

USER'S MANUAL
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REVISION 3



Multi-Workstation Control Box Installation and Operation Manual

Multi-Work Station Control Box Operation Manual

Revision: 3

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1. Overview

1.1. Introduction

The Multi-Station Control Box (MWS) is a device used to share control of a single Miyachi laser system with two, three or four *workstations*. These *workstations* can be a Miyachi Delta Work Station or some other system that utilizes the shared laser system. The MWS acts as an intelligent switch box that manages access of the control signals between laser system and the work stations. Each work station can request and relinquish access to the laser system.

1.2. Front Panel Overview

The front panel of the MWS is shown in Figure 1.

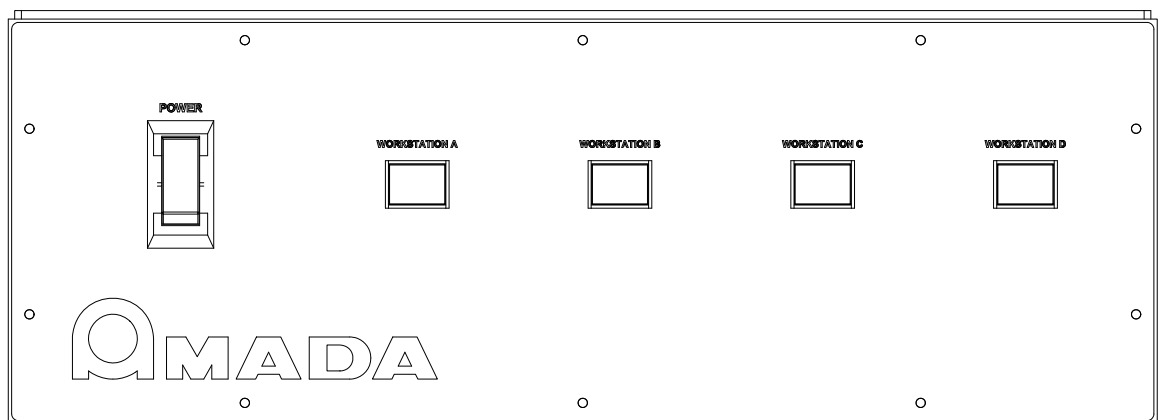


Figure 1.

The front panel contains the main power switch and four lighted workstation select pushbuttons, named workstation A, B, C and D. Pressing these select buttons signals the MWS a request to gain access to the laser system. More details are provided later in this manual.

1.3. *Rear Panel Overview*

The rear panel of the MWS is shown in Figure 2.

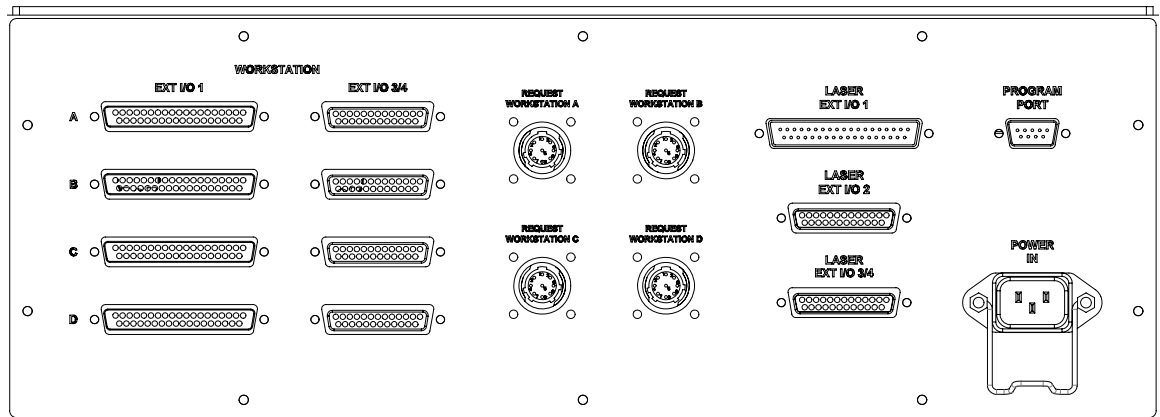


Figure 2.

The rear panel contains several connectors are provided to connect the control signals between the work stations and the laser system. In addition, the connection for the main AC input power for the MWS is provided. The connector labeled *Program Port* is for factory use only.

1.4. *System Compatibility*

The MWS is designed to share the control signals of Miyachi laser system with a Miyachi Delta Workstation or any other system that can operate the control signals according to the specifications specified later in this manual.



VERIFY ALL LASER I/O CABLES ARE SECURELY CONNECTED BEFORE STARTUP SEQUENCE

2. Operation

2.0 System Startup Sequence

The following sequence of steps must be followed exactly in order to start up the multi-workstation controller, the Miyachi laser, and all connected workstations.

- 1) Push on the toggle switch on the MWC front panel, a small light inside the toggle switch should glow, demonstrating that the MWC is in a powered on state.
- 2) Turn on all connected workstations. All workstations will be receiving an E-STOP signal from the MWC because the laser is not yet powered on.
- 3) Turn on the front breaker of the Miyachi laser.
- 4) IMMEDIATELY clear all E-STOP states from all connected machines. During this time, the MWC front panel buttons will light up and blink in a sequence from A to D. The pendant of the Miyachi laser will display the name of the machine. This step must be done in approximately 10 seconds after turning on the front breaker of the Miyachi laser.
- 5) Wait for the Miyachi laser to go through its auto-start process. If the Miyachi laser shows 2 to 6 "Branch Shutter # Trouble" errors, turn off the front breaker of the Miyachi laser. Return to the startup sequence step 3.
- 6) Initiate the startup/E-Stop recovery sequences for the all connected workstations.
- 7) Once the Miyachi laser and all connected workstations have finished their respective startup sequences, the system is ready for work.

2.1. Front Panel Operation

The MWS can be operated solely from the front panel buttons for the selection of workstations. To request access for a specific workstation (labeled on the front panel as workstation A, B, C and D), press and release the corresponding workstation push button. If no other workstation has ownership of the laser system, the selected workstation will be granted access and the push button will be illuminated until the selected workstation relinquishes access. If another workstation has ownership of the laser system, the selected workstation will be put in a waiting queue and the push button will flash indicating it is in a waiting state. Once the laser system is relinquished, the next workstation in the waiting queue will be granted access and its push button will illuminate (and no longer will be flashing). Up to three workstations are permitted in the waiting queue. While a workstation is waiting for access, the flash rate indicates its position in the waiting queue. The workstation in the first position of the waiting queue will flash at a rate of 3Hz. The workstation in the second position will flash at 2 Hz. Finally, the workstation in the third position will flash at 1 Hz.

To command a workstation to relinquish ownership of the laser system, press the corresponding push button of that workstation and its push button will go dark, indicating it no longer has ownership of the laser system. Similarly, to remove a workstation from the waiting queue, press the corresponding push button of that workstation and its push button will go dark, indicating it no longer waiting for access to the laser system.

When a workstation has access to the laser system, all the laser control signals are accessible and immediately acted upon by the laser systems as if the workstation is directly connected to the laser system.

2.2. Delta Workstation Operation

The Miyachi Delta Workstation is capable of requesting and relinquishing access of the laser system through its pendant push buttons and from NC code software commands. This control works in parallel with the MWS front panel buttons. Pressing the *AUX2* button on the Delta Workstation pendant is identical functionally to pressing the workstation push button on the front panel of the MWS. Depending on which set of workstation connectors on the rear panel of the MWS are connected to the Delta Workstation, the corresponding workstation (A, B, C or D) is affected accordingly. Refer to the *Front Panel Operation* section for details on the behavior of the workstation pushbutton.

It is possible to request and relinquish access to the laser system from NC code software commands. There are several M-codes used for this purpose.

M90 – Wait Until Laser Access is Granted

M91 – Request Laser Access

M92 – Relinquish Laser Access

In an NC program, the typical use of these M-codes is as follows:

```
M91 ; request laser access
M90 ; wait until access is granted
      (proceed to use the laser system...)
M92 ; relinquish the laser to other workstations
```

2.3. Beam Shutter Control

One of the laser systems control signals, *Beam Shutter*, is handled in a unique manner in the MWS control box. On the Miyachi laser systems, there are up to four beam shutter inputs, depending on the specific laser system being used. The MWS is configured at the factory such that each workstation will propagate a specific beam shutter signal as shown in the following table.

Workstation	Beam Shutter Channel	“External I/O 1” Connector Pin #	NC Program M-Codes
A	1	pin 25	M60 and M61
B	2	pin 26	M62 and M63
C	3	pin 27	M64 and M65
D	4	pin 28	M66 and M67

Table 1.

If an NC program is used to control the laser system, refer to the above table for using the correct M-code to open and close the correct beam shutter. Note that this configuration can be changed in the field if required. Contact Miyachi for more information.

2.4. Control Signal Operation

When using an alternate workstation (that is, a system that *is not* a Miyachi Delta Workstation), a more detailed understanding of how the laser control signals operate is required. For details on controlling the laser system through the I/O control signals, refer to the laser system’s documentation.

For controlling the behavior of the MWS control box workstation selection, several control signals are involved. On the rear panel there are four 9-pin circular connectors labeled “*Workstation Request*” for workstations A, B, C, and D. This connector contains the signals for requesting/relinquishing access to the laser (input to the MWS) and the status of access/waiting (output from the MWS). Table 2 below shows the function of each pin on this connector.

Pin	Type	Function
1	input	Request/relinquish access (+)
2	output	Laser access granted (+)
3		Not used
4		Not used
5	output	Access/wait status (-)
6	input	Request/relinquish access (+)
7	input	Request/relinquish access (-)
8	output	Access/wait status (+)
9		Not used

Table 2.

Figure 3 below illustrates a typical connection using a push button for access request/relinquish and an LED for status.

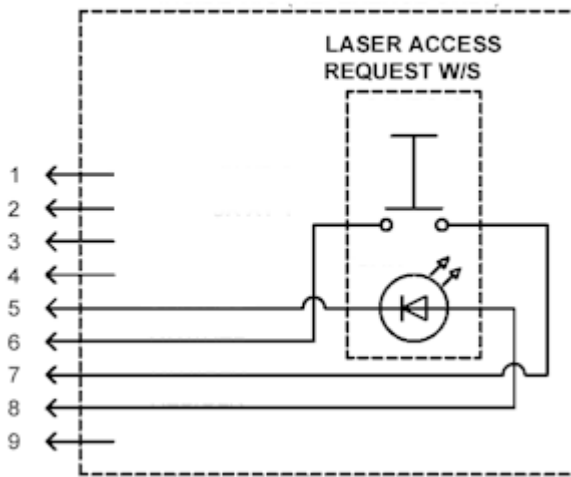


Figure 3.

Figure 4 below shows the typical timing between the MWS signals *Request Access*, *Access/Wait Status* and *Access Granted*. This diagram involves only a single workstation.

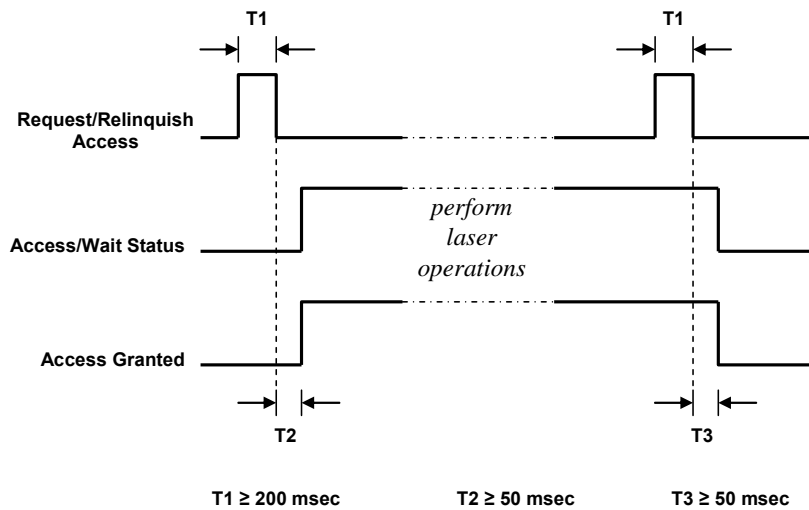


Figure 4.

Figure 5 below illustrates the timing of these signals involving two workstations. Workstation A requests and is granted access to the laser system first. Workstation B requests access shortly after Workstation A, and is subsequently placed in the waiting queue with its access/wait status pulsing on and off (at 3 Hz). After Workstation A relinquishes the laser system, Workstation B is granted access. Finally, Workstation B relinquishes access.

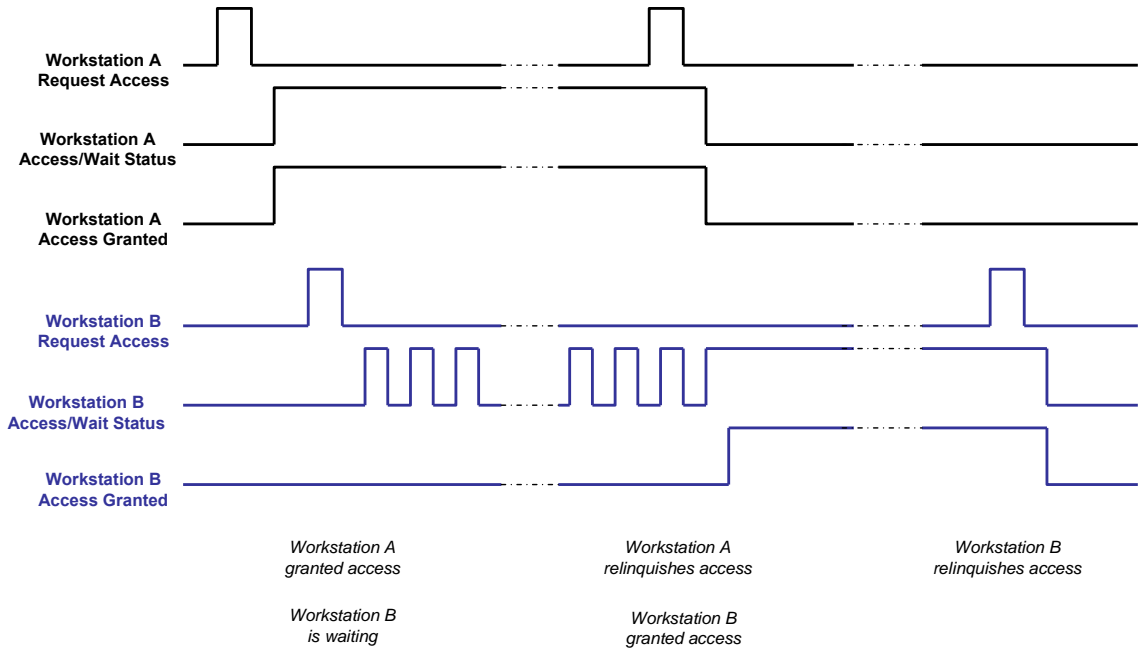


Figure 5.

Figure 6 below illustrates the timing of these signals involving three workstations. Workstation A requests and is granted access to the laser system first. Workstation B requests access shortly after Workstation A, and is subsequently placed in the waiting queue with its access/wait status pulsing on and off (at 3 Hz). Workstation C requests access shortly after Workstation B, and is subsequently placed 2nd in the waiting queue with its access/wait status pulsing on and off (at 2 Hz). After Workstation A relinquishes the laser system, Workstation B is granted access and Workstation C moves up the line to 1st place in the waiting queue and its access/wait state pulses now at 1 Hz. Workstation B relinquishes access and Workstation C is granted access.

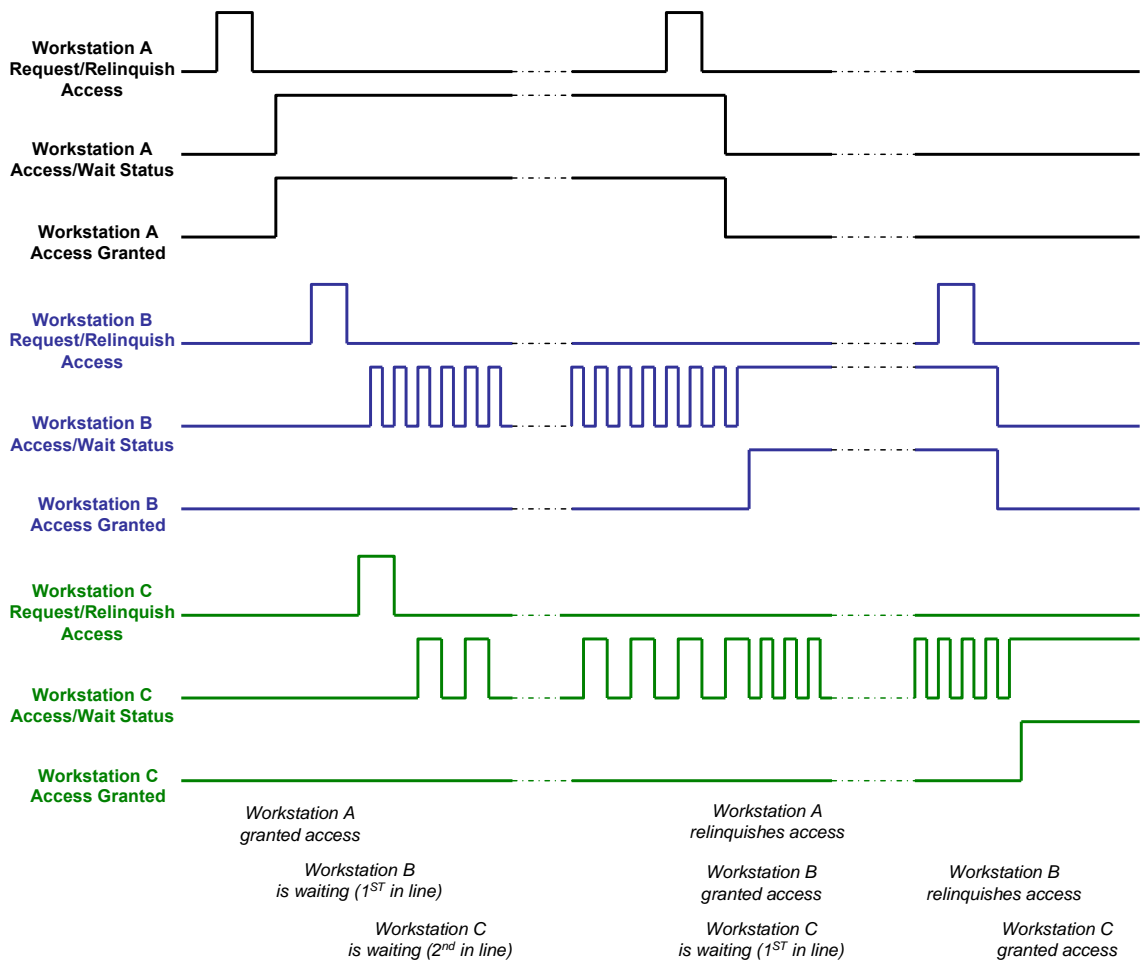


Figure 6.

3. Hardware Connections

3.1. Overview

The MWS control box is designed to be connected to a Miyachi laser system and to Miyachi Delta Workstations. However, an alternate workstation (that is, a system that *is not* a Miyachi Delta Workstation) can also be used instead. In this case, careful attention must be paid to electrical signal connections and operation use of the signals to achieve proper functionality.

3.2. AC Power

The MWS control box is powered by 115 to 125 VAC power. Using the power cable provided, connect the power cable to the MWS and an 115 VAC power source. The MWS is turned on and off using the power toggle switch on the front panel.

3.3. Connecting to Laser System

Three connections are required between the MWS control box and the laser system. The table below specifies these connections.

Connector Name	MWS	Laser System
LASER EXT. I/O 1	DB 37 pin, male	DB 37 pin, female
LASER EXT. I/O 2	DB 25 pin, male	DB 25 pin, female
LASER EXT. I/O 3/4	DB 25 pin, female	DB 25 pin, male

Table 3.

3.4. Connecting to Delta Workstations

Three connections are required between the MWS control box and each of the Delta Workstations. The table below specifies these connections.

Connector Name	MWS	Delta Workstation
A/B/C/D EXT. I/O 1	DB 37 pin, female	DB 37 pin, female
A/B/C/D EXT. I/O 3/4	DB 25 pin, male	DB 25 pin, male
A/B/C/D WORKSTATION REQUEST	CPC 9 pin, male	CPC 9 pin, male

Table 4.

3.5. *Connecting to Alternate Workstations*

Three connections are required between the MWS control box and each of the alternate workstations. Refer to Table 4 above for required connectors. Table 5 below shows the pins descriptions for the *EXT I/O 1* connectors. There is one connector for each workstation A, B, C and D. Refer to the laser system operational manual for detailed descriptions on how to use these signals.

Pin	Type	Function
1	output	Ready
2	output	High Voltage ON
3	output	Trouble
4	output	End
5	output	Monitor normal
6	output	Monitor trouble
7	output	Trigger output
8	output	Input signal enabled
9	output	Lamp power upper limit
10	output	Spare Output 1
11	output	Spare Output 2
12	common	Signal common
13	common	Signal common
14	output	0 volts
15	output	+24 volts
16	input	External signal source
17	common	External signal common
18	input	High voltage on/off
19	input	Trouble reset
20	input	Laser start
21	input	Laser stop
22	input	Guide beam
23	input	Control changeover
24	input	Main Shutter
25	input	Beam select 1
26	input	Beam select 2
27	input	Beam select 3
28	input	Beam select 4
29	input	Schedule 1
30	input	Schedule 2
31	input	Schedule 4
32	input	Schedule 8
33	input	Schedule 16
34	common	Signal common
35	common	Signal common
36	common	Signal common
37	common	Signal common

Table 5. *EXT. I/O 1*

Table 6 below shows the pins descriptions for the *EXT I/O 2* connectors. There is one connector for each workstation A, B, C and D. Refer to the laser system operational manual for detailed descriptions on how to use these signals.

Pin	Type	Function
1	output	Main Shutter - Open
2	output	Branch Shutter – Open 1
3	output	Branch Shutter – Open 2
4	output	Branch Shutter – Open 3
5	output	Branch Shutter – Open 4
6	output	Branch Shutter – Open 5
7	output	Branch Shutter – Open 6
8	output	Timesharing Unit 1 On
9	output	Timesharing Unit 2 On
10	output	Timesharing Unit 3 On
11	output	Timesharing Unit 4 On
12	output	Timesharing Unit 5 On
13	output	Spare Output 3
14	output	Spare Output 4
15	input	Beam Select 5
16	input	Beam Select 6
17	input	Timesharing Unit 1
18	input	Timesharing Unit 2
19	input	Timesharing Unit 3
20	input	Timesharing Unit 4
21	input	Timesharing Unit 5
22	input	Spare Input 1
23	input	Spare Input 2
24	input	Spare Input 3
25	input	Spare Input 4

Table 6. EXT. I/O 2

Table 7 below shows the pins descriptions for the *EXT I/O 3/4* connectors. There is one connector for each workstation A, B, C and D. Refer to the laser system operational manual for detailed descriptions on how to use these signals.

Pin	Type	Function
1	input	E-Stop input 1
2	input	E-Stop input 2
3		Not used
4		Not used
5		Not used
6	input	E-Stop input 2
7		Not used
8	input	E-Stop input 1
9	output	E-Stop output 1
10	output	E-Stop output 2
11	output	E-Stop output 2
12	output	E-Stop output 1
13		Not used
14	input	Interlock input 1
15	input	Interlock input 1
16	input	Interlock input 2
17	input	Interlock input 2
18		Not used
19		Not used
20		Not used
21		Not used
22		Not used
23		Not used
24		Not used
25		Not used

Table 7. EXT. I/O 3/4

Table 8 below shows the pins descriptions for the *WORKSTATION REQUEST* connectors. There is one connector for each workstation A, B, C and D.

Pin	Type	Function
1	input	Request/relinquish access (+)
2	output	Laser access granted
3		Not used
4		Not used
5	output	Access/wait status (-)
6	input	Request/relinquish access (+)
7	input	Request/relinquish access (-)
8	output	Access/wait status (+)
9		Not used

Table 8. Workstation Request