

INSTRUCTIONS and PARTS MANUAL

SE-4PTD PROGRAMMABLE PASS THROUGH

Please record your equipment identification information below for future reference. This information can be found on your machine nameplate.

Model Number _____

Serial Number _____

Date of Purchase _____

Whenever you request replacement parts or information on this equipment, always supply the information you have recorded above.

LIT-SE4PTD-IPM-0719

Bug-O Systems is committed to empowering our customers by providing operator controlled mechanized solutions for their welding, cutting and custom applications.



B U G - O S Y S T E M S

A DIVISION OF WELD TOOLING CORPORATION



280 TECHNOLOGY DRIVE CANONSBURG, PENNSYLVANIA 15317-9564 USA
PHONE: 412-331-1776 <http://www.bugo.com> FAX: 412-331-0383

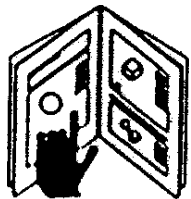
SAFETY

PROTECT YOURSELF AND OTHERS FROM SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.



ELECTRIC SHOCK CAN KILL.

- 1) The equipment is not waterproof. Using the unit in a wet environment may result in serious injury. Do not touch equipment when wet or standing in a wet location.
- 2) The unused connectors have power on them. Always keep the unused connectors covered with the supplied protective panels. Operation of the machine without the protective panels may result in injury.
- 3) Never open the equipment without first unplugging the power cord or serious injury may result.
- 4) Verify the customer supplied power connections are made in accordance with all applicable local and national electrical safety codes. If none exist, use International Electric Code (IEC) 950.
- 5) Never remove or bypass the equipment power cord ground. Verify the equipment is grounded accordance with all applicable local and national electrical safety codes. In none exist, use International Electric Code (IEC) 950.



READ INSTRUCTIONS.

Read the instruction manual before installing and using the equipment.



MOVING PARTS can cause serious injury.

- 1) Never try to stop the pinion from moving except by removing power or by using the STOP control.
- 2) Do not remove any protective panels, covers or guards and operate equipment.



FALLING EQUIPMENT can cause serious personal injury and equipment damage.

Faulty or careless user installation is possible. As a result, never stand or walk underneath equipment.



PLASMA CUTTING can produce destructive High Voltage at High Frequency.

- 1) If using plasma, see that the machine as well as the plasma power source is properly grounded.
- 2) Do not use older model plasma machines meant for manual operation. These can leak high frequency at high voltages, which can cause dangerous shock, as well as destroy control circuits.
- 3) Read the instruction manual page on plasma cutting carefully, and follow all precautions.

HIGH FREQUENCY WARNINGS

SPECIAL PRECAUTIONS ARE REQUIRED WHEN USING PLASMA, TIG OR ANY WELDING PROCESS THAT USES HIGH FREQUENCY TO STRIKE AN ARC.



WARNING: HIGH FREQUENCY CAN EFFECT MACHINE OPERATION AND THEREFORE, WELD QUALITY.

Read the precautions below before installing and using the equipment.

PRECAUTIONS:

- 1) Some plasma or welding cables are strong sources of high frequency interference. NEVER lay a plasma or welding cable across the controls of the machine.
- 2) Always physically separate the plasma or welding cable leads from the machine cables. For example, the plasma or welding cable leads should NEVER be bundled with a pendant cable or the machine power cord. Maximize the separation between any machine cables and the plasma or welding cables.
- 3) Strictly follow the grounding procedures specified for the plasma or welding unit. NOTE: Some plasma and welding units produce exceptionally large amounts of high frequency noise. They may require a grounding rod be driven into the earth within six feet (2 meters) of the plasma or welding unit to become compatible with an automatic cutting or welding process.
- 4) If the high frequency is produced using a spark gap, adjust the points so the gap is as small as possible. The larger the gap, the higher the voltage and the higher the interference.
- 5) Some plasma or welding units will inject high frequency interference into the AC power line. Use separate power line branches whenever possible to power the plasma or welding source and the machine. Do not plug them into the same outlet box.
- 6) High frequency noise may enter the machine through the plasma or welding supply remote contactor leads. Some plasma and welding sources can produce noise spikes of up to several thousand volts. These sources are not compatible with automated cutting and welding equipment. It is recommended that the remote contactor leads on these plasma or welding sources not be connected to the machine. An alternate solution is to purchase a separate remote contactor isolation box.

SE-4PTD

INSTRUCTIONS AND PARTS MANUAL

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Patents Pending

INTRODUCTION

The Programmable Pass Through machine automates the end preparation of pipes for fabrication using a program that makes saddle cuts, offset (hillside) cuts, lateral cuts and mitre cuts. The SE-4PTD rotates a pipe held in its three-jaw chuck while driving a cutting torch back and forth along the pipe axis, so that the torch cuts a contour on one pipe to fit onto another pipe of larger diameter. Pipes from 4" (100 mm) to 12.5" (318 mm) outside diameter can be chucked internally in the machine. Smaller pipes require optional extension jaws. The SE-4PTD is suitable for plasma and oxy-fuel cutting and eliminates the need to make templates or layout complex cuts.

DESCRIPTION

The SE-4PTD is designed to sit on a work table. The machine can be used with oxy-fuel torched or plasma. If the machine is set up for oxy-fuel cutting, the 3-hose cutting torch is connected to the solenoid manifold located on the left hand side of the machine. If the machine is set up for a plasma torch, it will be equipped with a rotary ground and holding clams for a plasma torch. The suggested method of plasma cutting will be air plasma. Power requirements are 240 VAC single phase and a clean air supply for the plasma source. The SE-4PTD should be operated from a separate power line; it can be supplied for voltage ratings of 120, or 240 VAC.

Panel controls include Start, Stop, and Reset push buttons, a joystick for manual positioning, and speed control knob which are shown on page 4, Panel Controls. All programming is done using a hand held terminal, with keypad and display. (See page 9).

SET-UP

Place the SE-4PTD on a work table, preferable bolting it down through the mounting holes located in the legs of the machine. Plug the power cord into the power line. The torch arm should be already inserted into the linear drive located on top of the SE-4PTD. If it is not, throw the power switch on, and *carefully* insert the slide into the V-wheels inside the linear drive from the chuck end. Then, using the manual joystick control, drive the arm back in to the machine. Push the reset button so the machine holds its position.

Insert the cutting torch into the torch holder by loosening the clamping lever and adjusting its position so that the torch is centered in line with the chuck axis. Then, lock the torch holder in place.

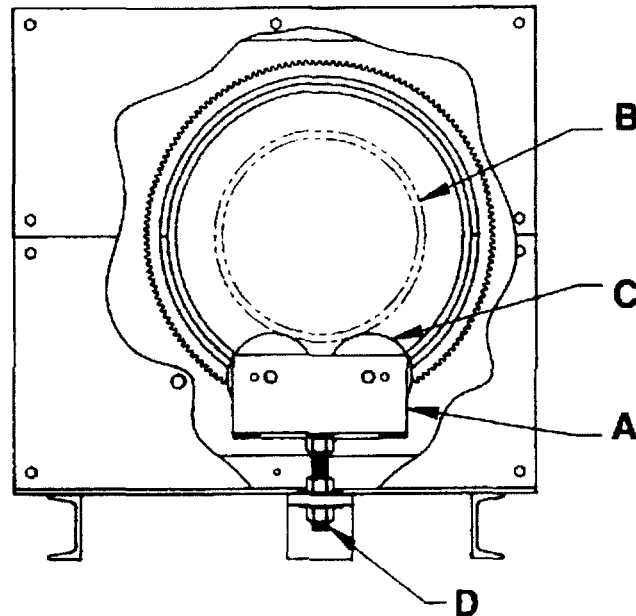
For plasma, mount the relay contact box on the short post located on the top right hand side of the machine above the control panel. Plug the relay into the contact output. Wire the trigger leads for the plasma machine to the supplied connector and plug into the relay box.

Loop the gas hose or plasma cable over the cable hanger located on the top right hand side of the machine above the control panel, for support. Plug the programming pendant cable into the 6-pin connector located on the control panel.

The adjustable pipe support (A) is attached to the rear of the machine, for use with long pipes, to help keep the pipe (B) aligned (see below). Make sure to adjust the height of the rollers (C) so that the pipe runs true when rotating. Two threaded rods are provided for different diameter ranges; use the 4 1/4" (108mm) rod (D) for diameters from 8" (203mm) to 12" (305mm) and the 7 1/4" (184mm) rod for diameters from 4" (102mm) to 8" (203 mm).

The SE-4PTD is now ready to be programmed for operation.

PIPE SUPPORT



SE-4PTD REAR VIEW PLASMA CUTTING

The SE-4PTD can be used successfully for plasma cutting; however it is important to take certain precautions to avoid interference and protect the control circuits. (These comments also apply to the TIG welding or any process that uses high frequency to strike an arc.) An external relay box is available separately or in the welding kit to provide the contact signal to the plasma source.

PRECAUTIONS:

1. NEVER lay the plasma gun cable across the top of the machine. The further away from the machine it can be routed and supported, the better.
2. See that all grounding procedures specified for the plasma source are followed diligently.
3. If the high frequency is produced using a spark gap, adjust the points so that the gap is as small as possible. The larger the gap, the higher the voltage and stronger the interference.
4. We strongly recommend you disconnect the Hand Held Terminal (programming pendant) when running the machine. Any length of wire acts as an antenna to receive HF radiation, and though the cable is shielded, it is possible for some induced voltage to leak through.
5. Use separate power line branched whenever possible to power the plasma source and the machine. Do not plug them into the same outlet box.
6. Though there is an internal power line filter, an external protective device will always help. Computer equipment line protection boxes are readily available at low cost, with surge suppression and line filtering circuitry. The machine can be plugged into the power line through one of these boxes.

PANEL CONTROLS

The function of various buttons and knobs on the control panel are described below:

START (Black push-button):

Computer control is interrupted when pushed until the start button or Reset button is pushed. If pushed while running, the torch is shut of and the SE-4PTD stops. Pushing the start button again will resume the cut. When Stop is pushed, the machine can be manually positioned by the joystick switch; this does not change the home reference position unless the Rest button is again pushed.

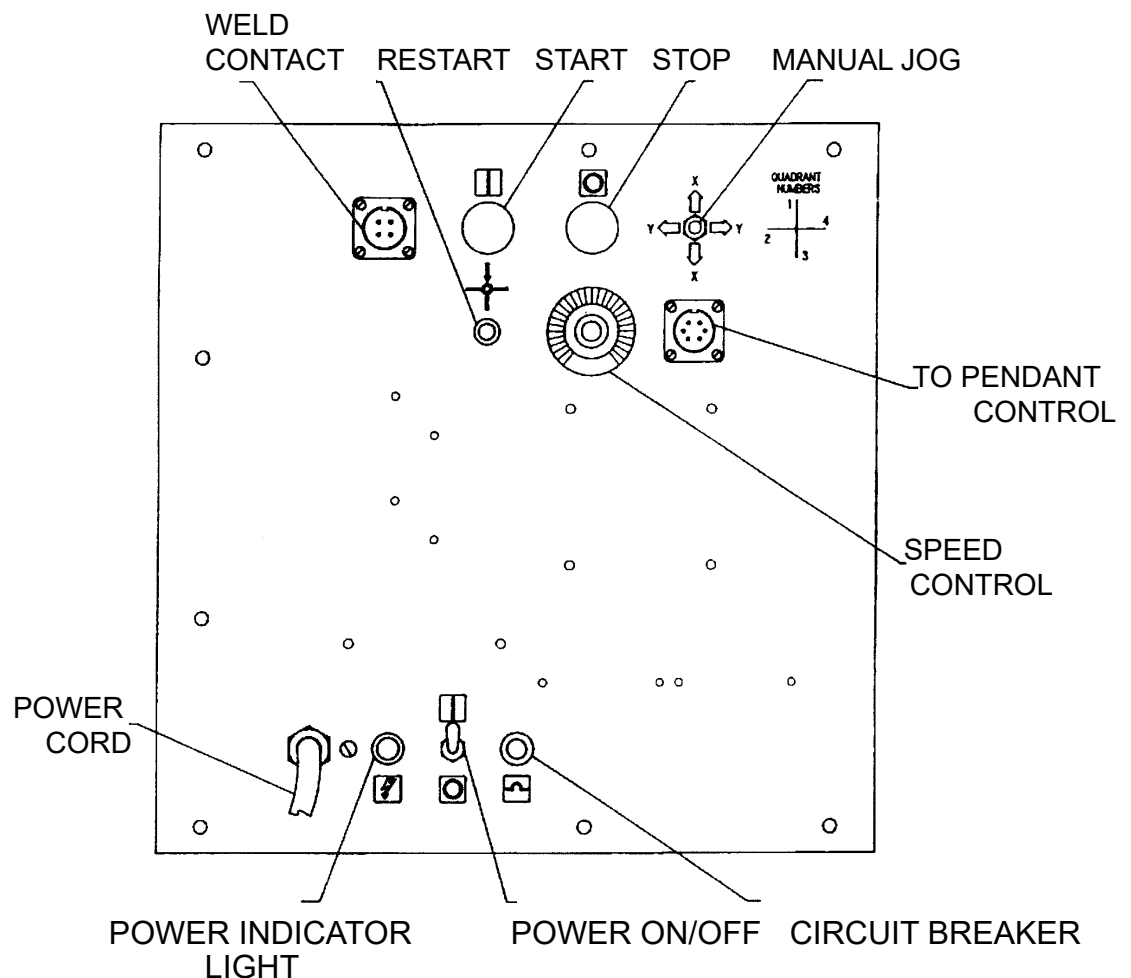
RESET (Small push-button):

Reset the computer when pushed and makes whatever position the machine is in the home reference position. If the torch or pipe is moved by the joystick, upon releasing it, the SE-4PTD will return to the home position.

SPEED knob:

Controls the tangential speed of the torch along the cut, from zero to maximum. The speed will depend on the diameter of the pipe. When the torch arm is moving in or out, the rotational speed will slow down to keep the resultant speed constant.

SE-4PTD PANEL CONTROLS



OPERATION

To make a cut:

1. Set up the SE-4PTD with pipe in position and power up.
2. Program the desired cut. (Refer to the instructions under programming.)
3. Push the red Stop button and use the joystick to manually move to the starting point.
4. Push the Reset button to fix the starting point here.
5. For oxy-fuel, turn on and ignite the pre-heat gases, and wait until is hot enough to start the cut. Push the Start button; the solenoid for cutting oxygen or plasma trigger is turned on and the machine starts the cut (after the delay which has been set for plasma).

NOTE: TYPE 4, MITRE

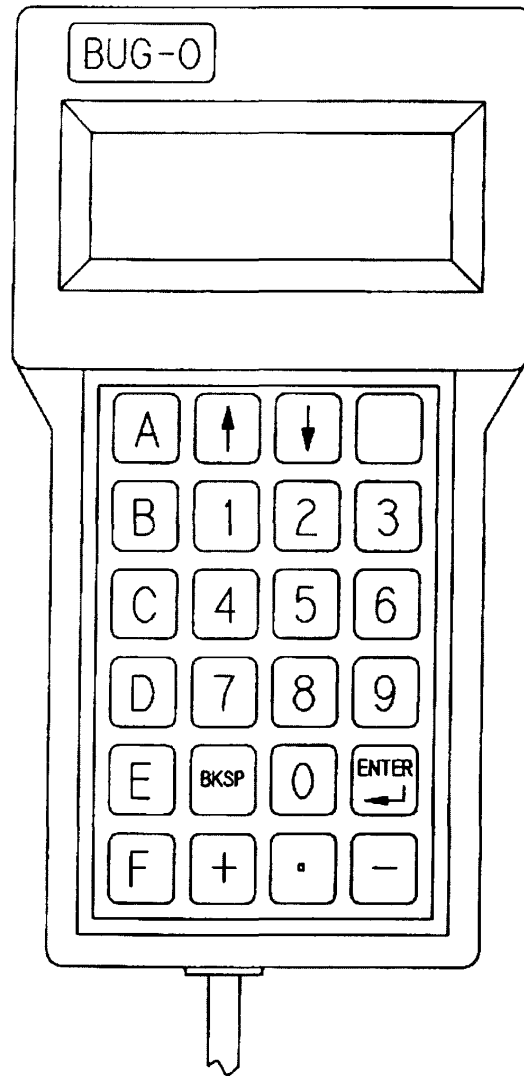
If a cutback dimension has been entered, the SE-4PTD will make one cut, shut off the gas or arc, back up the given distance, and rotate the 180°. The machine will pause here until Start button is pressed again, and then repeat the same cut but rotated 180° from the first.

To make a dry run without cutting:

1. Push Stop button and hold down.
2. Push Start button and hold down.
3. Release Stop button (quickly, after no. 2 above).
4. Release Start button.

The machine will move along the programmed cut without turning on the contacts for plasma, or the cutting solenoid.

PROGRAMMING MODULE



This is a hand held terminal with key pad and displayed which plugs in to the control panel. Press keys A, B, C, D, or E for the function desired, as described in the Programming instructions on page 12. Use the digit keys to enter pipe diameters or other dimensions; push the Enter button to store the numeric value entered. The Backspace key removes the last digit before pushing the Enter button, in case a correction is required.

PROGRAMMING

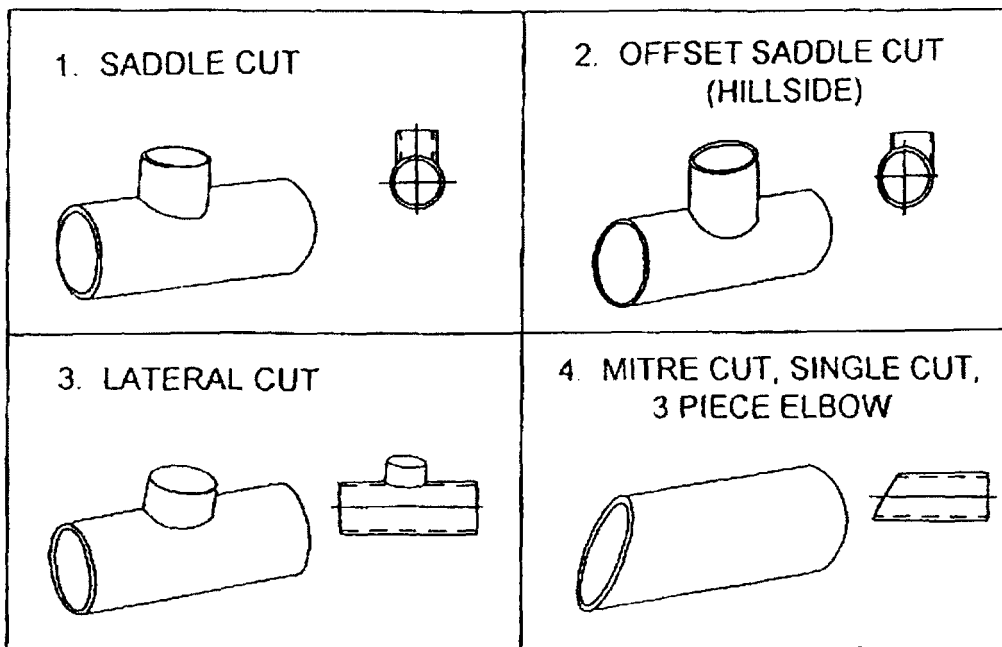
For programming, the following keys on the keypad are used:

- Push A: To select the time delay for plasma cutting.
- B: To enter the time delay for plasma cutting.
- C: To display the Cut No. in memory (Nos. 0-99)
- D: To display the type and dimensions of cut.
- E: To enter end of cut slowdown.

To Program a cut, select one of five types as follows:

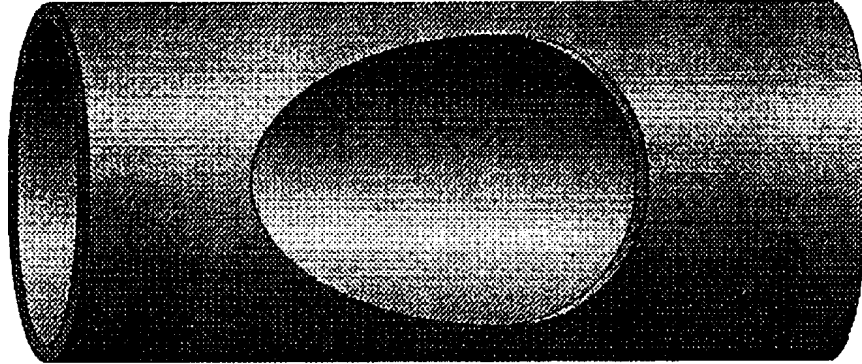
- Type 1: Saddle Cut on centerline.
- Type 2: Saddle Cut offset (hillside).
- Type 3: Lateral Cut, offset or on centerline (for center line, put offset = 0)
- Type 4: Mitre Cut
- Type 5: Holes (see next page)

CUT TYPES 1 to 4:

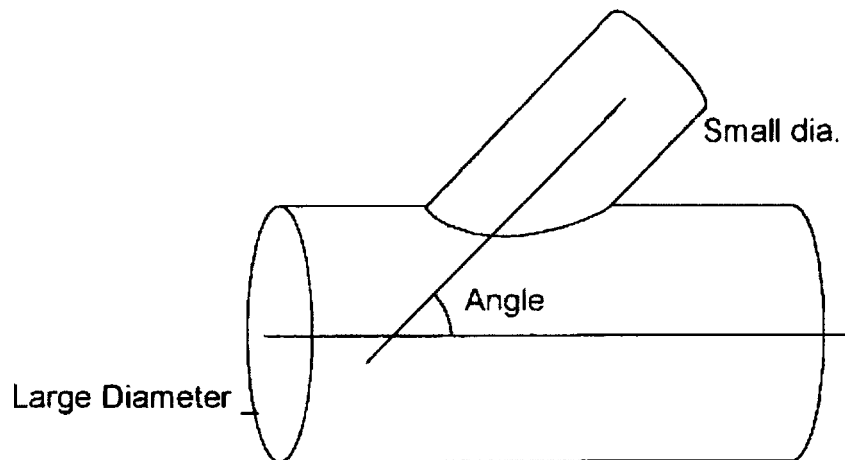


CUTTING HOLES: TYPE 5

Select Type 5 to cut a hole on the side of a pipe. Using Type 5, the machine is programmed to cut holes in pipes for branching joints, either square (T-joints) or angled (laterals). The joint must be on centerline.



The display will ask for small diameter, and then large diameter. Enter the diameter of the branch pipe for small diameter, and then large diameter, as shown in the diagram, and the diameter of the pipe being cut for large diameter. Next the display will prompt for angle. Enter the angle, in degrees x 100 (e.g. for 60° enter 6000). For square cuts you must enter 9000 (for 90°).



NOTE:

The type 5 Cut is provided on both the standard SE-4PTD and the Dual program SE-4PTD machines.

Data Entry

When entering data on the keypad, multiply inches, degrees, or seconds by 100 and enter the number without a decimal point. For metric dimensions, multiply mm x10 or cm x100.

For Example: 350 for 3.5 inches,
 800 for 80mm on metric machines
 1500 for 15°

Press the return button after the number is entered.

Data Required:

TYPE 1: Requires 1. Small diameter (pipe being cut)
 2. Large diameter (pipe it fits on)

TYPE 2: Requires: 1. Small diameter
 2. Large diameter
 3. Offset distance between centerlines

TYPE 3: Requires: 1. Small diameter
 2. Large diameter
 3. Offset
 4. Angle between pipes

TYPE 4: Requires: 1. Small diameter
 2. Cutback distance
 3. Angle of mitre cut

For plasma cutting, a value for the time delay is also required to allow for the delay in striking the arc. A commonly used delay is 3 seconds (enter 300 on the terminal keypad).

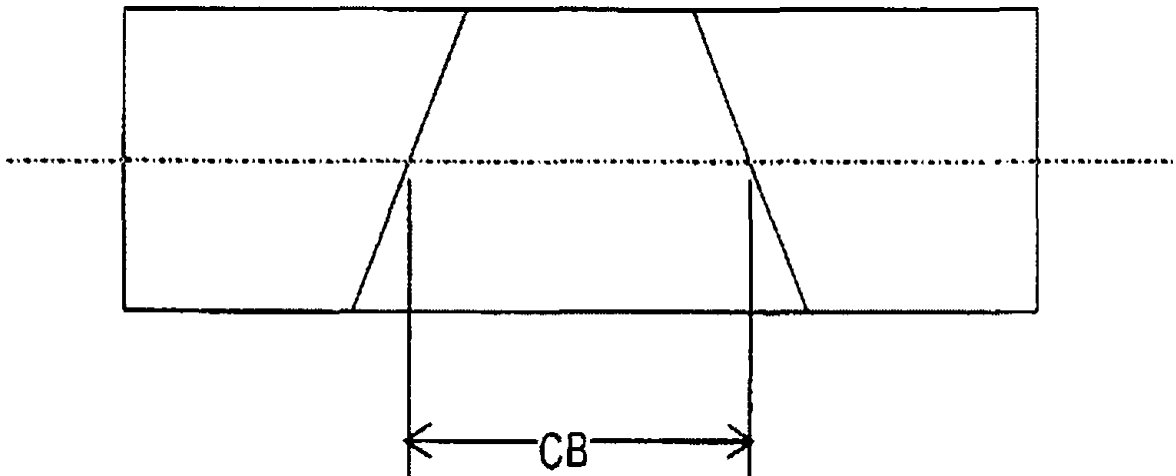
When entering diameters, use the diameters of the surface along whose intersection the cut has been made. Usually they will be the inside diameter of the pipe being cut, and the outside diameter of the pipe it fits on. This will also allow for any bevel, if necessary.

In TYPE 4, cutback refers to the distance on the centerline when making two cuts opposed to each other, for the middle piece of an elbow. If only one cut is to be made, enter 0 or just press for cutback.

NOTE: If the red Stop button is pushed, the machine will be in the pause mode, and cannot be programmed. Push the Reset button to get back to the ready mode for programming.

Program Memory:

The SE-4PTD has memory storage for 100 cuts. These are numbered Cut No. 0-99. to switch to a different Cut No. push "C" on the keypad and enter the number. Cut data is retained until programmed.



Type 4 Mitre Cut: Showing Cutback Length CB.

INSTRUCTIONS FOR THE DUAL FUNCTION SE-4PTD SHAPE PROGRAMMING

The following pages describe the shape programming capabilities of the dual function machines. Arbitrary shapes can be programmed and cut on a pipe mounted in the chuck.

PROGRAMMING SHAPES ON THE SE-4PTD

The capability is provided only on the Dual function SE-4PTD. Cuts of any arbitrary shape can be programmed, by building up the shape from the sequence of straight lines and circular arcs.

Programming is very similar to the Shape Machine- see detailed Shape Machine programming instructions.

ONE IMPORTANT DIFFERENCE is that for every change of pipe diameter in the machine, the new diameter has to be entered in the machine. If the machine is set to cut a square hole on a 4 inch or 100 mm pipe, and an 8 inch or 200 mm diameter pipe is put in the chuck, the hole will be rectangular, stretched out to twice the dimension in the circumferential direction.

Press 'E' on the keypad to enter diameter; the display will ask for pipe diameter first, and then the segment end slowdown as in the Shape Machine.

The shapes are laid out on a flat surface as if the pipe is slit and opened up flat, and the cut line developed on it.

If the Shape Machine PC program is used to download shapes, the pipe diameter has to be entered manually as the program does not handle it. This can be done from the computer if desired, by the F9 function "emulate pendant". From there, press E and follow the prompts.

NOTE: the machine must be connected to the PC for "emulate pendant" functions; turn power ON and press the Reset button.

SWITCHING FUNCTION IN DUAL FUNCTION MACHINE

The dual function SE-4PTD machine under either the Shape program, for custom programmed shapes, or the Pipe program, for pipe intersections.

To switch functions,

- Press 'C' on the keypad,
- Release the key immediately,
- Press 'F' immediately (within half a second)

The machine should change to the other program:

- If the machine is in the Pipe program, the message "Shape prog" should be displayed. If in the Shape program, the message "Pipe prog" should be displayed.

DESCRIPTION

The machine has 10 storage areas in memory for different programmed shapes, numbered 0 to 9. At any time, one of these shape numbers is active, and will stay selected even when power is shut off and turned back on, until the shape number is changed by the operator.

All programming is done with the hand-held terminal provided; this may be plugged into the connector on the control panel of the machine or unplugged as anytime. The terminal is not needed to run the machine once programmed.

Shapes are built up only from the segments provided; circular arcs and straight lines, square or inclined, by selecting type and quadrant for each segment. A shape can have up to 50 segments. Some other operations, like solenoid On/Off, time delay, or repeat another shape, also count as one segment each if used.

In normal operation, first position the torch at the starting point. Next turn on the preheat gases, and wait until the required preheat is reached. Push the Run button; the machine will turn on the cutting oxygen and start cutting the current shape. At the end of the shape the machine will turn off the cutting oxygen and stop. Manually turn off the preheat gases.

When plasma cutting, an external contact relay is used instead of cutting oxygen solenoid. A delay to allow for striking the arc should be the first segment programmed.

OPERATION

When power is turned on, the torch becomes the reference Start position.

There are three options (the hand held terminal is not needed for the first two):

1. MOVE- To change the Start position, push the STOP button, move the machine manually to the required position using the 4-way joystick, and push the RESET button.
2. RUN- Push the START/RUN button to cut a shape.
3. PROGRAM (entry or change) – The programming operation is selected by pressing keys A, B, C, D, E.

A: All segments; data entry for a new shape consists of total number of segments.

Data for each: Type	(arc, x/y line of slope)
Quadrant	1-4
Size	(radius, or x/y dimension)

See Shape programming for details.

For Example, a 2 inch diameter circle could be four segments:

1. 2, 1, 100 Counterclockwise arc, quadrant 1, 1.00 inch radius
2. 2, 2, 100 Counterclockwise arc, quadrant 2, 1.00 inch radius
3. 2, 3, 100 Counterclockwise arc, quadrant 3, 1.00 inch radius
4. 2, 4, 100 Counterclockwise arc, quadrant 4, 1.00 inch radius

The data should be tabulated on paper from a diagram before entering.

B. Program Segment

Press B on terminal to re-program a single segment. This is useful if there is an error in data for just one segment, so the whole shape does not have to be re-entered.

C. CHANGE shape number

Press C on terminal to change the current shape number, and enter the desired number at the prompt. The program switched to the new number in memory, and to whatever shape is stored there.

D. DISPLAY Shape Data

Press D to display the data for the current shape. The terminal display shows total No. of segments, and data for each segment one by one each time you press enter.

E. END of segment Slowdown

Press E to set deceleration value for the shape, when the machine approaches the end of each segment. This is useful when the shape has sharp corners, to prevent overshoot. 99 is maximum slowdown, 0 is no slowdown.

IMPORTANT

1. Once the Hold button is pressed, computer control is halted until the RUN or the reset button is pressed. Therefore the programming cannot be done with the hand held terminal in this state; the Reset button should be pressed first.
2. After pushing A and programming a new shape, End of Segment Slowdown will still have the old value unless reprogrammed. To Set a new value, push E.

SHAPE PROGRAMMING

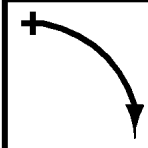
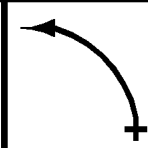
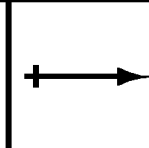
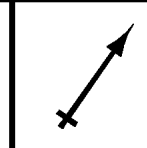
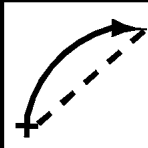
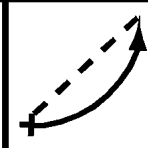
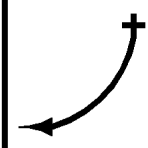
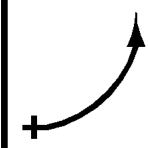
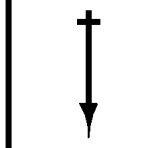
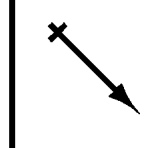


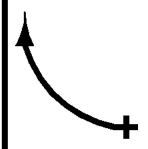
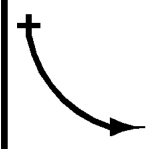
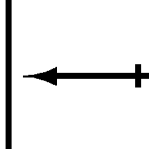
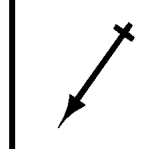
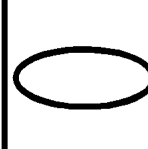

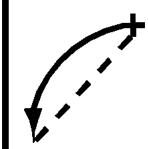
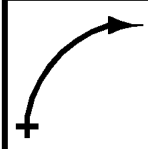
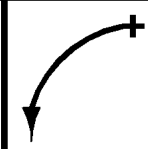
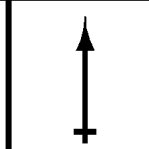
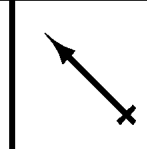

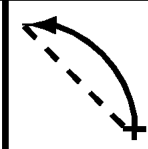
The shape to be cut on the pipe must be first laid out flat as if the pipe is slit along the length and opened out.

1. Draw the required shape on the paper to some convenient scale.
2. Refer to the Segment Chart and divide the shape into straight line straight line and arc segments.
3. Decide on the operation sequence and mark any other operations such as turning torch on or off, or delay.
4. Numbering all the segments in sequence, including other operations if any, and make a table with required data. Example for a clockwise circle starting from the top: (dimensions described fir metric version)

Segment:	No.	Type	Quadrant	Dimensions
1.	1		1	300 (30 mm)
2.	1		4	300
3.	1		3	300
4.	1		2	300

5. With machine turned on and the pendant plugged in, select which shape number this will be – for instance, No. 3.
Push C: display reads Shape No._
Push 3 for No. 3, press Enter key (backwards arrow).
The program is now in Shape No. 3.
6. Push A: display read “Total Segments?”
Push 4 for 4 segments and Enter. Display reads “1 Type?” waiting for segment 1 data.
7. Push 1 for type, clockwise arc. (refer to programming Chart on next page)
Display reads “Quadrant?”
Push 1 for quadrant 1
Display reads “mm x 10”
Push 3, 0, 0 Enter, for 300, which is 30.0 mm
Segment 1 has now been entered,
Display reads “2. type?”, asking for data for Segment 2.
8. Repeat above steps to enter data for segments, in sequence.
Display will read “Ready” after all segments are entered.
The Shape program is now stored in memory as Shape No. 3
and the machine is ready to cut the shape.

PROGRAMMING CHART

Segment Type and Line Chart									
Quadrant:	#4					Time Delay	Percent Speed		
	#3					Wait for Start Button	Auxilliary Mode		
	#2					Weld / Oxy Off			
	#1					Weld / Oxy On	Repeat Another Step		
		1. Clockwise 90 Deg Arc	2. Counter-Clockwise 90 Deg Arc	3. X or Y Axis Line	4. Oblique Line	5. Functions	6. Functions	7. Clockwise Partial Arc	8. Counter-Clockwise Partial Arc
Segment Types:									
A. All Segments - Build New Shape			B. Reprogram One Segment			C. Change Shape Number			
D. Display Current Shape Data			E. End of Segment Slowdown						

DATA ENTRY required for Programming

To Program a complete new shape (press 'A')

Count the number of segments or operations and enter the total.

For each segment, enter:

Type: Select form 1 through 8
Quadrant: 1, 2, 3 or 4; refer to chart
Size: one or more dimensions per segment as described below
100 per inch or 10 per mm (depending on machine version); or for
time, 100 per second of delay.
(e.g. 150 = 1.5", or for metric 375 = 37.5 mm)

Detailed description of Types

Type 1.

Clockwise, 90° arc segments.

Quadrant determined by which quarter of a full circle makes the arc. (See chart)

Dimensions required: Radius only.

Type 2.

Counterclockwise, 90° arc segments

Quadrant determined by which quarter of a full circle makes the arc. (See chart)

Dimensions required: Radius only.

Type 3.

Lines along X or Y axis.

Quadrant determined by direction of movement. (See chart)

(East: 1, North: 2, West: 3, South: 4).

Dimensions required: Length only.

Type 4.

Angled straight line.

Quadrant determined by direction of movement. (See chart)

(NE: 1, NW: 2, SW: 3, SE: 4).

Dimensions required: (1) X- dimension; movement along X axis
(2) Y- dimension; movement along Y axis

Type 5.

Functions or other operations.

Quadrant by selection function. (See chart)

1. Weld/ oxygen ON: turn ON contact Relay or cutting oxygen solenoid.

Dimensions required: none

2. Weld/ oxygen OFF

Dimensions required : None

3. Pause: machine stops and waits until Start/ Run button is pushed again.

Dimensions required: None

4. Delay: Machine stops and hold position for a programmed time period, up to 99.99 Seconds.

Dimensions required: time in .01 seconds units. (e.g. 250 for 2.5 seconds)

Type 6.

Special functions.

Quadrant by selecting function.

1. Repeat: Another complete shape will be repeated the specified number of times.

Shape No. of the repeated shape MUST BE LOWER than the Shape No. of the current shape being programmed. Therefore it CANNOT BE USED IN

SHAPE No. 0

Data required: (1) Shape No. to be repeated

(2) Number of times.

2. Ellipse: This is provided for making a complete true ellipse, always starting from the left (west extremity) and moving clockwise.

Dimension required: (1) diameter along X- axis

(2) diameter along Y- axis

3. Auxiliary modes: Provides commands to turn On or OFF two line-switching outputs independently, and also switch speeds from set speed to Rapid Traverse and back. Mode numbers are from 0 to 7; see table page 36 to select mode.

4. Set percent speed

Used to change speed of the machine in the middle of a shape to a lower speed. See details

page 22.

Type 7.

Clockwise arc, must be less than 180°.

Quadrant determined by direction of end point of arc relative to the start point. (See chart)

Dimensions required:

(1) X- dimensions: offset along X-axis from start to end point

(2) Y-dimensions: offset Y- axis from start to end point

(3) Radius of arc.

Type 8.

Counterclockwise arc, must be less than 180°.

Quadrant determined by direction of end point of arc relative to the start point. (See Chart)

Dimensions required:

- (1) X-dimension: offset along X-axis from Start to end point.
- (2) Y-dimension: offset along Y-axis from start to end point.
- (3) Radius of arc.

AUXILIARY MODES: Type 6, Quadrant 3

These are additional controls to independently turn the two internal Solid State Relay outputs ON and OFF, and to switch the machine into Rapid Traverse Mode or Set speed.

The machine is shipped with OUTPUT (1) wired to the external relay or solenoid connector. By default, this output turns ON when the Start button is pressed to run a shape, and turns OFF at the end. The output is taken from screws (3) and (4) on the 4-terminal strip, on the controller inside the machine.

ONLY OUTPUT (1) IS NORMALLY USED.

OUTPUT (2) is present at screws (1) and (2) on the controller, but not wired. By default the output is OFF when a shape is started, until turned ON by command Type 5, Quad 1. Both the SEO-4470 Plasma Cutting Kit and the SEO-4490 Oxyfuel Cutting kit use only output (1). Subsequently while running, the Type 5 ON and OFF command turns both outputs On and Off together, and both Off at the end.

When programming Type 6 Quad 3, a Mode number is required to be entered. The eight auxiliary modes, numbered 0 through 7, allow the setting of a mode with any combination of outputs On or Off, and choice of set speed by the speed knob, or maximum speed regardless of setting. The combinations are listed in the table below:

Mode No	Output 1	Output 2	Speed
0	Off	Off	Set
1	Off	On	Set
2	Off	Off	HI
3	Off	On	HI
4	On	Off	Set
5	On	On	Set
6	On	Off	HI
7	On	On	HI

SET % SPEED, FRACTION OF SET SPEED: TYPE 6, QUADRANT 4

Selecting Type 6-4 allows the speed to change to a fraction of the set speed. Display will read "Speed %", and data entry is accepted from 1 to 99. Entering 0 or just Return will make the speed 100%, which is the same as set speed.

When the program reaches a Type 6-3 segment while running, the speed will change to the percent entered, and continue at this setting until there is a later Type 6-3 segment which changed it to another % setting or back to 100%.

Note: If Type 6-3 has been set for HI (rapid traverse), then this setting will cut down the HI speed to the same %.

Settings below 10% are not recommended.

PROGRAMMING EXAMPLES

To cut a slot in a pipe like the one in the diagram shown below:

The cut is split in to a sequence of straight lines or circular arcs that make up the desired pattern.

Next, these should be listed in a table with the Type, Quadrant and required dimensions (refer to the programming Chart). The table for the shape is listed below.

To program the shape, press 'A', then enter the total segment at the prompt. (6 in the example below).

Next enter the data for each segment- Type, Quadrant and dimensions- as prompted.

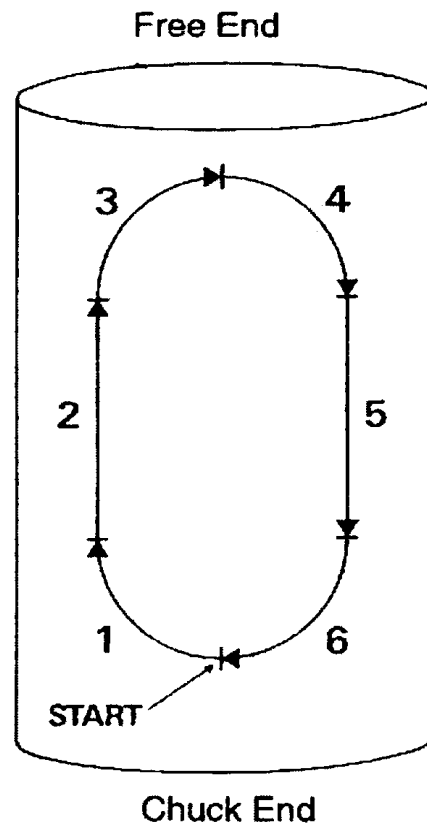
Finally an End of Segment slowdown value is entered, and the display will read 'Ready'.

FOR THE FIRST CUT OF A GIVEN DIAMETER, IN THE SHAPE PROGRAM, THE PIPE DIAMETER MUST BE ENTERED.

Press 'E' on the keypad, when the display will first ask for the diameter, and then the Slowdown value.

Segment	Type	Quad	Dimensions
1	1	3	400
2	3	2	600
3	1	2	400
4	1	1	400
5	3	4	600
6	1	4	400

The first segment is a clockwise 90° arc, which is Type 1, Quad 3 and the required dimension is the radius, set here as 40 mm.



TECHNICAL DATA

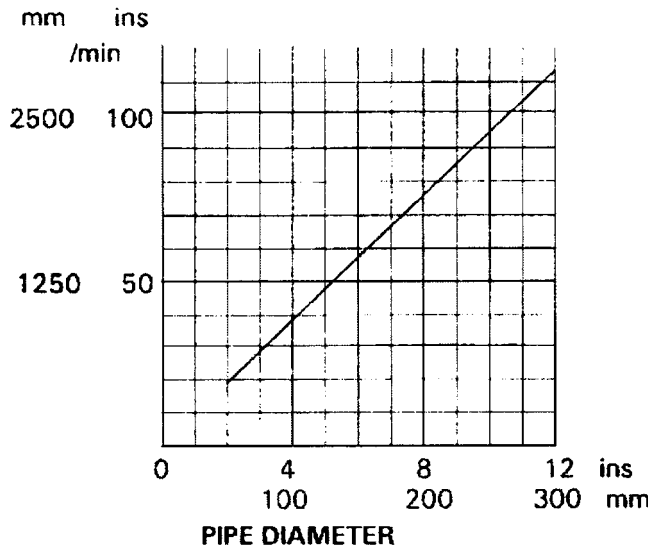
Power SEO-4400 120 VAC / 50-60 Hz /1.0 A
 Requirements SEO-4402 240 VAC / 50-60 Hz /0.7 A

Cutting Diameter Pass through 8" to 12.5" O.D. (200 to 315 mm)
 or 4 to 8" (100 to 200 mm) with optional extension jaws. Smaller
 diameters can be handled at lower cutting speeds – see chart
 below.

Additional Capacity: Short lengths of pipe up to 20" (508 mm) diameter can be chucked
 internally.
 Maximum Length: 18" (457 mm)
 Maximum Weight: 150 lbs (68 kg)*

Rotation Speed 0.15 to 3.0 rpm
 (See charts for surface speed at various diameters)

MAXIMUM CUTTING SPEED

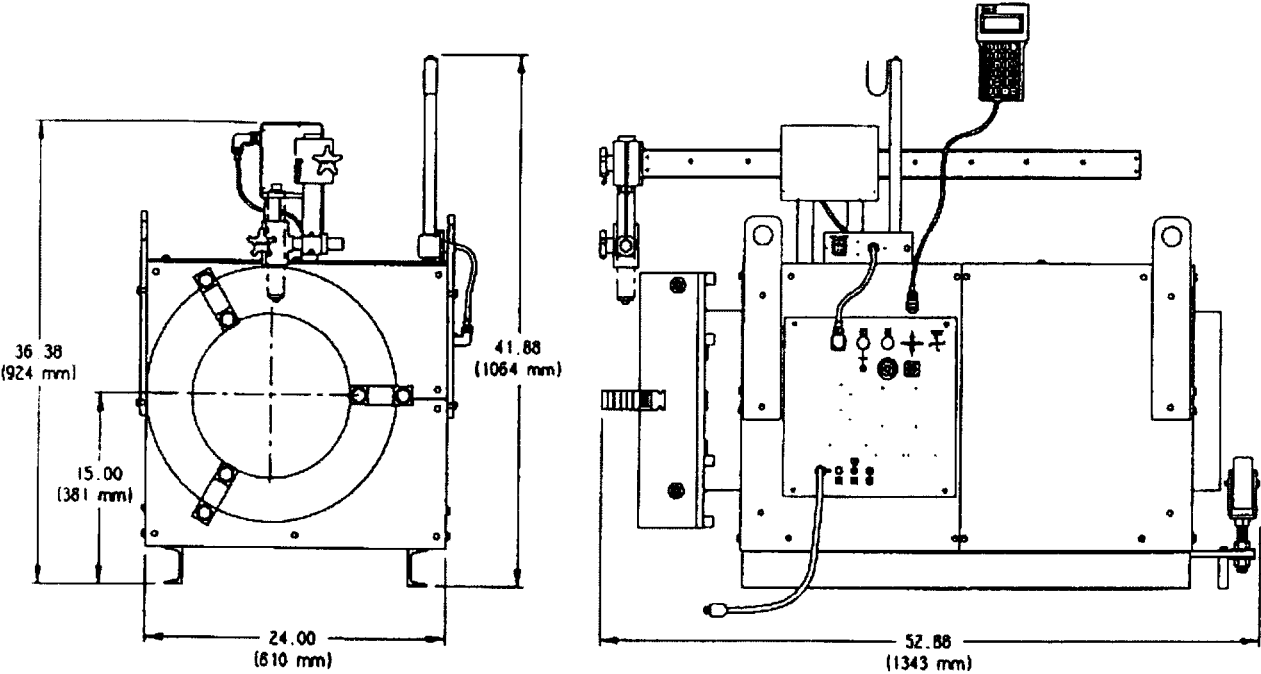


*NOTE: When using the pass through feature, the maximum weight of the pipe should not exceed 500 lbs (227 kg). It is very important to have the pipe supports in alignment with the machine to support the pipe in back of the SE-4PTD. If the pipe is projecting from either end of the machine, more than 30" (760 mm), it must be supported in rotating pipe stands.

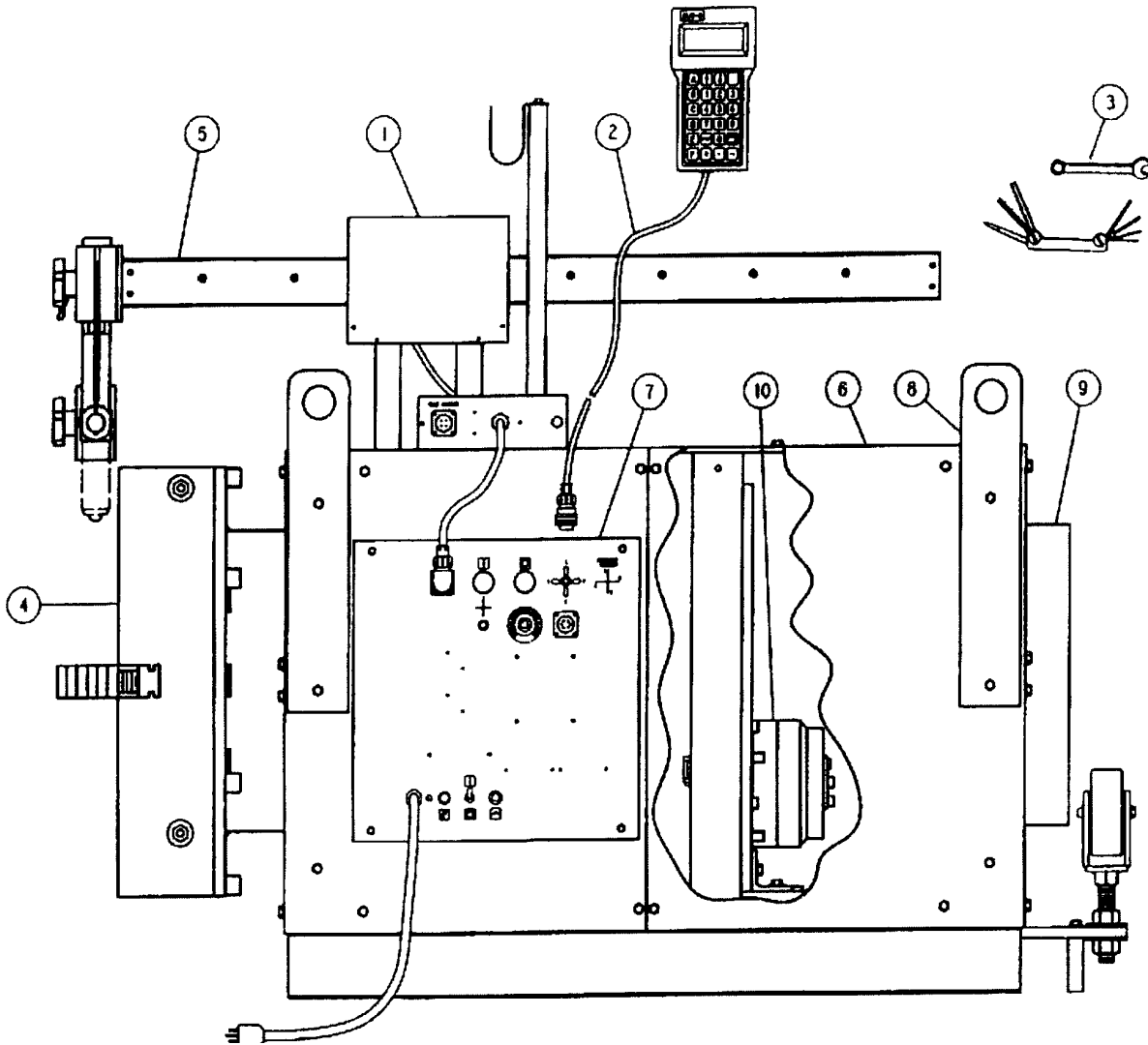
TECHNICAL DATA/ DIMENSIONS

- Cut Types: 1. Saddle Cuts
 2. Offset (Hillside) Cut
 3. Lateral Cuts
 4. Mitre Cuts, Single Cut or 3-Piece Elbow
 5. Holes
- Dimensions: 53" L x 24" W x 37" H
 (1343 x 610 x 940 mm)
- Net Weight 830 lb (377 kg)
Shipping Weight 1030 lb (467 kg)

SE-4PTD PROGRAMMABLE PASS THROUGH



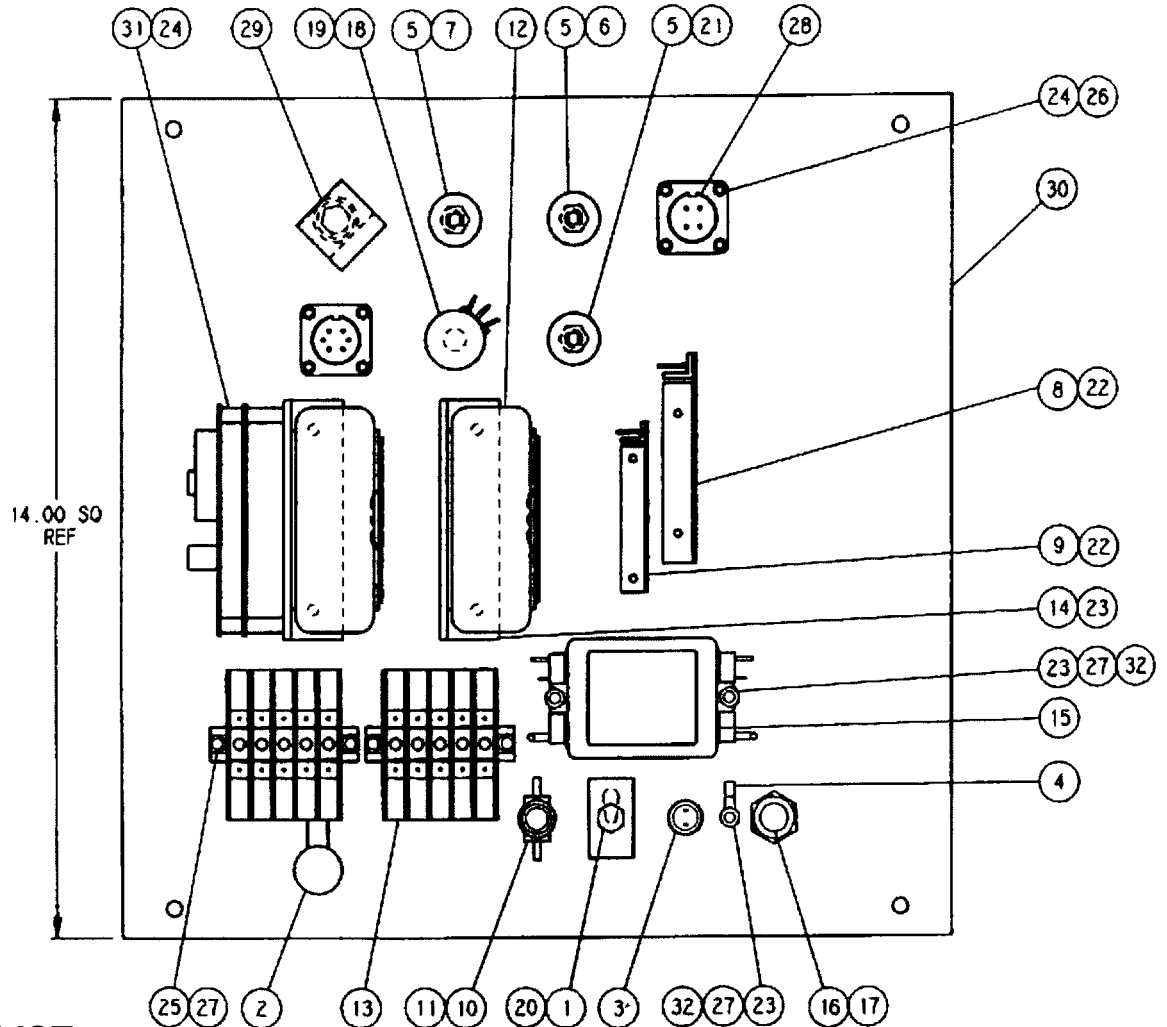
SEO-4400 SE-4PTD PROGRAMMABLE PASS THROUGH 120 VAC



PARTS LIST

<u>ITEM</u>	<u>QTY</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
1	1	BUG- 5605-PT	Linear Drive (100:1)
2	1	BUG-6050	Hand Held Pendant
3	1	BUG-9444	Tool Kit
4	1	CWO-9238	Chuck with 3 Master Jaws
5	1	SEO-4145	V-Guide with Torch Mount
6	1	SEO-4405	Cabinet, Bare
7	1	SEO-4410	Control Panel 120 V
8	4	SEO-4449	Lifting Lug
9	1	SEO-4460	Main Spindle Assembly
10	1	SEO-4465	Rotating Drive

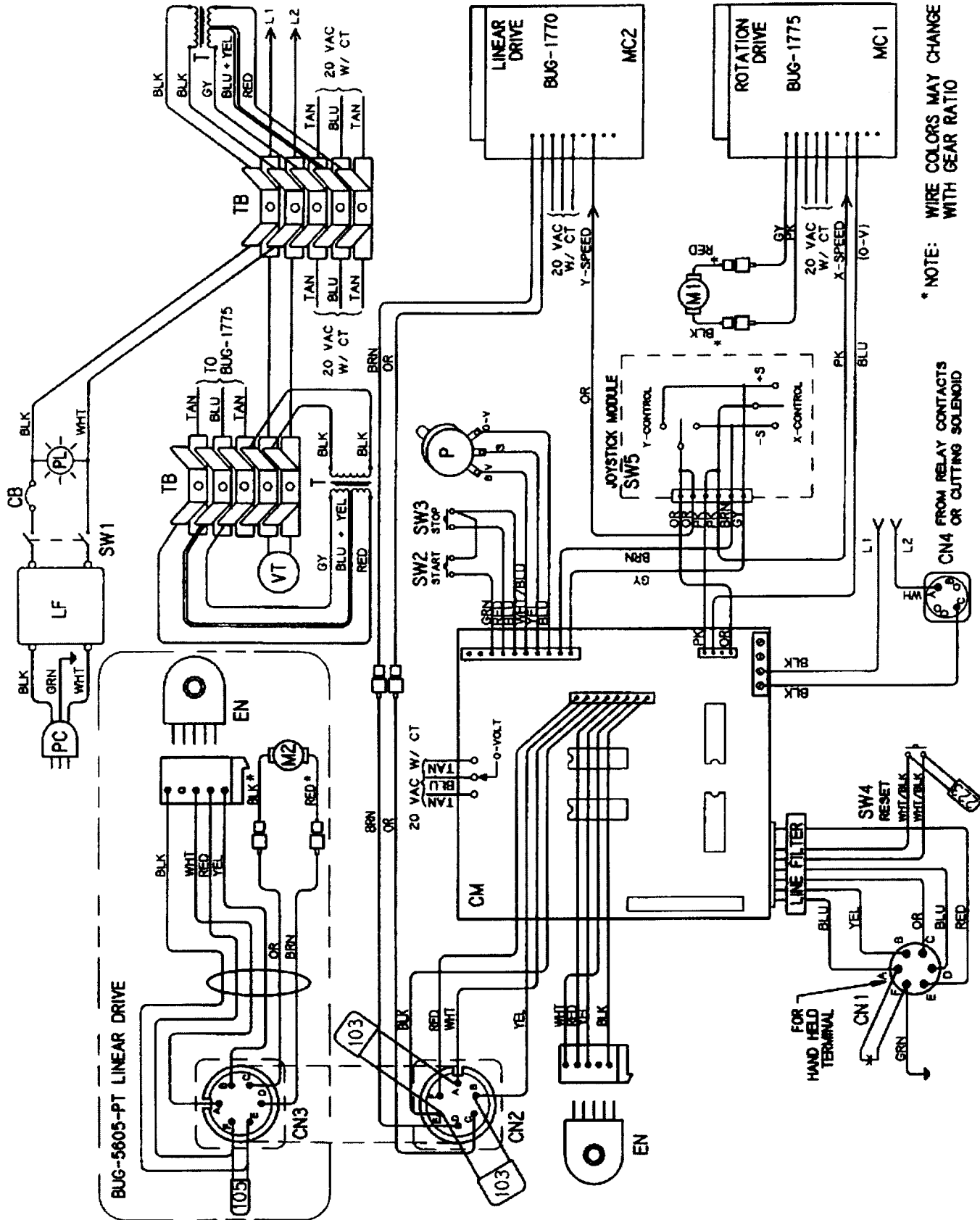
SEO-4410 CONTROL PANEL 120 V/ COMPONENT LAYOUT



PARTS LIST

<u>ITEM</u>	<u>QTY</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>ITEM</u>	<u>QTY</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
1	1	ARM-2279	Toggle Switch, DPST, On-Off	17	1	BUG-9446	Cord Grip
2	1	BUG-1393	Volt Trap 120 VAC	18	1	BUG-9686	Potentiometer Control
3	1	BUG-1415	Pilot Light	19	1	BUG-9688	Dial
4	1	BUG-1435	Sta-kon Connector	20	1	BUG-9884	On-Off Switch Plate
5	3	BUG-1536	Push-button Switch SP NO	21	1	CAP-0223	Cap. 022 Film
6	1	BUG-1537	Cap Black	22	4	FAS-0114	Pan Hd Screw 6-23 x 3/8
7	1	BUG-1557	Cap Red	23	7	FAS-0124	Pan Hd Screw 8-32 x 3/8
8	1	BUG-1770	Motor Control Board	24	12	FAS-0204	Rnd Hd Screw 4-40 x 3/8
9	1	BUG-1775	Motor Control Board	25	4	FAS-0225	Rnd Hd Screw 8-32 x 1/2
10	1	BUG-2924	Reset Button Seal	26	8	FAS-1305	Hex Nut 4-40
11	1	BUG-2931	Circuit Breaker 1.0 A	27	7	FAS-1320	Hex Nut 8-32
12	2	BUG-5218	Transformer 117V 50/60 Hz	28	1	MUG-1156	Panel Connector, 4-t, F
13	2	BUG-6028	Terminal Block	29	1	PRS-1065	Joystick
14	2	BUG-6029	Bracket	30	1	SEO-4151	Panel
15	1	BUG-6069	Filter	31	1	SEO-6030	Control Module
16	1	BUG-9445	Power Cord 120 V	32	3	WAS-0221	#8 Star Lockwasher

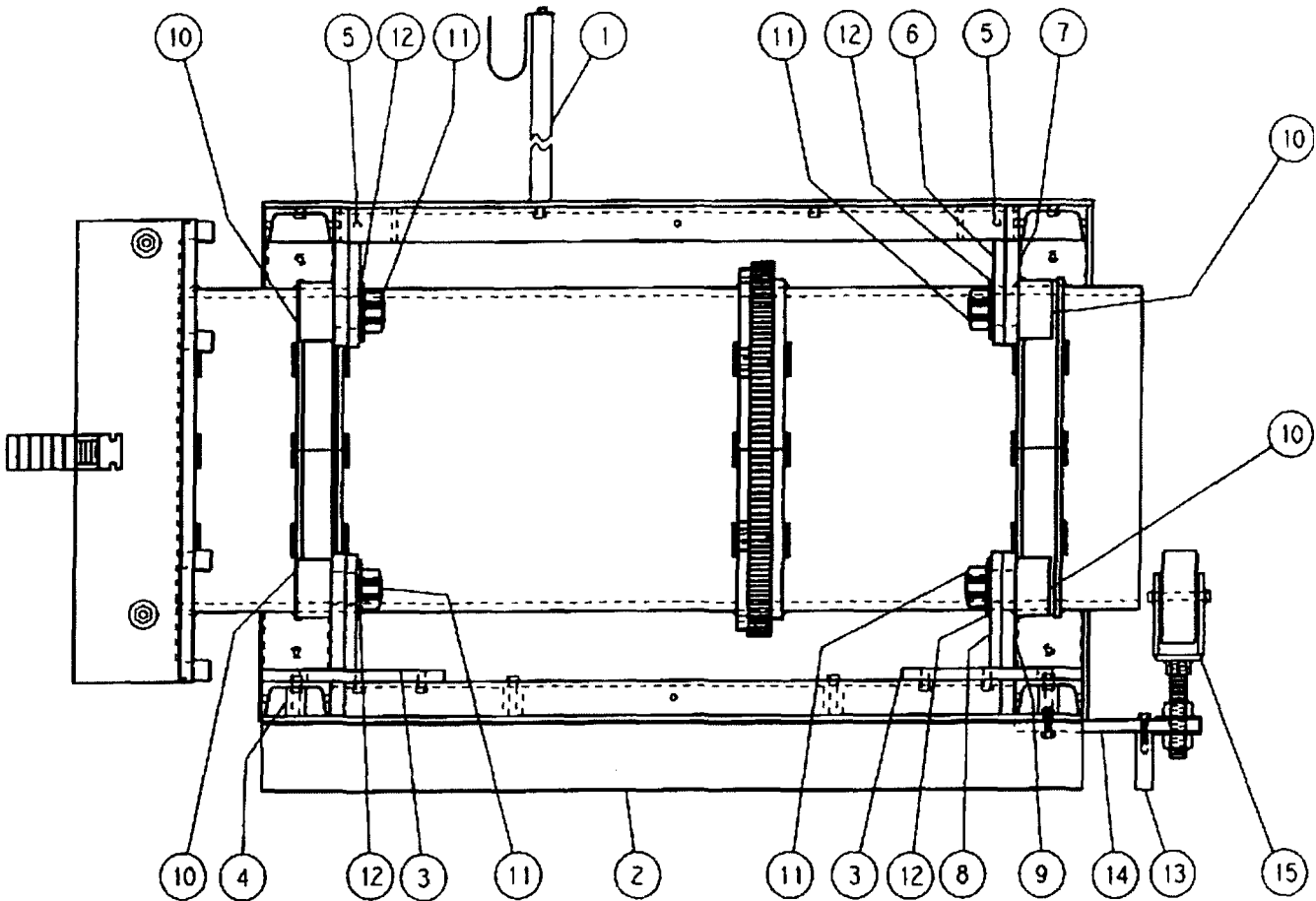
SE-4PTD PROGRAMMABLE PASS THROUGH WIRING DIAGRAM



**SE-4PTD PROGRAMMABLE PASS THROUGH
ELECTRICAL COMPONENT CHART**

ITEM	DESCRIPTION	SEO-4400 120 VAC	SEO-4402 240 VAC	SEO-4404 42 VAC
PC	Power Cord	BUG-9445	GOF-3115	BUG-9942
CB	Circuit Breaker	BUG-2931 1.0 A	BUG-2923 0.7 A	ARM-2278 3.0 A
PL	Pilot Light	BUG-1415	BUG-1428	BUG-1427
VT	Volt Trap	BUG-1339	BUG-1563	BUG-1393
T	Transformer	BUG-5218	BUG-5231	BUG-5232
P	Potentiometer		BUG-9686	
SW1	Toggle Switch (power)		ARM-2279	
SW2	PB Switch (start)		BUG-1536	
SW3	PB Switch (stop)		BUG-1536	
SW4	PB Switch (Reset)		BUG-1536	
SW5	Joystick Switch		PRS-1065	
TB	Terminal Block		BUG-6028	
LF	Line Filter		BUG-6069	
CM	Control Module		BUG-6030	
MC1	Motor Control Board		BUG-1775	
MC2	Motor Control Board		BUG-1770	
EN	Encoder		BUG-6093	
CN1	Connector (Pendant)		BUG-9902	
CN2	Connector (Rotating Drive)		BUG-9902	
CN3	Connector (Linear Drive)		BUG-9909	
CN4	Connector (Auxiliary)		MUG-1156	
M1	Gear Motor (100:1)		BUG-5209	
M2	Gear Motor (100:1)		BUG-1595	

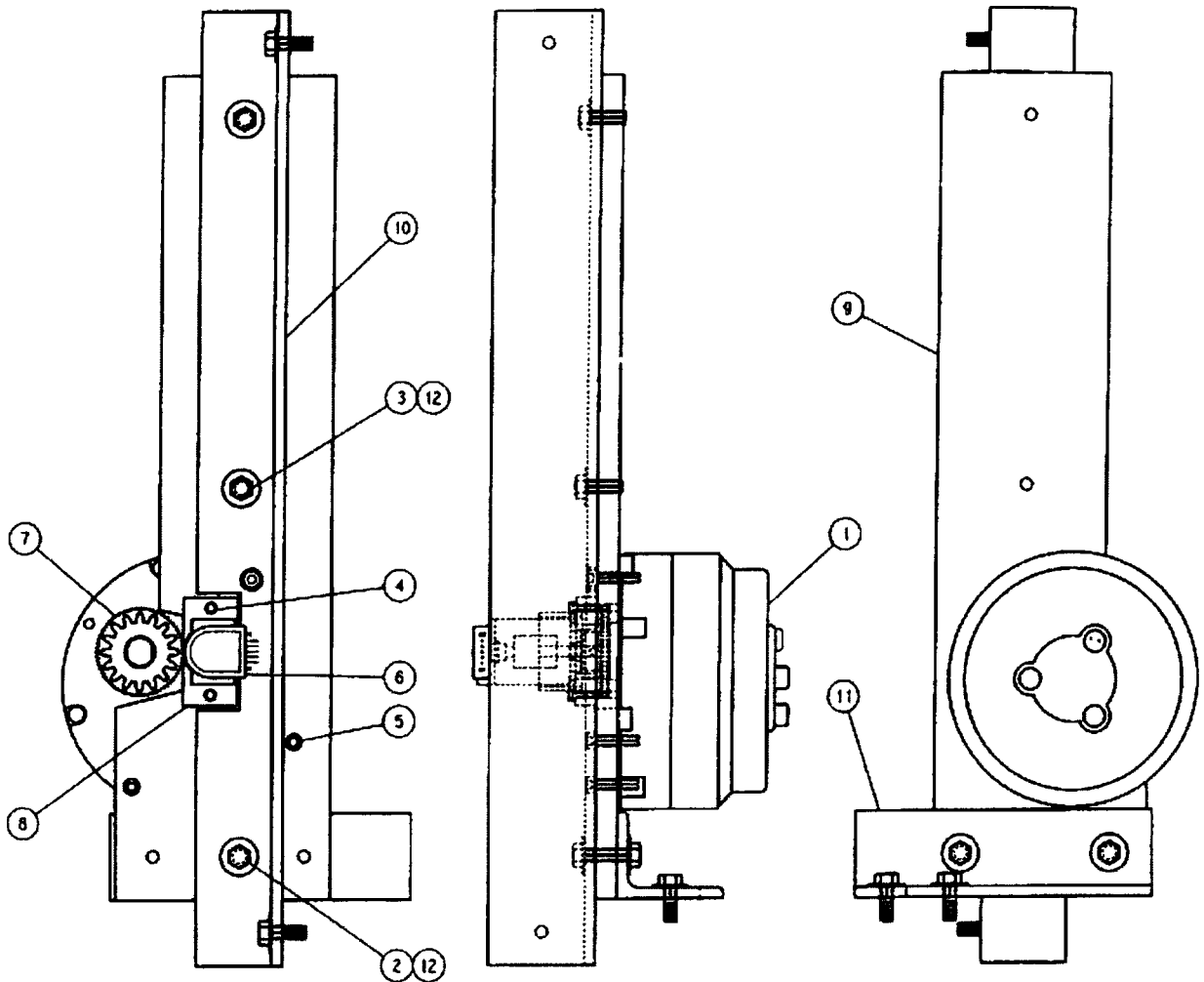
SE-4PTD INTERNAL STRUCTURE



PARTS LIST

<u>ITEM</u>	<u>QTY</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
1	1	SEO-4106	Cable Support
2	2	SEO-4415	Leg
3	4	SEO-4426	Gusset Plate
4	10	SEO-4427	Stand Off
5	4	SEO-4428	Joining Angle
6	2	SEO-4429	Top Cam Roll Plate
7	2	SEO-4430	Top Filler Plate
8	2	SEO-4431	Bottom Cam Roll Plate
9	2	SEO-4432	Cam Roll Follower
10	8	SEO-4433	Cam Roll Follower
11	8	SEO-4434	Hex-Nut 1" x 14 Thread
12	8	SEO-4439	1" Flat Washer
13	1	SEO-4453	Support Foot
14	1	SEO-4454	Support Plate
15	1	SEO-4455	Support Assembly

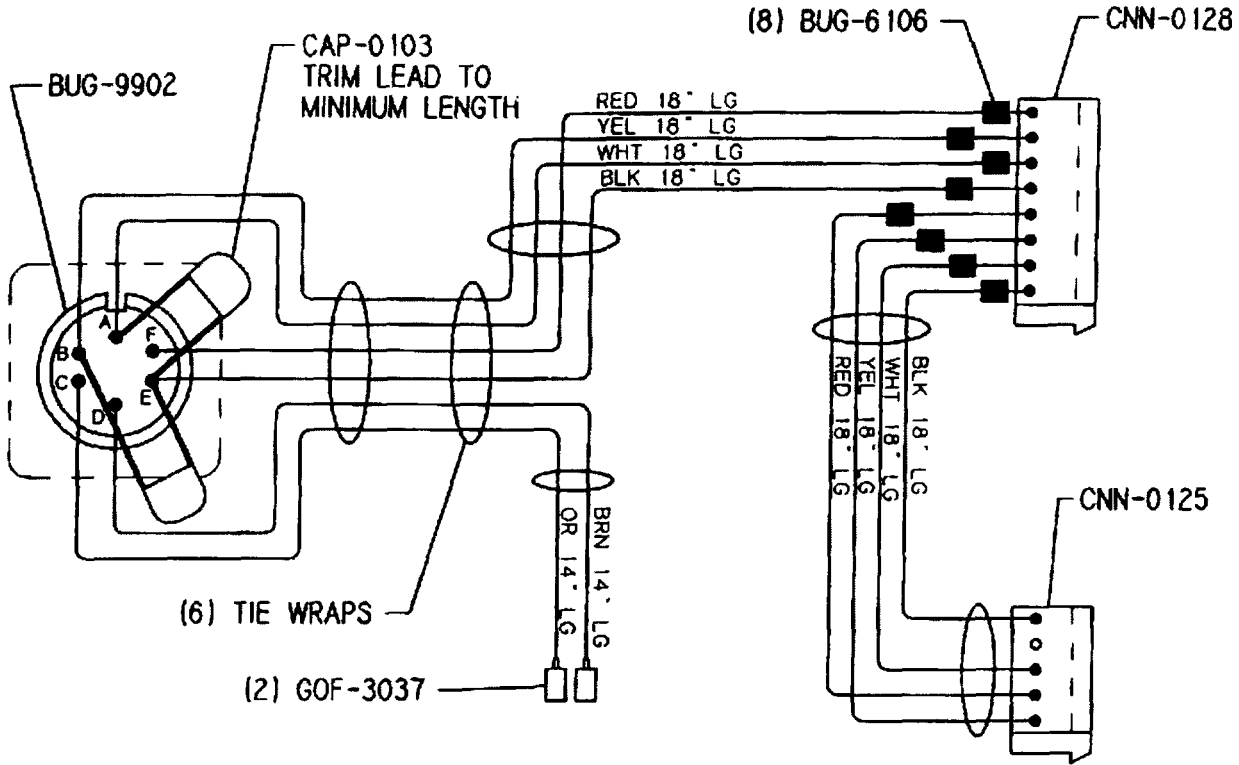
SEO-4PTD ROTATING DRIVE



PARTS LIST

<u>ITEM</u>	<u>QTY</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
1	1	BUG-5209	Gear Motor (100:1)
2	1	FAS-0386	Hex Hd Cap Screw 5/16 – 24 x 5/8" Lg
3	8	FAS-0388	Hex Hd Cap Screw 5/16-24 x 7/8" Lg
4	2	FAS-0527	Soc Hd Cap Screw 8-32 x 3/4" Lg
5	3	FAS-0559	Soc Hd Cap Screw 1/4 -20 x 1" Lg
6	1	SEO-4125	Encoder Assembly [Includes (1) BUG-6039 Encoder]
7	1	SEO-4435	Gear Assembly
8	1	SEO-4441	Encoder Block
9	1	SEO-4446	Motor Mount Plate
10	1	SEO-4447	Motor Mount Angle
11	1	SEO-4448	Motor Mount Support Angle
12	9	WAS-0250	5/16 SEA Washer

SEO-4113 ENCODER WIRING HARNESS



PART NO.

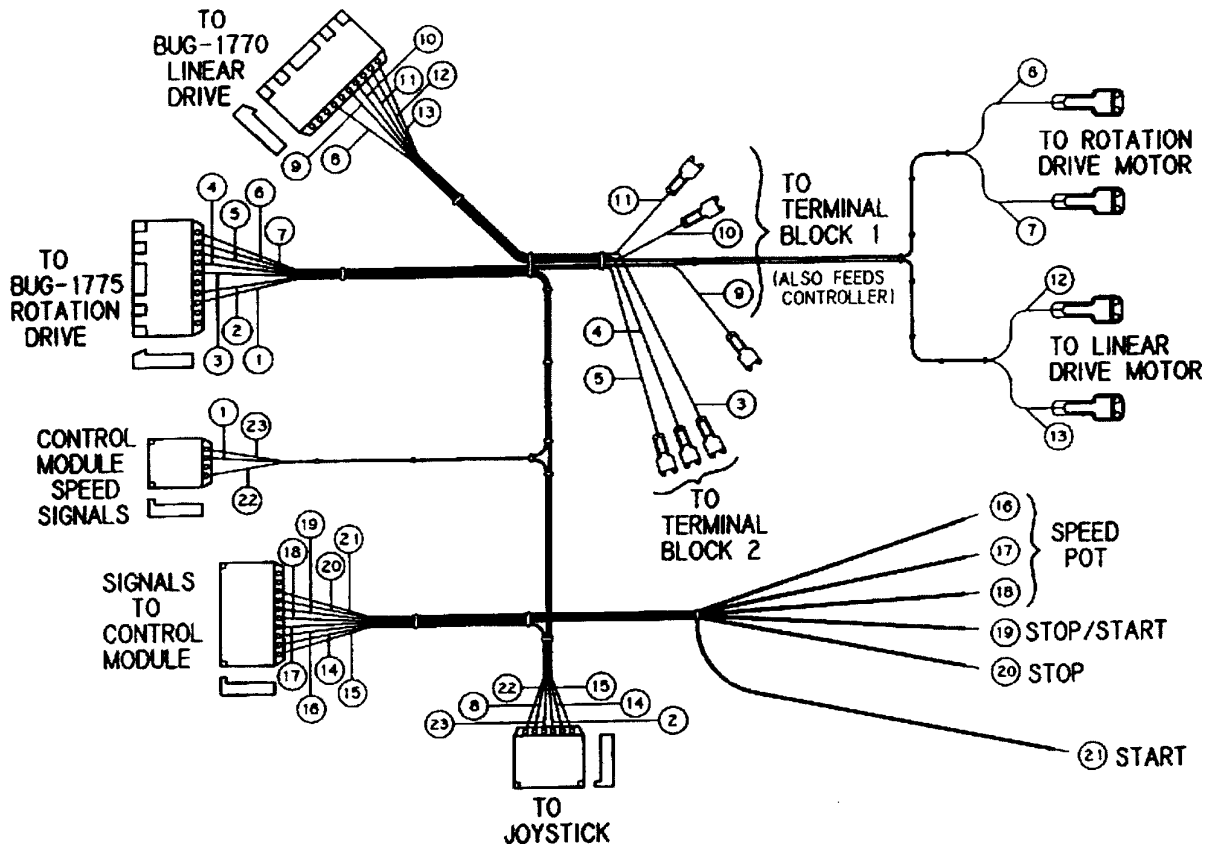
BUG-6106	Ferrite Bead
BUG-9902	Panel Connector, 6-T, Female
CAP-0103	Capacitor, .01 Film
CNN-0125	5-Pin Housing Assembly
CNN-0128	8-Pin Housing Assembly
GOF-3037	Male Connector

DESCRIPTION

WIRE

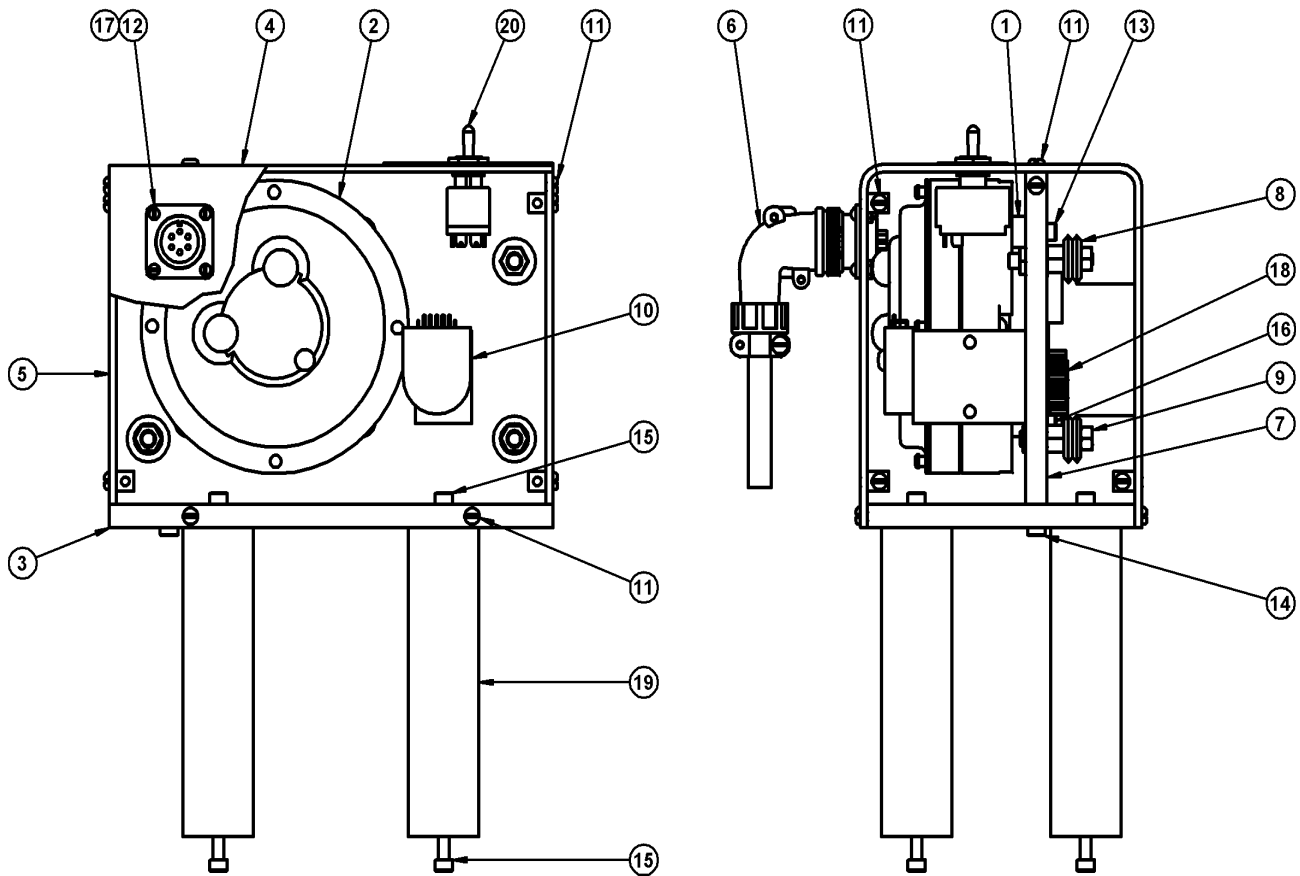
10x30 20AWG

SEO-4119 INTERCONNECTING WIRE HARNESS



<u>WIRE NO.</u>	<u>COLOR</u>	<u>WIRE NO.</u>	<u>COLOR</u>
1	Blue	12	Orange
2	Pink	13	Brown
3	Tan	14	Brown
4	Blue	15	Gray
5	Tan	16	Blue
6	Pink	17	Yellow
7	Gray	18	White/ Blue
8	Orange	19	Blue
9	Tan	20	Red
10	Blue	21	Green
11	Tan	22	Orange
		23	Pink

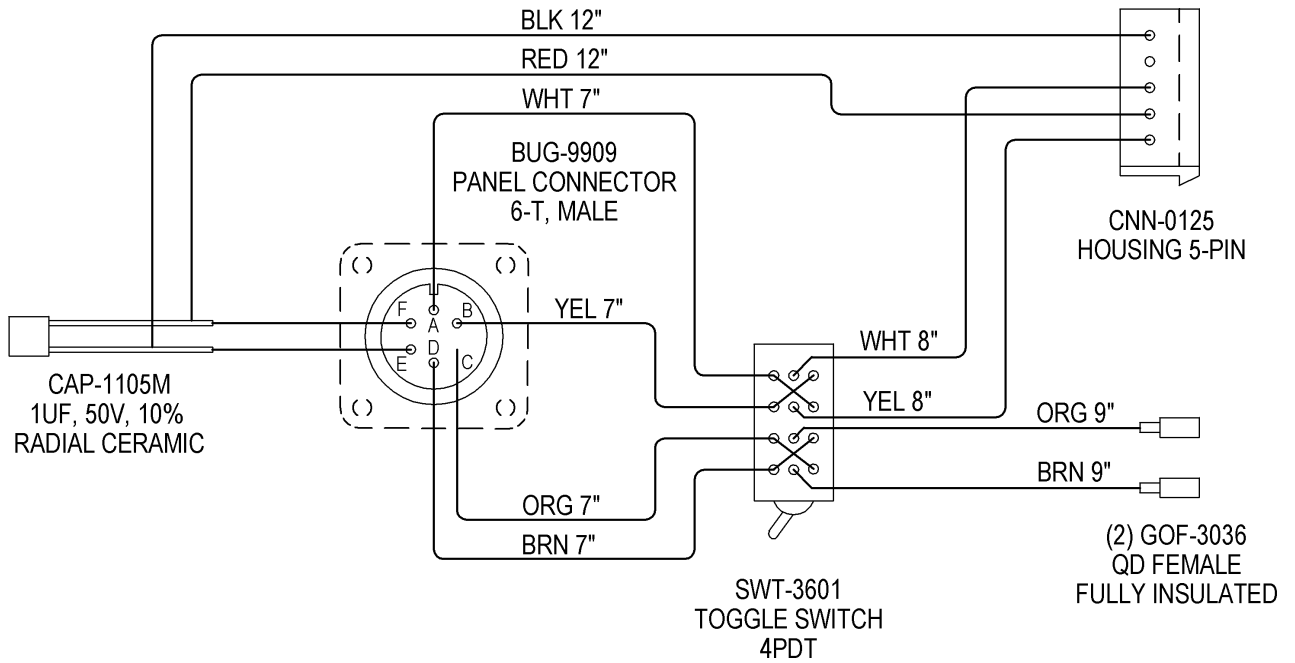
BUG-5605-PT LINEAR DRIVE (100:1)



PARTS LIST

<u>ITEM</u>	<u>QTY</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
1	4	BUG-1528	Spacer
2	1	BUG-1595	Gear Motor (100:1)
3	1	BUG-5611	Base, Linear Drive
4	1	BUG-5612	Cover
5	2	BUG-5613	Side Panel
6	1	BUG-5617	Cable Assembly Linear Drive
7	1	BUG-5618	Mounting Plate
8	2	BUG-5670	Adjustable Leg & Wheel Assembly
9	2	BUG-5675	Fixed Leg & wheel Assembly
10	1	BUG-6040	Gear/ Encoder Assembly
11	14	FAS-0114	PAB hd Scr 6-23 x 3/8 Black
12	4	FAS-0204	Rnd Hd Slit Scr 4-40 x 3/8
13	3	FAS-0529	Soc Hd Cap 8-32 x 1
14	2	FAS-0537	Soc hd cap 10-24 x 3/4
15	8	FAS-0557	Soc Hd Cap 1/4 - x 3/4
16	1	FAS- 0829	Flt Hd Slit Scr 8-32 x 1"
17	4	FAS-1305	HEX Nut 4-40
18	1	GOF-3014	Drive Pinion W/ Set Screw
19	4	SEO-4444	Stand off 1 1/4 dia x 5" LG
20	1	SEO-6050	Mirror Image Retro Fit Kit

SEO-6050 Mirror Image Retro Fit Kit



PART NO.

BUG-9909
CAP-1105
CNN-0125
GOF-3037
SWT-3601

DESCRIPTION

Panel Connector, 6-T, male
Capacitor, 1.0 Ceramic (CK06BK105K)
5-Pin Housing Assembly
Male Connector
Toggle Switch

WIRE

10x30 20 AWG
all wires 9" long

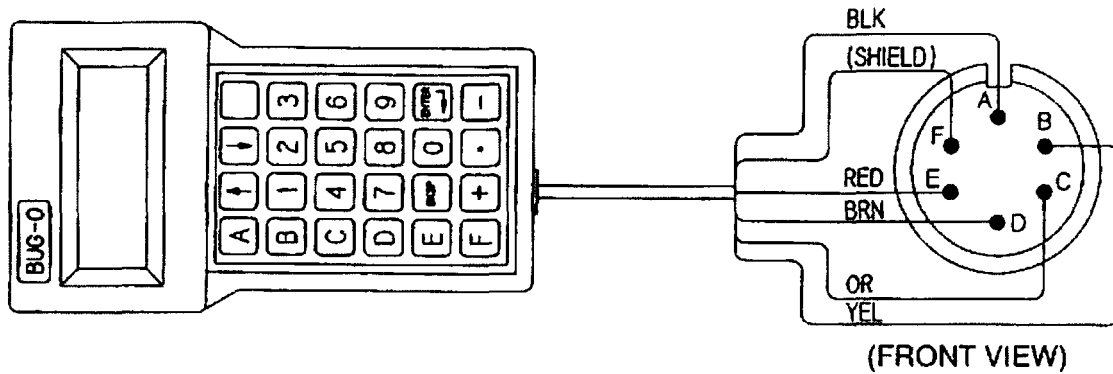
PENDANT CONTROL WIRING DIAGRAM

BUG-6050

Hand Held Terminal

BUG-9906

Cable Connector, 6-T, Male



- A _____ BLACK CIRCUIT COM
- B _____ YELLOW: TX (TRANSMIT)
- C _____ ORANGE:RX (RECEIVE)9600 BAUD
- D _____ BROWN: SIGNAL GROUND
- E _____ RED: POWER (5 V)
- F _____ SHIELD DRAIN WIRE, BARE
 TOUCHING FOIL SHIELDING

NOTE: OTHER WIRES SHOULD BE TRIMMED AND UNABLE TO TOUCH TERMINAL PINS.

OPERATION CHECKLIST and TROUBLESHOOTING

1. Plug in the machine and turn on the Power switch. Operate the manual joystick in all 4 directions in turn. This overrides any speed command from the computer control. If the drive runs in a corresponding direction, and the speed can be varied with the speed pot, this indicates
 - a) the speed control boards are OK
 - b) the controller circuit is supplying the required voltage.

If only one motor does not run correctly and the other one does, then it is likely that the motor's speed control is faulty.

If both do not operate properly, then there may be a bad component on the control module that prevents proper voltage to be supplied to the joystick.

A bad connection in the speed signal line to the speed board may also run the motor in one direction only at full speed.

Manual control must function correctly before checking the computer control

2. Attach the Hand held Pendant and push the Reset button. The display should read "Reset OK". Push "D" on the keypad and push "Return" until the display shows the Cut No. and all the data for the cut.

If the display functions, this indicates

 - a) the communication line is functioning
 - b) the computer is operating its program

If the message "Reset Ok" comes up but Pushing "D" or any other key has no effect, there could be a false signal coming in from the stop button, due to a wire short or damaged switch.
3. Disconnect the Hand held Terminal and turn power on.

Toggle the joystick in all 4 directions after pushing "Reset". When the joystick is let go, the machine should go back to its original position.

This confirms the computer is running its program, and also interfacing correctly with the encoders and the speed signal outputs to the speed boards.

If one motor returns home and not the other, then the computer may not be receiving the encoder signals properly from that axis- encoder pick up gear or coupling may be loose or the pin in the encoder plug may not be making a good connection.

If a motor returns home from one direction but not from the other, the speed control may be faulty and drive only in one direction.

PROGRAMMED DIAGNOSTICS FOR SE-4P

Some simple diagnostic tests are available in the program, by using the Hand Held Terminal. These require using the "Shift" key on the keypad: refer to the keypad character map for shifted characters, to use these commands.

If the machine is a DUAL FUNCTION SE4-PD or SE-4PTD, change function to the PIPE PROGRAM to perform the following tests.

Press "**T**" for Test

The display should show "D-E-F?"

Next press **D** to check **D**rives

E for **E**ncoders

F to **F**inish; get back to main menu

After selecting either D or E, for Drive or Encoder, the display will show "Axis No."

Press **1** for Axis 1: rotation, or **2** for Axis 2: longitudinal motion.

If Drive was selected, the corresponding axis selected should run

1 second forward (display will show 'F')

1 second back (display will show 'B')

The drive should move at the speed set by the speed pot, regardless of whether encoder pulses are being counted.

If **E**ncoder was selected, the encoder count of the corresponding encoder (1 or 2) should scroll up continuously in the display. Press any key to stop. Rotating the encoder in either direction will increase or decrease the displayed count, if the computer is successfully counting the pulses from it. The encoder can be rotated manually if disengaged, or by using the joystick to move in the desired direction.

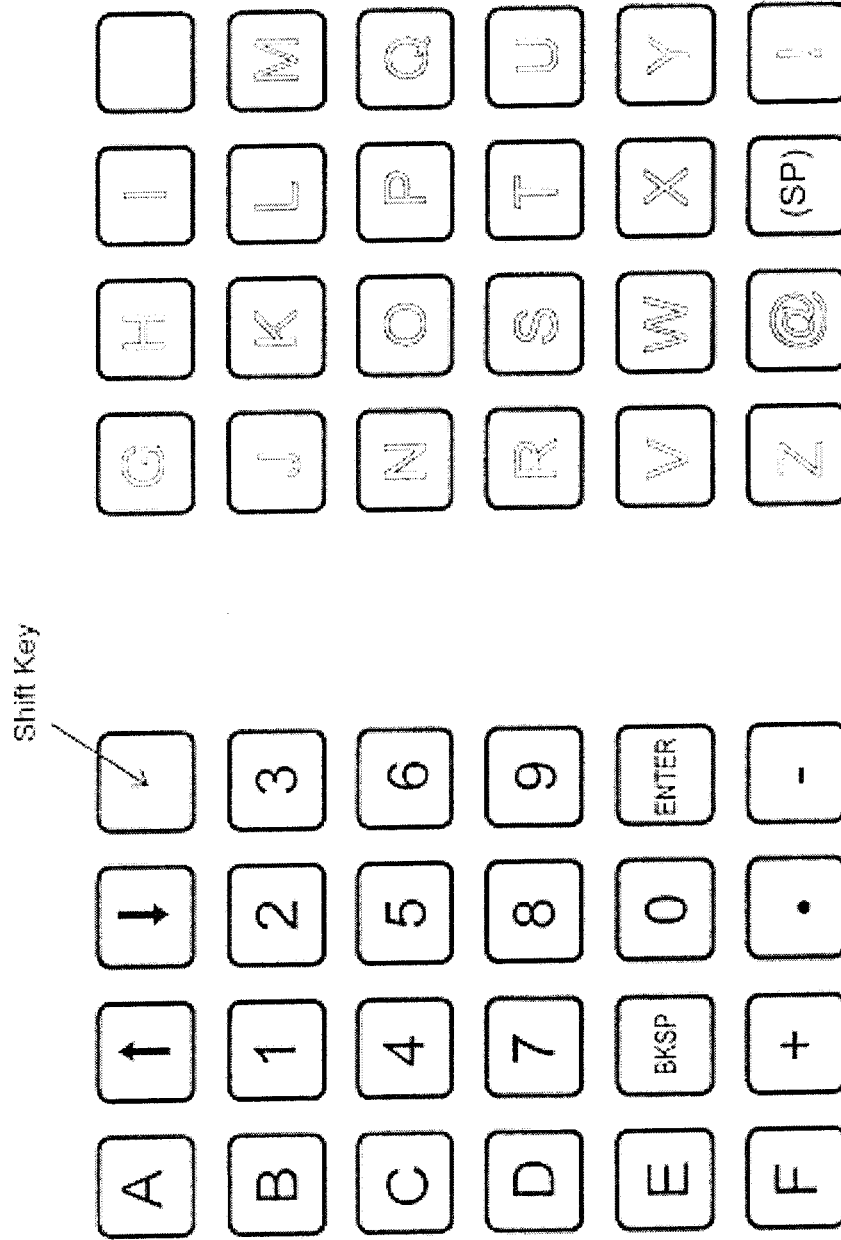
Note: the count is in hexadecimal notation (number base 16), (10 H=16 decimal, 400 H = 1024 decimal).

1 rotation of the encoder corresponds to 400 (HEX) counts.

Program Version:

Press "**V**" to determine the Version. No.; e.g. SEO41, which will show on the display.

Keypad Character Map
Direct and Shifted Characters.



SHIFTED CHARACTER SET

E.g. to type U for units, press
Shift Key, then "g"

- U: set Units, inch or metric
- R: set Ratio SE4-p; DO NOT USE
- T: Test drives & encoders, function
- V: Version Number.

WARRANTY

Limited 3-Year Warranty

Model _____
Serial No. _____
Date Purchased: _____
Where Purchased: _____

For a period ending one (1) year from the date of invoice, Manufacturer warrants that any new machine or part is free from defects in materials and workmanship and Manufacturer agrees to repair or replace at its option, any defective part or machine. HOWEVER, if the invoiced customer registers the Product Warranty by returning the Warranty Registration Card supplied with the product within 90 days of the invoice date, or by registering on-line at www.bugo.com, Manufacturer will extend the warranty period an additional two (2) years which will provide three (3) total years from the date of original invoice to customer. This warranty does not apply to machines which, after Manufacturer's inspection are determined by Manufacturer to have been damaged due to neglect, abuse, overloading, accident or improper usage. All shipping and handling charges will be paid by the customer.

The foregoing express warranty is exclusive and Manufacturer makes no representation or warranty (either express or implied) other than as set forth expressly in the preceding sentence. Specifically, Manufacturer makes no express or implied warranty of merchantability or fitness for any particular purpose with respect to any goods. Manufacturer shall not be subject to any other obligations or liabilities whatsoever with respect to machines or parts furnished by Manufacturer.

Manufacturer shall not in any event be liable to Distributor or any customer for any loss of profits, incidental or consequential damages or special damages of any kind. Distributor's or customer's sole and exclusive remedy against Manufacturer for any breach of warranty, negligence, strict liability or any other claim relating to goods delivered pursuant hereto shall be for repair or replacement (at Manufacturer's option) of the machines or parts affected by such breach.

Distributor's Warranty:

In no event shall Manufacturer be liable to Distributor or to any customer thereof for any warranties, representations or promises, express or implied, extended by Distributor without the advance written consent of Manufacturer, including but not limited to any and all warranties of merchantability or fitness for a particular purpose and all warranties, representations or promises which exceed or are different from the express limited warranty set forth above. Distributor agrees to indemnify and hold Manufacturer harmless from any claim by a customer based upon any express or implied warranty by Distributor which exceeds or differs from Manufacturer's express limited warranty set forth above.

HOW TO OBTAIN SERVICE:

If you think this machine is not operating properly, re-read the instruction manual carefully, then call your Authorized BUG-O dealer/distributor. If they cannot give you the necessary service, write or phone us to tell us exactly what difficulty you have experienced. BE SURE to mention the MODEL and SERIAL numbers.