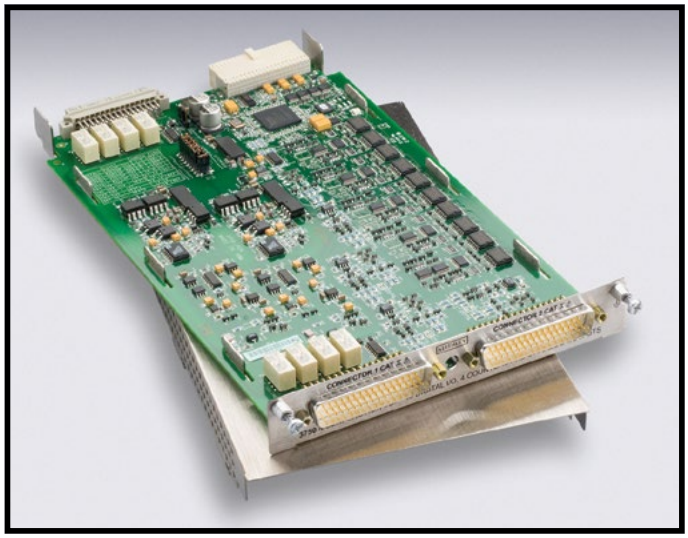
3750

Multifunction Control Card

40 digital I/O bits, 2 analog output channels, and 4 counters

- **40 bidirectional digital input/output bits**
- **High current driver outputs for sinking (300mA)**
- **Internal 5V, 50mA logic supply for powering external logic circuits**
- **2 isolated analog output channels, programmable to ±12V, 0–20mA, or 4–20mA**
- **4 gated 32-bit counters with 1MHz input rate**
- **Screw terminal connections provided with removable 3750-ST accessory**
- **External supply voltage supported on digital I/O**



Use the Model 3750 to monitor and control your automated test system. The flexibility and speed provided by the 40 digital I/O bits, four counters, and two analog outputs make it well-suited for a wide variety of system control applications.

Digital I/O

The Model 3750 offers 40 digital I/O bits arranged in five banks. Each bank is comprised of eight bits each, and each bank can be programmed as either input or output. Digital I/O is often used to control processes and monitor the status of switches, contacts, and other control points. Additional features include scanning capabilities, such as writing a unique output pattern or reading banks of inputs at rates up to 1000 rdgs/second. Also, pattern matching is available, making it ideal for complex event algorithms.

Further versatility is provided by supporting external voltage levels of up to 30V and output current sink levels of 300mA for control of external devices like RF/microwave relays.

Analog Outputs

The two analog outputs of the Model 3750 are designed for general purpose applications such as setpoint control or as bias supplies to your device under test. For maximum utility, these outputs are programmable as voltage (±12V) or current (0–20mA or 4–20mA). A number of protection features are provided, including monitoring for current and/or voltage compliance and the ability to disconnect automatically during fault conditions. Output relays are supplied for each channel, ensuring mechanical isolation between your control device and the analog output.

Counters

Four 32-bit counters are provided with a maximum input rate of 1MHz. Each counter has a gate input that offers precise control of event counting and totalizing for a broad range of system components, such as: fixtures, limit switches, pass/fail indicators, revolutions, or time-related quantities. The counters, like the digital I/O, can be used in scanning operations and pattern matching as well as supporting reading rates of up to 1000 rdgs/second.

Self-calibration

When your Model 3706A mainframe is equipped with the high performance multimeter option, hardware and software is provided for self-calibration of analog outputs (voltage and current) and counter thresholds.

Ordering Information

3750 **Multifunction Control Card**

ACCESSORIES AVAILABLE

3721-MTC-1.5	50-pin female-to-male D-sub Cable Assembly, 1.5m (4.9 ft)
3721-MTC-3	50-pin female-to-male D-sub Cable Assembly, 3m (9.8 ft)
3750-ST	Screw Terminal Block
3790-KIT50-R	50-pin female D-sub Connector Kit (contains 2 D-sub connectors and 100 solder cup contacts)

SERVICES AVAILABLE

3750-3Y-EW-STD	1-year factory warranty extended to 3 years from date of shipment
3750-5Y-EW-STD	1-year factory warranty extended to 5 years from date of shipment
C/3750-3Y-DATA	3 (Z540-1 compliant) calibrations within 3 years of purchase*

*Not available in all countries

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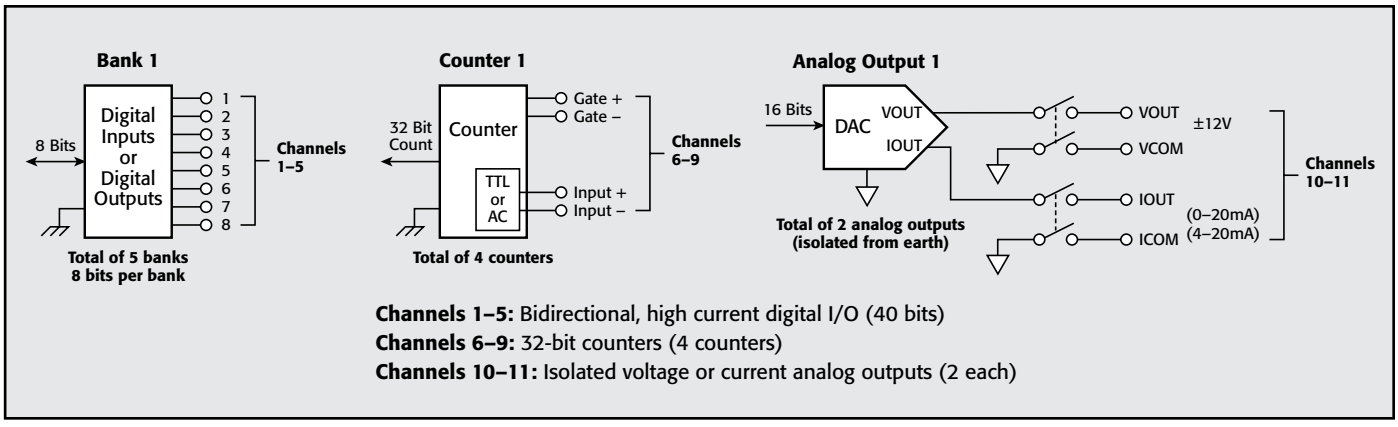

Figure 1. Block diagram

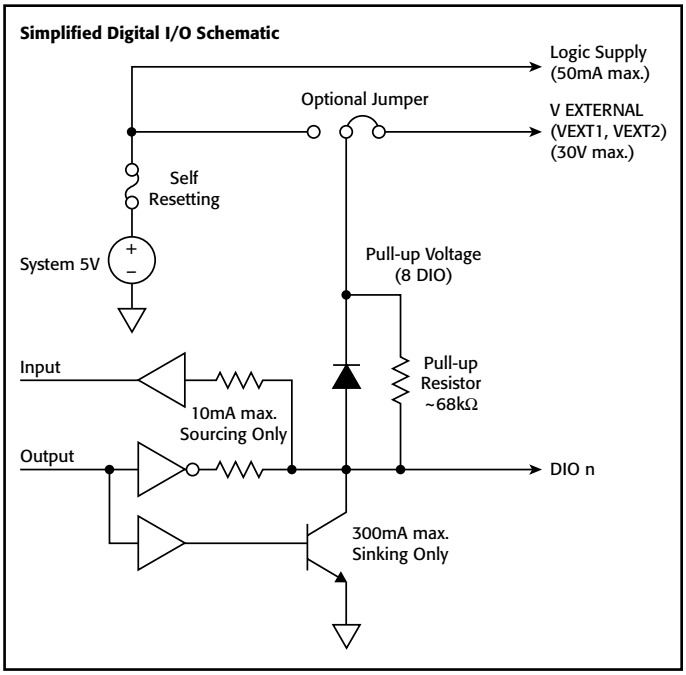

Figure 2. Simplified I/O schematic

Specifications

DIGITAL I/O[1]

CONFIGURATION: 40 bidirectional digital I/O bits arranged in 5 banks of 8 bits each. Each bank can be configured for either input or output capability. 1 bank of I/O is equivalent to 1 system channel.

DIGITAL INPUT SPECIFICATIONS

An internal weak pull-up resistor of approximately 68kΩ is provided on the card for each I/O. This pull-up resistor can be removed via onboard jumper on a channel (8 bit) basis. The pull-up voltage can either connect to the internally supplied 5V or an externally supplied voltage of up to 30V via onboard jumper. An internal 5V supply connection is separately available to run external logic circuits.

DIGITAL INPUT LOGIC LOW VOLTAGE: 0.8V max.

DIGITAL INPUT LOGIC HIGH VOLTAGE: 2V min.

DIGITAL INPUT LOGIC LOW CURRENT: –600μA max @ 0V.

DIGITAL INPUT LOGIC HIGH CURRENT: 50μA max @ 5V.

LOGIC: Positive true.

SYSTEM INPUT MINIMUM READ SPEED[2]: 1000 readings/second.

MAXIMUM EXTERNALLY SUPPLIED PULL-UP VOLTAGE: 30V.

MAXIMUM EXTERNALLY SUPPLIED VOLTAGE TO ANY DIGITAL I/O LINE: Pull-up voltage (5V internal or up to 30V external).

DIGITAL OUTPUT SPECIFICATIONS

Each output has an internal fly-back diode for driving inductive loads. Each output is protected against continuous short circuits and over temperature. An internal 5V supply connection is separately available to run external logic circuits.

DIGITAL OUTPUT LOGIC HIGH VOLTAGE: 2.4V minimum @ Iout = 10mA, sourcing only.

DIGITAL OUTPUT LOGIC LOW VOLTAGE: 0.5V maximum @ Iout = -300mA, sinking only.

MAXIMUM OUTPUT SINK CURRENT: 300mA per output, 3.0A total per card.

LOGIC: Positive true.

SYSTEM OUTPUT MINIMUM WRITE SPEED[3]: 1000 readings/second.

MAXIMUM EXTERNALLY SUPPLIED VOLTAGE TO ANY DIGITAL I/O LINE: Pull-up voltage (5V internal or up to 30V external).

ALARM: Trigger generation is supported for a maskable pattern match or state change on any of channels 1 through 5.

PROTECTION: Optional disconnect (set to inputs) during output fault conditions.

INTERNAL 5V LOGIC SUPPLY: The internal logic supply is designed for powering external logic circuits of up to 50mA maximum. The logic supply is internally protected with a self-resetting fuse. Fuse reset time < 1 hour.

NOTES

1. All channels power up configured as inputs.
2. All channels configured as inputs.
3. All channels configured as outputs.

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COUNTER/TOTALIZER INPUT

MAXIMUM COUNT: $2^{32} - 1$.

MAXIMUM INPUT RATE: 1MHz, rising or falling edge, programmable.

MINIMUM INPUT PULSE WIDTH: 500ns.

INPUT SIGNAL LEVEL: 200mV p-p (minimum), 42V peak (maximum).

THRESHOLD: AC (0V) or TTL logic level.

GATE INPUT: TTL–HI (Gate+), TTL–LO (Gate–) or NONE.

MINIMUM GATE INPUT SETUP TIME: 1µs.

COUNT RESET: Manual or Read + Reset.

SYSTEM INPUT MINIMUM READ SPEED: 1000 readings/second.

ALARM: Trigger generation is supported for a count match or counter overflow on any of channels 6 though 9.

ANALOG VOLTAGE OUTPUT

The isolated analog voltage output is designed for general purpose, low power applications.

OUTPUT AMPLITUDE[1]: ±12V up to 10mA.

OVERLOAD CURRENT: 21mA minimum.

RESOLUTION: 1mV.

FULL SCALE SETTLING TIME[2]: 1ms to 0.1% of output.

DC ACCURACY[3] ±(% of output + mV):
1 Year 23° ±5°C: 0.15% + 16mV.
90 Day 23° ±5°C: 0.1% + 16mV.
24 Hour 23° ±5°C: 0.04% + 16mV.

TEMPERATURE COEFFICIENT: ±(0.02% + 1.2mV)/°C.

10mV MAXIMUM UPDATE RATE: 350µs to 1% accuracy. System limited.

OUTPUT FAULT DETECTION: System fault detection is available for short circuit output/current compliance.

ISOLATION: 300V peak channel to channel or channel to chassis.

PROTECTION: Optional disconnect during output fault conditions.

MINIMUM GUARANTEED STABLE CAPACITIVE LOAD: 10nF.

NOTES

1. Programming up to 1% over full scale range is supported.
2. Measured with standard load shown in Figure 3.
3. Measured with >10MΩ input DMM (DCV, filter, 1 PLC rate). Warm-up time is 1 hour @ 10mA load with 3750-ST.

ANALOG CURRENT OUTPUT

The isolated analog current output is designed for 0–20mA or 4–20mA unipolar modes of operation.

OUTPUT AMPLITUDE: 0 to 20mA or 4 to 20mA.

COMPLIANCE VOLTAGE: 11V minimum.

MAXIMUM OPEN CIRCUIT VOLTAGE: 16V.

RESOLUTION: 1µA.

FULL SCALE SETTLING TIME[1]: 1ms to 0.1% of output.

DC ACCURACY[2] ±(% of output + µA):
1 Year 23° ±5°C: 0.15% + 18µA.
90 Day 23° ±5°C: 0.1% + 18µA.
24 Hour 23° ±5°C: 0.04% + 18µA.

TEMPERATURE COEFFICIENT: ±(0.02% + 1.6µA)/°C.

OUTPUT FAULT DETECTION: System fault detection is available for open circuit output/voltage compliance.

ISOLATION: 300V peak channel to channel or channel to chassis.

PROTECTION: Optional disconnect during output fault conditions.

NOTES

1. Measured with standard load shown in Figure 3.
2. Measured with <2Ω shunt DMM (DCI, filter, 1 PLC rate). Warm-up time is 1 hour with 3750-ST.

GENERAL

CONNECTOR TYPE: Two 50-pin male D-shells.

OPERATING ENVIRONMENT: Specified for 0°C to 50°C. Specified to 70% R.H. at 35°C.

STORAGE ENVIRONMENT: –25°C to 65°C.

WEIGHT: 1.27kg (2.80 lbs.).

SAFETY: Conforms to European Union Directive 73/23/EEC, EN61010-1.

EMC: Conforms to European Union Directive 2004/108/EC, EN61326-1.

POWER BUDGET INFORMATION:
Quiescent Power: 3300mW.
Digital Outputs Each Channel (1 through 5): 325mW.
Analog Channel Each (10 and 11): 820mW.
Totalizer Channel All (6 through 9): 730mW.

Analog channels and counter channels may optionally be turned off to conserve system power.

See Chapter 8 of the Series 3700A user's manual for more detailed information.

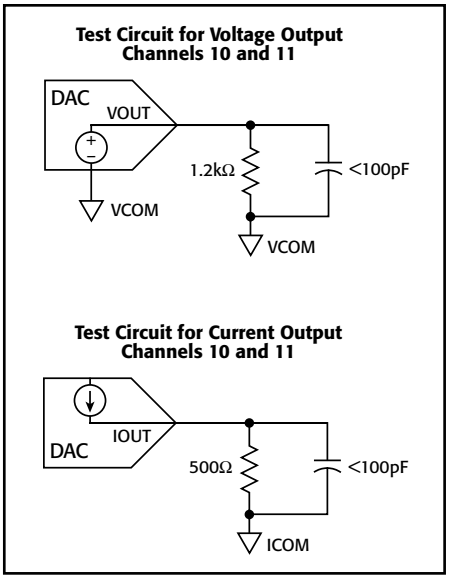

Figure 3. Standard load test circuits