DIT-MCO INTERNATIONAL

wiring analyzers מבדקי חיווט
wire harness testing

נציגים ומפיצים בלעדיים בישראל - יעוץ • מכירה • שרות
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TABLE OF CONTENTS

WIRE HARNESS TESTING

Today's high technology products contain many interconnections. With higher complexity comes a higher probability of unwanted leakage, shorted conductors and wrong terminations. Early detection of these faults produces cost savings and improves quality.

Maintenance and repair services also require verification of the wire harness. Ensuring the assembly meets its original performance standards requires continuous maintenance and testing.

What is a wiring analyzer?

The term "cable tester" does not accurately reflect the robust capabilities of DIT-MCO's test systems. DIT-MCO's wiring analyzers test more than just cables and go beyond the simple measurements of cable testers. DIT-MCO's wiring analyzers verify wiring integrity in products such as:

- Wire harnesses and looms
- Backpanels and motherboards
- Chassis and electrical cabinets
- Relay and control assemblies
- Assembled vehicles such as aircraft, rolling stock, or military vehicles
- Communication systems, racks and shelves

A wiring analyzer finds faults and tells you what is wrong by applying tests to determine if the interconnections and components are good. If an error exists, the wiring analyzer performs an "analysis" to tell you what is wrong and where it failed.

Why use DIT-MCO test equipment?

DIT-MCO has developed test equipment that utilizes high voltage and high current to provide the greatest level of fault detection. Simply stated, you will find more problems using higher values of stimulus.

But you are not limited by the DIT-MCO test system as everything is programmable. Stimulus limits keep the testing safe and non-destructive in all environments. You can even test electronics with the stimulus limited to 0.25V preventing activation of solid state devices.

In addition to offering a system flexible enough to meet a wide variety of test requirements, DIT-MCO has a proven track record in customer support. With DIT-MCO, you will be working with a company that can support your system not only next year but also in the next decade and beyond.

Test Specifications

Before testing, you must first determine what test specifications apply to your product. These may be internal quality control specifications, your customer's specifications, or accepted industry standards. Some industry specifications that might apply are as follows:

MIL-STD-202 Requires the insulation resistance measurements to be performed using one of three test conditions; 100, 500 or 1000 VDC.

EN 2283 European Standard for Aerospace requires stimulus of 1300 VDC for most wiring. Exceptions allow 500 and 50 VDC stimulus for certain types of circuits.

IEEE-16 International Standard for Electric Control Apparatus for Land Transportation Vehicles. Requires test voltage of two times the rated voltage plus 1000 VAC.

Besides test specifications, you must also consider the production demands on the test system.

- How fast must the testing cycle be completed?
- How many products will be tested over the life cycle?
- Does the test solution need to be portable?
- Will tests be conducted in a workshop setting or in an assembly line?

If you have a high volume or fast test cycle requirements, consider integrating additional tooling making it easier, faster, and more ergonomically sound for the test technician. Tooling might consist of support stands, booms, or lifts for the interface cables to position the cables next to the required connection point.

DIT-MCO Test Systems

DIT-MCO takes testing one step beyond simple comparison-to-limit, GO/NO-GO resistance testing. Positioned for today's complex products, the instrumentation provides great testing flexibility. In a DIT-MCO test system, the basic instrument is the comparator that functions as both a stimulus generator and a measurement instrument.

Each system comes complete with the capability to test:

- Circuit continuity for opens
- Insulation resistance verification for shorts
- Dielectric breakdown (hipot) tests
- Resistors
- Relays
- Diodes
- Capacitors
- Switches and circuit breakers

Product Adaptation

Once you determine the testing requirements, you need to connect the test system to your Unit Under Test (UUT). Product adaptation takes many different forms from simple cables to complex fixtures. DIT-MCO's experience in adaptation means users can start testing upon installation of their test system.

Our engineers have designed fixtures to contact backpanels, wired assemblies and circuit boards as well as the facility tooling required to accommodate the testing. DIT-MCO's Special Products Group can provide a complete turnkey installation including all design, development and manufacturing required to test your product.

Error Reporting

DIT-MCO allows you to capture product errors found during the test process printed in the form of an error log. You can have errors identified in either DIT-MCO addressing, your product terminology, or both. You will find the error logs easy to format to meet your particular needs. Use the error log as a process control tool to improve manufacturing processes, product design, and speed up repair.

Fault Diagnostics and Repair Support

Nobody but DIT-MCO gives you the features that help you debug and rework your product.

- DIT-MCO includes the Write Error Program (WEP) function which builds a test file containing only those tests that produced errors. Using WEP allows you to repair the product as you go, repeating the fault-causing instruction until the fault clears.
- You can also use the Manual Mode of operation to help find and diagnose product faults. Manual Mode operation gives you complete interactive control of the system without first building a test file.
- The optional Fault Locator pinpoints the location of shorts and opens within the circuit so that you do not need to sort through intermediate connections in search of the fault.
- Graphic Error Display lets you visualize the fault instead of reading text only reports.

Tooling supports adapters to facilitate the testing.

Customer Support

Once you own a DIT-MCO system, you receive on-going technical advice and repair support. DIT-MCO's success in the automatic test business over the past 60 years is due to setting high priorities for customer support. With service technicians located throughout the world, we support thousands of installations worldwide.

Need to replace a board or component in your test system? DIT-MCO ships them overnight using air express. Our centralized repair service location provides those repairs or exchange services at a minimum cost.

Training

DIT-MCO offers training of maintenance, operation, and programming personnel at our centrally located headquarters. Choose from standard training or work with our staff to develop training customized for your application. You also have the option of receiving training at your facility.

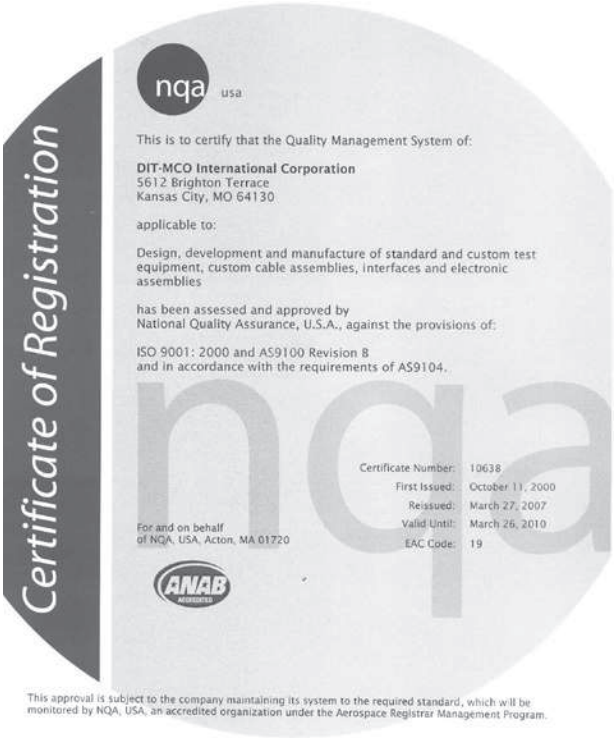
Certifications

DIT-MCO products have been tested by independent laboratories for EMI and safety as required by the European Union for CE conformance. When required, DIT-MCO systems have been tested by Underwriter's Laboratory (UL) providing a site inspection and compliance to UL standards.

DIT-MCO's quality system is certified to ISO 9001 standards. DIT-MCO also achieved certification to the Aerospace Quality standard, AS-9100, the singular quality management standard created for the precise needs of the aerospace industry. This international standard is utilized throughout the aerospace industry for quality control systems with requirements that exceed ISO-9000.

ISO 9001 COMPLIANT

AS 9100 CERTIFIED



DIT-MCO is certified to ISO-9001 and AS9100

Model 2115

A bench top system designed for smaller applications, the system can easily be located in the fabrication department, test department, or even in the field. The 2115 answers the need of lean applications where the tester is located right on the fabrication bench.

Model 2135

On-going maintenance requires portable test systems. The Model 2135 provides the ability to test assemblies at the depot level or even in the field. The system can be carried and is housed in a tough enclosure for transportation.

Model 2650

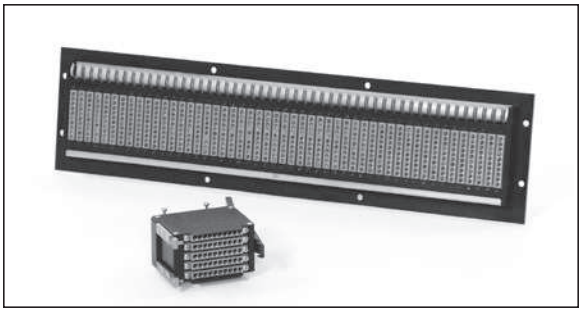
The Model 2650 offers flexible configurations and test options making it the most versatile test solution available. Utilizing distributed switching system architecture allows the switching modules to be centralized or remotely located.

Model 2651

Designed for field maintenance and depot use with MIL-STD-810 compliance, the Model 2651 offers a rugged enclosure and compliance with harsh environmental specifications.

EasyMate® Interface System

The EasyMate connector system uses modular blocks matched to the unit under test. This results in simple test adapters perfect for departments looking to reduce interface inventories and costs.



EASYMATE® TEST INTERFACE SYSTEM

The EasyMate® connector system utilizes modular blocks so that you can match the test system interface to the tested assembly's connector. This results in simple, one to one, interface cables which can easily be reused on other products.

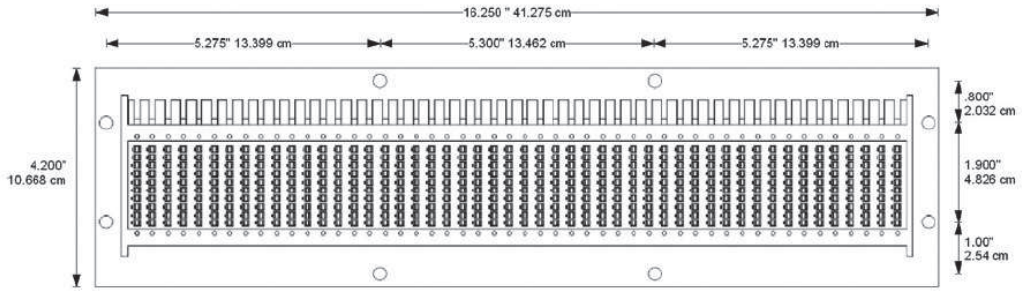
The EasyMate connector system is the perfect test interface for wire harness shops, assembly testing and maintenance depots where a common inventory of test adapters is needed.

Unlike other interfaces, the EasyMate is configured in 10 point increments reducing wasted test points and resulting in lower cost. No longer must you design complicated, multiple branched test adapters.

EasyMate is manufactured with a robust metal body to resist damage and withstand rough treatment. Operators will appreciate the quick insertion with one downward motion and low insertion force. The latch retains the connection during the testing. The contacts are plated with twenty-five microns of gold over nickel to provide a reliable electrical contact with low resistance. The insertion of the connector creates a wiping action resulting in a low current capable connection. The test interface module contains 500 contacts (or optionally 1000) while the plugs range from 10 to 140 pins.

Traditional connectors require complex branched cables while the EasyMate allows for simple one-to-one cables.

Mounting Dimensions



EasyMate Specifications

Insulator	DR48
Insulation Resistance (500 VDC)	>5 GΩ
Breakdown between contacts	2000 VAC
Current Rating	5A
Contacts	25 microns gold over nickel
Contact resistance	3 mΩ
Life	2000 cycles

EasyMate Part Numbers

100229-500	500 Point Interface
100230-XXX	10 – 140 Pin Plug (XXX is pin count)
301385-001	Interface Receptacle
510727-003	Connector Pin

MODEL 2115 BENCHTOP 1500 VOLT

The Model 2115's compact size makes it the ideal choice for many bench top or portable test applications. However this does not mean you sacrifice any functionality. The 2115 delivers a full 1500 volt isolation and 2 amp continuity test stimulus. With the optional AC hipot test providing 1000 VAC test stimulus, you will meet all test requirements.

The heart of the system is the Master Switching Unit (MSU) which contains all of the control and instrumentation electronics as well as up to 1000 test points of switching. If you need more test points, you can add Expansion Switching Units (ESU) with up to 1000 test points per unit. The system expands to a total of 15,000 test points.

Each MSU and ESU fits into a standard rack mount enclosure. For applications requiring larger test systems, you may mount the MSU and ESU chassis into a larger cabinet. This provides a centralized test interface and protects the interconnect cables between the units. Select from several standard enclosures or request a customized solution to meet your requirements.

The interface connection can also be customized to meet your application. Choose from one of DIT-MCO's standard options or specify one unique to your requirements.

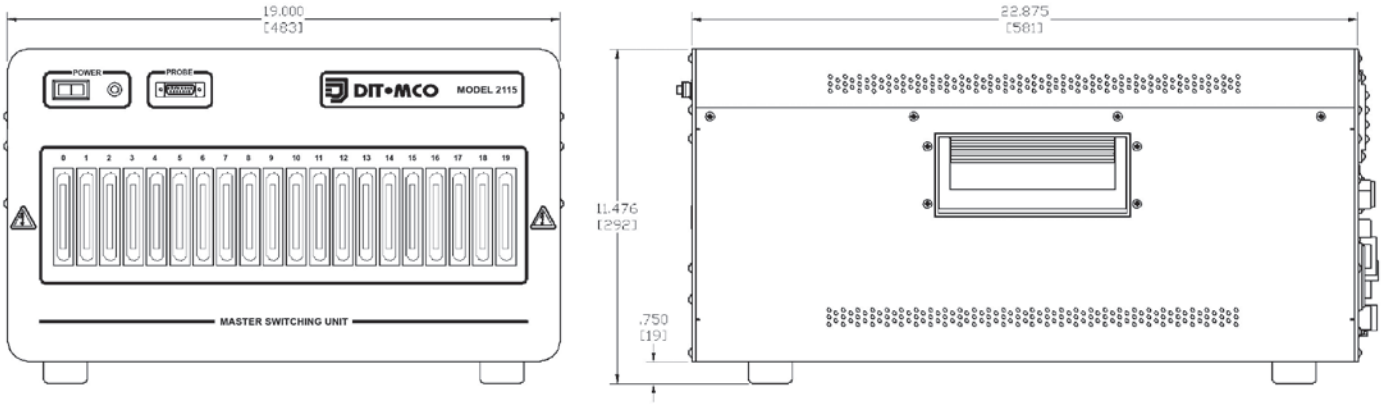
There is a connection for a Continuity Test Probe (CTP) on the front of the 2115 MSU. The probe can be used to verify connections to loose wires or other non-adapted test points found in the assembly. See the CTP under the "Options" section.

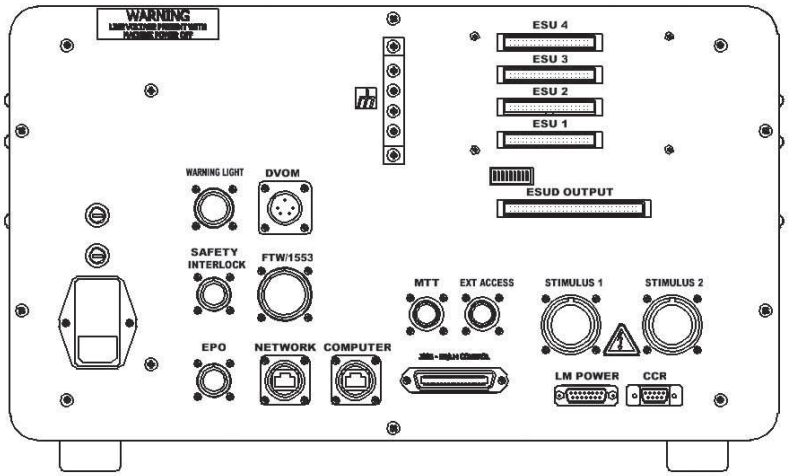
Model 2115 Specifications

Test Points	Up to 15,000 typical
Stimulus	1500 VDC / 1000 VAC / 2A
AC Input Power	115/230 V selectable, 50/60 Hz
Volt Amperes	MSU 300 (1047 BTU) ESU 200 (698 BTU)
Operating Temperature (excluding computer)	60 to 90°F (15.5 to 32.0° C)
Humidity	8% to 80% non-condensing (High humidity conditions will degrade leakage testing)

2115 Master Switching Unit (MSU)

The 2115 Master Switching Unit (MSU) is a self-contained unit with a maximum of 1,000 test points. The MSU controls external Expansion Switching Units (ESU) for a switching configuration of up to 15,000 test points. The MSU contains the test system control and instrumentation: the NetLink analyzer controller, the SMU measurement instrument and the switching control terminal selector.



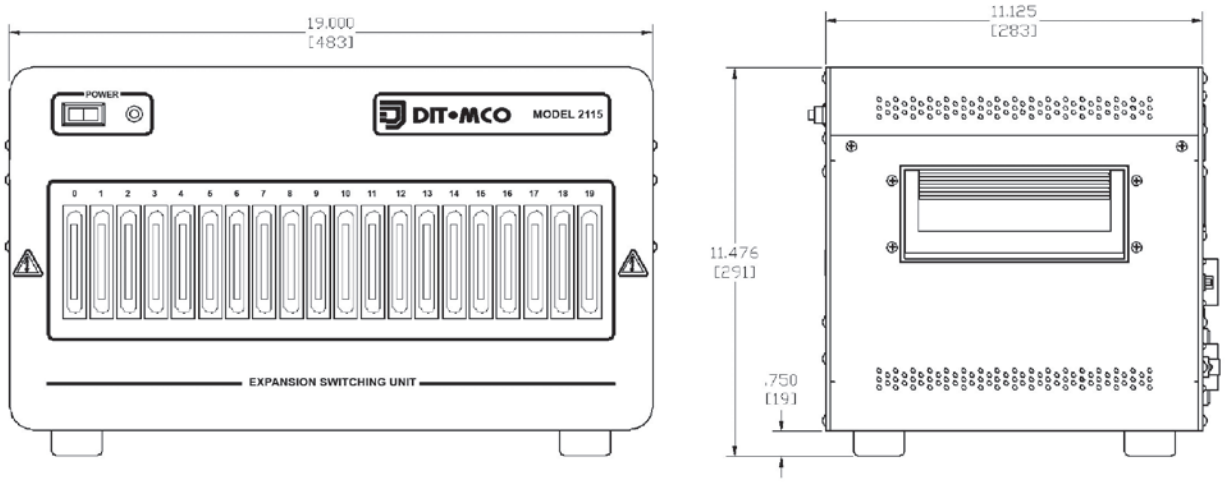


REAR VIEW

MSU Dimensions	22.86" (58.1 cm) Length 27.86" (70.8 cm) Length with Custom Interface 19" (48.3 cm) Width 11.48" (29.2 cm) Height
MSU Weight (with 1000 test points)	85 lbs. (39 kg)

2115 Expansion Switching Unit

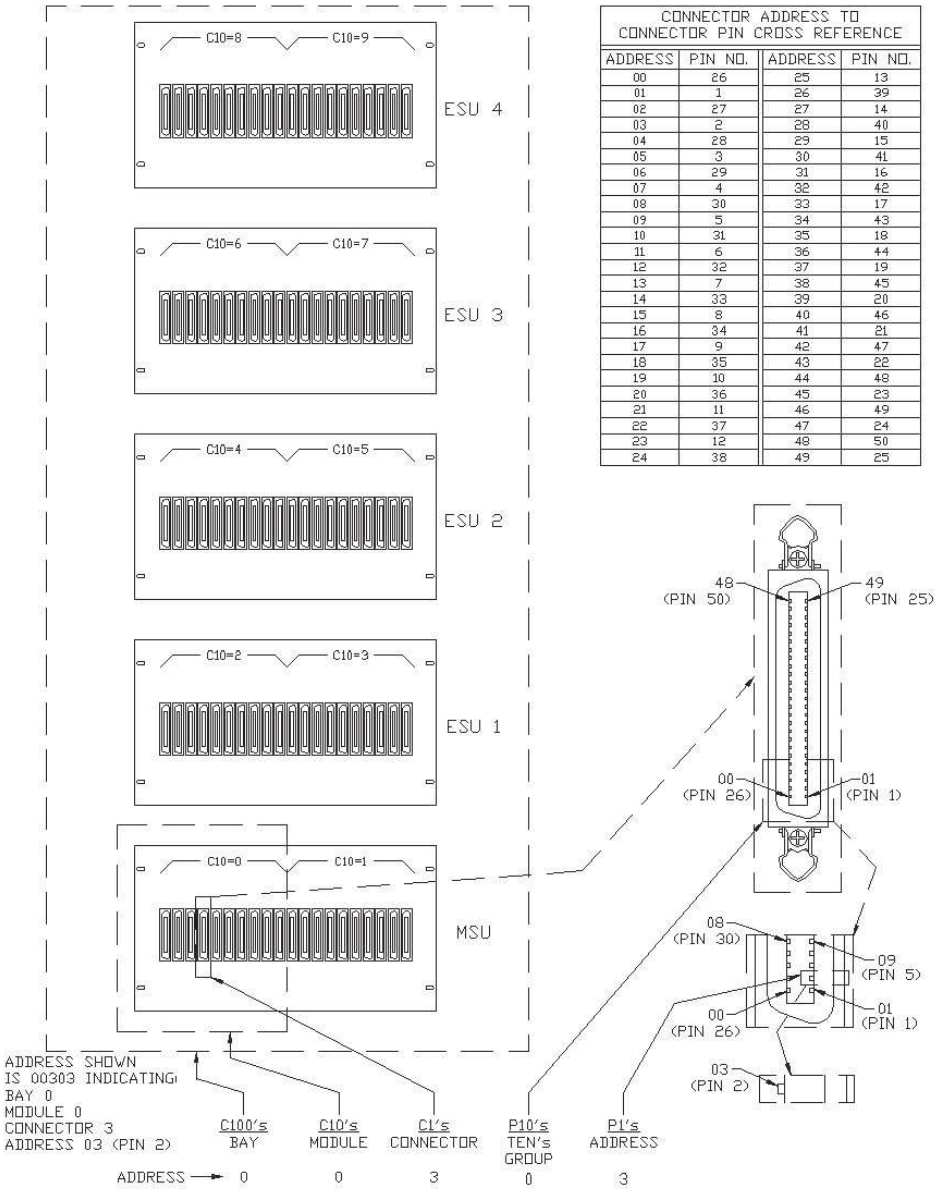
The Expansion Switching Unit (ESU) contains up to twenty switching cards for a maximum of 1,000 test points. The ESU can be populated with twenty switching or LM cards.



ESU Dimensions (with case)	11.13" (28.3 cm) Length 16.13" (40.0 cm) Length with Custom Interface 19" (48.3 cm) Width 11.48" (29.2 cm) Height
ESU Weight (1000 test points)	45 lbs. (21 kg)

2115 Test Addressing

Each 50 point switching board is addressed using test addresses 0 to 49. This is referred to as the "pin" number address referring to the connector pin. The next higher digit in the test addressing indicates the connector number starting from 0 and incrementing through the entire system. The MSU supports up to 20 switching cards so the connector number in the MSU range from 0 to 19. The test address is comprised of five digits in the format of connector number – pin number or CCC-PP. The address range of the MSU would then be from 00-00 to 19-49.



CONNECTOR ADDRESS TO CONNECTOR PIN CROSS REFERENCE

ADDRESS	PIN NO.	ADDRESS	PIN NO.
00	26	25	13
01	1	26	39
02	27	27	14
03	2	28	40
04	28	29	15
05	3	30	41
06	29	31	16
07	4	32	42
08	30	33	17
09	5	34	43
10	31	35	18
11	6	36	44
12	32	37	19
13	7	38	45
14	33	39	20
15	8	40	46
16	34	41	21
17	9	42	47
18	35	43	22
19	10	44	48
20	36	45	23
21	11	46	49
22	37	47	24
23	12	48	50
24	38	49	25

2115 Switching System

The 2115 utilizes a modular switching board with 50 test points that removes easily for servicing. The interface connector is a 50 pin Ribbon style connector rated for 1500V.

Mating Connectors for 2115

IDC Connection	025-01578-1150
Solder Connection	025-01578-1150

MTT

The MSU provides a connection for bused test points through the Multiple Terminal Test (MTT) connector found on the backside of the MSU. There are four (4) MTT test points which are typically connected to ground and power buses in the assembly. For more information on the MTT, see MTT under the section "Standard Features."

Mating Connectors for 2115 MTT

DIT-MCO Part	025-01627-0005
Number	005-01101-0010 (Strain Relief Clamp)
MS Part	MIL-C-38999
Number	MS2746711F5P

External Access

There is a connection for external access found on the backside of the MSU. The External Access allows for another instrument to access the assembly under test through the DIT-MCO switching system. For more information on External Access, see the section "Standard Features."

Mating Connectors for 2115 Ext. Access

DIT-MCO Part	025-01627-0007
Number	005-01101-0010 (Strain Relief Clamp)
MS Part	MIL-C-38999
Number	MS2746711F54P

Safety Interlock

The safety interlock connection allows the user to integrate a safety device with the test system. The safety interlock is must be closed when AC stimulus is active. If the interlock is open while AC stimulus is active, power will be removed from the tester resulting in a termination of the test operation.

Mating Connectors for Safety Interlock

DIT-MCO Part	025-01373-0002
Number	005-02524-0001 (Backshell)
MS Part	MS3106A-12S-3P
Number	MS3057-4A (Backshell)

Model 2115 External Energization

External Energization allows you to supply power under the test control to the UUT. The Module 2115 offers a Latching Matrix (LM) card that plugs directly into the switching unit (MSU or ESU). Additionally, a module that supports only LM boards is available as a Latching Matrix Unit (LMU).

Each LM card offers 10 Form "C" relays on the board and occupies the same space as a regular switching matrix board. For a switching module to utilize the LM boards and LM controller board, it must reside in the switching unit. Each LM controller board supports up to 10 LM boards.

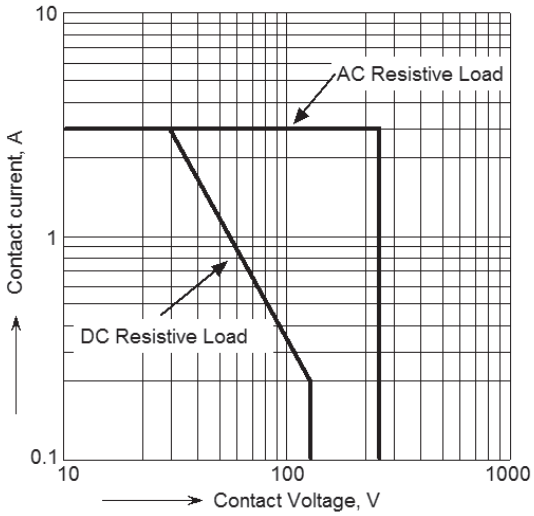
Latching Matrix Ratings (resistive)	
Max. switching power	1250 VA, 150 W
Max. switching voltage	250 VAC, 125 VDC
Max. switching current	3 Amp

The 2115 LM board is rated for a maximum of 3 A constant current. However, if the relay is switched with power connected (switched hot), then the current is dependent on the switched voltage according to the Switched Voltage chart.

In DC applications, the relay can switch up to 30 V at 3 A. As the voltage increases up to 125, the switched current decreases to a maximum of 200 mA at 125 V. In AC applications, the relay can switch up to 250 VAC at 3 A.

Latching Matrix Power Supply

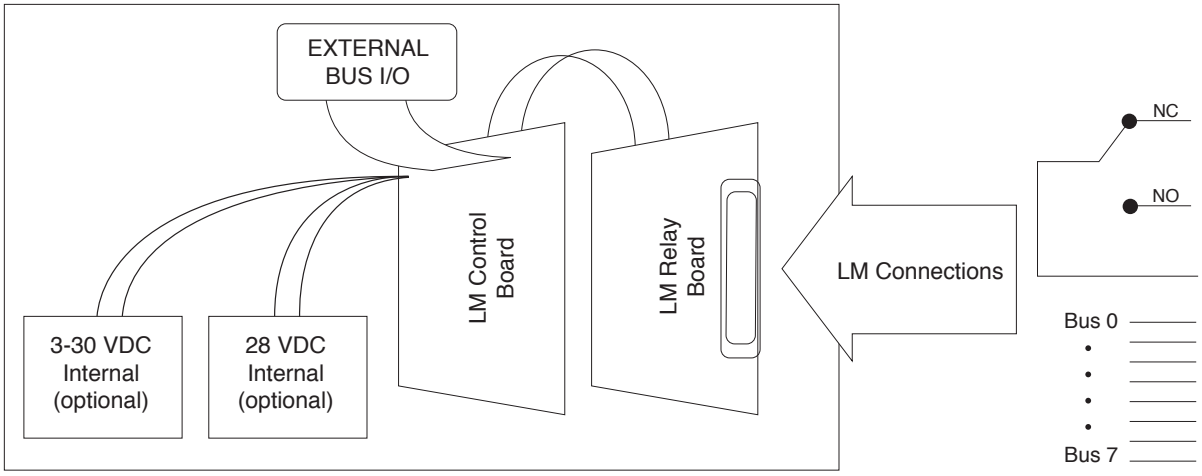
DIT-MCO offers optional fixed 28 VDC and programmable 3 – 30 VDC power supplies which are part of the MSU assembly. Additionally, a 28 VDC power supply can be added to any switching unit. External power supplies can be provided with fixed or programmable DC and AC sources.



Latching Matrix Configuration

Each of the LM boards utilizes a 50-pin connector accessible from the front of the switching unit. This connector provides connections to each of the 10 relay's normally open, normally closed, and common contacts. Additionally, there are 8 bused connections which can be used for power supplies. The bused points are wired to an I/O connector on the back of the unit. Additionally, if an internal 28 VDC power supply is used, the power supply is connected to two of the bused points. This flexibility allows you to use the latching matrix relays however you desire by making the appropriate connections to the I/O connector.

MSU LM Configuration



PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
1	K0 NC	26	K0 COM	17	Power 1
2	K0 NO	27	K1 NC	18	Power 2
3	K1 COM	28	K1 NO	19	Power 3
4	K2 NC	29	K2 COM	20	Power 4
5	K2 NO	30	K3 NC	21	Power 5
6	K3 COM	31	K3 NO	22	Power 6
7	K4 NC	32	K4 COM	23	Power 7
8	K4 NO	33	K5 NC	24	Power 8
9	K5 COM	34	K5 NO		
10	K6 NC	35	K6 COM	42	Power 1
11	K6 NO	36	K7 NC	43	Power 2
12	K7 COM	37	K7 NO	44	Power 3
13	K8 NC	38	K8 COM	45	Power 4
14	K8 NO	39	K9 NC	46	Power 5
15	K9 COM	40	K9 NO	47	Power 6
				48	Power 7
25	Ground	50	Ground	49	Power 8

Typically, the LM boards are used to source power to the UUT. However, the relays can be used for any application where you need to provide a program controlled switch closure. This may include an interface to a control system or material handling process. You could also use the LM relays to connect other instrumentation to the UUT for a specialized test.

MODEL 2135 PORTABLE 1000 VOLT

When you need portability to take the tester to the product, you'll appreciate the convenient packaging of the Model 2135. Whether for production of new assemblies or maintenance of field installed systems, the Model 2135 is ready to move.

The Model 2135 is a portable tester that can be used to provide field support and maintenance. It is also used to test small assemblies requiring fewer than 300 points or 1000 points with expansion unit.

The system is enclosed in a strong but lightweight reinforced molded case. The enclosure is highly resistant to impact, moisture, corrosion, and has permanent color molded in to resist scratches and dents.

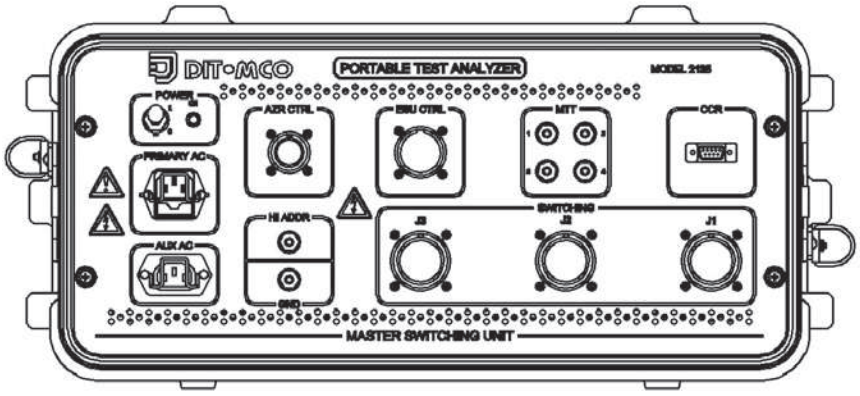
The basic system of 300 test points includes a controller and one switching unit. The Master Switching Unit (MSU) includes the instrumentation, power supplies, and control logic.

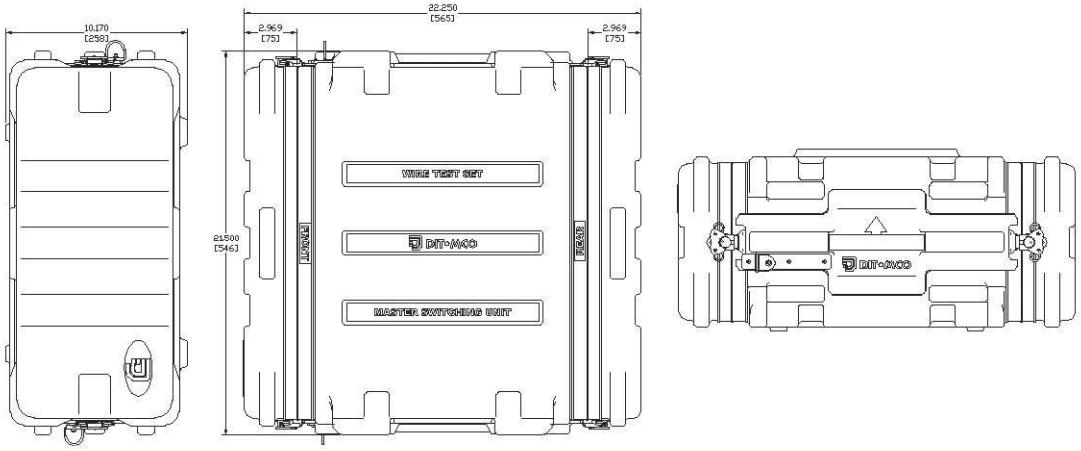
The Expansion Switching Unit (ESU) supports up to 700 test points.

The case includes storage for interconnection cables within the front and rear covers. The units can be stacked securely.

Model 2135 Master Switching Unit

The Master Switching Unit (MSU) provides the control, instrumentation and 300 test points. The interface is a 100 contact circular connector. Connections are available to power and control an Expansion Switching Unit.

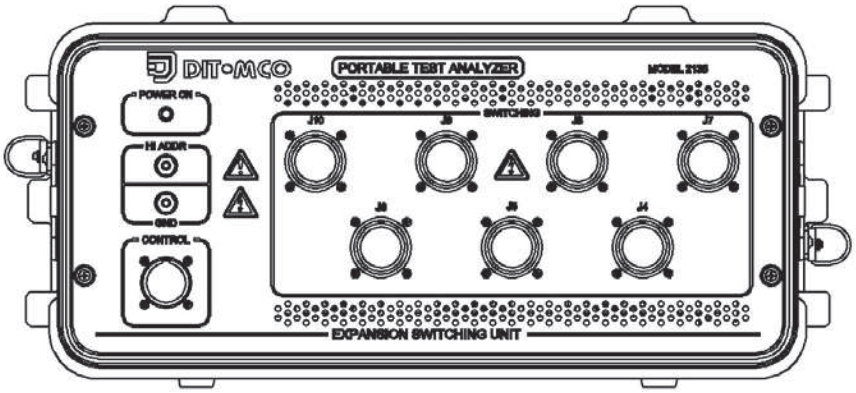


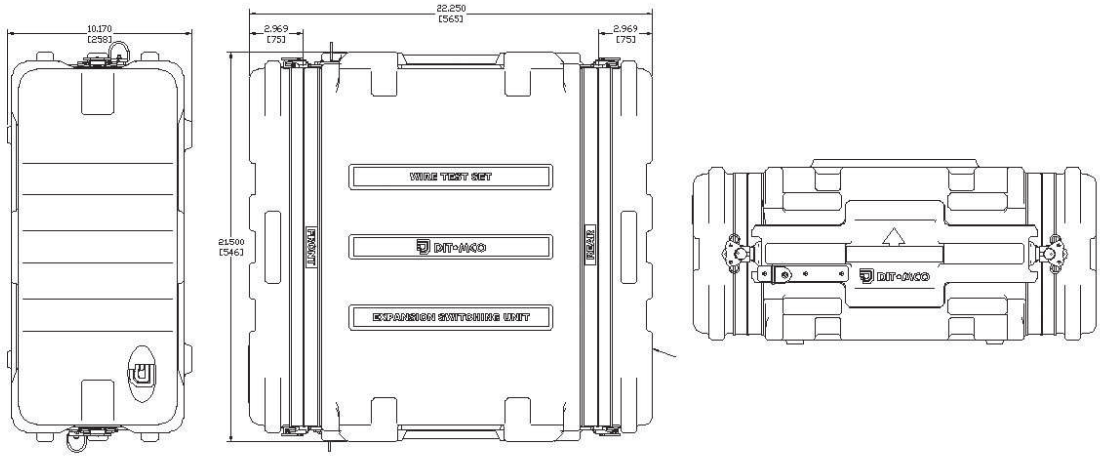


MSU Dimensions (with case closed)	22.25" (56.5 cm) Length 21.50" (54.61 cm) Width 10.17" (25.8 cm) Height
MSU Weight (with covers)	47 lbs. (21.3 kg)
Stimulus	1000 V / 2A
AC Input Power	100 – 240 V, 50/60 Hz
Volt Amperes	MSU 220 (768 BTU)
Operating Temperature (excluding computer)	60 to 90°F (15.5 to 32.0° C)
Humidity	8% to 80% non-condensing (High humidity conditions will degrade leakage testing)

Model 2135 Expansion Switching Unit

The Expansion Switching Unit (ESU) provides 700 test points through a 100 pin circular connector.





Volt Amperes	ESU 200 (698 BTU)
ESU Dimensions (with case closed)	22.25" (56.5 cm) Length
	21.50" (54.61 cm) Width
	10.17" (25.8 cm) Height
ESU Weight (with covers)	48 lbs. (21.7 kg)

MODEL 2650 1500/2000 VOLT

The DIT-MCO Model 2650 utilizes a modular switching system which provides flexibility in application. The switching modules can be centrally positioned as with traditional test systems or distributed over long distances.

Each module supports up to 1,500 test points. Only a simple daisy-chained cable linking each module is required. All of the control, instrumentation and power is provided through the daisy-chain cable.

The 2650 allows the switching to be located close to the UUT significantly reducing the cost of the test adapters. Setup time with the Model 2650 realizes significant reductions due to its conveniently located switching. This means you will be handling fewer cables as part of the testing process.

The control console can be either a rack mount cabinet enclosure or a portable assembly. The basic controller provides power for up to 15,000 test points. For applications greater than 15,000 test points, additional segment drivers provide the additional power requirements. The 2650 supports up to 100,000 test points.

External energization relays are located within each module providing the capability to power circuits under test. Four buses in the control cable connect to the power sources needed to activate relays in the product during a test. No additional external connections are required.

Each module assembly contains a switch where the number of the module is selected. This switch is easily accessible on the exterior of the module. Additionally, there are four status indicator lights to easily detect any problems in the connections between modules.

Model 2650 Controller

The 2650 controller is available in a bench or cabinet configuration. The bench configuration is capable to drive up to 15,000 test points in a single segment. For larger switching systems, additional segment drivers can be added each for up to an additional 15,000 test points in a single segment.

Cabinet configurations are typically used if additional segment drivers and external instruments and power supplies are required. The cabinet allows for all of the hardware to be securely mounted while maintaining a portable package. Frequently the computer is rack mounted in the cabinet and the monitor mounted onto the cabinet top allowing the system to be easily moved without damage to the components.

2650 MBA Switching Option

The 2650.MBA (Multiple Bus Architecture) is specifically designed for functional testing of relay chassis, control panels, and other assemblies with components. The multiple bus design extends the capabilities of the standard wiring analyzer to accommodate functional tests.

The 2650.MBA provides power and/or instrumentation to any circuit connected to the system without special interface cables with split or "Y" connections. These special cables result in large inventories of dedicated interfaces. With the MBA system, dedicated cables are a thing of the

Model 2650 Specifications

Test Points	Up to 100,000
Stimulus	1500 VDC / 1000 VAC 2A
System AC Power	115±10V, 50/60 Hz, 1Φ, 20A
	230±10V, 50/60 Hz, 1Φ, 10A)
	100±10V, 50/60 Hz, 1Φ, 20A
	208±10V, 50/60 Hz, 3Φ, 10A
	200±10V, 50/60 Hz, 3Φ, 10A
Operating Temperature (excluding computer)	60 to 90°F (15.5 to 32.0° C)
Humidity	8% to 80% non-condensing

past. The MBA simplifies the product interface and accommodates product design changes without changing the interface to the product.

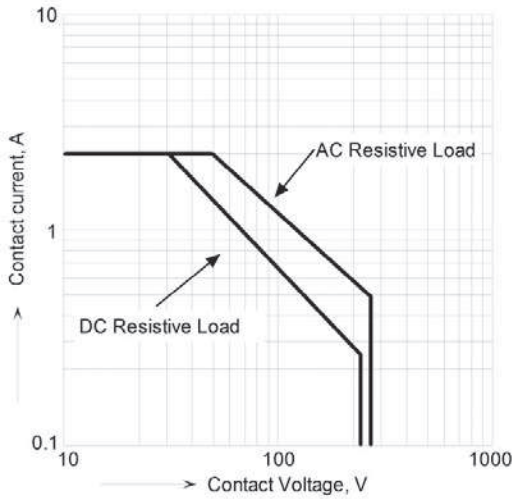
You'll find test program generation much simpler with the MBA system since all test points are able to provide power. It is no longer necessary to design the interface prior to generating the test program. All test points have the same test capabilities. Implementing change orders will be even easier.

Each MBA switching board provides 50 test points and 50 two-bus energization points. Therefore the standard module can be configured for 750 test points. In a four bus MBA, an additional switching board is used resulting in a 300 test point module.

An instrument and/or power supply routing matrix connects the power supply or instrument to the desired bus. The size of this routing matrix depends on the number of power supplies and/or instruments. The use of the routing matrix allows you to change the power supply or instrument connected to the random buses under program control. So even if you need two separate power sources in your product, you'll only need one bus pair (if the power supplies are not required simultaneously).

MBA Matrix Ratings (resistive)

Max. switching power	62.5 VA, 60 W
Max. switching voltage	250 VAC, 220 VDC
Max. switching current	2 Amp

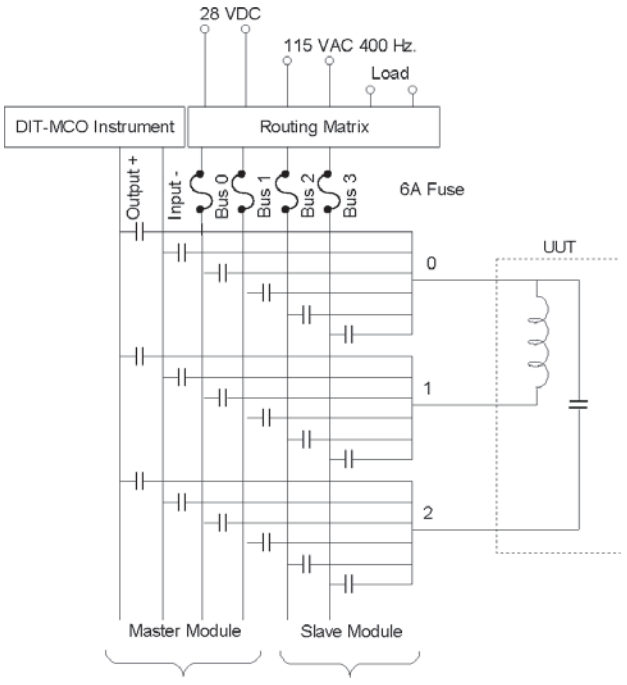


The random access relays are latching and mount on printed circuit boards. Each board contains 100 access points for two buses. The random access board attaches to a 100-point switching board via five connectors; one for control and four with test point access.

The random access relays can switch large currents with each relay rated for 2 amps. The printed circuit board design allows for short circuit currents up to 6 amps. The inputs to the buses are fused for 6 amps.

2650 HVA Switching Option

The 2650.HVA provides high voltage switching access to the UUT with up to 2000 VDC and 1500 VAC stimulus. The HVA modules use a separate daisy chain cable from the standard modules to isolate the high voltage.



Multiple Bus Architecture configured with four buses.

Power is applied to UUT through 0 and 1 and then the contact is then tested through 0 and 2.

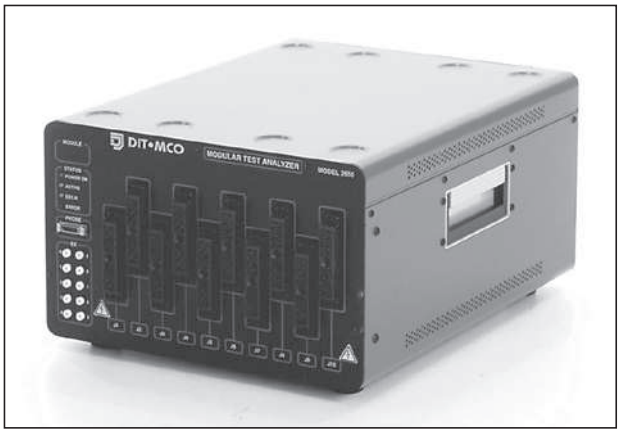
Mixed Switching Configurations

It is possible to mix any switching types in a single system. This means a system could accommodate a large wire harness with standard switching modules. A single HVA module could be added for high voltage (2000 VDC / 1500 VAC) requirements and a MBA module added for relay panels. All of the modules would work together as a single system. During the HVA testing, all other switching is connected to ground potential and isolated from the stimulus. This means that all circuits can be tested for isolation from the high voltage circuits and failures will be detected between these circuits.

2650 Modules

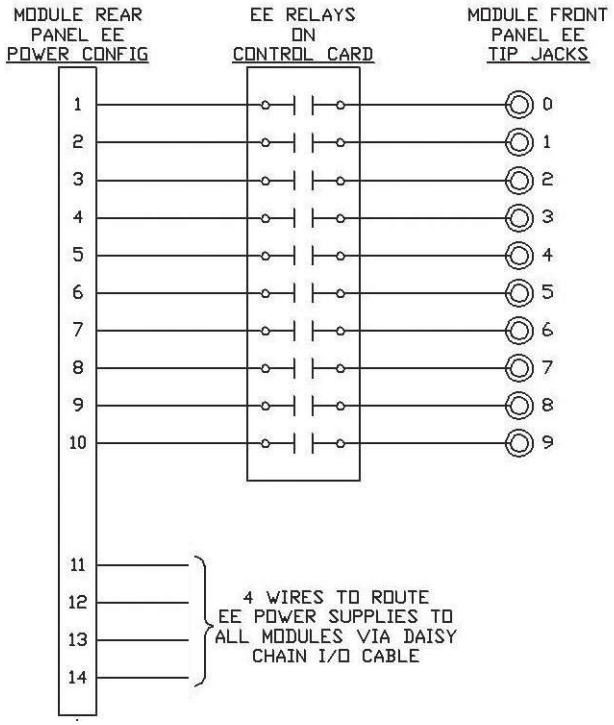
A switching unit (assembly) consists of a power supply/control board and switching cards. Two sizes of switching modules are available. The larger module contains up to 15 switching card while the smaller holds up to 5 cards. Each box has a unique identification number representing the test address for that assembly which is assigned by the Distributed Switching Configuration software.

Up to 255 switching assemblies may be used in the 2650 system. Each switching assembly has a cable IN from the previous unit and a cable OUT to the next unit (except for the last unit in the chain). These cables house all of the control signals, power, and stimulus connections for the switching units.



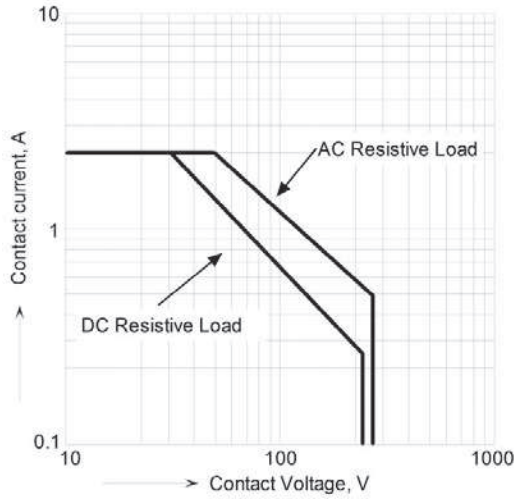
2650 External Energization

Applying power or changing circuit configuration under program control has been difficult in the past and has required special Y adapter cables and power supply routing cables. The design of the 2650 switching module has made the EE process easier to incorporate by routing four EE power supply buses to every switching module via the standard I/O daisy-chain cable. Each module includes ten points of EE located on the switching module controller.



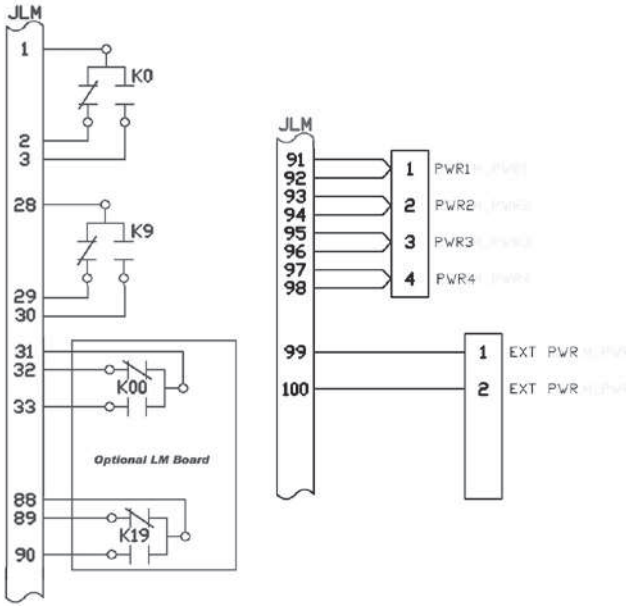
2650 Standard EE Ratings (resistive)

Max. switching power	62.5 VA, 60 W
Max. switching voltage	250 VAC, 220 VDC
Max. switching current	2 Amp



Ten EE tip jacks are provided on the front face of the switching module and a 15-point connector is located on the rear of the module. The tip jacks are connected to the normally open (NO) contacts of the EE relay. Ten points of the 15-point connector are connected to the common (COM) contacts from the EE relays and four points are connected to the EE power supply buses in the daisy-chain cable. An EE configuration connector is inserted into the rear 15-point connector to determine which EE power supply bus is connected to which EE relay common.

An alternate configuration of the external energization utilizes a 100 pin circular connector. All contacts of the ten EE relays (NO, NC, COM) are wired to the first 30 pins of the circular connector. The remaining contacts in the circular connector are wired to the last slot in the switching module so that an expansion 20 point LM can be installed into the last position. This would then allow for 30 EE relays in the module.



Additionally, the power buses are available in the circular connector so that the power source can be connected to the relay through the interface connector.

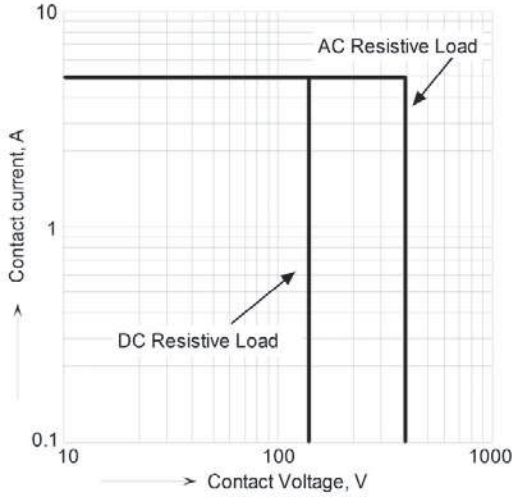
In addition to the 10 EE/LM relays the switching module controller provides, you can incorporate a 20 point LM board into any switching module. Or entire modules can be dedicated to LM providing up to 300 LM relays in a single module.

2650 Latching Matrix High Current

The option 20 point Latching Matrix (LM) board can be installed into any 2650 module to provide extra energization points as required by the application. The 20 point LM card can also be used for higher power requirements as the board is capable of a 5A continuous load. The LM can be wired into the interface through a separate LM connector or mixed into the switching interface connectors so that LM is available in each test adapter. The LM board can also be supplied with tip jacks on the card edge of the board.

2650 20 Point
Latching Matrix Ratings (resistive)

Max. switching power	2000 VA, 625 W
Max. switching voltage	400 VAC, 125 VDC
Max. switching current	5 Amp



2650 Latching Matrix Modules

Modules with only Latching Matrix (LM) relays can be used when there are many energization points required. Various configurations are available. Power sources typically are provided through the daisy chain control cable but there are accommodations for power supplies or other instruments to connect directly to the modules.

Circuit breakers are provided on each bus for the entire module. Additionally, there may be circuit breakers included for a smaller number of LM points with lower current ratings. The additional circuit breakers provide a higher level of protection.

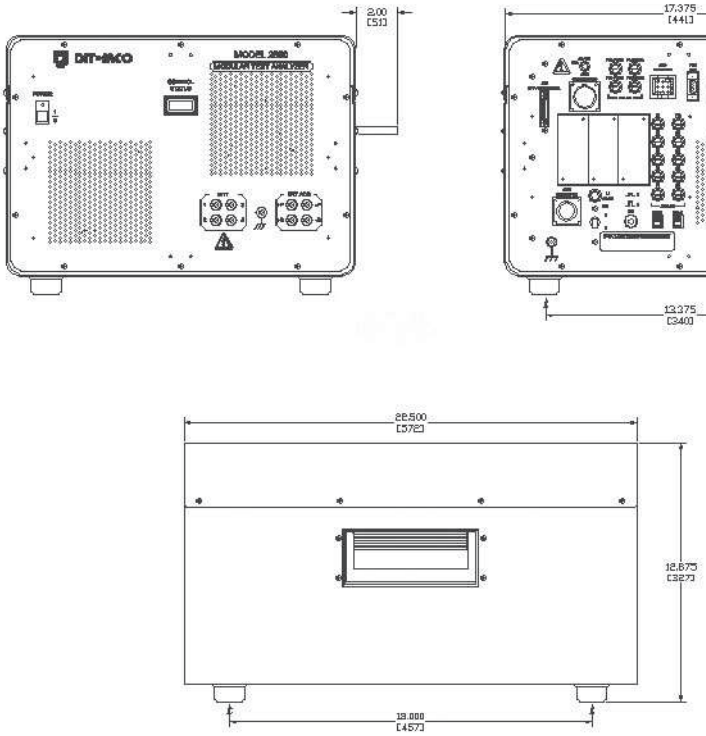
The LM-100 module provides connection to 100 relays through 100 pin Dual 50 connectors. All of the normally open (NO) contacts are wired to one of the I/O connectors. The normally closed (NC) and common (COM) contacts are wired to the other two connectors respectively. There is a circuit breaker provided on each of the four power buses. Tip jacks provide convenient access to the power buses for troubleshooting. The module can be expanded with a second set of LM-100 connections.

The LM-200 provides 200 points of LM through 20 circular connectors. Each of the connectors contains the connections (NO, NC and COM) to ten of the LM relays. Additionally, each of the connectors provides connections to the four power buses. There is a circuit breaker on two of the power buses at each circular connector. Additionally, there is a circuit breaker on each of the four buses at the source to all of the connectors. Tip jacks are provided for verification of the power buses.

Bench Controller

The bench controller is a complete test system controller with the ability to drive up to 15,000 test points on a single segment. If additional test points are required, external driver modules can be added to the bench controller. The controller includes:

- Logic controller and Standard Measurement Unit (SMU)
- Optional AC dielectric instrument
- 28 VDC power supply and optional programmable DC power supply
- Multiple Terminal Test (MTT) and External Access points
- One segment driver for up to 15,000 test points of switching

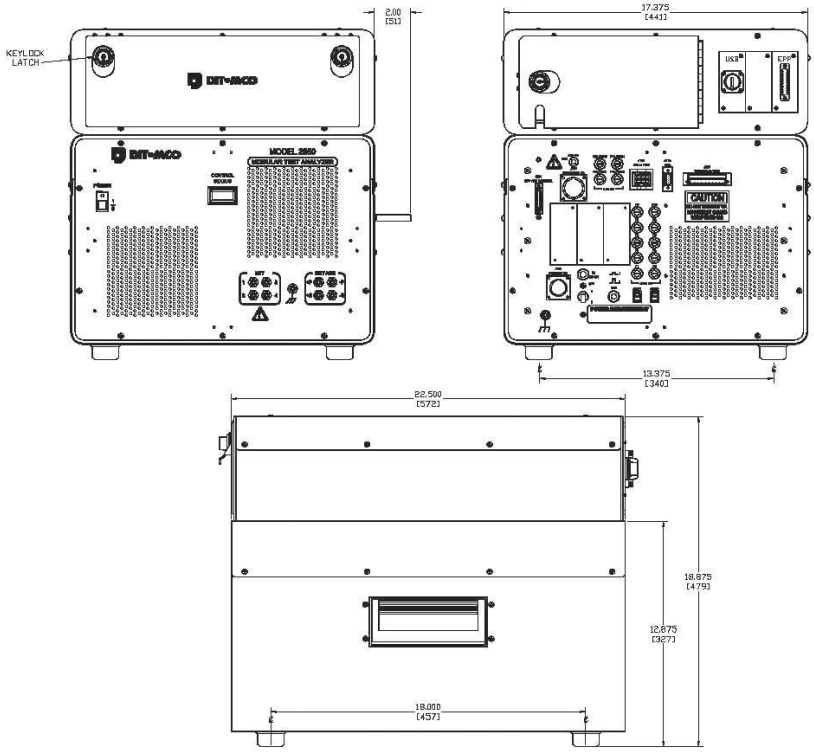


Controller Dimensions	22.50" (57.15 cm) Length
	17.37" (44.1 cm) Width
	12.875" (32.70 cm) Height
System AC Power	115±10V, 50/60 Hz, 1Φ, 30A
	230±10V, 50/60 Hz, 1Φ, 15A
	100±10V, 50/60 Hz, 1Φ, 30A
Volt Amperes	2850 (9727 BTU)
Weight	80 lbs. (36 kg)
Operating Temperature (excluding computer)	60 to 90°F (15.5 to 32.0° C)
Humidity	8% to 80% non-condensing

Bench Controller with Computer Case

The bench controller can be supplied with an optional case for a notebook computer. The case is rigidly connected to the controller and provides protection to the computer in portable applications. The controller includes:

- Computer storage drawer with notebook computer
- Logic controller and Standard Measurement Unit (SMU)
- Optional AC dielectric instrument
- 28 VDC power supply and optional programmable DC power supply
- Multiple Terminal Test (MTT) and External Access points
- One segment driver for up to 15,000 test points of switching

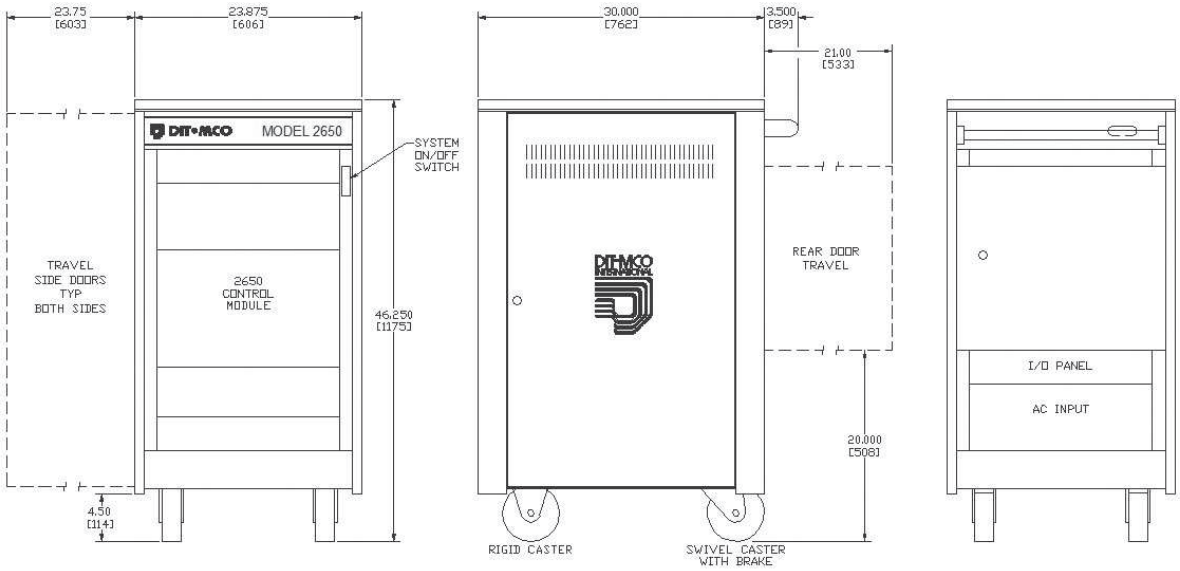


Controller Dimensions	22.50" (57.2 cm) Length
	17.37" (44.1 cm) Width
	18.88" (47.9 cm) Height
System AC Power	115±10V, 50/60 Hz, 1Φ, 30A
	230±10V, 50/60 Hz, 1Φ, 15A
	100±10V, 50/60 Hz, 1Φ, 30A
Volt Amperes	2850 (9727 BTU)
Weight with Computer Case and Notebook Computer	80 lbs. (36 kg)
Operating Temperature (with rugged computer)	60 to 90°F (15.5 to 32.0° C)
Humidity	8% to 80% non-condensing

Control Console

The portable control console is a complete test system controller with the ability to drive up to 45,000 test points on three segments. Additional segment drivers can be added if necessary or external driver modules can be used. The console allows for the integration of the computer system and additional instrumentation options into a single, portable cabinet. The controller includes:

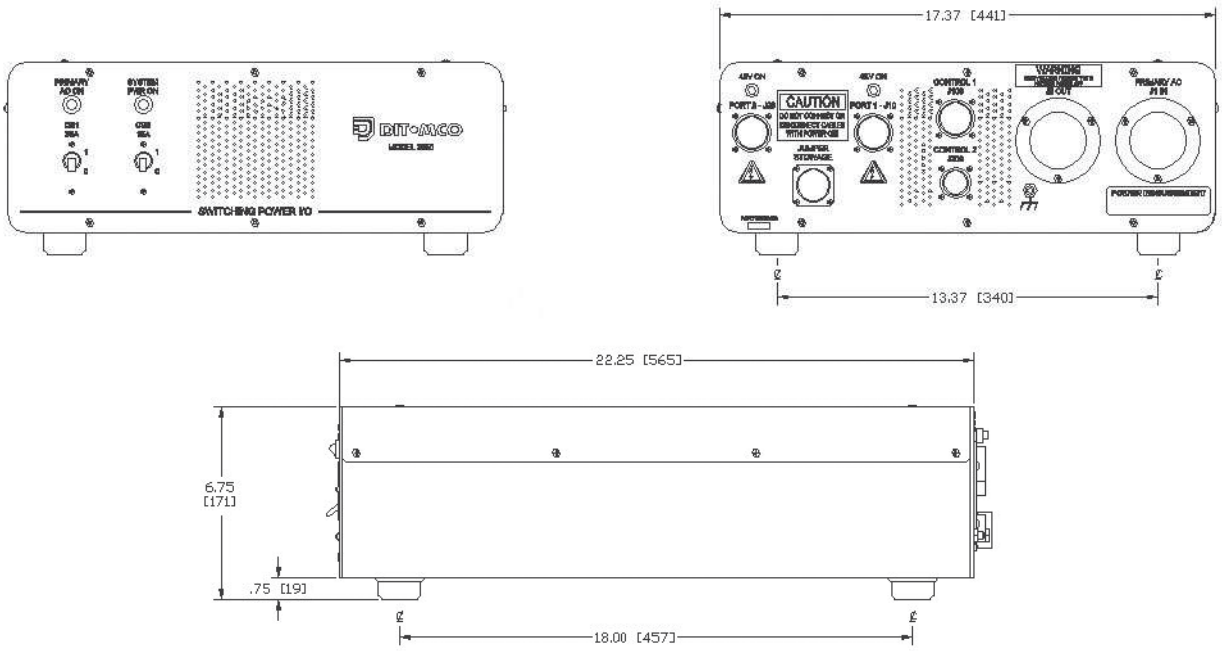
- Logic controller and Standard Measurement Unit (SMU)
- Optional AC hipot instrument
- 28 VDC power supply and optional programmable DC power supply
- Multiple Terminal Test (MTT) and External Access points
- Up to three segment drivers for up to 45,000 test points of switching



Controller Dimensions	30.00" (76.2 cm) Length
	23.875" (60.6 cm) Width
	46.25" (117.5 cm) Height
System AC Power	115±10V, 50/60 Hz, 1Φ, 30A
	230±10V, 50/60 Hz, 1Φ, 20A
	208±10V, 50/60 Hz, 3Φ, 10A
	200±10V, 50/60 Hz, 3Φ, 10A
Volt Amperes	2000 (6825 BTU)
Weight	500 lbs. (227 kg)
Operating Temperature (excluding computer)	60 to 90°F (15.5 to 32.0° C)
Humidity	8% to 80% non-condensing

External Segment Driver

External segment drivers provide additional power segments for up to 15,000 test points. The external segment driver provides an AC power connection for the main controller such that only one connection to the power main is required. A control cable connects the external driver to the controller so that power is controlled with a single switch.



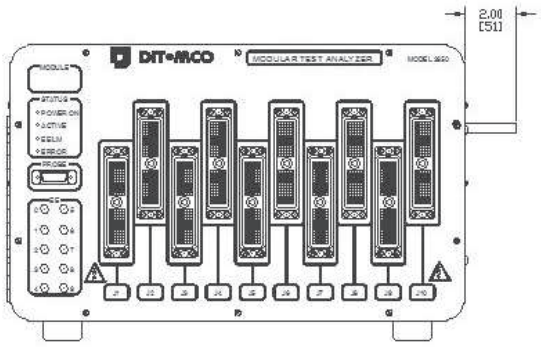
Controller Dimensions	22.50" (57.15 cm) Length
	17.37" (44.1 cm) Width
	6.75" (17.10 cm) Height
System AC Power	115±10V, 50/60 Hz, 1Φ, 30A
	230±10V, 50/60 Hz, 1Φ, 15A
	100±10V, 50/60 Hz, 1Φ, 30A
Volt Amperes	1500 (5120 BTU)
Module Weight	30 lbs. (13.6 kg)
Operating Temperature (excluding computer)	60 to 90°F (15.5 to 32.0° C)
Humidity	8% to 80% non-condensing

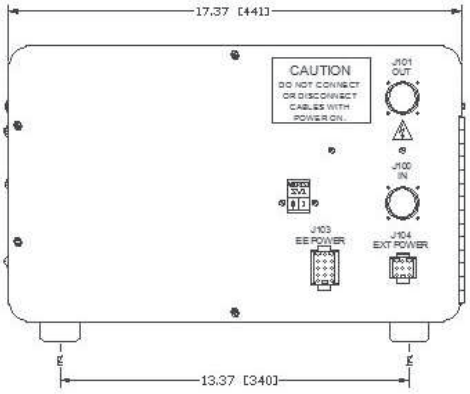
1500 Point Switching Module ZIF Connector

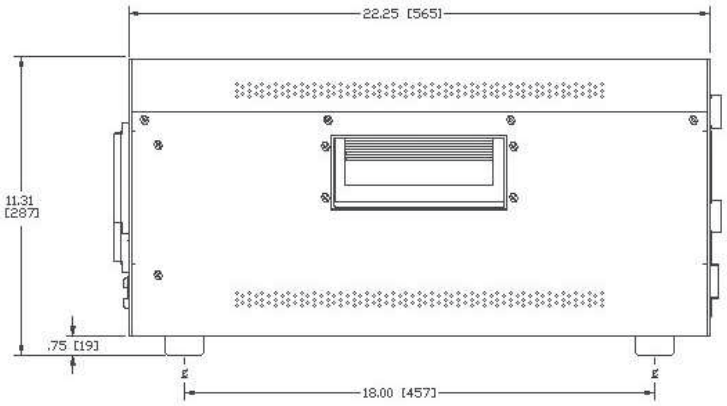
The standard switching module supports up to 15 switching boards of 100 points each for a total of 1500 test points. The module provides for a connection to 10 EE jacks and a probe. Each ZIF connector is wired with 150 test points.

There are 10 EE jacks on the front of the module which can be used for the application of external energization to the unit under test. Additionally, there is a probe connection on the switching module. The ZIF module is also available with a 100 pin circular interface in place of the 10 EE jacks.

The address of the switching module is selected by the two digit switch on the back of the module. This two digit number identifies the box to the software which then assigns the test address to each 50 pin group of test points. Addressing can be assigned in any order within the module.







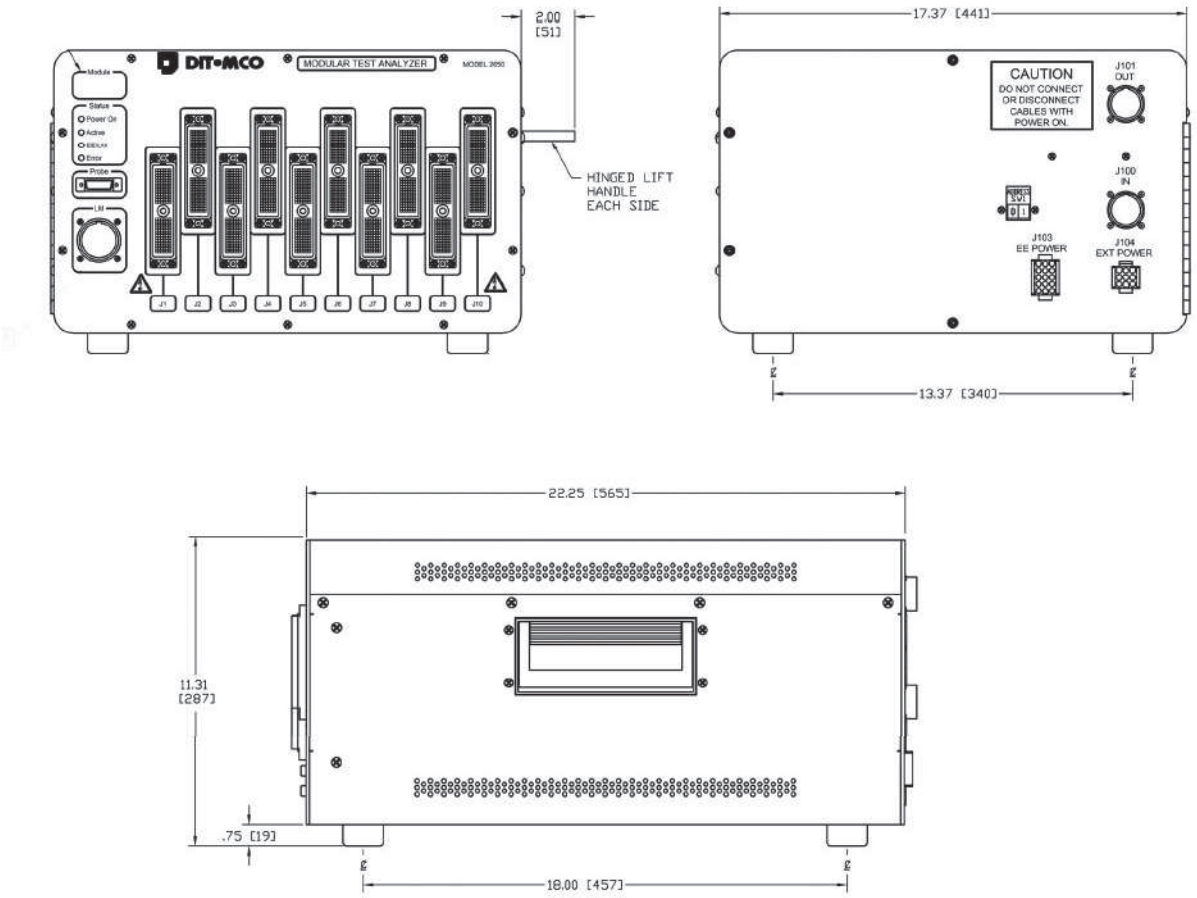
Module Dimensions	22.25" (56.5 cm) Length
	17.37" (44.1 cm) Width
	11.31" (28.7 cm) Height
Module Weight	50 lbs. (22.7 kg)

1500 Point Switching Module with Circular LM

An alternative configuration to the tip jacks for the EE points is to use a circular connector. All of the ten EE relays contact (NO, NC, COM) located on the control board are wired to the interface connector. Additionally the power sources from the daisy chain cable are available in the connector. You can program each relay's source by connecting the relay to the desired source in the connection.

The switching utilizes the Zero Insertion Force (ZIF) connector with 150 points wired to each.

The address of the switching module is selected by the two digit switch on the back of the module. This two digit number identifies the box to the software which then assigns the test address to each 50 pin group of test points. Addressing can be assigned in any order within the module.



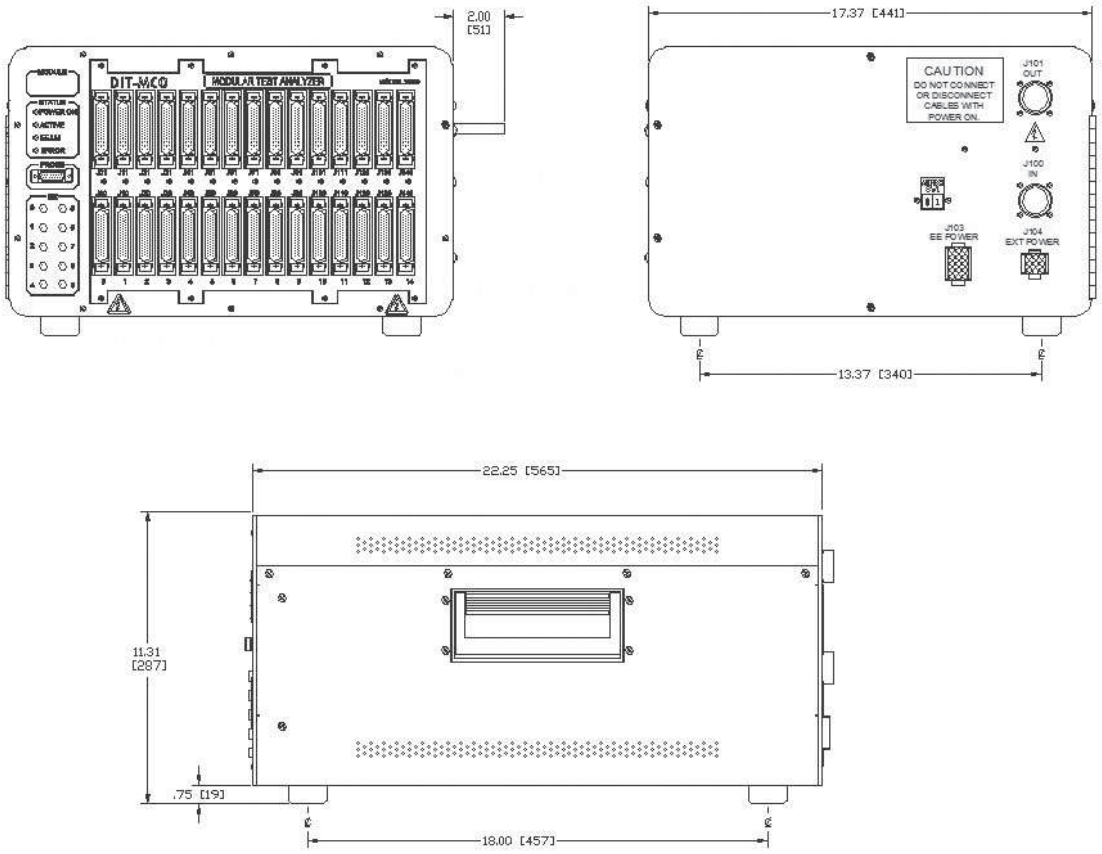
Module Dimensions	22.25" (56.5 cm) Length
	17.37" (44.1 cm) Width
	11.31" (28.7 cm) Height
Module Weight	50 lbs. (22.7 kg)

1500 Point Switching Module D-Sub Connector

The standard switching module supports up to 15 switching boards of 100 points each for a total of 1500 test points. The module provides for a connection to 10 EE jacks and a probe. Each D-Sub connector is wired with 50 test points.

There are 10 EE jacks on the front of the module which can be used for the application of external energization to the unit under test. Additionally, there is a probe connection on the switching module.

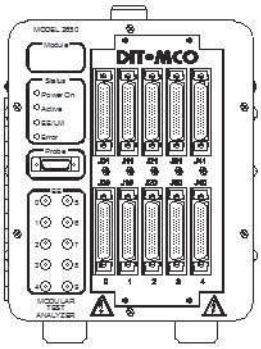
The address of the switching module is selected by the two digit switch on the back of the module. This two digit number identifies the box to the software which then assigns the test address to each 50 pin group of test points. Addressing can be assigned in any order within the module.

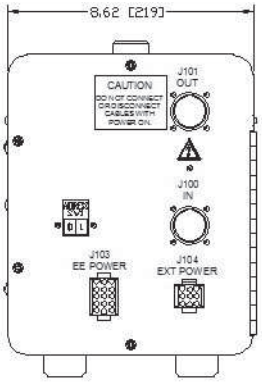


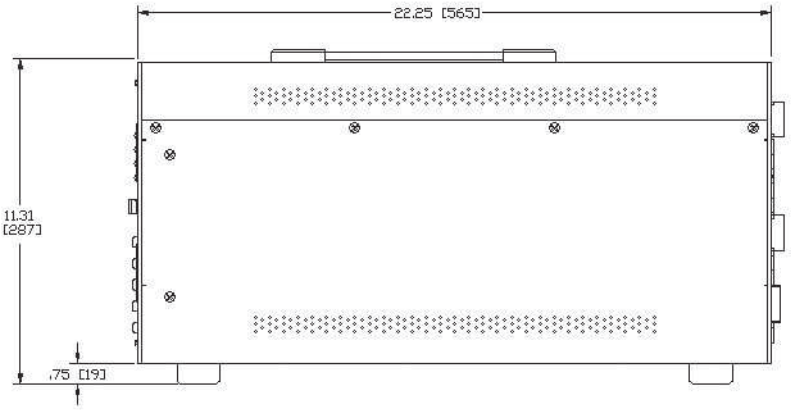
Module Dimensions	22.25" (56.5 cm) Length
	17.37" (44.1 cm) Width
	11.31" (28.7 cm) Height
Module Weight	50 lbs. (22.7 kg)

500 Point Switching Module D-Sub Connector

The small size of the 500 point module makes it easy to move to locations where only a few test points are required. The 500 point module supports up to 5 switching boards of 100 points each. The module provides for a connection to 10 EE jacks and a probe. Each D-Sub connector is wired with 50 test points.







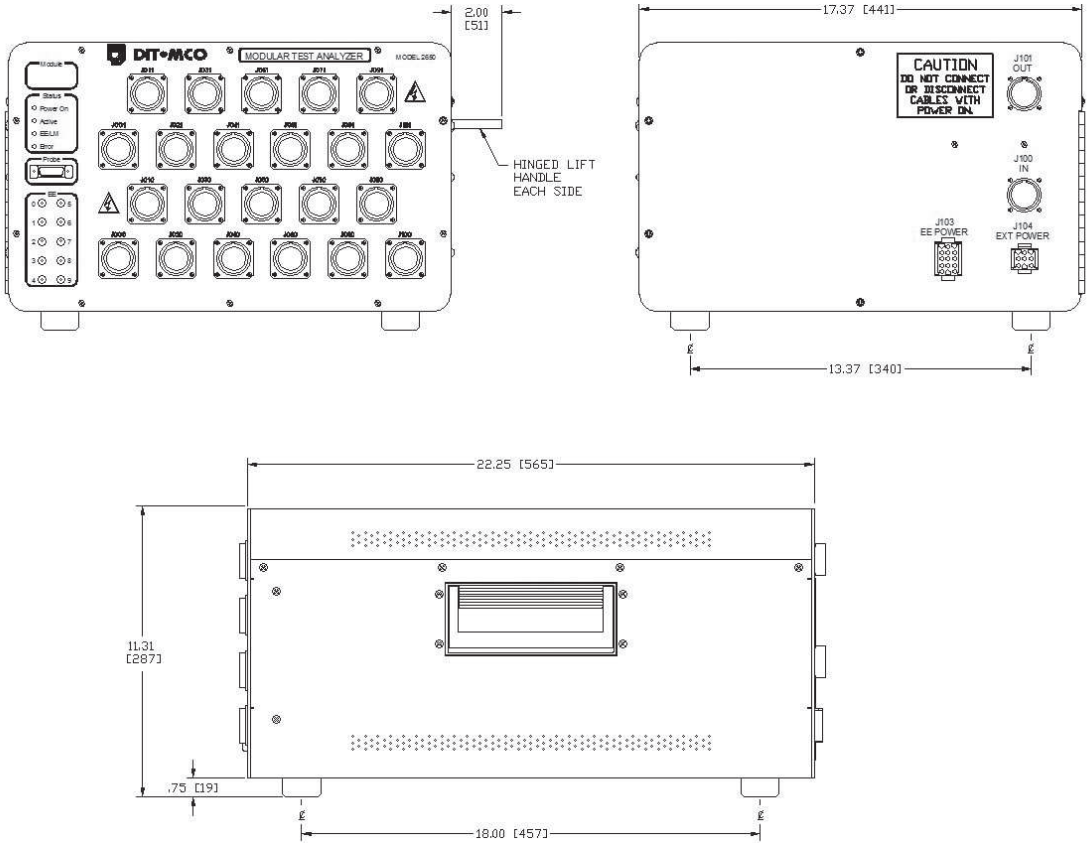
Module Dimensions	22.25" (56.5 cm) Length
	8.62" (21.9 cm) Width
	11.31" (28.7 cm) Height
Module Weight	30 lbs. (13.6 kg)

1100 Point Switching Module Circular Connector

The circular interface support 1100 test points. The module provides for a connection to 10 EE jacks and a probe. Each 55 pin circular connector is wired with 50 test points.

There are 10 EE jacks on the front of the module which can be used for the application of external energization to the unit under test. Additionally, there is a probe connection on the switching module.

The address of the switching module is selected by the two digit switch on the back of the module. This two digit number identifies the box to the software which then assigns the test address to each 50 pin group of test points. Addressing can be assigned in any order within the module.



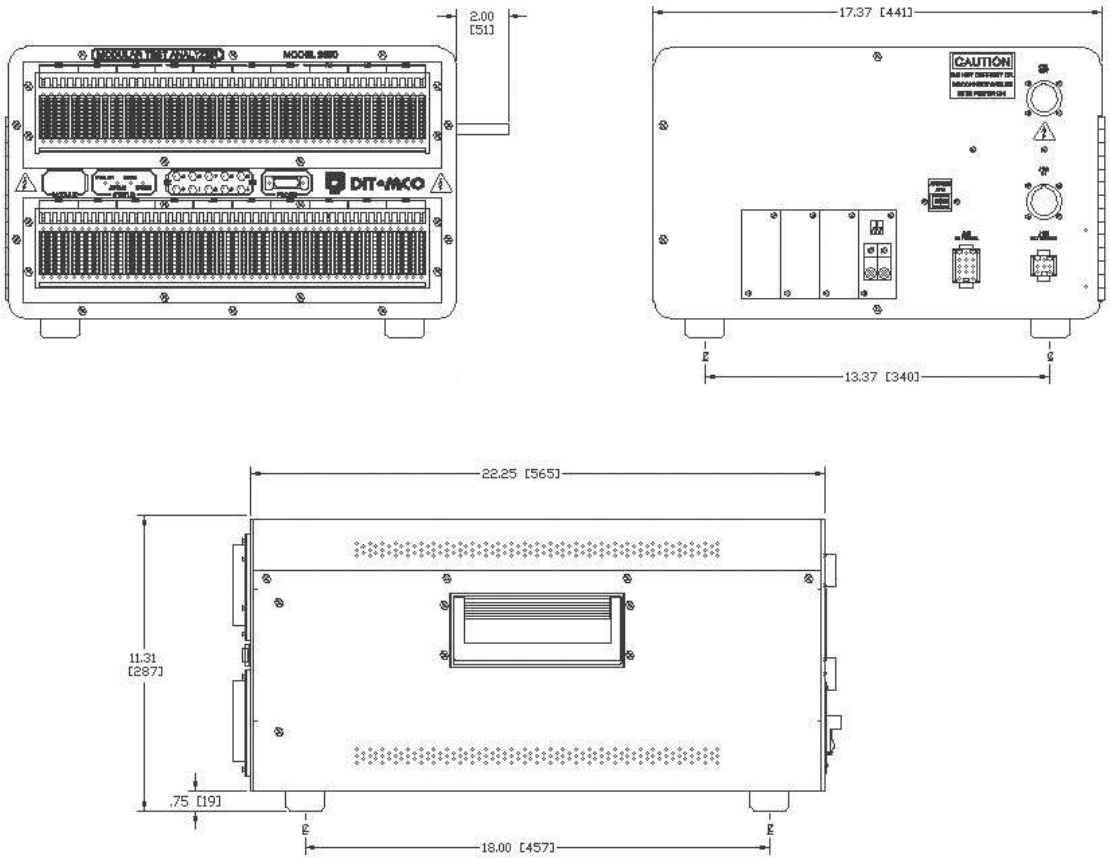
Module Dimensions	22.25" (56.5 cm) Length
	17.37" (44.1 cm) Width
	11.31" (28.7 cm) Height
Module Weight	50 lbs. (22.7 kg)

1000 Point Switching Module EasyMate Connector

The EasyMate connector provides a modular connector interface. The EasyMate interface consists of 500 test points and accepts mating plugs from 10 pins to 120 pins. This allows the adapter cable to match the number of test points required in the unit under test.

There are 10 EE jacks on the front of the module which can be used for the application of external energization to the unit under test. Additionally, there is a probe connection on the switching module.

The address of the switching module is selected by the two digit switch on the back of the module. This two digit number identifies the box to the software which then assigns the test address to each 50 pin group of test points. Addressing can be assigned in any order within the module.



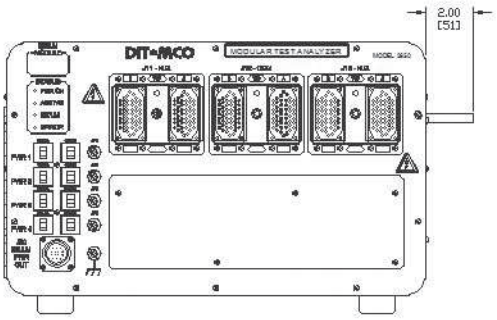
Module Dimensions	22.25" (56.5 cm) Length
	17.37" (44.1 cm) Width
	11.31" (28.7 cm) Height
Module Weight	50 lbs. (22.7 kg)

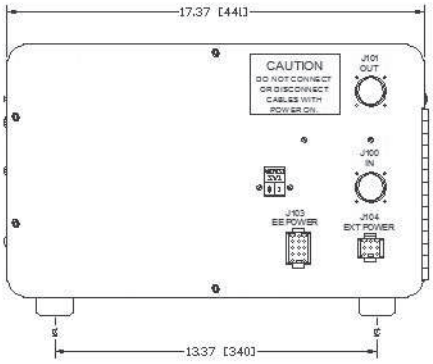
200 Point Latching Matrix Dual-50 Interface

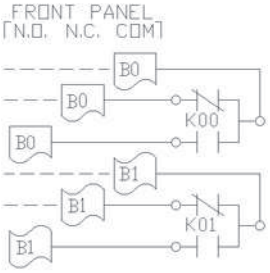
There are three connectors for each 100 LM points identified as common (COM), normally open (NO) and normally closed (NC). Each LM relay connects to each of the three connectors. For 200 LM relays, there are then six connectors.

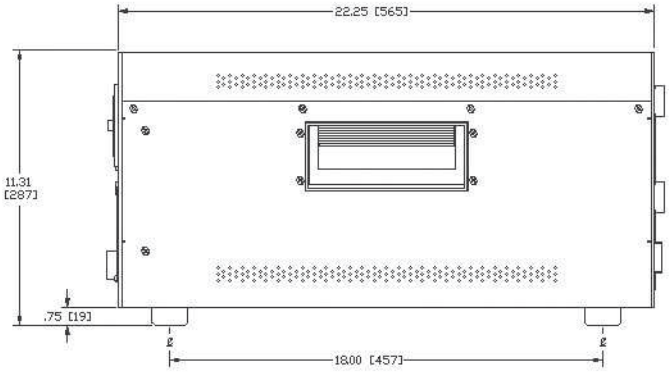
The mating connector is DIT-MCO 025-04623-0003 with pins 007-01157 and cable clamp 005-04706-0002. Two cable clamps are required for each mating plug.

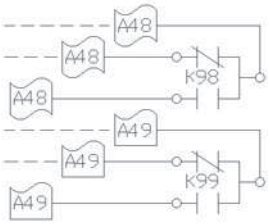
There are four power buses that connect to the controller through the daisy chain control cable. Each power bus has a 5A circuit breaker and is connected to the front panel circular connector with mating connector DIT-MCO 025-01300-0002 and pin contact 007-01157-0002 or -0003 and clamp 005-01051-0003. Additionally power supplies can be connected directly to the module rather than using the daisy chain cable power buses.











Module Dimensions	22.25" (56.5 cm) Length
	17.37" (44.1 cm) Width
	11.31" (28.7 cm) Height
Module Weight	40 lbs. (18.1 kg)

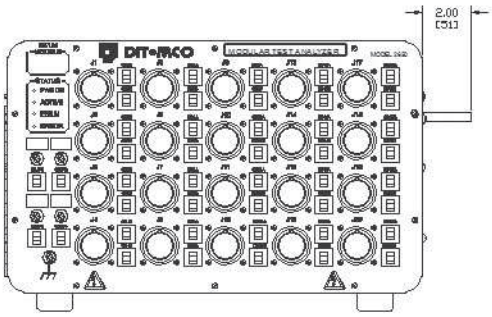
200 Point Latching Matrix Circular Interface

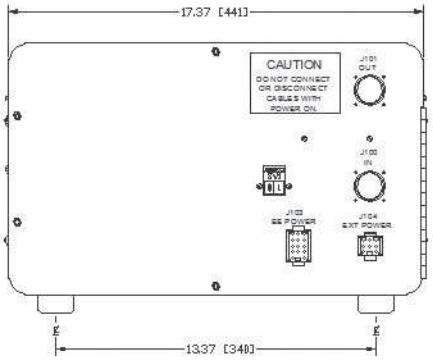
LM connectors are Tyco (AMP) circular type 23-37 part number 206306-1. Mating connectors are DIT-MCO part number 025-01300-0020 (206305-1) using clamp shell 005-01051-0004 (206138-1). Contacts for mating connector are 007-01157-0002 (20 – 24 AWG) or 007-01157-0003 (16-18 AWG).

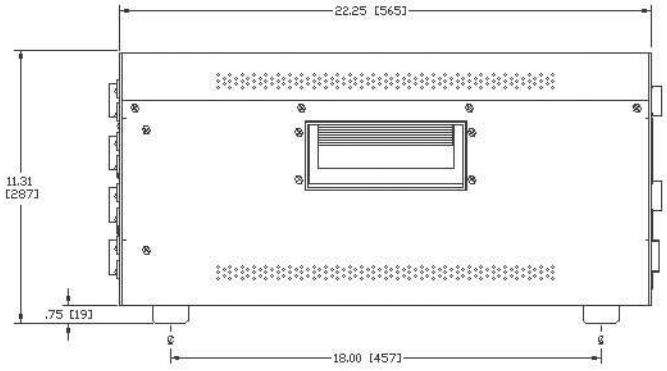
There are four power buses connecting the module to the controller by way of the control cable. Each power bus has a 2A circuit breaker for each 10 LM contacts (circular connector). Additionally each bus has a 5A circuit breaker for the entire module total power.

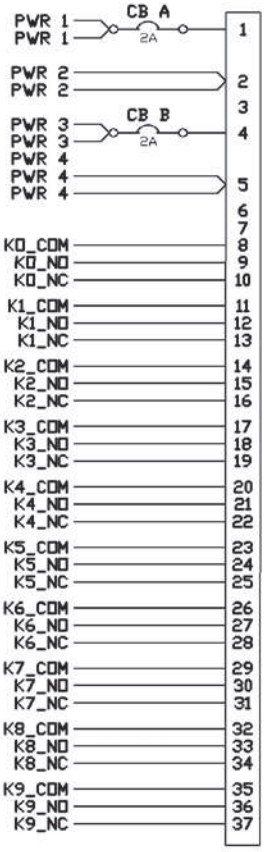
There are a total of 20 connectors each of 37 pins on the front of the LM unit. Each connector provides the connections for 10 LM relays. All three contacts, NO, NC and COM are wired into the connector.

To use the LM relay to apply power to a circuit, the COM contact would be wired to the appropriate bus pin and the NO would be wired to the desired test point.









Module Dimensions	22.25" (56.5 cm) Length
	17.37" (44.1 cm) Width
	11.31" (28.7 cm) Height
Module Weight	45 lbs. (20.4 kg)

MODEL 2651 FIELD DEPLOYABLE TEST SET 1500 VOLT

The DIT-MCO Model 2651 fulfills the testing requirements of military and commercial intermediate and depot maintenance by reducing the time to diagnose faults and return the equipment to service.

The 2651 complies with MIL-STD-810F Method 511.4 so that the system can operate safely in the presence of hazardous vapors. The controller includes a high voltage interlock switch so that high voltage can be disabled while repairing detected faults. The 2651 is also certified to MIL-PRF-28800 Class 3 for shock, vibration and temperature so that the system can be operated in the harshest environments. Sealed covers guard against infiltration by dust, sand and rain.

Integrated handles provide for easy lifting and movement. Connections to the unit under test are through circular "military" connectors. The system includes an embedded rugged notebook computer mounted on extension slides. During storage and shipping, the computer is safely stored within the system controller. For operation, the computer is easily accessed by opening the storage drawer.

The optional MBA switching matrix allows every test point to connect to secondary buses which are typically used for the application of power during the testing. Use MBA access to test relay panels and other assemblies that require activation to fully test. Or the additional buses can be used to connect instruments or loads to the test assembly. The MBA matrix card can be mixed with traditional switching to provide a highly flexible test solution.

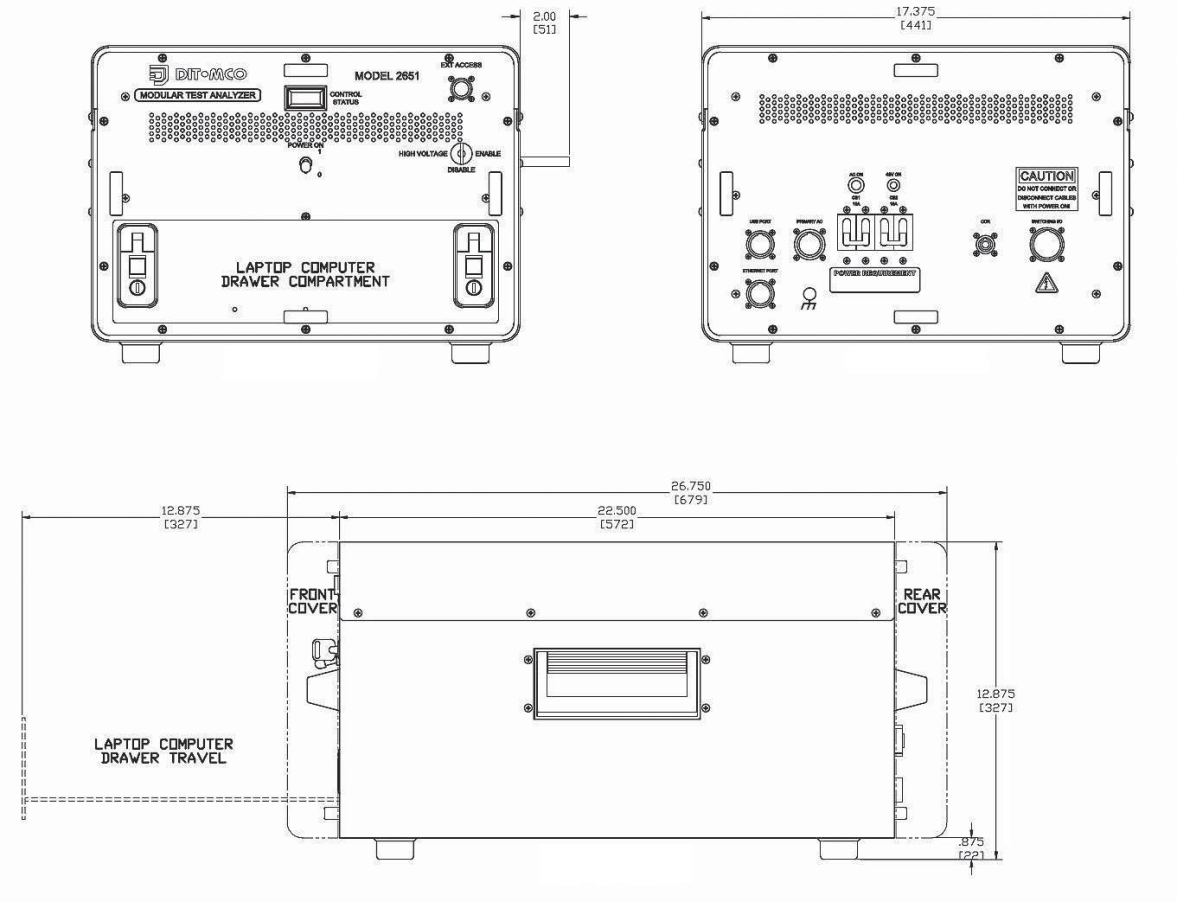
Model 2651 Specifications

AC Input Power	115/230 V selectable, 50/60 Hz
Volt Amperes	MSU 200 (698 BTU) ESU 200 (698 BTU)
MSU Weight (with case and 1000 test points)	98 lbs. (45 kg)
ESU Weight (with case and 1000 test points)	55 lbs. (25 kg)
Operating Temperature (excluding computer)	60 to 90° F (15.5 to 32.0° C)
Humidity	8% to 80% non-condensing (High humidity conditions will degrade leakage testing)

2651 Control Module

The 2651 control module includes a "rugged" notebook computer mounted onto a slide providing storage when not in operation. The standard system includes power for up to 3,000 test points. Covers for the front and rear of the unit provide protection during transportation of the unit.

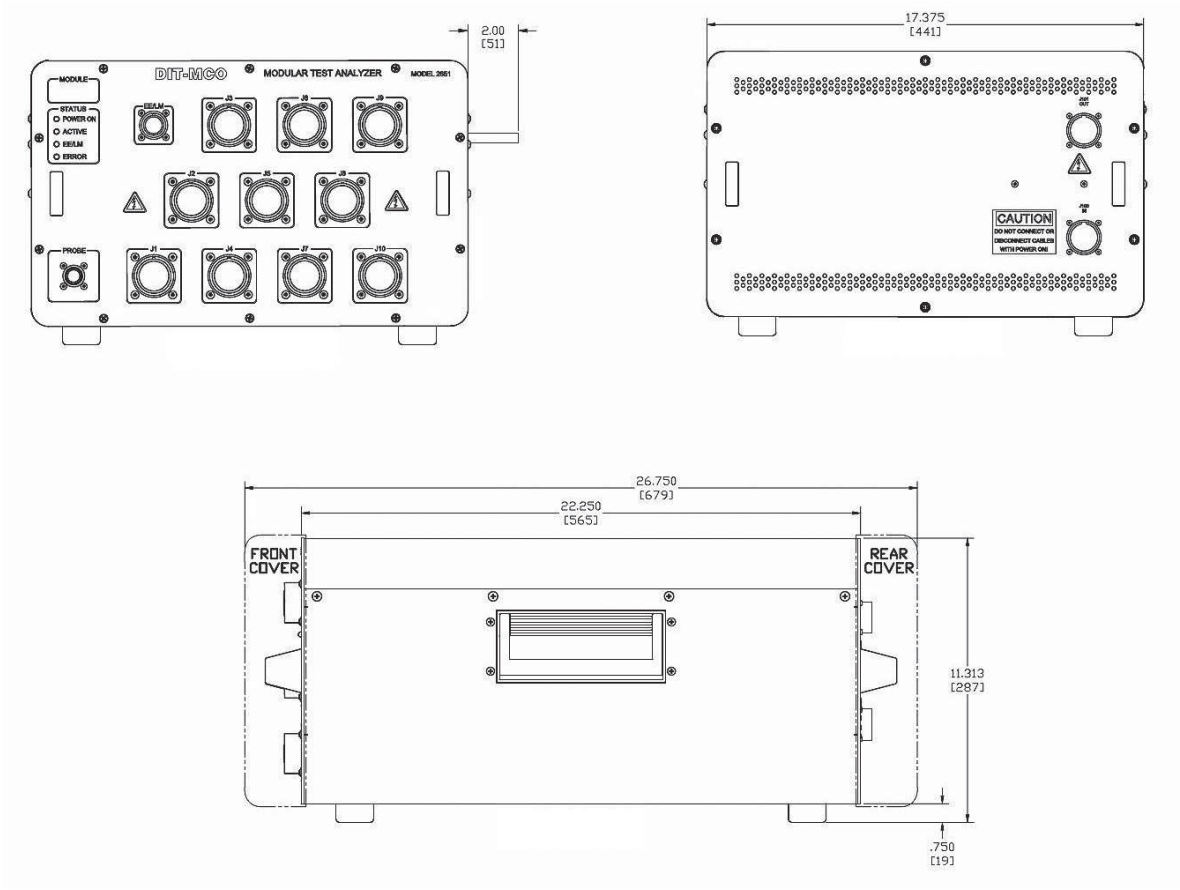
Designed for military applications, the 2651 offers compliance with MIL-STD-810 for use in explosive environments as well as the environmental conditions of MIL-PRF-28800.



Module Dimensions	22.50" (57.2 cm) Length (Operating) 26.75" (67.9 cm) Length (Storage with covers) 17.37" (44.1 cm) Width 12.875" (32.7 cm) Height
Module Weight	100 lbs. (46 kg)

2651 Switching Module 1280 Test Points

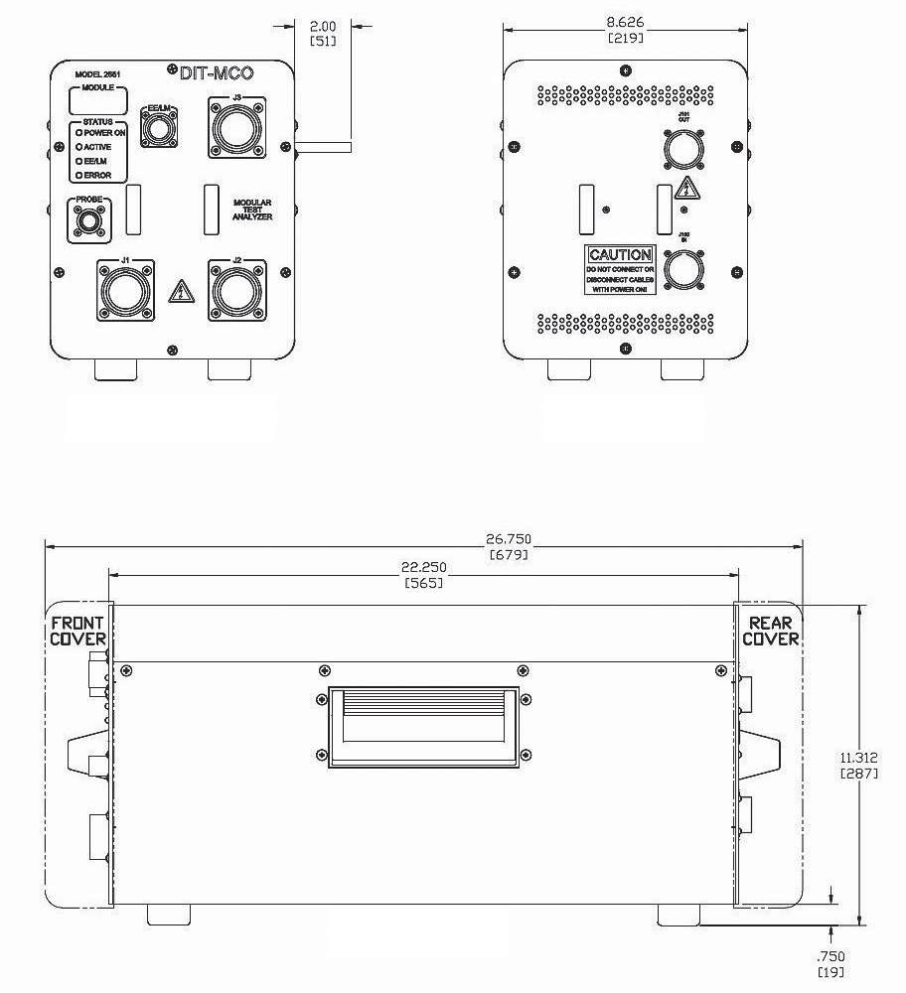
The switching module provides 1280 test points through 128 pin Mil-Spec circular interface connectors. Covers are fitted to the front and rear of the unit for transportation and storage.



Module Dimensions	22.50" (57.2 cm) Length (Operating)
	26.75" (67.9 cm) Length (Storage with covers)
	17.37" (44.1 cm) Width
	11.313" (28.7 cm) Height
Module Weight	63 lbs. (29 kg)

2651 Switching Module 384 Test Points

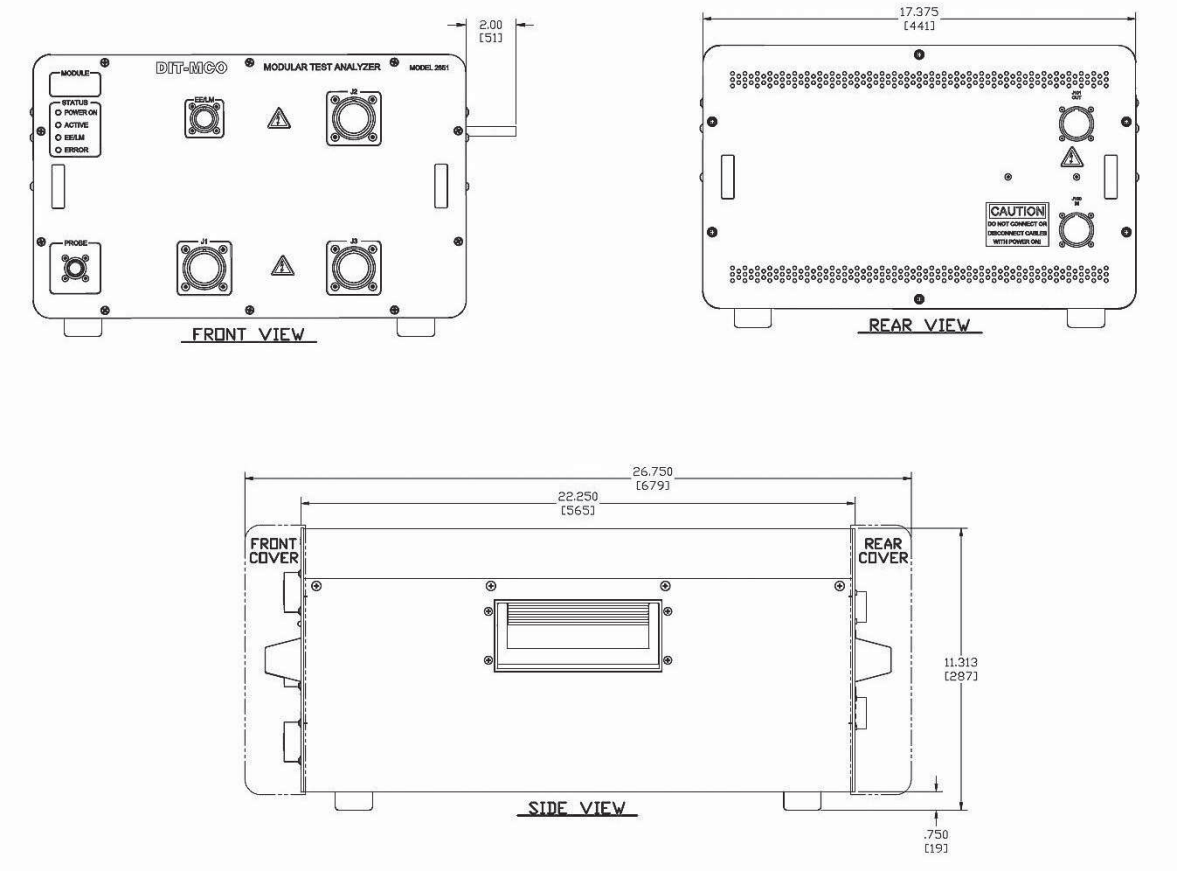
The small module is ideal for use in portable applications. The module provides 384 test points through three Mil-Spec circular connectors of 128 pins each. Covers are fitted to the front and rear of the unit for transportation and storage.



Module Dimensions	22.50" (57.2 cm) Length (Operating) 26.75" (67.9 cm) Length (Storage with covers) 8.626" (21.9 cm) Width 11.312" (28.7 cm) Height
Module Weight	33 lbs. (15 kg)

2651 MBA Switching Module

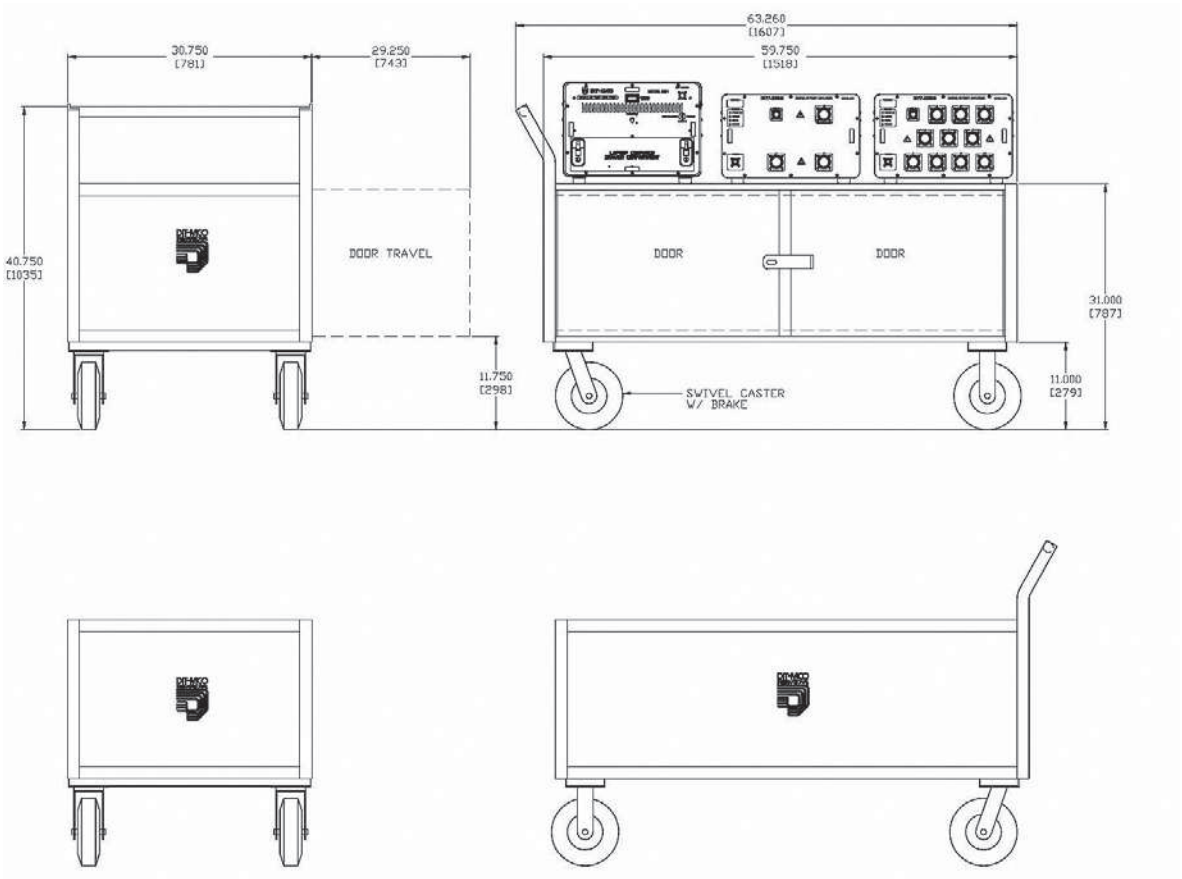
The MBA module is used for applications where testing of complex relay assemblies is required. The MBA module provides 384 test points through three Mil-Spec circular interface connectors of 128 pins each. Each test point can be a source or measure point and supply power to the UUT from two sources. Typically, the power sources are 28 VDC and 115 VAC 400 Hz.



Module Dimensions	22.50" (57.2 cm) Length (Operating)
	26.75" (67.9 cm) Length (Storage with covers)
	8.626" (21.9 cm) Width
	11.313" (28.7 cm) Height
Module Weight	63 lbs. (29 kg)

2651 Transport and Storage Cart

The 2651 storage cart provides a platform for the test system and storage for the adaptation cables. The cart can be moved to the unit to be tested in the maintenance hangar.



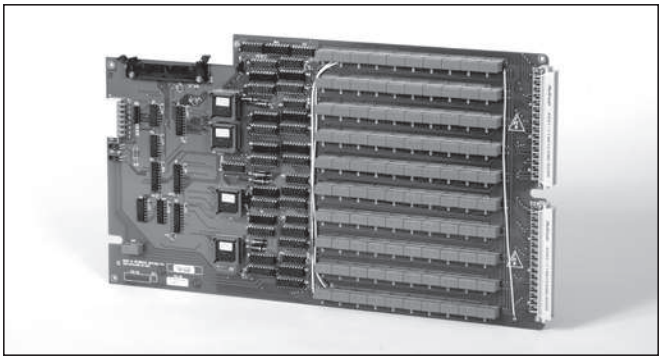
Module Dimensions	63.26" (160.7 cm) Length
	30.75" (78.1 cm) Width
	31.00" (78.7 cm) Height
Weight	210 lbs. (95 kg)

2650/2651 Switching

The switching boards include the switching device and the logic to control the devices during the testing. Each group of 50 test points or 10 latching relay points can be configured to any address. The placement of the boards into a module does not determine the actual testing addressing. Instead, the test addressing is controlled by the configuration software.

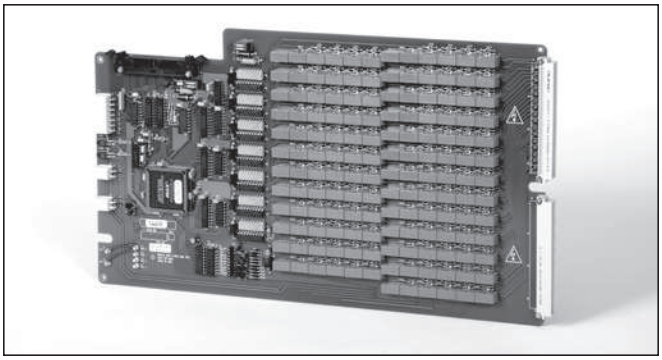
Standard 1500 VDC

The standard switching board provides 100 test points at 1500 VDC and 1000 VAC.



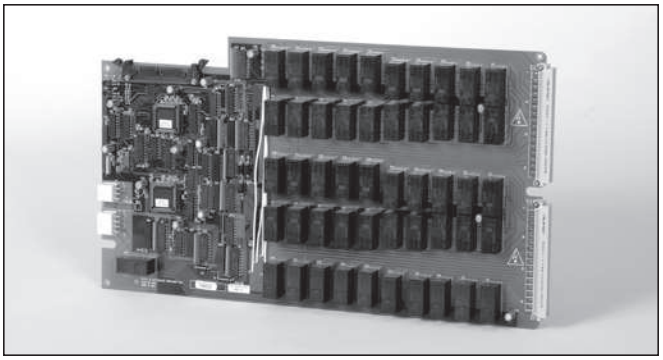
MBA Switching

The MBA switching board provides 50 test points with an addition two bus random access switching matrix. The random access matrix allows each of the two buses to be connected to any of the switching test points. The random access buses can be expanded with additional switching boards.



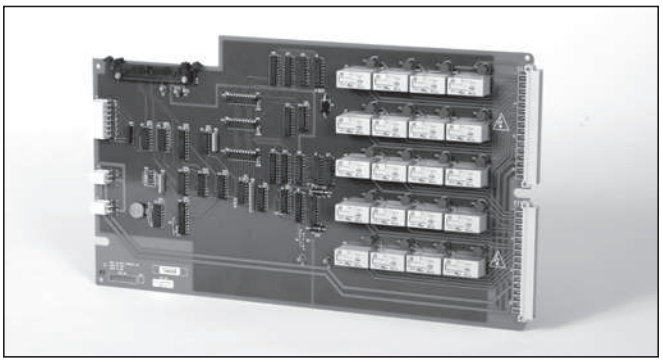
HVA Switching

The 50 test points HVA switching board provides high voltage testing with up to 2000 VDC and 1500 VAC. Switching modules fitted with the HVA switching boards can operate in the same system with standard and MBA boards.



Latching Matrix (LM) Switching

The LM switching board provides 20 form C relays (NO, NC, COM) which can be controlled through the test program independent of the switching matrix. Typically, the LM relays are used to provide power to the unit under test but may also be used for indicator lights or control system interfaces.



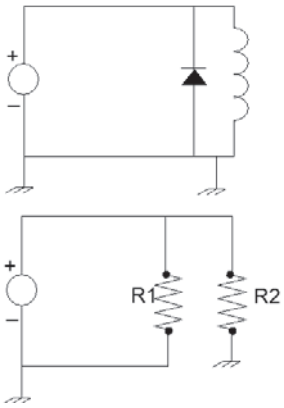
STANDARD INSTRUMENTATION

Grounded and Floating Instrumentation

While many test systems utilize a ground referenced instrument, DIT-MCO's instrumentation is ground isolated (floating) so that there are no limitations on the type of tests you can perform. While the grounded instrumentation may be sufficient for testing simple cable assemblies, complex assemblies with components and those that are connected to an earth ground require a floating instrument.

Testing Components

- The drawing to the right is an example of a common diode/relay configuration that cannot be fully tested with a ground reference instrument. In this case, the diode cannot be tested in the forward bias condition unless the instrument is floating.



- Another case where a fully floating instrument would be required is testing resistor networks that are connected to ground. In the example shown, if R1 and R2 are 100 ohms each, the measured value would be 50 ohms but with the polarity reversed, the test would be 100 ohms.

Standard Measurement Unit (SMU)

The SMU is a single printed circuit assembly capable of generating the test stimulus for measuring voltage, resistance, and capacitance while comparing these measured values to programmable limits.

With the SMU, you have the flexibility to program test stimuli as a constant voltage from 0.225 volt to 1500 volts (2000 volts with HVA switching) or as a constant current from 0.005 to 2.0 amps.

The instrument utilizes an analog comparison to provide fast continuity and isolation testing. The analog comparison is enabled only for single "high" limit continuity tests with current stimulus and single "low" limit isolation tests with voltage stimulus. If the analog measured value is within approximately 15% of the programmed limit, the comparator will shift to the digital mode and calculate the value for comparison to the limit. All measurements can be digitized with the appropriate test program commands.

Stimulus

The SMU offers an exceptionally broad range of stimulus. It can provide constant voltage from a high or low voltage source, or constant current stimulus in the following ranges:

- Low voltage 0.225 VDC to 29.75 VDC
- High voltage 30 VDC to 1500/2000 VDC
- Current 5mA to 2A

Resistance Measurement

The SMU can measure resistance in a range from 0.01 Ω to 1 GΩ, digitizing the value at the applied stimulus.

DC Voltage Measurement

The SMU measures DC voltages from 0.01 volt to 1500 volts with the SMU or 2000 volts with the High Voltage Switching (HVA). Voltages greater than -4.5V will cause a pass test decision if the test instruction does not contain a low limit, allowing testing for "zero" volts.

AC Voltage Measurement

The SMU measures AC voltages from 1.0 volt to 500 volts RMS within the frequency range of 50 Hz to 400 Hz. Non-sine wave functions can be measured including DC voltages. The AC voltage measurement capability can thus be used to measure DC voltages where the polarity is unknown.

DC Dielectric (Hipot) Testing

The SMU can detect momentary (10 microseconds or longer) breakdowns or arcs in the Unit Under Test (UUT). The SMU monitors the current through the UUT while the stimulus is applied. If the current exceeds a programmed limit of 0.5mA, 1mA, 1.5mA, 2mA, or 2.5mA, the hipot test fails even though the current may return to normal prior to the completion of the test. Valid stimulus voltage is from 250 VDC through 1500 VDC. The SMU has a maximum short circuit current of 5.0 mA during hipot tests.

Capacitance Measurements

The SMU is capable of measuring capacitance which may be found in your product with four digit resolution from 10 pf to 5000μf. These measurements use time domain techniques and a low voltage constant current source. A constant current generator with a compliance voltage up to 30 VDC is connected and used to determine the time to charge the unknown capacitance. Charging currents vary from 0.25 mA to 200 mA. The SMU uses a "time-constant" measurement technique to reduce the effect of noise and parasitic inductance.

A tare mapping feature eliminates the inherent capacitance of the switching system, instrumentation and the interface adapters. It makes the measurements, subtracts the tare value, compares the results to a specified limit, and returns the PASS or FAIL decision.

Programmable Dwell Times

You can control the minimum and maximum time the stimulus will be applied to the circuit under test (called dwell time). These are programmable over the range of 0.001 to 1638 seconds. With the dwell time bypass mode enabled, the test is completed as soon as a pass condition is true and the minimum dwell has elapsed, allowing you to achieve the maximum test rate.

Discharge Wait Circuit

The SMU incorporates a "discharge wait" circuit that monitors to ensure the test stimulus has been discharged after the test is complete. This keeps the system from opening the switch relays while any charge is present, therefore protecting the switching devices from being switched "hot", preserving the switch life, and saving on maintenance costs.

Compensated Continuity Resistance

The DIT-MCO tester provides a method to make low resistance measurements without using four-wire access to the product. The compensated continuity resistance measurement mode eliminates the series "tare" resistance from the two- wire measurement.

Simultaneous Hipot IR

Many applications require both insulation resistance and hipot testing. With the SMU you can simultaneously run the insulation resistance measurements and hipot testing, significantly reducing test times.

Programmable Ramp Rate

The DC (and optional AC) voltage source has a programmable ramping function which allows you to specify the rate at which the voltage is applied to the UUT. The range of valid ramping rates is 50 V/s to 5000 V/s.

The stimulus is also removed at the programmed rate. The programmed dwell times apply once the voltage reaches the full programmed value.

Programmable Compliance Voltage

The maximum open circuit voltage or compliance voltage for tests utilizing a constant current stimulus can be programmed in 0.1 V increments.

Standard Measurement Unit (SMU) Specifications

Stimulus

Source	Range	Programming Steps	Accuracy
Low Voltage	0.225 to 29.75 V	0.075 V	±3%±0.1 V
High Voltage	30 to 1500 V (2000 V HVA)	2 V	±3%±2 V
Constant Current	0.005 to 2.0 A	2.5 mA	±3%±3 mA

Constant Current Measurements

Stimulus(Amps)	Range (Ohms)	Accuracy
0.005 to 0.0975 (not for HVA)	10 to 9.99 K	±3%, ±1 W
0.1 to 2.0	1 to 999	±1% ±0.5 W
0.1 to 2.0	1 K to 99.9 K	±1% ±1 W
1.0 to 2.0 (Compensated)	0.1 to 999	±1% ±0.05 W
0.1 to 0.9975 (4-Wire only)	0.1 to 999	±2% ±0.03 W
1.0 to 2.0 (4-Wire only)	0.01 to 999	±1% ±0.003 W

Constant Voltage Resistance Measurements

Stimulus(Volts)	Range (Ohms)	Accuracy
0.25 to 5.00	10 to 9.99 K	±1%, ±1 W
5.25 to 29.75	10 to 9.99 M	±1%, ±3 W
30 to 98	100 K to 99.9 M	±3%
100 to 498	1 M to 499 M	±1%
500 to 1500	100 K to 999 M	±1%
500 to 1500	1 G to 5 G	+5% - 20%

Dielectric Detector

Stimulus(Volts DC)	Limits (mAmps)	Accuracy
250 to 1500 in 2 V steps	0.5 to 2.5 in 0.5 mA steps	±10%

Voltage Measurements

DC Voltage (Volts)	Accuracy	AC Voltage (Volts)	Accuracy
0.01 to 0.990	±3%±10 mV	1 to 9.99	±2%±0.02 V
1 to 9.99	±1%±10 mV	10.0 to 99.9	±2%±0.2 V
10 to 99.9	±1%±100 mV	100 to 1000	±2%±1 V
100 to 1500	±1%±1 V		

Capacitance Measurement

Range	Accuracy
10.00 - 999.9 pF	±10% + 10 pF
1.00 - 9.999 nF	±5% + 50 pF
10.00 - 999.9 nF	±2% + 100 pF
1.000 – 5000 uF	±5%

Dwell Times

Range (Seconds)	Accuracy
0.001 to 16.383	±2 ms±1 conversion
0.01 to 163.83	±2 ms±1 conversion
0.1 to 1638.2	±2 ms±1 conversion

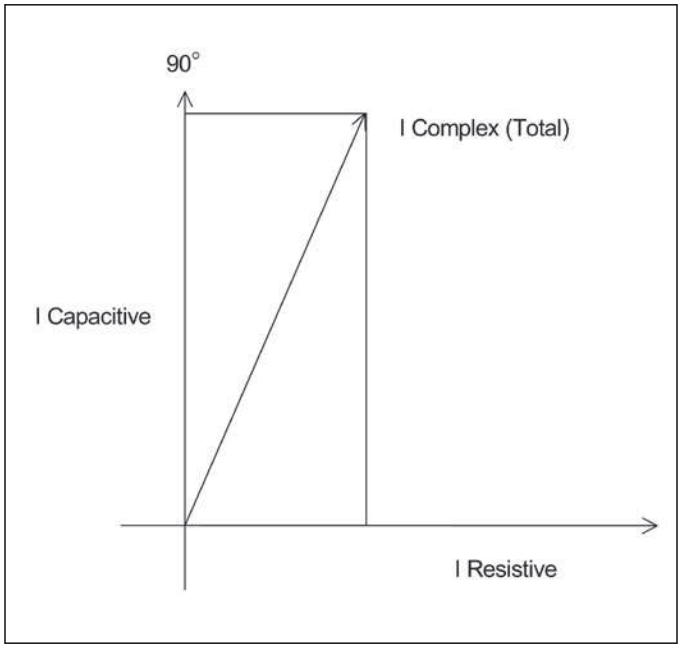
OPTIONAL INSTRUMENTATION

AC Dielectric (Hipot)

AC Dielectric is used to determine whether the insulating material and separation is adequate. AC dielectric presents a different electric circuit due to the alternating currents and capacitive effects on the circuit. DIT-MCO offers two AC sources which supply either 20 mA or 80 mA of current. The application must be considered to determine which one is required.

Resistive and Capacitive Currents

The total current flowing through a capacitive circuit has two components, an in-phase (resistive) and a quadrature (capacitive) component. The total current is a complex (vector sum) of the two components.



The amount of current capacitive current which must be supplied is expressed by the formula:

$I_c = V2\pi fC$

Where: I_c = Capacitance Current
V = Voltage Applied
C = Total Cable & System Capacitance

If: V = 1000 Volts AC rms
C = 0.02 mF
f = 60 Hz

Then:
$I_c = 1000V*2\pi*60*0.02\pi F$
$I_c = 7.54$ *m*A

The amount of current I Resistive which must be supplied is the determined by the formula:

$I_r = V / R$

Where: I_r = Resistive Current
V = Voltage applied
R = Total Leakage Resistance of UUT and System

If: V = 1000 Volts A.C. rms
R = 1 MΩ

Then:
I_r = 1000 V / 1 MΩ
I_r = 1 *m*A

The Complex (Total) current is the vectored sum of the two currents and is given by the following formula:

$I_t = \sqrt{I_c^2 + I_r^2}$

Where: It = Total Current
Ic = Capacitive Current
Ir Resistive Current

If: Ic = 7.45 mA
It = 1.0 mA

Then:

$I_t = \sqrt{(7.45)^2 + (1.0)^2}$

$I_t = 7.60$ *m*A

From the above equation, the I_t (Total) current is 7.60 mA, which is only 60 µ amp greater than the capacitive current (I_c).

In a typical system with a capacitance of 0.02 µF, the AC Hipot Detector (instrumentation) must be capable of supplying a minimum total current of 10 mA.

SMU AC Dielectric Detector

This SMU has the ability to provide AC voltages from 200 VAC to 1000 or 1500 VAC depending on the switching system used. The dielectric detector contains an arc detection network that monitors the UUT during the application of the test stimulus. This detection circuit has a capacitance compensation factor to look at the in-phase current only. Consequently, capacitance load variations up to 0.1 mf do not affect the error indications.

The dielectric detector allows you to select between ramp mode operation or zero-crossing operation. When the test system has completed the ramp and the test is complete, the voltage is removed at the same rate.

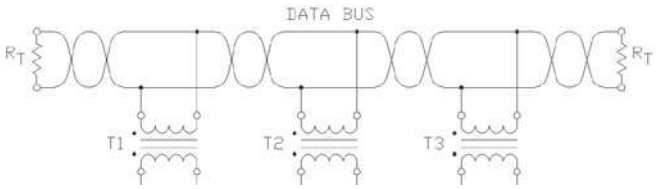
The AC dielectric tester uses an internally generated AC voltage stimulus to supply a 50/60 Hz sine wave to the UUT. The stimulus can be programmed from 200 VAC up to 1000 VAC (1500 VAC) in 2 V increments. The stimulus can either ramp up and down the test voltage or apply voltage at the zero-crossing point.

At the beginning of each test, the detection system is looking at the total current for indications of a low impedance circuit or that an arc is occurring before the circuit stabilizes. During circuit stabilization, the system monitors AC current on a per cycle basis and calculates the real current. If at any time the total current exceeds total current limit (peak or RMS limit) or the real current exceeds a programmed limit the system will then remove stimulus on the UUT and indicate a fail condition.

Test voltage	200 VAC to 1000 VAC (or up to 2000 VAC with HVA) programmable in 2 VAC increment (stimulus accuracy ± 10%)
Real Current Limit (17mA source)	0.2 mA RMS to .5 mA RMS (±15% ± 0.1 mA) 0.5 mA RMS to 2.5 mA RMS (±5% ±0.15 mA)
Real Current Limit (80mA source)	0.2 mA RMS to .5 mA RMS (±15% ±0.1 mA) 0.5 mA RMS to 3.5 mA RMS (±5% ±0.15 mA) 0.5 mA RMS to 3.5 mA RMS (±15% ±0.25 mA) with total current >15 mA RMS
Total Current Limit	17 mA RMS 80 mA RMS (80 mA source)
Peak Current Limit	30 mA 140 mA (80 mA source)

1553 Data Bus Attenuation and Polarity Measurements

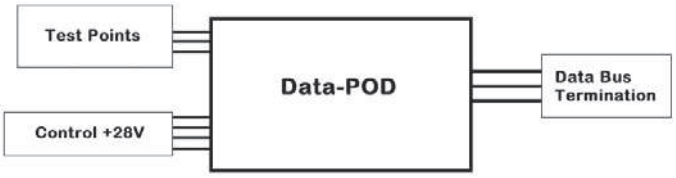
The MIL-STD-1553 data bus utilizes transformer coupled bus transceiver to connect the bus devices.



The data bus consists of twisted pair cable and isolation transformers.

DIT-MCO's wiring analyzers can verify the connections to the transformer by measuring the coil resistance. However the transformers prohibit the ability to test the bus using DC continuity tests. The Data-Pod option allows you to measure the bus attenuation and verify the polarity of the terminations ensuring that the wiring system is fully tested.

The Data-Pod is a small device that can be built into the test adaptation. It connects three test points to the data bus termination (two signals plus shield). The Data-Pod incorporates a signal generator and measurement detector. This allows for the data bus to be tested using a high frequency signal which matches the operational specifications of the data bus. In the case of the 1553 data bus, the Data-Pod generates a 1 MHz signal for bus measurements.



Data-Pods perform attenuation and polarity measurements.

The Data-Pod option provides an integrated solution for the verification of interconnection, loss and phasing of the transformer coupled buses. Each Data-Pod can operate as a transmitter or receiver although only one transmitter is required per bus. By sequentially addressing all of the receivers, the bus attenuation can be measured through each bus termination.

The Data-Pods are powered and controlled by 28 VDC typically applied with external energization. When the Data-Pod is inactive, it connects the test system directly to the data bus terminations. After applying power to the Data-Pod, the test system's test points are connected to the instrumentation inside the Data-Pod and the data bus is connected to the transmitter/receiver.

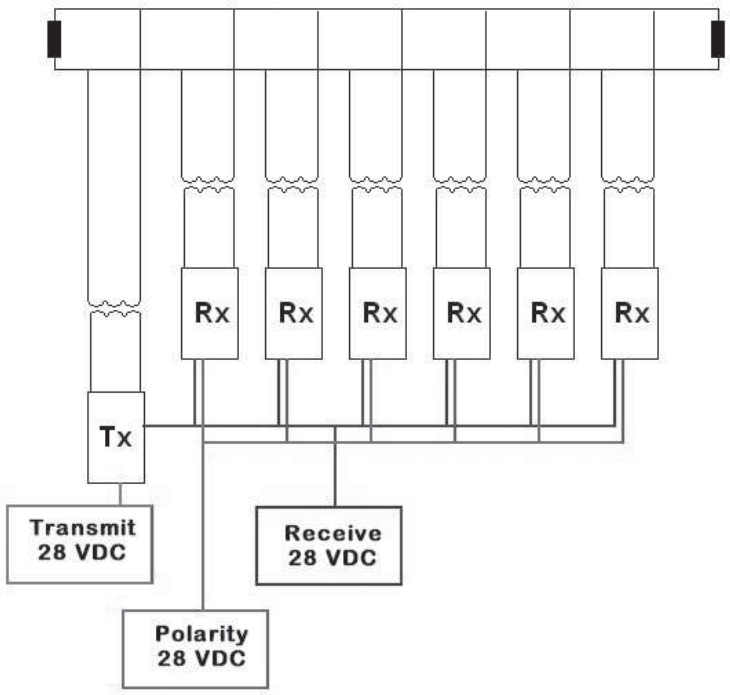
Each Data-Pod has a connection for two control signal and a return which are typically applied using energization relays and a standard 28VDC power source. However only one or two of the connections is required depending on the function of the module.

- Receiver: This connection is used if the Data-Pod is to be a receiver and measure the insertion loss.
- Polarity: This power connection is used if the Data-Pod is to detect polarity and phasing.
- Transmitter: This power connection is used if the pod is to be a source on the data bus. Any transmitter also requires a connection on the receive connection of the device.

Note: A common return path is required for the module. All modules can be activated at the same time through a single external energization connection.

Data-Pod Specifications

- Transmitter output power 300mA
- Transmitter Signal 7V (peak)
- Maximum loss measurement 19dB



STANDARD SYSTEM CAPABILITIES

NetLink Controller

DIT-MCO's NetLink provides TCP/IP networking connectivity for DIT-MCO test systems. Each system includes an Ethernet connection port which simplifies the interface connections, allows a greater distance between controller and test hardware, and expands communication possibilities for the test operations.

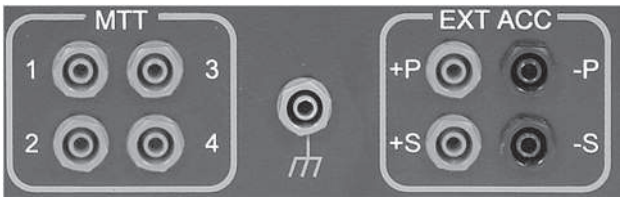
The NetLink controller allows the host PC to connect directly to the test system through a standardized, commercial interface. No specialized hardware is required, so any computer – desktop or notebook – can easily become the test system controller. You can even integrate a Wi-Fi network so that the test system is controlled wirelessly.

With NetLink, the test system can communicate directly with a local area network (LAN) while sharing common network resources such as file and print servers. Engineers can easily administer the test systems from their office as well as release test programs to a common file server.

But the biggest advantage of networking is possible by integrating isolated test setups with each other through a LAN to build an archive of test results.

External Access

DIT-MCO gives you the capability of accessing the UUT through the switching matrix. With external access enabled, the connections to the switching from the instrument are disconnected and routed to the external access connectors. In this way, you can measure the same circuit that the tester measured using an external instrument. And external access can be used to provide additional test capabilities not found within the standard DIT-MCO instrumentation.



Multiple Terminal Testing

Each DIT-MCO system provides four special test points called the Multiple Terminal Test (MTT) points. The MTT points are scanned first during error conditions. If the scan determines that the MTT point is part of the scan, then the scan terminates.

Normally the MTT points are used with power bus circuits. For example, in a large complex product a ground circuit may consist of over 1,000 connections. If there is a connection between the MTT point and the product ground, then the system stops scanning as soon as it finds the MTT point. This prevents longer scan times and lengthy error printouts. Instead, the system reports a simple shorted connection to the MTT point rather than scanning all the connections in the ground circuit.

Whenever a bulk test fails, the analyzer scans the MTT jacks. If it encounters an MTT error, it does not scan the switching system and does not report higher addressed errors.

You can also use MTT points for two-wire tests that have an MTT terminal as an input address. The Q switching code sets up MTT two point tests.

The system does not activate MTT jacks during Continuity Error Scans.

Hipot Testing

All systems have the capability to perform DC Hipot (Dielectric Breakdown) tests in addition to insulation resistance tests. Hipot tests detect momentary breakdowns in the UUT when the current exceeds a programmed limit. If a momentary breakdown occurs, the hipot stores the test result (FAIL) and waits until the end of a maximum dwell to terminate the test. This differs from normal insulation resistance testing in that any breakdown causes a failure, even if it is momentary, and the insulation resistance measurement passes at the completion of the dwell time.

SYSTEM OPTIONS

Programmed Power Application

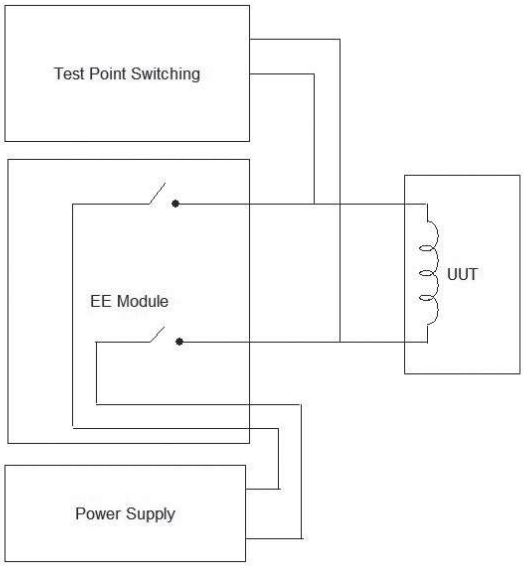
Frequently you need to apply power to the unit under test (UUT) to completely test the interconnections. With program power it is possible to activate relays, lights, motors, solenoids, and other UUT components. For example, a relay in the product needs activating to test the wiring to the normally open contacts. DIT-MCO offers relay matrices to accomplish this using a latching relay which remains activated for the duration of the test. There are two configurations of program power matrices.

- External Energization (EE)
- Latching Matrix (LM)

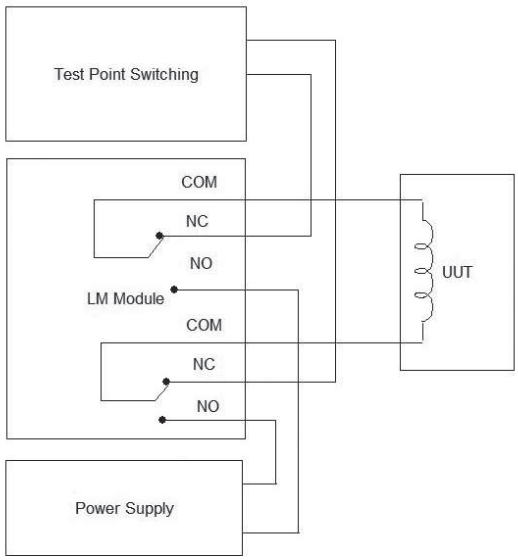
The distinguishing characteristic between the two configurations is the number of relay contacts (Normally Open NO, Normally Closed NC and Common COM) that are available for connection to a power source or UUT. In the EE configuration, a form A relay (NO and COM contacts) is used. With the Form A relay one side is connected to a power source and the other side is connected to the UUT. Frequently with the EE configuration, the power side of the relay is connected to a power bus.

The LM configuration uses a Form C relay (NO, NC, COM) and all three contacts are available. The LM can be used identically to the EE by using only the NO and COM contacts. But there is more that is possible with the LM configuration by using the NC contact.

By connecting the COM contact to the UUT, you can switch between the test points switching matrix and the power source. When you activate the LM relay to connect the power supply, you are also disconnecting the test point matrix protecting the matrix from the power supply. In this case, the NO contact connects to the power source and the NC to the test point matrix.



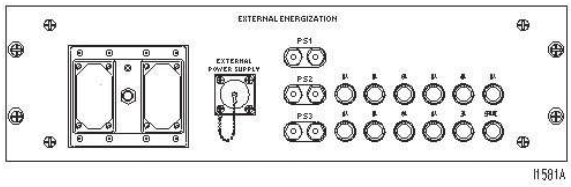
EE Configuration of Program Power connects the power source to the UUT and test system.



The LM configuration isolates the test system during activation..

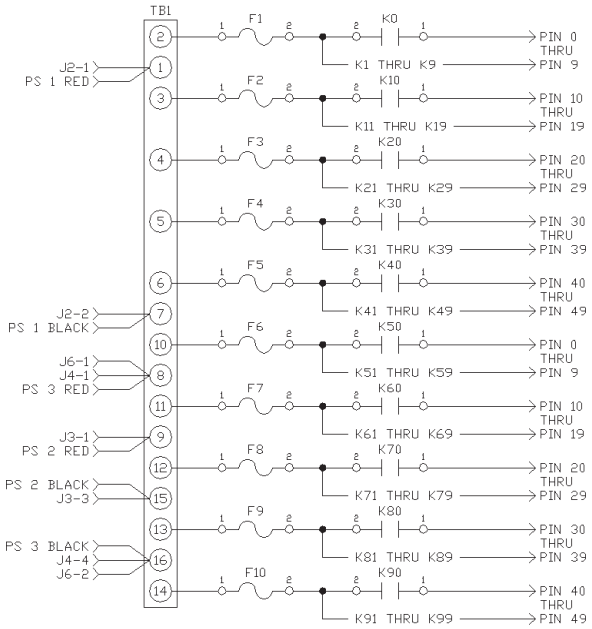
External Energization Chassis (EE-50, EE-100)

The EE-50 and EE-100 chassis provide 50 and 100 points of external energization, respectively. Each group of 10 relays connects one contact to a power distribution bus. The other contact is then wired to the I/O connector. Each of the power buses can be connected to the same or different sources through the connections on the back of the chassis.



External Energization (resistive)	
Max. switching voltage	240 VAC
Max. switching current	6 Amp

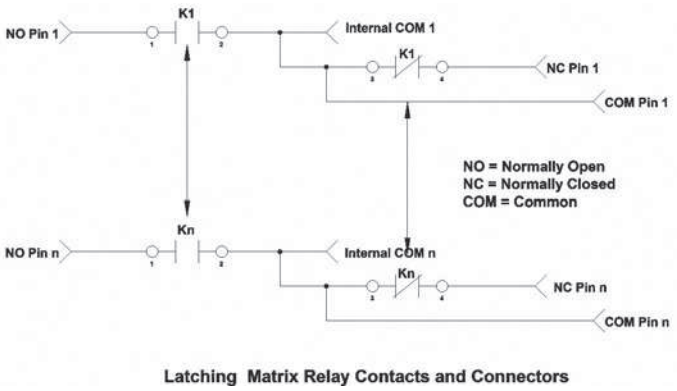
Each EE power bus is fused at 6 amps. Power supplies are connected to a terminal block on the back of the chassis. Connections to the UUT are made through the 100 pin connector on the front of the chassis.



Latching Matrix Chassis (LM-50, LM-100)

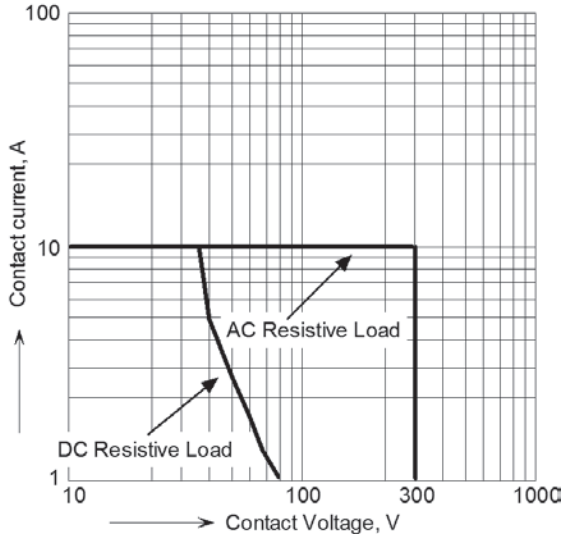
The LM-50 and LM-100 chassis provide 50 or 100 relays, respectively, using a Form "C" configuration. This means you have both a normally open and a normally closed contact available in addition to the common contact. This makes it possible to disconnect the standard switching matrix from the product when the LM module applies external energization power.

Latching Matrix (resistive)	
Max. switching voltage	277 VAC
Max. switching current	10 Amp



Latching Matrix Relay Contacts and Connectors

Power supplies can connect to the relay contacts through the I/O connectors on the front of the system or through the connector on the back of the chassis. By wiring the common connection to the UUT, it is possible to isolate the switching from the external power. In this case, the normally closed contact is connected to the switching and the normally open is connected to the external power source. This protects the switching matrix from accidental damage by the application of the power sources.



Relay Specifications for EE and LM

The Latching Matrix (LM) uses a relay that allows switching of high amounts of power to the UUT. The maximum switching and carry current for the Latching Matrix is 10 Amps. The maximum switching and carry current for the External Energization (EE) module is 6 Amps. The maximum current, however, is dependent upon the type of voltage (AC/DC) and the open circuit value of that voltage. The maximum current may not be able to be switched for all conditions.

The switching characteristics of both the External Energization and Latching Matrix must be evaluated for each application as they are applicable for certain electrical conditions and do not apply for all conditions. For example, for a DC voltage above 30 VDC, the maximum current that can be switched must be determined by the value of the open circuit voltage and many not be able to switch the maximum current of 10 Amps. This is due to the arc welding characteristics of opening a contact with voltage applied. The actual switching capabilities of the relay are given in the above "Maximum Switching Capacity" graph. If applying more current than allowed by these curves, then it will be necessary to apply the power by programming up the power supply after the relay is closed and removing the power before opening the contacts.

Power Supplies

Any power supply can be connected to the LM or EE chassis. DIT-MCO has standard power supplies to provide 28 VDC and 115 VAC at 400 Hz.

28 VDC Power Supply EEPS-28, LMPS-28	28 Volts at up to 10 Amps
115 VAC Power Supply EEPS-115, LMPS-115	115 VAC at 1500 volt Amps 400 Hz

Programmable Power Supply

Programmable GPIB power supplies can be incorporated into the test system providing power sources to active components such as relays and solenoids. The power supplies are controlled through the TestExecutive and the VirtComp software. The GPIB control commands can be incorporated directly into the test program or macros can be created so that simple, logical commands can be used without knowledge of the GPIB commands. Available power supplies include the following:

- Agilent 6633B 0 – 50 VDC, 0 – 2 A
- Agilent 6643A 0 – 120 VDC, 0 – 4 A
- Agilent 6653A 0 – 35 VDC, 0 – 15 A
- Agilent 6654A 0 – 60 VDC, 0 – 9 A
- Agilent 6655A 0 – 120 VDC, 0 – 4 A
- Agilent 6674A 0 – 60 VDC, 0 – 35 A
- Kepco 0-75 VDC, 0 – 8 A
- AC Power Source 0 – 132 VAC, 1500 VA, 15 to 1200 Hz

Internal Programmable Power Supply

An internal programmable power supply is also available for the Model 2115 and 2650 systems. The internal power supply is controlled by the TestExecutive Programmable Instrument Interface (PII) command. The internal programmable power supply is available with a 3 – 30 V range or a 3 – 60 V range depending upon the hardware option installed. The supply sources up to 6 amp of current.

The internal programmable power supply is designated as the PS1 instrument with the PII command and is controlled with two commands; SETPWR and RESET. The SETPWR command sets both the voltage and the current.

PII PS1 SETPWR 10V 3A

Programmable Instruments

GPIB instruments can expand the measurements and capabilities of the test system. GPIB instruments can be incorporated with DIT-MCO's VirtComp software. With VirtComp, the instruments are programmed using a set of macro files which can be developed by DIT-MCO or by the test programmer. The instruments can then be controlled directly from the test program file and the results incorporated directly into the error report. Available instrument options include the following:

- Agilent 34401A Digital Multi-Meter (DMM) 6.5 Digit
- Agilent 3458A Digital Multi-Meter (DMM) 8.5 Digit
- Agilent 8904A Frequency Generator
- Associated Research Dielectric Detector

Continuity Probe

The hand held Continuity Probe option allows an operator to probe specific points on the UUT. It permits controlled sequencing of tests while manually probing along selected circuit paths to isolate a fault. It is used with low voltage on current stimulus only. The probe has indicators for Probe Enabled, PASS and FAIL. It also includes a "Continue" switch to stop the test, report the results and continue to the next operation.

Probes are generally used on cables with loose wires (sometimes referred to as "hanging ends") that are not terminated until final installation. You can automatically enter the probe mode on a continuity failure by using the Probe on Fail directive. The operator then uses the probe to contact several adjacent circuits to debug the fault.

Wireless Remote Control

The TestExecutive Touch option provides complete mobility and greatly enhances your ability to test, debug, and rework large products. By providing the operator with comprehensive control of the test system, the wireless remote allows you to conduct all testing operations remotely.

Wireless Remote Control utilizes a PDA with a touch screen interface. The small and lightweight package can be easily carried through the test facility. A typical wireless access point can provide a range of up to 300 ft. (100 meters) but this can extended depending upon the networking that you are using.

The TestExecutive Touch allows the following capability:

- Allows the user to fix wiring problems and make repairs to the UUT.
- A test run can be initiated from the handheld device.
- Hookup instructions can be viewed directly on the handheld.
- Stop/Advance functionality to interrupt program execution and then continue from the paused state.
- Test results are displayed at both the controller and the handheld device.
- Manual operations can be performed with full control of the test station to help determine fault locations and initiate repairs.

Calibration Verification Tool (CVT-1)

The Calibration Verification Tool is an optional tool and program. It is used to verify that the analyzer's comparator can apply voltage and current stimulus and then make measurements within the stated accuracy of the analyzer. The tests are made in three sections including 4-wire resistance verification, 2-wire resistance self-checks, and voltage measurements.

The test tool contains a battery with divider string to allow verification of low voltage measurements against programmed limits.

Resistance Value (Ohms)	Tool Accuracy (%)
0.01	0.25
0.1	0.25
1	0.25
10	0.25
100	0.25
1000	0.25
5000	0.25
10 K	0.25
100 K	0.25
200 K	0.25
1 M	0.5
10 M	0.5
100 M	0.5
500 M	1
1000 M	1

Safety High Voltage Alarm

DIT-MCO analyzers can be equipped with an alarm to indicate testing conditions. The safety alarm generates an audio and visual warning for either AC stimulus, high voltage DC stimulus, or any active test operation depending on the alarm configuration settings.

The alarm is always active when AC voltage is used, but other conditions can activate the alarm as well.

Alarm Active for AC Only

This setting causes the alarm to be active whenever the test stimulus is an AC voltage. The alarm stays on until the test is complete.

Alarm Active for High Voltage DC and AC

This setting causes the alarm to be active whenever the test stimulus is greater than 30 V DC or for any AC voltage. The alarm stays on until the system is "off line", or a low- DC voltage test is executed.

Alarm Active for Testing

This setting causes the alarm to be active whenever the system is executing a test file or is in Manual Mode. The alarm stays on until the system is "off line".

The alarm will be active for a minimum of approximately 1 second for DC testing, when DC tests are selected to activate the alarm. So even if a DC test is executed with a short dwell, the alarm is active long enough to alert the user. AC tests should always be programmed with a minimum dwell of at least one second.

An interlock on the DIT-MCO analyzer is used as a safety feature to protect users. If the interlock is not in place for a specified condition, power is removed from the test system. The safety interlock can be active during the AC test operation only or during the same conditions for which the alarm is active.

SYSTEM SOFTWARE

DIT-MCO provides the software you need to create test files, run the test system and track errors. You can generate the test files manually with text editors or automatically by learning the interconnects in your product. The software features simple-to-learn menu commands and utilizes familiar "Windows" interfaces.

Test Program Development

DIT-MCO test systems require only an ASCII file to test your product, however, you may also want to build an Address Correspondence Table (ACT) file. The ACT file stores your product language in addition to the test system switching addresses for use in error reporting. The error reports will show your product language in addition to the test system switching addresses.

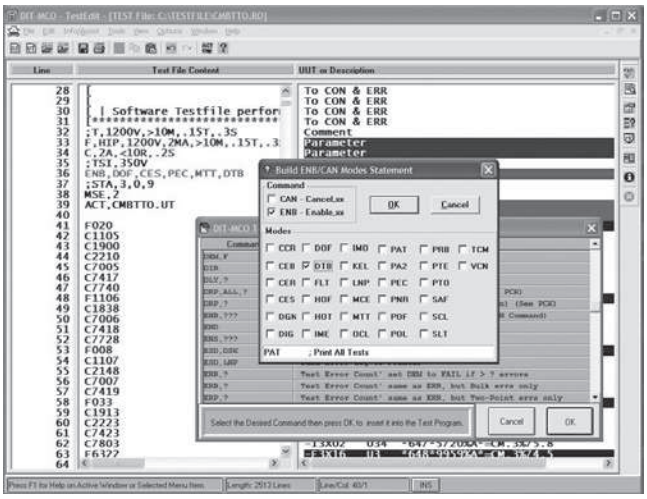
1. Development of a new test program requires several tasks. First, examine the product and determine the most efficient method to connect the product to the test system.

2. Next, build the adapter cables or fixture interface to connect the product to the test system. If you need assistance with this task, DIT-MCO designs, fabricates, and tests adapter cables as well as fixtures.

3. Then generate the test program by self-programming, converting a wire list with Automatic Program Generation (APG) software, or manually entering the test commands.

TestEdit®

DIT-MCO's Windows™ based TestEdit provides help at every click so that you don't have to remember difficult commands or keystrokes. TestEdit creates and maintains product test files and Address Correspondence Table (ACT) files. Although not required to perform a test, the ACT files improve the meaning of the error reports by providing up to 64 characters of information about the test point or the EE/LM point.



The multiple windows capability enables you to open and display a number of files simultaneously. This feature also allows sharing of information between files. Another TestEdit exclusive capability allows for the display of the product's ACT reference designators simultaneously with the test file in the same window.

Point-and-click dialog boxes help you create mode and parameter commands, virtually eliminating typing errors and memorization. Build functions let you create product sequence names to be saved in the ACT file. The powerful "find and replace" function makes it easier to locate specific test commands or product names.

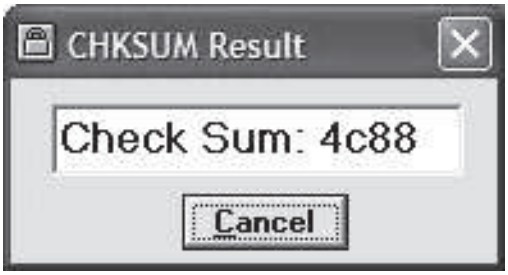
The Quick-zoom function displays all parameter, mode, ACT, and skip commands with the associated line number so you can quickly see what is in effect and move to the desired location.

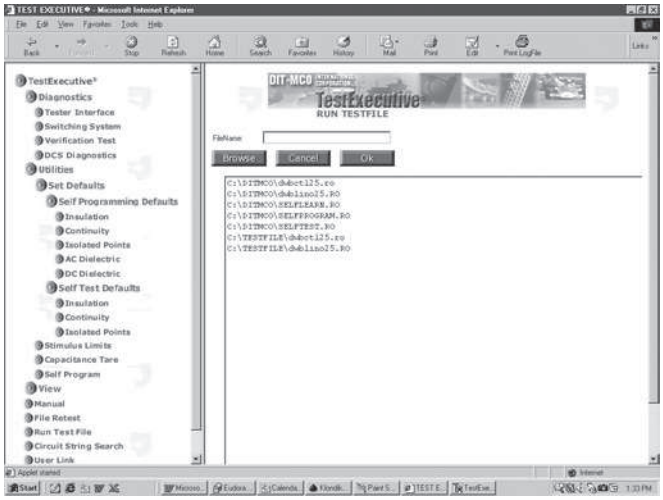
Checksum Generator (CHKSUM)

Checksum Generator (CHKSUM) guarantees you are using the right version of a test program. The program reads the data in a disk resident file and produces a unique four (4) digit identification number (CHKSUM) for that test file. You can even configure your test software to automatically stop if the checksum value changes, indicating that the wrong version of a test program has been accessed.

Each time you execute CHKSUM, it assigns a number to a selected test file. The checksum for a file changes if you change, delete, or add characters, instructions, etc. Use CHKSUM first on a completed test program to produce the master checksum value. CHKSUM applies a formula to each byte of data in a file. The result is a checksum value that is unique to the sequential order, number of bytes, and byte value in the file.

At a later date, or each time you run a test, you can run CHKSUM to verify you are using the right version. Compare this number with the original number to make sure you do not use a modified test program. You can also automatically capture the checksum to your error log each time you execute your test program. Just use the file directive CKS at the beginning of your error log. CHKSUM is invaluable for ensuring all staff use only the approved version of a test program.





TestExecutive®

TestExecutive assists the test operator on the test floor and gives the test programmer a powerful, flexible, easy-to-use programming language.

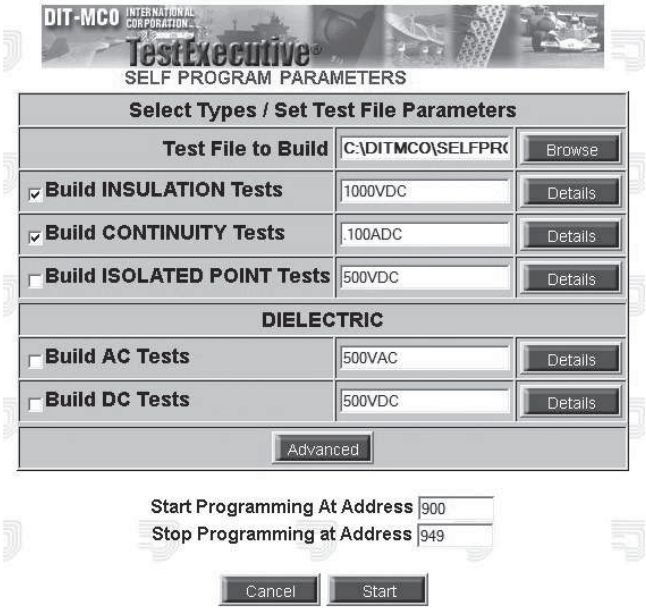
DIT-MCO's exposure to a wide variety of product-testing applications, from computers to aerospace, fueled many of the features in TestExecutive. DIT-MCO incorporates many customer suggestions based on particular testing requirements. This results in software that is easy to use and full-featured to meet testing needs.

Self-Programming

TestExecutive" software can create a test program using a "known good" or "golden" product. The operator loads a "golden" product and then selects the self-program mode. The analyzer examines the product and creates the disk resident test program.

Product Language Lookup

TestExecutive includes a feature called Product Language Lookup (PLL) for programs or manual rework. This allows you to enter the test instructions in the UUT terminology (such as J01 Pin A) rather than using the analyzer address. On-the-fly translation uses the correct analyzer addresses for the test.



Write Error Program

The Write Error Program (WEP) mode of TestExecutive collects all test instructions that created an error while re-running the test program. Operators can use this information during the repair process to verify they have corrected all errors before re-running the complete test file.

Manual Mode

The Manual mode operation of TestExecutive provides an extremely useful method to debug the errors in your products and verify wiring changes. The manual mode allows you full control of the analyzer without requiring you to create or compile a test program. Manual mode can be entered while the analyzer is idle or during a test cycle. You can even instruct the system to stop on a failure and then enter manual mode, permitting you to correct the faults as you test.

Compensated Measurements

Compensated measurements allows accurate low resistance tests without using costly four-wire switching and adapter cables. This is accomplished by referencing stored tare resistance database to remove all of the series resistance from the desired measurement. The software stores the internal resistance and the external adapter cabling resistance so that the stored values can be subtracted from the measured value during the test.

Syntax Checker

The syntax checker program inspects test program files for correct syntax. This program is used after test file creation or while editing to verify that the program does not have any syntax errors. This ensures that your new test program will operate successfully with your product.

Diagnostics

The system comes complete with several programs to confirm proper operation and to assist in pinpointing faults, should they arise. These diagnostics allow board level fault diagnosis of all logic cards, switching cards and the comparator.

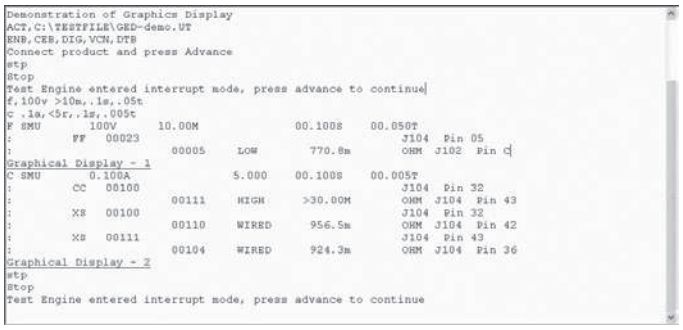
TestExecutive Graphical Display

Getting test results that you can understand helps you quickly find the fault. Traditional reports list the testing results in text format. DIT-MCO's TestExecutive offers a better way to view the test results using a graphic format. You can improve your understanding of the test results using the Graphical Display feature so that you can improve your testing throughput.

The Graphic Display feature is a standard capability of TestExecutive. There is no additional programming or data required. TestExecutive determines the circuit connectivity from the test program data.

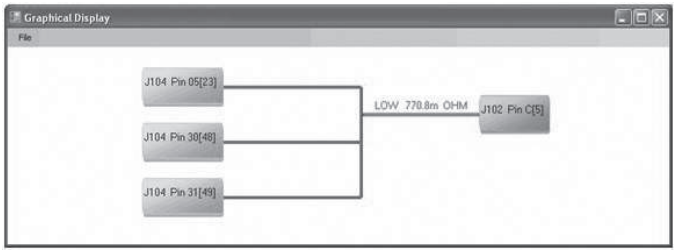
The Graphic display is available through a hyperlink in the error report. Click on the hyperlink and a simple graphic will be generated to show you the circuit under test and any open and shorts found in the testing. The graphic shows you all of the connections that should be in the circuit as well as the faults detected during the testing.

Consider the following error listing.



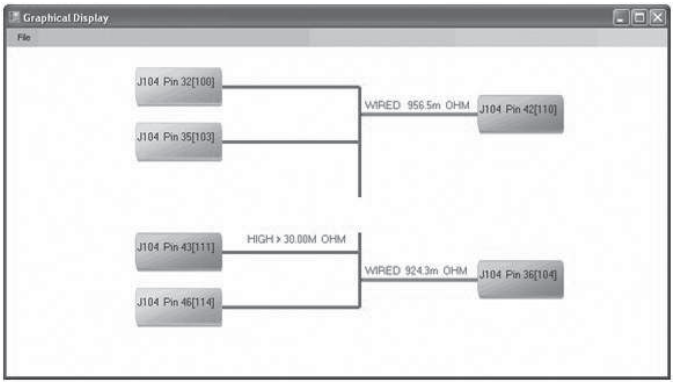
TestExecutive Error Log Display

Simply clicking on the displayed hyperlink "Graphical Display – 1" generates the TestExecutive Graphical Display.



TestExecutive Graphical Display showing a short circuit

The left side of the diagram displays the points within the net, with any shorts or miss-wired points on the right side. Correct connections within the circuit as displayed in green while faults are highlighted in red. The display above shows the representation of a short to the string.



TestExecutive Graphical Display
showing two short circuits and one open circuit.

Shorts and miss-wires are limited to a maximum of ten entries displayed to reduce the complexity of the drawing.

The identifiers on each end point includes the ACT file definition (typically reference designator and pin name) followed by the test address of the end point. If there is no ACT information available, then only the bracketed test address will be visible.

Example Point with Long UTT Information

If the UUT or MTT information is longer than thirty-two characters long TestExecutive will automatically shorten the display to the maximum displayable width and append ellipses ("…") to the end of the point.

TestExecutive Graphical Display includes support for printing of the on-screen diagram. Just select the print function from the menu in the display.

Test Program Files

Test programs and related files are resident on the computer controller or they may be networked to provide shared data capabilities among other test stations. TestExecutive uses two types of disk-resident test program files:

- The ASCII test instruction file, like a computer program, defines a sequence of actions or tests.
- The Address Correspondence Table (ACT) file translates DIT-MCO analyzer addresses into product terminology meaningful to you. The ACT file entries make the error reports easier to read and provide useful product information. Each ACT field provides up to 64 characters to describe the test point. Use the ACT files in addition to the test files for more comprehensive error information.

Test Instructions

Test instructions tell the analyzer how to test your product. A test instruction may command the system to test a circuit for isolation or to measure a voltage. The most commonly used commands to verify interconnects are continuity and isolation.

Continuity Tests

A continuity test verifies a connection between two points that are wired together. The test system checks for continuity by applying low voltage or constant current between two points on the UUT. Continuity tests use a "High Limit" meaning the test passes if the measured resistance is less than the specified high limit.

Isolation Tests

An isolation test confirms the isolation of a given point or circuit string from other points or circuit strings on the product. The test system applies voltage between two or more points on the UUT and measures the resistance. Isolation tests use a "Low Limit" meaning the test passes if the measured resistance is greater than the specified low limit.

Generally, an isolation test utilizes a bulk switching matrix setup in which a number of points are grouped or bulked together. The bulk switching setups allow for fast detection of shorts or leakages between all other circuits in the product.

Directives

TestExecutive allows the flexibility to control the analyzer through directive commands. For example, the directive command may display information on the screen or may instruct the analyzer to report the measurements.

Directive and Mode Summary

#	Skip on non contingent pass	DRP	Unlatch LM or EE Relay	PCF	Product Characterization File
&	Skip on non contingent fail	DTB	Dwell Time Bypass	PCK	Latch LM or EE Relay
(	Display Line on Computer	EDS	End Device Stimulus	PEC	Print Errors at Computer
*	Enter Line in the Error Log	ENB	Enable Mode	PNR	Print NO Responses
;	Comments in Test File	END	End of File	POF	Continuity Probe On Fail
[	Computer and Error Log	ENS	End Skip	POL	Instrument Polling
ABT	Abort	ERB	Bulk Test Error Count	PRB	Continuity Probe
ACE,file	Addr Correspod Exceptions	ERP	Two Point Test Error Count	PRF	Product Resistance File
ACT,file	Address Correspondence File	ERR	Test Error Count	PTC	Print Test and Comments
ADI	Address Incrementing	ESD,DSK	Save Error Log	PTE	Print Test Errors Only
AFE	Append Error File	ESR	Error Summary Report	PTO	Print Tests Only
ASSIGN	MBA Bus Assignment	ETB	End Test Block	REF,file	Self Program Reference File
ATV	ARC Tare Value	FLT	Filtered Measurements	REMOVE	MBA Bus Remove
BOF	Beep on Fail	FMT	Error Log Format	RESET	MBA Reset
BTB	Begin Test Block	FOR	Looped Test Addressing	ROUTE	MBA Bus Routing
BTN	Game Port Button	FYR	Four Digit Year Format	RTN	Return to Main Program
CAN	Cancel Mode	HDR,txt	Print Text Header of Log	SAF	Stop After Fail
CCR	Compensated Continuity	HOF	Hold On Fail	SAL	Save All Results to File
CDP	Clear Device Parameter	HOT	Hold On Test	SCF	Switch Characterization File
CEB	Continuity Scan Both	IBT	Inhibit Bulk Tests	SCL	Short Circuit Locator
CER	Test Certification	IF	Conditional Control	SDS	Start Internal Test
CES	Continuity Error Scan	IME	Inhibit Manual Entry	SEL,file	Save Error Log
CKS	Calculate a Checksum Value	IMO	Inhibit Manual Override	SKP,label	Skip to ENS,label
CMP	Compliance Voltage	INP	Input data from operator	SLC	Set Loop Counter
CNP,file	Call Next Program	ITT	Inhibit Two-Point Tests	SLT	Single Test
CNR,file	Call Next with Return	KEL	4-Wire (Kelvin) Switching	STA	Station Select
CON	MBA Connect	LIN,n	Print n Lines per Page	STD	Send to Device
CPR	Control Panel Response	LNP	Line Printer Switch	STP	Stop Testing
CTF,file	Capacitance Tare File	LOG	Specify Error Log	SYS	Execute System Command
DCD	Disconnect Current Device	MBE	Maximum Bulk Errors	TAR,n	Reset Tare Value
DDA	Define Device Access	MCE	MTT Continuity Error Scan	TCM	Tare Compensation Mode
DDP	Define Device Parameter	MPE	Maximum Two Point Errors	TIM	Display Time and Date
DEFINE	MBA Bus Definition	MSE,n	Maximum Scan Error	TRN	Buffered Transfer Text
DEM	Set Decision Memory	MSL,n	Maximum String Length	TSI	Two Step Insulation
DIS	MBA Disconnect	MTE,n	Maximum Test Error	TST	Logical Test
DGN	Diagnostic Messages	MTT	Multiple Terminal Test	VAR	Variable Definition
DIG	Digitize test results	NOP	No Operation	VCN	Virtual Console Display
DIR	Change Directory	OCL	Open Circuit Locator	VER	Display Version Number
DLC	Decrement Loop Counter	OUT	Serial Port Output Control	WEP	Write Error Program File
DLY,n	Delay Time for n Second(s)	PA2	Print All Tests (Modified)		
DOF	Digitize On Fail	PAT	Print All Tests		

Test Parameters Statements

The test parameters specify the stimulus values, the duration of the test, and the limit used to decide a pass or fail condition. A parameter directive includes the following fields:

```
Test  Device  Stimulus  Limit  Dwell
```

You can have up to 24 parameter sets defined in the test program. You can redefine each parameter set as many times as necessary so you have virtually unlimited capability to test various components in the product. The parameter tag is any letter between A and Z, except for X and W. The parameter tag identifies the parameter directive throughout the test program.

The Device code informs the system as to which instrument will perform the test. Normally, the system only has one device, the Standard Measurement Unit (SMU). Examples of device codes are as follows:

SMU	Standard Measurement Unit
DIODE	Performs Diode Tests
HIP	Hipot (DC Dielectric) Tests
DIE	AC Dielectric Tests
ARC	AC Arc Detector
CAP	Capacitance Measurements

The Stimulus value depends on the instrument utilized for the test. Generally, for an isolation test, the stimulus value is in volts and for a continuity test the stimulus value is in amps.

The Limit value tells the instrument how much resistance, voltage, capacitance, etc., it must detect for a pass condition.

The Dwell time specifies the minimum and maximum time allowed for the test. Enabling the testing mode of Dwell Time Bypass instructs the system to go to the next test at the completion of the minimum dwell and a pass condition, therefore bypassing the maximum dwell time.

Parameter Examples

Isolation tests detect shorts or leakages between circuits based upon the measured resistance being greater than a specified value. This means the test passes if the detected measurement is greater than n ohms. Most programmers use the F tag for isolation test. Additionally, M represents Meg-ohms, K represents Kilo-ohms and R represents ohms.

```
F 1000V >10M 0.5S
```

Continuity tests measure the circuit resistance and pass if the measured value is less than the specified limit. This means the test passes if the detected measurement is less than n ohms. Most programmers use the C tag for continuity test.

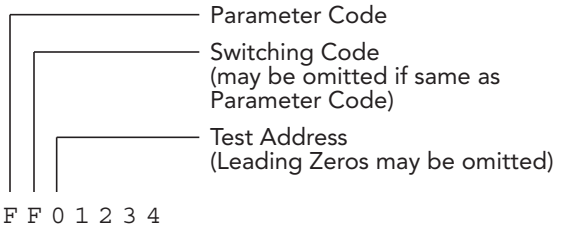
```
C 1A <10R 0.1S
```

You can also use dual limits with resistance values or by way of percentages.

```
C 1A >28.5R <31.5R ...
C 10V 50R+-10%...
```

Designing Test Instructions

Test instructions tell the system the parameters and test points to use. The type of test (isolation or continuity for example) is defined by the parameter set used in the test command. The basic format for a test instruction is a parameter set followed by a switching code and the test point address.



The previous test instruction tells the analyzer to:

- Use the F parameter set
- Set up switching as a low-order bulk
- Activate test point address of 1234

Test Using Product Language

You can also write the test commands using product language in which case you don't need to specify the test point address. The system looks up the actual test point address when the test program is executed. To use product language you need only write the parameter code and switching code.

```
FF-J1 Pin 1
```

Switching Codes

The switching code instructs the switching matrix which switches to turn on for a test. For example, a low order bulk switching setup activates all switch addresses lower than the specified address and then tests against the specified address. Each test requires activating at least two switching points. The first, referred to as the output point, is the location where the stimulus is applied. The second, referred to as the input, is the point where the stimulus is detected.

Switching Codes

A	Input address, two point test
B	Input address, two point test
C	Input address, two point test
D	Output address, low order bulk, no scan
E	Input address, two point test
F	Output address, low order bulk, scan
G	Input address, two point test
H	Input address, two point test
I	Input address, two point test
J	Input address, two point test
K	Input address, two point test
L	Input address, two point test
M	Input address, two point test
N	Input address, two point test
O	Input address, two point test
P	Input address, two point test
Q	MTT terminals, input address, two point test
R	Output address, low order bulk, low point scan
S	Output address, high order bulk, scan
T	Output address, all point bulk, scan
U	Input address, two point test
V	Input address, two point test, input transfer
W	Input address, two point test
X	Output address, no test
Y	Input address, two point test
Z	Input address, two point test

OPTIONAL SOFTWARE

Many cables use simple pin-to-pin wiring and can be easily tested. Even with slightly more complex interconnections, the task is manageable. DIT-MCO testers can even automatically learn the interconnections and create a test program with no programming effort.

However, the larger and more complicated the product under test (such as aircraft, transportation vehicles or satellites), the more sophisticated the tools must be to manage the process.

For example, a typical aircraft may have 20,000 terminations in the wiring through 250 connectors. The wire list may detail 15,000 connections and may include components such as resistors, relays, circuit breakers, diodes and switches, in addition to splices and terminal blocks. The schematics may include more than 100 pages.

Without tools designed to manage the data and generate the required engineering documentation, these development and implementation tasks are very complicated. Attempting to develop a test for such complex products without appropriate software design tools may require six to 12 months of engineering development time. As an alternative, apply robust development tools designed for the process and accomplish the engineering in a fraction of that time and achieve better results.

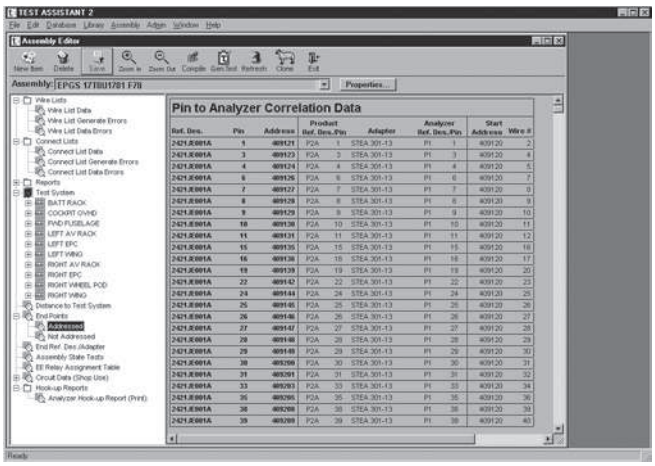
Use of a software development tool cut development time for an aircraft modernization program by one third of what was previously required. This program required test files and adapters for 18,000 test points. Manually, this would have taken three people six months but with the right tools, this was accomplished by a single engineer.

Software tools that support design and analysis lay the foundation for an efficient process with high quality results. First, a comprehensive engineering design package provides a robust environment to create testing solutions for complex wired assemblies. Once into production, a data capture tool establishes a rich database that can be used for detailed analysis to push ongoing process, quality and productivity improvements.

DIT-MCO has developed application programs to make your job more efficient and productive. DIT-MCO's powerful software helps you with program generation through error analysis.

TestAssistant®

Windows'based TestAssistant guides you through the complete test development process and generates the information you need including test files, adapter cable designs and fabrication information, and even hook-up instructions.

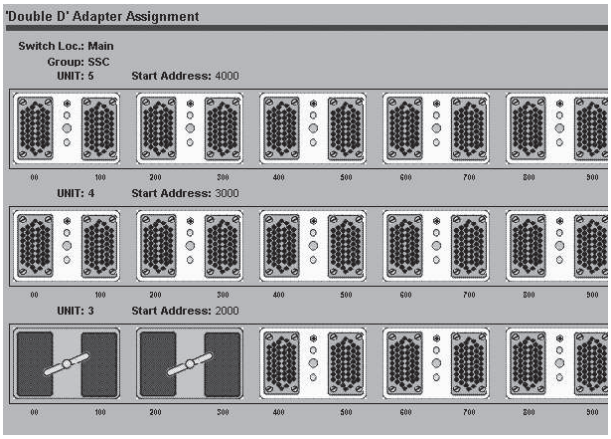


If you have design database information available, TestAssistant is even simpler to use with built-in import utilities. No matter the format, just let TestAssistant do the work for you in a fraction of the time.

Adapter Cables and Connectors

TestAssistant supports data management for both dedicated test setups and workshop environments with a common inventory of adapters.

- The software maintains a database of all existing test adapters.
- Once the product's end points are found, TestAssistant searches the database to find candidates with the appropriate mating connectors.
- If new adapters are required, TestAssistant automatically designs them, generating a Bill Of Material (BOM) and wire list for each one.
- The software creates a unique part number in the user's standard format.



TestAssistant determines the best fit of the end point connectors to the test system to avoid using overly complex adapters. The software can even design "clip" adapters for any loose wires the product may contain.

Once the test adapters have been selected from the library or design documents generated for new adapters, TestAssistant features a simple method to define the connection of each adapter to the product. The screen displays a graphical image of the test system. The engineer drags the specified test adapter on screen to a connector on the test system. To change the test point location of any adapter, the engineer simply drags the adapter to another available connector.

TestAssistant Test Program Generation

The software now "knows" how the product will be connected to the tester. TestAssistant automatically generates the test sequences that the user has selected which may include:

- Low voltage safety test
- High voltage leakage and continuity testing
- Continuity through passive components
- Complex component testing including activation of relays in the product

At this point, new adapters would be built, per design documents generated by the software, or existing adapters pulled from inventory. Once all the adapters are in hand and the product is ready, the next step is verifying the test solution.

TestAssistant Commissioning and Verification

With the test system, test adapters, test program and test product on site, it might appear that you're ready to test the first production unit. There actually are interim steps that will improve the process. A methodical diagnostics process accomplishes this goal in a predictable, controlled manner. TestAssistant generates specialized diagnostic test programs specifically for this phase of the development.

Probe Test

The probe tests verifies the adapter cable construction and the connection of each in the test system. TestAssistant generates a program that directs you to manually probe each of the test adapters. This accomplishes two things: It verifies the wiring of each adapter against its design, and it proves that the test system is correctly addressing the adapter through the test software.

One-Pin Test

When technicians hook up the adapters to the product, the software systemically, automatically looks at every connector on the product and automatically selects one pin on each connector to test. One-pin testing proves that each test adapter is connected to the corresponding location on the product and, because only a single pin is tested on each connector, the test runs very quickly.

With commissioning and verification completed, "pre-work" is complete. You can proceed to production knowing that any faults exist either in the product wiring or in the accuracy of the original. With this process, you can feel confident that you are dealing with real faults that need to be resolved in the product under test.

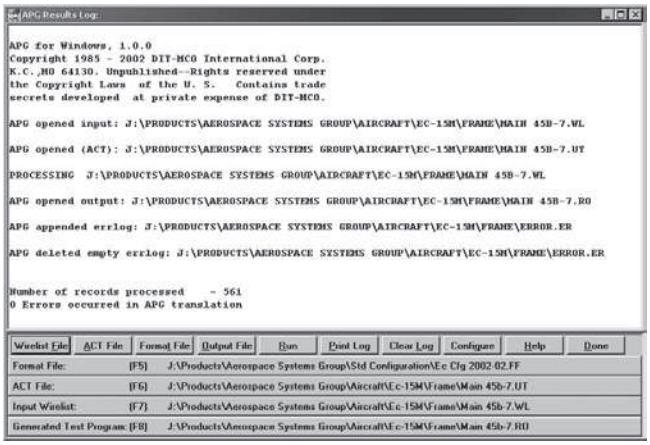
TestAssistant Life Cycle Support

For most projects, production testing is just the start of the ongoing process of responding to engineering change orders (ECOs). TestAssistant quickly and easily reacts to ECOs that inevitably occur during production by importing the wiring changes through a series of "add" and "delete" instructions.

If new test adapters are required to support the ECO, the process is identical to the initial design task. Test adapters can be automatically designed and visually placed, on screen, on any available test connector.

Automatic Program Generator (APG)

If a wire list for the UUT exists, you can use Automatic Program Generator (APG) to develop a test program. APG verifies the product has been fabricated per the design documentation. The APG software converts the wirelist information quickly, resulting in a test program generated directly from the design information.



APG is the most efficient method to generate complicated test programs and results in considerable timesavings over other methods. Using APG reduces the programming effort and eliminates the guesswork. Best of all, you can generate the test programs off-line from the test system so you don't negatively impact testing schedules.

The following options are available when processing wire lists:

- Checking for duplicate net names
- Including references to non-adapted points (points specified in the wire list but not connected to the test system)
- Testing all non-connected points (test points connected but not specified in the wire list)
- Checking for net (circuit strings) member continuity
- Generating "follow the wire" tests

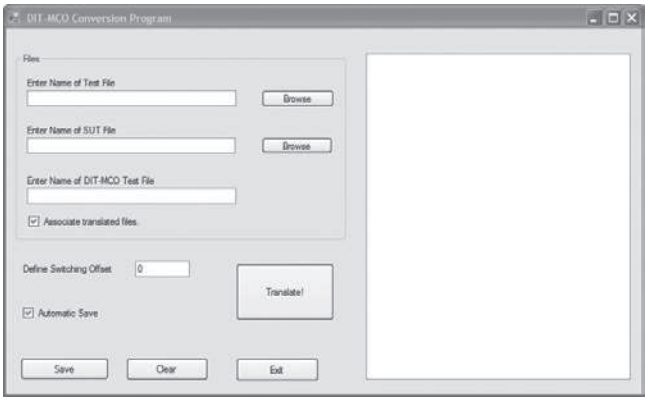
APG's test program includes input and output address setups as well as continuity and insulation tests. You can also automatically insert parameters and directives from the wire list attachment files.

The wire sort function of APG sorts FROM-TO wire lists with non-contiguous nets. WIRESORT groups the strings that belong to the same net by analyzing the FROM and TO identifiers and determining the net continuity. The program supplies net numbers and creates a wire list ordered by net. You can then use the sorted wire list file as input for several other programs, such as APG, to create a test program.

Configuration options allow specifying field locations within the wire list record. This makes it possible to sort almost any wire list file, with or without signal names, into contiguous strings for APG to reference.

Language Translators

DIT-MCO offers several language translators that convert existing test programs and auxiliary files into the TestExecutive format. This makes it easy for you to use existing test files you may have created on DIT-MCO or other manufacturers' analyzers. Each of these programs converts existing files easily and quickly.



Fault Locator

Fault Locator facilitates the task of physically locating faults in your cable assemblies. The quick and accurate location of opens and shorts reduces trouble-shooting and repair time. This software tool approximates the physical location of opens and shorts. Error reports illustrate the location of faults relative to their position in your cable assembly.

Fault Locator first characterizes DIT-MCO's switching system and adapter cables for resistance and capacitance. Fault Locator then takes these measurements and stores them in two files accessed by the TestExecutive control program. One file defines the specific test system and the second defines the product interface configuration.

How Fault Locator Works

Locating opens: During a test, TestExecutive uses the standard Continuity Error Scan (CES) to locate mis-wires. If the test program detects a "true open", TestExecutive activates the Open Circuit Locator (OCL) to measure the capacitance of the reported continuity error. Then TestExecutive uses this measurement along with the capacitance measurements stored in the product characterization files to approximate the physical location of the open along the cable.

Locating shorts: Shorts pose a more complicated problem and require a more involved solution. When TestExecutive reports a low resistance short, the Short Circuit Locator (SCL) scans every possible combination of paths in the shorted nets until it detects the lowest resistance. It reports this information in the error log, along with the UUT product nomenclature.

- In the first example below, an open exists between pins 28 and 128. The standard error log tells you only that the test isolated an open, but does not indicate the location of that open. Fault Locator shows where you can find the fault along a cable assembly using percentages (ratio). Therefore, a 100% or 0% ratio indicates the fault is at one end (left) or the other (right). The 0% marks the open at pin at a position 28% from the left connector (9FCB 132 22 using UUT product nomenclature).
- In the second example below, an open exists somewhere between test points 12 and 112. The open circuit locator determined that the open circuit occurred 24% between test point 12 (product location 9FCB 132 22) and test point 112 (product location 9FCB 132 56).
- In the third example below, there is a short between pins 21 and 18. The standard error log reports the resistance and a "LOW" message. Based on this information, an experienced technician might expect to find the short closer to pins 18 (9FCB 132 10) and 21 (9FCB 132 13). However, Fault Locator accurately indicates just the opposite is true, SCL found the short closest to address: 121 (9FCB 132 65) and address: 118 (9FCB 132 62). As with opens, Fault Locator also reports the UUT information.

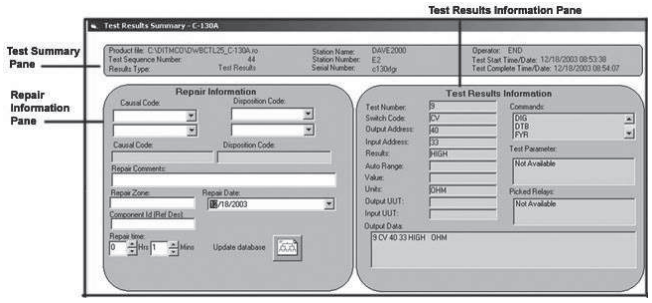
```
:  CC 00028                                  9FCB 132 22
:             00128 HIGH      >48.90KM  OHM 017VEA 135 F
:  XT 00128      ISOLATED       1.034KM  OHM 017VEA 135 F
   28X-------------------------------------------------------------------128 0%
   9FCB 132 22                                                  017VEA 135 F
```

```
:  CC 00012                                  9FCB  132 4
:             00112 HIGH      1.537KM   OHM 017VEA 135 56
:  XT 00112      ISOLATED     510.5M    OHM 017VEA 135 56
   12---------X-------------------------------------------------------------112 24%
   9FCB 132 22                                                   9FCB 132 56
```

```
:  FF 00021                                    9FCB 132 13
:              00018 LOW      4.891       OHM  9FCB 132 10
SCL found short closest to address: 121 and address: 118
9FCB 132 65                                    9FCB 132 62
```

TestStats

Monitoring and storing test results rather than deleting them when the product is error-free allows for analysis to detect trends and determine the root cause of failures. TestStats facilitates this by automatically capturing raw test data and providing the means to add detail related to the cause and location of each test failure. For example, the technician can enter the cause of a fault as well as the amount of time spent fixing a particular fault. Investing a little extra time filling out fault information ultimately pays off by reducing test and rework time. In the process, this software tool creates a rich database for immediate and ongoing analysis.



TestStats provides numerous capabilities to analyze the data, including identifying for the most common and most time-consuming faults to repair. If the same fault continually appears, for example, you need to identify the cause and correct the problem. If you can eliminate these time consuming faults from your test process, you will see dramatic time savings in the test cycle.

Over time, you build a rich set of data to find trends and help identify the root cause of common faults.

NETLINK TERMINAL SELECTOR UPGRADE

The NetLink Terminal Selector Upgrade replaces the existing logic assembly, terminal selector and computer interface of older DIT-MCO test systems without sacrificing your investment in switching, adapter cables, and test programs. The NetLink terminal selector offers you:

- Improved reliability and decreased downtime with new quality terminal selector relays
- Compatibility with DIT-MCO's Series 12, 13*, 15, 21**, 23, 24, 25** switching systems
- Printed circuit board circuitry instead of less reliable wire wrap boards
- State-of-the-art electronics to replace obsolete, expensive, and hard-to-find components

Receive on-going product support while lowering your maintenance costs and preventing future downtime with a NetLink terminal selector. Your new electronics mount on printed circuit boards for a modular system that is easy to maintain. Its design eliminates many interconnections, the source of failure in many older systems. It's also a necessary replacement for existing logic rack assemblies. These older logic rack assemblies contain expensive, hard-to-find, and even obsolete components. Without these essential components, DIT-MCO cannot provide product support.

When you upgrade, you receive a single 10-1/2" x 19" chassis to replace your existing logic rack, terminal selector hardware, and optional comparator. The new chassis contains a printed circuit board with the control interfaces, new terminal selector, as well as the Standard Measurement Unit (SMU). The upgrade eliminates the obsolete control and instrumentation while enhancing reliability.

To operate, your NetLink Terminal Selector uses a microprocessor-based controller assembly and DIT-MCO's TestExecutive system software. This self-contained board interfaces and controls the terminal selector's relays through the computer's network port. The assembly's small size with fewer components improves reliability.

The NetLink Terminal Selector upgrade adds the power and reliability of a new system at a fraction of the cost. Talk to your DIT-MCO regional sales manager or corporate sales department for information on upgrading your particular configuration.

** Rated 1000 VAC maximum*
*** Series 17 test speeds apply*

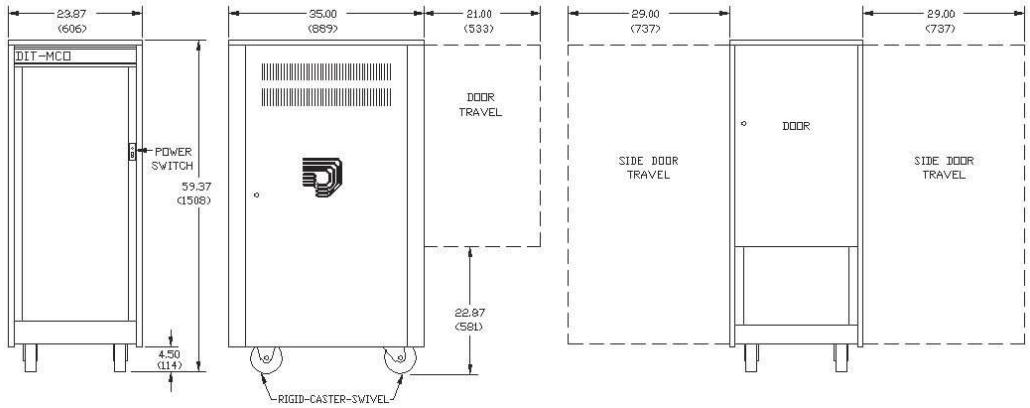
Terminal Selector Specifications

Voltage	1500 VDC
	1000 VDC
Switching Interface	30,000 test points standard

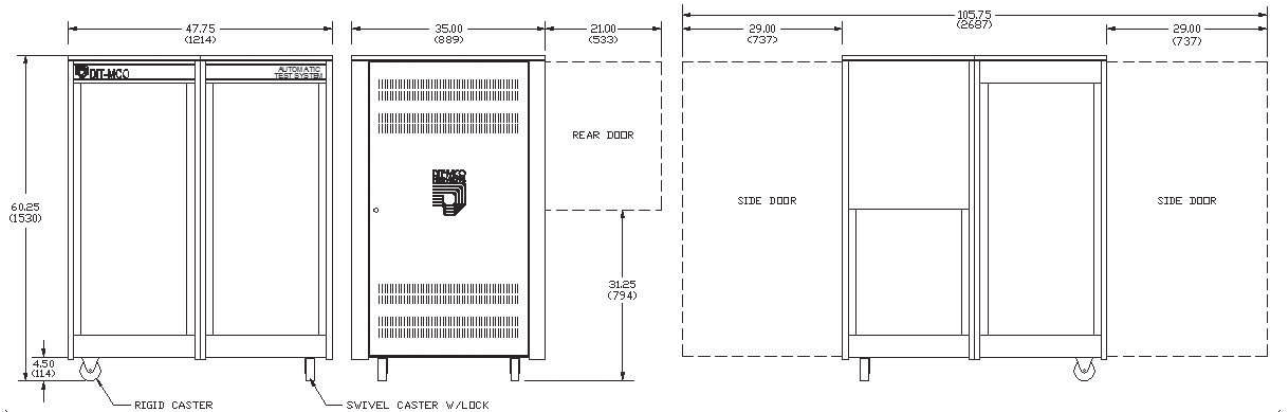
CABINET CONFIGURATIONS

While many customized configurations are possible, common cabinet configuration are shown along with the dimensions of those cabinets.

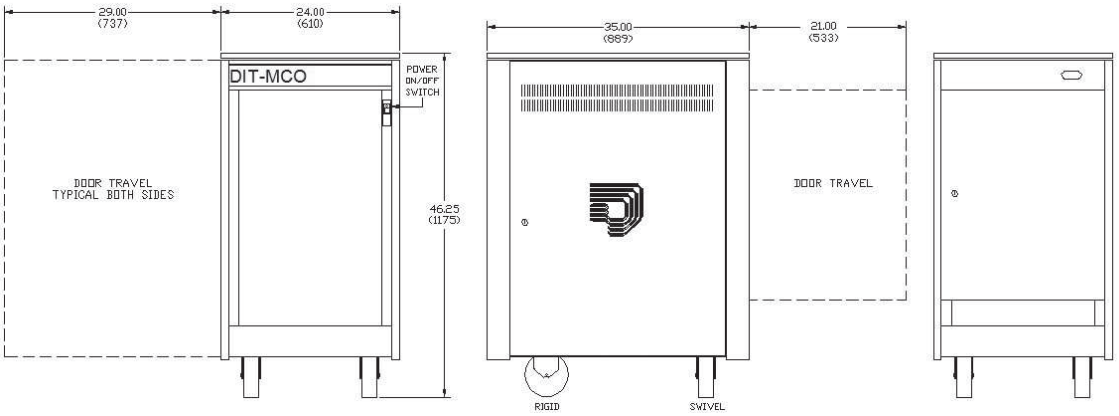
Single bay 4519



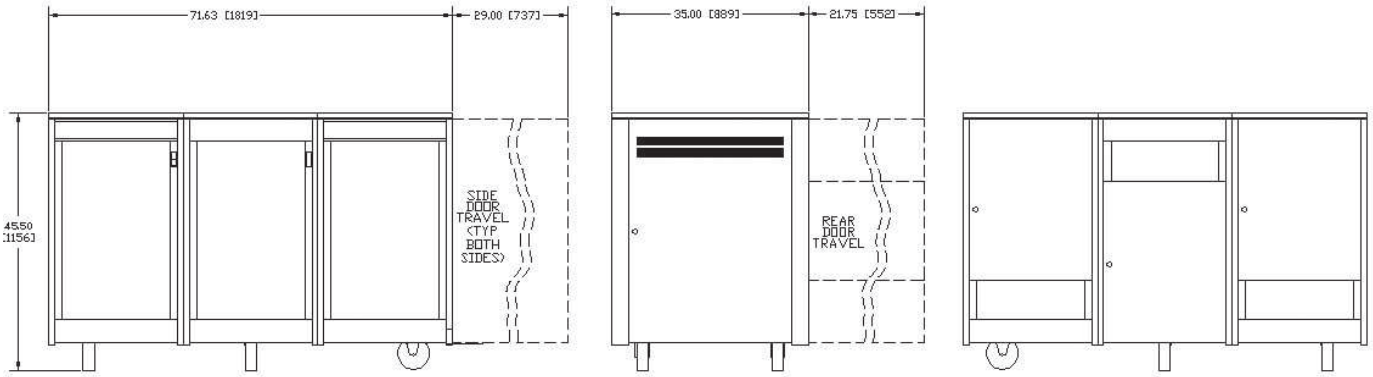
Double bay 4519-19



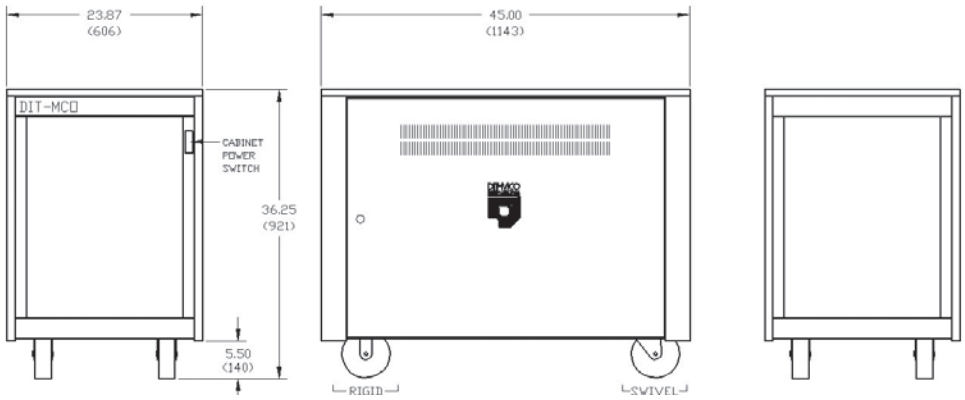
Single bay 3119



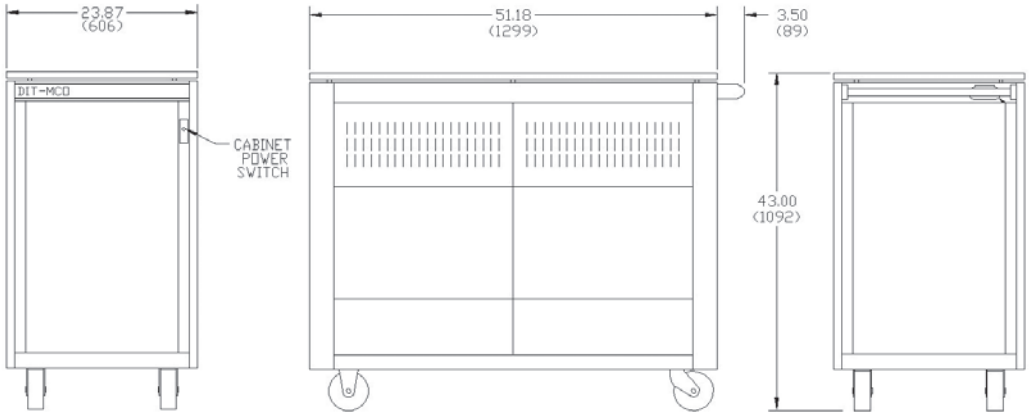
Double bay 3119-19



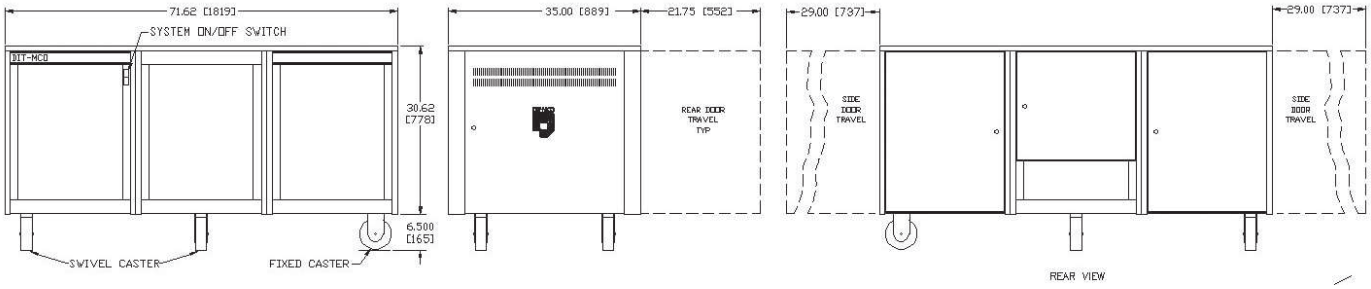
Single bay 2419



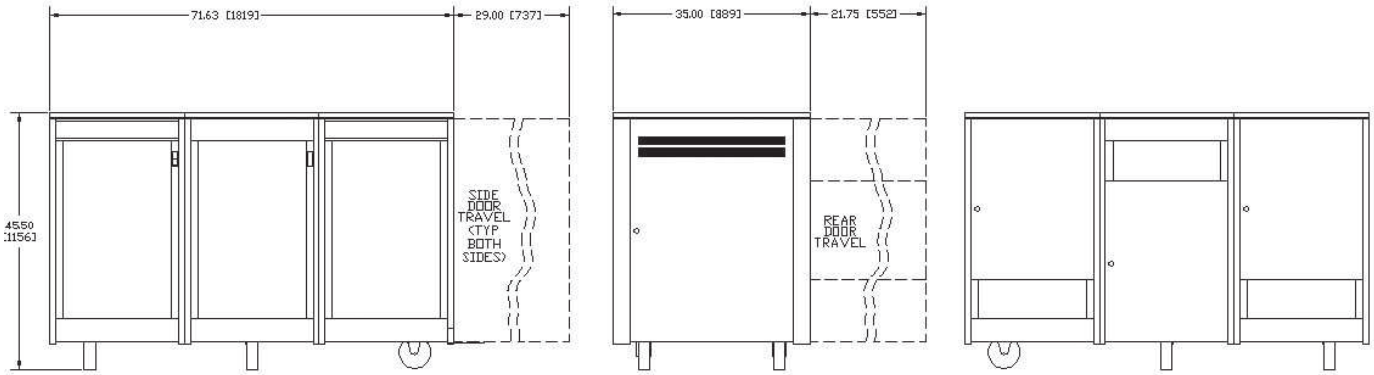
Single bay, double sided 3119/51



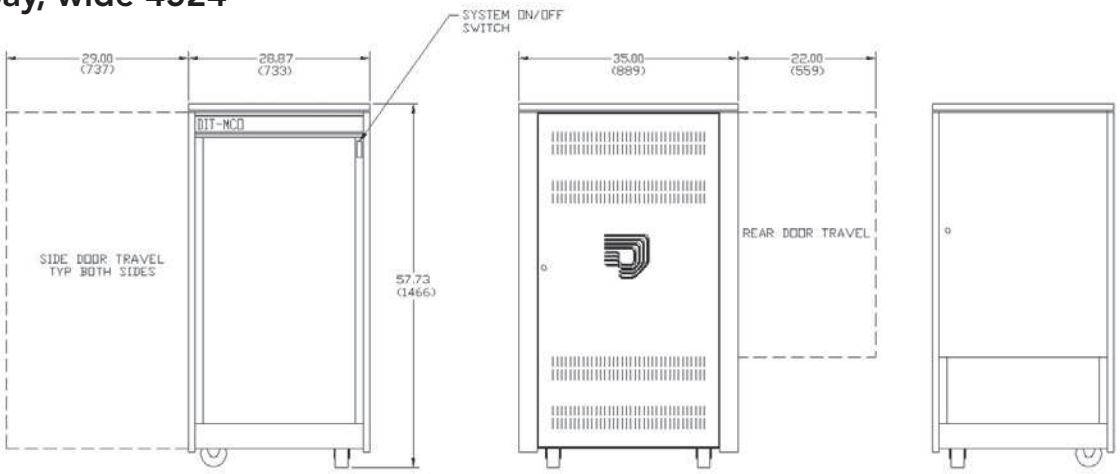
Triple bay 2419-19-19



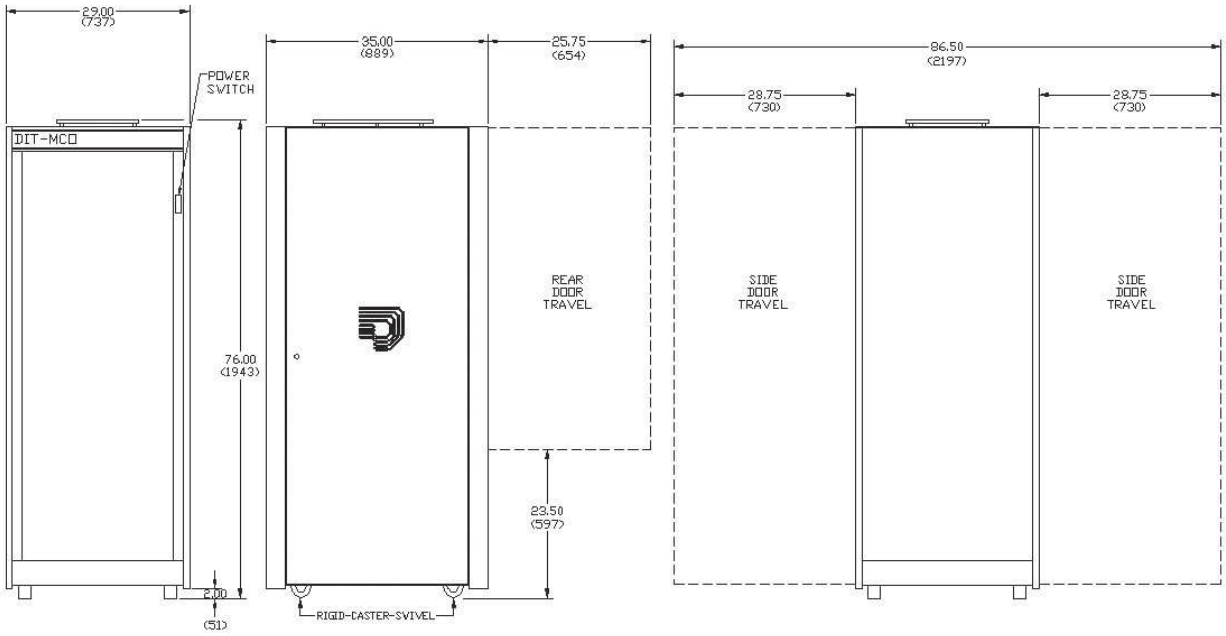
Triple bay 3119-19-19



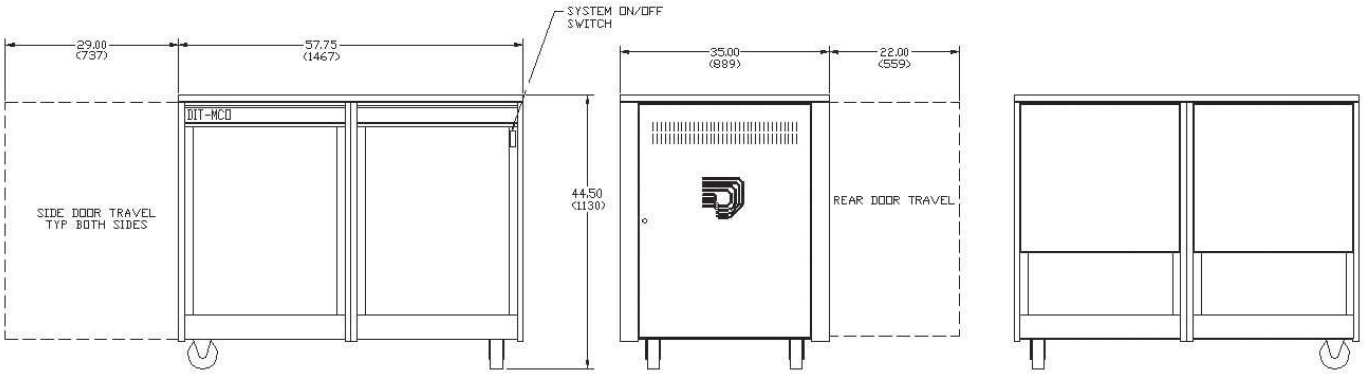
Single bay, wide 4524



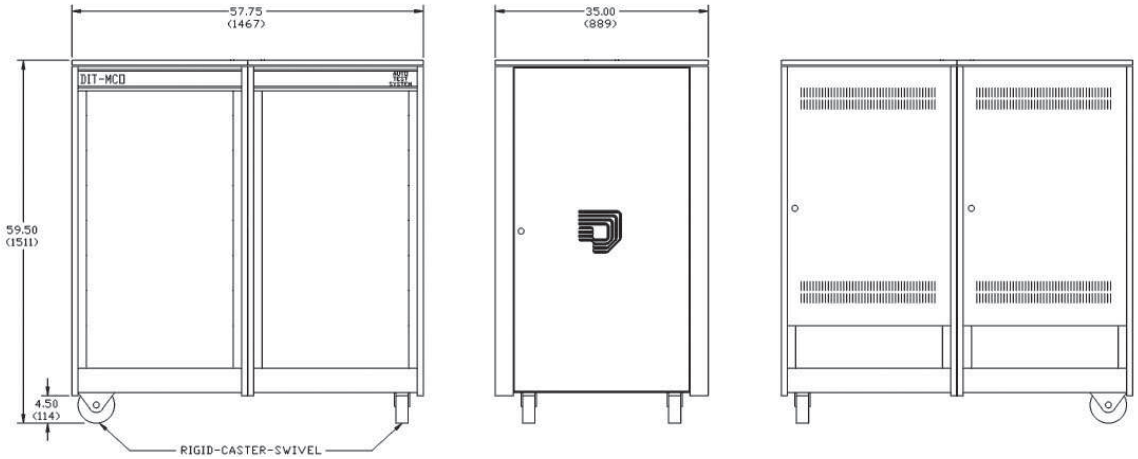
Single bay, wide 6424



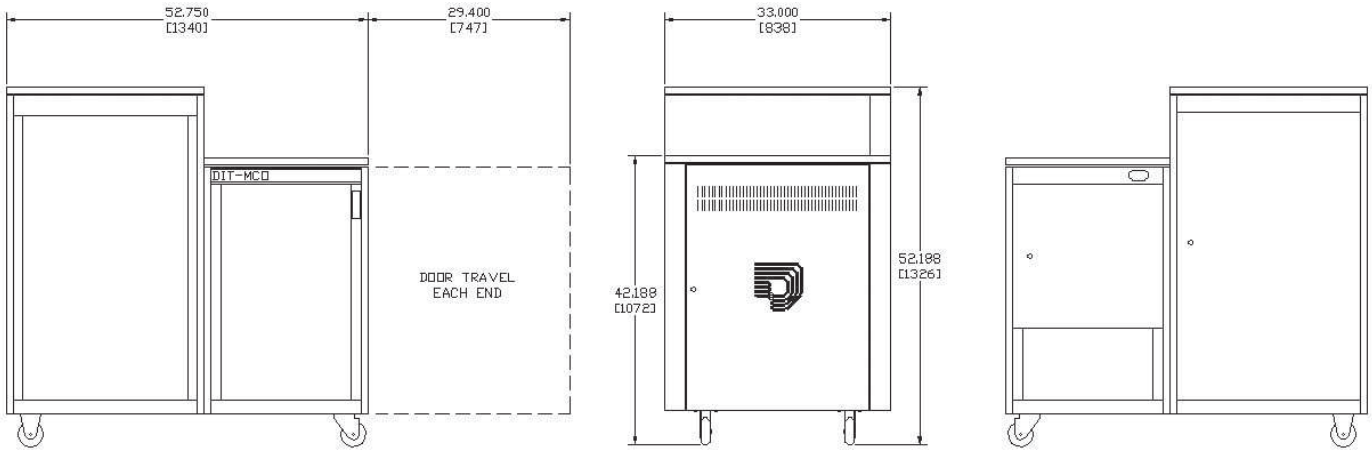
Double bay, wide 3124-24



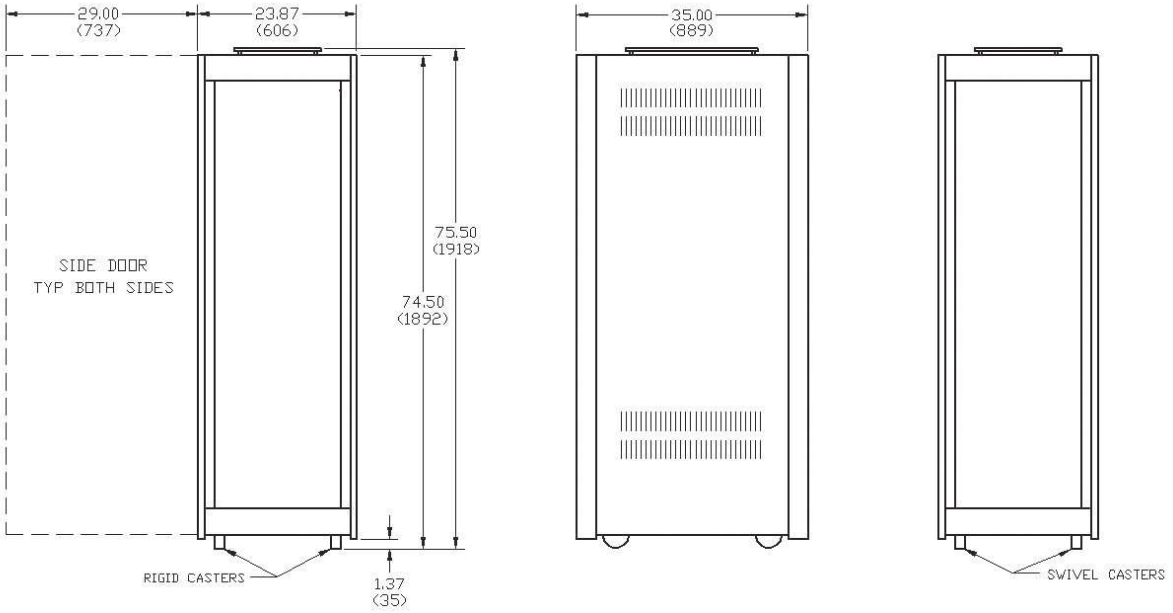
Double bay, wide 4524-24



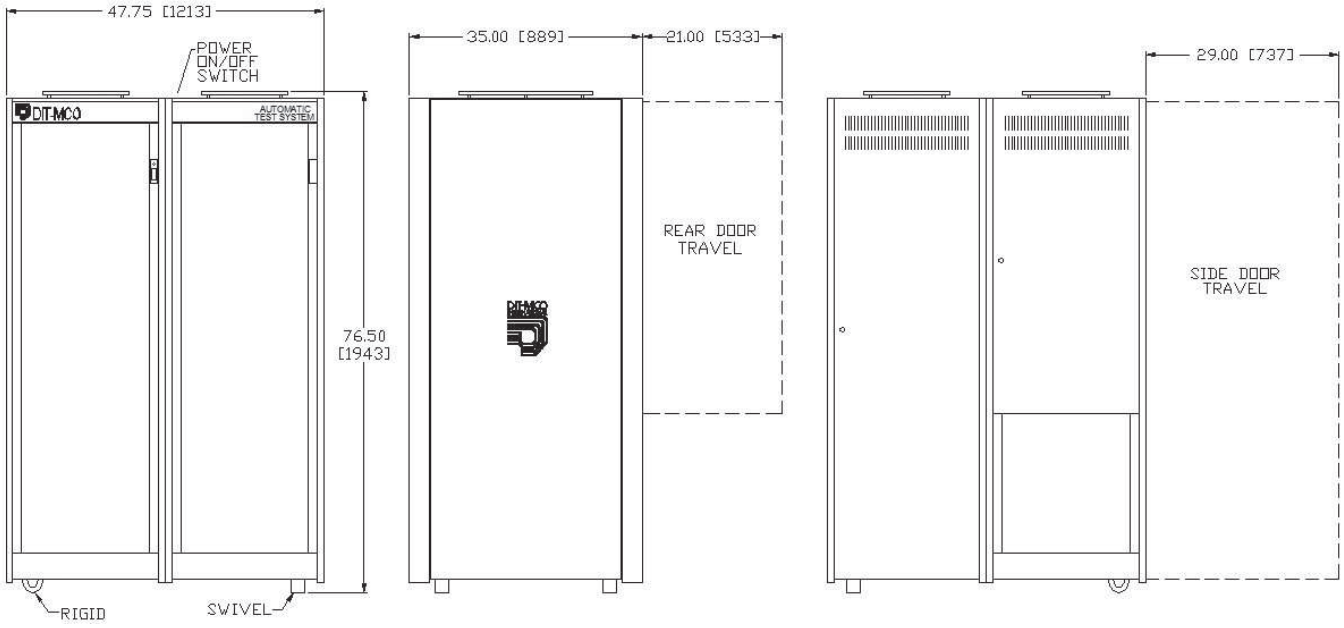
9501 Style 4524-3119



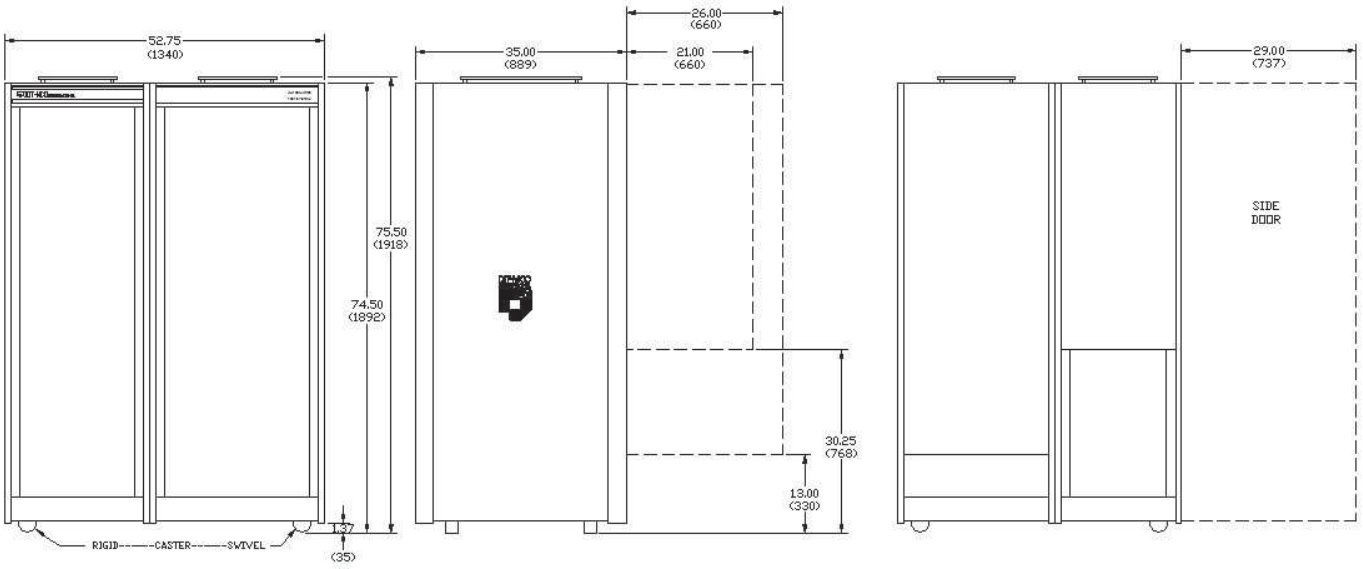
Tall single bay 6419



Tall double bay 6419-19



Tall double bay mixed width 6419-24

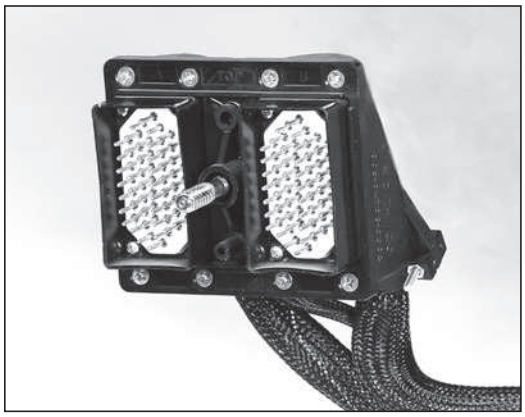


SWITCHING INTERFACE CONNECTORS

Any interface connector can be incorporated into your test system. The connectors that DIT-MCO frequently uses in the test interfaces include the following.

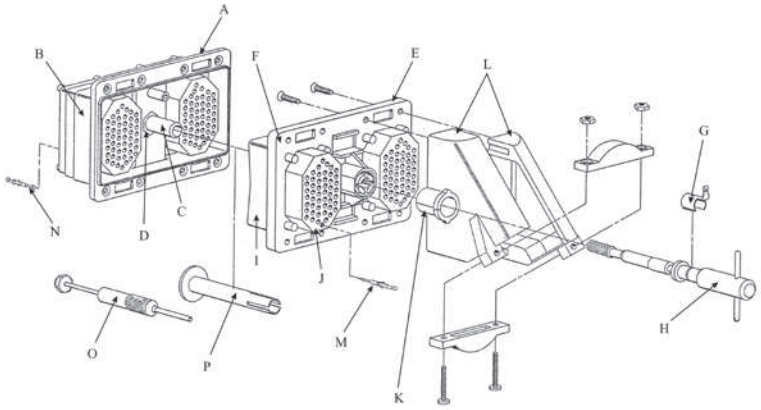
Dual-50

The DIT-MCO Dual-50 connector was adopted in early generations of DIT-MCO test systems as the standard interface. While it is not frequently used in new systems, it is available to provide compatibility with existing test systems and adapters. There are 50 contacts in each side of the connector. A screw jack is used to mate the connector.



Mating Connectors

025-04623-0003	100 Contact Plug
007-01157-0004	Pins for 26 – 30 AWG (quantity 100)
007-01157-0005	Pins for 20 – 24 AWG (quantity 100)
007-01157-0006	Pins for 16 – 18 AWG (quantity 100)
005-04706-0002	Cable clamp (two required)



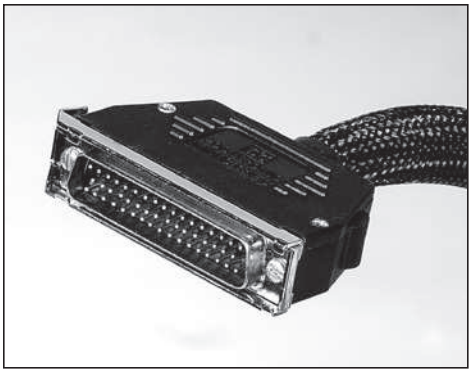
A	024-04624-0003	Contact Receptacle
B	024-04624-0030	Frame Assembly
C	024-04624-0031	Jack Screw Socket
D	024-04624-0032	"C" Ring
E	025-04623-0003	Connector Plug
F	025-04623-0030	Plug Frame
G	025-04623-0031	Ground Clip
H	025-04623-0032	Jack Screw
I	025-04623-0033	Connector Shell Guard
J	025-04623-0034	Plug Insert
K	025-04623-0035	Retaining Bushing
L	005-04706-0002	Cable Clamp (2 required)
M	007-01157-0005	Pin 26-30 AWG
M	007-01157-0005	Pin 20-24 AWG
M	007-01157-0006	Pin 16-18 AWG
N	007-01158-0004	Socket 26-30 AWG
N	007-01158-0005	Socket 20-24 AWG
N	007-01158-0006	Socket 16-18 AWG
O	052-01862-0001	Pin/Socket Extractor
P	020-09597-0001	Jack Screw Tool

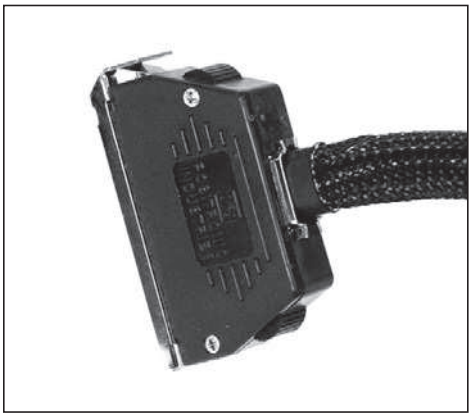
Also Available:

052-01851-0001	Crimping Tool
510064-DC1	Dust Cover-100 Contact Receptacle
510064-DC2	Dust Cover-100 Contact Plug

D-Sub

D-Sub connectors are frequently used in many applications. However, the quality of D-Sub connectors varies widely. After testing many connectors, DIT-MCO qualified this connector for use with high voltage testing. The connector holds 50 contact pins and includes a strain relief clamp. The strain relief is simply activated by pushing the contact onto the receptacle and is opened by squeezing the release on the side of the connector body.



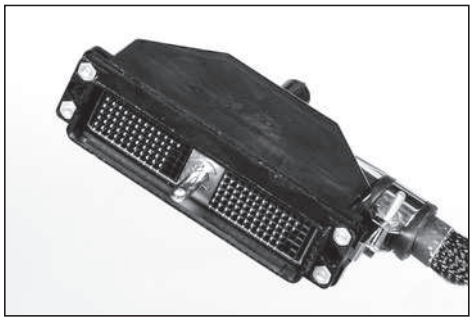


Mating Connectors

025-01630-1150	Latching 50 pin D-Sub with backshell and contacts

ZIF

The ZIF (Zero Insertion Force) connectors feature a minimum rated life of 10,000 complete mating and unmating cycles with no performance loss. The connector can be mated and unmated quickly with no insertion force required as the contacts do not touch during the mating cycle. Activation of the cam mechanism locks the connector in place and brings the contacts together.



Mating Connectors

025-01225-0003	156 pin ZIF
005-01036-0001	Backshell for 156 pin ZIF
007-01100-0001	Contact for 24 – 26 AWG
007-01100-0003	Contact for 20 – 22 AWG

LIF

LIF connectors (Low Insertion Force) incorporate the same form factor as the ZIF but use a pin and socket design with some mating force required. The engagement mechanism engages the connectors with a 180 degree turn. The sockets employ a hyperboloid design where the socket is formed by wires strung at an angle to the socket's axis, forming a hyperboloid cage. When the pin is inserted into this socket, the wires stretch around it, providing a number of linear contact paths.

Mating Connectors

025-01633-0156	156 pin LIF with backshell with 156 contact 20 to 24 AWG
025-01633-4156	156 pin LIF with backshell with 156 contact 24 to 28 AWG
007-01330-0011	Pin for 20 – 24 AWG wire

Ribbon

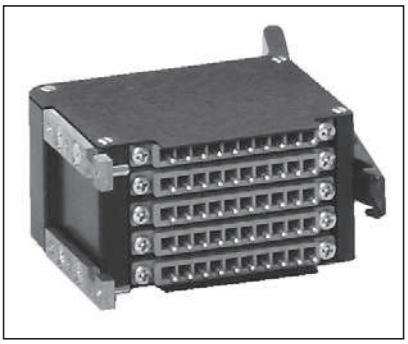
The standard connector used on the Model 2115 system is the 50 pin Ribbon connector. This connector is widely available at a low cost.

Mating Connectors

025-01478-1150	IDC 50 pin connector for 26 – 30 AWG flat cable
025-01578-2050	Junction shell for 025-01478-1150
025-01216-0001	50 pin with metal backshell

EasyMate

The EasyMate offers superior flexibility in adaptation due to the modular design of the mating plugs. Complex branched adaptation cables are eliminated by using the EasyMate connector.



Mating Connectors

100230-XXX	EasyMate plug where XXX is the number of pins (multiple of ten only)

Cable Adapter Stubs

The following list summarizes standard interface cables that DIT-MCO manufactures. These cables are unterminated on one end allowing you to add your product connector. Or DIT-MCO can provide the complete cable by working from your specifications or product drawings. Any cable can be built to your specifications even if you don't see the cable you need listed. Just send us a copy of your requirements and our Special Products Group will do the rest.

Part Number	Description
110199	50 conductor extension cable with one end terminated to connect with Model 2115. 26 AWG PVC wire with metal shell and solder connections.
110200	50 conductor extension cable with one end terminated to connect with Model 2115. 24 AWG EE Teflon wire with metal shell and solder connections.
110201	50 conductor extension cable with one end terminated to connect with Model 2115. 26 AWG molded PVC wire with metal shell and solder connections.
110202	50 conductor extension cable with one end terminated to connect with Model 2115. 26 AWG ribbon PVC wire with metal shell and IDC termination.
110203	100 conductor extension cable with 025-04623-0003 connector one end to mate with standard "Dual D." 26 AWG PCV wire with crimp connections.
110204	100 conductor extension cable with 025-04623-0003 connector one end to mate with standard "Dual D." 24 AWG EE Teflon wire with crimp connections.
110205	100 conductor extension cable with 025-04623-0003 connector one end to mate with standard "Dual D." 26 AWG PCV wire with molded sheath over each 50 wires with crimp connections.
110206	100 conductor extension cable with 025-04623-0003 connector one end to mate with standard "Dual D." 26 AWG ribbon PCV wire with crimp connections.
110226	100 conductor extension cable with 025-04623-0003 connector one end to mate with standard "Dual D' and two each MS3120F22-55S (50 Points Wired Per) on other end. 26 AWG PCV wire with crimp connections.
110227	100 conductor extension cable with 025-04623-0003 connector one end to mate with standard "Dual D" and two each MS3120F22-55S (50 Points Wired Per) on other end. 24 AWG EE Teflon wire with crimp connections. Adapter cable with one each 100 Point.
110228	100 conductor extension cable with 025-04623-0003 connector one end to mate with standard "Dual D" and two each MS3120F22-55S (50 Points Wired Per) on other end. 26 AWG ribbon PCV wire with crimp connections.
110229	100 conductor extension cable with 025-04623-0003 connector one end to mate with standard "Dual D" and two each MS3120F22-55S (50 Points Wired Per) on other end. 26 AWG PCV wire with molded sheath over each 50 wires. Crimp connections.

COMPANY INFORMATION

About the Company

When you buy a wiring analyzer, you buy not only the analyzer but also the company behind it. You need a provider that will support your system now and in the future.

DIT-MCO International Corporation, the first name in wire harness testing equipment, has over 60 years of experience manufacturing and supporting automatic test systems. DIT-MCO provides a complete line of test systems capable of meeting your ATE needs.

Headquartered in Kansas City, Missouri, DIT-MCO has a sales and service office in the UK as well as agents and distributors in l6 other countries.

About the Service

DIT-MCO's success in the automatic test equipment industry comes from setting high priorities for customer support. DIT-MCO now has over 2,000 major installations worldwide and a Customer Support Service department to match. The services they offer include:

- Free telephone consultation on any matter pertaining to your analyzer
- Remote diagnostics
- Low cost parts exchange and repair
- Express service for maintenance parts
- Fully trained service technicians for field service work and product installation
- Training offered at DIT-MCO's Kansas City corporate headquarters or on-site at your location

Contacting Us

Your local representative can give you additional information on the company, products, or available services. In the USA, call toll free at (800) 821-3487. Or you can visit us on the web at www.ditmco.com for updates, specifications, events, training information, etc.

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Appendix I – Configurations

	Model 2115	Series 2135	Model 2650	Model 2650.MBA	Model 2650.HVA	Model 2651
Configuration	Benchtop with optional rack mounted consoles	Portable	Distributed Switching Modules	Distributed Switching Modules	Distributed Switching Modules	Distributed Switching Modules
Max. Test Points	15,000	1,000	100,000+	100,000+	100,000+	2,500
Expansion	50 Point Boards 1000 Point Chassis	150 Point Boards 700 Point Boards	100 Point Boards 1500 Point Boards	50 Point Boards 750 Point Modules/ 2 buses 300 Point Modules/ 4 buses	50 Point Boards 750 Point Modules	100 Point Boards 1280 Point Module 384 Point Module
Switching	Series 17B	Series 19	Series 10	Series 10	Series 10	Series 10
Max Test Voltage	1500 VDC, 1000 VAC	1000 VDC	1500 VDC, 1000 VAC	1500 VDC, 1000 VAC	2000 VDC, 2000 VAC	1500 VDC, 1000 VAC
Standard Instrumentation	SMU	SMU	SMU	SMU	SMU	SMU
Optional	AC Dielectric 1000 VAC	None	AC Dielectric 1000 VAC	AC Dielectric 1000 VAC	AC Dielectric 1500 VAC	AC Dielectric 1000 VAC
External Power	LM Card – 10 points each, up to 200 points in LMU	None	10 LM in each module 20 LM optional board EE 50 or 100 point chassis LM 50 or 100 point chassis	10 LM in each Switching Module Standard MBA provides EE for each test point EE 50 or 100 point chassis LM 50 or 100 point chassis	10 LM in each module 20 LM optional board EE 50 or 100 point chassis LM 50 or 100 point chassis	10 LM in each module 20 LM optional board
Internal Power Supplies	28 VDC (Optional) 3 – 30 VDC (Optional) 3 – 60 VDC (Optional)	None	28 VDC (Standard) 3 – 30 VDC (Optional) 3 – 60 VDC (Optional)	28 VDC (Standard) 3 – 30 VDC (Optional) 3 – 60 VDC (Optional)	28 VDC (Standard) 3 – 30 VDC (Optional) 3 – 60 VDC (Optional)	28 VDC (Optional) 3 – 30 VDC (Optional) 3 – 60 VDC (Optional)
External Power Supplies	28 VDC 115 VAC @ 400 Hz GPIB Power Supplies	None	28 VDC 115 VAC @ 400 Hz GPIB Power Supplies	28 VDC 115 VAC @ 400 Hz GPIB Power Supplies	28 VDC 115 VAC @ 400 Hz GPIB Power Supplies	28 VDC 115 VAC @ 400 Hz GPIB Power Supplies
Continuity Probe	CTP-5	CTP-5	CTP-5	CTP-5	CTP-5	CTP-5

	Model 2115	Model 2135	Model 2650 (and MBA)	Model 2650.HVA	Model 2651
Reference	Ground Isolated (Floating)	Ground Isolated (Floating)	Ground Isolated (Floating)	Ground Isolated (Floating)	Ground Isolated (Floating)
Programmable Voltage Stimulus	0-1500 VDC 2 VDC Steps 200 – 1000 VAC	0-1000 VDC 2 VDC Steps 200 – 750 VAC	0-1500 VDC 2 VDC Steps 200 – 1000 VAC	0-2000 VDC 2 VDC Steps 200 – 1000 VAC	0-1500 VDC 2 VDC Steps 200 – 1000 VAC
Programmable Current Stimulus	5 ma – 2 Amp 2.5 mA Steps	5 ma – 2 Amp 2.5 mA Steps	5 ma – 2 Amp 2.5 mA Steps	100 ma – 2 Amp 2.5 mA Steps	5 ma – 2 Amp 2.5 mA Steps
Programmable Resistance	.010 ohms – 99.9 Kohms	.010 ohms – 99.9 Kohms	.010 ohms – 99.9 Kohms	.010 ohms – 99.9 Kohms	.010 ohms – 99.9 Kohms
Insulation Resistance	1000 Mohms	1000 Mohms	1000 Mohms	1000 Mohms	1000 Mohms
DC Voltage Measurements	10mV – 1000 VDC	10mV – 1000 VDC	10mV – 1000 VDC	10mV – 1000 VDC	10mV – 1000 VDC
AC Voltage Measurements	1 VRMS – 1000 VRMS	1 VRMS – 750 VRMS	1 VRMS – 1000 VRMS	1 VRMS – 1000 VRMS	1 VRMS – 1000 VRMS
Programmable DC Hipot	Up to 1500 VDC .5 mA-2.5 mA	Up to 1000 VDC .5 mA-2.5 mA	Up to 1500 VDC .5 mA-2.5 mA	Up to 2000 VDC .5 mA-2.5 mA	Up to 1500 VDC .5 mA-2.5 mA
Programmable Capacitance	0.01 – 5000 µf	0.01 – 5000 µf	0.01 – 5000 µf	0.01 – 5000 µf	0.01 – 5000 µf
4-Wire Kelvin	Standard	Standard	Standard	Standard	Standard
Set-up Complete	Standard	Standard	Standard	Standard	Standard
Discharge Wait	Standard	Standard	Standard	Standard	Standard
Simultaneous IR/Hipot	Standard	Standard	Standard	Standard	Standard
Diode Testing	Standard	Standard	Standard	Standard	Standard
Digitized Measurements	Standard	Standard	Standard	Standard	Standard
Dual Limit Testing	Standard	Standard	Standard	Standard	Standard
Programmable Dwell	1 msec – 1638 sec	1 msec – 1638 sec	1 msec – 1638 sec	1 msec – 1638 sec	1 msec – 1638 sec