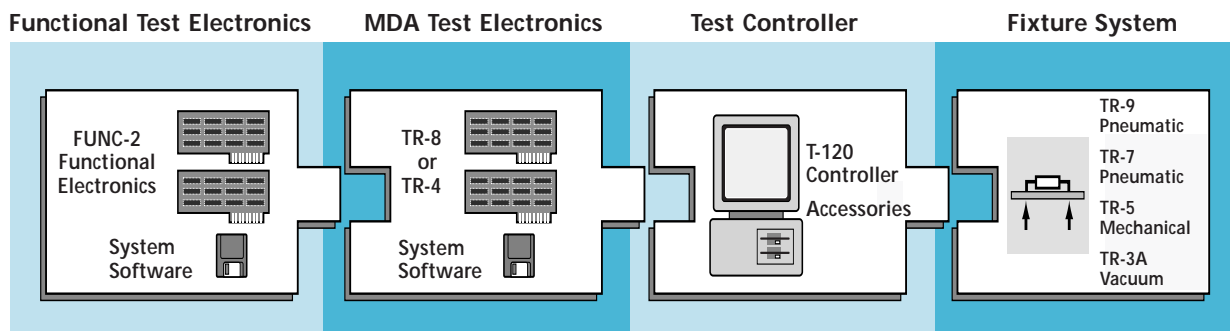


Model FUNC-2 Functional Test Module



Product Features

- Power-on test of assemblies
- Integrated test hardware/software
- Measure AC/DC voltages, resistance, frequency, time, digital signals
- Source DC, sine, and square waves, power, digital
- Relay switching, undedicated relays, GPIB
- Low-cost

Applications

- *Analog and digital assemblies*
- *Components*
- *Final test*
- *Incoming inspection*

Overview

By combining manufacturing defects analysis (MDA) and functional test capabilities, CheckSum provides a single low-cost, high-speed system that can be used to first passively test your assemblies to find manufacturing faults such as shorts, opens, and improper component installation then power up the assembly to check for proper circuit operation. A CheckSum Model TR-8 or Model TR-4 MDA System provides the advantages of low cost, easy programming, fast test times, fault-finding to the component level, and isolation of faults before power-up on the unit-under-test (UUT). Typical fault coverage with an MDA is 80%-90%. To help isolate remaining faults, the Model FUNC-2 Functional Test System provides the capability to power-up the UUT to find performance-oriented problems. You can use CheckSum's Model TR-8, Model TR-4 or FUNC-2 independently, or by taking advantage of the modern, highly integrated design of the systems, you can perform both MDA and functional test for significantly less than the cost of alternative testers that provide only MDA or functional test capabilities. By sharing the development of the test fixture and providing a unified programming and operating environment, costs are cut even further.

General Capabilities

The CheckSum Model FUNC-2 Functional Test System is designed to be used as an extension to a CheckSum MDA System. While this brochure refers to the Model TR-8 MDA System, the Model FUNC-2 can also be used with a Model TR-4 MDA System. In addition, it can be used as a stand alone functional tester. Functional testing is performed by powering up the UUT, then applying stimulus to sensor and switch inputs while monitoring UUT outputs for proper response. The CheckSum Model FUNC-2 provides the capabilities used for most functional testing requirements:

- Switch closures for supplying power to the UUT or controlling relays on the assembly being tested
- Fused DC power from the PC for powering UUTs requiring low power, or for external interfaces
- Relay MPX points that can be used for measurement of voltages greater than $\pm 12V$ or with the necessity for low path resistance
- A DMM for measurement of AC and DC voltages and low resistances
- A counter/timer for measuring oscillator frequencies or event times
- A function generator for sourcing DC, sine or square waves
- Digital I/O bits for logic sourcing, sensing and controlling external hardware, or direct control external relays.

TEST ACCESSORIES

Model FUNC-2 Functional Test Module

- 16 back panel test points for signal switching (extendable in 50-point increments).

For unique or more sophisticated functional testing needs, the system can control GPIB instrumentation via an optional IEEE-488 interface that plugs into the PC bus.

System Architecture

All of the standard functional test capabilities are provided on one high-density AT-sized module that fits into the test controller (PC). A 50-pin ribbon-cable connector on the back of the module allows signal input and output to the test fixture. An internal bus connects the analog capabilities of the Model FUNC-2 Functional Test System with those of a Model TR-8 MDA System.

The Model FUNC-2 test points are used on UUT nodes that have voltages in excess of $\pm 12V$ that could damage the solid-state MDA switching. The Model FUNC-2 can use these points to make DMM and Counter-Timer measurements on the UUT. These points can also be accessed by the MDA for standard TR-8 measurements.

The Model FUNC-2 signal sources are available unswitched at the FUNC-2 back panel or they can be routed into the Model TR-8 MDA solid-state switching. Up to 4 stimuli can be simultaneously present at the MDA test points - a sine wave, square wave, DC voltage, and user-supplied source. Other TR-8 or FUNC-2 test points can be simultaneously used to make a measure-

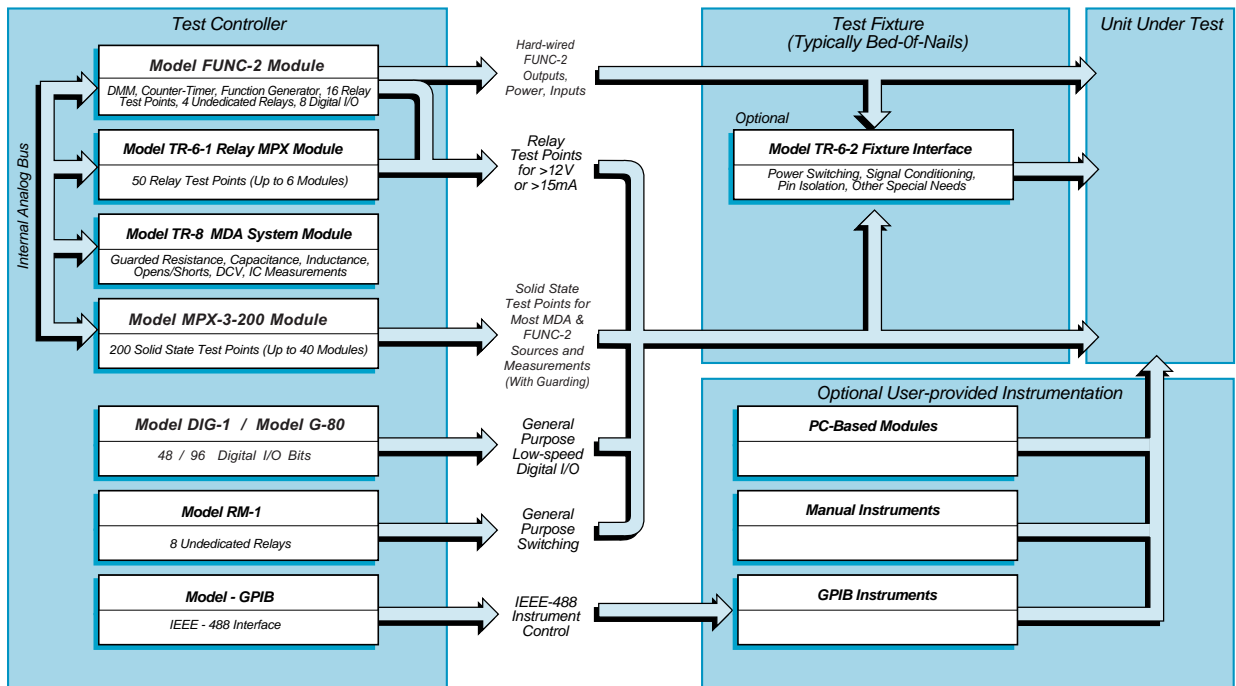
ment. The system's test point count can be extended with additional MPX modules.

The software package is easy to learn and use. Since the Model FUNC-2 Software is integrated with that of the Model TR-8 MDA System, tests can mix MDA and functional elements. The optional GPIB interface allows you to add other instrumentation for special needs. Using the EXEC test, you can also integrate other hardware elements or unique features via .EXE or .COM files supplied by other vendors or which you can write in your favorite language and call from within the test program.

Configuration

Typical MDA/Functional test configurations begin with Model TR-8 and MPX-3-200 MDA elements as described in the Model TR-8 information. Basic functional test capabilities are supplied with the addition of a Model FUNC-2. If the UUT has more than 16 points exceeding ± 12 volts when powered up, a Model TR-6-1 Relay MPX module is installed for each additional 50 points.

For standalone functional test applications, order one Model FUNC-2 Test System and one Model TR-6-1 Relay MPX module for each 50 test points necessary (in excess of the 16 points on the FUNC-2). Note that the source capabilities of the Model FUNC-2 are available at the back panel or through the MPX-3-200 test points, and do not route through the Model FUNC-2 test point matrix.



Model FUNC-2 Functional Test Module

If you would like to control IEEE-488 instrumentation, order the Model-GPIB interface kit, which requires one controller slot.

If you would like to perform any special interface functions near the UUT, such as switching high-current or buffering signals, add a Model TR-6-2 Interface Kit. It can be used in the basic configuration or populated to meet your specific needs from various accessory kits.

Self-Test/Calibration

Self-test software is included to confirm proper operation of the Model FUNC-2 and Model TR-6-1. In addition, if traceability is required, software-guided calibration is included with the system. Calibration requires an external calibrator supplying AC/DC voltages (e.g., Fluke 5100) and a DMM for measuring current (e.g., Fluke 8840).

Specifications

Digital Multimeter

The DMM is used to make voltage and resistance measurements on the UUT. It can make voltage measurements through the FUNC-2 test points (up to ± 250 volts) or through the TR-8 test points (up to ± 12 volts). Low resistance measurements, through the back panel or FUNC-2 test points, augment the Model TR-8 MDA resistance measurement capabilities.

DC Voltage Measurement

Ranges	200 mV, 600 mV, 2V, 6V, 20V, 60V, 200V, 600V (max input 250V), autorange
Accuracy	0.5% of range
Resolution	.05% of full range

AC Voltage Measurement

Ranges	200 mV, 600 mV, 2V, 6V, 20V, 60V, 200V, 600V (max input 250V RMS), autorange
Accuracy	2% of range (40Hz to 1KHz) 5% of range (1KHz to 10KHz)
Resolution	.05% of full range
Input	AC or AC+DC Coupled

Resistance Measurement

Ranges	2 Ω , 6 Ω , 20 Ω , autorange (including lead resistance)
Resolution	.05% of full range
Accuracy	3% of range $\pm 2\Omega$
Ohms Source	100 mA

DMM General

Voltage Levels	The DMM can take fully floating differential measurements up to 250 V, either lead, on all ranges
Measurement Speed	~60mSec (AC readings and filtered DC readings ~500mSec)

Counter/Timer

The counter/timer is used to measure frequencies and periods. It is typically used to measure UUT oscillator frequency and other UUT signal frequencies. Inputs can be taken from the unswitched back panel connector, the FUNC-2 switching, or through the TR-8 test points. The DMM input (usable to 50 KHz) can be accessed for low-level differential inputs through the FUNC-2 test points. The Model TR-6-2 Interface can be used to amplify, buffer, and divide frequency signals in close proximity to the UUT.

Input Frequency Range	DC to 10 MHz (higher frequencies can be prescaled by a Model TR-6-2 in the test fixture - see Test Accessories)
Channels	2 plus DMM input
Triggering	Programmable threshold -2.2V to +2.2V
Input Level	300 mV to 5 V (60 mV to 250 V through DMM channel)
Coupling	AC/DC
Common	Ground-referenced (except on differential input ranges of DMM)
Frequency Ranges:	5 KHz, 50 KHz, 500 KHz, 5 MHz, 10 MHz
Resolution:	.0015% of range
Accuracy:	.01% ± 2 counts
Period Range:	12.8 μ S - 128 Sec (in 8 decade ranges)
Resolution:	.0015% of range
Accuracy:	.01% ± 2 counts
Totalize Range	1 to 65,535 counts (up to 5MHz input)
Pulse Width	Same specifications as period, with start and stop slope selectable

Function Generator

The Function Generator is used to provide UUT stimulus. It can provide DC, sine and square waves. Both square wave output levels are separately programmable to provide full flexibility. The stimulus is available at unswitched Model FUNC-2 back panel outputs, or at Model TR-8 test points. All three stimuli are available simultaneously with some limitations (sine and square frequencies must match; DC, sine, and square wave must be ground-referenced). When switched through the MDA test points, the total path resistance is 1 K Ω or

TEST
ACCESSORIES

Model FUNC-2 Functional Test Module

less. Each function generator output can source up to 10mA into low impedances, but the current/voltage is limited by the switch resistance.

Functions	DC Voltage / Sine Wave / Square Wave
Frequency Range	DC, 1Hz - 50KHz in 1Hz steps
Common	Ground-referenced
Frequency Accuracy	.01%
Amplitude Accuracy	1% of full scale (DC) 5% of full scale (20Hz to 1KHz) 10% of full scale (1KHz to 20KHz)
Sine Amplitude	100mV to 2V (1mV steps) 2V to 20V (10mV steps)
Square Wave Amplitude	Each level programmable from -10V to +10V (5mV steps)
DC V Amplitude	Programmable from -10V to +10V (5mV steps)

Digital I/O

The Model FUNC-2 provides digital capabilities allowing you to perform low-speed digital input and output for test of UUT functionality. The digital I/O capability can also be used to drive relays or send and receive digital signals and switch closures controlling test flow.

The standard Model FUNC-2 includes eight bits of digital I/O. These bits are available at the FUNC-2 back panel. Open-collector outputs can directly control external relays requiring up to 100mA when used with an external source. The digital outputs can be left floating, or jumper-connected on the FUNC-2 through pull-ups to either +5V, +12V or +3V. The status of the eight bits can be read back by the system. The digital I/O capability of the system can be expanded by addition of a Model DIG-1 or Model G-80 Digital I/O Module.

Basic FUNC-2 Digital I/O

Bits	8
Direction	Output with readback
Logic Family	5V TTL/LS/HCMOS
Outputs	Open-collector with pull-up
Distribution	Back panel connector only
Sink/Source	Sink 100 mA. Source is determined by pull-up resistor.
Pull-ups	10K pull-up to +5V, +12V or 3V

Undedicated Switching

The Model FUNC-2 provides four undedicated relays, available at the back panel, that can be used for various testing needs such as switching power or other signals to the UUT. Typically, all of the signals from the Model FUNC-2 back panel connector are available inside the

test fixture. When a test fixture is built for a particular UUT, the FUNC-2 signals and UUT test points can be connected to undedicated relay connections for use during the power-on tests. An accessory 16-pin ribbon cable header on each Model TR-6-1 MPX Module provides four relays for custom use.

Undedicated Switches	4 SPDT relays hardwired to back panel (12 connections)
Contact Rating	250V, 1A, 30 VA resistive switched
Isolation	250V RMS

Power Outputs

The Model FUNC-2 makes PC-power available at the back panel connector. Each supply is fused on the FUNC-2 with a plug-in fuse. Fuse status can be checked by system self-test. The power outputs can be used to power UUTs with limited current requirements.

The power outputs can be switched to the UUT with built-in relay switching or undedicated relay switches.

Fixed Outputs	+12V fused at 1A, -12V fused at 0.1A +5V fused at 1A, GND unfused
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Test Point Switching

The Model FUNC-2 provides 16 relay-switched test points at its back panel. These test points can be expanded in 50-point increments by adding TR-6-1 Relay Modules (up to six TR-6-1 modules can be configured in a system).

The relay test points are used for UUT connections that exceed ± 12 volts with respect to the computer chassis when power is applied to the UUT. The Model FUNC-2 can make DMM and Counter/Timer measurements at these points. In addition, unguarded 2-wire Model TR-8 MDA measurements (e.g., resistance, capacitance and inductance) can be made through these points.

FUNC-2 Test Point Matrix	16 relay-switched test points. Each relay test point may be specified as a high or low for the DMM measurement.
Model TR-6-1 Relay Module	The matrix may be expanded in 50-point increments with a Model TR-6-1 Relay Module. Each Model TR-6-1 module uses one full-length, full-height PC slot.
Model TR-8 Test Points	2-wire measurements from the Model TR-8 can be made through the FUNC-2 matrix. FUNC-2 source and measurement capabilities (except high-voltage and resistance measurement) are available from all TR-8 test points. Multiple sources can be active at TR-8 test points while making measurements.