

Model 578 Multichannel Scaler

User's Manual

9231719A



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The information in this manual describes the product as accurately as possible, but is subject to change without notice.

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1. Introduction

The 578 4/8-Input MCS Module performs concurrent multichannel scaling from one to eight inputs when used in conjunction with a Multichannel Analyzer (MCA) System. The module uses the MCA PHA mode of operation with all data transactions between the module and the MCA occurring via the MCA's ADC port using standard ADC signal arrangements and transfer protocols.

During multiple input multichannel scaling operation, each input is assigned to a separate memory group resulting in separate records representing data derived from each input with each record indicating the individual characteristics of its related source. Each accepted input is stored in the currently addressed channel of the respective memory group. A front panel switch selects the number of channels per input.

Actual count rate capabilities are a function of the host acquisition system. Typically the MCS module services up to eight count inputs at a combined input count rate in excess of 100 kHz total.

The MCS module may be operated in a gate mode with up to four inputs. An internal clock time base provides two digit dwell time selection via front panel switches.

Inputs and outputs are via front and rear panel BNC connectors. Connection to an MCA is via a flat ribbon cable connector on the rear panel. An optional analog ramp output is also available by special order.

2. Controls and Connectors

2.1 Front Panel

This is a brief description of the 578's front panel controls and connectors. For more detailed information, refer to Appendix A, Specifications.

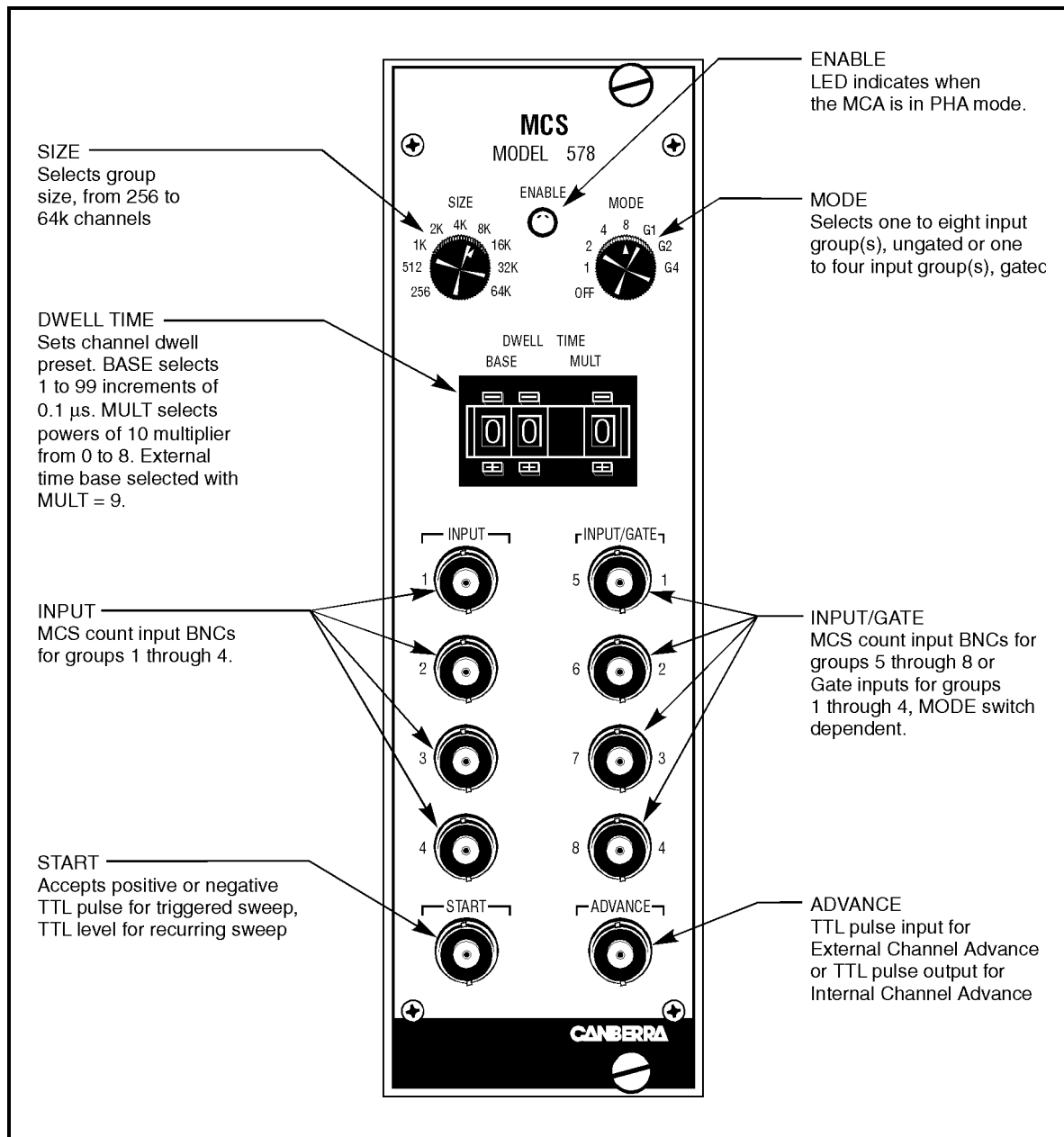


Figure 2.1 Front Panel Controls and Connectors

2.2 Rear Panel

This is a brief description of the 578's rear panel connectors. For more detailed information, refer to Appendix A, Specifications.

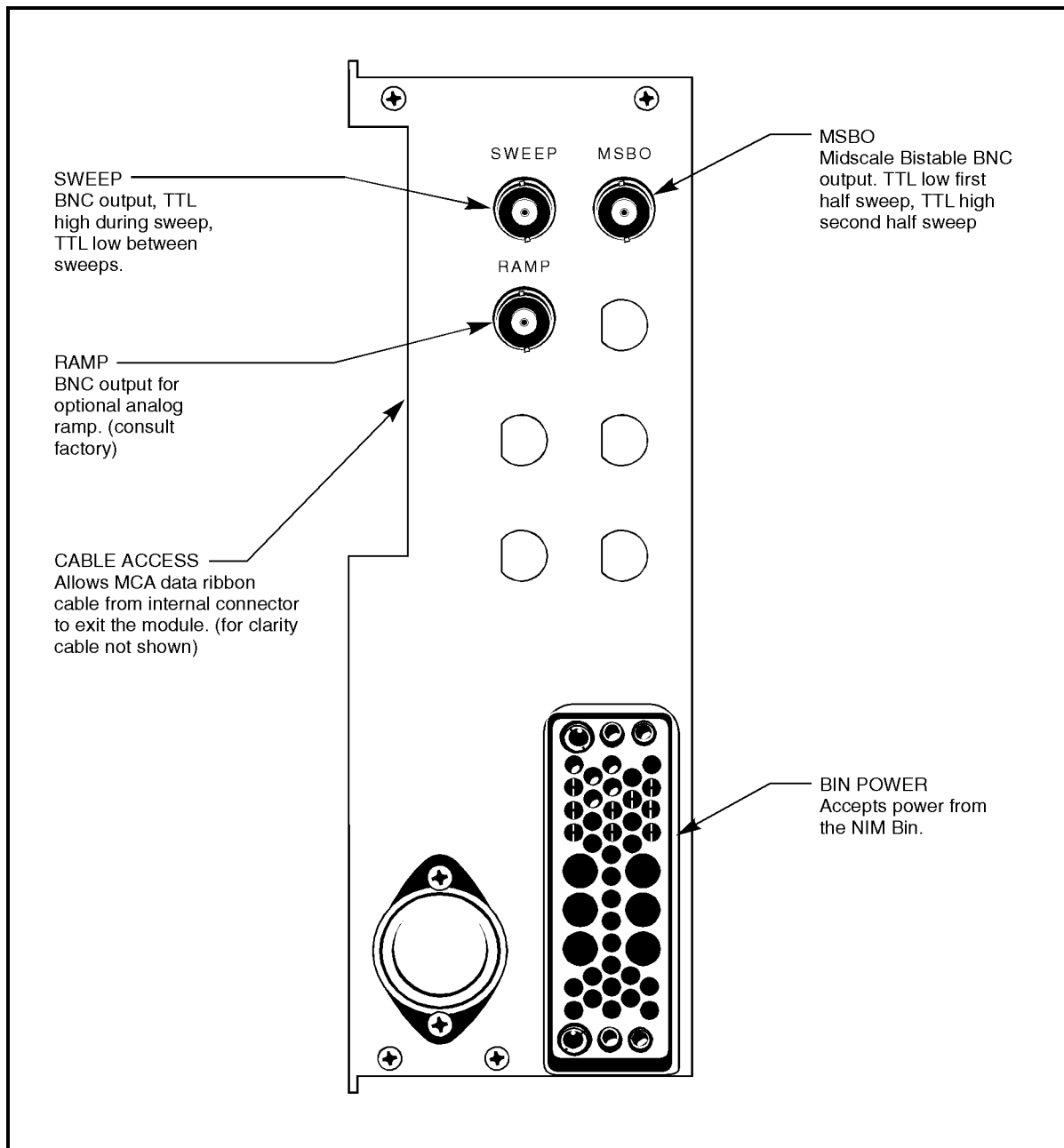


Figure 2.2 Rear Panel Connectors

2.3 Internal Controls

This is a brief description of the 578's internal controls. For more detailed information, refer to Appendix A, Specifications.

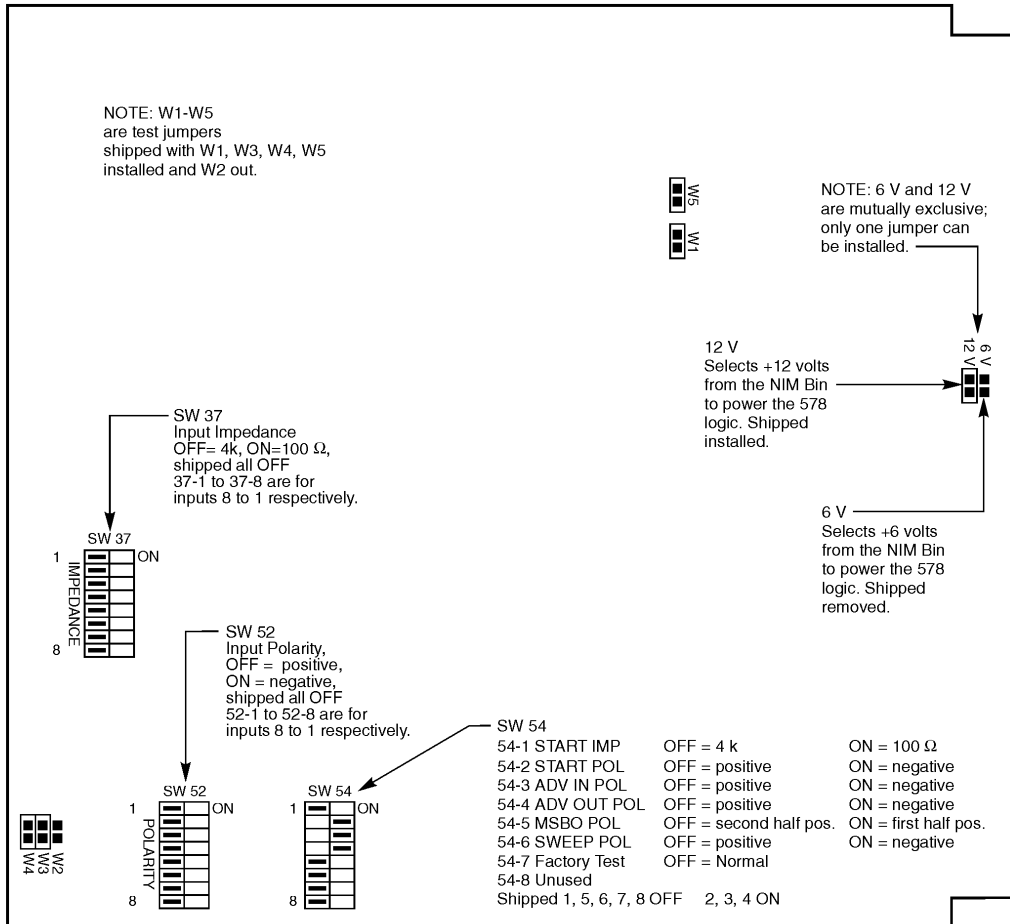


Figure 2.3 Internal Controls

3. Operation

To better understand how to use the 578 MCS module in your application, read this chapter, which explains the function and use of each of the 578's switches and connectors.

3.1 System Setup

Insert the 578 into a standard NIM Bin, then connect the rear panel's ribbon cable to the ADC's acquisition interface. Following the instructions in this chapter:

- Set the front panel Group Size, Mode and Dwell Time switches as required by your application.
- Connect the proper signals to the various front and rear panel connectors, as required by your application.

3.2 Group Size and Mode

The Group Size switch selects the memory size of each of the selected inputs, from 256 to 64K channels. The Mode switch lets you enable up to eight inputs in the non-gated mode. In the gated mode, only four inputs are allowed, with inputs 5 through 8 becoming gated mode inputs 1 through 4.

For proper operation, the system memory size must be equal to the product of the group size and mode and may not exceed the host system's available memory per input. For example, if the mode is eight inputs and the group size is 512, the system memory size must be 4096.

Setting the mode switch to the *off* position disables the 578.

3.3 Dwell Time

The Dwell Time Base switches allow you to select a time base of 1 to 99 (in 0.1 μ s increments) times the time multiplier in powers of 10 from 0 to 8. A multiplier power of 9 selects the external time base input.

CAUTION Data may be lost unless the dwell time selected is longer than the MCA's service time.

Timebase Examples

The front panel Dwell Time switches select a two-decade time base: tenths of a microsecond and a power of ten multiplier. The following examples show how to use these two switches in setting a dwell time frequency.

Switch Settings:

<u>Base and Mult</u>	<u>Resulting Dwell Time</u>
01 and 3	$0.1 \mu\text{s} \times 10^3 = 100 \mu\text{s}$
10 and 2	$1.0 \mu\text{s} \times 10^2 = 100 \mu\text{s}$
50 and 3	$5.0 \mu\text{s} \times 10^3 = 5 \text{ ms}$
02 and 5	$0.2 \mu\text{s} \times 10^5 = 20 \text{ ms}$
35 and 6	$3.5 \mu\text{s} \times 10^6 = 3.5 \text{ s}$
28 and 8	$2.8 \mu\text{s} \times 10^8 = 280 \text{ s}$
<i>nn</i> and 9	External dwell rate

3.4 Advance Connector

The internal time base is enabled in all MULT switch positions except position 9. When the internal time base is enabled, the front panel ADVANCE connector provides an output signal generated at the selected time base frequency, as shown in Figure 3.1.

External Advance

When the internal time base is disabled (MULT switch is in position 9), an external device which can generate an advance signal must be connected to the front panel ADVANCE connector. This input signal's minimum pulse width is $0.1 \mu\text{s}$.

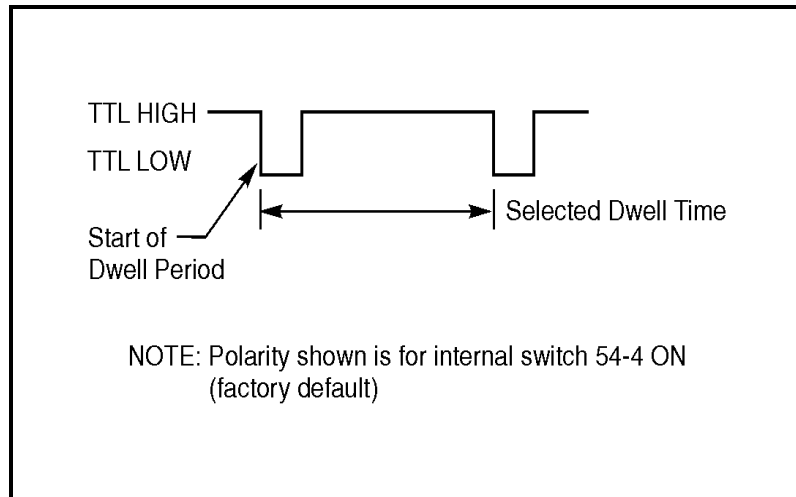


Figure 3.1 Advance Output Signal

3.5 Input/Gate Connector

Eight of the front panel's connectors, labeled INPUT 1-8, are MCS count inputs, as shown in Figure 2.1. Depending on how the MODE switch is set, the four connectors on the right side of the front panel, labeled GATE 1-4, can be used as Gate Signal inputs.

The input signal requirements for the Count and Gate functions are defined by internal switches. To change these requirements from the factory default settings of positive polarity and 4K impedance, change the settings of switches SW 52 and SW 37. Refer to Figure 2.3 for the location of these switches.

Input Mode

When the MODE switch is set to 1, 2, 4 or 8 (for one, two, four or eight inputs), the four INPUT/GATE connectors are defined as Count Inputs (the four INPUT connectors on the left side of the front panel are always defined as Count Inputs). The Count Input signals, which are clocked on the signal's leading edge, must be a minimum of 0.1 μ s wide.

Gate Mode

Gate Signals can be used to enable INPUTS 1-4. To use the Gate Mode, move the MODE switch to G1 for one input, G2 for two inputs, or G4 for four inputs. The four INPUT/GATE connectors will now accept Gate Signals for INPUTS 1-4. The gate signals must be a minimum of 0.1 μ s wide during the count input to enable counting (see Figure 3.2).

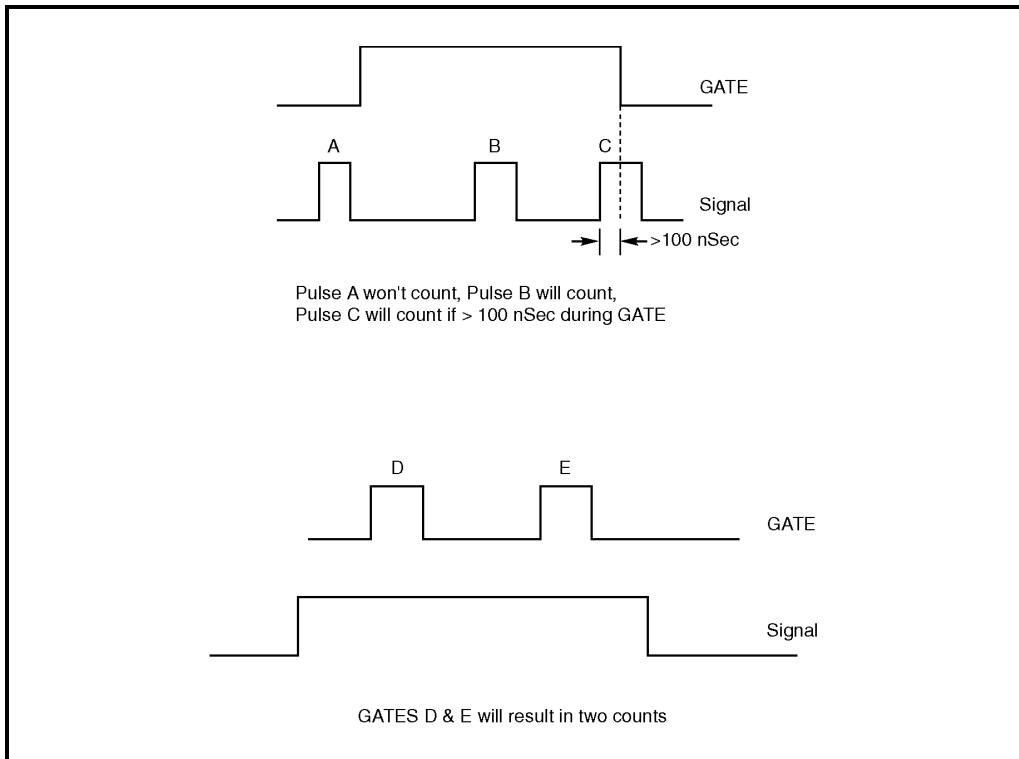


Figure 3.2 Gate/Signal Timing

3.6 Start Connector

The Start connector can accept a pulse for triggered sweep or a dc level for recurring sweep. The minimum pulse width for starting a sweep is 0.5 μ s. The input signal requirements for the Start function are defined by internal switches. To change these requirements from the factory default settings of 4K impedance and positive polarity, change the position of switches SW 54-1 and 54-2. Refer to Figure 2.3 for the location of these switches.

3.7 Sweep Connector

The SWEEP connector outputs a TTL compatible signal, which is activated during Sweep Time. The signal is high during sweep time and low between sweeps.

At the end of the sweep, the 578 MCS adds one count per sweep to the first channel of each selected sub-group of the MCA as a sweep counter. Where supported, the acquisition system can use this for sweep termination by selecting one of these channels for a preset totals region.

Note that because the MCA is not synchronized to the actual sweep, that acquisition will be terminated during a sweep.

The input signal polarity for the Sweep function is defined by an internal switch. To change the requirement from the factory default setting of positive polarity, change the position of switch SW 54-6. Refer to Figure 2.3 for the location of this switch.

3.8 MBSO Connector

The rear panel Midscale BiStable Output (MBSO) connector outputs a TTL change of state at the midscale of each sweep.

The signal polarity for the MBSO function is defined by an internal switch. The factory default setting is: during the first half of the sweep, a positive polarity signal is produced; during the second half of the sweep, a negative polarity signal is produced. For a first half negative – second half positive signal, change the position of switch SW 54-5. Refer to Figure 2.3 for the location of this switch.

3.9 Ramp Connector

This connector is used for an optional feature which can be added to the 578 to allow the output of an analog signal, the amplitude of which is proportional to the MCS address.

3.10 Ribbon Cable

The 34-pin cable exiting the rear of the 578 must be connected to the MCA's acquisition interface.

A. Specifications

A.1 Inputs

INPUT - MCS count inputs; logic high $>+3.0$ V, logic low $>+0.8$ V; polarity reversal via internal jumpers; input range ± 15 V, maximum; pulse duration 30 ns, minimum; $Z_{in}=4$ k Ω (nominal) or 100 Ω , selectable via internal jumpers; front panel BNC connectors.

GATE - MCS count enable inputs; logic high $>+3.0$ V, logic low $>+0.8$ V; polarity reversal via internal jumpers; input range ± 15 V, maximum; duration equal to the time the respective count input is to be enabled/disabled; $Z_{in}=4$ k Ω (nominal) or 100 Ω , selectable via internal jumpers; front panel BNC connectors (functional only when the MODE switch is in a "G" position).

START - MCS trigger input; logic high $>+3.0$ V, logic low $>+0.8$ V; polarity reversal via internal jumper; input range ± 15 V, maximum; pulse duration 0.5 μ s, minimum; $Z_{in}=4$ k Ω (nominal) or 100 Ω , selectable via internal jumper; a ground level signal $+0.4 \pm 0.4$ V or no connection enables recurrent sweeps when negative polarity is selected; front panel BNC connector.

ADVANCE - Channel advance input/output (output when dwell time multiplier is 0 to 8, external time-base input when multiplier is 9); logic high $>+3.0$ V, logic low $>+0.8$ V; polarity reversal via internal jumper; input range 0 to ± 15 V, maximum; input pulse duration 0.5 μ s, minimum; $Z_{in}=4$ k Ω (nominal); front panel BNC connector.

A.2 Outputs

ADVANCE - Channel advance input/output (output when dwell time multiplier is 0 to 8, external time-base input when multiplier is 9); output is a TTL compatible output pulse; leading edge is synchronous with internal channel advance; high level output $+2.7$ to $+5.0$ V at 400 μ A; low level output $+0.25$ to ± 0.25 V at -8 mA; front panel BNC connector.

SWEEP - TTL compatible high output level; high level output $+2.7$ to $+5.0$ V at 400 mA; low level output $+0.25 \pm 0.25$ V at -8 mA; front panel BNC connector.

MIDSCALE BISTABLE - TTL compatible output level; $+0.25 \pm 2.25$ V at -8 mA during first half of sweep, $+2.7$ to $+5.0$ V at 400 μ A during second half of sweep; rear panel BNC connector.

ANALOG RAMP - Optional analog ramp generator output available by special order; 10 V full scale at 5 mA maximum current.

A.3 Front Panel Controls

MODE - Rotary switch selects 1-, 2-, or 4-input multichannel scaling via the MCA's PHA mode with or without external gates; 8-input multichannel scaling with gates; Gate modes G1, G2 or G4 with MCS counting from the respective inputs enabled/disabled while sweeping; OFF disables MCS operation.

GROUP SIZE - Rotary switch selects acquisition group size in binary increments from 256 to 64K channels.

DWELL TIME - Two digit BASE and one-digit MULT thumbwheel switches select dwell time of 1 to 99 times multiplier in powers of 10 from 0 to 8 in increments of 0.1 μ s; multiplier power of 9 selects external time base input; minimum dwell time selection depends on host MCA transfer times.

A.4 Indicators

ENABLE - Indicates when the MCA is in active PHA mode; front panel LED.

A.5 Performance

OPERATING MODES - 1, 2, or 4-input multichannel scaling via the MCA's PHA mode with or without external gates; 8-input multichannel scaling without gates; In the Gate modes, MCS counting from the respective inputs is enabled/disabled while sweeping.

DWELL TIME - 1 to 99 times multiplier in powers of 10 from 0 to 8 in increments of 0.1 μ s; multiplier power of 9 selects external time base input; minimum dwell time selection depends on the transfer time of the host MCA. Typical transfer time for the 556 AIM: 0.75, 1.0, 1.5, or 2.0 μ s (internal AIM jumper). Typical transfer time for the AccuSpec/B: 0.5, 1.0, 1.5, or 2.0 μ s (internal AccuSpec jumper).

SWEEP COUNTER - Single count per sweep is directed to first channel of each group of host MCA.

TIME BASE - Internal 20 MHz crystal oscillator generated time intervals for dwell time selection.

INPUT COUNT RATE - Function of host system (typically 100 kHz combined total for all inputs).

OPERATING TEMPERATURE RANGE - 0 to 50 °C.

COMPATIBILITY - Connects directly to AIM or AccuSpec/B or /MC. Consult factory for compatibility with other MCAs.

A.6 Power Requirements

+12 V dc – 600 mA

(If a +6 V dc supply is available, internal jumpers may be specified to switch the 600 mA power drain from the +12 V dc supply to the +6 V dc supply.)

A.7 Physical

SIZE - Standard double-width NIM module 6.86 X 22.12 cm (2.70 X 8.71 in.) per DOE/ER-0457T.

NET WEIGHT - 1.5 kg (3.2 lb).

SHIPPING WEIGHT - 2.4 kg (5.2 lb).

B. Data Interface Connector

This 34-pin ribbon connector provides all the necessary signals for connection to the MCA. Negative true signals are shown with a trailing asterisk (CLADC*); all other signals are positive true.

PIN	SIGNAL	PIN	SIGNAL
1	GND	2	CLADC*
3	GND	4	ATR*
5	GND	6	n/c
7	GND	8	ACQ*
9	GND	10	READY*
11	GND	12	n/c
13	ADC13*	14	ADC00*
15	ADC07*	16	ADC01*
17	ADC08*	18	ADC02*
19	ADC09*	20	ADC03*
21	ADC10*	22	ADC04*
23	ADC11*	24	ADC05*
25	ADC12*	26	ADC06*
27	ADC14*	28	ADC15*
29	n/c	30	n/c
31	n/c	32	n/c
33	n/c	34	ADC13X*

B.1 Interface Signal Functions

This section describes the function of each interface signal in detail. All input and output signals are TTL compatible. Unless otherwise noted, the input signal levels are:

Low = 0 to 1.0 volts
High = 2.0 to 5.0 volts

And the output signal levels are:

Low = 0 to 0.5 volts
High = 3.0 to 5.0 volts

All input and output signals considered to be a logic 1 for a high voltage level unless the signal name is followed by an asterisk (*), in which case the signal is considered to be a logic 1 for a low voltage level.

<u>SIGNAL</u>	<u>PIN</u>	<u>DESCRIPTION</u>
ADC00*	14	OUTPUT: Binary data 2^0 (LSB)
ADC01*	16	OUTPUT: Binary data 2^1
ADC02*	18	OUTPUT: Binary data 2^2
ADC03*	20	OUTPUT: Binary data 2^3
ADC04*	22	OUTPUT: Binary data 2^4
ADC05*	24	OUTPUT: Binary data 2^5
ADC06*	26	OUTPUT: Binary data 2^6
ADC07*	15	OUTPUT: Binary data 2^7
ADC08*	17	OUTPUT: Binary data 2^8
ADC09*	19	OUTPUT: Binary data 2^9
ADC10*	21	OUTPUT: Binary data 2^{10}
ADC11*	23	OUTPUT: Binary data 2^{11}
ADC12*	25	OUTPUT: Binary data 2^{12}
ADC13*	13	OUTPUT: Binary data 2^{13}
ADC13X*	34	OUTPUT: Binary data 2^{13} (Alternate)
ADC14*	27	OUTPUT: Binary data 2^{14}
ADC15*	28	OUTPUT: Binary data 2^{15}
ATR* (ENDATA*)	4	INPUT (Enable Data): Used to enable the tri-state buffers driving the 16-bits of data onto the output lines ADC00* through ADC15*.
READY*	10	OUTPUT (Data Ready): Indicates that data is available for transfer to the MCA. READY* will be reset after receipt of signal CLADC*.
CLADC* (ACCEPT*)	2	INPUT (Data Accepted): Signals the ADC that the data has been accepted by the MCA. CLADC* may reset when READY* resets (handshake).
ACQ* (ENC*)	8	INPUT (Enable Convertor): This signal enables or disables the ADC module.
GND	1,3,5,7,9,11	DC common for all interface signals.

Warranty

Canberra's product warranty covers hardware and software shipped to customers within the United States. For hardware and software shipped outside the United States, a similar warranty is provided by Canberra's local representative.

DOMESTIC WARRANTY

Canberra (we, us, our) warrants to the customer (you, your) that equipment manufactured by us shall be free from defects in materials and workmanship under normal use for a period of one (1) year from the date of shipment.

We warrant proper operation of our software only when used with software and hardware supplied by us and warrant that our software media shall be free from defects for a period of 90 days from the date of shipment.

If defects are discovered within 90 days of receipt of an order, we will pay for shipping costs incurred in connection with the return of the equipment. If defects are discovered after the first 90 days, all shipping, insurance and other costs shall be borne by you.

LIMITATIONS

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EXCLUSIONS

Our warranty does not cover damage to equipment which has been altered or modified without our written permission or damage which has been caused by abuse, misuse, accident or unusual physical or electrical stress, as determined by our Service Personnel.

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Model 578 4/8-Input Multichannel Scaler

Features

- Eight MCS inputs
- Pseudo ADC operation
- 1, 2, 4 or 8 input operation
- Internal time base 1-99 times multiplier 10^0 - 10^8
- 16K channel maximum address range
- Optional analog ramp 0-10 V
- Gates for Inputs 1, 2, 3 and 4
- Standard midscale bistable output for Mössbauer

Description

The Model 578 4/8-Input MCS double-width NIM Module performs concurrent multichannel scaling from one to eight inputs when used in conjunction with a Multichannel Analyzer (MCA) System. The MCS module uses the MCA PHA mode of operation with all data transactions between the module and the MCA occurring via the MCA's ADC port, using standard ADC signal arrangements and transfer protocols.

During multiple input multichannel scaling operation, each input is assigned to a separate memory group resulting in separate records representing data derived from each input with each record indicating the individual characteristics of its related source. Each accepted input is stored in the currently addressed channel of the respective memory group. A front panel switch selects the number of channels per input.

Actual count rate capabilities are a function of the host acquisition system. Typically the MCS module services up to eight count inputs at a combined input count rate in excess of 100 kHz total.

The MCS module may be operated in a Gate mode with up to four inputs. An internal clock time BASE provides two-digit dwell time selection via front panel switches. Dwell Time MULTIplier adjusts in powers of 10, at external time base inputs.

Inputs and outputs are via front and rear panel BNC connectors. Connection to an MCA is via a flat ribbon cable connector on the rear panel. An optional analog ramp output is also available by special order.

Specifications

INPUTS

- INPUT – MCS count inputs; logic high $>+3.0$ V, logic low $>+0.8$ V; polarity reversal via internal jumpers; input range ± 15 V, maximum; pulse duration 30 ns, minimum; $Z_{in}=4$ k Ω (nominal) or 100 Ω , selectable via internal jumpers; front panel BNC connectors.
- GATE – MCS count enable inputs (functional only when the MODE switch is in a "G" position); logic high $>+3.0$ V, logic low $>+0.8$ V; polarity reversal via internal jumpers; input range ± 15 V, maximum; duration equal to the time the respective count input is to be enabled/disabled; $Z_{in}=4$ k Ω (nominal) or 100 Ω , selectable via internal jumpers; front panel BNC connectors.
- START – MCS trigger input; logic high $>+3.0$ V, logic low $>+0.8$ V; polarity reversal via internal jumper; input range ± 15 V, maximum; pulse duration 0.5 μ s, minimum; $Z_{in}=4$ k Ω (nominal) or 100 Ω , selectable via internal jumper; a ground level signal $+0.4 \pm 0.4$ V or no connection enables recurrent sweeps when negative polarity is selected; front panel BNC connector.



Phone contact information

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Model 578 4/8-Input Multichannel Scaler

- **ADVANCE** – Channel advance input/output (output when dwell time MULTIplier is 0 to 8, external time-base input when MULTIplier is 9); logic high $>+3.0$ V, logic low $>+0.8$ V; polarity reversal via internal jumper; input range 0 to ± 15 V, maximum; input pulse duration 0.5 μ s, minimum; $Z_{in}=4$ k Ω (nominal); front panel BNC connector.

OUTPUTS

- **ADVANCE** – Channel advance input/output (output when dwell time MULTIplier is 0 to 8, external time-base input when MULTIplier is 9); output is a TTL compatible output pulse; leading edge is synchronous with internal channel advance; high level output $+2.7$ to $+5.0$ V at 400 μ A; low level output $+0.25$ to ± 0.25 V at -8 mA; front panel BNC connector.
- **SWEEP** – TTL compatible high output level; high level output $+2.7$ to $+5.0$ V at 400 mA; low level output $+0.25 \pm 0.25$ V at -8 mA; front panel BNC connector.
- **MIDSCALE BISTABLE** – TTL compatible output level; $+0.25 \pm 2.25$ V at -8 mA during first half of sweep, $+2.7$ to $+5.0$ V at 400 μ A during second half of sweep; rear panel BNC connector.
- **ANALOG RAMP** – Optional analog ramp generator output available by special order; 10 V full scale at 5 mA maximum current.

FRONT PANEL CONTROLS

- **MODE** – Rotary switch selects 1-, 2-, or 4-input multichannel scaling via the MCA's PHA mode with or without external gates; 8-input multichannel scaling with gates; Gate modes G1, G2 or G4 with MCS counting from the respective inputs enabled/disabled while sweeping; OFF disables MCS operation.
- **GROUP SIZE** – Rotary switch selects acquisition group size in binary increments from 256 to 64K channels.
- **DWELL TIME** – Two-digit BASE and one-digit MULT thumbwheel switches select dwell time of 1 to 99 times MULTIplier in powers of 10 from 0 to 8 in increments of 0.1 μ s; MULTIplier power of 9 selects external time base input; minimum dwell time selection depends on host MCA transfer times.

INDICATORS

- **ENABLE** – Indicates when the MCA is in active PHA mode; front panel LED.

PERFORMANCE

- **OPERATING MODES** – 1, 2, or 4-input multichannel scaling via the MCA's PHA mode with or without external gates; 8-input multichannel scaling without gates; in the Gate modes, MCS counting from the respective inputs is enabled/disabled while sweeping.
- **DWELL TIME** – 1 to 99 times MULTIplier in powers of 10 from 0 to 8 in increments of 0.1 μ s; MULTIplier power of 9 selects external time base input; minimum dwell time selection depends on the transfer time of the host MCA. Typical transfer time for the Model 556A AIM: 0.75, 1.0, 1.5, or 2.0 μ s (internal AIM jumper).
- **SWEEP COUNTER** – Single count per sweep is directed to first channel of each group of host MCA.
- **TIME BASE** – Internal 20 MHz crystal oscillator generated time intervals for dwell time selection.
- **INPUT COUNT RATE** – Function of host system (typically 100 kHz combined total for all inputs).
- **OPERATING TEMPERATURE RANGE** – 0 to 50 $^{\circ}$ C.
- **COMPATIBILITY** – Connects directly to Model 556A AIM. Consult factory for compatibility with other MCAs.

POWER REQUIREMENTS

+12 V dc – 600 mA

- (If a +6 V dc supply is available, internal jumpers may be specified to switch the 600 mA power drain from the +12 V dc supply to the +6 V dc supply.)

PHYSICAL

- **SIZE** – Standard double-width NIM module 6.86 x 22.12 cm (2.70 x 8.71 in.) per DOE/ER-0457T.
- **NET WEIGHT** – 1.5 kg (3.2 lb).
- **SHIPPING WEIGHT** – 2.4 kg (5.2 lb).

