1 to   1 6

Low input identifier for status channel [1 to 16] is -

     two groups of three-digits (see Appendix A)

Alarm on low input for status channel [1 to 16] is -
          * = Disabled   # = Enabled

Command channel number for low input of status channel [1 t 16] is -
          0 0 to   1 6

Active command channel contact for low input of status
channel [1 to 16] is -
          * = A contact   # = B contact

High input identifier for status channel [1 to 16] is -

     two groups of three-digits (see Appendix A)

Alarm on high input for status channel [1 to 16] is -
          * = Disabled   # = Enabled

Command channel number for high input of status channel [1 t 16] is -
          0 0 to   1 6

Active command channel contact for high input of status
channel [1 to 16] is -
          * = A contact   # = B contact

WARRANTY

GENTNER RF PRODUCTS DIVISION, GENTNER ENGINEERING COMPANY, INC. (Manufacturer) warrants that this product is free of defects in both materials and workmanship. Should any part of this equipment be defective, Manufacturer agrees, at its option, to:

A.   Repair or replace any defective part free of charge (except transportation charges) for a period of 12 months from the date of the original purchase, provided the owner returns the equipment to Manufacturer at the address set forth below. No charge will be paid for parts or labor during this period.

B.   Replace or furnish replacement for any defective parts in the equipment for a period of one year from the date of original purchase. Replacement parts shall be furnished without charge except labor and transportation.

This Warranty excludes assembled products not manufactured by Manufacturer whether or not they are incorporated in a Manufacturer product or sold under a Manufacturer part or model number.

THIS WARRANTY IS VOID IF:

A.   The equipment has been damaged by negligence, accident, act-of-God or mishandling, or has not be operated in accordance with the procedures described in the operating and technical instructions; or,

B.   The equipment has been altered or repaired by other than manufactured or provided by authorized service representative of Manufacturer; or,

C.   Adaptations or accessories other than those manufactured or provided by Manufacturer have been made or attached to the equipment which, in the determination of Manufacturer, shall have affected the performance, safety, or reliability of the equipment; or,

D.   The equipment's original serial number has been modified or removed.

NO OTHER WARRANTY EXPRESS OR IMPLIED, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE, APPLIES TO THE EQUIPMENT, nor is any person or company authorized to assume any warranty for Manufacturer or any other liability in connection with the sale of Manufacturer products.

Manufacturer does not assume any responsibility for consequential damages, expenses or loss of revenue or property, inconvenience or interruption in operation experienced by the customer due to a malfunction in the purchased equipment. No warranty service performed on any product shall extend the applicable warranty period.

In case of unsatisfactory operation, the purchaser shall promptly notify Manufacturer at the address set forth below, in writing, giving full particulars as to the defects or unsatisfactory operation. Upon receipt of such notice, Manufacturer will give instructions respecting the shipment of the equipment, or such other manners as it elects to honor this warranty as above provided. This warranty does not cover damage to the equipment during shipping and Manufacturer assumes no responsibility for such damage. All shipping costs shall be paid by customer.

This warranty extends only to the original purchaser and is not assignable or transferable.

GENTNER
RF PRODUCTS DIVISION
540 WEST 3560 SOUTH SALT LAKE CITY, UTAH 84115

TIME OR DAY	TIME-HOURS	TIME-MINUTES	TIME SECONDS	AM = * PM = #	COMMAND CHANNEL (202 TO 216)	COMMAND * = CONTACT A # = CONTACT B
301 X	___	___	___	___	___	___
302 X	___	___	___	___	___	___
303 X	___	___	___	___	___	___
304 X	___	___	___	___	___	___
305 X	___	___	___	___	___	___
306 X	___	___	___	___	___	___
307 X	___	___	___	___	___	___
308 X	___	___	___	___	___	___
309 X	___	___	___	___	___	___
310 X	___	___	___	___	___	___
311 X	___	___	___	___	___	___
312 X	___	___	___	___	___	___
313 X	___	___	___	___	___	___
314 X	___	___	___	___	___	___
315 X	___	___	___	___	___	___
316 X	___	___	___	___	___	___
317 X	___	___	___	___	___	___
318 X	___	___	___	___	___	___
319 X	___	___	___	___	___	___
320 X	___	___	___	___	___	___

X = Suffix =   * = DISABLED
                  # = READBACK / PROGRAM