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20050.pdf

Sterownik silnika monochromatora - uszkodzona przetwornica flyback

W trakcie kompletowania stanowiska pomiarowego napotkałem na problem ze sterownikiem silnika monochromatora. Jest to urządzenie sterowane przez RS232 lub GPIB i nazywa się Oriel 20050. W instrukcji są schematy poszczególnych modułów, w tym zasilacza (w załączniku, na końcu dokumentu). Proszę o pomoc na forum, bo z przetwornicami flyback nie mam żadnego doświadczenia. http://obrazki.elektroda.pl /1176806700_1474971813_thumb.jpg Na mostku jest napięcie powyżej 300V, na wyprowadzeniach scalaka UC3840N są napięcia ponad 100V, jednak nie ma żadnych objawów w postaci palenia się elementów, rozgrzewa się z czasem jedynie transformator. Zasilacz ma napięcia wyjściowe -15V, +15V, +5V oraz +24V niestabilizowane. Na tym ostatnim wyjściu napięcie waha się mniej więcej w zakresie 5V-14V z częstotliwością około 1Hz. Na pozostałych wyjściach stabilizowanych brak napięcia (nie są zwarte). Wymieniłem w ciemno scalak UC3840N, ale niestety objawy są wciąż te same. W zasadzie chciałbym prosić o sugestie czy to raczej wina transformatora (zamiennik jest nieosiągalny), czy próbować wymiany innych elementów w układzie zasilacza (tranzystory i diody sprawdziłem i nie mają zwarć). Ostatecznie jeśli winowajcą okaże się transformator, planuję wstawienie swojego zasilacza i chciałbym też właśnie zapytać czy musi to być układ typu flyback, czy może można go śmiało zastąpić zwykłym zasilaczem transformatorowym.

M-20050

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MONOCHROMATOR DRIVER
MODEL 20050

USER MANUAL

Please read these instructions completely before operating this equipment. The specification and operating instructions apply only to the model(s) covered by this manual. If there are any questions or problems regarding the
use of this equipment, please contact Newport or the representative from whom this equipment was purchased.
Rev: 02/21/97

M-20050

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MONOCHROMATOR DRIVER

I.

INTRODUCTION

The Oriel Model 20050 Monochromator Driver can drive 118 meter and 114 meter monochromators.
The 20050 Monochromator Driver may be controlled by a computer equipped with RS-232 or IEEE-488
interface. A more detailed description of the interface between the monochromator driver and the control
interface is outlined in Section V.
The rear panel contains the connectors for the power connections, the stepper motor connection, and the

interface connectors. The main power switch is located on the front panel.

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M-20050
MONOCHROMATOR DRIVER

II.

SPECIFICATIONS
a) Power:
95 - 275 Volts AC; 50160 Hz ; 75 Watts - Universal input
b) Motor Drive:
All Oriel monochromators - 4 phase step, power controlled
c) RS-232 - Interface
Half or Full duplex 110, 150,300, 600, 1200,2400,4800,9600 baud 8 bit 1S,NP
d) IEEE-488 - Interface
Addressable talker or listener. Address range 0 - 31

2

M-20050
MONOCHROMATOR DRIVER

III.

SET UP & OPERATION

Figure 1: 20050 Rear Panel

Description of Switches & Connectors:
1. Power Input:

Power line in and fuse holder.

2. I/O Connector:

15 pin subminiature 'D' connector (female) for the user TTL interface.
The connector pin-out is provided in this section.

3. RS-232 Connector:

9 pin subminiature ' D' connector (female) for RS-232 110. The
connector pin-out is provided in this section.

4. Motor Connector:

10 pin IDC connector (ma1e). The connector pin-out is provided in

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5. GPIB Connector

Standard 24 pin IEEE-488 connector.

6. Configuration Switches:

A combination of 10 switch positions that sets the I10 address or
baud rate depending on the type of interface selected.

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MONOCHROMATOR DRIVER

1.

Power connector
This is the power input connector. The internal power supply is capable
of operating over a wide range of input voltage. The fuse for the 20050
controller is located at this power connector. Be aware of potentially
hazardous voltages present at this connector when changing fuses and
always replace with the properly rated fuse.

2.

I/O Connector

20050 I/O-Connector Pin Assignment
DB-15 Pins

Function

I/O Type

1

RESERVED

2

RESERVED

3

RESERVED

4

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RESERVED
/rtvforum/forums.html)

5

RESERVED

6

RESERVED

7

Power (+5 volts) 100mA

8

Not Connected

9

A Motor Half/Full

Input

10

A Motor Enable/Disable

Input

11

A motor Fwd. Limit

Output

12

A Motor Rev. Limit

Output

13

A Motor Step Pulse

Input

14

A Motor Forward/Reverse

15

Logic Ground

Logic 0 = & lt; 1.6 Volts
Logic 1 = & gt; 2.7 Volts

4

Power

Input
Ground

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MONOCHROMATOR DRIVER

3.

RS-232 Connector

The RS-232 serial I/0 connector is located on the rear panel. This connector is a 9 pin subminiature " D "
connector.
Cable wiring scheme of RS-232 Connector

To computer: 9 pin female connector
Pin Connections Used on 20050: 9 pin male connector
Pin Connections Used on 20050:
Pin

Function
1

Ground

2

Transmitted Data (Tx)

3

Received Data (Rx)

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(https://www.elektroda.pl
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Request to Send (RTS)

5

Clear to Send (CTS)

Power Adjustment

An adjustment is provided on the rear panel for motor power control. This control is located in the center of the rear panel, above the TTL interface connector. Normally this adjustment is set at the factory and requires no further adjustment.

To make the power adjustment, the monochromator must be moving continuously. If the monochromator appears to be missing steps, the power must be increased. To reduce noise, turn this control counterclockwise. When reducing power always test for missing steps. Missing steps should be checked by moving the monochromator between two wavelengths at the highest anticipated speed.

5

M-20050
MONOCHROMATOR DRIVER

4.

Monochromator Connection

The monochromator connection is made at the rear panel through a single rectangular 10 pin connector. Connection to the monochromator is made through a flat 10-conductor ribbon cable. This cable is supplied with the monochromator being utilized (118 meter or 114 meter monochromator).

The following is a pin-out of the connector on the rear of the Model 20050 Monochromator Driver for reference and connection. If you want to make your own cable DO NOT use a cable length of more than 2m.

Pin

Function
1

+5 volts; 50 mA maximum

2

Rev. Limit - logic low = limit

3

Forwd. Limit - logic low = limit

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Motor power return

5

Phase A

6

Phase B

7

Phase C

8

Phase D

9

Power select

10

Logic Common (Digital Gnd)

6

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MONOCHROMATOR DRIVER

5.

IEEE-488 Connector

Contact

Signal Line

Contact

Signal Line

1

DIO 5

2

DIO 2

14

DIO 6

3

DIO 3

15

DIO 7

4

DIO 4

16

DIO 8

5

EIO

17

REN

6

DAV

18

Gnd

7

NRFD

19

Gnd

8

NDAC

20

Gnd

9

IFC

21

Gnd

10

SQR

22

Gnd

11

ATN

23

Gnd

12

Shield

24

Gnd LOGIC

7

MFK066

MONOCHROMATOR DRIVER

6.

Configuration Switch

INTERFACE SETUP

Configuration switch is set for 9600 baud, computer mode

S8 UP
S1

S2

S3

S4

S5

S6

S7

Function
Half Duplex

UP

UP

UP

UP

*

*

*

110 Baud Computer Mode

DOWN

Forum (https://www.elektroda.pl/rtvforum/forums.html)

UP

UP

*

*

*

150 Baud Computer Mode

UP

DOWN

UP

UP

*

*

*

300 Baud Computer Mode

DOWN

DOWN

UP

UP

*

*

*

600 Baud Computer Mode

UP

Forum (https://www.elektroda.pl/rtvforum/forums.html)

UP

*

*

*

1200 Baud Computer Mode

DOWN

UP

DOWN

UP

*

*

*

2400 Baud Computer Mode

UP

DOWN

DOWN

UP

*

*

*

4800 Baud Computer Mode

DOWN

Forum (https://www.elektroda.pl/rtvforum/forums.html)

UP

*

*

*

9600 Baud Computer Mode
Full Duplex

UP

UP

UP

DOWN

*

*

*

110 Baud Terminal Mode

DOWN

UP

UP

DOWN

*

*

*

150 Baud Terminal Mode

UP

Forum (https://www.elektroda.pl/rtvforum/forums.html)

DOWN

*

*

*

300 Baud Terminal Mode

DOWN

DOWN

UP

DOWN

*

*

*

600 Baud Terminal Mode

UP

UP

DOWN

DOWN

*

*

*

1200 Baud Terminal Mode

DOWN

DOWN

DOWN

*

*

*

2400 Baud Terminal Mode

UP

DOWN

DOWN

DOWN

*

*

*

4800 Baud Terminal Mode

DOWN

DOWN

DOWN

DOWN

*

*

*

9600 Baud Terminal Mode

* = Don't care

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Forum (https://www.elektroda.pl/rtvforum/forums.html)

Mf 20050

MONOCHROMATOR DRIVER

S8 DOWN
S1
UP
DOWN
UP
DOWN
UP
DOWN
UP
DOWN
UP
DOWN
UP
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UP
DOWN
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S2
UP
UP
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DOWN
UP
UP

DOWN

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UP

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(https://www.elektroda.pl
/rtvforum/forums.html)

UP

DOWN
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S5

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DOWN

DOWN

DOWN

DOWN

DOWN

DOWN

DOWN

DOWN

DOWN

* = Don't care

9

S6

*

*

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(https://www.elektroda.pl
/rtvforum/forums.html)

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S7

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Function
GPIB Address 0-Reserved
GPIB Address 1
GPIB Address 2
GPIB Address 3
GPIB Address 4
GPIB Address 5
GPIB Address 6
GPIB Address 7
GPIB Address 8
GPIB Address 9
GPIB Address 10
GPIB Address 11
GPIB Address 12
GPIB Address 13
GPIB Address 14
GPIB Address 15
GPIB Address 16
GPIB Address 17
GPIB Address 18
GPIB Address 19
GPIB Address 20
GPIB Address 21
GPIB Address 22
GPIB Address 23
GPIB Address 24
GPIB Address 25
GPIB Address 26
GPIB Address 27
GPIB Address 28
GPIB Address 29
GPIB Address 30
GPIB Address 31-listen only

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MONOCHROMATOR DRIVER

IV.

DESCRIPTION OF COMMANDS

This section contains description of the commands for the Model 20050 accepts. The typed command is shown. The output data, if any, is delimited by the word response in italics. The outputs for both the debug/terminal mode and the computer mode are shown. Special operations, such as line feed, space and carriage return are shown in parenthesis: (LF),(SP), and (CR) respectively. Control key operations are shown in brackets[ ], where the control button is depressed and held and then a character key is pressed.

Clear Absolute Register - C
Purpose: To clear the absolute register to zero.
Format:
C response - C.
Disable Motor Windings - D
Purpose:
To disable the monochromator driver so no current flows through the motor windings.
Format:
D response - D
Enable Command - E
Purpose: Enables the monochromator driver. This command allows the motor to step normally.
Format:
E response - E
Inquire Command - I
Purpose: The I command displays the status of the drive motor to the terminal.
Format:
I response - (CR), (LF) A or B (sp) +I- Direction (CR), (LF) A or B (sp) Full or Half Step
(CR), (LF) A or B (sp) Disable Or Enable Axis (CR), (LF)
Jump Command - J
Purpose:
The J command provides an index mode of operation. This command works in
conjunction with the T command. The T command sets the number of index steps.
Format:
J response - J motion is initiated when the S command is issued.
Move Command - M
Purpose:
The M command provides continuous motion until a limit is reached or another M
command is issued. Note: This command is available in Terminal/Debug only.
Format:
M response - M
Query Command - Q
Purpose: The Q instruction displays the status of the Monochromator to the terminal.
Format:
Q response (CR), (LF) A Motor On or Off (CR), (LF) A (sp) No or - Limit (CR), (LF) A (sp)
No or - Limit (CR), (LF)
Start Command - S
Purpose: To start the selected axis.
Format: S response - S
Travel Command - T

Purpose: This command includes a data field consisting of up to 8 decimal digits of data terminated by a comma. After the 8th digit, the numeric field is automatically terminated. A back space may also be used to edit the data field.

Format:
+ Tdddd, or + T0000dddd, or + Tdddddddd, or - Tddd, or - T0000dddd, or - Tdddddddd
Where:
d = numeric data up to 8 digits.

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MONOCHROMATOR DRIVER

U Command - U
Purpose: Entering a U instructs the controller to output the value of the monochromator travel register.
Format:
U response (CR), (LF) dddddd (CR), (LF)
Where:
d = numeric data up to 8 digits
Velocity Command - V
Purpose: This command includes a data field consisting of up to 4 decimal digits of data terminated by a comma. After the 4th digit, the numeric field is automatically terminated. A back space may also be used to edit the data field. On power up velocity is set to 100 stepslsec.
Format:
Vdddd, or Vdd
X Command
Purpose:
Format:
Where:

Entering an X will instruct the controller to output the value of the Monochromator absolute register.
X response (CR), (LF) + or - dddd ... (CR), (LF)
d = numeric data up to 8 digits

Zero Command - Z
Purpose: Z clears the absolute destination register. This command is the same as G + or -0.
Format:
Z response Z
@ Command
Purpose:
Format:

@ unconditionally stops both motors. This is similar to " Panic " stop @ will also clear a " Go Lockout " caused by specifying a range of travel outside of the limits.
@ response @ (CR), (LF) motor off (CR), (LF) B Motor off (CR), (LF)

& gt; response & gt; (CR), (LF) A (sp) Motor Off (CR), (LF)

Less Than Command & lt;

Purpose: c will take a single step counter- clockwise. This is the same as entering - T1 ,S

Format:

& lt; response c (CR), (LF) A (sp) Motor Off (CR), (LF)

Plus Command +

Purpose: To preset the direction to clockwise.

Format:

c+ & gt; (response) +

Minus Command Purpose: To preset the direction to counter-clockwise.

Format:

- response -

Change to Debug/Terminal Mode

Purpose: To take out of computer mode without resetting the controller, this is useful for manual operation.

Format:

[Control] - W response (CR), (LF) Terminal Mode (CR), (LF)

Change to Computer Mode

Purpose: To return to computer mode without resetting the controller.

Format:

[Control] - U response * (CR)

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MONOCHROMATOR DRIVER

COMPUTER MODE This section contains the description of the commands the 20050 accepts under the computer mode. In

most cases the input format will be the same. The major difference is in the way the output is presented to the computer. When a command is entered that returns no value, there is no echo back sent (half duplex). If a command that requires a value is sent, then that value is outputted and terminated with a carriage return and no line feed.

V.

COMMAND SUMMARY

Group 1 - Translator Commands - This command group affects the motor driver:

Command Name

Command Character

Command Description

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(https://www.elektroda.pl
/rtvforum/forums.html)

Disables motor winding current

Enable

E

Enables motor winding current

Plus

+

Set for clockwise operation

Minus

-

Set for counter-clockwise operation

Group 2 - Data/Status Commands - This command group outputs data:
Command Name

Command Character

Command Description

Inquire

I

Inquire about the translator status

Query

Q

Query the status of the move

U relative register

U

Number of steps in motor A relative register

Forum (https://www.elektroda.pl/rtvforum/forums.html)

A absolute register

X

Absolute number of steps for motor A

Group 3 - Control Data Commands - This command group loads the motor control registers:
Command Name

Command Character

Command Description

Clear

C

Set the value in the absolute register to Zero

Jump

J

Index by number of steps set by the relative register

Travel

T

Set relative register to travel a number of steps

Velocity

V

Set step rate of motor

Group 4 - Direct Control Commands
Command Name

Command Character

Command Description

Move continuous

M

S

Start motor

Stop Both

@

Stop both motors

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MONOCHROMATOR DRIVER

Group 5 - Macro Instruction Group - This command group simulates a multiple instruction:
Command Name

Command Character

Command Description

Zero

Z

Same as G 0, commands

Single step reverse

& lt;

Same as - T1, S commands

Single step forward

& gt;

Same as + T1, S commands

Group 6 - Special/Control Characters
Command Name
Command Character

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,

Used as terminator for numeric data field

Back Space

[Control - H]

Used to edit numeric data

Terminal Mode

[Control - W]

Switch to terminal mode

Computer Mode

[Control - U]

Switch to computer mode

VI.

SPECIAL MESSAGES

Terminal Mode Message Description
"A Motor Off"

This message is sent when the Monochromator reaches a limit or its
destination count.

"Terminal Mode"

This message is sent when a [Control - W] is typed. The controller is now in
the Terminal/Data mode.

Overflow

This message is sent when a destination value larger than 16,777,215 steps
is requested.

Computer Mode Message Description

"" (CR)

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This message is sent when a [Control - X] is typed. The controller is now in the command mode.

"a" (CR)

Same function as a "A Motor Off"

IEEE-488 Mode has no special messages

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MONOCHROMATOR DRIVER

VII.

REPORTING COMMANDS

The reporting commands are I,Q,U & X. The Q command and the I command are used for status reporting. The X command reports absolute steps taken, and the U command reports how many steps remain in a relative move (counts to zero).

Q Command

Terminal/Debug

Computer Mode

GPIB

A MOTOR OFF
A NO + LIMIT
A NO - LIMIT

0(cr)

Same as Computer Mode

A MOTOR ON
A NO + LIMIT
A NO - LIMIT

1(cr)

Same as Computer Mode

A MOTOR OFF
A + LIMIT

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(https://www.elektroda.pl
2(cr)
/rtvforum/forums.html)

Same as Computer Mode

A MOTOR ON
either A + LIMIT or A - LIMIT

3(cr)

Same as Computer Mode

A MOTOR OFF
A NO + LIMIT
A - LIMIT

4(cr)

Same as Computer Mode

Terminal/Debug

Computer Mode

GPIB

A - DIRECTION
A FULL STEP
A DISABLE

0(cr)

Same as Computer Mode

A + DIRECTION
A FULL STEP
A DISABLE

1(cr)

Same as Computer Mode

A - DIRECTION
A HALF STEP
A DISABLE

2(cr)

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Same as Computer Mode

A DIRECTION

A FULL STEP

A ENABLE

4(cr)

Same as Computer Mode

I Command

Command

Terminal/Debug

Computer Mode

GPIB

U Command

dddddddd

dddddddd(cr)

Same as Computer Mode

X Command

?dddddddd

?dddddddd(cr)

Same as Computer Mode

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MONOCHROMATOR DRIVER

VIII.

OPERATIONAL EXAMPLES

Connect an RS-232 terminal to the 20050 using the appropriate cable. Set the mode switch to terminal
mode and the baud rate to the baud rate of the terminal. Turn the terminal on and press the caps lock on

the terminal. Push the power switch to the ON position. This message should appear after 2 seconds.

Model 20050

Monochromator Drive Controller

V1.l 1994

Insert on

Next type Q, the message below should appear on the screen.

A MOTOR OFF

A NO + LIMIT

A NO - LIMIT

Type I and a new message should appear.

A - DIRECTION

A FULL STEP

A DISABLE

The Q and the I commands are status reporting messages, these messages are important for determining if the monochromator has stopped running and under what conditions.

Typing X will display the absolute number of steps. Upon power up this value will be zero. The range for the absolute number of steps is ?16777215 steps.

Type & gt; , the screen should display the following:

A MOTOR OFF

Next type X and the screen should display:

+1

Type & lt; , again the screen should display the following:

A MOTOR OFF

If X is typed the screen should display:

+0

The & lt; and & gt; characters are used for single step forward and single step reverse.

Type M and wait a few seconds then type M again. The screen should display;

A MOTOR OFF

Next type X , the screen should display some number of steps based on the time between typing M again. For example: The M command will cause the Monochromator to move continuously until M is typed again. The M command only functions under debugIterminal mode, this function is inhibited when computer mode or GPIB is selected.

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MONOCHROMATOR DRIVER

Type C and then type X, the screen should display:

-0

The C command clears the absolute register of the counter to zero.

Type + T500,S and after about 3 seconds the screen should display:

A MOTOR OFF

Type X and the screen should read:

+500

The T command is a relative move command and the value after the command is the number of steps

relative to the absolute register to move. The range for the T command is 1677721 5 steps.

Next type X again after about 3 seconds the screen should display:

A MOTOR OFF

Type X again and the screen should read:

+I000

The J command is an index type of command that is used in conjunction with the T command, where the T command sets the value for the number of steps to index.

Type -JS and after about 3 seconds the screen should display:

A MOTOR OFF

Type X again and the screen should display:

+500

In this case the Monochromator indexed in reverse by 500 steps. The direction for an index can be set by the plus or minus character, if no direction is selected before an index move, the Monochromator will move in the last direction selected.

Type ZS and wait about 15 to 20 seconds:

A MOTOR OFF

Type X again and the screen should display:

+0

The Z command zeros the absolute register, the Monochromator will move in a direction that causes this to happen. This command along with the C command can be used for a home function.

Connect the cable between the Monochromator and the 20050 controller. Type E+I, the screen should display:

A +DIRECTION
A FULL STEP
A ENABLED

The Monochromator is now set to move in the positive direction and the motor windings are enabled.

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MONOCHROMATOR DRIVER

Type M and the Monochromator should begin moving in the positive direction at about 150 steps per second. Type V60, ,the step rate will change to 60 steps per second, next type V10, and the step rate will change to 10 steps per second. The V command changes the step rate of the Monochromator. The range for the V command is 1 to 2000 steps per second in one step per second increments. Although the range is from 1 to 2000 steps per second most Monochromators will not move correctly above 180 steps per second. Type M to stop the Monochromator.

The 20050 can be changed to computer mode operation by Typing [control]U. The screen will display:
*

Most of the commands used in the above examples will remain the same, but the command characters will not echo back (half duplex) and status reporting will be a numeric code. GPIB mode is the same in all cases as computer mode except in the case when the Monochromator has just stopped moving. When in computer mode, if motor stepping has ended or terminated (due to limits or a stop command) the 20050 will send thelower case character a to indicate this condition. This will not happen in GPIB mode, you must employ status checking.

COMMAND SUMMARY

Monochromator Drive Commands

A .... Switch commands to motor
C .... Clear absolute register
D .... Disable power to the motor windings
E .... Enable power to the motor windings
I .... Report the status of the Monochromator
J .... Repeat the Index steps
M .... Move or stop moving continuously
Q .... Display the status of the drive motor
S .... Start
T .... Set the Index register
U .... Report the travel distance of motor
V .... Set the selected motor step rate in steps/sec.
X .... Report the absolute number of steps
Z .... Go to zero absolute
& lt; Control-W & gt; .... Change to user mode
& lt; Control-U & gt; .... Change to computer mode
+ .... Set to cw direction
- .... Set to ccw direction
& gt; .... Single step CW
& lt; .... Single step CCW
@ .... Stop

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MONOCHROMATOR DRIVER

IX.

CIRCUIT DESCRIPTION

Refer to Schematic 20040-3-1001
The Oriel Model 20040 Monochromator Driver consists of a single printed circuit board containing a 75watt
switching power supply (flyback) and the digital motor controller circuitry. The operation of the circuit
is broken down into three major components: The flyback 75-watt switching power supply, the discrete
digital gates, and monochromator motor driver.
The switching supply is a flyback type circuit with automatic line/voltage detection feeding the input high
voltage level through a pass FET transistor. The pulse width modulation and voltage sense is performed
by a 3840 PWM regulator integrated circuit.
Refer to Schematic 20040-4-1002
The power supply section of the main PCB supplies the driver circuits with +I-15v, +5v & +24v. Digital
signal levels are buffered and conditioned by U108. Limit switch signals are conditioned by Q111, Q112,
C107, C108 & R145 - 150. The limit switch conditions are tested against the command direction by U106,
U107, & U110. Digital step pulses will appear at U106 pin 1 if no limit conditions exist. The step pulses

are terminated to a pulse width of x by U109. U105 is a step motor driver I.C. creates the drive sequence to Q107-Q120 pol drive the motor windings. Power through the motor windings is controlled by Q101 & Q103. The electro current and voltage signals are multiplied by U102 or U104, this provides a power feedback signal. The power feedback signal is compared to a ramp pedestal signal generated by CR101, CR102, U101 or CR103, CR104, U103. This ramp is reset after each motor pulse by Q105 or Q106. The pedestal voltage (power) is adjusted by the rear panel control, R152. Maximum available power is selected by (2113, CR110 or CR111.

Refer to schematic 20050-4-1 301.

The IEEURS-232 control PCB reads the switch settings on the rear panel and activates the desired

interface. The onboard micro controller converts the commands to digital signals.

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X.

INTERFACE

RS-232 INTERFACE:
RS-232 standard is chosen for computer interface because:
1. Most computers offer this interface option
2. It can work at long distances (& gt; loom)
3. It has high noise immunity, and
4. It is supported by most computer languages.
RS-232 is an electrical standard, meaning that it is not important what format the signal is in, as long as it is the proper voltage level and can supply the proper current. For RS-232 the asserted voltage or logic high level must not be higher than +25 volts and the not asserted voltage or logic low level must now be less than -25 volts.
After the electrical conditions have been met, the speed or rate has to be considered. Information rates are measured in bits per second or baud. To relate that to information exchange rates, a terminal operating at 4800 baud can transmit or receive 480 characters per second. Standard baud rates are: 150 Baud, 300 Baud, 600 Baud, 200 Baud, 2400 Baud, 4800 Baud, and 9600 Baud.
RS-232 Data Format
The next area to be considered is the word structure or how the information is to be transmitted. Since RS-232 formats the information serially or sequentially in the form of bits, which are either logic 1 or logic 0, a beginning tag (start bit) and ending tag (stop bit) must also be encoded. Now the information must be encoded into bits.
A common form of information encoding is called ASCII (American Standard Communication information Interchange) in which the information is encoded into words of 10 bit length (1 start bit, 7 information bits and 2 stop bits). 7 information bits can produce up to 128 different information combinations (a typical key board has about 70 - 96 characters).
Standard Word Structure:
Start 1 2 3 4 5 6 7 Stop
Bit
Bit

Stop

The last important item in the RS-232 standard is to be aware of information structure. RS-232
information is transmitted in asynchronous mode, which can be as character strings, or single characters
transmitted randomly. This mode often requires a buffer to gather up randomly sent characters so that
they can be properly interpreted.

Interchange circuits between data terminal equipment (DTE) and data communication equipment (DCE)
fall into four general categories.

- Ground or Common Return
- Data Circuits
- Control Circuits
- Timing Circuits

Driver a) The electronic circuitry or relay contact at the transmitting end (source) of an interchange circuit,
which transmits binary digital signals to a terminator via an interconnecting cable.
b) The transmitter of a binary digital signal.

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Terminator a) The electronic circuitry at the receiving end (sink) of an interchange circuit which receives binary
digital signals from a driver via an interconnecting cable.
b) The receiver of a binary digital signal.

Signal Characteristics, General Interchange circuits transferring data signals across the interface point shall hold
marking (binary ONE) or
spacing (binary ZERO) conditions for the total nominal duration of each signal element.
During the transmission of data, the marking condition shall be used to denote the binary state ONE and
the spacing condition shall be used to denote the binary state ZERO.

Notion
Interchangeable Voltage
Negative
Positive
Binary State
1
0
Signal Condition
Marking Spacing
Function
OFF
ON

Interchangeable Circuits
Circuit AA - Protective Ground
Direction - Not applicable

This conductor shall be electrically bonded to the machine or equipment frame. It may be further

connected to external grounds as required by applicable regulations.

Circuit AB - Signal Ground or Common Return

Direction - Not applicable

This conductor shall be electrically connected to the power supply ground return. It may be further connected to external grounds as required by applicable regulations.

Circuit BA - Transmitted Data

Direction - TO data communication equipment

Signals on this circuit are generated by the data terminal equipment and are transferred to the local transmitting signal converter for transmission of data to remote data terminal equipment. The data terminal equipment shall hold Circuit BA (Transmitted Data) in marking condition during intervals between characters or words, and at all times when no data are being transmitted. In all systems, the data terminal equipment shall not transmit data unless an ON condition is present on all of the following four circuits, where implemented.

1. Circuit CA (Request to Sent)
2. Circuit CB (Clear to Send)
3. Circuit CC (Data Set Ready)
4. Circuit CD (Data Terminal Ready)

All data signals that are transmitted across the interface on interchange circuit BA (Transmitted Data) during the time an ON condition is maintained on all of the above four circuits, where implemented, shall be transmitted to the communication channel.

Circuit BB - Received Data

Direction - FROM data communication equipment

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Signals on this circuit are generated by the receiving signal converter in response to data signals received from remote data terminal equipment via the remote transmitting signal converter. Circuit BB (Received Data) shall be held in the binary ONE (Marking) condition at all times when Circuit CF (Received Line Signal Detector) is in the OFF condition.

On a half duplex channel, Circuit BB shall be held in the Binary One (Marking) condition when Circuit CA (Request to Send) is in the ON condition and for a brief interval following the ON to OFF transition of Circuit CA to allow for the completion of transmission.

Circuit CA - Request to Send

Direction - TO data communication equipment

This circuit is used to condition the local data communication equipment for data transmission and, on a half duplex channel, to control the direction of data transmission of the local data communication equipment.

On one way only channels or duplex channels, the ON condition maintains the data communication equipment in the transmit mode. The OFF condition maintains the data communication equipment in a non-transmit mode.

On a half duplex channel, the ON condition maintains the data communication equipment in the transmit mode and inhibits the receive mode. The OFF condition maintains the data communication equipment in the receive mode.

Circuit CB - Clear to Send

Direction - FROM data communication equipment
Signals on this circuit are generated by the data communication equipment to indicate whether or not the data set is ready to transmit data.
The ON condition, together with the ON condition on interchange circuits CA, CC and, where implemented, CD, is an indication to the data terminal equipment that signals presented on Circuit BA (Transmitted Data) will be transmitted to the communication channel.
The OFF condition is an indication to the data terminal equipment that it should not transfer data across the interface on interchange Circuit BA.
Circuit CC - Data Set Ready
Direction - FROM data communication equipment
Signals on this circuit are used to indicate the status of the local data set.
Circuit CD - Data Terminal Ready
Direction - To data communication equipment
Signals on this circuit are used to control switching of the data communication equipment to the communication channel. The ON condition prepares the data communication equipment to be connected to the communication channel and maintains the connection established by external means (e.g., manual call origination, manual answering or automatic call origination).

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Interchangeable Circuit

Description

Gnd

AA
AB
BA
BB

Protective Ground
Signal Ground/ Common Return
Transmitted Data
Received Data

X
X

CA
CB
CC

Request to Send
Clear to Send

Data Set Ready

Data

Data Terminal Ready

Control

Timing

X
X
X
X
X
X

Pin Out for 20050 DE-9 Connector

Pin Number
1
2
3
4
5
6
8

Circuit
CF
BA
BB
CD
AB
CC
CB

Description
Data Carrier Detect
Transmitted Data
Received Data
Data Terminal Ready
Signal Ground (Common Return
Data Set Ready
Clear to Send

9

The load impedance (R and C) of the terminator side of an interchange circuit shall have a dc resistance (R) of not less than 3000 Ohms, measured with an applied voltage not greater than 25 volts in magnitude, nor more than 7000 Ohms, measured with an applied voltage of 3 to 25 volts in magnitude. The effective shunt capacitance (C) of the terminator side of an interchange circuit, measured at the interface point, shall not exceed 2500 picofarads. The reactive component of the load impedance shall not be inductive. The open circuit terminator voltage (E) shall not exceed 2 volts in magnitude.

RS-232 Connection On the rear panel of the 20050 is the RS-232 connector. The RS-232 connector is a 9 pin subminiature D

style connector thru all data and commands are processed.

The RS-232 interface has a pin for input (Rx) and a pin for output (Tx). These two signals and the signal common are the only signals that the 20050 processes. All other signals and control connections are ignored.

The baud rate or speed at which data is transferred is selected by the baud rate switch on the back panel of the 20050. The switch is tested during turn on, therefore if the switch position is changed during normal operation the baud rate will not change until the 20050 is restarted.

Because of the different requirements in each RS-232 installation, the interface cabling between the 20050 and the computer or terminal is the responsibility of the end user. Figure shows which connections are implemented on the 20050.

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When attempting to establish a communications interface, it is important to read the interface manuals for the computer or terminal to determine which control signals must be asserted for proper operation. Sometimes connecting an output to an input solves the problem. (i.e., connect RTS to CTS and DSR to DTR.)

Next, if a terminal is available, a test interface can be set up using the terminal to simulate the 20050. Usually this requires a null modem connection. If a personal computer is used as a terminal, the connection can be straight through.

IEEE-488 INTERFACE:

History

The IEEE standard 488 describes a " Standard Digital lnterface for Programmable Instrumentation " . This

standard was introduced in 1975 and has become the most popular means of interconnecting instruments and controllers in laboratory, automatic test and some industrial applications.

Defining the GPlB

This section presents a summary of the IEEE-488 standard that defines a bus structure known as the General Purpose lnterface Bus, or GPIB. A system will be defined as a minimum of two devices, one device must be a receiver, the other may be a controller or source. The source is typically a talker and the receiver is a listener. Devices are defined as instruments with GPlB interface capability.

Every IEEE-488 device must be capable of performing one or more of the following interface functions.

1. Listener- A device capable of receiving data over the interface when addressed. There can be up to 14 active listeners simultaneously on the bus.

2. Talker- A device capable of transmitting data over the interface when addressed. There can only be one active talker on the interface at a time.

3. Controller- A device capable of specifying the talker and listeners for information transfer.

Summary of the IEEE Standard

The IEEE standard applies to systems used to connect programmable and non-programmable electronic instrumentation with other instruments necessary to configure a complete system.

The GPIB transfers digital data among a number of instruments. Communications among these instruments is via signals and protocols specified by the IEEE standard. The IEEE standard allows programmable instruments produced by different manufactures to be connected to a computer using one interface, the GPIB. This simplifies system configuration and reduces hardware complexity. Any instrument that meets the IEEE standard may be connected to the GPIB without interface circuitry.

General GPIB Information

The GPIB connector is a 24 pin connector with hardware for fastening the mating cable connector. The cable has sixteen signal lines and eight ground lines. The total length of the cable in a system must not be longer than 20 meters and no interconnecting cable should be any longer than 2 meters.

Each data byte transferred by the interface system uses the handshake lines to exchange data between a talker and a listener. Local messages flow between device functions and interface functions.

Message coding is the process of converting remote messages to or from interface signal line values. There are two types of messages, uniline and multiline. A uniline message is sent over a single line. A

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multiline message is sent over a group of lines. only one multiline message may be sent at a time. Several uniline messages may be sent simultaneously on different lines

IEEE-488 CONNECTOR

Contact

Signal Line

Contact

Signal Line

1

DIO 1

13

DIO 5

DIO 2

14

DIO 6

3

DIO 3

15

DIO 7

4

DIO 4

16

DIO 8

5

EIO

17

REN

6

DAV

18

Gnd

7

NRFD

19

Gnd

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(https://www.elektroda.pl
/rtvforum/forums.html)

NDAC

20

Gnd

9

IFC

21

Gnd

10

SQR

22

Gnd

11

ATN

23

Gnd

12

Shield

24

Gnd LOGIC

The GPIB signal lines
The GPIB has eight data lines, three handshake lines, and five bus management lines.
Data lines (Dl01 - DI08)
The data lines transfer data and messages in synchronous, bidirectional, eight bit format.
Handshake lines (DAV, NRFD, NDAC)
These interface signal lines transfer the valid data on the data lines between the instruments or
the controller. The hand shake lines operate in an interlocked sequence.
DAV

Indicates availability of valid data on the data bus lines
- Indicates the instrument is ready to accept data on the bus
- Indicates the instrument has accepted the data on the bus

Management lines (ATN, IFC, SQR, REN, EOI)
The bus management group is made up of five signal lines that send certain single line bus
commands and maintain an orderly flow of data across the interface.
ATN

IFC
SRQ
REN

- Specifies how data on the bus is to be interpreted. The state of the ATN line
determines whether the information on the data bus is to be considered data or a
command.
- Resets the bus to a quiescent state
- Indicates need for attention and requests an interrupt of the current sequence of
events
- Sets up instruments on the bus for remote operation.

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EOI

- Indicates the end of a multiple byte data transfer, or, ATN, executes a polling
sequence

HANDSHAKE TIMING SEQUENCE
Handshake timing:
t1 - All become ready for data. NRFD goes high with slowest device
t2 - Source validates data. DAV goes high.
t3 - First acceptor sets NRFD low to indicate it is not ready for a new data byte.
t4 - NDAC goes high with slowest acceptor to indicate all have accepted the data byte.
t5 - DAV goes high to indicate this data byte is no longer valid.
t6 - First acceptor sets NDAC low in preparation for the next byte.
t7 - beginning of next handshake cycle.
Data Transfer Sequence
The complete handshake sequence for one data byte is shown above. The data bus lines should be high
and the NDAC line low from the previous byte transfer. If these conditions are not true, the source must
wait NRFD and NDAC returns low.
GPIB Signal Levels

All of the electrical specifications for the driver and receiver are TTL compatible. The IEEE standard uses the negative logic convention. The logic is related to the signal level as follows:

0 = False & lt; =
1 = True & amp; gt; =

Signal Level
2.0v High state
0.8v Low state

COMMAND MODE
The commands serve different purposes:
1. Set the device address- This multiline command selects the devices that will talk or listen.

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2. Universal Command- There are seven multiline and three uniline commands. These commands cause the device to perform a specific task.
3. Addressed Commands- These commands are similar to universal commands and are all multiline. Addressed commands only affect the devices that have been previously addressed.
4. Secondary commands- Secondary commands are multiline messages that are always used with an address, universal command, or an addressed command to provide additional command codes.

Universal Commands
Multiline Command

Mnemonic

Decimal Code

Hex Code

ASCII Character

Untalk

UNT

95

5F

—

Unlisten

3F

?

Device Clear

DCL

20

14

DC4

Local Lockout

LLO

17

11

XON

Serial Poll Enable

SPE

24

18

CAN

Serial Poll Disable

SPD

25

19

EM

21

15

NAK

UNT

The untalk command unadresses the current talker. Sending an unused talk address would
accomplish the same thing.

UNL

The unlisten command unaddresses all current listeners on the bus. Specific listeners cannot be
unaddressed without unaddressing all listeners. This command is used to guarantee that only desired
listeners are addressed.

DCL

The device clear command causes all recognizing devices to return to a pre-defined state. All recognizing
devices will respond whether they are addressed or not.

LLO

The local lockout command disables a particular front panel local reset or return to local button on
devices that recognize the command. All recognizing devices will respond whether they are addressed or
not. REN must be set to false to re-enable the front panel button, this will also place all devices under
local control.

SPE

The serial poll enable command establishes serial poll mode for all responding talker devices on the bus.
When they are addressed to talk each responding device will return a single byte of status from each
device. Devices which recognize this command must have talker capabilities to output the status byte.

SPD

The serial poll disable terminates serial poll mode for all responding devices, returning the devices to their
normal talker state where they output device dependent data rather than status information.

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PPU

The parallel poll unconfigure resets all parallel devices to idle or unable to respond to a parallel poll.
Unline Command

Interface Line Mnemonic

IEEE-488 Connector

Interface Clear

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IFC

(https://www.elektroda.pl
/rtvforum/forums.html)

Forum (https://www.elektroda.pl/rtvforum/forums.html)

Pin 9

Remote Enable

REN

Pin 17

Attention

ATN

Pin 12

IFC
The interface clear line is used only by the system controller to halt current operations on the bus. All talkers and listeners are un-addressed and the serial poll is disabled. All devices must monitor IFC at all times, in addition all devices must respond to an IFC in 100pS.

REN
The remote enable line is used only by the system controller to put listeners into the remote programming mode. When REN is asserted, all listeners capable of remote operation are placed in remote when addressed to listen. All devices capable of remote and local operation must monitor REN at all times, in addition all devices must respond to REN in 100pS.

ATN
The attention line is used to indicate whether the bus will be used for data or commands. All devices must monitor ATN at all times, in addition all devices must respond to ATN in 200nS. When ATN is " true " the
interface is in command mode. In command mode all data on the bus are commands. When ATN is " false " there will be device dependent data on the bus.

Addressed Commands

Addressed Command

Mnemonic

Decimal Code

Hex Code

ASCII Character

Group Execute Trigger

GET

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(https://www.elektroda.pl
/rtvforum/forums.html)

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BS

Selected Device Clear

SDC

04

04

EOT

Go to Local

GTL

01

01

SOH

Parallel Poll Configure

PPC

05

05

ENQ

GET

The group execute trigger causes all addressed devices to initiate a preprogrammed action. This
command provides a method of triggering devices simultaneously.

SDC

The selected device clear resets the device currently addressed to listen. This command results in an
action similar to DCL but only for the selected device.

GTL

The Go to local command causes the device currently addressed to exit the remote state and return to
local control.

PPC

The parallel poll command causes the addressed listening device to be configured to the parallel poll
enable.

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Secondary Command

Mnemonic

Decimal Code

Hex Code

ASCII Character

Parallel Poll Enable

PPE

96-111

60-6F

\-o

Parallel Poll Disable

PPD

112

70

p

PPE
The parallel poll enable secondary command configures the devices to respond to to a parallel poll.
PPD
The parallel poll disable command disables the devices, which have received the PPC, command from responding to a parallel poll.

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INTERFACE FUNCTIONS:

Interface functions are predefined capabilities of a device.

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Interface functions that may be designed into an IEEE-488 device

Mnemonic

Description

Talker or Extended Talker

T,TE

Device is a talker

Listener or Extended Listener

L,LE

Device is a listener

Source Handshake

SH

Device can transfer a multilane message

Acceptor Handshake

AH

Device can
messages

Remote/Local

RL

Device can be operated from the front
panel controls or from the IEEE-488 bus1

Service Request

SR

Device can asynchronously request service
from the controller2

Forum (https://www.elektroda.pl/rtvforum/forums.html)

Device can identify itself if it requires
service from the controller3

Device Clear

DC

Device is initialized to a pre-defined state4

Device Trigger

DT

Controller

C

Drivers

D

receive

remote

multilane

This function permits a device to have its
basic function initiated by the talker on the
bus
This function permits a device to be a
controller5
Type of electrical drivers used.

_____
1
Some instruments will lock out the front panel to prevent manual operation.
2
The controller must periodically conduct a parallel poll to determine if a device needs service.
3
The effect of this command is device dependent and is usually described in the manual.
4
There can only be one controller in per system.
5

There can only be one controller in per system.

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XI.

PROGRAMMING

1. RS-232 PROGRAMMING WITH THE 20050

1.1 Interface Setup
Set the configuration switches on a rear panel for 9600 baud, computer mode:

1

2

3

4

5

6

7

8

ON

ON

ON

OFF

*

*

*

OFF

1.2 Writing a QBasic Program to Communicate with the 20050

Every version of Microsoft's MS-DOS since v5.0 comes with QBasic. This version of the BASIC

language supports high speed serial communications through your computer's COM1 or COM2

(https://www.elektroda.pl serial ports. These provide an easy way to get up and running quickly with your 20050.

/rtvforum/forums.html) Bring up QBasic by typing:

QBASIC

at the DOS prompt

In the main editing window, enter the following short program. (The source code is supplied with the

20050 as the file \RS232\EXAMPLE1 .BAS).

Make sure to substitute the COM port actually connected to the 20050 for COM2 on the second

line.

```
CLEAR
OPEN " COM2:9600,N,8,1 " FOR OUTPUT AS #1
PRINT #1, " C "
PRINT #1, " E "
PRINT #1, " V60, "
PRINT #1, " + T100,SW
SLEEP 2
PRINT #1, " - T50,S "
SLEEP 2
PRINT #1, " ZS "
CLOSE #1
```

\RS232\Example1.bas

Run the program and your 20050 should:

o clear the absolute register to zero (make the current position zero position)

o enable the motor driver

o set the motor step rate to 60 steps/sec

o travel 100 steps in positive direction

o move 50 steps in negative direction

o go to the zero position.

NOTE: That this program is very simple, and it does not read the 20050 response. Also, note

that the current position becomes a zero position as the program starts, which might not

correspond to the zero position of your monochromator.

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MONOCHROMATOR DRIVER

1.3 Tips for Success in Writing More Advanced RS-232 Programs

o Use buffered, interrupt-driven serial communication routines to read and write from the COM

port to which you have connected your 20050. This will ensure that you do not drop characters

at the 9600 baud communication rate. Many development environments have such serial

communication routines built-in (e.g. QBasic, Visual Basic, Labwindows, Labview). Other

languages, such as Borland or Microsoft C, rely on your PC's relatively slow BIGS

communications functions. In these cases, a third pa* serial communications library will help

guarantee success.

o Use the computer mode of operation (set the switch #4 to 'OFF').

o Remember that the 20050 accepts only upper case character strings as commands.

o When reading responses from your 20050, remember that the length of the response may vary.

Use ASCII character buffers.

o Remember that some monochromators, including ORIEL'S 77250 1/8 m and 77200 1/4 m monochromators will not move correctly above 180 steps per second. Set the step rate to a value of 180, or less.

o Remember that a lower case 'a' comes from the 20050 if motor stepping has ended or terminated. Wait for this response before issuing the next move command.

1.4 BASIC Language RS-232 Motion Control Example

This QuickBASIC program was designed to demonstrate several basic features of the instrument. The source code is supplied with the 20050 as the file \RS232\EXAMPLE2.BAS.

Since Microsoft QuickBASIC supports only two communication ports, make sure you connect the 20050 to either COM1 or COM2.

The program is fully compatible with QBASIC version 1.0 and Microsoft BASIC 7.0 Professional Development System.

```
COMMON SHARED response$
DECLARE SUB XCommand ( )
DECLARE SUB Travel ( )
DECLARE SUB SetRate ( )
DECLARE SUB Zero ( )
DECLARE SUB CCommand 0
DECLARE SUB Enable ( )
DECLARE SUB ReadResponse ( )
DECLARE SUB Initialize ( )
DECLARE SUB GetPortNumber (port$)
CONST TRUE = 1, FALSE = NOT TRUE
CLS
COLOR 1, 11
PRINT &quot; ================================================================ &quot;
PRINT &quot;
ORIEL 20050, Monochromator Driver „
&quot;
PRINT &quot;
QuickBASIC Demonstration Program I#
&quot;
&quot;
PRINT &quot;
&quot;
PRINT &quot;
(R) Copyright 1997 Oriel Instruments I#
&quot;
PRINT &quot;
250 Long Beach Blvd., Stratford, CT 06497 I
&quot;
PRINT &quot;
Voice: (203) 377-8282 Fax: (203) 378-2457
PRINT &quot; ==================================================== &quot;
COLOR 9, 8
```

Forum (https://www.elektroda.pl/rtvforum/forums.html)

```
MONOCHROMATOR DRIVER

PRINT &quot; INITIALIZE THE INSTRUMENT &quot;
CALL Initialize
CALL Enable
CALL Xcommand
DO
PRINT
PRINT &quot; QUIT &quot; , , 0
PRINT &quot; GET CURRENT STEP &quot; , 1
PRINT &quot; MOVE RELATIVE &quot; , , 2
PRINT &quot; SET RATE &quot; , , 3
PRINT &quot; GO TO ZERO POSITION &quot; , 4
PRINT &quot; CLEAR COMMAND &quot; , , 5
INPUT &quot; &quot; ; I%
SELECT CASE I%
CASE 0
SYSTEM
CASE 1
CALL XCommand
CASE 2
CALL Travel
CASE 3
CALL SetRate
CASE 4
CALL Zero
CASE 5
CALL CCommand
CASE ELSE
PRINT &quot; Select 0, 1, 2, 3, 4 or 5. &quot;
END SELECT
LOOP
SUB CCommand
PRINT #I, &quot; C &quot;
END SUB
SUB Enable
PRINT #1, &quot; EN &quot;
END SUB
SUB GetPortNumber (port$)
DO
answer% = TRUE
PRINT &quot; Enter comm port: 1 = COM1, 2 = COM2, or 0 to quit
INPUT &quot; &quot; ; 1%
SELECT CASE 1%
```

CASE 0

```
CASE 1
port$ = " COM1: "
CASE 2
port$ = " COM2: "
CASE ELSE
PRINT " Select 0, 1, or 2. "
PRINT
answer% = FALSE
END SELECT
LOOP UNTIL answer% = TRUE
END SUB
SUB Initialize
```

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```
CALL GetPortNumber(port$)
port.config$ = port$ + " 9600,N,8,l "
OPEN port.config$ FOR RANDOM AS #1
END SUB
SUB ReadResponse
responses = " "
DO
valid% = 0
IF NOT EOF (1) THEN
s$ = INPUT$((1), #1)
IF s$ = CHR$ ( &amp; HD) THEN
valid% = valid% + 1
ELSE
responses = responses + s$
END IF
END IF
LOOP UNTIL valid% = 1
END SUB
SUB SetRate
PRINT " Enter the rate: "
INPUT " " ; rate%
PRINT #1, " V " + STR$ (rate%) + " , "
END SUB
SUB Travel
PRINT "Enter step position:"
INPUT ""; st%
IF SGN(st%) = -1 THEN
PRINT #1, "-T" = STR$(ABS(st%))+ ",S"
```

```
    ELSE
      PRINT #1,"m" + STR$(st%) + ",S"
    END IF
    CALL ReadResponse
    END SUB
    SUB XCommand
    PRINT #1,"x"
    CALL ReadResponse
    PRINT "The Current step position is ";response$
    END SUB
    SUB zero
    PRINT #1,"zs"
    CALL ReadResponse
    END SUB
    \RS232\example2.bas
```

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1.5 BASIC Language RS-232 Wavelength Calibration Example
This QuickBASIC program was designed to demonstrate 'step-wavelength' conversion programming
for the 20050. The program was written for the 77250 1/8m or 77200 1/4m monochromators running
with a 1:1 drive ratio and a 1200 I/mm grating. All step-wavelength calculations are based upon
those two parameters:
steps = wl / [(0.1 / drive ratio) * (1200 / lines)]

wl = (0.1 / drive ratio) * (1200 / lines) steps
The source code is supplied with the 20050 as the file \RS232\EXAMPLE3.BAS.
Since Microsoft QuickBASIC supports only two communication ports, make sure you
connect the 20050 to either COM1 or COM2.
The program is fully compatible with QBASIC version 1 .O and Microsoft BASIC 7.0
Professional Development System.

```
    COMMON SHARED response%
    COMMON SHARED offset%
    COMMON SHARED currentstep%
    COMMON SHARED wl#
    DECLARE SUB Initialize ( )
    DECLARE SUB Travel 0
    DECLARE SUB XComrnand ( )
    DECLARE SUB TravelTom ( )
    DECLARE SUB GetWL ( )
    DECLARE SUB Calibrate ( )
    DECLARE SUB ReadResponse ( )
    DECLARE SUB GetPortNumber (port$)
    CONST TRUE = 1, FALSE = NOT TRUE
    CONST LINES = 1200
```

```basic
CONST DRIVERATIO = 1
```

```basic
CLS
COLOR 1, 14
PRINT
PRINT " ------------------------------------------------------- "
PRINT "
ORIEL 20050, Monochromator Driver
"
PRINT "
QuickBASIC Demonstration Program
"
PRINT "
PRINT "
(R) Copyright 1997 Oriel Instruments
"
PRINT "
250 Long Beach Blvd., Stratford, CT 06497
"
PRINT "
Voice: (203) 377-8282 Fax: (203) 378-2457
PRINT " ------------------------------------------------------- "
PRINT
COLOR 9, 8
PRINT " INITIALIZE THE INSTRUMENT "
CALL Initialize
CALL XCommand
PRINT " The current step position is " ; currentstep%
DO
PRINT
PRINT " QUIT " , , 0
PRINT " TRAVEL TO STEP " , 1
PRINT " GET CURRENT STEP " , 2
```

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```
"
"
```

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```basic
PRINT " TRAVEL TO WAVELENGTH " , 3
PRINT " GET CURRENT WAVELENGTH " , 4
PRINT " CALIBRATE " , , 5
INPUT " " ; 1%
SELECT CASE 1%
CASE 0
SYSTEM
```

```
CASE 1
PRINT &quot; Enter step position: &quot;
INPUT &quot; &quot; ; currentstep%
CALL Travel
CASE 2
CALL XCommand
PRINT &quot; The current step position is &quot; ; currentstep%
CASE 3
PRINT &quot; Enter wavelength: &quot;
INPUT &quot; &quot; ; wl#
CALL TravelToWL
CASE 4
CALL GetWL
PRINT &quot; The current wavelength is &quot; ; wl#; &quot; nm &quot;
CASE 5
PRINT &quot; Enter calib wavelength: &quot;
INPUT ' &quot; ; wl#
CALL Calibrate
CASE ELSE
PRINT &quot; Select 0, 1, 2, 3, 4, or 5. &quot;
END SELECT
LOOP
SUB Calibrate
calstep% = wl# / ((-1 / DRIVERATIO) * (1200 / LINES))
CALL XCommand
offset% = calstep% - currentstep%
END SUB
SUB GetPortNumber (port$)
DO
answer% = TRUE
PRINT &quot; Enter corn port: 1 = COM1, 2 = COM2, or 0 to quit
INPUT &quot; &quot; ; I%
SELECT CASE I%
CASE 0
END
CASE 1
port $ = &quot; COM1: I'
CASE 2
port$ = &quot; COM2 : &quot;
CASE ELSE
PRINT &quot; Select 0, 1, or 2. &quot;
PRINT
answer% = FALSE
END SELECT
LOOP UNTIL answer% = TRUE
END SUB
SUB GetWL
CALL XComrnand
```

```
wl# = (.l / DRIVERATIO) * (1200 / LINES) * currentstep%
```

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```
SUB Travel
currentstep% = currentstep% - offset%
IF SGN(currentstep%) = -1 THEN
PRINT #1, &quot; - T &quot; + STR$(ABS(currentstep%)) + &quot; ,S &quot;
ELSE
PRINT #I, &quot; + T &quot; + STR$(currentstep%) + &quot; ,S &quot;
END IF
CALL ReadResponse
END SUB
SUB TravelToWL
currentstep% = wl# / ((.l / DRIVERATIO) * (1200 / LINES))
CALL Travel
END SUB
SUB Initialize
CALL GetPortNumber(port$)
port.config$ = port$ + &quot; 9600,N18,1 &quot;
OPEN port.config$ FOR RANDOM AS #1
PRINT #1, &quot; En &quot;
' Enable the motor driver
PRINT #1, &quot; V80, &quot; ' Set the rate to 80 steps per second
END SUB
SUB ReadResponse
responses = &quot; &quot;
DO
valid% = 0
IF NOT EOF (1) THEN
S$ = INPUT$((^), #I)
IF s$ = CHR$ ( &amp; HD) THEN
valid% = valid% + 1
ELSE
Response$ = response$ + s$
END IF
END IF
LOOP UNTIL valid% = 1
END SUB
SUB XCommand
PRINT #1, &quot; X &quot;
CALL ReadResponse
currentstep% = VAL(response$)
currentstep% = currentstep% + offset%
```

END SUB

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2. IEEE-488 programming with the 20050

2.1 Interface Setup
Set the configuration switches on the rear panel for GPIB mode. (Switch #8 - 'ON').

2.2 Addressing the 20050
Use of the IEEE-488 interface requires that it has a communication address. Set the primary
address by using the configuration DIP switches 1 through 5.

2.3 Communicating with the 20050 Using IEEE-488
The information in this section was written with National Instruments IEEE-488 interface boards and
NI-488 software drivers in mind. Refer to the manuals that came with your particular board and
software for exact details on how to setup and configure your system.

2.4 Configuring Your IEEE-488 Interface Board
National Instruments supplies a configuration program called IBCONF that you can use to configure
your interface board and the devices connected to it. Bring up the configuration program by typing:
IBCONF
at the DOS prompt
The GPIB Device Map is displayed on a screen. Press F3 key (Autoconfig) to start scanning for
devices.
The IBCONF will detect a GPIB device for each 20050 connected to your interface board. Let us
assume that the DEVA corresponds to your 20050. Configure DEVA using the following table.

Parameter
Primary GPIB Address
Secondary GPIB Address
Timeout setting
Serial Poll Timeout
Terminate Read on EOS
Set EOI with EOS on Writes
Type of Compare on EOS
EOS Byte
Send EOI at End of Write
Enable Repeat Addressing

Setting
1-30
NONE
10 sec
1 sec

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Press F9 key to return to the GPIB Devices Map and save the settings to the disk.

A short routine helps you check the IEEE-488 communications from the DOS command line:

Bring up the IEEE-488 Interface Bus Interactive Control Program by typing

IBIC

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at the DOS prompt.

Type

IBFIND DEVA

at the : prompt.

Type

IBWRT " E "

at the DEVA: prompt. This should enable the motor driver.

Type

IBWRT " + T150,S "

at the DEVA: prompt. This should drive the monochromator by 150 steps.

Type

Q

at the DEVA: prompt to exit the program, or send any other command to your 20050 following the

pattern shown above.

2.5 Writing a Quick BASIC Program to Communicate with the 20050

Bring up QBasic by typing:

QBASIC

at the DOS prompt

In the main editing window, enter the following short program. Make sure to substitute the name of

the GPIB device corresponding to the 20050 for DEVA on the first line. The source code is supplied

with the 20050 as the file \IEEE488\EXAMPLE4.BAS.

```
CLEAR
OPEN &quot; DEVA &quot; FOR OUTPUT AS #1
PRINT #1, &quot; C &quot;
PRINT #1, &quot; E &quot;
PRINT #1, &quot; V60,'
PRINT #1, &quot; + T100,SW
SLEEP 2
PRINT #1, &quot; - T50,SW
SLEEP 2
```

PRINT #1, " ZS "

CLOSE #1

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Run the program and your 20050 should:
- o - clear the absolute register to zero (make the current position zero position)
- o - enable the motor driver
- o - set the motor step rate to 60 stepslsec
- o - travel 100 steps in positive direction
- o - move 50 steps in negative direction
- o - go to the zero position.

NOTE: That this program is very simple, and it does not read the 20050 response. Also, note
that the current position becomes a zero position as the program starts, which might not
correspond to a zero position of your monochromator.

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2.6 Tips for IEEE-488 Success with Your 20050
o Use the GPIB of operation (set the switch #8 to 'ON').
o Remember that the 20050 accepts only upper case character strings as commands.
o When reading responses from your 20050, remember that the length of the response may vary.
Use 120 character buffers.
o Remember that most monochromators, including ORIEL'S 77250 118 m and 77200 114 m
monochromators, will not move correctly above 180 steps per second. Set the step rate to a
value of 180, or less.

2.7 C Language IEEE-488 Travel Command Example
This C program was designed to demonstrate the T and X commands programming for the 20050.
Upon successful device configuration, the program excutes the T command with 100 positive steps
followed by 50 negative steps for five consecutive times, with each execution reading the absolute
number of steps. The source code is supplied with the 20050 as the files \IEEE488\EXAMPLE5.C.
The low-level communication utilities are provided by the National Instruments standard DOSinstalled GPIB
device driver, which comes with the National Instruments GPIB board. In order to run
this program you will need a communication library, which provides an access to the driver. If you
are using a National Instruments GPIB board (or 100% compatible) to communicate with the 20050,
then you may use the object module, which comes with the board. For example, MCIB.OBJ module
comes with NI-488.2 AT-GPIB board. Or, the GPIB-C.LIB library, which comes with the
LabWindows, can be used.

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SCHEMATICS

20040-3-1 001 Universal Power Supply
20040-4-1 002 Monochromator Wavelength Drive
20050-4-1 301 IEEURS232 Stepper Controller
20050-2-1 21 1 IEEEIRS232 Connector Board

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XIII.

WARRANTY AND RETURNS

Newport warrants that all goods described in this
manual (except consumables such as lamps, bulbs,
filters, ellipses, etc.) shall be free from defects in
material and workmanship. Such defects become
apparent within the following period:

This warranty shall not be extended, altered or varied
except by a written document signed by both parties. If
any portion of this agreement is invalidated, the
remainder of the agreement shall remain in full force
and effect.

All products described here, except spare parts: one (1)
year or 3000 hours of operation, whichever comes first,
after delivery of the goods to the buyer.

CONSEQUENTIAL DAMAGES

Newport shall be responsible for consequential damages resulting from misfunctions or malfunctions of the goods described in this manual. Newport's total responsibility is limited to repairing or replacing the misfunctioning or malfunctioning goods under the terms and conditions of the above described warranty.

Spare parts: ninety (90) days after delivery of goods to the buyer.
Newport's liability under this warranty is limited to the adjustment, repair and/or replacement of the defective part(s). During the above listed warranty period, Newport shall provide all materials to accomplish the repaired adjustment, repair or replacement. Newport shall provide the labor required during the above listed warranty period to adjust, repair and/or replace the defective goods at no cost to the buyer ONLY IF the defective goods are returned, freight prepaid, to a Newport designated facility. If goods are not returned to Newport, and the user chooses to have repairs made at their premises, Newport shall provide labor for field adjustment, repair and/or replacement at prevailing rates for field service, on a portal-to-portal basis.

INSURANCE
Persons receiving goods for demonstrations, demo loan, temporary use or in any manner in which title is not transferred from Newport, shall assume full responsibility for any and all damage while in their care, custody and control. If damage occurs, unrelated to the proper and warranted use and performance of the goods, recipient of the goods accepts full responsibility for restoring the goods to their condition upon original delivery, and for assuming all costs and charges.

Newport shall be relieved of all obligations and liability under this warranty of:
The user operates the device with any accessory, equipment or part not specifically approved or manufactured or specified by Newport unless buyer furnishes reasonable evidence that such installations were not the cause of the defect. This provision shall not apply to any accessory, equipment or part which does not affect the safe operation of the device.

RETURNS

Before returning equipment to Newport for repair, please call the Customer Service Department at (203) 377-8282.

Have your purchase order number available before calling Newport. The Customer Service Representative will give you a Return Material Authorization number (RMA). Having an RMA will shorten the time required for repair, because it ensures that your equipment will be properly processed. Write the RMA on the returned equipment's box. Equipment returned without a RMA may be rejected by the Newport Receiving Department. Equipment returned under warranty will be returned with no charge for the repair or shipping. Newport will notify you of any repairs not covered by the warranty, with the cost of the repair, before starting the work.

The goods are not operated or maintained in accordance with Newport's instructions and specifications.
The goods have been repaired, altered or modified by other than authorized Newport personnel.
Buyer does not return the defective goods, freight prepaid, to a Newport facility within the applicable warranty period.

Please return equipment in the original (or equivalent) packaging. You will be responsible for damage incurred from inadequate packaging, if the original packaging is not used.

IT IS EXPRESSLY AGREED THAT THIS WARRANTY SHALL REPLACE ALL WARRANTIES OF FITNESS AND MERCHANTABILITY. BUYER HEREBY WAIVES ALL OTHER WARRANTIES, GUARANTEES, CONDITIONS OR LIABILITIES, EXPRESSED OR IMPLIED, ARRISING BY LAW
OR
OTHERWISE,
WHETHER
OR
NOT
OCCASIONED BY NEWPORT'S NEGLIGENCE.

Include the cables, connector caps and antistatic materials sent and/or used with the equipment, so that Newport can verify correct operation of these accessories.

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