MDL Series

Motorized Variable Optical Delay Line

User's Manual

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Declaration of Conformity

We declare that the accompanying product, identified with the $C\epsilon$ mark, complies with requirements of the Electromagnetic Compatibility Directive *89/336/EEC* as amended by Directives *92/31/EEC* and *93/68/EEC*.

Model Number: MDL Series Motorized Variable Optical Delay Line

Year $C\epsilon$ mark affixed: 2004

Type of Equipment: Electrical equipment for measurement, control and laboratory use

Manufacturer: Newport Corporation

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        Irvine, California 92606

Standards Applied:

Compliance was demonstrated to the following standards to the extent applicable:

EN 55022:1998 + A1: 2000 + A2:2003 "Information technology equipment - Radio disturbance characteristics". This instrument meets the requirements of CISPR 22:1997/A2:2002.

EN 55024:1998 + A1: 2001 + A2:2003 "Information technology equipment - Immunity characteristics". This instrument meets the requirements of CISPR 24:1997/A2:2002.

EN 61000-3-2: 2000 "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)"

EN 61000-3-3: 1995 + A1: 2001 "Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection"

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Newport Corporation Calling Procedure

If there are any defects in material or workmanship or a failure to meet specifications, promptly notify Newport's Returns Department by calling 1-800-222-6440 or by visiting our website at www.newport.com/returns within the warranty period to obtain a **Return Material Authorization Number (RMA#)**. Return the product to Newport Corporation, freight prepaid, clearly marked with the RMA# and we will either repair or replace it at our discretion. Newport is not responsible for damage occurring in transit and is not obligated to accept products returned without an RMA#.

E-mail: rma.service@newport.com

When calling Newport Corporation, please provide the customer care representative with the following information:

- Your Contact Information
- Serial number or original order number
- Description of problem (i.e., hardware or software)

To help our Technical Support Representatives diagnose your problem, please note the following conditions:

- Is the system used for manufacturing or research and development?
- What was the state of the system right before the problem?
- Have you seen this problem before? If so, how often?
- Can the system continue to operate with this problem? Or is the system non-operational?
- Can you identify anything that was different before this problem occurred?

Safety Information

Do not use the MDL Series if the instrument looks damaged, or if you suspect that it is not operating properly.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, it is suggested to try to correct the interference by taking one or more of the following steps:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment to an outlet that is on a different circuit than the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

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1 General Information

1.1   Overview

Newport motorized variable optical delay lines (MDL) provide precision optical path delay of up to 17 cm, which corresponds to 560 picoseconds maximum delay in the time domain. Driven by a DC motor with an integrated encoder, the motorized variable optical delay line (MDL) has a fine delay resolution of 0.3 µm, or 1 fs for both the 330 and 560 ps models. As shown in Figure 1, MDL motorized optical delay lines have a compact, rugged package design that makes the devices ideal for network equipment and test instrument integration. They can also be used in laboratories for precision optical path length control or timing alignment. Major applications of MDL devices include time division multiplexing (TDM), pulse alignment, optical spectrum analysis, interferometry, pulse alignment, and optical coherence tomography (OCT). They can also be used to vary the modulation phase of reflections for the testing of reflection effects on transmitters.

The MDL family consists of two members: 560 ps (17 cm) and 330 ps (10 cm) optical delay models. Each model can be equipped with either SM fiber or PM fiber pigtails.
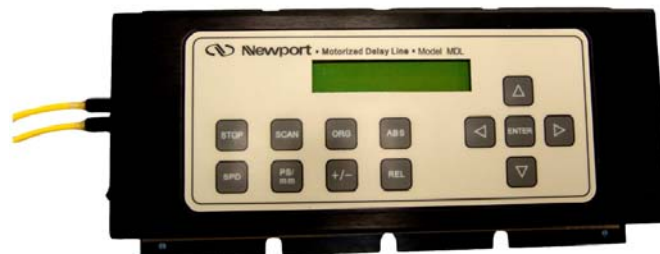

Figure 1   *MDL Series Motorized Variable Optical Delay Line*

The MDL is a standalone delay unit integrated with an embedded microprocessor, a keypad, and an LCD display panel, along with a wall-plug power supply adapter. Operation commands and delay parameters can be keyed in from the keypad, and the status of the device is displayed on the LCD. In addition, the MDL can be remote controlled by a personal computer via a built-in RS-232 port. Popular PC interface software such as LabView (National Instruments) can be used to send commands and read back the device status. Furthermore, the MDL allows arbitrary switching between local and remote control modes from the keypad and computer.

1.2   Unpacking

Each Newport MDL Series Motorized Variable Optical Delay Line is thoroughly tested and calibrated prior to shipment.

Great care must be taken when unpacking the MDL module from its original shipment package.

Avoid applying any force to optical fiber pigtail(s) and do not let any free-drop of fiber connectors occur at any time. Excessive force on fiber pigtails may degrade the device performance or damage the variable optical delay module.

Visually inspect your MDL Series instrument after removing it from the shipping container. If you see any damage, retain all packaging materials and shipping receipts. Any damage claim should be made promptly to the transportation company. Notify the nearest Newport representative concerning the claim, so that any repair or replacement can be arranged as soon as possible.

1.3   Parts List

The following is a list of parts included with the MDL Series. Please make sure everything is present before discarding packing materials.

- MDL Series Motorized Variable Optical Delay Line
- 12V/1A DC power supply
- User Manual

1.4 General Specifications

Wavelength Range[1]	SM: 1260-1650 nm PM: 1310±50 or 1550±50 nm
Optical Delay Range [2]	0~330 ps continuous for 330 ps model
	0~560 ps continuous for 560 ps model
Optical Delay Resolution	0.3µm or 1 fs per encoder count
Optical Delay Accuracy[3]	± 0.01 ps or ±3µm
Optical Delay Repeatability[3]	± 0.01 ps or ±3µm
Operation mode	µ-processor embedded system • Point-to-point operation • Continuous scan operation • Remote control operation
Delay Varying Speed	10 selectable speed levels [4] From 0.01 ps/sec. to 256 ps/sec.
Insertion Loss	1.0 dB nominal
Insertion Loss Variation	± 0.3 dB max. over entire delay range for 330 ps model
	± 0.5 dB max. over entire delay range for 560 ps model
Return Loss	50 dB
PDL	0.1 dB max. for single mode fiber
Extinction Ratio	> 18 dB for PM model
Fiber Type	Single mode fiber: SMF-28 standard
	PM fiber: PM Panda fiber standard
Optical Connectors	FC/APC, FC/PC
Power Supply	12V DC/1A (max)
Control	Panel keypad and RS-232 interface
Display	2 × 16 character LCD
Dimensions	330ps model 1.6” (H) × 4.4” (W) × 7.0” (L)
	560ps model 1.6” (H) × 4.4” (W) × 8.9” (L)
Operation temperature	0 ~ 40°C
Storage temperature	- 20°C ~ 60°C
Humidity	Max. 95% non condensing

Notes:

1. The delay line operation wavelength range is determined by fiber type. The AR coating will also affect the performance. A dual window (1310 nm and 1550 nm) AR coating is standard for the single mode fiber version.

2. The display is factory set to read 0.000 ps at absolute origin. The 0.000 ps read can be set as a relative origin at any point between 0 and 330ps for the 330 ps model and between 0 and 560ps for the 560ps model. The delay can be displayed in units of picoseconds (ps) or millimeters (mm).

3. The accuracy and repeatability data are measured at worst case.

4. The delay change speed levels are as follows:

Speed 0:	0.01	ps/second
Speed 1:	0.25	ps/second
Speed 2:	1	ps/second
Speed 3:	4	ps/second
Speed 4:	8	ps/second
Speed 5:	16	ps/second
Speed 6:	32	ps/second (default setting)
Speed 7:	64	ps/second
Speed 8:	128	ps/second
Speed 9:	256	ps/second

Please note that the speeds in the list above are steady state speeds. There will be an acceleration and deceleration period at the beginning and the end of the travel.

1.5 Device Description

1.5.1 General Description

The MDL motorized optical variable delay line consists of three sub-modules: the variable optical delay module, electronic controller module, and operation panel (display/keypad) module. Input/output optical signals are connected to the variable optical delay module via two single mode optical fibers. The electronic controller carries out the control commands, senses the delay state, and controls a 2-line, 16-character liquid crystal display (LCD). There are two interfaces for control command input. As long as communication between a PC or hand-held device and the MDL is established, commands can be sent through the built-in RS-232 connector. In manual control mode, the front panel keypad is used to send the corresponding control commands. Press any key on the keypad to switch from remote control to manual control. The delay status and command information are displayed on the LCD.

1.5.2 Package

The optical delay module, electronic controller, and operation panel are integrated in a rugged, easy to mount case, as shown in Figure 1. The electronic controller and display/keypad modules are integrated at the top of the package. The optical delay module is internally connected to the electronic controller via a 4-wire ribbon cable.

The input/output optical fiber pigtails and the power switch are mounted on the left side of the package. The RS-232 and DC power supply connectors are mounted on the right. The optical input/output can be single mode, or can be polarization maintaining (PM) fiber to maintain a linearly polarized input/output state.

External package dimensions of the MDL 330 and 560ps models are shown in Figure 2.
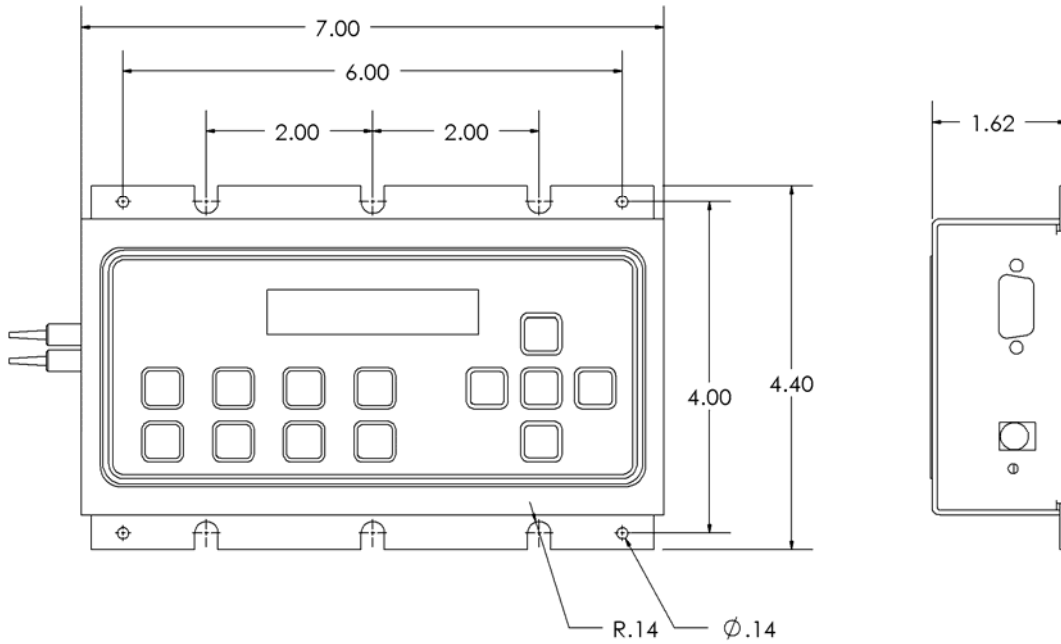
(a) 330ps Device
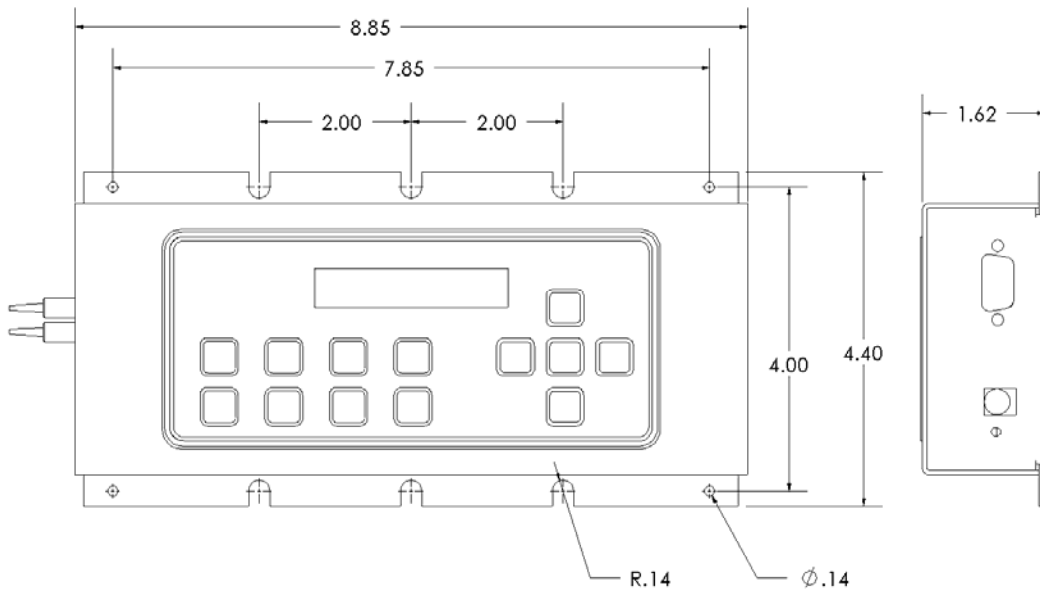
(b) 560ps Device

(All dimensions are in inches)

Figure 2   MDL Series Mounting Dimensions

1.5.3 Polarization Properties

The MDL device employs free space optics to adjust optical path length. Therefore, the polarization state will not change during delay adjustment. However, the standard single mode input/output fiber(s) may transform the input polarization state to a different state at the output.

The PM pigtailed MDL can be used for applications requiring high polarization stability. It is designed for a single linear polarization state input aligned to a specified PM fiber axis. Along this axis, the input linear polarization state will be maintained at the output PM fiber port. However, if the input polarization state is aligned at a 90-degree orientation to the specified polarization state, the polarization state may be transformed after propagating through the MDL device. Therefore, it is important to match source polarization state to the specified PM MDL orientation before operating the device. Unless otherwise specified, the factory default setting is for slow axis orientation of the PM fiber.

1.5.4 Power Supply

All MDL devices require a 12V/1A DC power supply to operate. A standard AC/DC power supply adapter is shipped with the MDL. If a user wants to use his/her own DC power supply, the DC power supply connector should have the correct polarity: the center pin is positive (+) and the outer contact is negative (-). If a third party DC power supply is used, it is important to check the power supply output voltage and polarity before connecting to a power line. Incorrect voltage and/or polarity will damage the MDL control electronics.

2 System Operation

Electrical and optical connections are required during setup of the MDL. Follow safety precautions when making these connections.

2.1 Getting Started

Follow the steps below to operate MDL in manual control mode.

Check the DC power supply output voltage (12 V DC) and polarity (center positive).

Connect fiber pigtails to the optical path where delay adjustment is to be performed. The input and output fiber pigtails are interchangeable unless users specify special connector combinations to match their measurement setups.

After power supply connection, turn on the power switch. The red power indicator LED should light up. The LCD will display the initialization screens (see Section 2.2.3 for display sequence).

Follow the operation panel (keypad) instructions (see Section 2.2) to enter commands.

2.2 Using Operation Panel

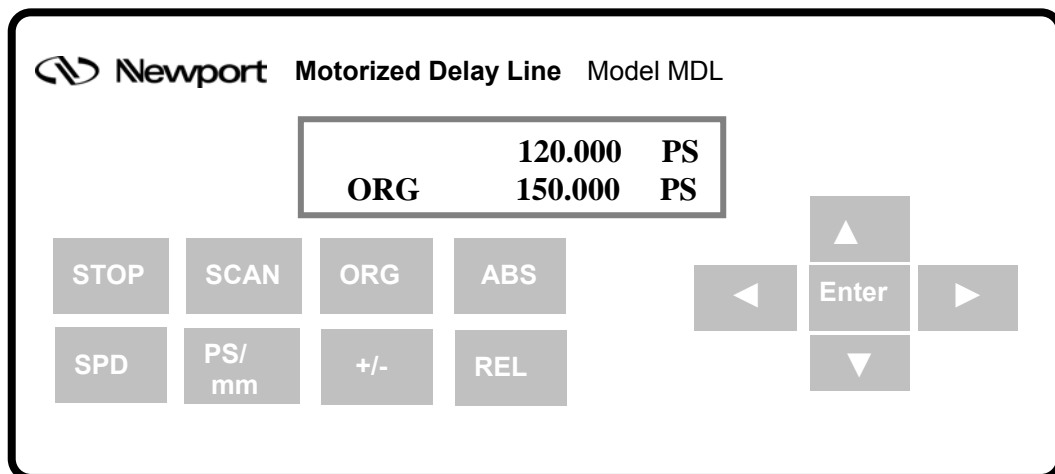The operation panel of the MDL is shown in Figure 3.

Figure 3   *MDL Operation Panel*

2.2.1 LCD

The LCD displays the delay time, system status, and commands.

2.2.2 Command Keys

There are 13 keys available on the panel for command input and status setting. The functions of these keys are described as follows:

(1) ABS

The ABS key is used to set a single delay value, relative to the current origin (0 point). If the current origin is at 0 ps (default setting), then the delay value displayed in the first line of the LCD is the absolute delay defined by the MDL's internal position sensor. When ABS is pressed, a cursor will appear in the delay value in the first line of the LCD. The arrow keys can then be used to set the desired delay value. Once the delay value is set, pressing ENTER causes the MDL to execute the delay setting.

(2) ORG

When ORG is pressed, the MDL performs a sensor position check routine and then resets the delay to the absolute zero point defined by the internal position sensor. It also resets the origin point to its default value of 0.000 ps. This is the same initialization process that it performs when it is first powered on. The ORG key can be pressed any time that the motor is not moving. The buzzer will sound when the absolute zero point is reached. The display when this process is finished will be:

	0.000	ps
ORG	0.000	ps

(3) SCAN

The SCAN key is used to enter scan setup mode and to set the scan start and end points. The first time the SCAN key is pressed, the first line of the LCD displays "SC1   0.000". This is the setup screen for the scan start point (SC1). Pressing the SCAN key repeatedly will toggle the display between the start (SC1) and end point (SC2) setup screens. Use the arrow keys to set the desired start/end point. The left and right arrow keys change the cursor position, and the up and down keys increment the selected digit. After the start and end points are set, pressing the ENTER key will start the scan; the MDL will continuously scan back and forth between the two set points. Press

the STOP key to stop the scan and display the current delay time on the LCD. During scanning, only the STOP key is functional. The scan must be stopped before any other settings can be changed.

NOTE

After 30 minutes of continuous scanning, the MDL will enter standby mode and stop scanning. This is a safety feature to prevent excessive heat generation from prolonged mechanical motion. To restart continuous scanning with the currently set scan parameters, press first SCAN and then ENTER.

---

(4) STOP

This key is used to stop the motor when it is in motion. When the MDL is scanning, STOP is used to stop the scan. STOP can also be used to stop the implementation of a single delay setting. For example, if a long delay and a slow speed are selected, it can take a long time to reach the final state. The STOP key can be used to stop the motor movement before the final state is reached. The LCD will display the current delay position at the time STOP was pressed.

(5) SPD

The SPD key is used to set the scan speed. There are 10 speeds available for selection:

SPD0 (Speed 0): 0.01   ps/second

SPD1 (Speed 1): 0.25   ps/second

SPD2 (Speed 2): 1   ps/second

SPD3 (Speed 3): 4   ps/second

SPD4 (Speed 4): 8   ps/second

SPD5 (Speed 5): 16   ps/second

SPD6 (Speed 6): 32   ps/second

SPD7 (Speed 7): 64   ps/second

SPD8 (Speed 8): 128   ps/second

SPD9 (Speed 9): 256   ps/second

When the SPD key is pressed, the top line of the LCD displays the currently selected speed setting- for example, "SPD6   32ps/s" (default setting). Use the UP and DOWN keys to change the speed to the desired value. Press ENTER to accept the speed setting.

(6) ps/mm

The ps/mm key is used to set the delay unit. It toggles the display between ps (picoseconds) and mm (millimeters). The default is ps.

(7) REL

The REL key puts the MDL into relative delay mode. In this mode, a zero offset function allows the user to set the origin (ORG) to any position within the MDL's range. The current delay value (top line of LCD) is then displayed relative to the new origin. For example, if the display initially shows:

```
              90.000 PS
ORG           0.000  PS
```

with the origin (ORG) at its default position of 0.000 ps, then when REL is pressed, the cursor moves to the second line:

```
              90.000 PS
ORG           0.000  PS
```

The arrow keys can now be used to set the relative origin point. For example, if ORG is set to 50.000 ps, the current delay (first line) will automatically change to 40.000 ps (90 – 50).

(8) +/-

In relative delay time setting mode, the delay range includes values that can be negative or positive, relative to the new origin. For example, if the relative origin is set to 165 ps, then the total delay range for a 330 ps MDL, relative to 165 ps, is now –165 to 165 ps. Now, when a (relative) delay time of 50 ps (corresponding to an actual delay of 215 ps) is entered, the LCD should display:

```
              50.000    PS
ORG           165.000   PS
```

The +/- key is used to set the sign of the entered delay value. For example:

```
                   - 50.000    PS
        ORG        165.000    PS
```

The actual delay value corresponding to the set value is now 115 ps (165 – 50).

If the ORG is set to 0.000 or the delay setting is outside the allowed delay range, the device will not respond to the +/- key.

(9-10) UP and Down (arrow) keys

The UP and DOWN (▲and ▼) arrow keys are used to change the currently selected digit (indicated by the cursor) during parameter setting (ex. delay time, origin).

(11-12) LEFT and RIGHT (arrow) keys

The LEFT and RIGHT (◄ and ►) arrow keys are used to move the cursor position.

(13) ENTER

The ENTER key executes a command or setting. For example, after a delay time is set, pressing ENTER causes the motor to move to a position corresponding to the set delay. The time needed to reach the final delay state depends on the delay value and selected speed. In scan mode, ENTER starts the scan.

WARNING:

When using the REF key to set a relative origin, please make sure that the delay value setting is within the allowed range for the MDL. When the relative origin position (T_2, bottom line on the display screen) is changed, the delay setting (T_1, top line on the display) should automatically adjust to display the value of the current delay state relative to the new origin, as shown below.

```
          50.000 PS
ORG       0.000   PS
```

Display with origin set at absolute zero position and delay setting 50 ps.

```
          -450.000 PS  ←——— T₁
ORG       500.000  PS  ←——— T₂
```

Display with same delay setting, but with relative origin set at 500 ps.

For relative origin point T_2, the acceptable range of values for T_1 is

$-T_2 \leq T_1 \leq 330 - T_2$	for a 330 ps MDL
$-T_2 \leq T_1 \leq 560 - T_2$	for a 560 ps MDL

If at any time the delay setting line (T_1) shows a value outside of this range, *__do not press ENTER.__* Also, do not use the ORG key to reset the MDL before changing the invalid setting. Press the ABS key to move the cursor to the delay setting line, and use the arrow keys to set the delay to a value within the allowed range before executing the setting.

2.2.3 Panel Operation Examples

(1) Set delay time to 100.5 ps with the origin (ORG) at (absolute) 0.000 ps.

Turn on the power switch. The buzzer will sound and the LCD will display:

```
              Initializing
```

After initialization, the LCD will display:

```
              0.000        ps
    ORG       0.000        ps
```

The underline indicates the cursor position. The top line shows the current delay state as 0 ps. The origin is also at its absolute (nonrelative) position at 0 ps. At this point, if the REL key is pressed, the LCD display changes to:

```
              0.000        ps
    ORG       0.000        ps
```

with the cursor now in the second line to allow a relative origin point to be set. If the ABS key is pressed, the cursor returns to the first line for delay state setting. To set the delay to 100.5 ps for this example, use the left and right arrow keys to move the cursor position and the up and down arrow keys to change the selected digit. The display will show:

```
              100.500      ps
    ORG       0.000        ps
```

Press the ENTER key to execute the delay setting.

(2) Set delay time to -100 ps with the relative origin (ORG) at 120ps (i.e., the absolute delay value is 20 ps).

Press REL key. The LCD displays:

```
          0.000       ps
  ORG     0.000       ps
```

The cursor will blink in the second line. Use the arrow keys to change the ORG setting to 120.000 ps (left and right arrow keys to move the cursor and up and down arrow keys to change the value of the selected digit). The display will show:

```
         -120.000     ps
  ORG     120.000     ps
```

The first line delay value automatically changes to –120.000ps to indicate the current delay position (0 ps absolute delay) relative to the new origin position.

Press the ABS key to change from relative 0 point setting mode to delay time setting. Use the arrow keys to change the delay time to -100.000 ps. The LCD displays:

```
        - 100.000   ps
  ORG    120.000    ps
```

Press ENTER key to execute the new delay setting.

(3) Scan function

Set the scan speed: Press the SPD key to display the speed setting. Use UP or DOWN arrow keys to select a speed setting. The default speed setting is 32 ps/second. The LCD displays:

```
         SPD6:       32p/s
  ORG    0.000       ps
```

Then press the SCAN key. The display will change to the scan start point setup window:

```
SC1    0.000          ps
ORG    0.000          ps
```

Use the arrow keys to set the scan start position SC1 (left and right arrow keys to move the cursor and up and down arrow keys to change the value of the selected digit). After setting SC1, press SCAN again. The display changes to the scan end point setup screen:

```
SC2    0.000          ps
ORG    0.000          ps
```

The end position SC2 can be set similarly using the arrow keys. After setting the start and end positions, press the ENTER key to start the scan. The MDL will continuously scan back and forth between the two set points until the STOP key is pressed, or until it enters standby mode.

3 Computer Interfacing

3.1 Installation

The MDL can be remotely controlled by a personal computer (PC) via a built-in RS-232 communication port. To establish remote control, the user needs to use a straight connection RS-232 cable to connect the computer RS-232 Serial Port to that of the MDL.

3.2 Setup

When the MDL is first powered on, the LCD will display:

```
        0.000      ps
ORG     0.000      ps
```

This indicates local control (panel control) mode. If an RS-232 command comes from the computer, the MDL will automatically switch to remote control mode, and the remote control signifier "R" will appear in the first position of the first line of the display. The LCD now shows:

```
R       0.000      ps
  ORG   0.000      ps
```

Many programming languages for PCs support serial communications, including Visual Basic, LabVIEW and C. Any such program can be used to send ASCII string commands to the MDL through the RS-232 port. Microsoft Windows' Hyper Terminal can be used to perform an RS-232 remote control test. The path is Programs/Accessories/Communications/HyperTerminal.

To perform computer remote control, use the following procedure:

Turn on MDL power switch;

Launch any serial port communication program;

Send a command from the Remote Control Command List. The command sequence should be sent one command at a time. The MDL response signal should be checked before sending the next command (see Section 3.2.1, Remote Control Command List).

To return to manual control mode, press ABS, REL, SCAN, ENTER, ORG, ps/mm, or SPD on the operation panel. If the MDL is scanning in remote mode, the user must stop the scan either by using a remote command or by pressing the STOP key on the panel before pressing any other key. The STOP key stops the scan and returns the MDL to panel control.

3.2.1 Remote Control Command List

The ASCII commands for MDL remote control are summarized in Table I.

Table I   Remote control ASCII commands

Command	Description	Example
ABS *$ or _abs_ *$	Set the delay time * is the delay time, range 0~330ps for 330 ps model	_ABS_ 1.2$ _abs_ -23.456$
REL *$ or _rel_ *$	Relative zero position set	_REL_100$ _rel_20$
_SC1_ *$ or _sc1_ *$	Scan start position	_SC1_10$ _sc1_10$
_SC2_ *$ or _sc2_ *$	Scan end position	_SC2_100$ _sc2_100$
_SPD_*$ or _spd_$	Scan speed setting * is the speed number, range 0~9	_SPD_0$ _spd_1$
ORG$ or _org_$	Reset to absolute zero position.	
SST$ or _sst_$	Start scan Note: Scan will time out after 30 minutes continuous operation	
STP$ or _stp_$	Stop motor motion	
MMU$ or _mmu_$	Set delay unit to mm	
PSU$ or _psu_$	Set delay unit to ps	

Remote Control Command Notes:

1. RS-232 commands are case sensitive ASCII codes. The last character of each command ASCII string, $, is an end mark.

2. RS-232 port uses asynchronous framing, 8 data bits, no parity bit, and 1 stop bit.

3. RS-232 data rate: 9600 bps.

4. Only one command is allowed in each command string. Wait for "OK" response from MDL device before sending the next command.

5. If MDL is scanning (the motor is moving), only the stop command will be received. Any other commands will receive a "NO" response.

The MDL will respond to the computer with an "OK" string when a command string is accepted. Any additional commands sent before the "OK" string is returned will be ignored by the MDL, with the exception of the stop command, "_stp_$" or "_STP_$". If the format of the command sent to MDL is incorrect, or input data is out of the allowed data range, for example: "abs_ 123.456$" (no "_" at beginning), "_ABS_ 123.456$" (space is not permitted), "_ABS_123.456" (no $ sign), or "_ABS_2723.456$" (delay data out of range), the MDL will respond with a "NO" string. *In user interface programs, please check the OK string before sending the next command unless sending the stop command, "_stp_$" or "_STP_$"*. Please note that if the motor is moving, it must be stopped before changing other settings.

4 Service Information

The MDL Series Motorized Variable Optical Delay Line contains no user serviceable parts. To obtain information regarding factory service, contact Newport Corporation or your Newport representative. Please have the following information available:

1. Instrument model number (MDL Series)

2. Instrument serial number (on rear panel)

3. Description of the problem.

If the instrument is to be returned to Newport Corporation, you will be given a Return Number, which you should reference in your shipping documents. Please fill out a copy of the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

To obtain warranty service, contact your nearest Newport agent or send the product, with a description of the problem, transportation and insurance prepaid, to the nearest Newport agent. Newport Corporation assumes no risk for the damage in transit. Newport Corporation will, at its option, repair or replace the defective product free of charge. However, if Newport Corporation determines that the failure is caused by misuse, alterations, accident or abnormal condition of operation or handling, you will be billed for the repair and the repaired product will be returned to you, transportation prepaid.

4.1   Service Form

Name _____   **Return Authorization #_____**
                                                                        (Please obtain RA# prior to return of item)

Company _____

Address _____ _____Date
_____

Country _____ Phone Number
_____

P.O. Number _____ FAX Number _____

Item(s) Being Returned:

Model # _____ Serial # _____

Description _____

Reason for return of goods (please list any specific problems):

**Newport Corporation
Worldwide Headquarters**

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(In U.S.): 800-222-6440
Tel: 949-863-3144
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