BENCHMARK MEDIA SYSTEMS, INC.

RGC-P Instruction Manual

1.0 General Features

The RGC-P is a controller accessory for use with the RGC-01 through -04 daughter boards. It utilizes the ±15 power that is available on the back plain of the MF-300 card frame to give the control voltage necessary to operate the Voltage Controlled Amplifiers, (VCAs) on the daughter boards, and the circuitry of the VCA-2. The RGC-P is a small printed circuit mounted the front panel potentiometer. The front panel potentiometers is variable from the broad range of the RGC-06 (-100 to +25 dB) down to ±1 dB by use of the two range trim potentiometers. The output of the RGC-P is a low impedance drive of 47? s unbalanced from an operational amplifier, and may drive almost unlimited lengths of cable. The RGC-P also has solder pads for connection to a SPDT switch, allowing instant switching between fixed unity gain and the potentiometers level.

2.0 Unpacking and Physical Installation

As with any delicate electronic equipment, care must be exercised in the handling of this board. Carefully unpack and place the RGC-P on the work table in preparation for installation.

Carefully drill a 3/8' hole in the panel or chassis intended to receive the RGC-P. If the switch option is to be used, it should be wired at this time and the appropriate holes drilled. See section 3.2 Mount the device in the hole(s) on the panel.

3.0 Installation and Operational Setup

The electrical installation of the RGC-P consists of three parts. Power installation, control switch wiring and signal return. Setup consists of adjusting the two trim resistors to the desired control range.

3.1 Power Connection

The device can operate with supply voltages from ±15 to ±22 volts. Connection to the board is made either with the enclosed three position female header or a Molex SL series three pin connector such as those used with audio connections at the main frame. As specified with the instructions for the RGC-06, power from the MF-300 frame must be used to power the RGC-P. The advantages are twofold. First it eliminates the requirement of an external supply, and secondly the possibility of ground loops is lowered.

Power voltages connections have this order in the three pin housing, +V, GND and -V. If a standard foil shielded audio pair is used to bring power from the MF-300 frame, we recommend that the red wire be used for positive voltage, the drain wire be used for ground and the black wire be used for the negative voltage. For wiring convenience this is the same wire arrangement as is used in the MF-300 card frame for audio interconnection. And the same connector inversion capability is possible.

!!! Warning !!!

The power connector arrangement makes it possible to reverse the voltages to the RGC-P. Extreme caution must be exercised when plugging up power to the RGC-P to prevent accidental polarity inversion. If polarity inversion should take place, catastrophic destruction of the integrated circuits will take place with possible damage to the printed circuit board.

Refer to the parts placement diagram for the correct power connections. You will note, when looking at the printed circuit board, that three holes exist in the board parallel to the header pins. These are for daisy-chaining power to additional boards. Wires may be soldered into these holes and routed to additional controllers, or additional header pins can be soldered in and connectors used.

3.2 Switch Wiring

As noted in the introduction, it is desirable to mount a switch along side of the RGC-P to expand the control capability of the system. At times it may be necessary to quickly return to a known unity gain at the RGC-01,2 daughter board. This is easily accomplished by the addition of a single pole, double throw switch. A single section Schadow F series "push-push" switch with non-illuminating indicator is ideal. This allows the instant switching from the voltage established by the panel potentiometer (either positive or negative) to ground voltage which is the unity gain position of the VCA.

The small jumper wire on the PC board should be carefully removed at this point and the switch wired in its place. See the parts placement diagram for the location of the holes and jumper. We suggest wiring the switch such that the "out" or "normal" position will give the action of the potentiometer, while the "in" position will give a unity gain (ground) response. Read the section on soldering and de-soldering with printed circuit assemblies in the manual on your System 1000 module.

The RGC-P is assembled on a single sided printed circuit board, and as such does not have holes with through plating. It is easier to damage one of these boards than those with through plating, so exercise great care in this procedure.

3.3 Output Signal Wiring

A single post and female housing next to the forward trim resistor constitute the output connection of the RGC-P. This is an unbalanced output and no companion ground tie point exists since it is assumed that power will be coming from the card frame that receives the control signal return. We suggest that a single foil shielded pair be used to bring back the control voltages from a pair of RGC-P controllers to typically a single RGC-06 daughter board. Tie the drain wire at the card frame and leave it open at the controller end.

3.4 Operational Setup

The range of the RGC-P can be set to anything the engineer desires. The maximum voltage range of the RGC-P is from -10 volts to +2.5 volts. Since the RGC-06 daughter board and the VCA-2 have a control sensitivity of +10 dB/Volt, this range represents a theoretical control range of -100 to +25 dB. Actually the range is somewhat less than this, with high frequency feed-through limiting the amount of attenuation that can be achieved to approximately 70 dB at 20 kHz. Additionally we recommend that no more than a maximum of 20 dB gain be taken from the daughter board in the interest of low distortion. In practice the use of the RGC-01, 02 daughter boards is usually to accomplish a small amount of gain

trim. As such it is desirable to limit the range of the RGC-Ps control to those desired limits. This is achieved using the two end stop or limit trim resistors located at the center of the PC assembly. The forward trimmer (toward the panel potentiometer) controls the counter clockwise end stop of the panel potentiometer, while the rear trimmer (toward the power connection) controls the clockwise end stop of the panel potentiometer. Both of these trim resistors have the same voltages at their end stops, that is the complete -10 to +2.5 volts. Therefore the action of the panel potentiometer can be setup to be either that of a gain control or an attenuator. You must observe the actual gain of loss at the output of the System 1000 module to precisely achieve the desired range. A close approximation, however, can be made by measuring the output voltage of the RGC-P at the two limits of the panel potentiometer. Due to gain drift errors that can occur over temperature with the VCA, we recommend that an additional 2 to 3 db of range be added to the desired limits of the RGC-P.

4.0 Theory of Operation

2 Through out the discussion of the theory of operation it is well to refer to the electrical schematic of the RGC-P.

Power from the MF-300 frame is brought into the RGC-P where it is de-coupled via two 10 µF @ 25 volt capacitors. This power is directly sent to supply the operational amplifier. It is also sent to the two adjustable voltage regulators, the LM317LZ and the LM337LZ. Here it is regulated down to the VCA limits of +2.5 volts and -10 volts respectively. These limits can be changed by an engineer familiar with these voltage regulators, by substituting the appropriate resistor values for those on the board, but since the card will typically be inaccessible this is probably not desirable.

The output of the voltage regulators is fed to the ends of the two trim potentiometers establishing the range limits of the controller. The wipers of the two trim potentiometers in turn are the end points of the panel potentiometer. The output impedance of the panel potentiometer can be as high as approximately 50 k? , therefore this voltage is "read" by the high input impedance of the FET Op-amp and in turn drives the line with a low source impedance. This is also the insertion point of the control switch mentioned earlier. A 10 Meg? resistor ties the input of the op-amp to ground to prevent amplifier saturation if the switch should become open. The operational amplifier is a low offset voltage device so when its input is switched to ground it is indeed within 1 mV of ground potential. The 47 ? output resistor is added to isolate cable capacitance from the amplifier, and thus preserve the phase margin and the stability of the amplifier.

This completes the RGC-P instruction manual. ED Dec 12,2002

BENCHMARK MEDIA SYSTEMS INC.
5925 Court Street Road, Syracuse, NY 13206
(315) 437-6300