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PRELIMINARY

OPERATING MANUAL
PROGRAMMABLE ATTENUATOR MODELS
9920.9921(Quad "C"-size)
9922.9923(Hex "D"-size)

March 1991

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INSTALLATION

UNPACKING

Save original packing cartons and other materials in case it is necessary to reship the equipment. Note how the cushioning materials were installed.

SETTING MODULE'S LOGICAL ADDRESS

Before installing the attenuator module, its LOGICAL ADDRESS may be set by using a small screwdriver to gently rotate the indicator/armature on each of two switches (SW1 and SW2), which are located between the P1 and P2 connectors at the rear of the module, and which are accessible when the module is not installed in the VXI enclosure. It is not necessary to remove the module's shield for this operation. See para. IV. C for details.

I. DESCRIPTION

The Model 9920 is a four "channel", single-width "C"-size programmable attenuator that can be controlled over the VXI bus. It has an attenuation range of 0 to 63 dB(X1 to X.0007 voltage factor), in 1 dB(about 10% voltage factor)steps. The Model 9921 is identical, except that the attenuation range is 0 to 127 dB. Models 9922 and 9923 are six channel, single-width "D"-size modules with 0-63 and 0-127 dB ranges, respectively. For all models, control includes setting and reading back the value of each attenuator.

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II. SPECIFICATIONS

A. Attenuator Specifications

Frequency Range: DC-1 GHz
Impedance: 50 Ohms Nominal

PARAMETER	MODEL 9920/9921	MODEL 9922/9923
Atten. Range	0-63 dB in 1 dB steps	0-127 dB in 1 dB steps
Atten. Steps	1,2,4,8,16 and 32 dB	1,2,4,8,16,32 and 64 dB
VSWR	1.4:1 maximum	1.4:1 maximum
Insertion Loss	2.5 dB maximum	3.5 dB maximum

Attenuation Accuracy(at maximum attenuation)

DC-100 MHz	±0.3 dB	±0.5 dB
100-500 MHz	±0.5 dB	±0.75 dB
500-1000 MHz	±0.75 dB	±1.0 dB

Power Rating: Max: 1 Watt Average, 1KW Peak
Voltage: Max: 300V Peak

B. Power Requirements

+5V 1.2 Amps
+12V 0.52 Amps (quad attens.),max
+12V 0.78 Amps(hex attens.),max
(Max. attenuation on all attenuators)

C. Physical

"C"-size, single width VXI Module (quad attens.).
"D"-size, single width VXI Module (hex attens.).

D. Operating Environment

Component temperature: 0 to 70 degrees Celsius
Relative Humidity: 0 to 95% noncondensing.

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E. VXI Attributes:

Manufacturer's ID No.(CAL-AV LABS)=4071 (See operational notes, Para. IV, last notice)
Addressing: A16 only
Communication: Register-based

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III. Connectors

A. Front Panel:

RF Connectors: Connect source and load to attenuators. Attenuators are symmetrical; either port can be used for source or load. BNC receptacles standard.

B. Rear Panel:

Module STATIC/DYNAMIC LOGICAL address selector. Two single-digit hexadecimal switches; screwdriver selectable when module not installed. See Para.IV.C

IV. OPERATION

A. Operational Notes:

CAUTION: ALWAYS turn crate power off before installing or removing module. Also, make sure that airflow to module is adequate.

CAUTION: 1 watt power limit is for prevention of damage to the attenuators and is NOT a recommended maximum operating level.Peak voltage is 300 volts, maximum. Note that the damage mechanism is not flashover, but migration of the metal film on the attenuator's resistive elements. For this reason, a fixed (inexpensive) pre-attenuator is recommended as an added protection for extended use at or near the maximum peak voltage.

NOTICE: The data word for each attenuator setting is a binary word consisting of the desired attenuation in dB. Leading-edge zeros are ignored.

NOTICE: All attenuators are automatically set to zero (full signal throughput) upon power-up.

NOTICE: Some early models of slot-0 controllers do not support the full 12 bits available for Mfg's ID No., in which case a query will result in a decimal answer that is 8192 low on the Model 9920, or "1728". The full model number is, however, in the appropriate register, and will be reported correctly to remote equipment.

B. Power:

Power required is +12V @ 0.52 Amps. and +5V @ 1.2 Amps

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C. Setting the Module Logical Address:

The logical address is set using a 2-digit hexadecimal number on SW1 and SW2:the range of possible settings is from 00 to FF(0 to 255 decimal).Note that address 00(0 decimal) is reserved for the SLOT 0 controller and that FF(255 decimal) enables the module's DYNAMIC CONFIGURATION circuitry. These modules support DYNAMIC CONFIGURATION, and are shipped from the factory with the switches set to FF. To set a STATIC CONFIGURATION address, first select an address not already in use in the system as a STATIC address. Then convert that number to a two-digit hexadecimal number and set it on the switches as viewed from the rear of the module, with the switches' zeros up, eights down(SW1, on the left, is the most significant digit).

For example to set logical addresses of:

1 (decimal) set the switches to 01 (hexadecimal)
12 (decimal) set the switches to 0C (hexadecimal)
17 (decimal) set the switches to 11 (hexadecimal)

Programming:

Programming the four (or six) attenuators consists of writing (poking) values into an appropriate memory location for each attenuator. By reading the value stored (peeking) at a particular attenuator's memory location, its requested attenuation value may be verified. Memory location for a module and its attenuators is a function of its logical address, which is either fixed, in the case of statically configured module addresses in the range of 1 to 254(0 to FE,hex) or is assigned by the slot-zero controller during power-up(DYNAMIC CONFIGURATION). In either case, the resulting LOGICAL ADDRESS determines a module's "base" memory location and, therefore, the locations that program the attenuators. The lower eight bits(00 through 07) are used for programming attenuation; the upper eight bits(08 through 15) float up to all 1's(any value written to the upper eight bits will be returned as all 1's or FF if queried).

At this time, only the lowest 6 bits are actually used for programming the 0-63 dB models and the lowest 7 bits are used for 0-127 dB models; however, the entire 8-bit word is stored and read back. The location of the attenuator memory space is just above the configuration registers and is determined as follows:

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C(hex) + [Logical Address(hex) * 40(hex)] is the "base" address for that module; at, and just above this address are the four basic configuration registers, (at 00, 02, 04, and 06). Just above these registers are the attenuator registers, at 08, 0A, 0C, and 0E; in the case of a 4-channel C- size; and additionally at 10 and 12 in the case of a 6-channel D size module. Therefore, with either a statically or a dynamically assigned logical address of 1 (01 hex) the attenuator registers will be found at addresses C048, C04A, C04C, etc.. For logical address 2, (02 hex) they will be found at C088, C08A, C08C, etc..

For actual operations using a control program, the logical address of each module can be obtained from the controller, the above calculation made, and the desired location defined as the variable "ATTA", or wnat-have-you. From that time on , attenuators can be programmed with commands such as "ATTB=36" and read back using commands such as "ATTC?".

V. CALIBRATION

Calibration consists of measuring each attenuator at selected settings, using an appropriate signal source and measuring instrument, to determine actual attenuation values.

VI. MAINTENANCE

A. Models 9920-9923 may be returned to the manufacturer for repair for transportation and material costs (See WARRANTY,page 1). The programmable attenuators are not field-repairable and must be returned to the manufacturer for repair or replacement.

B. Removing Shield Cover: Notice the seven blind studs on the component-side shield. Remove the corresponding seven flat-head screws (six long and one short) from the solder-side chassis.

C. Replacing an Attenuator: Using a 7/16" open-end wrench, loosen the two thick cable retaining nuts that hold the semi-flexible cables into the front-panel BNC receptacles until they disengage from the receptacle body. Do not loosen the paint-secured panel-mounting nuts. Unplug the 10-conductor ribbon cable plug from the printed wiring board(PWB) header. Now, while supporting the attenuator, remove the four attenuator chassis mounting screws. Slide the attenuator assembly, with cables, toward the PWB and up away from the chassis, gently lifting the longer cable to clear the

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header and guiding the cable terminations out of the front-panel receptacle bodies. Using a 5/16" open end wrench, and noting the amount of tightness, loosen each SMA nut and remove each semi-flexible cable assembly and transfer it to the new attenuator. Tighten each SMA nut to the same snugness observed. Do not over-tighten. Hold the 1/8 inch protruding gold cable transition with a small pair of long-nose pliers to prevent cable rotation while tightening the nut. Try to avoid any unnecessary flexing or bending of the semi-flexible cables. Now, reverse the procedure, sliding the BNC cable ends into their receptacle bodies as the new attenuator assembly is moved forward into place and secured.

D. Fuses: There are two fuses at the rear of the PWB. F1 is a 1-Amp fuse in the +12 volt supply line and F2 is a 2-Amp fuse in the +5 volt supply line.

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