2555 Baird Road, Penfield, New York 14526 • cytec-ate.com • sales@cytec-ate.com • (585)381-4740

CXM SERIES MICROWAVE
COAXIAL SWITCHING SYSTEMS

The CXM Series Systems are computer controlled, passive bi-directional coaxial switching systems designed to handle 50 ohm RF signals from DC to 18 GHz, and in some cases up to 40 GHz. Two basic topologies are offered: Nx1 multiplexers and NxM nonblocking matrices. Ethernet, RS232 & IEEE488 controls are standard, while USB and front panel Manual Controls are optionally available.

CXM/128 Mainframe

FEATURES:

- **RF systems with bandpass from DC to 18 GHz, 50 ohms impedance, low crosstalk & high isolation.**
- **Systems with extended bandpass as high as 40 GHz.**
- **Both Nx1 multiplexers and NxM matrices offered. SMA connectors standard, N, BNC, TNC also available.**
- **Computer control via LAN & RS232 standard. GPIB, USB and front panel manual controls optional.**
- **Front Panel LEDs for visual indication of closed switches and remote status feedback aid in debugging.**
- **Passive design doesn't add to signal noise or create intermodulation products typical of solid state devices.**

CHASSIS:

The **CXM** systems are 19" rack mounted chassis, and are built as either mainframes or expansion chassis. They are designed to hold CXM Series microwave switches in configurations specified by the user. All chassis have front panel LEDs showing switch point status. RF connectors are typically mounted on the rear panel.

CXM/16 Chassis - Furnishes 16 relay drives, allowing two 8x1 switch modules, four 4x1 modules or eight 2x1 modules.
CXM/32 Chassis - 32 relay drives allow four 8x1 modules, eight 4x1 modules, thirty-two 2x1s, or a combination.
CXM/64 Chassis - Up to 64 relay drives. Control up to eight 8x1 modules, sixteen 4x1s, sixty-four 2x1s or a combination.
CXM/128 Chassis - Up to 128 relay drives. Control up to sixteen 8x1 modules, thirty-two 4x1s or combinations.
CXM/256 Chassis - Up to 256 relay drives. Typically used to control single relays with more than 8 ports or large configurations.

MICROWAVE SWITCH MODULES:

Several microwave switch module types are offered. Each type has design features tailored to meet specific needs.

CXM/Nx1-NO Series are Normally Open type and are available in sizes ranging from 3x1 to 14x1.
CXM/Nx1-F Series are Failsafe type. Similar to the NO type, but these modules default to Port 0 closed when powered off.
CXM/Nx1-NO-T Series terminate unused ports to ground via 50 ohms. Prevents reflections off open ports. 2x1 to 10x1 sizes.
CXM Transfer Switches have four ports that switch to one of two configurations. Configuration A routes Ports 1-3 and 2-4. Configuration B routes Ports 1-2 and 3-4.
Microwave Switches are available with connectors other than SMAs, higher power ratings and frequencies to 40 Ghz. Please contact the Factory for more information. We are open to using any brand of relay you prefer.

CONTROL MODULES:

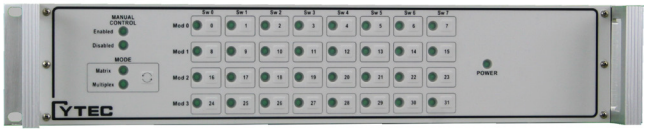
All systems available with Ethernet LAN, GPIB & RS232 (standard), USB or TTL Control (optional).

CXM CHASSIS

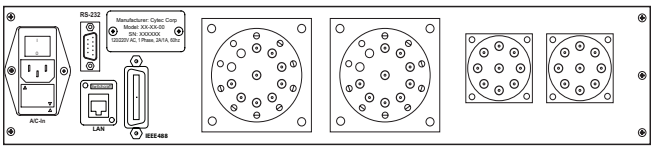
The CXM Series are 19" rack mounting chassis with built in power supplies and are designed to hold the CXM microwave switches selected by the user. The switches are typically mounted so that their RF connectors protrude through the rear panel. The front panels have discrete LEDs showing the status of all switch points. The front panels also hold the optional manual controls.

CXM/16 & 32 MAINFRAME or -E EXPANSION CHASSIS

These chassis furnish either 16 or 32 switch points in user defined configurations. Built-in front panel LEDs show switch and power status. Add CXM switches along with controls to complete the system.



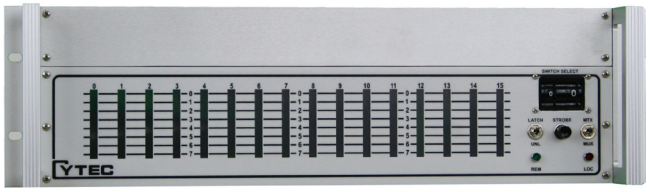
Dimensions: 19" rack mount (483 mm)
15" deep (381 mm)
3.5" (2 RU) high (89 mm)
Weight: 15 lbs (6.8 kg) max.
AC Power : 10 W per closed switch- 115/230 VAC selectable.



CXM/32 with GPIB, RS232 and LAN Control

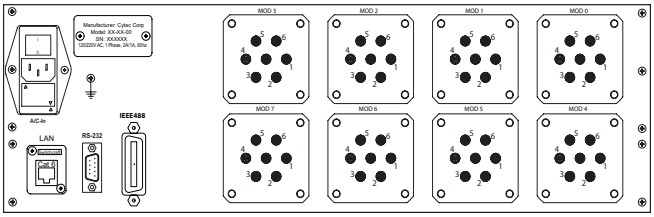
CXM/64 MAINFRAME OR -E EXPANSION CHASSIS

These chassis control up to 64 switch points as defined by the user. Front panel LEDs indicate both switch point and power status. Add controls, the required CXM switches and one CP8 display module for every eight switch points to complete the system.



Dimensions: 19" rack mount (483 mm)
15" deep (381 mm)
5.25" (3 RU) or 7" (4 RU) high if needed for relays.
Weight: 25 lbs (11 kg) max
AC Power : 10 W per closed switch- 115/230 VAC selectable

Up to 64 1x2 relays, 16 1x4 relays or 8 1x8 relays per chassis.
Up to eight, 8 bit programmable attenuators.
Combinations, specials and custom systems with no NRE.



CXM/64 with GPIB, RS232 & LAN Control

CXM MATRICES

Bidirectional NxM matrices are assembled by interconnecting the required number of individual microwave switches as shown in **Fig. 1**. The matrix is non-blocking, but not full fan-out. Non-blocking means that any input can be connected to any output without interrupting a previously set path. When a matrix is not full fan-out, an input may be switched to only one output. Matrix configurations from 2x2 to 8x8 or larger are possible. The switches and interconnects are assembled inside the chassis. The input and output connectors (typically SMAs) are mounted on the rear panel. Unidirectional full fan-out systems and bidirectional full fan-out systems are also available. Just call and ask.

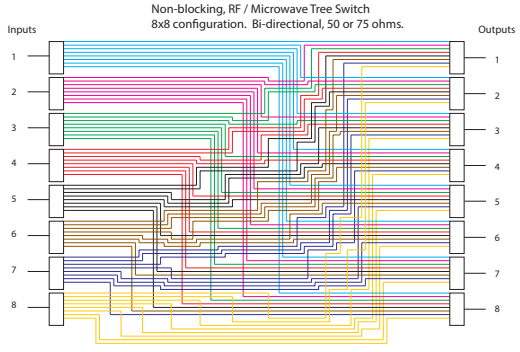


Fig. 1 8x8 Matrix using sixteen CXM/8x1 switches

FOR TECHNICAL ASSISTANCE, CONTACT CYTEC AT 585-381-4740
E-mail: sales@cytec-ate.com or VISIT OUR WEBSITE AT cytec-ate.com

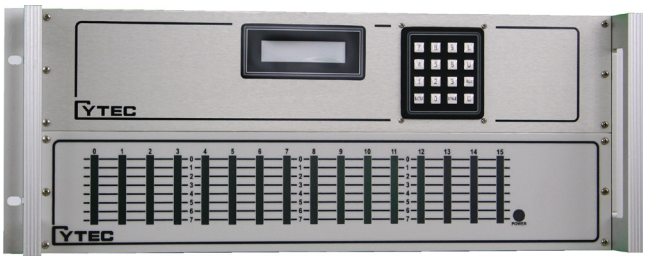
CXM/128 MAINFRAME OR -E EXPANSION CHASSIS

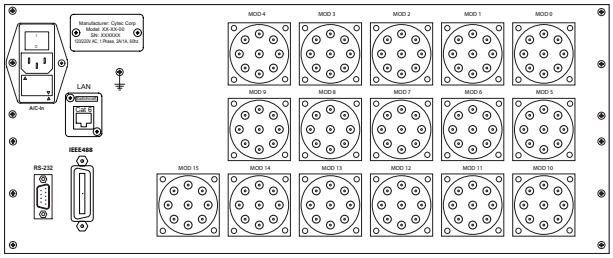
These chassis control up to sixteen 1x8 CXM switches arranged as shown on the drawing, or combinations of 1x2, 1x4 and 1x8 switches. LEDs visible through the front panel show switch and power status. Add CXM switches, controls, and one CP8 Display module for every eight switch points to complete the system.

Dimensions: 19" rack mount (483 mm)
15" deep (381 mm)
7" (4 RU) high (178 mm)
Weight: 30 lbs (14 kg) max
AC Power : 10 W per closed switch- 115/230 VAC selectable

Can control any combination of 1x2 through 1x8 relays and 8 bit programmable attenuators.

Combinations, specials and custom systems with no NRE.
Also available as relay driver chassis to drive your external relays.





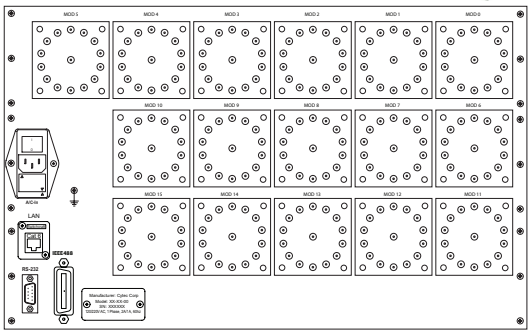
CXM/128 with LAN, GPIB & RS232 Control

CXM/256 MAINFRAME OR -E EXPANSION CHASSIS

This chassis typically controls up to sixteen CXM/9x1 through 12x1 relays, although other configurations are possible when you need up to 256 drives in a single chassis. LEDs visible through the front panel show switch and power Status. Add CXM switches, controls and one CP16 display module for every 16 switch points to complete the system.

Dimensions: 19" rack mount (483 mm)
15" deep (381 mm)
7" (4 RU), 8.75" (5 RU) or 10.5" high
Weight: 45 lbs (16 kg) max
AC Power : 10 W per closed switch- 115/230VAC selectable

Create custom systems or special configurations.
Chassis is available with D connectors on the rear panel to drive your own +28 volt external relays or components.



CXM/256 with LAN, GPIB & RS232 Control

CXM MULTIPLEXERS

Nx1 multiplexers are assembled from standard CXM chassis by interconnecting microwave switches as shown schematically in **Fig. 2**. The interconnects are typically semi-rigid coaxial cables and are wired on the rear panel.
Configurations as large as 1x1728 can be built by going through only 3 stages of 1x12 relays.
These types of tree switch topologies are necessary to eliminate unterminated stubs and maintain the bandpass specs and characteristic impedance. Many high performance relays such as terminated relays rated to 40 GHz are only available in sizes up to 1x4 or 1x6 so this technique is required to build larger systems.

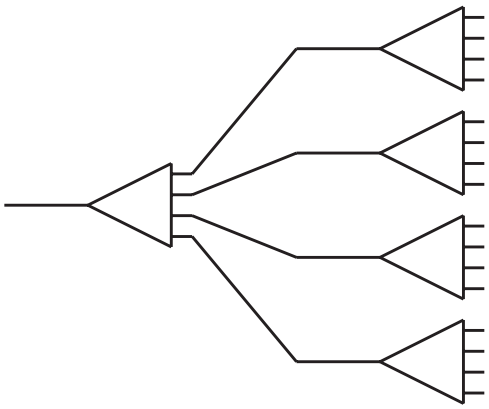


Fig. 2 16x1 multiplexer using five CXM/4x1 Switches

CXM EXPANSION CHASSIS

All CXM chassis can be built as either stand-alone mainframes or expansion chassis. Multiple expansion chassis are controlled via a single MESA control chassis. This design allows configuration of large, complex systems with one point of control. Using a Mesa controller along with several expansion chassis has the following advantages:

Cost Savings

Expansion chassis do not require their own control modules or manual controls, which results in cost savings that pay for the MESA on any system using three or more expansion chassis.

Single Point of Control

Using a single GPIB address, RS232 Port or TCP/IP address, you can control up to 16 CXM chassis, or combinations of different series chassis such as power or digital switches, from a single MESA.

Complex Test Systems

Since any Cytec chassis may be controlled from the MESA, you can build complicated systems switching a number of different signal types by using different Cytec products for each signal type. For example, RF signals, AC power, and high speed digital signals could all be switched with a single, muti-chassis system.

10x4 non-blocking, full fan-out matrix

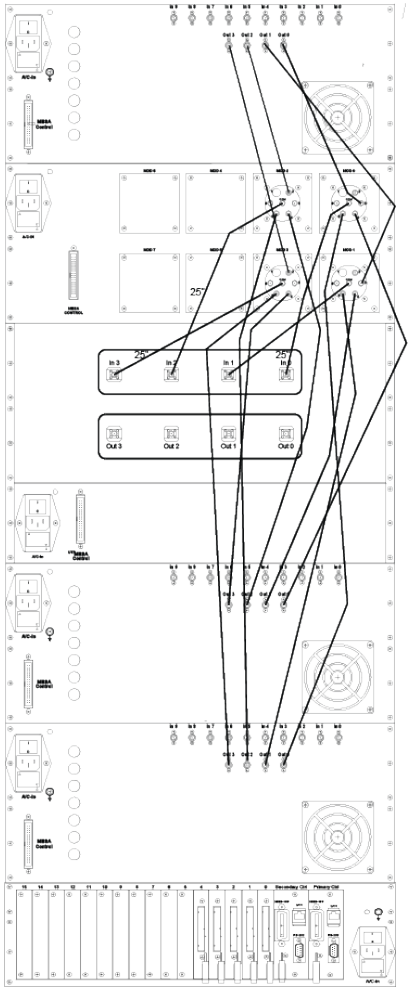
4-1x4 terminated, failsafe submux

4x4 matrix with 8 bit programmable attenuators for hand-over simulations

10x4 non-blocking, full fan-out matrix

10x4 non-blocking, full fan-out matrix

Mesa II control chassis w/ redundant control modules



30x4x4 non-blocking, full fan-out matrix with 8 bit programmable attenuators and redundant controls, DC to 18 GHz.

LED INDICATORS / STATUS FEEDBACK

All CXM chassis have front panels LED displays that show the status of every switch point, which provides an invaluable aid for program debugging and troubleshooting. One LED is assigned to every switch point, and you can verify status by simply watching the front panel.

CXM/16 and CXM/32 LED Indicators

LEDs are built into the front panel and are included in the chassis prices.

CXM/64 and CXM/128 LEDs - CP8 Modules

LEDs are supplied by CP8 display / driver module, each of which provides eight relays drives and status LEDs. These modules must be purchased separately.

CXM/256 LED Indicators - CP16 Modules

LEDs are built into the CP16 display / driver module, which also supplies 16 relay drives. These are purchased separately.

CXM CUSTOM CHASSIS

Cytec can usually customize your chassis to meet specific requirements with little or no additional NRE (Non Recurring Engineering) charges. The following examples are only some of the options available. If you don't see what you need feel free to ask us if it can be done. Our engineers will work with you to provide a tailored solution for your specific application.

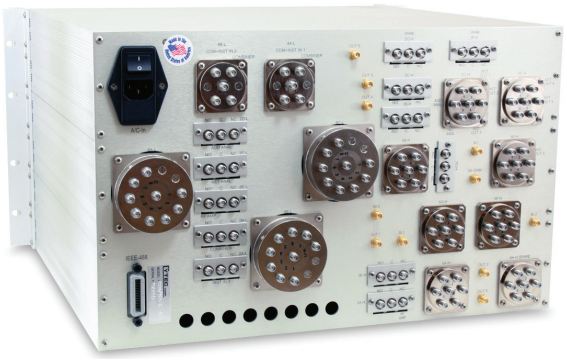
Labeling

Cytec's laser etch labeling system allows rapid custom labeling of front or rear panels. Silk screening options or custom polycarbonite overlays are also available for OEM systems.

Configuration

Cytec can pre-configure your system according to your exact needs. Some examples are:

- Include RF amplifiers to boost signals.
- Built in programmable attenuators reduce signals by a defined amount (1, 2, 4, 8 dB, etc.).
- Splitter/Combiners divide or mix signals as required.
- Directional couplers provide sampling ports.



Don't see what you need? Just ask!

CXM COAXIAL MECHANICAL MICROWAVE SWITCHES

Standard CXM Switches are 50 ohm, bi-directional, failsafe, Normally Open switches with a bandpass of DC to 18, 26.5 or 40 GHz. Microwave switches from 1x2 to 1x14 are available, and SMA, N or 2.9mm connectors are standard. Cytec does not manufacture microwave components but gets them from over 20 different vendors well established in the industry. This allows us to provide the best parts needed for your specific system at the lowest price. We can build from your BOM! Price and availability varies quite a bit depending on specifications, options and lead time.
OPTIONAL FEATURES INCLUDE: Failsafe default to Port 0 closed, latching actuators, SMA, 2.9mm, TNC or N connectors, unused input ports terminated to 50 ohms and higher frequency or power handling capacity. All options are not available on all models; contact one of our expert Sales Engineers for more information.

CXM/2x1-F (Form C)

Is a SPDT microwave switch that defaults to its NC position. Options include connector type, higher RF power handling ability, unused port termination and latching actuators.

CXM/2x1-F-SMA

CXM/NX1-NO SWITCH, N = 3 TO 14

Is a SPNT (Single Pole N Throw) where N = 3 through 14. Normally Open microwave switch. Options include connector type, higher RF power, latching actuators, fail-safe operation, and frequencies to 26.5 or 40 GHz.

CXM/6x1-NO-SMA

CXM/10x1-NO-SMA

CXM/12x1-NO-SMA

CXM TRANSFER SWITCH

Transfer switches have four ports and two switch positions. Position 1 connects Ports J1 to J4 and J2 to J3. Position 2 connects J1 to J2 and Ports J3 to J4. Options include different connectors and frequencies to 40 GHz. See **Fig. 3.** This can also be used as a terminated SPDT by adding an external termination to one port.

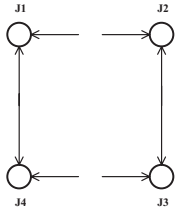


Fig. 3 CXM Transfer Switch

CXM TERMINATED SWITCHES

Self-terminating microwave switches connect all unused input ports to ground via 50 ohm terminations. Available with all multi-position switches from CXM/2x1-T to CXM/10-T. Terminations can handle 2 watts CW. See **Fig. 4** for a schematic of a terminated CXM/2x1-T.

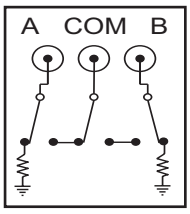


Fig. 4 CXM/2x1-T Terminated Switch

CXM/2X1-T-SMA (TERMINATED)

Is a SPDT microwave switch with both inputs terminated to 50 ohms when not switched. See **Fig. 4**. Options include latching actuators and frequencies to 26.5 or 40 GHz.

CXM/NX1-T-NO SWITCH, N = 3 TO 10

Are Normally Open single pole N throw relays with non-switched inputs terminated to 50 ohms. Options include latching actuators and frequencies to 26.5 or 40 GHz. SMA connectors up to 26.5 GHz, 2.9mm for 40 GHz.

CONNECTOR OPTIONS

SMA connectors are standard on all microwave switches rated up to 26 GHz. Optional connectors include **K Type** rated at DC to 40 GHz and **N** or **TNC** rated for higher power but lower frequency applications. Not all connectors are available on all switch types; for example, Terminated Switches are only built with SMA or 2.9mm connectors. Please contact the factory for more information.

LATCHING ACTUATORS

Microwave Switches with optional **Latching Actuators** remain in their current switched positions until switched by the user to another position, even if power is removed.

SWITCH MODULES SPECIFICATIONS

Microwave Switch specifications vary depending on the options selected. The following are typical for 18 GHz rated relays:

	1 GHz	18 GHz
Insertion Loss	0.3 dB	0.8 dB
Isolation	-80 dB	-60 dB
VSWR	<1.2:1	<1.5:1
Switching Time	<15 ms	<15 ms
RF Power, SMAs *	150 W	40 W
RF Power, Type N **	300 W	90 W at 14 GHz

Notes:
*** RF power is CW cold switching at frequency indicated.**
**** Type N connectors rated to 18 GHz only.**

The following specs are typical for relays rated to **26.5** or **40 GHz** depending on configuration:

1GHz	18 GHz	26.5 GHz*	40 GHz**
0.2 dB	0.5 dB	0.7 dB	1.10 dB
-80 dB	-60 dB	-55 dB	-50 dB
<1.15:1	<1.5:1	<1.7:1	<2.2:1
<15 ms	<15 ms	<15 ms	<15 ms
40 W	25 W	15 W	5 W

N connectors not available beyond 18 GHz

Notes:
*** 26.5 GHz relays with SMA precision connectors.**
**** 40 GHz relays have 2.9mm (K type) connectors.**

PROGRAMMABLE ATTENUATORS, SPLITTER/COMBINERS

On a semi-custom basis RF devices such as programmable attenuators, fixed attenuators, splitter/combiners, directional couplers, amplifiers or any other microwave component can be installed inside your CXM chassis to furnish a complete, turn-key test setup.

PROGRAMMABLE ATTENUATORS

Relay based and solid state attenuators are available in a variety of step sizes (such as 1 dB, 2 dB, 4 dB, 8 dB, etc.) and frequency ranges. Step size control is via Cytec's standard, simple programming commands. Including attenuators as part of the switching systems permits the end user to consistently, repeatable program precise signal attenuation steps. See **Fig. 6**.

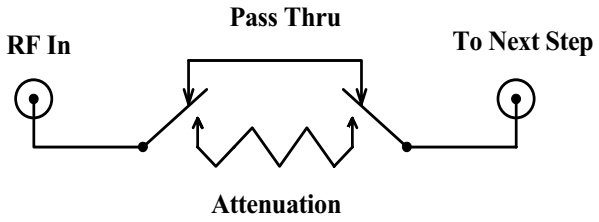


Fig. 6 Relay-based Programmable Attenuator

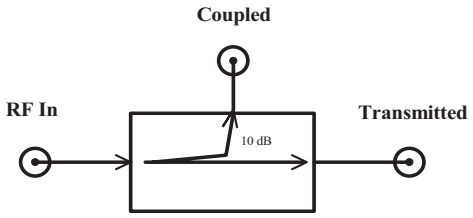


Fig. 8 Directional Coupler -10 dB

CYTEC SWITCH SOFTWARE

Check out the latest version of free GUI software on our webpage at: http://cytec-ate.com/support
The software runs on Windows XP or later. Source code available on request.

SOFTWARE HELP

Free drivers and/or sample programs are available for most commonly available application programming languages.

WARRANTY

All CXM Series Microwave Relays include a full one year warranty. All other system components (Cytec components) include five year warranties.

MANUAL CONTROL OPTION

Manual Controls are available for all mainframe chassis.

CXM/16 and **CXM/32** chassis can be purchased with optional pushbutton manual controls PB/16 or PB/32.

CXM/64, CXM/128 and **CXM/256** mainframes can be built with with optional keypad manual controls MC-2.

POWER DIVIDERS/COMBINERS

Are passive devices that offer high directivity and good port to port matching. 2 - way, 4 - way, 8 - way and 16 - way power dividers/combiners can be included as part of your microwave system. Inductive and resistive dividers are offered that have low insertion losses and VSWR. Frequencies as high as 40 GHz. Contact factory for more information. See **Fig. 7**.

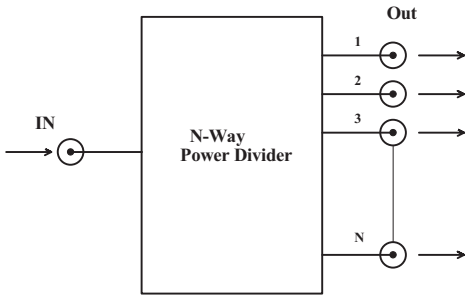


Fig. 7 1 : N Power Divider/Coupler

DIRECTIONAL COUPLERS

A directional coupler has three ports: input, transmitted and coupled. It couples part of the transmission power to the coupled port by a known amount, typically -10 dB, -20 dB or -30 dB. The coupled output can be used to measure information (for example, power level and frequency) without interrupting the main RF power flow. See **Fig.8**.

CONTROL MODULES

IF-12 LAN / GPIB / RS232 Control
Cytec's newest control module has the three most popular control interface protocols built into one module and is backwards compatible with all previous Cytec control modules.

LAN - 10/100BaseT Ethernet with an RJ45 Connector.
The interface uses DHCP or can be set to a static IP for secure networks. There are three ports available and all may be used at the same time. Two ports can be set by the end user and one is the default Telnet which may be disabled.

GPIB - IEEE488.2 compliant control module.
Commonly used with automated test applications. Works with all GPIB control cards and software including National Instruments, Matlab and Keysight. Drivers available upon request.

RS232 - Standard D9 serial port which can be used from computer com ports or USB to COM port cables

Contact Cytec for technical questions or support at:
1-585-381-4740
Email: sales@cytec-ate.com
Web: cytec-ate.com

CYTEC

Programmable switching systems for automated test,
data acquisition and communications

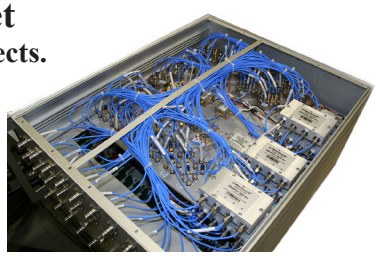
2555 Baird Road, Penfield, New York 14526 • cytec-ate.com • sales@cytec-ate.com • (585)381-4740

Cytec Custom Microwave Systems

Need a complex microwave switching system?
We can build it with little to no NRE!

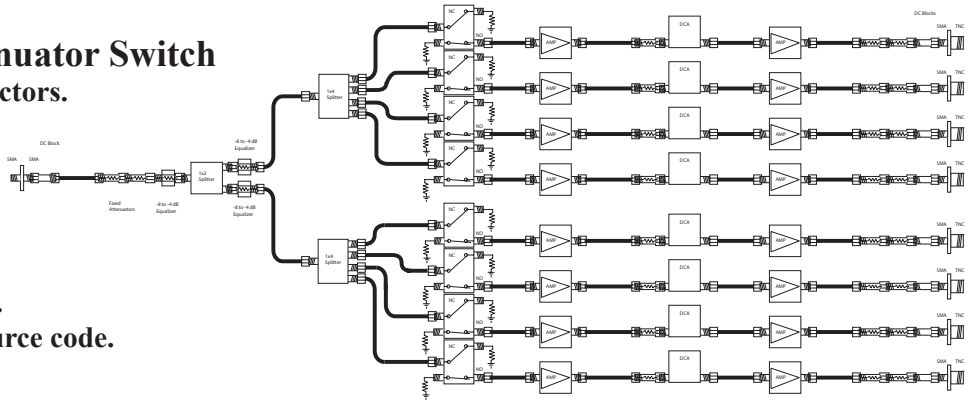
Custom In-Flight Navigation Test Set

- 34 relays, 12 splitters, 3 amps, 120 interconnects.
- Teflon wiring and ruggedized chassis.
- TNC panel mount connectors.
- LAN, GPIB, RS232 and manual controls.
- LED and remote status feedback.



High Speed Programmable Attenuator Switch

- 2 to 18 GHz range. SMA or TNC connectors.
- 0 to 63.5 dB attenuation in 0.5 dB steps.
- +3 dB output flat to +/- 3 dB.
- Switch speed of 400 ns.
- Attenuator step speeds of < 1 us.
- Ethernet or on board FPGA control.
- 1 Gbyte of on-board command memory.
- Matlab Interface, AHDL and VHDL source code.



Modular 4 - 4x2 DC to 26.5 GHz Matrix

- Four 4x2 matrix modules allow large variety of configurations.
- Latching, terminated Keysight /Agilent relays w/ LED indicators.
- 2.92 mm replacable panel flange mount connectors.
- DC to 26.5 GHz bandpass (-2 dB IL @ 26.5 GHz).
- VSWR < 1.45 to 18 GHz, < 1.6 to 26.5 GHz. Time stable.
- Isolation > 100 dB to 10 GHz, > 85 dB to 18 GHz
- Phase matched to +/- 15 degrees at 10 GHz.
- 5 million cycle relays. Teledyne Storm Interconnects.
- LAN, GPIB, RS232 and Manual Controls.
- LED and Remote status feedback.
- 19" rack mount, reversible chassis 3 RU high.

Don't see what you need? Just ask!

We can build it using your choice of components from any vendor and build it to your specifications.
With 40 years of switching system design experience we have probably already done most of the work.

FOR TECHNICAL ASSISTANCE, CONTACT CYTEC AT 585-381-4740
E-mail: sales@cytec-ate.com or VISIT OUR WEBSITE AT cytec-ate.com