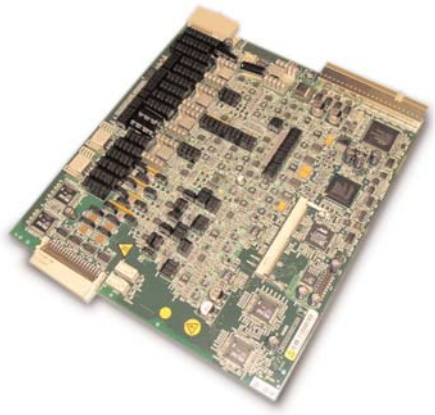
# 5800 Series

## Multi-Functional Card (MFC)



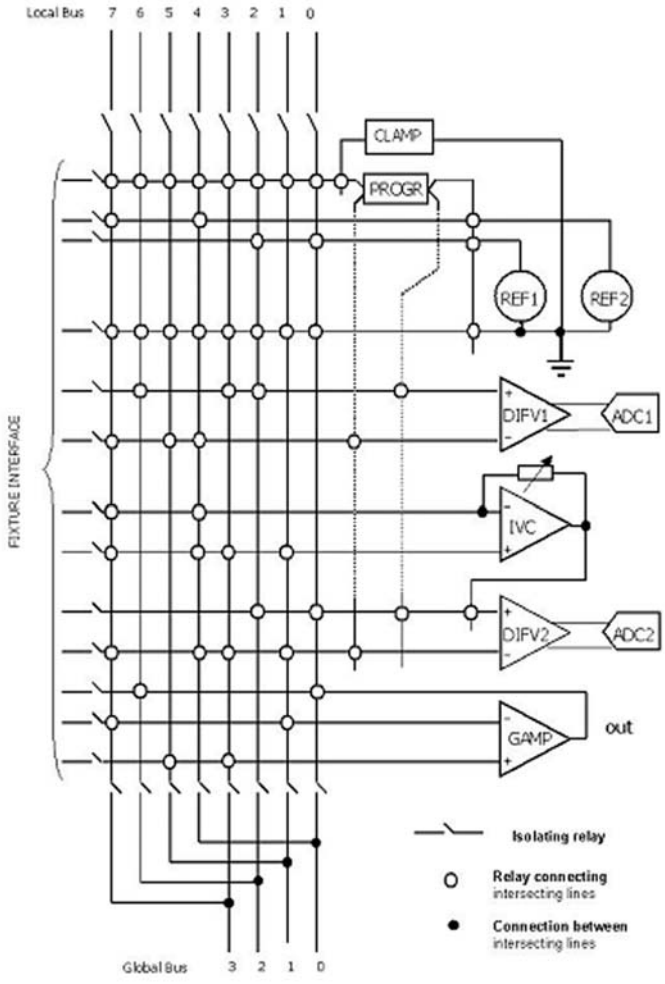
The Multi-Functional Card is a versatile instrument that provides a number of commonly used test and measurement functions.

- Two Channel Reference Generator
- Two Channel Differential Voltmeter
- Voltage Measurement +/- 100V
- Programmable Resistance
- Guard Amplifier
- Current to Voltage Converter
- Over Voltage Protection
- Fast measurement execution

The MFC forms the heart of a 5800 Series analog test system. It provides the stimulus and measurement circuitry to enable analog in-circuit tests to be carried out in conjunction with a number of Test Point Relay cards (from 1 to 18). The card can also act as a general purpose DC and AC signal source and signal measurement facility for functional testing, with additional connections via a fixture interface.

In any given 5800 Series test system a number of MFC's can be fitted into the 19 available instrument slots to form separate analog subsystems. These analog subsystems then allow parallel testing of test subjects, reducing overall test times and increasing throughput.

The modular design of the MFC allows many types of measurement to be made with the automatic configuration of the internal modules via a relay matrix.



### Module Functionality

Capacitor Discharge

Contact

Track/Shorts

Link/Opens

AC Impedance Measurement

AC Low Impedance Measurement

DC Resistance Measurement

DC Low Resistance Measurement

DC Capacitance Measurement

DIODE ON/OFF/Leakage

LED ON/OFF/Leakage

ZENER

TRAN ON/OFF/HFE

FET ON/OFF/RDS

TRANSFORMER RATIO

DC Voltage

AC Voltage

DC Current

AC Current

CODA Vectorless Test

Each channel is separately capable of generating programmable DC signals, or AC signals with a DC offset. The output stage has programmable current limits that enable it to operate as a current source and a current sink up to 250mA. The sink and source limits are controlled separately and a monitor line indicates when either part is in current limit.

AC signals are synthesised by the on board DSP writing data to a digital to analog converter (DAC). The output of this DAC can be routed through a programmable low pass filter, to produce high integrity signals.

High frequency sinewaves needed for functional testing are generated by using direct digital synthesis together with a multiplying DAC to provide amplitude control. A further DAC provides a DC offset capability.

The outputs of the reference generators are switchable for low and high gains to allow accurate low level signals to be generated as well as high level. This gain control can be utilised with the current to voltage converter (IVC) to provide an autorange facility.

The autorange feature can be used to automatically reduce the stimulus voltage when the output current from the tested device rises near full scale. In addition, the output stage of REF1 includes a discharge buffer, which can be switched in to discharge capacitors on the unit under test (UUT). This buffer is able to withstand high voltages across capacitors of a UUT, and provide a means of safely discharging them.

### Current to Voltage Converter (IVC)

The current to voltage converter consists of an operational amplifier with the inverting input used as the current terminal, and the non-inverting input used as the reference. The operational amplifier has a current drive capability of up to 250mA to allow quick settling time for measurements.

A two stage pre-charge facility reduces the feedback resistance to rapidly charge capacitors being measured on low current ranges. Separately switchable feedback capacitors are also included to increase the immunity to oscillation.

### Differential Voltmeter (DIFV1/DIFV2)

The MFC has two identical differential voltmeter channels, DIFV1 and DIFV2. Each has a switchable divider, two programmable gain stages, a programmable lowpass filter, and a differential drive with fixed frequency anti-aliasing filter to a 16-bit ADC circuit.

The attenuation and gain have separate controls so that common mode voltages above 5V can be accommodated by using the ¸10 divider and the gain together. Several input voltage ranges from ±10mV to ±100V full-scale can be achieved.

The ADC sampling and reading is controlled by the DSP to allow synchronous generation and analysis to be carried out. In addition the MFC includes two voltage comparators with programmable threshold levels to provide an indication when the measured voltage rises above or falls below the pre-set levels. This is used to control automated sequences, which use the comparator to indicate when the voltage level crosses a defined level or is within a window. The same two threshold levels are applied to both voltmeter channels.

### Programmable Resistor (PROGR)

A parallel configuration of relay switchable resistors, with decade values from 1 Ohms to 10 MOhm are provided to be used in series with the reference generator output in order to provide an AC current source, and also to act as reference components in low impedance measurements.

Three capacitor values are also included (1nF, 10nF and 100nF) to connect instead of, or in parallel with the resistance. The components used are accurate and stable types to enable these devices to be used as reference components for calibration purposes.

A clamp circuit can be connected between the output side of the programmable resistor, to prevent any damaging high voltage on the output.

### Guard Amplifier (GAMP)

This buffer amplifier is used to drive a guard pin(s) with the reference generator signal to nullify the effect of parallel paths on the UUT.

### Analog Multiplexers

Two analog multiplexers are on the MFC, one to route each differential voltmeter channel to a number of inputs on the fixture interface connector. These inputs are protected and have a limited voltage range. Each multiplexer can be configured to provide 8 differential inputs, or 16 single ended inputs by switching the - input to GND.

### Fixture Grounding

Four pins on the fixture interface connector are connected to 0V (GND) via relays. REF1 and DIFV1 can be used to measure the resistance to 0V on internal analog bus line 0. By closing the relays in sequence each may be checked for stuck closed or stuck open condition.

# SPECIFICATION *

## REFERENCE GENERATOR (REF1/REF2)

**Voltage range**

-10V to +10V DC

Low range: 0.01 to 1V AC peak

High range: 1 to 10V AC peak

**Resolution**

16-bit normal

12-bit DDS

**Accuracy (DC)**

±1% ±5mV

**AC Accuracy (standard frequencies)**

High range: ±1% ±10mV

Low range: ±1% ±1mV

**Frequency (sine wave)**

0.1Hz to 50kHz normal

1Hz to 200kHz DDS

**AC Distortion**

Typically better than 0.2%

**Settling time**

Typically less than 50usec

**Current ranges**

10 to 250mA (high range)

0.1 to 10mA (low range)

**Resolution**

14-bit

**Accuracy (DC)**

100uA to 10mA: ±1% ±15uA

10mA to 250mA: ±1% ±0.3mA

## DIFFERENTIAL VOLTMETER (DIFV1/DIFV2)

**Range**

±100mV to ±100V full scale peak in 7 ranges

**Input protection**

±100V

**DC Accuracy**

| Range | without Filter | with Filter |
|---|---|---|
| 100V | ±0.5% of reading ±100mV | ±0.6% of reading ±200mV |
| 25V | ±0.5% of reading ±25mV | ±0.6% of reading ±50mV |
| 10V | ±0.4% of reading ±10mV | ±0.5% of reading ±20mV |
| 2.5V | ±0.4% of reading ±2.5mV | ±0.5% of reading ±5mV |
| 1V | ±0.5% of reading ±1mV | ±0.6% of reading ±2mV |
| 0.25V | ±0.5% of reading ±0.5mV | ±0.6% of reading ±1mV |
| 100mV | ±0.5% of reading ±0.2mV | ±0.6% of reading ±0.4mV |

AC Accuracy

| Range | without Filter | with Filter |
|---|---|---|
| 100V | ±2% of reading ±200mV | ±4% of reading ±400mV |
| 25V | ±2% of reading ±50mV | ±4% of reading ±100mV |
| 10V | ±2% of reading ±20mV | ±4% of reading ±40mV |
| 2.5V | ±2% of reading ±5mV | ±4% of reading ±10mV |
| 1V | ±2% of reading ±2mV | ±4% of reading ±4mV |
| 0.25V | ±2% of reading ±0.5mV | ±4% of reading ±1mV |
| 100mV | ±2% of reading ±0.2mV | ±4% of reading ±0.4mV |

**Resolution**

16-bit

**Bandwidth**

200kHz, approximately

**Test speed**

Up to 700 tests per second

**Noise Filter**

8 pole elliptic, programmable cut-off frequency between 10kHz and 150kHz in steps of 10kHz

**Anti-alias filter**

Switchable between linear amplitude (3-pole Butterworth) and linear phase

**Input Resistance**

**100V & 25V Ranges**

Nominally 10MΩ to ground at each terminal/20MΩs differential

**Other Ranges**

Nominally 1MΩ to ground at each terminal/2MΩ differential or >100MΩ selectable

## CURRENT TO VOLTAGE CONVERTER (IVC)

**Current ranges**

0 to ±2.5uA, up to ±250mA in 6 ranges

**DC Accuracy**

±2% of reading ±0.1% full scale

**Bandwidth**

DC to 100kHz depending on Frequency

## PROGRAMMABLE RESISTOR (PROGR)

**Resistance Values**

1Ω

10Ω

100Ω

1KΩ

10KΩ

100KΩ

1MΩ

10MΩ

**Accuracy**

±2.5% (1Ω to 100Ω)
±1.5% (others)

* - Warranted figures over the operating temperature range of the system (+10oC - +35oC)

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