VFC 2504

VME VOLTAGE-TO-FREQUENCY CONVERTER

TECHNICAL MANUAL

and CIRCUIT DESCRIPTION

VFC 2504 TECHNICAL MANUAL
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1. Introduction

The VFC 2504 is a dual height VME module containing eight channels of Voltage-to-Frequency conversion electronics.

Inputs are differential, isolated from VME ground and gains of X1, X10 and X100 are available. The input may optionally be jumpered to a single-ended configuration.

The standard conversion gain is 10 volts = 1MHz (at X1 gain).

Both TTL and NIM outputs are available; the TTL outputs being suitable for input to the Daresbury Scaler, type EC738.

2. Functional Description

Each channel has an input connector on the front panel, which is an isolated single-pole LEMO (size 00) socket. Optionally, the unit may be supplied with two-pole sockets.

The input signal is accepted from the connector with the core being the more positive signal and the screen being the more negative or return line.

The input stage is fundamentally differential, but may be jumpered to be single-ended (see below).

The input device is an Instrumentation Amplifier and further jumpers allow its gain to be set to X10 or X100.

This amplifier converts the input signal into a low impedance single-ended signal for presentation to the voltage-to-frequency converter device, which is a synchronous converter, clocked at 2 MHz offering the highest conversion accuracy available.

The output of this converter is a pulse 100 nanoseconds wide (pulse width may be varied to special order), which is passed to a high-speed logic opto-coupler.

The output of this opto-coupler is a TTL signal referred to VME ground, and standard buffers then send this signal to the front panel TTL output connector, a 16-way header, and via level converters to single-pole LEMO (size 00) sockets as NIM output signals.

If the NIM output channels are not in use, they can be disabled, and their power dissipation avoided, by removing jumper JP41. This is the standard configuration and is recommended.

2.1 Input Configurations - Isolated PSUs

The power supply for the input and conversion section described above is floating with respect to VME ground, but each set of input electronics does not have its own separate power supply - the channels share power supplies in pairs; thus channels 1 and 2, 3 and 4 etc. share common supplies.

This means that although the inputs float relative to VME ground, there is a limit on the differential common mode voltage which may exist between channels in each pair.

Each input line has a 1 M Ohm resistor connecting it to Analogue Common for that channel pair, thus this Analogue Common will float to the average or mean of all four signal voltages. The maximum permitted voltage on any input line relative to that mean is +12 volts for guaranteed linear operation.

Since the standard input connectors are single-pole LEMOs, which have the screen (negative input side) connected to the body of the connector, clearly for safety reasons the voltage on this side with respect to VME or local ground should not exceed a safe DC value of 50 volts or less.

The optional two-pole connectors would, of course, remove this restriction, except that the potentially hazardous voltages would still be present on the PCB. This would only be permissible under special circumstances, of course, but common mode voltages of up to + 500 volts would be allowed by the isolating power supply.

3. Operational Links and Adjustments

Each channel has its own set of jumpers and trimming potentiometers, clearly marked on the PCB.

At manufacture, the jumpers are set for X1 gain and presets are adjusted for 0-1 MHz output from 0-10 volt input.

3.1 Jumper Selections.

JUMPER FUNCTION	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Input Single-ended	JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8
Input Gain X10	JP9	JP11	JP13	JP15	JP17	JP19	JP21	JP23
Input Gain X100	JP10	JP12	JP14	JP16	JP18	JP20	JP22	JP24

Gain Setting Table.

Jumpers fitted	Gain
None	X1
X10 IN, X100 OUT	X10
X10 OUT, X100 IN	X100
X10 IN, X100 IN	Not allowed.

Jumper JP41 disconnects –12 volt power from the NIM output stages if they are not in use. This is the recommended configuration.

3.2 Preset Potentiometer Functions.

PRESET FUNCTION	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Input Amp. O/P Offset	VR1	VR3	VR5	VR7	VR9	VR11	VR13	VR15
Input Amp. I/P Offset	VR2	VR4	VR6	VR8	VR10	VR12	VR14	VR16
V/F Converter Gain	VR17	VR19	VR21	VR23	VR25	VR27	VR29	VR31
V/F Converter Offset	VR18	VR20	VR22	VR24	VR26	VR28	VR30	VR32

Note: The input instrumentation amplifiers have two offset trimming potentiometers, one for the input stage and one for the output stage. In general, in high gain applications, the input offset should be set first with the input shorted and X10 gain selected, then the output offset with X1 gain. This process should be repeated until no difference is seen at the output of the amplifier (at the test point) when the gain is changed.

3.3 Test Points

TEST POINT FUNCTION	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Input Amp. O/P Monitor	P1	P2	P3	P4	P5	P6	P7	P8

Note: When setting up the input instrumentation amplifiers, the output can be monitored using the test point indicated above and the appropriate analogue common, which can be found on the "non-input" side of the corresponding single-ended selecting jumper; that is for channel 1, use P1 and the 'supply' side of JP1, which is away from the front panel.

Further test points are fitted to permit the input configuration to be changed by isolating the input common connection of the instrumentation amplifier; these are P9-P24 inclusive and are not intended to be used as standard.

4. Physical and Electrical

As mentioned above, the unit is a dual-height VME board.

It picks up only power from the VMEbus, no signals are connected.

4.1 Power Requirements:-

+ 5 Volts at 0.5 amps

- 12 Volts at 0.5 amps

4.2 Connector Pinouts:-

4.2.1 Input LEMO Connectors:

Centre pin (core) +ve input

Outer body (screen) -ve input

4.2.2 NIM Output LEMO Connectors:

Centre pin (core) Output (negative going pulse)

Outer body (screen) Common (VME ground)

4.2.3 TTL Output DIL Header:

Signal Name	Pin	Pin	Signal Name
	TOP		
GND	16	15	Channel 8 Output
GND	14	13	Channel 7 Output
GND	12	11	Channel 6 Output
GND	10	9	Channel 5 Output
GND	8	7	Channel 4 Output
GND	6	5	Channel 3 Output
GND	4	3	Channel 2 Output
GND	2	1	Channel 1 Output
	BOTTOM		