

**BURNY**

**REPLICATOR**

**1100 CCD**

**Operation and  
Maintenance  
Manual**

CE Compliant

Revision: 7-July-2000

AO-70160-0 (A)



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**WARRANTY**

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PART 1 SYSTEM OVERVIEW

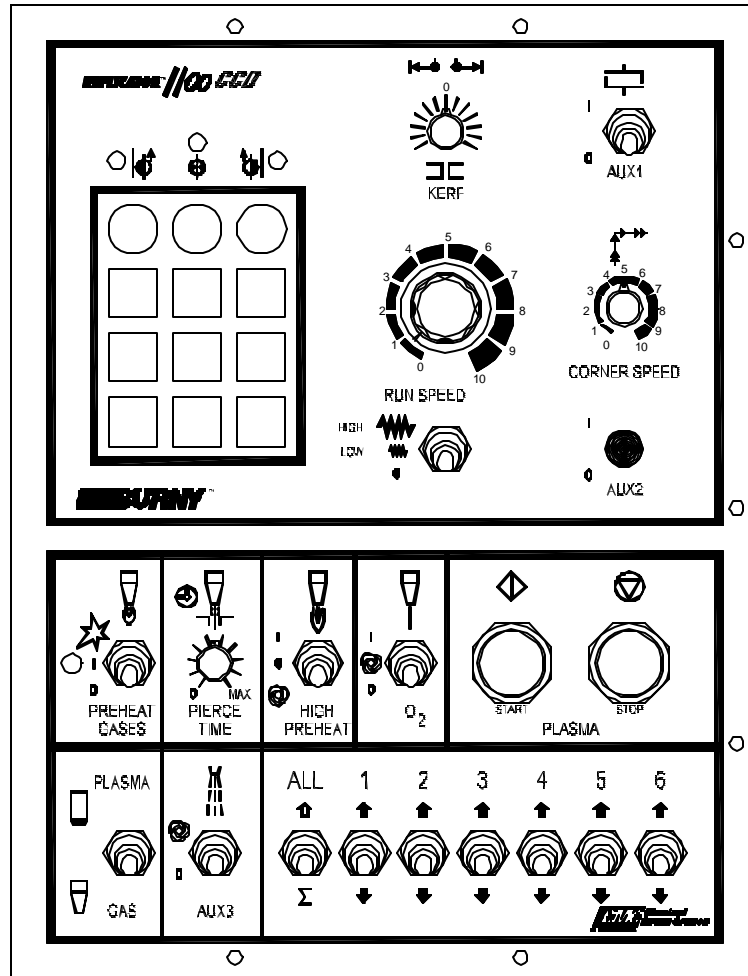


Figure 1.1 – Operator Control Panel

1.1 INTRODUCTION

The Replicator® 1100 CCD is an optical tracing system complete with scanner assembly, operator control panel, two-axis servo amplifier, and scanner cable. Also available are motor gearbox assemblies and cables. When integrated with a Burny® CNC, the Replicator 1100 CCD can be configured for external two-axis and three axis (drive synchronized) servo amplifier applications.

The optical scanner (tracing head) is normally mounted vertically, allowing it to trace a horizontal template. The template can be either a line or a silhouette (edge) type.

The tracing head automatically follows the edge of this template and transmits optical information to the logic card that is located in the enclosure.

The logic card translates this information into speed, axis, and direction signals, which are then amplified by a second printed circuit card that is also located in the enclosure.

On units with an internal two-axis servo amplifier, the output of this card is then sent directly to both of the axis servo motors.

The Operator Control Panel contains switches and controls that allow the operator to utilize all of the features of the tracing head. In addition, manual jog control of each axis is also provided.

This economical optical tracing system is ideally suited for small and medium size cutting machines. It can scan and follow either line drawings or contrasting edge patterns.

The Replicator CCD features automatic "lead-in" and "lock-on" in the direction of travel desired. This can be either clockwise or counter clockwise around the template. This is possible with either a line or silhouette template.

In either the tracing mode or the jog mode the operator can change the speed of the machine using a continuously adjustable potentiometer that is conveniently located at the Operator Control Panel.

## PART 1 – SYSTEM OVERVIEW

### 1.2 SPECIFICATIONS

#### 1.2.1 ENVIRONMENTAL SPECIFICATIONS

ENVIRONMENT:	Operating Temperature 0-50°C (32°-120°F) Relative Humidity 5% -95% Non-condensing
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#### 1.2.2 FEATURE SPECIFICATIONS

KERF COMPENSATION:	Kerf compensation is applied electronically and is available for tool diameter up to 12 mm. Kerf Compensation values range: -1 mm (-0.039 in) to +6 mm (0.236 in) + is away from the template
TRACING SPEED:	101.6 mmPM - 3048 mmPM (4-120 IPM) Based on drives selected, machine weight and stability.
LEADIN SPEED	Cannot exceed one third of maximum machine speed. Can be adjused lower with Speed Pot.
PATTERN (TEMPLATE, EDGE MODE)	White background with black line width of 1.0 mm (0.040 in.) recommended. Minimum of 0.7 mm (0.028 in.) or black and white silhouette (edge mode only).
PATTERN (TEMPLATE, CENTERLINE)	White background with black solid line of width 0.7 mm to 1.7 mm (0.028 to 0.067 in). 1.0 mm (0.040 in.) line width recommended
FORWARD OFFSET (LEAD)	Automatic in software
PATTERN ILLUMINATION:	Long life (3500 Hour) lamp
TRACER HEIGHT:	53mm ± 12.5 mm (2.09 ± 0.50 in.) from template to bottom of tracing-head housing.

### 1.2.3 ELECTRICAL SPECIFICATIONS

MYX-12383 REPLICATOR 1100 (for AC lifters)

“**PWR**” connector I/O ratings

PIN #	DESCRIPTION	RATINGS
1	Line HOT input for Replicator power supply.	115 or 230 V max AC, 50/60 Hz, 1.6 A max, protected by FU1 on rear panel. <b>CAUTION: Set internal jumper according to voltage to be used.</b>
5	Line NEUTRAL input	Neutral connection for pin 1 ac power.
6	Chassis Ground	(18 AWG wire)



## PART 1 – SYSTEM OVERVIEW

### MYX-12383 REPLICATOR 1100 (for AC lifters)

#### “SOL” connector I/O ratings

Note: All solenoids are served by the same fuse, FU2, 6.3 A, on the rear panel. Maximum total current of the solenoids is limited by this fuse.

PIN #	DESCRIPTION	RATINGS
9	Input - Solenoid Hot	24 V max AC, 50/60 Hz, or 24 V max DC, 6.3 A max
33	Input - Solenoid Neutral	Neutral or common for pin 9
2, 6, 11, 17, 21, 24, 35, 30	Output - Solenoid Neutral	Neutral or common for pins 1, 5, 10, 16, 20, 23, 34, and 29
3, 7, 12, 18, 22, 25, 36, 31	Chassis ground	18 AWG wire
1	Oxygen Vent Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse, FU2 with 7 other solenoid outputs.
5	Second Stage Cut O2 Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2A max, but on same 6.3 A fuse, FU2 with 7 other solenoid outputs.
10	Lo Preheat Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse, FU2 with 7 other solenoid outputs.
16	Ignite Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse, FU2 with 7 other solenoid outputs.
20	First Stage Cut Oxygen Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse, FU2 with 7 other solenoid outputs.
23	Water Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse, FU2 with 7 other solenoid outputs.
34	Hi Preheat Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse, FU2 with 7 other solenoid outputs.
29	Auxilliary Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse, FU2 with 7 other solenoid outputs.

## MYX-12383 REPLICATOR 1100 (for AC lifters) **“LIFT”**

connector I/O ratings Note: All lifters are served by the same fuse, FU3, 6.3 A maximum, on the rear panel. Maximum total current of the lifters is limited by this fuse.

PIN #	DESCRIPTION	RATINGS
10	Lifter 1 up switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
5	Lifter 1 down switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
11	Lifter 1 Hot un-switched output	Un-switched 24 V max AC Line, 50/60 Hz, max 2 A See note above.
6	Lifter 1 Neutral un-switched output	Un-switched 24 V max AC Neutral, 50/60 Hz, max 2 A. See FU3 note above.
1	Chassis Ground	18 AWG wire
2	Lifter 2 up switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
3	Lifter 2 down switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
7	Lifter 2 Hot un-switched output	Un-switched 24 V max AC Line, 50/60 Hz, max 2 A See note above.
8	Lifter 2 Neutral un-switched output	Un-switched 24 V max AC Neutral, 50/60 Hz, max 2 A See note above.
4	Chassis Ground	18 AWG wire
9	Lifter 3 up switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
15	Lifter 3 down switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
14	Lifter 3 Hot un-switched output	Un-switched 24 V max AC Line, 50/60 Hz, max 2 A See note above.
21	Lifter 3 Neutral un-switched output	Un-switched 24 V max AC Neutral, 50/60 Hz, max 2 A See note above.
22	Chassis Ground	18 AWG wire
28	Lifter 4 up switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
33	Lifter 4 down switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.

## PART 1 – SYSTEM OVERVIEW

27	Lifter 4 Hot un-switched output	Un-switched 24 V max AC Line, 50/60 Hz, max 2 A See note above.
32	Lifter 4 Neutral un-switched output	Un-switched 24 V max AC Neutral, 50/60 Hz, max 2 A See note above.
37	Chassis Ground	18 AWG wire
36	Lifter 5 up switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
35	Lifter 5 down switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
31	Lifter 5 Hot un-switched output	Un-switched 24 V max AC Line, 50/60 Hz, max 2 A See note above.
30	Lifter 5 Neutral un-switched output	Un-switched 24 V max AC Neutral, 50/60 Hz, max 2 A See note above.
34	Chassis Ground	18 AWG wire
29	Lifter 6 up switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
23	Lifter 6 down switched output	Switched 24 V max AC, 50/60 Hz, 2 A max. See note above.
24	Lifter 6 Hot un-switched output	Un-switched 24 V max AC Line, 50/60 Hz, max 2 A See note above.
17	Lifter 6 Neutral un-switched output	Un-switched 24 V max AC Neutral, 50/60 Hz, max 2 A See note above.
16	Chassis Ground	18 AWG wire
19	Input for External AC Lifter supply – Hot	24 V max AC, 50/60 Hz, or 24 V max DC 6.3 A max. See note above.
20	Input for External AC Lifter supply – Neutral	24 V max AC, 50/60 Hz, or 24 V max DC 6.3 A max. See note above.

**MYX-12383 REPLICATOR 1100 (for AC lifters) “PLAS”**  
connector I/O ratings

PIN #	DESCRIPTION	RATINGS
1, 2	Plasma Start relay normally closed contacts	30 VDC or 230 VAC, 2 A
1, 3	Plasma Start relay normally open contacts	30 VDC or 230 VAC, 2 A
4, 5	Plasma Stop relay normally closed contacts	30 VDC or 230 VAC, 2 A
4, 6	Plasma Stop relay normally open contacts	30 VDC or 230 VAC, 2 A
7, 8	Height Sensor Disable relay normally open contacts	30 VDC or 230 VAC, 2 A
7, 9	Height Sensor Disable relay normally closed contacts	30 VDC or 230 VAC, 2 A
15	Arc On Sense input	24-115 V DC or AC, 30 mA max
16	Arc On Sense input	115-230 V DC or AC, 30 mA max
14	Arc On Sense input	Return for signal of pin 15 or 16.

**MYX-12383 REPLICATOR 1100 (for AC lifters) “RMTR”**  
connector I/O ratings

PIN #	DESCRIPTION	RATINGS
3, 5	Clutch Switch on front panel	24 V max, AC or DC, 3 A max
2, 8	Rail Axis Motor	± 30 VDC, 4 A
1, 4	Rail Axis Tach	20 V, 5 mA Max
6	Input for + limit switch	10 mA required to pull the 24VDC input to ground
7	Input common for limit switches	25 mA, to be used as common for pins 6 and 9.
9	Input for - limit switch	10 mA required to pull the 24VDC input to ground

**MYX-12383 REPLICATOR 1100 (for AC lifters) “CMTR”**  
connector I/O ratings

PIN #	DESCRIPTION	RATINGS
3, 5	Clutch Switch on front panel	24 V max, AC or DC, 3 A max
2, 8	Cross axis Motor	± 30 VDC, 4 A
1, 4	Cross Axis Tach	20 V, 5 mA Max
6	Input for + limit switch	10 mA required to pull the 24 VDC input to ground
7	Input common for limit switches	25 mA, to be used as common for pins 6 and 9.
9	Input for - limit switch	10 mA required to pull the 24 VDC input to ground

**PART 1 – SYSTEM OVERVIEW**

MYX-12384 REPLICATOR 1100 (for DC lifters) **“PWR”**  
connector I/O ratings

PIN #	DESCRIPTION	RATINGS
1	Line HOT input for Replicator power supply	115 or 230 V max AC, 50/60 Hz, 1.6 A max  <b>CAUTION: Set internal jumper according to voltage to be used.</b>
5	Line NEUTRAL input	Neutral connection for pin 1 ac power.
6	Chassis Ground	(18 AWG wire)

MYX-12384 REPLICATOR 1100 (for DC lifters) **“SOL”**  
connector I/O ratings

Note: All solenoids are served by the same fuse, FU2, on the rear panel. Maximum total current of the solenoids is limited by this fuse.

PIN #	DESCRIPTION	RATINGS
9	Input - Solenoid Hot	24 V max AC, 50/60 Hz, or 24 V max DC, 6.3 A max
33	Input - Solenoid Neutral or common	Neutral or common for pin 9
2, 6, 11, 17, 21, 24, 35, 30	Output - Solenoid Neutral	Neutral for pins 1, 5, 10, 16, 20, 23, 34, and 29
3, 7, 12, 18, 22, 25, 36, 31	Chassis ground	18 AWG wire
1	Oxygen Vent Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse with 7 other solenoid outputs.
5	Second Stage Cut O2 Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse with 7 other solenoid outputs.
10	Lo Preheat Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse with 7 other solenoid outputs.
16	Ignite Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse with 7 other solenoid outputs.
20	First Stage Cut Oxygen Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse with 7 other solenoid outputs.
23	Water Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse with 7 other solenoid outputs.
34	Hi Preheat Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse with 7 other solenoid outputs.
29	Auxilliary Solenoid Output	24 V max AC, 50/60 Hz, or 24 V max DC. 2 A max, but on same 6.3 A fuse with 7 other solenoid outputs.

## PART 1 – SYSTEM OVERVIEW

**MYX-12384 REPLICATOR 1100 (for DC lifters) “LIFT”**  
 connector I/O ratings Note: All lifters are served by the same fuse, FU3, on the rear panel. Maximum total current of the lifters is limited by this fuse.

PIN #	DESCRIPTION	RATINGS
19	Input for External DC Lifter supply (+)	24 VDC max. 6.3 A max. See FU3 note above.
20	Input for External DC Lifter supply (-)	24 VDC max. 6.3 A max. See FU3 note above.
10	Lifter 1 up output	24 VDC @ 1 A See note above.
5	Lifter 1 down output	24 VDC @ 1 A See note above.
11	DC Lifter supply (+)	Same as pin 19, except fused by FU3
6	DC Lifter supply (-)	Same as pin 20, except fused by FU3
1	Chassis Ground	18 AWG wire
2	Lifter 2 up output	24 VDC @ 1 A See note above.
3	Lifter 2 down output	24 VDC @ 1 A See note above.
7	DC Lifter supply (+)	Same as pin 19, except fused by FU3
8	DC Lifter supply (-)	Same as pin 20, except fused by FU3
4	Chassis Ground	18 AWG wire
9	Lifter 3 up output	24 VDC @ 1 A See note above.
15	Lifter 3 down output	24 VDC @ 1 A See note above.
14	DC Lifter supply (+)	Same as pin 19, except fused by FU3
21	DC Lifter supply (-)	Same as pin 20, except fused by FU3
22	Chassis Ground	18 AWG wire
28	Lifter 4 up output	24 VDC @ 1 A
33	Lifter 4 down output	24 VDC @ 1 A
27	DC Lifter supply (+)	Same as pin 19, except fused by FU3
32	DC Lifter supply (-)	Same as pin 20, except fused by FU3
37	Chassis Ground	18 AWG wire
36	Lifter 5 up output	24 VDC @ 1 A See note above.
35	Lifter 5 down output	24 VDC @ 1 A See note above.
31	DC Lifter supply (+)	Same as pin 19, except fused by FU3
30	DC Lifter supply (-)	Same as pin 20, except fused by FU3
34	Chassis Ground	18 AWG wire
29	Lifter 6 up output	24 VDC @ 1 A See note above.

23	Lifter 6 down output	24 VDC @ 1 A See note above.
24	DC Lifter supply (+)	Same as pin 19, except fused by FU3
17	DC Lifter supply (-)	Same as pin 20, except fused by FU3
16	Chassis Ground	18 AWG wire

**MYX-12384 REPLICATOR 1100 (for DC lifters) “PLAS”  
connector I/O ratings**

<b>PIN #</b>	<b>DESCRIPTION</b>	<b>RATINGS</b>
1, 2	Plasma Start relay normally closed contacts	30 VDC or 230 VAC, 2 A
1, 3	Plasma Start relay normally open contacts	30 VDC or 230 VAC, 2 A
4, 5	Plasma Stop relay normally closed contacts	30 VDC or 230 VAC, 2 A
4, 6	Plasma Stop relay normally open contacts	30 VDC or 230 VAC, 2 A
7, 8	Height Sensor Disable relay normally open contacts	30 VDC or 230 VAC, 2 A
7, 9	Height Sensor Disable relay normally closed contacts	30 VDC or 230 VAC, 2 A
15	Arc On Sense input	24-115 V DC or AC, 30 mA max
16	Arc On Sense input	115-230 V DC or AC, 30 mA max
14	Arc On Sense input	Return for signal of pin 15 or 16.

**MYX-12384 REPLICATOR 1100 (for DC lifters)  
“RMTR” connector I/O ratings**

<b>PIN #</b>	<b>DESCRIPTION</b>	<b>RATINGS</b>
3, 5	Clutch Switch on front panel	24 V max 3 A max
2, 8	Rail Axis Motor	± 30 VDC, 4 A
1, 4	Rail Axis Tach	20 V, 5 mA max
6	Input for + limit switch	10 mA required to pull the 24VDC input to ground
7	Input common for limit switches	25 mA, to be used as common for pins 6 and 9.
9	Input for - limit switch	10 mA required to pull the 24VDC input to ground



## PART 1 – SYSTEM OVERVIEW

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MYX-12384 REPLICATOR 1100 (for DC lifters)

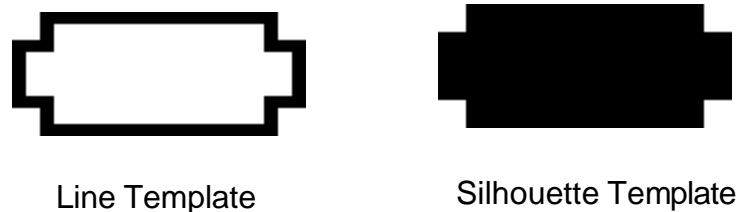
**“CMTR”** connector I/O ratings

PIN #	DESCRIPTION	RATINGS
3, 5	Clutch Switch on front panel	24 V max, 3 A max
2, 8	Cross axis Motor	± 30 VDC, 4 A
1, 4	Cross Axis Tach	20 V, 5 mA Max
6	Input for + limit switch	10 mA required to pull the 24 VDC input to ground
7	Input common for limit switches	25 mA, to be used as common for pins 6 and 9.
9	Input for - limit switch	10 mA required to pull the 24 VDC input to ground

## 1.3 TEMPLATE PREPARATION

### 1.3.1 INTRODUCTION

The Replicator CCD tracing system uses a template, a full-scale drawing of the part or hole to be cut. The system can trace a line drawing or a silhouette. See the figure below showing these two drawing types.



**Figure 1.2 – Template Types**

The system can trace a black line on white paper in Edge Mode or Centerline Mode. It can also trace a silhouette (edge) template in Edge Mode only.

For best performance the contrast of the line or edge template should be as high as possible. If various shades of gray are encountered, or if the patterns are not kept clean, tracing performance will deteriorate accordingly.

Black ink on white paper has proved to provide the best overall tracing regarding both accuracy and reliability.

### 1.3.2 INSTRUCTIONS FOR TEMPLATE PREPARATION

#### ***SHAPE***

A line template usually has the same size and shape as the part or hole to be cut, at the outside edge of the template or along the centerline of the template. In edge mode tracing with the Tracer Kerf pot set to zero, the center of the tracing head and the center of the torch follow the outside edge of the template line. In centerline mode tracing with the Tracer Kerf pot set to zero, the center of the tracing head and the center of the torch follow the center of the template line.

A template that will always be used with the same value of kerf can be enlarged by half this kerf value. Then it can be run with the Tracer Kerf pot set to zero and the part will cut to the correct size.

#### ***LINE WIDTH***

For best performance, template lines should be a minimum of 0.7mm (0.028 in.) in width.

### ***SPEED***

For speeds less than 1000 mm/min (40 in/min) a corner radius of 2.5mm (0.1 in.) is recommended. For speeds above 1000 mm/min the radius should be increased based on the machine performance. This will be directly related to the drives selected and the frame weight and stability.

### ***CORNERS***

The smallest angle which can be traced (without a corner radius) is 90°. If an angle less than this is required, or if kerf is to be used, the template must have a corner radius as described under *Speed* above. If a corner radius is not provided an alternative solution is to use corner slowdown.

### ***CORNER SLOWDOWN***

The Replicator CCD has two modes for corner slowdown:

- Automatic Slowdown
- Corner Marker Slowdown

Corner slowdown modes are selected by the yellow tracer function pushbuttons as described in the “Replicator Trace Function Activation Table” in Part 2.

The corner slowdown speed is set using the Corner Speed pot, but is never greater than the speed set by the Run Speed pot and the High / Low / Off Speed switch.

### ***AUTOMATIC CORNER SLOWDOWN***

When the Automatic Corner Slowdown mode is active, the tracer will slowdown under certain template conditions. Typically, these conditions are when the tracer approaches:

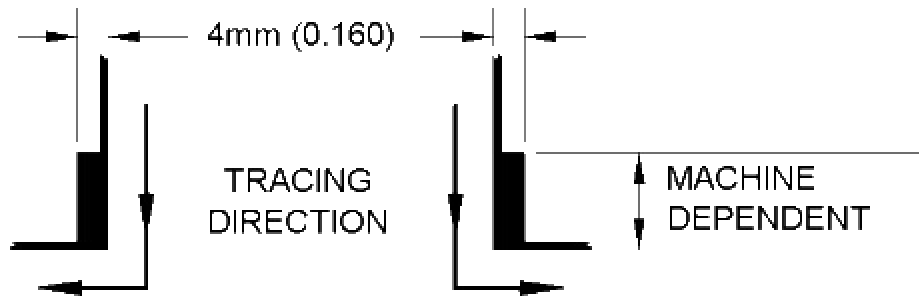
1. Any radius of 8 mm (5/16”) or less.
2. Any corner of 135° or less.

### ***CORNER MARKER SLOWDOWN***

With the Corner Marker Slowdown mode active, the tracer will slow down in areas where the template is prepared as follows.

Increase the width of the line to 4mm (0.160 in.) at each corner or location where slowdown is desired, as shown in Figure 1.3 below. Note that the line must be widened on the edge not followed by the tracer.

Slowdown begins when the wide part of the line is encountered by the tracer. Speed will decrease from the machine feedrate to a value set by the Corner Speed pot, if the slowdown began soon enough. This means that the best length of the widened line depends on the machine performance.



**Figure 1.3 – Slowdown Marker**

## ***PART 2 SYSTEM OPERATIONS***

### **2.1 INTRODUCTION**

The operator has a choice of two modes available to control machine motion:

- Manual Mode
- Tracing Mode

In Manual mode, the machine is moved (jogged) with the arrows on the directional keypad. Manual jog can be used for positioning the machine and for straight line cutting.

The Tracing mode uses two basic methods:

- Edge tracing
- Centerline tracing

The operator can choose from two types of edge tracing: trace left and trace right. Trace left means that as the tracer head moves forward along the edge of the template, the template is on the left side. This means that trace left causes the tracer to move counterclockwise around the outside of a template. In the same way, trace right makes the tracer move clockwise around the outside of the template.

Clockwise (trace right) or counterclockwise (trace left) tracing is selected with the two outer yellow buttons above the directional touchpad. These are the two examples of edge tracing. The center yellow button picks Centerline tracing. The operator must always assign a clockwise or counterclockwise direction to a Centerline tracing operation by pressing one of the outer yellow buttons.

When making a part, the tracer head approaches the template from the outside. The tracer turns left along the template if trace right (clockwise) has been selected or right for trace left (counterclockwise). In both cases when kerf is set to zero and one of the edge tracing modes is chosen, the center of the tracing head is directly over the edge of the template: the right edge for counterclockwise tracing and the left edge for clockwise.

When making a hole, the tracer head approaches the template from the inside. It still turns in the same direction when it detects the template. This means that the setting that gives clockwise when approaching the outside of the template gives counterclockwise when approaching from inside.

When a kerf distance is set and edgemode tracing is chosen, the center of the tracer head is offset from the edge of the template line by half that distance. The kerf distance can be positive or negative. See the description of the Kerf setting below for details.

When Centerline tracing is selected and kerf is set at zero, the center of the tracing head moves along the center of the template line. Centerline tracing can be done in the clockwise or counterclockwise direction. If a value for kerf is set, the center of the tracer head will be offset from the center of the template line.

Edge tracing or centerline tracing can be done on a line template. Only edge tracing can be done on a silhouette template.

When the tracer is combined with a Burny CNC Control, the Burny must be out of "NC RUN" in order to operate the tracer functions.

## **2.2 OPERATOR CONTROLS**

### **2.2.1 INTRODUCTION**

The controls on the Operator Control Panel are described below in detail. The descriptions of operating modes that follow will refer to these controls, assuming an understanding of this material.

### **2.2.2 POWER**

The Replicator is controlled by the E-Stop switch mounted on the lower right side of the Operator Control cabinet. Once pressed, the Replicator will be turned off. To restore operation, rotate the switch knob and let it spring out.

### **WARNING**

EVEN THOUGH THE EMERGENCY STOP BUTTON IS DEPRESSED, HIGH VOLTAGE MAY BE PRESENT INSIDE OF THE REPLICATOR ENCLOSURE, AND ON VARIOUS CIRCUITS THAT ARE CONNECTED TO THE REPLICATOR.

2.2.3 TRACER PANEL CONTROLS

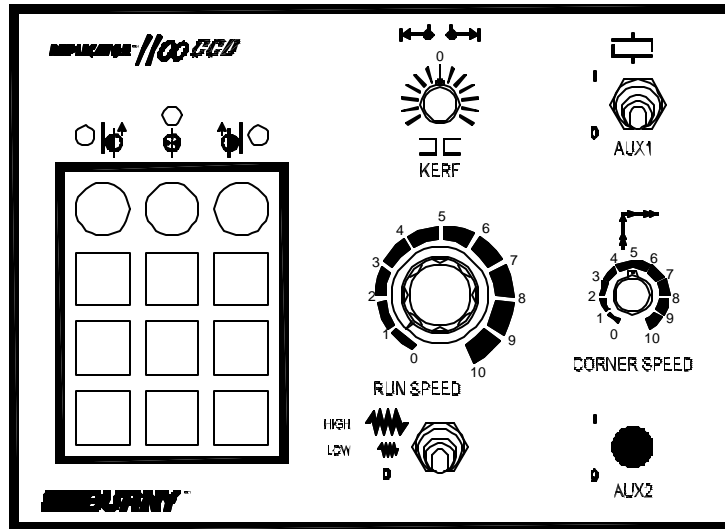


Figure 2.1 – Replicator 1100 CCD Upper Front (Tracer) Panel

**TRACER FUNCTION KEYS**

At the upper left of the Tracer Panel are the Tracer Function Keys and Indicators, shown in Figure 2.2 below. The three LED indicators give information about the tracing mode selected and its status by changing colors and blinking rates. The three yellow pushbuttons, F1, F2, and F3, select the tracing mode. See Section 2.4 for details.

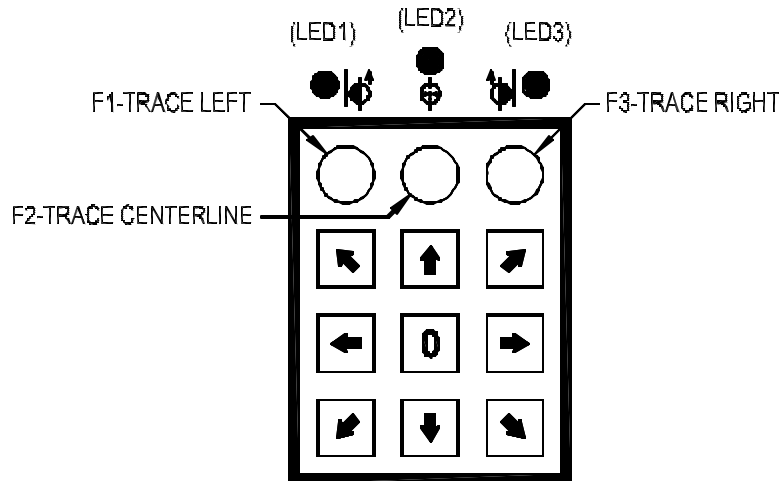
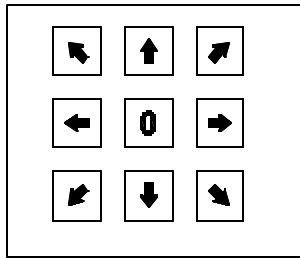


Figure 2.2 – Tracer Function Keys

## ***JOG KEYS***



Start motion by pressing the red center stop (0) button on the Direction Keypad, then pressing the desired direction key. Press the red center Stop button to stop the motion.

**Figure 2.3 – Jog Keypad**

## ***SPEED POT***

The SPEED POT (also referred to as the FEEDRATE knob) controls both the cut and jog speed. The maximum range of the cutting speed in inches or millimeters per minute over the 0 to 10 range on the knob setting will depend on several factors:

1. Position of the HIGH/LOW/OFF switch
2. Speed parameters of the CNC
3. Specific design of the cutting machine's drives and gear boxes

## ***HIGH/LOW/OFF SWITCH***

This switch controls the range of the SPEED knob, as follows:

- HIGH Position: SPEED knob range: zero to maximum machine speed.
- LOW Position: SPEED knob range: zero to one-half maximum.
- OFF Position: SPEED knob setting is disabled, motion stops.

The OFF position is useful for setting the cutting speed to zero without changing the setting of the SPEED knob.

## ***KERF KNOB***

Kerf is the width of the cut made by the torch. The torch must be moved away from the part by half this distance to make the part the right size. The distances of 12mm and 2mm refer to the kerf so that a full scale knob setting of six divisions moves the tracer head just 6mm away from the template. See the table below for the action of the Kerf Knob.

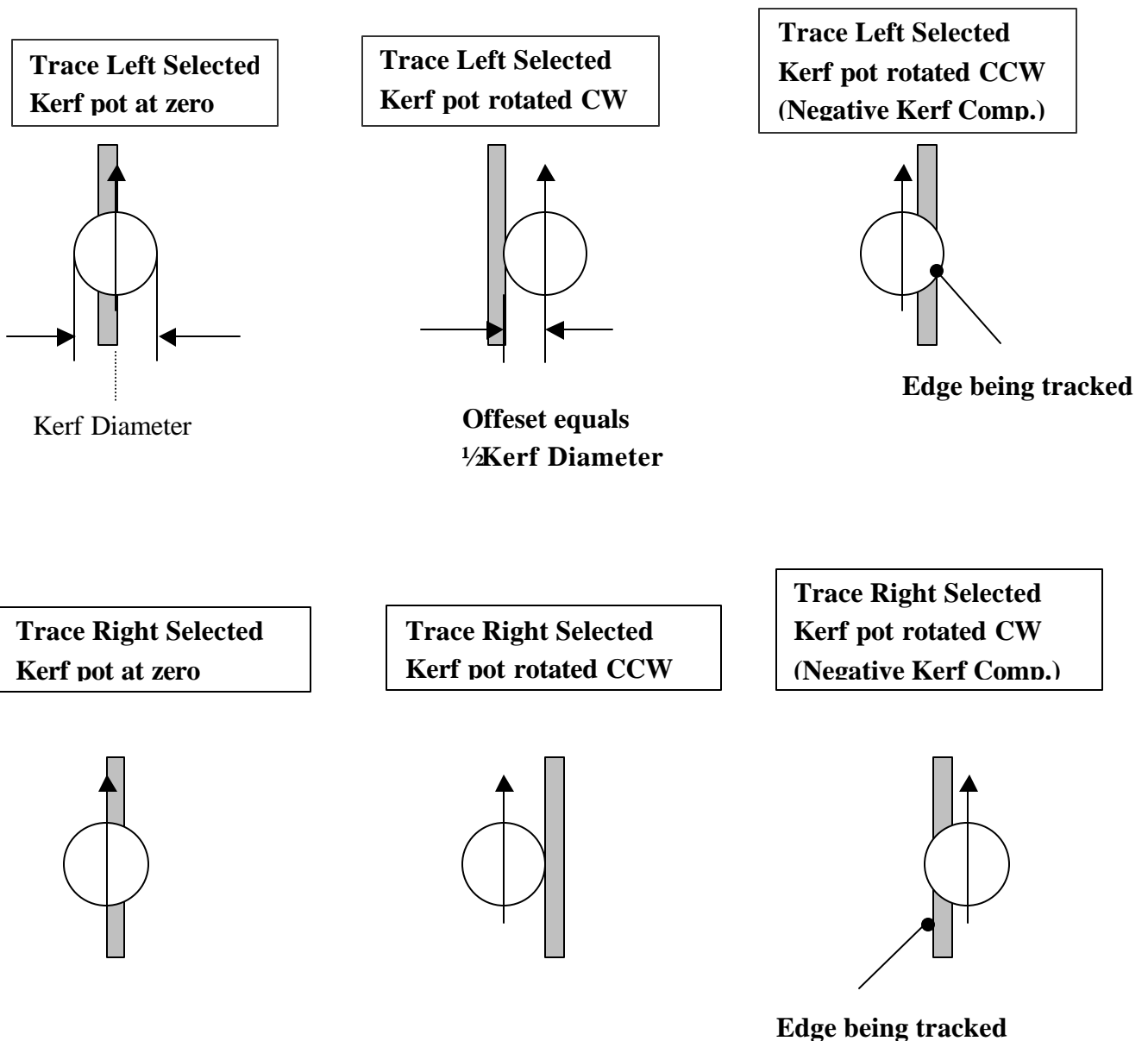
TRACE MODE	INCREASE KERF	DECREASE KERF
<b>TRACE LEFT (Edge or C-line)</b>	<b>TURN KNOB RIGHT</b>	<b>TURN KNOB LEFT</b>
<b>TRACE RIGHT (Edge or C-line)</b>	<b>TURN KNOB LEFT</b>	<b>TURN KNOB RIGHT</b>



## PART 2 – SYSTEM OPERATIONS

In the pictures below, the circle represents the amount of material that the cutting device will remove during the cutting process, kerf. (This is sometimes thought of as tool diameter.) The diameter determines the kerf compensation value (e.g. if kerf pot is set to 4 divisions, the kerf diameter is 8 and the resulting spacing from the tracked edge is 4mm). Replicator 1100 CCD can compensate for tool diameters up to 12 mm.

Negative kerf is primarily provided for users who build the proper kerf into the template, but need to slightly adjust the resulting part. Too much negative kerf compensation can cause instability, and so should be used carefully. For a 2mm negative compensation, try a knob setting of negative two divisions.



## CORNER SPEED

The Corner Speed potentiometer sets the speed for Automatic Corner Slowdown. The Corner Speed potentiometer uses the speed switch high setting value. It must be turned down to give a speed value below the main cutting speed or it will have no effect.

When this tracing mode is selected, the tracer slows down at corners and small radius areas of the template. If the corner speed is set greater than the main cutting speed, there is no slowdown. The corners are cut at the speed set by the Speed knob. The center front panel LED, LED2, will change color from green to yellow when the Tracer is in slowdown mode.

## AUX 1 SWITCH (CLUTCH)

The Clutch switch, located on the tracer panel, provides two sets of isolated contacts to operate the machine's clutch circuits. The power for the clutch circuit is to be provided external to the Replicator but the switch is intended to be wired to the machine to operate in the following manner:

- UP Position (1): Clutch is engaged
- DOWN Position (0): Clutch is disengaged

## 2.2.4 CUT PROCESS CONTROLS

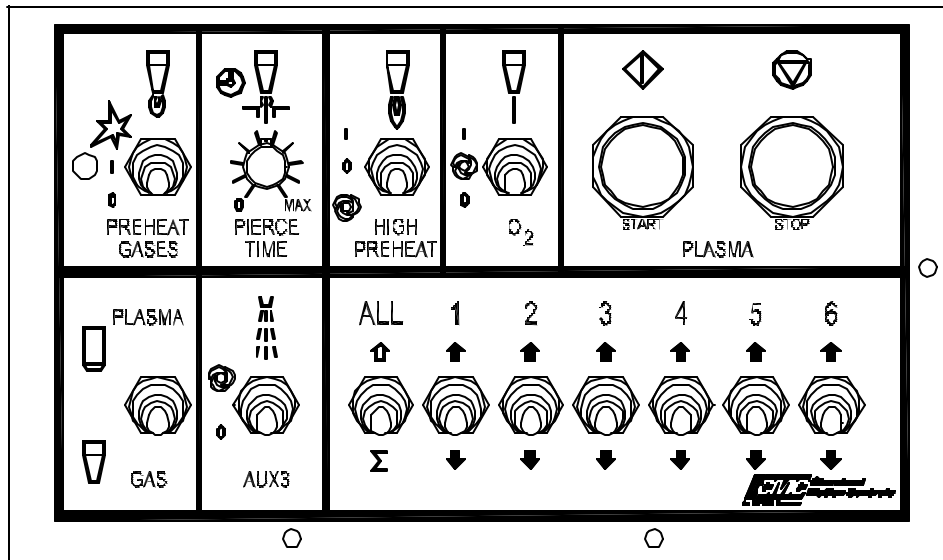


Figure 2.4 – Cut Process Panel

**PLASMA/GAS SWITCH**

The Plasma/Gas control is a two-position toggle switch defined as follows:

Down	Maintained On:	Oxygen cutting mode selected
Up	Maintained On:	Plasma cutting mode selected

**GAS CONTROLS**

**PREHEAT GASES**

This PREHEAT GASES switch is used to control the fuel gases and can supply power to a torch ignition circuit, if the machine is so equipped. The switch has three positions: Off (0), On (1), and Start (★). To turn gas on, move the PREHEAT GASES switch into the START position. The green light to the left of the switch will light indicating that the gases are on. If the machine is equipped with ignitors, continue to hold the switch in the START position until the torches are ignited, then release the switch.

When the switch is released, the gases will remain on, as the red light will indicate. Turning the gases on also activates the oxygen vent. The gases can be turned off by putting the GAS switch into the OFF position. In the OFF position all cutting functions are disabled.

**PIERCE TIME**

This tracer has a dual stage pierce assembly. When the low cut oxygen is turned on, high pressure oxygen is enabled a short time later. The PIERCE TIME potentiometer is used to adjust the high cut oxygen delay time from 0 seconds to a maximum of about 25 seconds.

**HIGH PREHEAT**

LOW Position (0):	Manual preheat oxygen LOW
HIGH Position (1):	Manual preheat oxygen HIGH
AUTO Position (⊕):	Allows a CNC to control preheat

**O2 (OXYGEN) SWITCH**

This switch controls the cutting oxygen and only operates when the PREHEAT GASES switch is on. To turn the oxygen on, push the switch into the On (1) position and then release. When the oxygen is turned on, the oxygen vent will shut off. The oxygen can be turned off by flipping the switch into the Off (0) position that, in turn, activates the oxygen vent. With the switch in the Auto (⊕) position, a CNC controls the oxygen.

**AUX3 SWITCH**

The AUX3 control is a two-position toggle switch defined as follows:

Down	Maintained Off:	No power to water spray circuit
Up	Maintained On:	Power to spray when cutting O <sub>2</sub> on

## ***PLASMA CONTROLS***

### **PLASMA START BUTTON**

This pushbutton is used to start plasma cutting. It activates the Plasma Control and Plasma Start relays and deactivates the Plasma Stop relay. The Plasma Start relay can be configured to have momentary or maintained contacts.

### **PLASMA STOP BUTTON**

This pushbutton is used to stop plasma cutting. It activates the Plasma Stop relays and deactivates the Plasma Control and Plasma Start relays. The Plasma Stop relay can be configured to have momentary or maintained contacts.

## ***TORCH LIFTER CONTROLS***

### **ALL (Up)**

All torches will rise at the same time when the toggle switch marked “ALL” is held in the momentary up (↑) position. When the switch is released, motion stops.

### **(UP/DOWN) SWITCHES**

Each of these six three position toggle switches can move one of the torches up or down. The up and down positions are momentary so that the torch moves only when the switch is held in the ↑ or ↓ position.

## **2.3 MANUAL MODE**

### **2.3.1 DESCRIPTION**

Once power is on, the operator uses Manual Mode to position the machine with the Tracer before the actual tracing operation starts. He sets speed using the HIGH, LOW, OFF switch and the SPEED knob. Then he starts the motion with the eight-direction keypad.

The operator can also use Manual Mode to make straight cuts in any of the directions available on the Direction Keypad.

### **2.3.2 DETAILS**

To position the torch (or the tracing head) using manual mode, proceed as follows when the Replicator is powered down:

1. Turn power on with the Emergency Stop Switch
2. Set the Speed Switch to High or Low, as desired
3. Set the Speed Pot to the desired setting
4. Press the red Stop button in the middle of the keypad
5. Press the desired green direction button

6. When the desired point is reached, press the red Stop button to halt motion

If the Replicator is connected to a Burny control, CNC must be Off to make a manual move using the tracer controls.

To make a straight cut using manual mode, proceed as follows:

1. Make a manual move to the desired starting point as explained above.
2. Set the desired cutting speed.
3. Set the Cut Process Controls, as described in Section 2.2.4.
4. Manually make the pierce.
5. Press the desired direction key.
6. End the cut by pressing the Stop key.

## 2.4 REPLICATOR CCD TRACER OPERATION

### 2.4.1 INTRODUCTION

A tracing operation uses seven steps:

- Locating the template in correct relation to the plate
- Moving the machine to the desired starting location
- Setting the Tracer Panel controls
- Selecting the tracing option
- Manually making the pierce
- Selecting the “lead-in” direction on the keypad
- Stopping the machine when finished

### 2.4.2 LOCATING THE TEMPLATE

Position the template and torches, if necessary, so that as the template is traced the torches will move over the area of the plate where the parts are to be cut.

### 2.4.2 MOVING TO START POSITION

In Manual Mode use the Jog Keypad to move the machine to the desired location for starting the leadin. This is usually the place where the plate is to be pierced. See Section 2.3 for details. Check the Speed Switch and Speed Pot for correct settings.

### 2.4.3 SETTING THE TRACER PANEL CONTROLS

Set the Kerf Pot, the Corner Speed Pot, and the AUX1 switch as desired. See Section 2.2.3 for details.



## PART 2 – SYSTEM OPERATIONS

### *REPLICATOR TRACE FUNCTION ACTIVATION TABLE*

#### Power Up

Mode	Activation Keys	LED Status	Notes
Power On	Emergency Stop Switch Released	LED1, 2 and 3 Solid GREEN—no flashing	All 3 LED's on GREEN — also when in Stop/Standby

#### Edge Line Tracing Functions

Mode	Activation Keys	LED Status	Notes
<b>Trace Left with no corner slowdown.</b>	<b>Step 1</b> – Press F1	LED1 solid GREEN. LED2, LED3 off.	LED1 will be solid GREEN (until STOP is pressed or tracer goes off pattern).
<b>Trace Left w/ Auto Corner Slowdown</b>	<b>Step 1</b> – Press F1 Twice	LED1 flashing slow GREEN. LED2, LED3 off.	LED1 GREEN flashing slow indicates left edge tracing with automatic corner slowdown (until STOP is pressed or tracer goes off pattern).
<b>Trace Left w/ Corner Marker Slowdown</b>	<b>Step 1</b> - Press F1 Three times.  Note: continually pressing F1 will rotate through all three modes.	LED1 flashing faster GREEN. LED2, LED3 off.	LED1 GREEN flashing faster indicates left edge tracing with corner marker slowdown sense enabled (until STOP is pressed or tracer goes off pattern).
<b>Trace Right with no corner slowdown.</b>	<b>Step 1</b> – Press F3	LED3 solid GREEN. LED1, LED 2 off.	LED3 will be solid GREEN (until STOP is pressed or tracer goes off pattern).
<b>Trace Right w/ Auto Corner Slowdown</b>	<b>Step 1</b> – Press F3 Twice	LED3 flashing slow GREEN. LED1, LED2 off.	LED3 GREEN flashing slow indicates right edge tracing with automatic corner slowdown (until STOP is pressed or tracer goes off pattern).
<b>Trace Right w/ Corner Marker Slowdown</b>	<b>Step 1</b> - Press F3 Three times. (Note: continually pressing F3 will rotate through all three modes).	LED3 flashing faster GREEN. LED1, LED 2 off.	LED3 GREEN flashing faster indicates right edge tracing with corner marker slowdown sense enabled (until STOP is pressed or tracer goes off pattern).
All modes	<b>Step 2</b> - Press Arrow key for lead-in direction	LED1 as above. LED2 blinking slow GREEN until on pattern. LED3 as above.	LED2 GREEN blinking slow to indicate lead-in has started.
All modes	When On Pattern	LED1 as above. LED2 solid GREEN. LED3 as above.	LED2 solid GREEN when on pattern and <u>not in corner slowdown mode</u> .
Only modes with corner slowdown	When On Pattern and in corner slowdown	LED1 as above. LED2 solid YELLOW. LED3 as above.	LED2 solid YELLOW when on pattern and <u>in corner slowdown mode</u> .

## Centerline Tracing Functions

Mode	Activation Keys	LED Status	Notes
<b>Center line trace mode</b>	<b>Step 1-</b> Press F2	<u>LED2 solid GREEN.</u> LED1 and LED 3 fast blinking GREEN to indicate that one of the directions must be pushed.	<u>LED2 solid GREEN to show centerline mode selected.</u> LED1 and LED 3 fast blinking awaiting tracing direction input from operator.
<b>Centerline Trace Left W/no corner Slowdown</b>	<b>Step 2-</b> Press F1	<u>LED2 solid GREEN.</u> LED1 blink, pause, blink GREEN pattern. LED3 off.	<u>LED2 solid GREEN to show centerline mode selected.</u> LED1 blink, pause, blink GREEN to show direction selected (until STOP is pressed or tracer goes off pattern).
<b>Centerline Trace Left W/Auto Corner Slowdown</b>	<b>Step 2-</b> Press F1 twice. (Note: continually pressing F3 will rotate through all three modes).	<u>LED2 solid GREEN</u> LED1 blink twice, pause, blink twice GREEN pattern. LED3 off.	<u>LED2 solid GREEN to show centerline mode selected.</u> LED1 blink twice, pause, blink twice GREEN to show direction selected (until STOP is pressed or tracer goes off pattern).
<b>Centerline Trace Right W/no corner Slowdown</b>	<b>Step 2-</b> Press F3	<u>LED2 Solid GREEN.</u> LED1 off. LED3 blink, pause, blink GREEN pattern.	<u>LED2 solid GREEN to show centerline mode selected.</u> LED3 blink, pause, blink GREEN to show direction selected (until STOP is pressed or tracer goes off pattern).
<b>Centerline Trace Right W/Auto Corner Slowdown</b>	<b>Step 2-</b> Press F3 twice.	<u>LED2 Solid GREEN</u> LED1 off. LED3 blink twice, pause, blink twice GREEN pattern.	<u>LED2 solid GREEN to show centerline mode selected.</u> LED3 blink twice, pause, blink twice GREEN to show direction selected (until STOP is pressed or tracer goes off pattern).
All modes	<b>Step 3-</b> Press Arrow key for lead-in direction.	LED1 as above. LED2 Slow blinking GREEN until on pattern. LED3 as above.	LED2 GREEN blinking slow to indicate lead-in has started.
All modes	When On Pattern	LED1 as above. LED2 solid GREEN. LED3 as above.	LED2 solid Green when on pattern and <u>not in corner slowdown mode.</u>
All modes	When On Pattern and in corner slowdown.	LED1 as above. LED2 solid YELLOW. LED3 as above.	LED2 solid YELLOW when on pattern and <u>in corner slowdown mode.</u>



### **2.4.5 MAKING THE PIERCE**

The next step is to manually make the pierce. Set the Cut Process Controls as detailed in Section 2.2.4 and make the pierce.

### **2.4.5 STARTING LEADIN**

The starting position was chosen to provide the desired distance and direction to the template, where lock-on will occur and cutting of the part will begin. When the pierce is complete, press the desired jog direction key. The tracer head will move to the template, then lock-on and move in the chosen direction along the pattern.

### **2.4.6 STOP THE MOTION**

Motion can be stopped at any time by pressing the red Stop (0) key. Usually, motion will be stopped when cutting the part is complete. Then the red Stop (0) key can be pressed to stop the torch in place or a direction key can be pressed to lead the torch away from the part. Press the Stop key to halt the motion.

**BLANK**

**PART 3 INSTALLATION AND MAINTENANCE**

**WARNING**

ONLY QUALIFIED ELECTRICAL PERSONNEL FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THIS EQUIPMENT SHOULD INSTALL, ADJUST, OR SERVICE THIS EQUIPMENT. READ AND UNDERSTAND THIS MANUAL IN ITS ENTIRETY BEFORE PROCEEDING.

FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN INJURY OR DEATH.

**3.1 INSTALLATION TYPES**

Installation of the Replicator 1100 CCD varies according to the configuration of the host machine. The following lists some of the differences in configurations:

- Presence of CNC control on the machine.
- Lifter type; AC or DC lifters
- Manufacturer of control installed

**3.2 ELECTRICAL INSTALLATION OF THE 1100**

The 1100 should be installed in accordance with the National Electrical Code in the United States, and with IEC 364-4-41 in European Community countries. Additionally, the system must always be installed in accordance with local statutes.

The 1100 should be installed, adjusted, tested and serviced by qualified personnel familiar with electrical equipment and with the contents of this manual. The 1100 is intended for use only as described in this manual.

These installation instructions have been prepared to ensure compliance with the European Community Electromagnetic Compatibility Directive, and Low Voltage Directive.

The ground for the system should be carried throughout the entire electrical system into which the product is installed by suitable conductors and connections. The conductors and connectors used for this should be in accordance with the National Electrical Code in the United States, the IEC in CE installations, and should be in accordance with all local statutes.

See drawings DO-32103 and DO-27806 for AC lifters or DO-32104 and DO-27805 for DC lifters.

The 1100 and Tracer enclosures must be grounded to the machine frame earth ground connection by a braided ground strap at least 12 mm in width.

A wide flat ground strap provides a better radio frequency ground path than a wire. The strap can be terminated with standard crimp terminals at both ends. The strap should connect to one of the chassis ground screws on the back of the enclosures. See the instructive ground strap installation drawing.

Cables used with the Replicator 1100 and Tracer must be obtained from, designed, or approved by Burny.

Cables and leads shall be insulated. The insulation must be rated for the maximum voltage of insulated or un-insulated conductors that the cable does or could contact. If, after installation, there are unused connectors on the rear panel of the unit, the unused connectors must be covered with a plastic protective cap.

Metal ground clamps are used at each end of every cable to connect the cable shield to equipment casings. Wherever the shield is not snug within a clamp, the clamp should be gently crimped. Over-crimping can cause internal damage to the cable. The clamp must make snug contact with the shield around the full circumference of the cable.

Cable ends connected to the 1100 and Tracer should have shield clamps connected directly to the 1100 and Tracer cabinets. See the cable ground to back of cabinet drawing.

Cables ends connected to rack mounted encoders (H20 or H25 type) must have the shield clamp connected to the housing of the encoder. See customer instruction drawing for the rack mounted encoder ground clamp. Motor cables are handled in a like manner, as shown on the drawing for motor cable ground clamp installation.

Compliance with the AC line Conducted Emission portion of the EMC Directive of the EC is only possible if the 1100 is supplied with high quality power supplies for the solenoid and lifters. If the 1100 is powered with the supply of the cutting machine drive or other equipment, compliance with the Line Conducted Emission and other portions of the EC directive is then the responsibility of the drive or other equipment manufacturer.

All motors used with the Replicator must be supplied by Burny-Etek to insure compliance with the EMC Directive. If other than Burny-Etek supplied motors are used, it is the responsibility of the machine builder to test the motors in the system for compliance with the EMC Directive

### **3.3 INSTALLATION STEPS**

#### **3.3.1**

Upon receipt of the unit, unpack all pieces. Retain all packaging until it has been verified that there is no physical damage to the contents, and the system has been installed. The contents of each shipping container should be recorded by model number and serial number, if serialized. It is further recommended that packaging be saved in case of future upgrade or service shipping needs.

### 3.3.2

All pieces should be carefully inspected for shipping damage, loose parts, and, most importantly, exposed uninsulated electrical parts. Contact Burny immediately if any problems occur.

### 3.3.3

Set the AC line voltage jumper as described in this installation section.

#### **WARNING:**

Be sure the input voltage selection jumper is properly installed.

Incorrect installation of the input voltage selection jumper can cause erratic operation and damage the equipment.

### 3.3.4

Mount the tracer head to the machine as shown on drawing DO-21683. When determining the location for the 1100 and Tracer, keep in mind the following factors.

- accordance with the Environmental Operating Specifications of the 1100 and scanner
- away from sources of moisture
- avoiding undue sources of dust and other particles if possible
- located so that unit and operator are out of areas of travel
- unit and operator are away from zones through which objects may accidentally fall, roll, or slide
- away from sources of heat
- away from combustible vapors or gasses
- located so that cables can be routed safely to the unit
- sufficient clearance for cables to exit the cabinet
- access to rear panel to permit dis/connection of cables and reading of labels on rear panel
- field of view and physical environment of operator

### 3.3.5

Mount the Replicator CCD control unit to the machine using the mounting diagram. The unit must always be mounted on top of a flat surface, using

four mounting bolts, lockwashers, and nuts of 1/4-20 or M6 size. Use the hole pattern shown in the cabinet drawing of the 1100.

### **3.3.6**

Route the Tracer cable from the Tracer to the Replicator. Be sure that the 360 degree grounding clamps are installed properly at both ends and that connector screws are tight.

### **3.3.7**

Connect motors, lifters, solenoids, lifter power, solenoid power, input power, and any additional required external connections using the external connection diagram and system schematic for guidance.

### **WARNING:**

THE USE OF LIMIT SWITCHES OR EQUIVALENT, TO CONTROL TABLE EXCURSIONS, IS HIGHLY RECOMMENDED.

LIMIT SWITCHES ARE NECESSARY TO CONTROL THE TABLE IN ORDER TO AVOID INJURY TO PERSONNEL, AND DAMAGE TO THE EQUIPMENT.

### **3.3.8**

After all connections have been made and checked, apply power with the motors disengaged. Jog the machine to verify that directions are correct. If motors run backward or run away, correct the wiring polarity at the motors. Refer to Section 2.2 for operation instructions.

### **WARNING**

EVEN THOUGH THE EMERGENCY STOP BUTTON IS DEPRESSED, HIGH VOLTAGE MAY BE PRESENT INSIDE THE REPLICATOR ENCLOSURE, AND ON VARIOUS CIRCUITS THAT ARE CONNECTED TO THE REPLICATOR.

### **3.3.9**

Using templates, check the tracer in all its modes of operation using all control settings.

## **3.4 CHECKING THE INSTALLATION**

A check of the installation is recommended to ensure that safety, performance, and time are not lost. In CE installations, three specific tests must be performed on the completed installation:

- Non-accessibility Test,
- Performance Test,
- Insulation Resistance Test (greater than 0.5 MOhm measured from AC input to chassis.)

## **PART 3-INSTALLATION AND MAINTENANCE**

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The following list should be checked after any installation is complete. If possible, these types of checks should be assisted by a qualified person other than the persons that performed the installation.

- All holes in bottom of 1100 enclosure have been sealed to dust, obtrusive objects and fingers.
- Unused wires have been protected and insulated according to local standards.
- Electrically live parts are all protected from access by enclosures or barriers.
- No loose or missing parts, including screws, especially 1100 front panel screws.
- Burny has been informed of all problems with the hardware.
- Environment within Burny operation specifications.
- Away from sources of moisture.
- Equipment away from combustible vapors and gases.
- Equipment adequately distanced from high-heat sources.
- Area dust and particulate level satisfactory.
- Operator and equipment away from areas where objects fall, slide, roll, etc.
- Operator's view of work and equipment satisfactory.
- Operator and equipment out of way of travel.
- Cables routed to avoid damage after the installation.
- No excessive cramping or stretching of cables.
- Rear panel of unit accessible enough to see and to change cables.
- Operator not subjected to unsafe or unnecessarily stressful conditions.
- Wire size for AC and DC mains should be AWG 18 or larger.
- Each cable is supplied by, designed by, or approved by Burny
- The system and all other electrical devices associated with and in the proximity of the system have been properly grounded.
- Both ends of every cable have a ground clamp attached snugly to the cable shield.
- Every ground clamp is attached to its component enclosure in the proper manner.

## **FUNCTIONAL TESTING OF THE SYSTEM AFTER INSTALLATION**

Functional testing of the Replicator 1100 CCD and Tracer after installation is recommended. Each installed system can have a unique design, therefore a unique test may be required for the installed system. The test should be designed to ensure that:

- ✓ All equipment has been properly integrated into the system.
- ✓ The 1100 and Tracer are suitable for and function correctly in their environment.
- ✓ Protective devices and control devices operate as intended.
- ✓ The 1100 and Tracer are compatible with other equipment.
- ✓ The 1100 and Tracer can perform to specifications when interconnected.
- ✓ The 1100 and Tracer have sufficient range in their controls.

## **3.5 SERVICE AND MAINTENANCE**

### **3.5.1 INTRODUCTION**

Most maintenance required on the Replicator CCD will be either a lamp replacement or repetition of procedures called out in Part 4, Tracer Calibration.

If a suspected malfunction is observed, refer to the proper section of this manual to help verify the observed problem is a malfunction.

### **WARNING:**

Service must only be performed by trained, authorized personnel.

Generally, components for the 1100 system are not repairable by the user. In the case of malfunction of the system, Burny service personnel shall be consulted to assist in isolating the component(s) causing the problem. If a component has sustained damage, the involved assembly is usually returned to the factory and a replacement assembly shipped to the user.

The user is cautioned concerning activities directed toward finding components that are malfunctioning. Without updated schematics, diagnostic equipment and training, field engineers run the risk of damaging more components than were initially damaged. This could extend down-time and repair expense. Always contact Burny Service when damage has occurred, in order to prevent further electrical damage. Burny Service personnel can often assist via telephone concerning the advisability of swapping parts that are already on site. Avoidance of damage to the swapped-in part is a consideration here.



The on-site person can be most valuable in diagnosing problems:

- Being familiar with equipment and user manual.
- Knowing conditions and events at time of failure.
- Being familiar with normal operation.
- Observing and reporting damage accurately.

### 3.5.2 LAMP REPLACEMENT

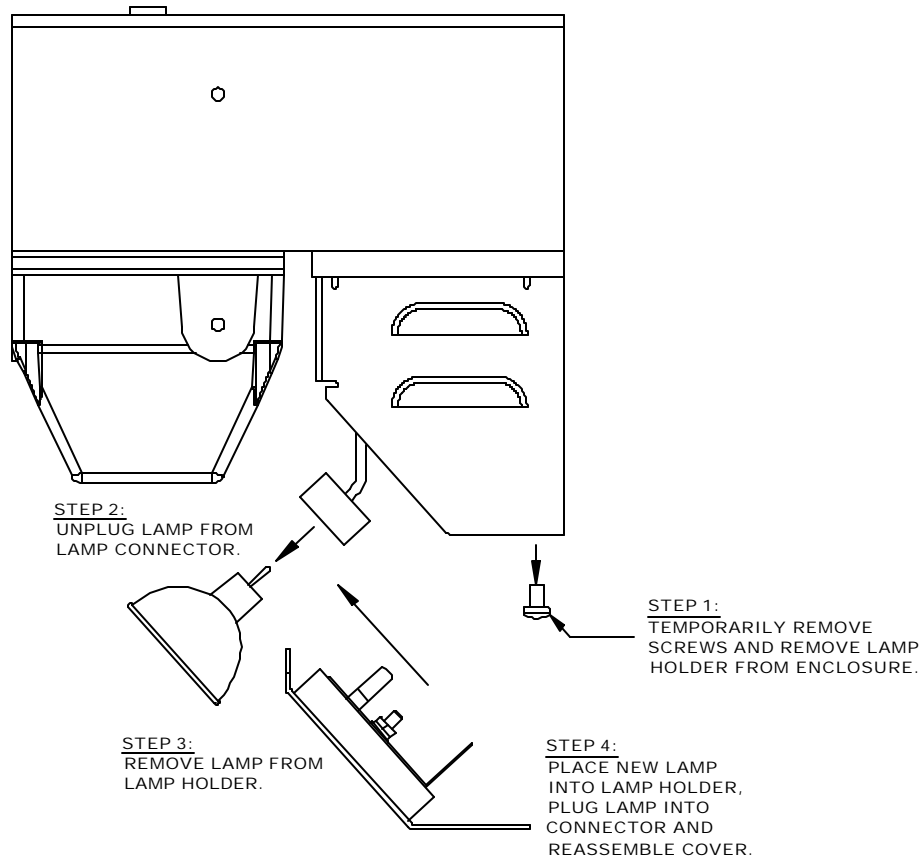
#### **WARNING**

EVEN THOUGH THE EMERGENCY STOP BUTTON IS DEPRESSED, HIGH VOLTAGE MAY BE PRESENT INSIDE OF THE REPLICATOR ENCLOSURE, AND ON VARIOUS CIRCUITS THAT ARE CONNECTED TO THE REPLICATOR.

If the illuminating light does not come on, remove power from the Tracer and engage the E-Stop. Proceed with the first two steps called out in Figure 3.1 below. Take care not to touch the bulb itself with your fingers. Touching the bulb itself will severely degrade the life expectancy, due to contamination of the glass.

Use the multi-meter to check for continuity of the filament. If the filament is open, proceed with steps 3 and 4 below. If the filament is good, check the power source.

The bulb must be replaced with CMC part number X01-31357 only. Using any other bulb could cause damage to the unit or erratic operation.



**Figure 3.1 – Lamp Replacement**

### 3.5.3 TOOLS

Special tools are not required for installation and maintenance of the 2.5RS. In the unusual event that a user is to construct or repair a Burny supplied cable, proper crimping and extraction tools will be specified by Burny .

### 3.5.4 PARTS

Contact Burny Service to obtain needed parts. Always use replacement parts that are supplied, designed, or approved by Burny . Some users choose to keep various parts on-site in case of a sudden need. Spare parts for this purpose are not supplied with purchased equipment. (Some extra fuses and fuse-holders may be supplied with the original purchase). However, replacement parts may be purchased from Burny for this purpose. Burny Service personnel can give advice as to which replacement parts are best to have on hand. A list of available replacement parts and assemblies can be found in Part 6, REPLACEMENT ITEMS, in this manual.

### **PART 4 TRACER CALIBRATION**

#### **4.1 INTRODUCTION**

The Tracer Calibration consists of the Logic Board Calibration and Testing, the Camera Rotation Adjustment, and the Maximum Speed Setting. The Special Key Functions are used in some of these procedures.

#### **4.2 LOGIC BOARD MO-12199 CALIBRATION AND TESTING**

##### **WARNING**

EVEN THOUGH THE E-STOP BUTTON IS DEPRESSED, HIGH VOLTAGE MAY BE PRESENT INSIDE OF THE REPLICATOR ENCLOSURE, AND ON VARIOUS CIRCUITS THAT ARE CONNECTED TO THE REPLICATOR.

This procedure covers Replicator CCD Logic Board Calibration adjustments and input/output testing.

Equipment needed:

- Multimeter
- Template with 1 mm and 4 mm lines (See *Part 6* for template.)

The logic board uses state of the art microprocessor technology to perform all tracing functions and all calibration is performed in software. There are three adjustments related to front panel controls that can be performed if needed. There are several inputs and outputs available for various cutting related functions, some of these can be used to provide additional control of the cutting process using additional external circuitry.

The GND Reference for all measurements is "0V" and can be located on the metal chassis of connector "J10" on the logic card. If the REPLICATOR CCD is connected to a Burny CNC, make sure the Burny is not in "NC RUN".

##### **4.2.1 POWER SUPPLY CHECKOUT**

1. Verify that the main lamp flashes momentarily and then the tracer head target LED is illuminated during initial power-up. The three front panel LED's should also be illuminated solid green.
2. Check for +6V (+/- 0.01) on pin #8 of IC "ISO2A".
3. Check for -6V (+/- 0.01) on pin #5 of IC "ISO2A".

4. Check for +12V (+/- 0.5) on output side (right lead) of 7812 regulator "U18".
5. Check for +3.3V (+/- 0.07) on + lead of capacitor "C91".
6. Check for +1.5V (+/- 0.04) on + lead of capacitor "C85".

#### **4.2.2 LOGIC BOARD ADJUSTMENTS:**

1. The kerf center adjustment is used to zero out minor differences in the kerf pot circuitry and pot rotational errors. This adjustment is done at the factory but must be repeated if the logic board or Kerf potentiometer is replaced.

To perform this adjustment center the kerf pot on the "0" dial position. Press the right yellow keypad button, F3, and the red stop "0" button simultaneously. If the center LED is not on, adjust the internal kerf center pot (P3) until the center LED is on.

#### **NOTE:**

The center LED may flicker back and forth to one or both of the side LED's. This is normal. Press the red Stop "0" button when completed to reset the unit.

2. The low speed adjustment is used to set the maximum low speed when the speed switch is set to low. This adjustment is factory set for 1/2 the high speed setting.

To change this setting, adjust the internal low speed pot (P1) until the desired maximum low speed is obtained.

To reset this adjustment to the 1/2 speed factory setting, connect a dc voltmeter from "GND" to the wiper of the front panel speed pot that can be located on pin # 9 of connector "J1". With the machine stationary, rotate the front panel speed pot to 10 (full speed) and set the speed switch to LOW. Adjust the internal low speed pot (P1) until the voltmeter reads +1.65 V.

3. The internal corner speed pot is only used on units that do not have a front panel corner speed pot available. This setting is done internally and cannot be adjusted by the operator. Also this setting has minimal effect on the front panel corner speed pot units.

The internal corner speed pot is factory set for 1/3 of actual speed based on the high speed position only. The LOW speed switch position has no effect on the corner speed setting.

To adjust the internal corner speed pot setting, place the unit in corner marker slowdown. Start tracing a solid filled silhouette pattern or a pattern



Max Speed		Dipswitch					
Inches/min	mm/min	5	4	3	2	1	0
<b>26.5</b>	<b>672</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>29.7</b>	<b>754</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>32.9</b>	<b>836</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>36.1</b>	<b>918</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>39.4</b>	<b>1000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>42.6</b>	<b>1082</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>45.8</b>	<b>1163</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>49</b>	<b>1245</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>52.2</b>	<b>1327</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>55.5</b>	<b>1409</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>58.7</b>	<b>1491</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>61.9</b>	<b>1573</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>65.2</b>	<b>1655</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>68.4</b>	<b>1737</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>71.6</b>	<b>1819</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>74.8</b>	<b>1901</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>78.1</b>	<b>1983</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>81.3</b>	<b>2065</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>84.5</b>	<b>2147</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>87.8</b>	<b>2229</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>91</b>	<b>2311</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>94.2</b>	<b>2393</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>97.4</b>	<b>2474</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>100.6</b>	<b>2556</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

## PART 4-TRACER CALIBRATION

Max Speed		Dipswitch					
Inches/min	mm/min	5	4	3	2	1	0
<b>103.9</b>	<b>2638</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>107.1</b>	<b>2720</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>110.3</b>	<b>2802</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>113.5</b>	<b>2884</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>116.8</b>	<b>2966</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>120</b>	<b>3048</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>135</b>	<b>3429</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>150</b>	<b>3810</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>165</b>	<b>4191</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>180</b>	<b>4572</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>195</b>	<b>4953</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>210</b>	<b>5334</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>225</b>	<b>5715</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>240</b>	<b>6096</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>255</b>	<b>6477</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>270</b>	<b>6858</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>285</b>	<b>7239</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>300</b>	<b>7620</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>315</b>	<b>8001</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>330</b>	<b>8382</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>345</b>	<b>8763</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>360</b>	<b>9144</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>375</b>	<b>9525</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>390</b>	<b>9906</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>

Max Speed		Dipswitch					
Inches/min	mm/min	5	4	3	2	1	0
<b>405</b>	<b>10287</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>420</b>	<b>10668</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>435</b>	<b>11049</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>450</b>	<b>11430</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>465</b>	<b>11811</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>480</b>	<b>12192</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>495</b>	<b>12573</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>510</b>	<b>12954</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>525</b>	<b>13335</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>540</b>	<b>13716</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>555</b>	<b>14097</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>570</b>	<b>14478</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>585</b>	<b>14859</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>600</b>	<b>15240</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>

**NOTE: If your machine falls in between speeds listed above, choose the setting for the closest speed. If your machine falls very close to exactly between two settings, you may want to experiment with the two settings to see if one gives better tracing results than the other. It is not likely that being off by one setting will have a noticeable impact on tracing performance, but it is highly recommended to set this up as accurately as possible.**

Record the Maximum Speed and the corresponding dipswitch settings for future reference.



### 4.2.4 CAMERA ROTATION ADJUSTMENT

#### *INTRODUCTION*

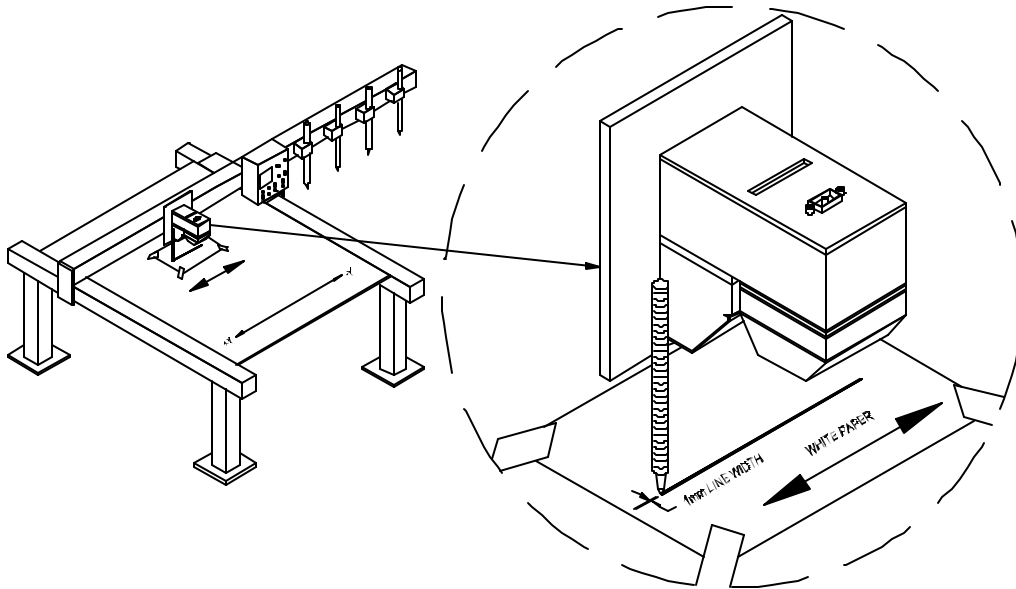
The Camera Rotation Adjustment performed at the factory will usually be sufficient for a field installation. In the event that the camera is removed from the unit or the head assembly mounting plate is not parallel to the “Y” axis, then this adjustment must be performed.

#### *DETAILS*

##### **CHECK CURRENT SETTING**

To check the Camera Rotation Adjustment, tape a white sheet of paper to the tracing table as shown in the figure below. Then take a black Sharpie-type of marker and hold or tape it against the tracing head with the tip touching the paper. Move the machine in the Y axis to strike a horizontal line approximately 1mm wide and a minimum of 100 mm long. The line must be parallel to the Y axis.

Remove the pen. Jog the head away from the line and stop. Setup for a Trace Left and lead into the center of the line. Press the Stop button when the head is over a continuous section of the line. Push the “RED STOP” and “RIGHT ARROW” buttons together. If the center LED is illuminated then this adjustment is not needed. If either the right or left LED is illuminated, perform the adjustment described below.



**Figure 4.1 – Reference Trace Generation**

## **ADJUSTMENT**

Turn the unit off. Remove the nose cone per the “tracer head camera rotation alignment detail” in Figure 4.2 and loosen the two mounting plate screws. Place a sheet of white paper in front of the illumination lamp to reduce the light reaching the camera.

Turn the unit back on and push the “RED STOP” and “RIGHT ARROW” buttons together. Rotate the camera until the center LED is solid GREEN with right and left LED’s off. Tighten the mounting plate screws and re-assemble the unit.

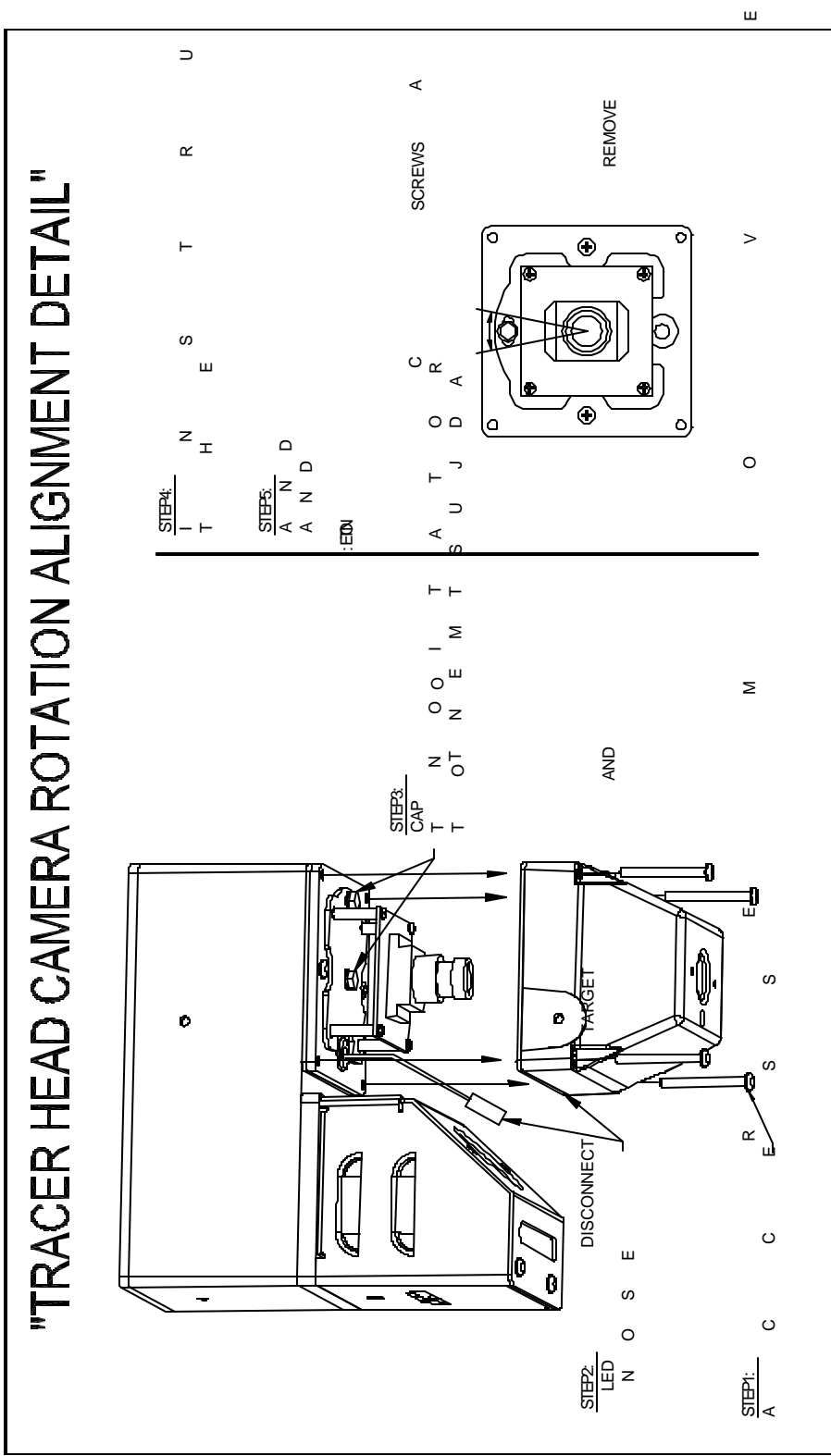


Figure 4.2 – Camera Rotation Alignment

## 4.2.5 SPECIAL KEY FUNCTIONS

Mode	Activation Keys	LED Status	Notes
Display Software Version	<b>F1 + STOP</b> together	Blink software version number (in binary) on LED1.	Short blink = 0, long blink = 1
Light On / Off	<b>F1 + F3</b> together		Toggles halogen light on and off. Does not toggle targeting LED. Active only before a trace begins.
Offset Adjust	<b>F2 + STOP</b> together	LED2 slow blink GREEN.	Turns on X and Y enables with XDRIVE and YDRIVE set to zero to allow XO and YO adjustments.
Camera focus adjust	<b>F1 + F3</b> together to turn on lamp.		Connect monitor to Video on Logic card. With nose cone assembly removed from the tracer head and head mounted to proper height from table, place pattern on table and rotate camera lens until best focus is achieved.
Camera Center adjust	<b>STOP + RIGHT ARROW</b>	Adjust camera rotation until center LED is solid GREEN. Right and Left LED's will be flashing GREEN if camera is not centered.	Place blank white paper on table under tracer head and using pen attached to Y axis, strike a horizontal line approx. 1mm wide and 100mm long (min.). Then lead into the middle of the line and STOP when line is acquired. Push STOP + RIGHT ARROW buttons then loosen and rotate camera mounting plate until center LED is solid green. Re-secure mounting plate. <b>Note:</b> early versions of software may require pushing F1 + F3 to turn on lamp before running this procedure.
Kerf Center adjust	<b>F3 + STOP</b> together	LED2 turns GREEN or flickers GREEN when adjustment is correct	Center front panel kerf pot. If LED1 OR LED2 are GREEN, adjust internal "kerf center" pot until LED2 turns GREEN or flickers GREEN. See Section 4.2.1, Step 1.

Note: Press STOP to exit special key functions.

### 4.3 120W PWM DRIVE CALIBRATION

This procedure covers servo drive calibration for units equipped with a 120W PWM I/O power assembly (MO-10773 or MO-12565).

#### Equipment needed:

Multimeter  
Frequency Counter  
Two-channel Oscilloscope

For the following adjustment the tracing head and the drive motors must be connected. The GND Reference for all measurements is "0V" (TP1) located on the I/O power assembly MO-10773 or MO-12565. If the REPLICATOR CCD is connected to a Burny CNC, make sure the Burny is not in "NC RUN".

#### 4.3.1 POWER SUPPLY ADJUSTMENTS

(I/O power assembly MO-10773 or MO-12565)

1. Switch on the control. All three LEDs must be on.
2. The following voltages must be checked:
  - + 24V regulated, pin 10 of IC17
  - + 30V filtered, pin 17 of IC14
3. Set +6V ( $\pm 0.01$  V) at J4 pin 1 on MO-12199 (Logic Card) with the "+6 ADJ" spindle trimmer (P2).
4. Set -6V ( $\pm 0.01$  V) at J4 pin 34 on MO-12199 (Logic Card) with the "-6 ADJ" spindle trimmer (P3).

#### 4.3.2 SERVO DRIVE ADJUSTMENTS

(I/O assembly MO-10773 or MO-12565)

##### Deadband Adjustment (P12, P13):

Connect dc voltmeter between M1 and M2 on the rail motor. Short "COM" (TP1) to "X" (TP2). Set the SPEED knob to 1 or higher and the selector switch to HIGH. Enable (jog) the X axis. Adjust "XD" (P12) until voltage appears on the meter, then back off until the voltage is 0.01VDC ( $\pm 0.001$ VDC). Repeat the procedure with the cross motor by shorting "COM" (TP1) to "Y" (TP3) and adjusting "YD" (P13). Remove shorts.

**Offset Adjustment (P4, P5):**

To turn on both drive enables, push the yellow center button on the keypad and the red "0" stop button simultaneously. Adjust "XO" (P4) to remove any drift in the rail motor, Then adjust "YO" (P5) to remove any drift in the cross motor. Push the red "0" stop button to reset the drive enables.

**Velocity Adjustment (P10, P11):**

Jog the machine in the rail (X) direction while monitoring the machine speed. Adjust "XV" (P10) for maximum desired speed. Repeat for cross (Y) direction using "YV" (P11) to adjust speed.

**Current Adjustment (P1):**

Place "J1" in the "4A" position. Connect dc voltmeter between "COM" (TP1) and pin 5 of IC1. For MO-10773, adjust P1 to get +1.25V ( $\pm 0.01V$ ). For MO-12565, adjust P1 to get a voltage between +0.95 Vdc and +1.00 Vdc.

**Stability Adjustment (P6, P7):**

Adjust "XS" (P6) and "YS" (P7) clockwise until the motors run quietly (no unstable, high frequency noise).

**Notch Filter adjustment (P8, P9):**

The notch filter is used to remove low frequency oscillations which may occur when the machine makes sudden changes in direction, such as when maneuvering a corner. The filters can be put into or left out of the loop by selection of the appropriate jumper settings on PL2 (See JUMPER SETTINGS BELOW). Adjust "XN" (P8) and "YN" (P9) until the notch filters eliminate the machine oscillation. The adjustments may be different for the rail and the cross axis.

**4.3.3 JUMPER SETTINGS (I/O assembly MO-10773 or MO-12565):**

"J1": Selects the maximum continuous operating current of the drive, select either "4A" (4 Amps) or "2A" (2 Amps).

"J2": Selects the type of limit switch contacts on the machine. Select either "NO" (normally open) or "NC" (normally closed), which refers to the state of the contacts when the machine is not on a limit switch.

"J3": Selects between "BRAKE" or "COAST" to a stop when a limit switch is encountered.

"J4": Must be in the "B" position.

"J5": Must be in the "B" position.

## PART 4-TRACER CALIBRATION

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<b>OPTION PLUG (PL2) JUMPER SETTINGS</b>	
<b>Configuration</b>	<b>PL2 Jumper Settings</b>
No Notch Filters	Jumper: 1-3, 2-4, 5-7, 6-8
With Notch Filters	Jumper: 1-3, 5-7, 13-14, 15-16

**BLANK**



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## **PART 6- REPLACEMENT ITEMS**

### **PART 6 REPLACEMENT ITEMS**

#### **6.1 REPLACEMENT ASSEMBLIES**

<b>ITEM: MYX-12384</b>	
<b>REP 1100 CCD, 120W, 6 DC LIFTER</b>	
<b>ITEM</b>	<b>DESCRIPTION</b>
MO-12631	1100/1300 POWER HARNESS
MO-07308	1100/1300 TRACER CONTROLS HARN
MO-08112	REP. 1000 SERIES CLUTCH OPTION
MO-08648	REP 1100/1300 RELAY CARD 6 DC
MO-08671	1100/1300 6 TORCH CUT HARNESS
MO-08672	1000 120W TACH HARNESS
MO-08674	1100/1300 6 DC LIFTER HARNESS
MO-12630	HARN. REP 120W BUS/MOTOR
MO-12565	REP 120 W PWM DRIVE CARD
MO-12199	CONTROL ASS'Y CCD LOGIC CARD
MO-12291-09	WIRE HARN, TRACER SPD POT, 9IN
MO-12472-24	CABLE, CCD TRACER INTERNAL WIRE HARNESS FROM LOGIC BOARD TO EXTERNAL HEAD ASSEMBLY CABLE
MO-12569	REP. KEYPAD PCB W/WIRES, GRN LED

**ITEM: MYX-12383****REP 1100 CCD, 120W, 6 AC LIFTER**

<b>ITEM</b>	<b>DESCRIPTION</b>
MO-12631	1100/1300 AC POWER HARNESS
MO-07308	1100/1300 TRACER CONTROLS HARN
MO-08112	REP. 1000 SERIES CLUTCH OPTION
MO-08647	REP 1100/1300 RELAY CARD 6 AC
MO-08671	1100/1300 6 TORCH CUT HARNESS
MO-08672	1000 120W TACH HARNESS
MO-08675	1100/1300 6 AC LIFTER HARNESS
MO-12630	HARN. REP 120W BUS/MOTOR
MO-12565	REP 120 W PWM DRIVE CARD
MO-12199	CONTROL ASS'Y CCD LOGIC CARD
MO-12291-09	WIRE HARN, TRACER SPD POT, 9IN
MO-12472-24	CABLE, CCD TRACER INTERNAL WIRE HARNESS FROM LOGIC BOARD TO EXTERNAL HEAD ASSEMBLY CABLE
MO-12569	REP. KEYPAD PCB W/WIRES, GRN LED,

## PART 6- REPLACEMENT ITEMS

### 6.2 REPLACEMENT PARTS

<b>ITEM: MYX-12384</b>	
<b>REP 1100 CCD, 120W, 6 DC LIFTER</b>	
<b>ITEM</b>	<b>DESCRIPTION</b>
A16-21477	SWITCH,TOGGLE, ON-NONE -MOM
A16-21479	SWITCH,TOGGLE, ON-OFF-MOM,
A16-21480	SWITCH,TOGGLE, ON-OFF-ON, .25QC
A16-21605	SWITCH,TOGGLE, ON-NONE -ON .25QC
C14-32290	TRANSFORMER, 1000 CCD MAIN, 115/230V PRI, DUAL SECONDARY,44CT @ 3A (132VA) AND 12V @ 2.5A (30VA)
C44-21838	KEYBOARD, 1000 SERIES TRACER
X01-31357	ILLUMINATION LAMP
X16-09149	CONT 1NC 115 VAC 10 A
X16-18570	SWITCH,TOGGLE, 2PDT,MOM-OFF-MOM
X16-21475	PB,IDEC 7/8",MOM,1NC,RED,
X16-21476	PB,IDEC, 7/8",MOM,1NO,BLK/RED/
X16-22048	SW, TOGGLE, ON-OFF-ON, 10A,
X21-29737	FUSE, SloBlo IEC TYPE T, 6.3 A
X21-32441	FUSE, SloBlo IEC TYPE T, 1.6 A
X23-00123	POT,1T 500. OHM 2.W
X23-00408	POT,1T K 25. OHM 2.W
X23-24701	POT, 1 TURN 1M OHM, 1 WATT
X44-32440	LINE FILTER

**ITEM: MYX-12384****REP 1100 CCD, 120W, 6 AC LIFTER**

<b>ITEM</b>	<b>DESCRIPTION</b>
A16-21477	SWITCH,TOGGLE, ON-NONE -MOM
A16-21478	SWITCH,TOGGLE, MOM-OFF-MOM
A16-21479	SWITCH,TOGGLE, ON-OFF-MOM,
A16-21480	SWITCH,TOGGLE, ON-OFF-ON, .25QC
A16-21605	SWITCH,TOGGLE, ON-NONE -ON .25QC
C14-32290	TRANSFORMER, 1000 CCD MAIN, 115/230V PRI, DUAL SECONDARY,44CT @ 3A (132VA) AND 12V @ 2.5A (30VA)
C44-21838	KEYBOARD, 1000 SERIES TRACER
X01-31357	ILLUMINATION LAMP
X16-09149	CONT 1NC 115 VAC 10 A
X16-21475	PB,IDEC 7/8",MOM,1NC,RED,
X16-21476	PB,IDEC, 7/8",MOM,1NO,BLK/RED/
X16-22048	SW, TOGGLE, ON-OFF-ON, 10A,
X21-29737	FUSE, SloBlo IEC TYPE T, 6.3 A
X21-32441	FUSE, SloBlo IEC TYPE T, 1.6 A
X23-00123	POT,1T 500. OHM 2.W
X23-00408	POT,1T K 25. OHM 2.W
X23-24701	POT, 1 TURN 1M OHM, 1 WATT
X44-32440	LINE FILTER

***PART 7 DRAWINGS***

**BLANK**