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MTA SERIES
ATTENUATOR SHELF

User's Manual

JDS Uniphase

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Safety Information, Instructions, and Symbols

Safety Information

Classification

The unit consists of an exposed metal chassis that is connected directly to earth via a power cord and, therefore, is classified as a Class 1 instrument. Class 1 refers to equipment relying on ground protection as a means of shock protection.

The following symbol is used to indicate a protective conductor terminal in the unit.



Disconnecting from Line Power

Some of the circuits are powered whenever the unit is connected to the AC power source (line power). To ensure that the unit is not connected to the line power, disconnect the power cord from either the power inlet on the unit's rear panel or from the AC line-power source (receptacle). The power cord must always be accessible from one of these points. If the unit is installed in a cabinet, the operator must be able to disconnect the unit from the line power by the system's line-power switch.

Line Power Requirements

The unit can operate from any single-phase AC power source that supplies between 100 and 240 V at a frequency range of 50 to 60 Hz. The maximum power consumption is 80 VA.

Fuse Type

The fuse type used by the unit is (5x20) mm, T1A/250 V (slow).

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Safety Instructions

The following safety instructions must be observed whenever the unit is operated, serviced, or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the user's manual is in direct violation of the standards of design, manufacture, and intended use of the unit. JDS Uniphase assumes no liability for the customer's failure to comply with any of these safety requirements.

Before Initializing and Operating the Unit

☑ Inspect the unit for any signs of damage, and read the user's manual thoroughly.

☑ Install the unit as specified in the **Getting Started** section.

☑ Ensure that the unit and any devices or cords connected to it are properly grounded.

Operating the Unit



Warning

To avoid the risk of injury or death, always observe the following precautions before initializing the unit:

- If using a voltage-reducing autotransformer to power the unit, ensure that the common terminal connects to the earthed pole of the power source.
- Use only the type of power cord supplied with the unit.
- Connect the power cord only to a power outlet equipped with a protective earth contact. Never connect to an extension cord that is not equipped with this feature.
- Willfully interrupting the protective earth connection is prohibited.
- Never look into the end of an optical cable connected to an optical output device that is operating. Laser radiation is invisible, and direct exposure can severely injure the human eye. For more information, see the user's manual of the laser source in use.
- Turning off the power to the device does not always block the externally supplied radiation to the connector at the output of the unit.
- Do not use the unit outdoors.
- To prevent potential fire or shock hazard, do not expose the unit to any source of excessive moisture.
- Do not operate the unit when its covers or panels have been removed.
- Do not interrupt the protective earth grounding. Any such action can lead to a potential shock hazard that can result in serious personal injury.
- Do not operate the unit if an interruption to the protective grounding is suspected. In this case, ensure that the unit remains inoperative.
- Use only the type of fuse specified by the manufacturer as appropriate for this unit. Do not use repaired fuses, and avoid any situations that can short-

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	circuit the fuse. • Unless absolutely necessary, do not attempt to adjust or perform any maintenance or repair procedure when the unit is opened and connected to a power source. • Repairs are to be carried out only by a qualified professional. • Do not attempt any adjustment, maintenance, or repair procedure to the unit's internal mechanism if immediate first aid is not accessible. • Disconnect the power cord from the unit before adding or removing any components. • Operating the unit in the presence of flammable gases or fumes is extremely hazardous. • Do not perform any operating or maintenance procedure that is not described in the user's manual. • Some of the unit's capacitors can be charged even when the unit is not connected to the power source.

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Safety Symbols

The following symbols and messages can be marked on the unit (Table 1). Observe all safety instructions that are associated with a symbol.

Table 1: Safety Symbols

Symbol	Description
	Laser safety. See the user's manual for instructions on handling and operating the unit safely.
	See the user's manual for instructions on handling and operating the unit safely.
	Electrostatic discharge (ESD). See the user's manual for instructions on handling and operating the unit safely.
	Frame or chassis terminal for electrical grounding within the unit.
	Protective conductor terminal for electrical grounding to the earth.
WARNING	**The procedure can result in serious injury or loss of life if not carried out in proper compliance with all safety instructions. Ensure that all conditions necessary for safe handling and operation are met before proceeding.**
CAUTION	The procedure can result in serious damage to or destruction of the unit if not carried out in compliance with all instructions for proper use. Ensure that all conditions necessary for safe handling and operation are met before proceeding.

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Compliance

FCC Compliance

The Federal Communications Commission (FCC) of the United States of America requires that equipment operating in that country does not cause interference to communications. The unit has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of Title 47 of the Code of Federal Regulations for Radio Frequency Devices. Operation is subject to the following two conditions, which the FCC requires to be labeled on the unit:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

FCC rules require that the following note and subsequent information be included in this manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

These limits are designed to provide reasonable protection against harmful interference in a commercial installation. The unit generates, uses, and radiates radio frequency energy and, if not installed and used in accordance with instructions, can cause harmful interference to radio communications.

Any user modification made to the unit voids the user's authority to operate the unit under the FCC rules.

If this unit is used in a residential setting, resulting interference must be corrected by the user.

For more information, see Title 47 of the Code of Federal Regulations at http://www.access.gpo.gov/nara/cfr/cfr-table-search.html.

CE Compliance

The unit has been designed and tested to comply with directive 73/23/EEC and its subsequent amendments by the European Community (EC or CE). The directive relates to electrical equipment designed for use within certain voltage limits. It ensures that electrical equipment is constructed with good engineering practice in safety matters.

The unit has been designed and tested to comply with directive 89/336/EEC and its subsequent amendments. The directive relates to electromagnetic compatibility. It demands that electromagnetic disturbance does not exceed a prescribed level; that the equipment be immune to a prescribed level of ambient level of interference; that the equipment be protected

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against electrostatic discharges; and that the equipment be immune to all electrical shock wave disturbances. As of 1997, measures have been added to test for fire hazard, electric shock hazard, and also external exposure to other forms of energy.

The requirements specified by directive 89/336/EEC are as follows. CE compliance requires that the manufacturer or its authorized representative established within the Community affix the EC conformity mark to the apparatus or else to the packaging, instructions for use, or guarantee certificate. The EC conformity mark shall consist of the letters CE as specified and the figures of the year in which the mark was affixed. This mark should, where appropriate, be accompanied by the distinctive letters used by the notified body issuing the EC type-examination certificate. Where the apparatus is the subject of other Directives providing for the EC conformity mark, the affixing of the EC mark shall also indicate conformity with the relevant requirements of those other Directives.

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General Information and Specifications

General Information

This user's manual for the MTA Series Attenuator Shelf contains complete operating instructions.

The MTA Series Attenuator Shelf is a modular system that holds up to eight programmable attenuator cassettes and an IEEE 488.2 control cassette in a low-profile, 19 in (48.26 cm) rack-mounting shelf.



Figure 1: MTA Series Attenuator Shelf

The system is designed for power equalization applications, such as eight-channel dense wavelength division multiplexer (DWDM) amplified systems. The attenuators feature low polarization dependent loss (PDL) and high return loss. The optical design is etalon-free for low signal distortion. Attenuation resolution and accuracy are 0.05 dB nominal and better than ±0.1, respectively. The attenuation is calibrated from 1200 to 1700 nm, with optimal performance within the 1545 to 1645 nm range.

The modular system consists of the following elements:

- One MTA100 AC-powered, rack-mountable chassis
- One MTA150 GPIB control cassette
- Up to eight MTA300 attenuator cassettes with user-defined connectors

The optics of the MTA300 cassettes are bidirectional. Therefore, either fiber port can be used as the input. If an optional coupler or switch is installed, the user must ensure that the connections to these instruments are appropriate.

The linear design and low polarization sensitivity of the MTA system allow the attenuators to be inserted directly at the output of an array of laser sources. This, in turn, allows stable optical power to be provided or adjusted over each channel. A built-in beam blocking switch provides rapid attenuation change from any attenuation setting to infinite attenuation. This feature can be used to simulate a broken fiber or a laser module failure and to emulate switching. Each attenuator cassette is available with a retractable connector plate to facilitate maintenance and cleaning.

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One attenuator is selected at a time for control. Control is achieved via the keypad and display on the control cassette or the IEEE 488.2 remote interface. The commands are SCPI compatible and LabVIEW drivers are supplied to simplify remote control.

Insertion Loss

Insertion loss is not included in the attenuation of the MTA300 cassettes.

Key Features

- Up to eight programmable attenuators
- 0.5 dB resolution
- Low polarization sensitivity
- IEEE 488.2 interface
- SCPI compatible commands
- 19 in rack mount shelf
- LabVIEW[1] drivers

Applications

- Power equalization in DWDM test systems
- Production testing of transmission systems
- Laboratory trials

Standard Accessories

- AC power cord
- User's manual

[1] LabVIEW is a registered trademark of National Instruments Corporation.

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Specifications

The following optical specifications describe the warranted characteristics of the attenuator and control cassettes (Table 2). Supplementary specifications describe the typical non-warranted performance of the shelf unit (Table 3).

Table 2: Optical Specifications

Parameter	Typical
MTS300 attenuator cassette[1]	
Wavelength range	1200 to 1700 nm
Attenuation range resolution repeatability[2] change rate accuracy	 >60 dB 0.05 nominal ±0.005 dB typical, ±0.02 dB maximum <6 s, 0 to 60 dB ±0.05 dB typical, ±0.1 dB maximum
Insertion loss[3,4]	2.2 dB typical, ≤2.5 dB maximum
Return loss[3,4]	>60 dB typical, >57 dB maximum
Maximum optical input power	200 mW
Recalibration period (recommended)	2 years
Polarization dependent loss	≤0.05 dB typical, ≤0.10 dB maximum
Polarization dependent loss at 1545 to 1565 nm	≤0.03 dB typical, ≤0.05 dB maximum
Beam block isolation	>100 dB
Beam block speed	<20 ms
MTA150 control cassette	
Local control	Front-panel keypad and display
Remote control	IEEE 488.2
Command set	SCPI compatible

[1] Customized configurations are also available.
[2] At constant temperature, wavelength, and polarization state after half-hour warm-up.
[3] Measured at 23 °C with a laser source.
[4] Including two SC/APC connectors.

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Table 3: Other Specifications

MTA100 AC-powered rack-mount shelf	
Electrical	
Input voltage	100 to 240 V AC, 50 to 60 Hz
Power consumption	80 VA maximum
Physical	
Dimensions (W x H x D) 19-in rack mounting	48.3 x 8.9 x 49.7 cm 2U high, standard 19 in (48.26 cm) width
Weight	Approximately 36 kg
Environmental	
Operating temperature	0 to 40 °C
Storage temperature	-40 to 60 °C
Humidity	maximum 95% up to 40 °C, decreasing 5% per °C from 40 to 60 °C

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Getting Started

The MTA Series Attenuator Shelf consists of the shelf, attenuator and control cassettes, and an AC power cord.

Before Initializing and Operating the Unit

☑ Inspect the unit for any signs of damage.

☑ Read the user's manual thoroughly, and become familiar with all safety symbols and instructions to ensure that the unit is operated and maintained safely.

Initial Inspection



Warning

To avoid electrical shock, do not initialize or operate the unit if it bears any sign of damage to any portion of its exterior surface, such as the outer cover or panels.

Check that the unit and contents are complete:

1. Wear an anti-static wrist strap, and work in an electrostatic discharge (ESD) controlled area.

2. Inspect the shipping container for any indication of excessive shock to the contents, and inspect the contents to ensure that the shipment is complete.

3. Inspect the unit for structural damage that can have occurred during shipping.

4. Place the MTA100 shelf on a bench or install it in the 19-in rack provided. Refer to the printing on labels on the rear panel to ensure that the shelf is right side up.

5. Ensure that MTA100 shelf is powered off (**O**).

6. Insert the MTA150 control cassette about 5 cm (2 in) into the card guides of the left-most shelf slot and align it with the upper and lower guides.

7. Slide the MTA150 cassette completely into the slot. Expect some resistance during the last 2 cm of travel as the MTA150 cassette and the back panel connectors on the shelf engage. The faceplate of a fully-inserted MTA150 cassette rests against the frame of the MTA100 shelf.

8. Use a slot-head screwdriver to tighten the cassette's captive screw and secure the MTA150 cassette's position.

9. Insert an MTA300 attenuator cassette into any of the remaining shelf slots, using the method described for the control cassette in steps 6 to 8. Up to eight attenuator cassettes can be installed on the MTA100 shelf.

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10. Connect the unit to the AC power source, using the AC power cord provided.

11. Set the power switch on the rear panel of the shelf to **I** (on), and observe the power-up sequence. The message "SCANNING" is displayed as the cassettes initialize. The message "MTA" is displayed once each cassette has been initialized and the MTA150 cassette is selected. An error message is displayed if a malfunction is detected in a selected cassette during the power-up sequence. See the **Error Messages** section for a description of the error messages.

12. Keep the packaging.

Immediately inform JDS Uniphase and, if necessary, the carrier if the contents of the shipment are incomplete, if the unit or any of its components are damaged or defective, or if the unit does not pass the initial inspection.

Operating Environment

In order for the unit to meet the warranted specifications, the operating environment must meet the following conditions for temperature, humidity, and ventilation.

Temperature

The unit can be operated in the temperature range of 0 to 40 °C.

Humidity

The unit can be operated in environments with up to 95% humidity (0 to 40 °C), decreasing 5% per °C from 40 to 60 °C. Do not expose it to any environmental conditions or changes to environmental conditions that can cause condensation to form inside the unit.

Ventilation

Do not install the unit in any location where the ventilation is blocked. For optimum performance, the unit must be operated from a location that provides at least 75 mm (3 in) of clearance at the rear and at least 25 mm (1 in) of clearance at the bottom. Blocking the air circulation around the unit can cause the unit to overheat, compromising its reliability.



Warning

- Do not use the unit outdoors.
- To prevent potential fire or shock hazard, do not expose the unit to any source of excessive moisture.

Storing and Shipping

To maintain optimum operating reliability, do not store the unit in locations where the temperature falls below -40 °C or rises above 60 °C. Avoid any environmental condition that can result in internal condensation. Ensure that these temperature and humidity requirements can also be met whenever the unit is shipped.

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Claims and Repackaging

Immediately inform JDS Uniphase and, if necessary, the carrier, if

- The contents of the shipment are incomplete
- The unit or any of its components are damaged or defective
- The unit does not pass the initial inspection

In the event of carrier responsibility, JDS Uniphase will allow for the repair or replacement of the unit while a claim against the carrier is being processed.

Returning Shipments to JDS Uniphase

JDS Uniphase only accepts returns for which an approved Return Material Authorization (RMA) has been issued by JDS Uniphase sales personnel. This number must be obtained prior to shipping any material to JDS Uniphase. The owner's name and address, the model number and full serial number of the unit, the RMA number, and an itemized statement of claimed defects must be included with the return material.

Ship return material in the original shipping container and packing material. If these are not available, packaging guidelines are as follows:

1. Wear an anti-static wrist strap and work in an ESD controlled area.

2. Cover the front panel with a strip of cardboard.

3. Wrap the unit in anti-static packaging. Use anti-static connector covers, if applicable.

4. Pack the unit in a reliable shipping container.

5. Use enough shock-absorbing material (10 to 15 cm or 4 to 6 in on all sides) to cushion the unit and prevent it from moving inside the container. Pink poly anti-static foam is the best material.

6. Seal the shipping container securely.

7. Clearly mark FRAGILE on its surface.

8. Always provide the model and serial number of the unit and, if necessary, the RMA number on any accompanying documentation.

9. Ship the unit only to the address given at the beginning of this document.

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Cleaning Connectors

	**Caution** • Connecting damaged or dirty fibers to the unit can damage the connectors on the unit. • Never force an optical connector. Some connectors have a ceramic ferrule that can easily be broken.

Optical cable ends need to be cleaned before using them with the unit.

The following items are required for cleaning:

- Filtered compressed air or dusting gas (for example, Tech Spray Envi-Ro-Tech Duster 1671 gas, available from http://www.techspray.com/1671.htm)
- Lint-free pipe cleaners (for example, from 3M[2]) or lint-free swab
- Lint-free towels (for example, 10 x 10 cm or 4 x 4 in HydroSorb III wipers, available from http://www.focenter.com/acctech/hydrosobr_wipers.htm)
- Optical grade isopropyl alcohol or optical grade 200° ethanol (do not use rubbing alcohol, which contains 30% water)

To clean the connectors:

1. Blow the sleeve with filtered compressed air (Figure 2).

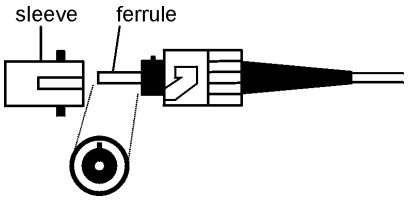


Figure 2: Connector Cleaning (connector type can vary)

2. Apply optical grade isopropyl alcohol or optical grade ethanol (do not use rubbing alcohol) to a small area of a lint-free towel and rub the end of the ferrule over the wet area.

3. Wipe the ferrule on a dry area of the lint-free towel.

4. Using the dusting gas or compressed air, blow the end of the ferrule.

5. Apply the alcohol or ethanol to a lint-free pipe cleaner or swab and wipe off the remaining parts of the connector.

6. With the other end of the pipe cleaner or swab, dry the areas cleaned.

7. Using the dusting gas or compressed air, blow the areas cleaned.

[2] 3M is a trademark of 3M.

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GPIB Interface Pin Assignment

The GPIB pin assignment is shown in Figure 3.

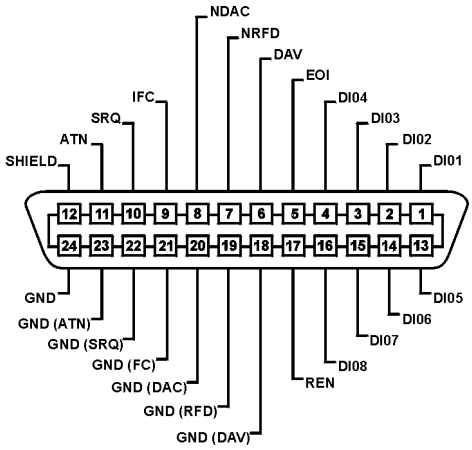


Figure 3: GPIB Pin Assignment

	Warning Tighten the connector lock screws by hand. Do not use a screwdriver.

Attenuation Display

When the control cassette is set to Attenuation mode, the cassette displays the attenuation of the active MTA300 attenuator cassette in dB. Generally, the attenuation displayed is relative to the 0 dB reference position of the attenuating prism of the selected MTA300 cassette. However, the Display Offset function can be used to include both the insertion loss of the MTA300 cassette and connection losses in the attenuation value displayed. See the **Setting the Display Offset** section.

When using the MTA system at high attenuation settings:

1. Shield the output fiber or cable to prevent erroneous readings caused by ambient light pickup.

Source Considerations

Source output powers can be sensitive to reflections. For example, if the output of the MTA300 attenuator cassette is connected to a jumper with an unterminated, non-angled connector, a large reflection can be coupled back into the source when the attenuator cassette is used at low attenuation settings. Consequently, as the attenuation is increased, the reflection level back into the source decreases, making the attenuator cassette appear non-linear over the range of 0 to 10 dB.

The following methods can offset the effects of reflection:

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- Use an angled connector (for example, FC/APC) at the detector
- Add some attenuation (5 to 10 dB typical) between the source and the MTA300 attenuator cassette
- Use an isolator between the source and the MTA300 attenuator cassette

Powering up the Shelf

To turn the MTA system on:

1. Connect the shelf unit to an AC power source, using the AC power cord provided.

2. Set the power switch on the back of the shelf to **I** (on), and observe the power-up sequence.

3. The message “SCANNING” is displayed as the cassettes initialize.

4. The message “MTA” is displayed once each cassette has been initialized and the MTA150 control cassette is selected.

An error message is displayed if a malfunction is detected in a selected cassette. See the **Error Messages** section for a description of error messages.

Setting the GPIB Address

Set the GPIB address before operating the MTA150 control cassette in Remote mode.

To set the GPIB address:

1. Press the Select key, and use the π,θ, τ, or υ key to select the MTA150 cassette. The message “MTA” is displayed to indicate that the MTA150 cassette is selected.

2. Press the Display key to access the functions menu.

3. Press the π,θ, τ, or υ key to scroll to G, the GPIB address function.

4. Press the Set key to display a GPIB address, for example, XX, where XX is a number between 0 and 30.

5. To change the GPIB address, press the τ or υ key to scroll to the first digit to be adjusted. Each digit flashes as the user scrolls through the displayed setting.

6. As the selected digit flashes, press the π or θ key to increase or decrease the value.

7. Press the τ or υ key to scroll to the next digit to be adjusted, and press the π or θ key to increase or decrease the value.

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Front Panel

The front of the unit is shown in Figure 4.

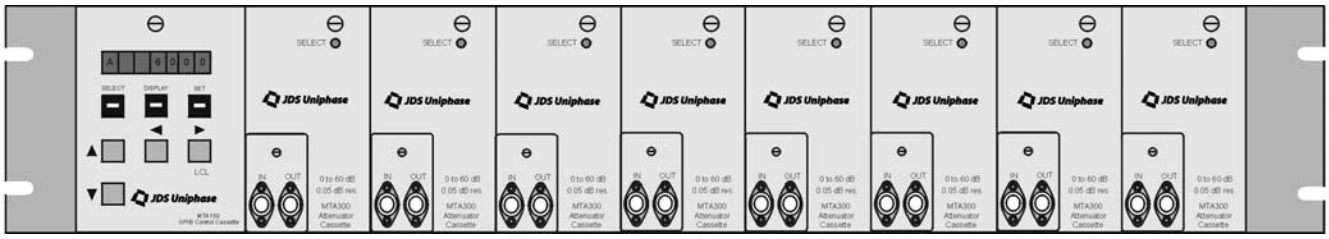


Figure 4: Front of Shelf

Two removable, fiberoptic connectors are mounted on each MTA300 cassette faceplate.

Operating Keys and Status LEDs

The operating keys and status LEDs are described in Table 4.

Table 4: Operating Keys and Status LEDs

Key/LED	Description
Select key	Sets the MTA150 control cassette to Select mode to enable the user to select and activate the required attenuator cassettes
Display	Sets the MTA150 control cassette to Display mode to enable the user to access the functions of the attenuator cassettes activated in Select mode
Set	Sets the MTA150 control cassette to Set mode to enable the user to adjust operation settings such as GPIB address and calibration wavelength
τ/υ π/θ	Scroll keys
LCL	Returns the unit to Local mode from Remote mode
Select LEDs	Light to indicate that the MTA300 attenuator cassettes are selected and activated

Rear Panel

The back of the shelf is shown in Figure 5.

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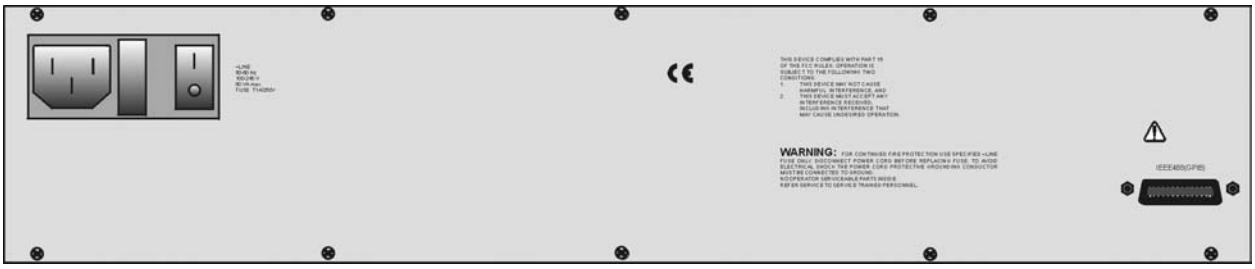


Figure 5: Back of Shelf

Controlling the Beam Block

The built-in beam block in each MTA300 cassette is automatically activated when the cassette is powered up. The beam block must be deactivated after power-up so that light can pass through the attenuator.

Deactivating the Beam Block

To deactivate the beam block after power-up:

1. Press the Select key, and use the π,θ, τ, or υ key to select the required MTA300 cassette. The required cassette is selected when its Select LED is lit.

2. Press the Display key to access the functions menu.

3. Press the π,θ, τ, or υ key to scroll to B, the beam block function.

4. Press the Set key to display a status setting, for example, On.

5. To change the status setting, press the π or θ key to scroll to Off.

Activating the Beam Block

To activate the beam block after power-up:

1. Press the Select key, and use the π,θ, τ, or υ key to select the required MTA300 cassette. The required cassette is selected when its Select LED is lit.

2. Press the Display key to access the functions menu.

3. Press the π,θ, τ, or υ key to scroll to B, the beam block function.

4. Press the Set key to display a status setting, for example, Off.

5. To change the status setting, press the π or θ key to scroll to On.

Setting the Calibration Wavelength

For accurate attenuation, set the calibration wavelength of the MTA300 attenuator cassettes to the source wavelength.

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Adjust the correction factor curve for each cassette to provide optimum performance with a laser diode source at 1310 nm and 1550 nm. To find a more suitable slope correction factor for the source in use, increase or decrease the calibration wavelength of the MTA300 cassette as required.

The MTA300 cassette is optimized for insertion loss at 1550 nm. Typically, the variation in insertion loss from 1200 to 1600 nm is ≤0.2 dB.

Set the calibration wavelength before setting the display offset and the attenuation.

To calibrate an MTA300 cassette for a specific source wavelength:

1. Press the Select key, and use the π,θ, τ, or υ key to select the required MTA300 cassette.

2. Press the Display key to access the functions menu.

3. Press the π,θ, τ, or υ key to scroll to W, the wavelength function.

4. Press the Set key to display a wavelength setting in nm, for example, XXXX.X.

5. Press the τ or υ key to scroll to the first digit to be adjusted. Each digit flashes as the user scrolls through the displayed setting.

6. As the selected digit flashes, press the π or θ key to increase or decrease the value.

7. Press the τ or υ key to scroll to the next digit to be adjusted, and press the π or θ key to increase or decrease the value. Repeat this step for each digit to be adjusted.

A change in the calibration wavelength automatically adjusts the attenuation to match the attenuation setting.

The calibration wavelength can be optimized by matching the user slope of an MTA300 cassette to a power meter. See the **Setting the User Slope** section.

Setting the User Slope

The calibration wavelength can be optimized by matching the user slope of an MTA300 cassette to a power meter for a specific source.

Set the user slope before setting the display offset and the attenuation.

To set the slope:

1. Press the Select key, and use the π,θ, τ, or υ key to select the required MTA300 cassette.

2. Ensure that the display offset is set to 0 dB.

3. Press the π or θ key to set the attenuation of the MTA300 cassette to 10 dB.

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4. Press the π,θ, τ, or υ key to scroll to W, the wavelength function.

5. Press the Set key to display a wavelength setting in nm, for example, XXXX.X.

6. Set the calibration wavelength to the source wavelength by pressing the τ or υ key to scroll to first digit to be adjusted. Then press the π or θ key to increase or decrease the value. Repeat for each digit to be adjusted.

7. Increase or decrease the calibration wavelength until the attenuation displayed on the MTA300 cassette matches the power meter reading. The MTA300 cassette can be set to an attenuation higher than 10 dB, provided that the power meter remains linear. Attenuation settings lower than 10 dB are not recommended.

Setting the Display Offset

The minimum offset level setting for the MTA300 cassette is -60.00 dB. The maximum offset level setting is 60.00 dB.

Set the calibration wavelength and the slope before setting the display offset (see the **Setting the Calibration Wavelength** and **Setting the User Slope** sections).

To set the display offset:

1. Press the Select key, and use the π,θ, τ, or υ key to select the required MTA300 cassette.

2. Press the Display key to access the functions menu.

3. Press the π,θ, τ, or υ key to scroll to O, the offset function.

4. Press the Set key to display a display offset setting, for example, XX.XX.

5. To change the display offset setting, press the τ or υ key to scroll to the first digit to be adjusted. Each digit flashes as the user scrolls through the displayed setting.

6. As the selected digit flashes, press the π or θ key to increase or decrease the value.

7. Press the τ or υ key to scroll to the next digit to be adjusted, and press the π or θ key to increase or decrease the value. Repeat this step for each digit to be adjusted. The display offset can be used to include both the insertion loss of the MTA300 cassette and any connection losses in the attenuation value displayed.

Setting the Attenuation

In the MTA300 cassette, attenuation is a function of the calibration wavelength. The maximum attenuation level that the cassette can be set to is 60 dB from the 0 dB reference point.

Set the calibration wavelength before setting the attenuation (see the **Setting the Calibration Wavelength** section).

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To set the attenuation:

1. Press the Select key, and use the π,θ, τ, or υ key to select the required MTA300 cassette. The default function setting for the MTA300 cassette is A, attenuation mode.

2. Press the Set key to display an attenuation setting, for example, XX.XX.

3. To change the attenuation setting, press the τ or υ key to scroll to first digit to be adjusted. Each digit flashes as the user scrolls through the displayed setting.

4. As the selected digit flashes, press the π or θ key to increase or decrease the value.

5. Press the τ or υ key to scroll to the next digit to be adjusted, and press the π or θ key to increase or decrease the value. Repeat this step for each digit to be adjusted. The attenuation displayed includes the offset that has been set for that MTA300 cassette.

Error Messages

If an error occurs in an MTA300 attenuator cassette, an error message is displayed when that cassette is selected. If any of the errors listed here occurs, record the error message and the serial number of the affected MTA300 cassette and of the MTA150 control cassette. Then contact JDS Uniphase or your representative.

BOOTFAIL **Bootup Failure**

An error occurred during the initialization of the selected MTA300 cassette. The cassette has been disabled and cannot be used until the system is powered off and the problem is corrected.

SENSFAIL **Sensor Failure**

A fault was detected in the operation of the position sensors on the selected MTA300 cassette. The cassette is disabled and cannot be used until the system is powered off and the problem is corrected.

LIMIT EX **Limit Exceeded**

The selected MTA300 cassette exceeded the allowed physical limit for the attenuation. The cassette is disabled and cannot be used until the system is powered off. Power the system off and then on again to correct the problem. If the error then recurs, contact JDS Uniphase.

COMM ERR **Communication Error**

A communication error occurred between the MTA150 cassette and the selected MTA300 cassette. The cassette is disabled and cannot be used until the system is powered off and the problem is corrected.

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Calibrating the Shelf

Calibration Verification

Use the following verification procedures to determine the calibration of a specific MTA300 cassette. If results indicate that the cassette is not operating within the specifications shown in the **Specifications** section, return the cassette to the manufacturer for recalibration.

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Required Equipment

The required equipment includes:

- A light source for the wavelength at which the calibration is being verified, for example, a 1550 nm source for calibration verification at 1550 nm. (Record the exact peak center wavelength of the source for future reference.)
- A power meter, accurate up to at least -60 dBm and with a resolution of at least 0.05 dB
- Appropriate jumpers (FC/PC or FC/APC, as required)
- Connectors
- Isolator (optional)

Verifying Accuracy

Clean all optical connections with an alcohol-soaked swab before each connection.

To avoid reflection-induced source power changes, connect to the power meter using a connector with low reflection or use an isolator for the source.

To check the accuracy:

1. Zero the power meter.

2. Connect the light source to the required MTA300 cassette, and connect the cassette to the power meter.

3. Set the power switch on the MTA100 shelf to **I** (on), and verify that both the attenuator and the power meter are set to the same wavelength as the source.

4. Set the required MTA300 cassette to zero, and record the value displayed on the power meter.

5. Increase the attenuation in 1 dB steps until the attenuator reads 60 dB. After each step, record the values displayed on the MTA150 cassette and the power meter.

6. Apply the following formula to each reading:

   (attenuator reading - 0) - (power reading - power reading with the MTA300 set to 0)

7. Each calculated value found using step 6 must fall within the specifications for accuracy provided in the **Specifications** section. For the highest specification, the slope must be set to match the source. This action is accomplished by optimizing the calibration wavelength (see the **Setting the Calibration Wavelength** section).

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Verifying Insertion Loss

To check the insertion loss:

1. Zero the power meter.
2. Connect the light source directly to the power meter, bypassing the MTA300 cassette and connecting the two jumpers or pigtails together.
3. Record the value displayed on the power meter.
4. Connect the source to the MTA300 cassette, and connect the cassette to the power meter.
5. Set the MTA300 cassette to 0 dB.
6. Record the value displayed on the power meter. The difference between this reading and the reading from step 3 is the insertion loss.

The insertion loss must fall within the specifications for accuracy provided in the **Specifications** section.

Maintaining the Shelf



Caution

To avoid damaging the fiber, do not remove the In and Out connector adapters on the front panel of an MTA300 cassette at the same time.

1. Remove the two connector bulkhead screws on the front panel of the MTA300 cassette.
2. Pull the connector bulkhead out carefully, extending it no more than 17 cm (7 in) from the faceplate.
3. Remove the connector from the connector bulkhead.
4. Clean the connector end and the bulkhead mating sleeve with a lint-free tissue and alcohol. See the **Cleaning Connectors** section.
5. Reinstall the connector into the connector bulkhead.
6. Reinstall the connector bulkhead, ensuring that the fiber is not stressed.

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Programming Guide

The following programming instructions for the MTA attenuator shelf are intended for users familiar with the GPIB interface and how to send or receive messages over a device. A detailed description of the GPIB interface is contained in *ANSI/IEEE Std. 488.1-1987 IEEE Standard Digital Interface for Programmable Instrumentation* published by the Institute of Electrical and Electronics Engineers.

The MTA system is equipped with a GPIB parallel interface. The MTA150 control cassette displays the current GPIB address when the system is powered on. For detailed information on Standard Commands for Programmable Instruments (SCPI) conformance, see the SCPI **Conformance Information** section.

Switching between Remote and Local Operation

The MTA150 control cassette is automatically set in Remote mode as soon as it is addressed by the controlling computer:

1. To exit Remote mode and return the system to Local mode, press the LCL key.

The LCL key is disabled if the MTA shelf has been set to Local Lockout mode.

GPIB Interface Functions

The GPIB interface functions are shown in Table 5.

Table 5: GPIB Interface Functions

Mnemonic	IEEE 488.1 Function
SH1	source handshake, complete capability
AH1	acceptor handshake, complete capability
T6	basic talker, serial poll, unaddressed if MLA
L4	basic listener, unaddressed if MTA
SR1	service request capability
RL1	remote/local, complete capability
PP0	parallel poll, no capability
DC1	device clear, complete capability
DT0	device trigger, no capability
C0	controller, no capability
E1	electrical interface, open collector drivers

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SCPI Command Set

Conformance Information

The GPIB interface of the MTA150 control cassette conforms to the ANSI/IEEE standards 488.1-1987 and 488.2-1987.

The common commands are defined in ANSI/IEEE 488.2. All other commands conform to the Standard Commands for Programmable Instruments (SCPI) command language, version 1995.0.

Program Message Formats

A program message consists of a command header, followed by its required parameters. The parameters must be separated from the command header by a space, for example, **:INPUT:ATTENUATION 10**. Multiple parameters must be separated by a comma (,).

Each program message can contain one or more message units. The message units in a program message must be separated by a semicolon (;), for example,

:INPUT:ATTENUATION 10;INPUT:OFFSET 20

Terminating a Program Message

The terminating sequence <LF> (ASCII character 10) or an EOI sent with character signals the MTA unit that the end of the program message has been received. When an EOI is received with any character other than the terminating sequence <LF>, <LF> is put in the input queue immediately after the character.

The terminating sequence <LF> does not always appear in the program examples provided in this section; however, it is implied.

Command Header Variations

Each command header in the command tree has both a long form and a short form. Either form is acceptable and each gives identical responses; for example, the following two message units both set the attenuation to 10 dB:

:INPUT:ATTENUATION 10 dB
:inp:att 10db

The query form of a command must end with a question mark; for example, the query form of **:INPUT:ATT** is **:INPUT:ATT?**.

A command can be entered in either uppercase or lowercase characters.

Specifying the Command Path

To use a command in the command tree, the MTA system must know the full path to the command. If the command is the first one in the program message, the command header must contain the full path to the command. Subsequent commands in the same program message are automatically referenced in the same path as the previous command, unless the command

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header is preceded by a colon (:), in which case the full path to the command must be included in the command header.

```
:STATus
    :OPERation
            :ENABle        <NRf>
    :PRESet
```

The following program messages are valid:

```
:STAT:OPER:ENAB 20;STAT:PRES
:STAT:OPER:ENAB 20;:STAT:PRES
```

The following program messages are not valid:

```
:STAT:PRES;ENAB 20              (ENAB command at different level than PRES)
:STAT:OPER:ENAB 20;PRES         (PRES command at different level than ENAB)
```

Default Commands

Default commands do not need to be explicitly included in the command path. If a default command for a path exists, it is enclosed by square brackets ([ ]) in the command tree. If a default command is implied in the first command of a program message, the command path for subsequent commands is determined as if the default command had been explicitly included in the first command header.

```
:STATus
:OPERation
        [:EVENt]?
:PRESet
```

The following program messages are valid:

```
:STAT:OPER:EVEN?:;STAT:PRES
:STAT:OPER?
:STAT:OPER:EVEN?
```

The following program message is not valid:

```
:STAT?:             (the OPER part is necessary)
```

Parameter Types

The acceptable parameter types for each command or query are listed in the command table (see the **IEEE 488.2 Common Commands** and **SCPI Command Tree** sections). The following are definitions of each parameter type:

- **Numeric Value**—Any value between 9.9E37 and -9.9E37. The value can be sent as an integer (154), a decimal (15.2), or an exponential number (4.5E6). The character data

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forms MIN (minimum), MAX (maximum), and DEF (default) are also acceptable. Other character data forms can be accepted for specific commands.

- **NRf**—Any value between 9.9E37 and -9.9E37. The value can be sent as an integer (154), a decimal (15.2), or an exponential number (4.5E6). The character data forms MIN, MAX, and DEF are not accepted.

- **Boolean**—0, 1, ON, OFF. Any other numeric value sent is rounded to the nearest integer. If the resulting integer is anything but 0, it is interpreted as 1.

- **Character**—A character string that contains no more than 12 characters. Each character in the string must be either an uppercase or a lowercase letter, a digit (0 to 9), or an underscore (_).

- **String**—Any character string. The characters in the string can be any ASCII character, and the string can be of any length unless otherwise specified in the command table. In order for the attenuator to recognize a single (‘) or double (“) quotation mark as part of the string and not as the end of the string, two sequential single quotation marks or two sequential double quotation marks are used to represent a single quotation mark or a double quotation mark, respectively.

- **Non-Decimal Numeric**—Any binary, octal, or hex value, where the non-decimal numeric values (xxxx) are preceded by the type (T), for example, #Txxxx. T is defined as follows:

  – Octal = # followed by q or Q
  – Hex = # followed by h or H
  – Binary = # followed by b or B

  The value (xxxx) following the type must be less than the decimal value 2^{32} and must conform to the following rules for each type:

  – Octal values can only contain the numeric characters 0 to 7
  – Hex values can only contain the numeric characters 0 to 9 and the letters A to F (both lowercase and uppercase are accepted)
  – Binary values can only contain the numeric characters 1 and 0

  For example,

  – #Q12347 is a valid octal number
  – #ha57b2 is a valid hex number
  – #B010111 is a valid binary number

Suffixes

Some commands have an optional base unit (see the **IEEE 488.2 Common Commands** and **SCPI Command Tree** sections) that can be combined with a multiplier to form a suffix. However, the base unit’s dBm and dB cannot be combined with a multiplier. The valid multipliers and their values are listed in Table 6.

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Table 6: Valid Multipliers

Multiplier	Value
EX	1E18
PE	1E15
T	1E12
G	1E9
MA	1E6
K	1E3
M	1E-3
U	1E-6
N	1E-9
P	1E-12
F	1E-15
A	1E-18

For example, for the wavelength command that has a base unit of meter (m), the following message formats are valid:

:INPUT:WAVELENGTH 1200NM
:INPUT:WAVELENGTH 1.6e-06 M
:INPUT:WAVELENGTH 1.4e-09 KM

The following message formats are not valid:

:INPUT:ATT 50 NDB
:OUTP:POW 10 mdBm

Response Formats

When a query is sent to the MTA Shelf system, the system returns a response message.

- Response messages are terminated by the sequence <LF>. If the response is being sent through the GPIB, the EOI is set true when the last character in a response is sent.

- A response message is generated for each query in a program message. Each response message is separated from the next by a semicolon. For example, if the total attenuation is set to 10 dB and the wavelength is set to 1550 nm, the program message **:INP:ATT?;WAV?** returns the response message 10.0000;1.550e-06.

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- Each response message can contain multiple pieces of data. Data within a response message is separated by a comma, for example, the query ***IDN?** returns JDS UNIPHASE,MTA,0,YY.YYY.

Overview of Implemented Status Structures

There are three distinct status data structures implemented in the MTA system:

- IEEE 488.2-defined standard registers (standard status structure)
- SCPI-defined operation registers (operation status structure)
- SCPI-defined questionable registers (questionable status structure)

The standard status structure consists of four registers:

- Status byte register
- Service request enable register
- Standard event status register
- Standard event status enable register

The operation and questionable status structures are identical except for the use of specific bits. These status structures are each composed of five registers:

- Condition register
- Positive transition register (PTRansition)
- Negative transition register (NTRansition)
- Event register
- Event enable register

The bits in the operation status structure reflect a specific condition within the MTA unit. The MTA unit only uses bits 1 and 8 of the operation registers. Bit 1, the settling bit, is set when the MTA unit is in the process of adjusting the attenuation of one of the cassettes. Bit 8, the processing bit, is set when the currently selected cassette is busy processing a command or query.

The bits in the questionable registers give an indication of the quality of the output of the MTA unit. None of the bits in the questionable register are currently used by the MTA unit.

All three status structures are connected by the status byte register. The relationship between the registers is shown in Figure 6 and Figure 7.

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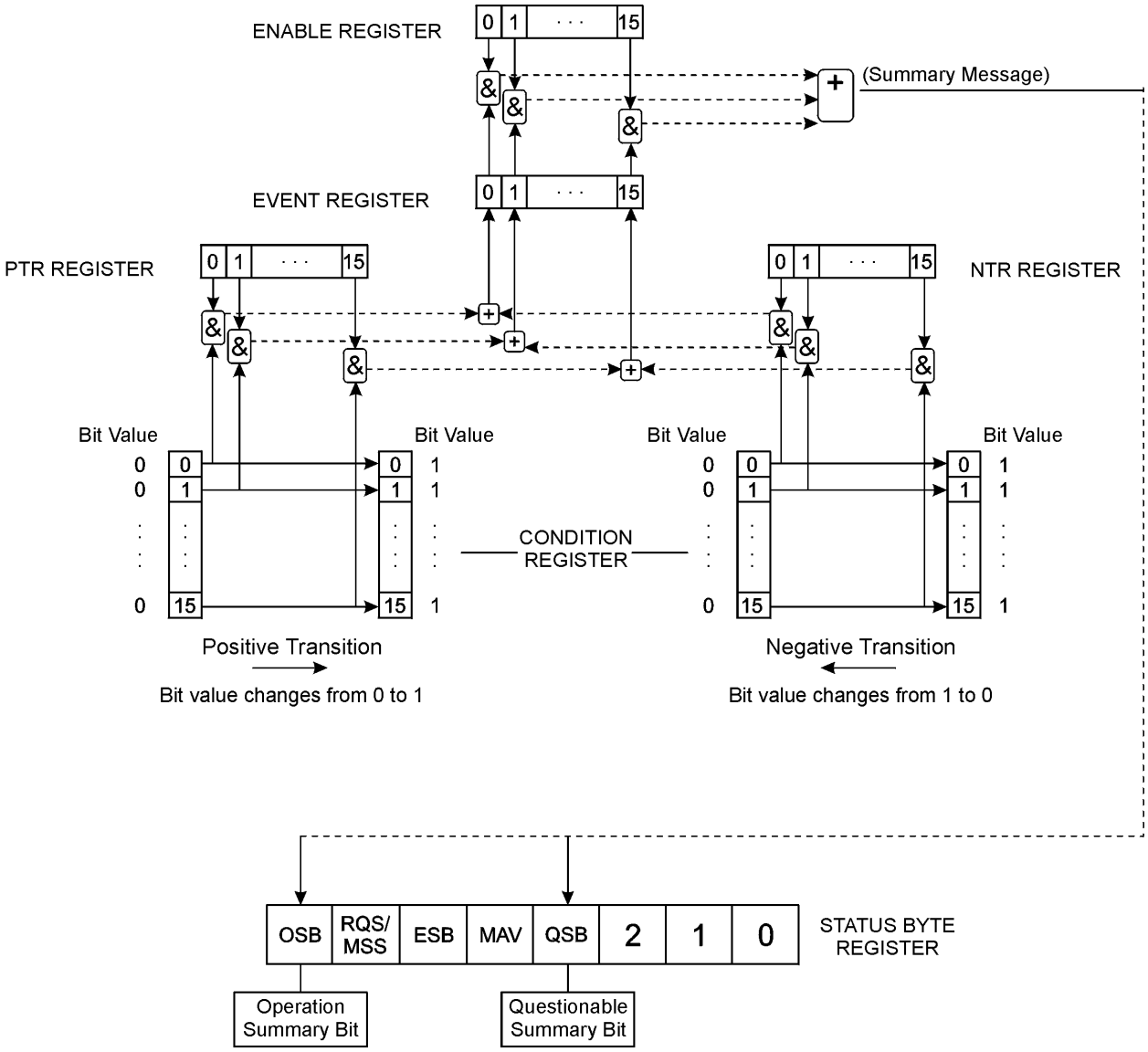


Figure 6: Operational and Questionable Status Data Structures

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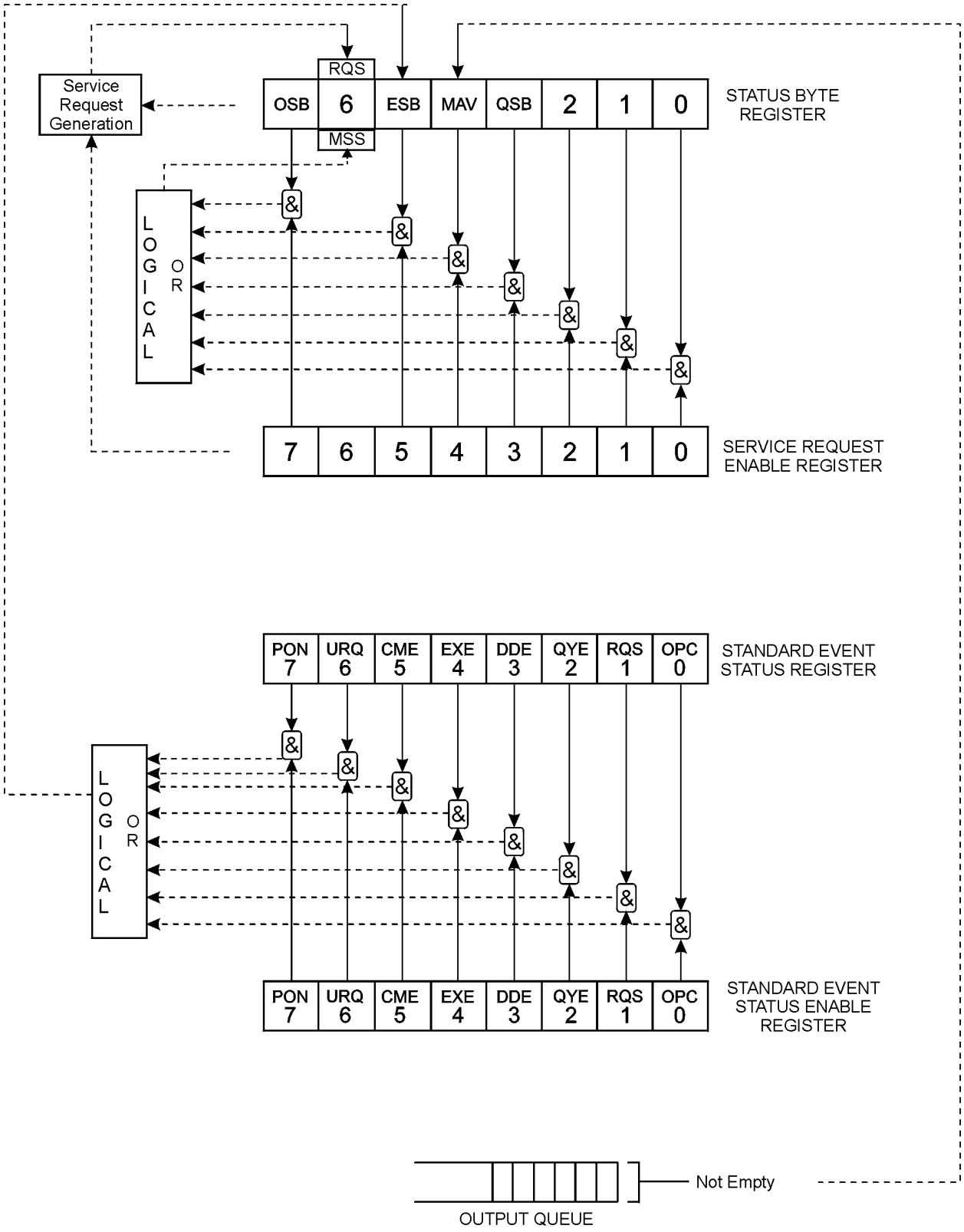


Figure 7: Status Report Model

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Status Byte Register

The status byte register contains the summary bits for each of the structures implemented in the MTA unit and either the master summary bit (MSB) or the request for service bit (RQS).

Status Register							
Bit 0	**Bit 1**	**Bit 2**	**Bit 3**	**Bit 4**	**Bit 5**	**Bit 6**	**Bit 7**
not used	not used	not used	questionable summary (QSB)	message available (MAV)	event summary (ESB)	request for service *or* master summary	operation summary (OSB)
Read with		By serial polling ***STB?**					
Written to with		Cannot be written to					
Cleared by		***CLS** common command					

- Bit 0 is not used.
- Bit 1 is not used.
- Bit 2 is not used.
- Bit 3 (questionable summary) is the summary bit for questionable status structure. It is set if any bit in the questionable event status register is set while the corresponding bit in the questionable event enable register is set.
- Bit 4 (message available) is set to 1 when a response message is available in the output queue.
- Bit 5 (event summary bit) is the summary bit for the standard event status structure. The ESB summary message bit is set if any bit in the standard event status register is set while its corresponding bit in the standard event status enable register is set.
- Bit 6, as the service request bit, is set to 1 if a service request has been generated. The SRQ bit is set internally and is not visible to the user.

  Bit 6, as the master summary bit, is set when there is at least one reason for the MTA unit to request service from the controller. That is, the master summary bit is set if any summary bit in the status byte register is set and if the corresponding bit in the service request enable register is also set. The MSB is returned as bit 6 when the status register is queried or the MTA unit is serial polled.
- Bit 7 (operation summary bit) is the summary bit for the operation status register. It is set if any bit in the operation event register is set while the corresponding bit in the operation event enable register is set.

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Service Request Enable Register

The service request enable register determines which summary bits in the status byte register can generate service requests. If a summary bit in the status register is set to 1 and the corresponding bit in the service request enable register is also set to 1, a service request is generated by the MTA shelf system. A new service request is not generated for this condition unless the bit in the status register or the bit in the service request enable register is cleared and the condition reoccurs.

Standard Request Enable Register	
Read with	***SRE?** common query (the value of bit 6 is always 0)
Written to with	***SRE** common command (the value of bit 6 is always zero, regardless of the value sent with the command)
Cleared by	***SRE** common command with a parameter value of 0 Power-on

Standard Event Status Register

Standard Event Status Register							
Bit 0	**Bit 1**	**Bit 2**	**Bit 3**	**Bit 4**	**Bit 5**	**Bit 6**	**Bit 7**
operation complete (OPC)	request control (RQC)	query error (QYE)	device dependent error (DDE)	execution error (EXE)	command error (CME)	user request (URQ)	power on (PON)
Read with		***ESR?** common query					
Written to with		Cannot be written to					
Cleared by		***ESR?** common query ***CLS** common command Power-on					

- Bit 0 (operation complete) is set in response to the ***OPC** common command. This bit is set when all operations are complete.

- Bit 1 (request control) is always set to 0.

- Bit 2 (query error) is set when a query error occurs, for example, an attempt is made to read the output queue when the output queue is empty or when the data in the output queue is lost.

- Bit 3 (device dependent error) is set by the MTA system to indicate that an error has occurred that is not a command error, an execution error, or a query error.

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- Bit 4 (execution error) is set when an execution error is detected by the MTA shelf system, for example, if a command parameter is out of the range of the MTA unit or if a valid program message could not be executed due to some condition in the MTA unit.
- Bit 5 (command error) is set when a command error is detected by the system, for example, if a syntax error is detected in a program message, an incorrect command header is received, or an IEEE GET message is received in the middle of a program message.

- Bit 6 (user request) is always set to 0.

- Bit 7 (power on) is set when an off-to-on transition occurs in the power supply of the MTA unit.

Standard Event Status Enable Register

The contents of the standard event status enable register determine which events in the standard event status register are reflected in the event summary bit (ESB) of the status byte register.

Standard Event Status Enable Register	
Read with	***ESE?** common query
Written to with	***ESE** common command
Cleared by	Power-on ***ESE** common command with a parameter value of 0

Operation and Questionable Condition Registers

Each bit in these condition registers reflects a specific condition or state within the MTA shelf system. A bit is set when the MTA system enters the state associated with that bit and remains set while the device is in that state.

Operation Condition Register	
Read with	**STATus:OPERation:CONDition?** query
Written to with	Cannot be written to
Cleared by	Power-on

Questionable Condition Register	
Read with	**STATus:QUEStionable:CONDition?** query
Written to with	Cannot be written to
Cleared by	Power-on

Operation and Questionable Event Registers

Event registers reflect changes in the conditions of the MTA shelf system. Each bit in the operation event register and the questionable event register is associated with a bit in the

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corresponding condition register. Depending on the values of the positive transition register and the negative transition register, a bit in the event register might be set when the associated bit in the condition register changes from 0 to 1, from 1 to 0, or both. If both the positive transition and negative transition bits are set to 0, the event register bit is not set on either transition.

Operation Event Register	
Read with	**STATus:OPERation:EVENT?** query
Written to with	Cannot be written to
Cleared by	***CLS** common command

Questionable Event Register	
Read with	**STATus:QUEStionable:EVENT?** query
Written to with	Cannot be written to
Cleared by	Power-on ***CLS** common command

Operation and Questionable Event Enable Registers

The event enable registers determine which event bits in the associated event register cause the summary message bit in the status byte register to be set. If any event bit in the event register is set while its associated bit in the event enable register is also set, the summary message bit is set.

Operation Event Enable Register	
Read with	**STATus:OPERation:ENABle?** query
Written to with	**STATus:OPERation:ENABLe** command
Cleared by	Power-on

Questionable Event Enable Register	
Read with	**STATus:QUEStionable:ENABle?** query
Written to with	**STATus:QUEStionable:ENABLe** command
Cleared by	Power-on

Operation and Condition Positive Transition Registers

If a bit in the positive transition register is set, a positive transition (a transition from 0 to 1) in the associated bit in the condition register sets the associated bit in the event register.

Operation Positive Transition Register

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Read with	**STATus:OPERation:PTRansition?** query
Written to with	**STATus:OPERation:PTRansition** command
Cleared by	Power-on

Condition Positive Transition Register	
Read with	**STATus:QUEStionable:PTRansition?** query
Written to with	**STATus:QUEStionable:PTRansition** command
Cleared by	Power-on

Operation and Questionable Negative Transition Registers

If a bit in the negative transition register is set, then a negative transition (a transition from 1 to 0) in the associated bit in the condition register causes the associated bit in the event register to be set.

Operation Negative Transition Register	
Read with	**STATus:OPERation:NTRansition?** query
Written to with	**STATus:OPERation:NTRansition** command
Cleared by	Power-on

Questionable Negative Transition Register	
Read with	**STATus:QUEStionable:NTRansition?** query
Written to with	**STATus:QUEStionable:NTRansition** command
Cleared by	Power-on

Input Queue

The input queue of the MTA shelf system is a first-in-first-out (FIFO) queue and is 200 bytes long. Data bytes received from the controller are placed in the input queue in the order that they are received. When a full message unit is received, it is transferred to the parser.

If the input queue becomes full while the GPIB is being used, the data acknowledge signal (DAQ) is not sent to the GPIB controller until a character is transferred from the input buffer to the parser. This ensures that no bytes in the program message are lost.

If a new program message is received before the response to a query in a previous message is read, the output queue is cleared, MAV is set to false, and the query error bit is set. This error is also referred to as an unterminated error.

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Output Queue

Responses to query messages are placed in the output queue. This queue is 200 bytes long. When a response is placed in the output queue, the MAV bit in the status register is set. The MAV bit is cleared when the response is sent.

If an attempt is made to read the output queue when it is empty and the current program message does not contain a query, a query error bit is set.

Error Queue

Errors are placed in the error queue. This queue is 100 bytes long. Because it is a FIFO queue, the error returned when the error queue is read is always the first error that occurred. An error is placed in the queue only once.

If more than 100 errors are placed in the error queue, an overflow error occurs and the last error in the queue is overwritten with error number -350 (Queue Overflow). Each error in the queue consists of an error number and a brief error message.

Description of Queue Error Numbers

0	**No error**

No error has occurred.

-100	**Command error**

A command error was detected, but the parser cannot be more specific.

-102	**Syntax error**

The command or data was not recognized.

-103	**Invalid separator**

The parser was expecting a separator and did not find one.

-104	**Data type error**

A parameter was not the right type, for example, a string was expected but a non-decimal numeric was received.

-108	**Parameter not allowed**

More parameters were received than the command or query requires.

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-109	**Missing parameter**

Fewer parameters were received than the command or query requires.

-110	**Command header error**

An error was detected in the command header, but the parser cannot be more specific.

-111	**Header separator error**

A character that was not a valid header separator was encountered.

-112	**Program mnemonic too long**

The command header contained too many characters.

-113	**Undefined header**

The command header has the correct syntax but is not defined for the MTA system.

-114	**Header suffix out of range**

The suffix was incorrect.

-120	**Numeric data error**

An error was detected in a numeric data element, but the parser cannot be more specific.

-121	**Invalid character in number**

An invalid character was found in a character-type parameter.

-123	**Exponent too large**

The exponent in a decimal numeric value was greater than 32,000.

-124	**Too many digits**

The mantissa in a decimal numeric value had more than 255 digits.

-128	**Numeric data not allowed**

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A valid numeric parameter was received, but the required parameter type is not numeric.

-130	**Suffix error**

An error was detected in the suffix sent with the command, but the parser cannot be more specific.

-134	**Suffix too long**

The suffix sent with the command was more than 12 characters long.

-140	**Character data error**

An error was detected in a character type parameter, but the parser cannot be more specific.

-141	**Invalid character data**

An invalid character was detected in a character-type parameter.

-144	**Character data too long**

A character-type parameter contained more than 12 characters.

-200	**Execution error**

An execution error occurred, but the control block cannot be more specific.

-220	**Parameter error**

An error was detected in a parameter, but the control block cannot be more specific.

-221	**Settings conflict**

A valid parameter was received, but it cannot be used due to the current state of the MTA system.

-222	**Data out of range**

A valid parameter type was received, but it is out of range for the MTA system.

-223	**Too much data**

A block-, expression-, or string-data type was too long for the MTA system to process.

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-224	**Illegal parameter value**

A valid parameter type was received, but it did not match any of the permitted values.

-240	**Hardware error**

A command was not executed due to a hardware error, but the control block cannot be more specific.

-300	**Device-specific error**

A device-specific error occurred, but more specific information is unavailable.

-310	**System error**

An instrument system error occurred.

-313	**Save/recall memory lost**

The non-volatile data saved by the command ***SAV** has been lost.

-330	**Self-test failed**

The device failed a self-test.

-350	**Queue overflow**

The error queue overflowed and an error occurred that cannot be recorded.

-400	**Query error**

A query error was detected, but the parser cannot be more specific.

-410	**Query interrupted**

An interrupted error occurred, for example, an attempt was made to read the output queue before a query had been received.

-420	**Query unterminated**

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An unterminated error occurred, for example, a new program message was sent before the response to a previous query was read.

-430	**Query deadlocked**

The device is deadlocked. Both the input buffer and output queue are full, and the MTA system is unable to continue.

??	**Undefined error number**

An undefined error occurred.

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IEEE 488.2 Common Commands

The IEEE 488.2 common commands are listed in Table 7

Table 7: IEEE Common Commands

Command	Parameter	Response	Minimum	Maximum
*CLS	N/A	N/A	N/A	N/A
*ESE	NRf	N/A	0	255
*ESE?	N/A	NRf		
*ESR?	N/A	NRf		
*IDN?	N/A	String		
*OPC	N/A	N/A	N/A	N/A
*OPC?	N/A	NRf		
*OPT?	N/A	String		
*RST	N/A	N/A	N/A	N/A
*SRE	NRf	N/A	0	255
*SRE?	N/A	NRf		
*STB?	N/A	NRf		
*TST?	N/A	NRf	0	1
*WAI	N/A	N/A	N/A	N/A

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SCPI Command Tree

All commands other than the IEEE 488.2 common commands are listed in Table 8. The following abbreviations are used the Command Status column:

- SC (SCPI-confirmed command)
- SA (SCPI-approved command)
- N (command is neither SCPI confirmed nor approved)

Table 8: Commands

Command	Parameters	Response	Unit	Minimum (MIN)	Maximum (MAX)	Default (DEF)	Command Status
:DISPlay							
:BRIGhtness	Numeric Value			0	6	0	SC
:BRIGhtness?	MAX | MIN | DEF	1		0	6	0	SC
:INPut							
:ATTenuation[3]	Numeric Value		dB	0.00	60.00	0	SC
:ATTenuation?[3]	MAX | MIN | DEF	NRf	dB	0.00	60.00	0	SC
:OFFSet	Numeric Value		dB	-60.00	60.00	0	SC
:OFFSet?	MAX | MIN | DEF	NRf	dB	-60.00	60.00	0	SC
:WAVelength	Numeric Value		NM	1200.0NM	1700.0NM	1300.0NM	N
:WAVelength?	MAX | MIN | DEF	NRf	NM	1200.0NM	1700.0NM	1300.0NM	N
:INSTrument							
:CATalog?		string					SC
:FULL?		string					SC
:DEFine	<identifier>, Numeric Value			1	8	1	SC
:DEFine?	<identifier>	NRf					SC
:DELete							SC
[:NAME]	<identifier>						SC
:ALL							SC
:NSELect	Numeric Value			1	8	1	SC
:NSELect?	MAX|MIN|DEF	NRf		1	8	1	SC
[:SELect]	<identifier>						SC
[:SELect]?		<identifier>					SC

[3] **:INP:ATT** sets the total attenuation, and **:INP:ATT?** returns the total attenuation. Therefore, the maximum value for this command and query is the current offset, 60 dB. The minimum and default value is the current offset, 0.

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Command	Parameters	Response	Unit	Minimum (MIN)	Maximum (MAX)	Default (DEF)	Command Status

(table continued)

:OUTPut							
[:STATe]	Boolean						N
[:STATe]?		NRf					N
:STATus							
:OPERation							
[:EVENt]?		NRf					SC
:CONDition?		NRf					SC
:ENABle	NRf			0	32,768		SC
:ENABle?		NRf					SC
:NTRansition	NRf			0	32,768		SC
NTRansition?		NRf					SC
:PTRansition	NRf			0	32,768		SC
PTRansition?		NRf					SC
:QUEStionable							
[:EVENt]?		NRf					SC
:CONDition?		NRf					SC
:ENABle	NRf			0	32,768		SC
:ENABle?		NRf					SC
:NTRansition	NRf			0	32,768		SC
NTRansition?		NRf					SC
:PTRansition	NRf			0	32,768		SC
PTRansition?		NRf					SC
:PRESet							
:SYSTem							
:ERRor?		NRf , String					SC
:VERSion?		String					SC

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Clear Status Command

Syntax	*CLS
Function	Clears the following queues and registers: • Error queue • Standard event status register • Status byte register • Operation event register • Questionable event register If ***CLS** is sent immediately after a message terminating sequence, both the output queue and the MAV bit in the status byte register are cleared. ***CLS** also cancels the functions of ***OPC** and ***OPC?**.
Example	***CLS**

Standard Event Status Enable Register Command

Syntax	*ESE<space><numeric value> where 0 ≤ <numeric value> ≤ 255
Function	Sets the bits in the standard event status enable register. The numeric value is rounded to the nearest integer and converted to a binary number. The bits of the register are set to match the bit values of the binary number.
Example	***ESE 216** sets the standard event status enable register bits to 11011000.

Standard Event Status Enable Register Query

Syntax	*ESE?
Function	Returns the contents of the standard event status enable register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	***ESE?** returns 216 if the standard event status enable register is set to 11011000.

Standard Event Status Register Query

Syntax	*ESR?
Function	Returns the contents of the standard event status register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	***ESR?** returns 195 if the standard event status register is set to 11000011.

Identification Query

Syntax	*IDN?
Function	Returns a string that identifies the manufacturer, the MTA model number, the serial number (or 0 if unavailable), and the firmware level.

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Example	***IDN?** returns JDS UNIPHASE, MTA, 0, YY.YYY

Operation Complete Command

Syntax	*****OPC
Function	Causes the MTA system to set the OPC bit in the standard event status register when all pending operations have been completed.
Example	***OPC**

Operation Complete Query

Syntax	*****OPC?
Function	Places a "1" in the output queue of the MTA system when all pending operations have been completed. Because the "1" is not always placed in the output queue immediately, poll the status byte register and check the MAV bit to determine if there is a message available in the output queue.
Example	***OPC?**

Option Identification Query

Syntax	*OPT?
Function	Reports on options installed or included with the MTA system.
Example	***OPT?** returns ??? in all cases (the MTA system has no defined device options).

Reset Command

Syntax	*RST
Function	Restores each MTA cassette to the following settings: • Total attenuation = 0 dB • Display offset = 0 dB • Wavelength = 1300 nm • Beam block state = ON
Example	***RST**

Service Request Enable Command

Syntax	*SRE<space><numeric value> where 0 ≤ <numeric value> ≤ 255
Function	Sets the bits in the service request enable register. The numeric value is rounded to the nearest integer and converted to a binary number. The bits of the register are set to match the bit values of the binary number.
Example	***SRE 216** sets the service request enable register bits to 11011000.

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Service Request Enable Query

Syntax	*SRE?
Function	Returns the contents of the service request enable register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	***SRE?** returns 195 if the service request enable register is set to 11000011.

Read Status Byte Query

Syntax	*STB?
Function	Returns the contents of the status byte register as an integer that, when converted to a binary number, represents the bit values of the register. The bit value for bit 6 of the register is the MSS bit value, not the RQS bit value.
Example	***STB?** Returns 170 if the status byte register is set to 10101010.

Self-Test Query

Syntax	*TST?
Function	Initiates a self-test of the MTA system, and returns 0 if the system passes the self-test or 1 if it fails.
Example	***TST?**

***WAI Command**

Syntax	*WAI
Function	Prevents the MTA system from executing any further commands or queries until all previously pending operations have been completed.
Example	**INPUT:ATT 10;WAI;INPUT:OFF?** prevents the MTA system from reading the offset until it has completed setting the attenuation to 10 dB.

DISPlay Commands

:DISPlay:BRIGhtness

Syntax	:DISPlay:BRIGhtness<space><numeric value> where 0 ≤ <numeric value> ≤ 6
Function	Sets the brightness of the LCD display. The range is from 0 to 6. Zero is 100% maximum brightness, 6 is 13%.
Example	**:DISP:BRIG: 1.0**

:DISPlay:BRIGhtness?

Syntax	:DISPlay:BRIGhtness?
Function	Returns the brightness setting for the display.

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Example	**:DISP:BRIG: 0.5;BRIG?** returns the current brightness setting.

INPut Commands

:INPut:ATTenuation

Syntax	:INPut:ATTenuation <space> <numeric value> [dB]
Function	Sets the total attenuation to the parameter value by changing the actual attenuation. Because the total attenuation includes the offset, the actual attenuation of the MTA system is set according to the following formula: $Att_{actual} = Att_{total}$ - Offset This command also accepts the parameters MIN (minimum), MAX (maximum), and DEF (default). The minimum total attenuation is the total attenuation at which the actual attenuation is 0 dB. The maximum total attenuation is the total attenuation at which the actual attenuation is 60 dB. The default total attenuation is the same as the minimum attenuation.
Example	**:INP:OFFS 30;INP:ATT 40** sets the total attenuation to 40 dB and the actual attenuation to 10 dB (for example, 40 dB - 30 dB = 10 dB).

:INPut:ATTenuation?

Syntax	:INPut:ATTenuation? [<space>MAX|MIN|DEF]
Function	Returns the current total attenuation in dB. The total attenuation is the total of the actual attenuation and the offset: $Att_{total} = Att_{actual}$ + Offset This query also accepts the parameters MIN, MAX, and DEF. The minimum, maximum, or default value for the total attenuation at the current offset setting is returned.
Example	**:INP:ATT? MAX** returns the current offset plus 60 dB (the maximum actual attenuation of the MTA unit).

:INPut:OFFSet

Syntax	:INPut:OFFSet <space> <numeric value> [<suffix>]
Function	Sets the display offset of the MTA system. The value of the offset has no affect on the actual attenuation, but it does affect the total attenuation, for example, $Att_{total} = Att_{actual}$ + Offset This command also accepts the parameters MIN, MAX, and DEF. The minimum offset is -60 dB, the maximum offset is 60 dB, and the default offset is 0.
Example	**:INP:OFFS 10** sets the offset to 10 dB. If the actual attenuation is 14 dB, the total attenuation is 24 dB.

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:INPut:OFFSet?

Syntax	:INPut:OFFSet? [<space> <MIN|MAX|DEF>]
Function	Returns the current setting of the display offset. The query accepts the parameters MIN, MAX, and DEF to return the minimum, maximum, or default value (respectively) for the display attenuation at the current offset setting.
Example	**:INP:OFFS 16;OFFS?** returns 16. **:INP:OFFS? MIN** returns -60.

:INPut:WAVelength

Syntax	:INPut:WAVelength <space> <numeric value> [<suffix>]
Function	Sets the calibration wavelength of the MTA system. Because the calibration wavelength is used to account for the wavelength dependence of the attenuation, the calibration wavelength should be set as close as possible to the source wavelength. This command also accepts the parameters MIN, MAX, and DEF. The minimum wavelength is 1200 nm, the maximum wavelength is 1700 nm, and the default wavelength is 1300 nm.
Example	**:INP:WAV 1500 nm**

:INPut:WAVelength?

Syntax	:INPut:WAVelength? [<space> <MAX|MIN|DEF>]
Function	Returns the current setting of the calibration wavelength in meters. This query also accepts the parameters MIN, MAX, and DEF, returning the minimum, maximum, or default value (respectively) for the calibration wavelength.
Example	**:INP:WAV 1300 nm;WAV?** returns 1.3e-06.

INSTrument Commands

:INSTrument:CATalog?

Syntax	:INSTrument:CATalog?
Function	Returns a comma-separated list of strings that contains the user-defined names of all cassettes as well as the intrinsic identifier (“IALW”) of each cassette. If no cassettes are defined, a single null string is returned.
Example	**:INST:CAT?**

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:INSTrument:CATalog?:FULL?

Syntax	:INSTrument:CATalog?:FULL?
Function	Returns a list of string-number pairs. The string contains the name of the cassette. The NR1-formatted number that follows immediately is the associated cassette number. All response data elements are separated by commas. If no cassettes are defined, a null string followed by a zero is returned.
Example	**:INST:CAT?:FULL?**

:INSTrument:DEFine

Syntax	:INSTrument:DEFine <identifier>,<numeric_value>
Function	Defines a cassette name, <identifier>, and associates it with a logical instrument number, <numeric_value>. The identifier is in character data format.
Example	**:INST:DEF cassette1,1**

:INSTrument:DEFine?

Syntax	:INSTrument:DEFine? <identifier>
Function	Returns the logical instrument number associated with the identifier.
Example	**:INST:DEF? cassette1** returns 1.

:INSTrument:DELete[:NAME]

Syntax	:INSTrument:DELete[:NAME] <identifier>
Function	Disassociates the identifier from its logical instrument number.
Example	**:INST:DEL:NAME cassette1**

:INSTrument:DELete:ALL

Syntax	:INSTrument:DELete:ALL
Function	Disassociates all identifiers from their logical instrument numbers, except the currently selected instrument.
Example	**:INST:DEL:ALL**

:INSTrument:NSELect

Syntax	:INSTrument:NSELect <numeric_value>
Function	Selects a cassette as the default. When a cassette is selected, all other cassettes are unavailable for programming until selected.
Example	**:INST:NSEL 4**

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:INSTrument:NSELect?

Syntax	:INSTrument:NSELect? [<space> <MIN|MAX|DEF>]
Function	Returns the logical instrument number of the currently selected cassette. The query accepts the parameters MIN, MAX, and DEF to return the minimum, maximum, or default value, respectively, for the selected cassette.
Example	**:INST:NSEL?** returns 4 if cassette 4 is selected.

:INSTrument[:SELect]

Syntax	:INSTrument[:SELect] <identifier>
Function	Sets a selected cassette as the default. When a cassette is selected, all other cassettes are unavailable for programming until selected.
Example	**:INST:SEL cassette1**

:INSTrument[:SELect]?

Syntax	:INSTrument[:SELect]?
Function	Returns the current setting of the logical instrument name.
Example	**:INST:SEL?** returns cassette1 if cassette1 is selected.

OUTPut Commands

:OUTPut[:STATe]

Syntax	:OUTPut[:STATe] <space> <boolean>
Function	Sets the state of the beam block. A boolean value of 0 or OFF leaves the beam block in the beam (the default position) thereby turning off the optical power out of the attenuator. When the beam block is in the beam, the attenuation of the MTA system is >110 dB. A boolean value of 1 or ON moves the beam block out of the beam, thereby turning on the optical power out of the attenuator. The attenuation setting of the MTA unit is not affected by the beam block state.
Example	**:OUTPut OFF** leaves the beam block in the beam. **:OUTP:STAT ON** removes the beam block from the beam.

:OUTPut[:STATe]?

Syntax	:OUTPut[:STATe]?
Function	Returns the state of the beam block, for example,returns 1 if the beam block is out of the beam, and 0 if the beam block is in the beam.
Example	**:OUTP ON;STAT?** returns 1. **:OUTP OFF;:STAT?** returns 0.

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:STATus:OPERation:CONDition?

Syntax	:STATus:OPERation:CONDition?
Function	Returns the contents of the operation condition register as an integer that, when converted to a binary number, represents the bit values of the register. The MTA system only uses bit 1 of the operation condition register. Bit 1, the settling bit, is set when the MTA system is in the process of adjusting the actual attenuation.
Example	**:STAT:OPER:COND?**

:STATus:OPERation:ENABle

Syntax	:STATus:OPERation:ENABle <space> <NRf>
Function	Sets the bits in the operation enable register. The NRf value is rounded to the nearest integer and converted to a binary number. The bits of the register are set to match the bit values of the binary number.
Example	**:STATUS:OPERATION:ENABLE 32.8** sets bits 0 and 5 of the operation enable register to 1.

:STATus:OPERation:ENABle?

Syntax	:STATus:OPERation:ENABle?
Function	Returns the contents of the operation event enable register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	**:STAT:OPER:ENAB 23;ENAB?** returns 23.

:STATus:OPERation[:EVENT]?

Syntax	:STATus:OPERation[:EVENT]?
Function	Returns the contents of the operation event register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	**:STAT:OPER:EVENT?**

:STATus:OPERation:NTRansition

Syntax	:STATus:OPERation:NTRansition <space> <NRf>
Function	Sets the bits of the operation negative transition register. The NRf value is rounded to the closest integer and converted to a binary number. The bits of the register are set to match the bits of the binary number.
Example	**:STAT:OPER:NTR 256** sets the bits of the operation negative transition register to 0000000011111111.

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:STATus:OPERation:NTRansition?

Syntax	:STATus:OPEReration:NTRansition?
Function	Returns the contents of the operation negative transition register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	**:STAT:OPER:NTR 12;NTR?** returns 12.

:STATus:OPERation:PTRansition

Syntax	:STATus:OPERation:PTRansition <space> <NRf>
Function	Sets the bits of the operation positive transition register. The NRf value is rounded to the closest integer and converted to a binary number. The bits of the register are set to match the bits of the binary number.
Example	**:STAT:OPER:PTR 255** sets the bits of the operation positive transition register to 0000000011111110.

:STATus:OPERation:PTRansition?

Syntax	:STATus:OPERation:PTRansition?
Function	Returns the contents of the operation positive transition register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	**:STAT:OPER:PTR 12;PTR?** returns 12.

:STATus:QUEStionable:CONDition?

Syntax	**:**STATus:QUEStionable:CONDition?
Function	Returns the contents of the questionable condition register as an integer that, when converted to a binary number, represents the bit values of the register. The MTA system only uses bit 1 of the register. Bit 1, the settling bit, is set when the MTA system is in the process of adjusting the actual attenuation.
Example	**:STAT:QUES:COND?**

:STATus:QUEStionable:ENABle

Syntax	:STATus:QUEStionable:ENABle <space> <NRf>
Function	Sets the bits in the questionable enable register. The NRf value is rounded to the nearest integer and converted to a binary number. The bits of the register are set to match the bit values of the binary number.
Example	**:STATUS:QUESTIONABLE:ENABLE 32.8** sets bits 0 and 5 of the questionable enable register to 1.

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:STATus:QUEStionable:ENABle?

Syntax	:STATus:QUEStionable:ENABle?
Function	Returns the contents of the questionable event enable register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	**:STAT:QUES:ENAB 23;ENAB?** returns 23.

:STATus:QUEStionable[:EVENT]?

Syntax	:STATus:QUEStionable[:EVENT]?
Function	Returns the contents of the questionable event register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	**:STAT:QUES:EVENT?**

:STATus:QUEStionable:NTRansition

Syntax	:STATus:QUEStionable:NTRansition <space> <NRf>
Function	Sets the bits of the questionable negative transition register. The NRf value is rounded to the closest integer and converted to a binary number. The bits of the register are set to match the bits of the binary number.
Example	**:STAT:QUES:NTR 256** sets the bits of the questionable negative transition register to 0000000011111111.

:STATus:QUEStionable:NTRansition?

Syntax	:STATus:QUEStionable:NTRansition?
Function	Returns the contents of the questionable negative transition register as an integer that, when converted to a binary number, represents the bit values of the register.
Example	**:STAT:QUES:NTR 12;NTR?** returns 12.

:STATus:QUEStionable:PTRansition

Syntax	:STATus:QUEStionable:PTRansition <space> <NRf>
Function	Sets the bits of the questionable positive transition register. The NRf value is rounded to the closest integer and converted to a binary number. The bits of the register are set to match the bits of the binary number.
Example	**:STAT:QUES:PTR 255** sets the bits of the questionable positive transition register to 0000000011111110.

:STATus:QUEStionable:PTRansition?

Syntax	:STATus:QUEStionable:PTRansition?
Function	Returns the contents of the questionable positive transition register as an integer that, when converted to a binary number, represents the bit values of the

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	register.
Example	**:STAT:QUES:PTR 12;PTR?** returns 12.

:STATus:PRESet

Syntax	:STATus:PRESet
Function	This command presets all the enable and transition registers in the questionable and operation registers to the following settings: • All bits in the ENABle registers are set to 0 • All bits in the positive transition registers are set to 1 • All bits in the negative transition registers are set to 0
Example	**:STATus:PRESet**

System Commands

:SYSTem:ERRor?

Syntax	:SYSTem:ERRor?
Function	Returns the next error message in the error queue. Because the error queue is a FIFO queue, the error returned is the oldest unread error. The error message consists of an error number followed by an error message, for example, 0, No Error See the **Error Queue** section for a list of error numbers and their associated messages.
Example	**:SYST:ERR?**

:SYSTem:VERSion?

Syntax	:SYSTem:VERSion?
Function	Returns the formatted numeric value corresponding to the SCPI version number to which the MTA system complies.
Example	**:SYST:VERS?** Returns 1995.0

GPIB Programming Examples

This section provides programming examples for controlling the MTA system over the GPIB interface. The examples were written in MS-DOS[4] Qbasic and run on a personal computer, equipped with a National Instruments GPIB interface board with National Instruments[5]

[4] MS-DOS is a registered trademark of the Microsoft Corporation.
[5] National Instruments is a trademark of National Instruments.

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Universal Language Interface drivers loaded. The commands that control the GPIB are similar to Hewlett Packard[6] HP Basic commands.

Sending Commands

This example selects cassette two and sets the offset to 10, the total attenuation to 30 dB, and the wavelength to 1550 nm.

```
OPEN "GPIB0" FOR OUTPUT AS #1
OPEN "GPIB0" FOR INPUT AS #2
PRINT #1, "ABORT"
PRINT #1, "RESET"
PRINT #1, "GPIBEOS IN  LF"                    ' setting terminating characters to LF
PRINT #1, "GPIBEOS OUT  LF"

DIM ATTEN AS SINGLE
DIM WAV AS INTEGER

PRINT #1, "OUTPUT 05;:INST:NSEL 2;:INP:OFFS 10"
ATTEN = 30.0
WAV = 1550
PRINT #1, "OUTPUT 05;:INP:ATT "; STR$(ATTEN); ";WAV "; STR$(WAV) ; " NM"
END
```

Sending Queries

This example queries the attenuation and the state of the beam block.

```
OPEN "GPIB0" FOR OUTPUT AS #1
OPEN "GPIB0" FOR INPUT AS #2
PRINT #1, "ABORT"
PRINT #1, "RESET"
PRINT #1, "GPIBEOS IN  LF"                    ' setting terminating characters to LF
PRINT #1, "GPIBEOS OUT  LF"

DIM RESPONSE AS STRING

‘ Set attenuation to 20 and the state of the beam block to 0 for cassette4 (this turns the beam
‘ block on).
PRINT #1, "OUTPUT 05;:INST:NSEL 4;:INP:ATT 20;:OUTP:STAT 0"

Query device
PRINT #1, "OUTPUT 05;:INP:ATT?;OUTP:STAT? "
PRINT #1, "ENTER 05"
INPUT #2, RESPONSE
PRINT RESPONSE
END
```

"20.0000**;** 0" will be displayed on the screen.

[6] Hewlett Packard is a registered trademark of Hewlett-Packard Co.

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LabVIEW Instrument Driver

The MTA LabVIEW Instrument Driver facilitates the control of the main MTA system functions. It consists of four driver elements:

- Attenuation driver
- Offset driver
- Wavelength driver
- Selection driver

Implementing the Attenuation Driver

The attenuation driver allows individual cassettes to be set or queried for attenuation. This driver includes a default command (**:input:attenuation**) and a query command (**:input:attenuation?**).

To implement the attenuation driver:

1. Insert att.vi and wire it as shown in Figure 8. The inputs are displayed on the left side; the outputs are displayed on the right side.

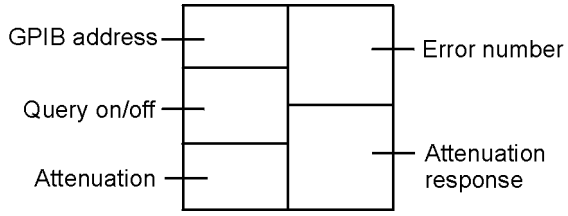


Figure 8: Implementing the Attenuation Driver

Implementing the Wavelength Driver

The wavelength driver allows individual cassettes to be set or have their wavelengths queried. This driver includes a default command (**:input:wavelength**) and a query command (**:input:wavelength?**).

To implement the wavelength driver:

1. Insert wav.vi and wire it as shown in Figure 9. The inputs are displayed on the left side; the outputs are displayed on the right side.

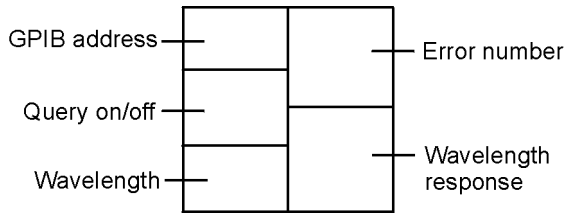


Figure 9: Implementing the Wavelength Driver

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Implementing the Offset Driver

The offset driver allows individual cassettes to be set or have their offsets queried. This driver includes a default command (**:input:offset)** and a query command (**:input:offset?**).

To implement the offset driver:

1. Insert offs.vi and wire it as shown in Figure 10. The inputs are displayed on the left side; the outputs are displayed on the right side.

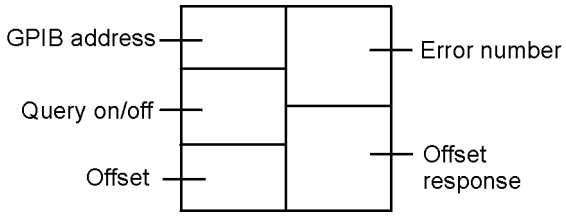


Figure 10: Implementing the Offset Driver

Implementing the Selection Driver

The selection driver allows individual cassettes to be selected or queried. This drive includes a default command (**:instrument:nselect)** and a query command (**:instrument:nselect?**).

To implement the selection driver:

1. Insert nsel.vi and wire it as shown in Figure 11. The inputs are displayed on the left side; the outputs are displayed on the right side.

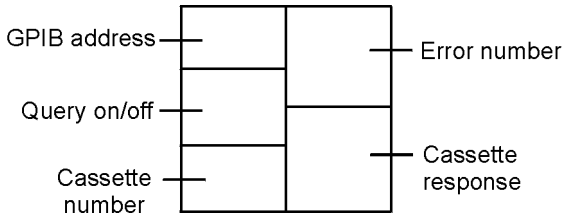


Figure 11: Implementing the Selection Driver

Implementing the General GPIB Driver

The general GPIB driver allows any commands to be sent to the MTA unit.

To implement the general GPIB driver:

1. Insert mtagpib.vi and wire it as shown in Figure 12. The inputs are displayed on the left side; the outputs are displayed on the right side.

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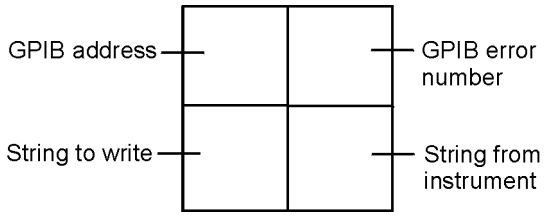


Figure 12: Implementing the General GPIB Driver

LabVIEW Program Examples

The MTA system is supplied with two program examples for controlling the system over the GPIB interface. The program mta-a-e.vi can be used to set the attenuation of each cassette. The program mta-e.vi can be used to set the attenuation, the wavelength, and the offset of each cassette.

The programs are written in LabVIEW and run on a personal computer, equipped with a National Instruments GPIB interface board, with National Instruments LabVIEW software installed.

Before running either of the program examples, ensure that the GPIB address of the MTA system is set to 11.

To run the examples:

1. Open LabVIEW.

2. Select the Open option from the File menu.

3. Open the directory in which the program example files are stored, and click on the program example required, for example, mta-a-e.vi or mta-e.vi.

4. Click the Run button. As the program is executing, the color of the Run button changes to black and the Stop button appears.

5. Adjust the parameters (for example, attenuation, wavelength, or offset) and click the corresponding Go button. For example, to change the parameter of Cassette 1, click the Go1 button after setting the parameter.

To terminate the program, click the Stop button.

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DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 EN 45014

Manufacturer's Name JDS Uniphase Corporation

Manufacturer's Address 570 West Hunt Club Road
Nepean (Ottawa), Ontario
K2G 5W8 Canada
613 727-1303
www.jdsunph.com

Declares that the products:

Product Name

Product Option This declaration covers all options of the named products.

Conform to the following product specifications:

Safety IEC 1010-1:1990+A1/EN 61010-1:1993
CAN/CSA-C22.2 No. 1010.1-92
UL Std. No. 3101.1-93

EMC CISPR 22:1995/EN55022:1995, FCC Part 15 Subpart B: 1996
EN61000-4-2:1995/EN50082-1:1997 4kV CD, 8kV AD
EN61000-4-3:1995/EN50082-1:1997 3V/m, 80-1000 MHz
EN61000-4-4:1995/EN50082-1:1997 EFT class 2
EN61000-4-5:1995/EN50082-1:1997 1 kV Sig. Lines, 2 kV Power Lines
EN61000-4-6:1996/EN50082-1:1997 Cond. Immunity 3V RMAS, 150kHz-80 MHz
EN61000-4-11:1994/EN50082-1:1997 Voltage Dips and Interruptions

Supplementary Information
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.

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