



*Model  
FD/FDL  
Power Supply*

INSTRUCTION MANUAL



**SONICS**.....

Sonics & Materials, Inc.

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# WARRANTY

Sonics & Materials, Inc., hereinafter referred to as "S&M", warrants its products for a period of one year from the date of shipment against defects in material and workmanship under normal installation, use, and maintenance as described in the operating instructions which accompany such equipment. During the warranty period, S&M will, at its option, as the exclusive remedy, either repair or replace without charge for material and labor, the part(s) which prove upon our examination to be defective, provided the defective unit is returned to us properly packed with all transportation charges prepaid.

## Limitation Of Warranty

This warranty is in lieu of any other warranties, either express, implied, or statutory. S&M neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the sale of its products. S&M hereby disclaims any warranty of merchantability or fitness for a particular purpose. No person or company is authorized to change, modify, or amend the terms of this warranty in any manner or fashion whatsoever. Under no circumstances shall S&M be liable to the purchaser or to any other person for any incidental or consequential damages or loss of profit or product resulting from any malfunction or failure of this S&M product.

This warranty does not apply to equipment which has been subject to unauthorized repair, misuse, abuse, negligence, or accident. Equipment which, in our judgement, shows evidence of having been used in violation of operating instructions, or which has had the serial number altered or removed, will be ineligible for service under this warranty.

No liability is assumed for expenses or damages resulting from interruptions in operation of the product or damages to material in process.

S&M equipment is designed for maximum operator safety and incorporates built-in safety devices. Any modifications to these safety features will void the warranty. S&M assumes no responsibilities for consequential damages incurred due to modifications to the said equipment.

This warranty does not cover equipment used for applications requiring metal-to-metal contact with weld time in excess of 1 second.

Data supplied in the instruction manual has been verified and validated and is believed adequate for the intended use of the equipment. If the equipment or procedures are used for purposes other than those specified herein, confirmation of their validity and suitability should be obtained in writing from S&M.



## **Safety Precautions Read Before Installing Or Using Equipment**

This system has been designed to assure maximum operator safety. However, no design can completely protect against improper usage. For maximum safety and equipment protection, observe the following warnings at all times and read the instruction manual carefully before you attempt to operate the equipment.

- High voltage is present in the equipment. Disconnect the line cord plug before removing the cover or servicing.
- Make sure the equipment is properly grounded with a 3-prong plug. Before plugging in the equipment, test the electrical outlet for proper earth grounding.
- Ultrasonic welders operate above normal audibility for most people. Ear protection is recommended. Consult the Appendix for a list of manufacturers of ear protectors.

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## **Important Service Literature**

### **Please read carefully before operating the equipment, then forward to your service department.**

The equipment supplied with this instruction manual is constructed of the finest material and the workmanship meets the highest manufacturing standards. It has been thoroughly tested and inspected before leaving the factory and when used in accordance with the procedures outlined in this manual, will provide you with many years of safe and dependable service.

### **Manual Change Information**

We continually strive to keep up with the latest electronic developments by adding circuit and component improvements to our equipment as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we cannot incorporate these changes immediately into printed manuals. Hence, your manual may contain new change information. Change information, if any, is located in the Appendix.

We reserve the right to make any changes in the design or construction of our equipment at any time, without incurring any obligation to make any change whatsoever in units previously delivered.

The technical data and schematics in the manual are for informational purposes only and may not reflect the current configuration being shipped from our factory. Upon formal request, complete and up to date information can be provided from the factory free of charge.

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# Table Of Contents

<i>Section</i>	<i>Page</i>
<b>I Description</b>	
1-1. Introduction .....	1-1
1-3. Principles of Ultrasonic Plastic Assembly .....	1-1
1-5. Ultrasonic Assembly System .....	1-2
1-7. Major Differences Between Controller / Power Supply Models .....	1-3
1-9. Specifications .....	1-3
<b>II Installation</b>	
2-1. Inspection .....	2-1
2-3. Claims For Loss Or Damage .....	2-1
2-6. Electrical Power Requirements .....	2-1
2-8. Installation Site Requirements .....	2-1
2-10. Making Electrical Connections .....	2-2
2-12. Internal Switch Settings .....	2-6
<b>III Programming and Setup</b>	
3-1. Introduction .....	3-1
3-3. Functions of Controls, Indicators, and Connectors .....	3-1
3-5. Controller / Power Supply Turn On and Shutdown .....	3-5
3-8. Review of Active Setup Parameter Values .....	3-6
3-10. Keyboard Lock / Unlock .....	3-7
3-12. Entering Parameter Values .....	3-7
3-14. TIMERS Function .....	3-9
3-18. Saving Controller / Power Supply Setups .....	3-12
3-20. Recalling Stored Setups .....	3-12
3-22. Clearing All Numerical Entries .....	3-13
3-24. Overload Reset .....	3-13
<b>Appendix</b>	
Manufacturers Of Hearing Protectors and Manufacturers Of Sound Absorbing Material	

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## List Of Illustrations / Tables

<i>Section</i>	<i>Page</i>
<b>I</b>	<b>Figures</b>
1-1.	Model FD Controller / Power Supply ..... 1-1
1-2.	Ultrasonic Assembly System Block Diagram ..... 1-3
	<b>Table</b>
1-1.	Controller / Power Supply Specifications ..... 1-3
<b>II</b>	<b>Figures</b>
2-1.	RF Interconnecting Cable ..... 2-3
2-2.	Actuating Cable ..... 2-3
2-3.	Linear Encoder Cable ..... 2-4
2-4.	Encoder Window Outputs Cable ..... 2-4
2-5.	I/O Control Cable ..... 2-5
2-6.	DIP Switch Identification ..... 2-5
<b>III</b>	<b>Figures</b>
3-1.	Model FD Controller / Power Supply, Front View ..... 3-2
3-2.	Controller / Power Supply Rear View ..... 3-3
3-3.	Informational Display Sequence Diagram ..... 3-6
3-4.	Linear Encoder Limits ..... 3-10

# DESCRIPTION

## Section I

### I-1. Introduction.

I-2. This instruction manual provides descriptive information and installation and programming instructions for the Model FD Controller/Power Supply (Figure I-1). This unit is a component of a Sonics & Materials ultrasonic assembly system. The Model FD consists of a number of versions with different output power capabilities. Unless otherwise stated, the information provided in this instruction manual applies to all versions.

### I-3. Principles Of Ultrasonic Plastic Assembly.

I-4. In ultrasonic plastic assembly, high frequency (15,000 to 40,000 Hz) electrical energy is converted into high-frequency mechanical energy in the form of reciprocating vertical motion. When applied to a thermoplastic, the reciprocating vertical motion generates frictional heat at the plastic/plastic or plastic/metal interface. In ultrasonic welding, the plastic melts and flows throughout the joint area because of applied pressure; when the ultrasonic vertical motion stops, the molten plastic solidifies and a high-strength bond results. In ultrasonic staking or Insertion, the controlled flow of molten plastic is used to capture or lock another material in place (staking) or encapsulate a metal insert (insertion).



Figure I-1  
Model FD  
Controller/ Power

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## Description

### 1-5. Ultrasonic Assembly System.

1-6. Sonics & Materials ultrasonic assembly systems typically consist of a controller/power supply, converter, booster, horn, pneumatic press, and holding fixture (Figure 1-2).

**a. Controller / Power Supply.**

The controller/power supply, the subject of this instruction manual, is a solid-state assembly which converts standard 50-60 Hz electrical power into ultrasonic electrical power. It also functions as the main control point for programming and monitoring the operating parameters of the system. Internal timers automatically time assembly functions in accordance with operator-programmed data.

**b. Converter.**

The converter changes the ultrasonic electrical power supplied by the controller/power supply to high-frequency mechanical vibrations.

**c. Booster.**

Successful ultrasonic assembly often depends on having the proper amplitude of mechanical vibrations at the horn tip. Designing a horn with the necessary shape and gain (ratio of output amplitude to input amplitude) is often impossible. In such cases, a booster is installed between the converter and the horn to increase or decrease the output amplitude as required for the particular application.

**d. Horn.**

The horn is the system component that contacts the parts to be assembled. It transfers the ultrasonic vibrations developed by the converter to the parts being assembled and applies the necessary pressure to the parts while the molten thermoplastic material resolidifies.

**e. Pneumatic Press.**

The pneumatic press, sometimes referred to as the stand, provides compression force and mounting for the converter, booster, and horn assembly. It consists of a base assembly, column, and head.

**f. Holding Fixture.**

The holding fixture or nest assures proper alignment and support of the parts being assembled.

## Description

### 1-7. Major Differences Between Controller / Power Supply Models.

1-8. The Model FD controller/power supply is available with output power ranging from 700 to 2,000 watts. An optional linear encoder is available, and will require the installation of an optical linear bar on the press.

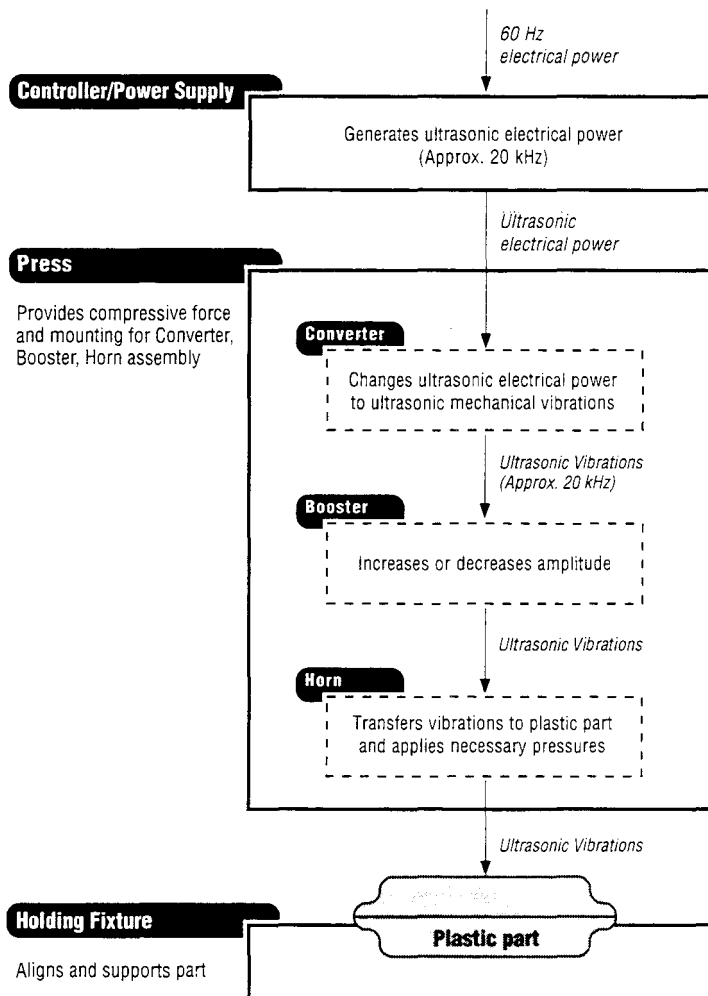
### 1-9. Specifications.

1-10. Pertinent specifications for the various models of the controller/power supply are listed in **Table 1-1**.

**Table 1-1. Specifications**

Output Power Rating	Input Power Requirement	Output Frequency	Dimensions
* 700 W	220 VAC, 10A	40k Hz	6.5" H x 17" W x 22.5" D (16.5 cm x 43.2 cm x 57.2 cm )
*1000 W	220 VAC, 10A	20k Hz	
1500 W	220 VAC, 15A	20k Hz	
2000 W	220 VAC, 15A	20k Hz	

\*110 VAC optional.



**Figure 1-2.**  
Ultrasonic  
Assembly  
System Block  
Diagram

# INSTALLATION

## Section II

### 2-1. Inspection.

2-2. After unpacking the controller/power supply, perform a thorough visual inspection for any evidence of damage that may have occurred during shipment. Check the packing material carefully for small items before disposing of the material.

### 2-3. Claims For Loss Or Damage.

2-4. The controller/power supply was thoroughly inspected and carefully packed before leaving the factory. Responsibility for its safe delivery was assumed by the carrier upon acceptance of the shipment. Claims for loss or damage in transit must be made to the carrier, as follows:

#### a. Concealed Loss Or Damage.

Concealed loss or damage is loss or damage that does not become apparent until the equipment has been unpacked. The contents might have been damaged in transit due to rough handling even though the shipping container may not show any external damage. When damage is discovered upon unpacking, make a written request for inspection by the carrier's agent within 48 hours of the delivery date. Then, file a claim with the carrier since the damage is the responsibility of the carrier. The form required to file such a claim will be supplied by the carrier. Do not destroy packing materials or move material from one location to another before the carrier makes his inspection.

#### b. Visible Loss Or Damage.

Any external evidence of loss or damage must be noted on the freight bill or express receipt and signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusal to honor a damage claim. The form required to file a claim will be supplied by the carrier.

2-5. If the controller/power supply is damaged, notify Sonics & Materials, Inc. We will arrange for repair or replacement of damaged equipment without waiting for the claim against the carrier to be settled, provided that a new purchase order is received to cover the repair or replacement costs. Should any damage, shortage, or discrepancy exist, please notify us immediately.

### 2-6. Electrical Power Requirements.

2-7. The controller/power supply requires a fused, single-phase, standard 3-terminal grounding type receptacle. Input voltage and current capability requirements for the various models are listed in **Table 1-1**.



*The line cord of the controller/power supply is equipped with a 3-prong, grounding plug. Do not, under any circumstances, remove the ground prong. The plug must be plugged into a mating 3-prong, grounding type outlet.*

### 2-8. Installation Site Requirements.

2-9. The controller/power supply is a free-standing assembly. It should be installed in a clear, uncluttered location that is free from excessive dirt, dust, corrosive fumes, and temperature and humidity extremes. Space requirements are listed in **Table 1-1**. The selected installation site should be near the electrical power source and away from

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**Installation**

equipment that generates abnormally high electrical transients. Observe the following additional instructions when installing the equipment:

- a. Allow at least 6 inches (15 cm) at the rear of the controller/power supply for cable connections.
- b. Position the controller/power supply so that the front panel controls are visible and readily accessible.
- c. The controller/power supply is air cooled; allow sufficient space around the assembly to ensure adequate ventilation. If the controller/power supply must be housed in a confined space, forced air cooling may be necessary to keep surrounding air within acceptable ambient temperature limits.
- d. Locate the controller/power supply within 30 feet (9 cm) of the pneumatic press.

**2-10. Making Electrical Connections.**

**2-11.** Make system electrical connections to the controller/power supply as follows:



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*When making electrical connections, be careful not to strain or kink the cables. When going around corners, make as wide a bend as possible.*

*Do not run cables parallel to any power line that is within 1 foot (30 cm) of the cables. The interconnecting cables are supplied with the system. (See Figures 2-1 through 2-4.)*

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- a. Connect the RF and base or actuating cables between the mating connectors at the rear of the controller/power supply and the pneumatic press.
- b. If the remote overload reset capability is to be used, connect the remote overload cable between the mating connector at the rear of the controller/power supply and the remote overload reset station.
- c. On units with a linear encoder installed, connect the linear encoder cable (**Figure 2-3**) between linear encoder connector J9 at the rear of the controller/power supply and the system linear encoder.
- d. If the controller/power supply is equipped with the encoder window outputs option, connect the encoder window outputs cable (**Figure 2-4**) between J7 the mating connector at the rear of the controller/power supply and the external monitoring equipment.
- e. If a controller such as a PLC device is used, connect a control cable (**Figure 2-5**) between J8 the mating connector at the rear of the controller/power supply and the external controller.
- f. Ensure that the voltage rating of the electrical power source matches that of the controller/power supply. Plug the line cord of the controller/power supply into the electrical outlet. To prevent the possibility of electrical shock, ensure that the line cord is properly grounded.

Section II

Installation

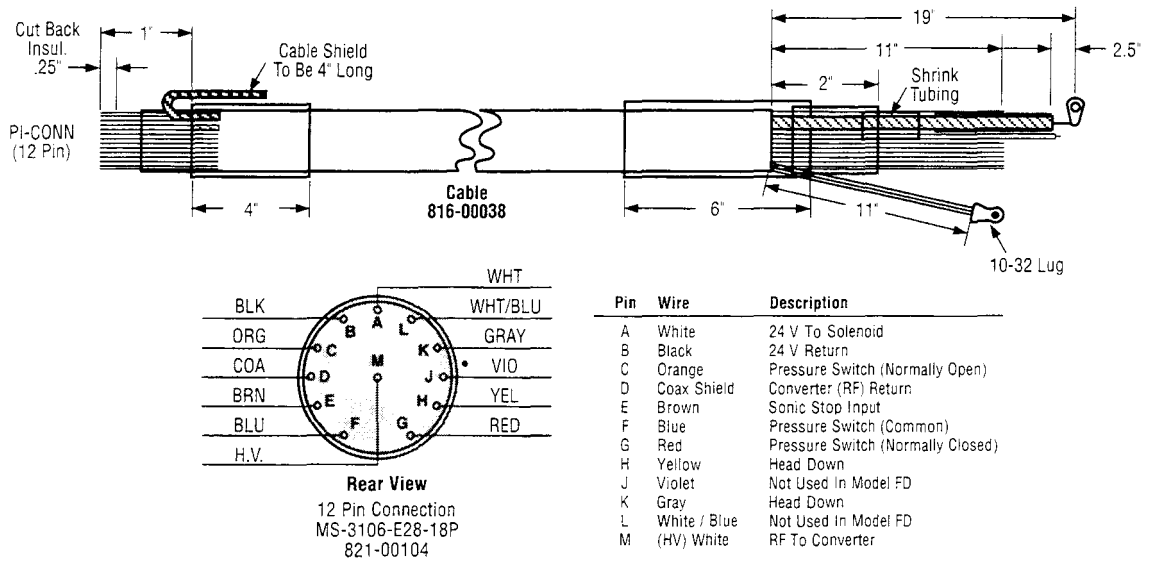
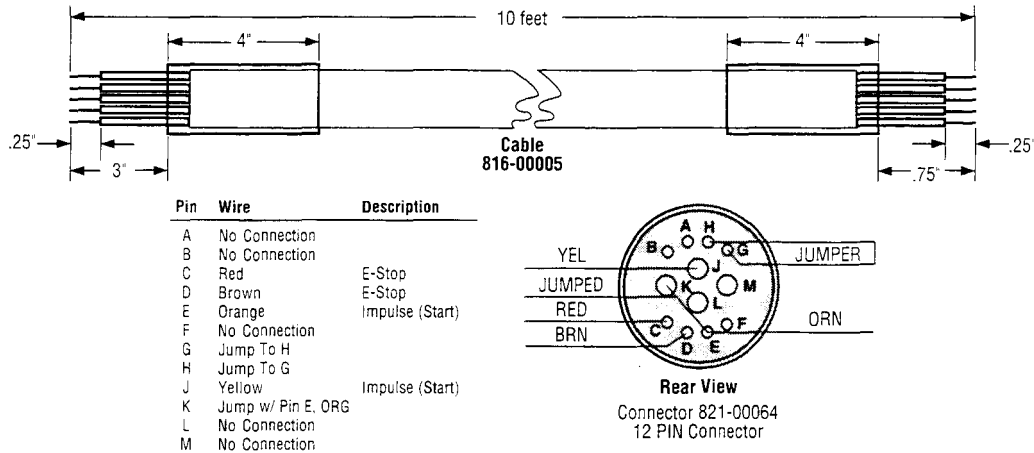


Figure 2-1.  
RF Interconnecting  
Cable

Impulse Actuation Cable



Base Cable

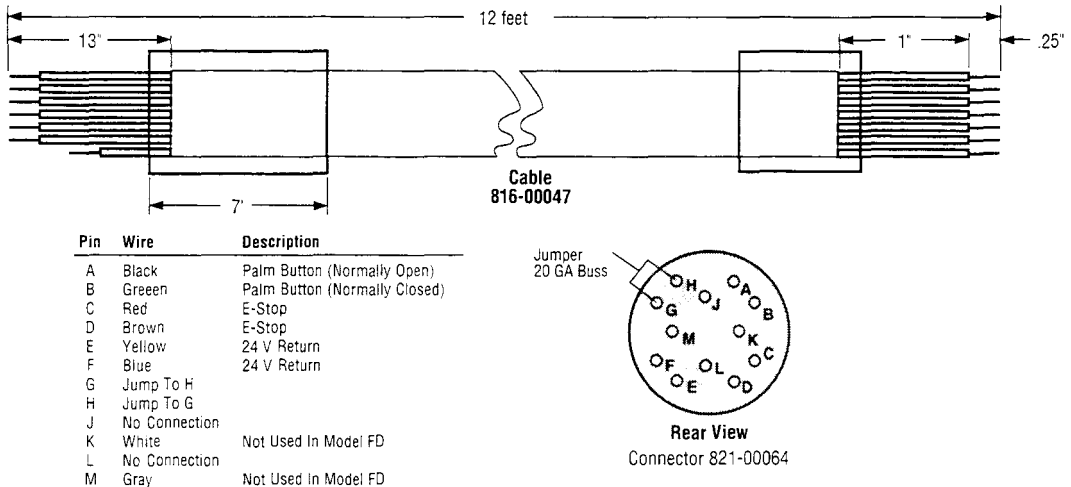


Figure 2-2.  
Actuating and  
Base Cables

# Installation

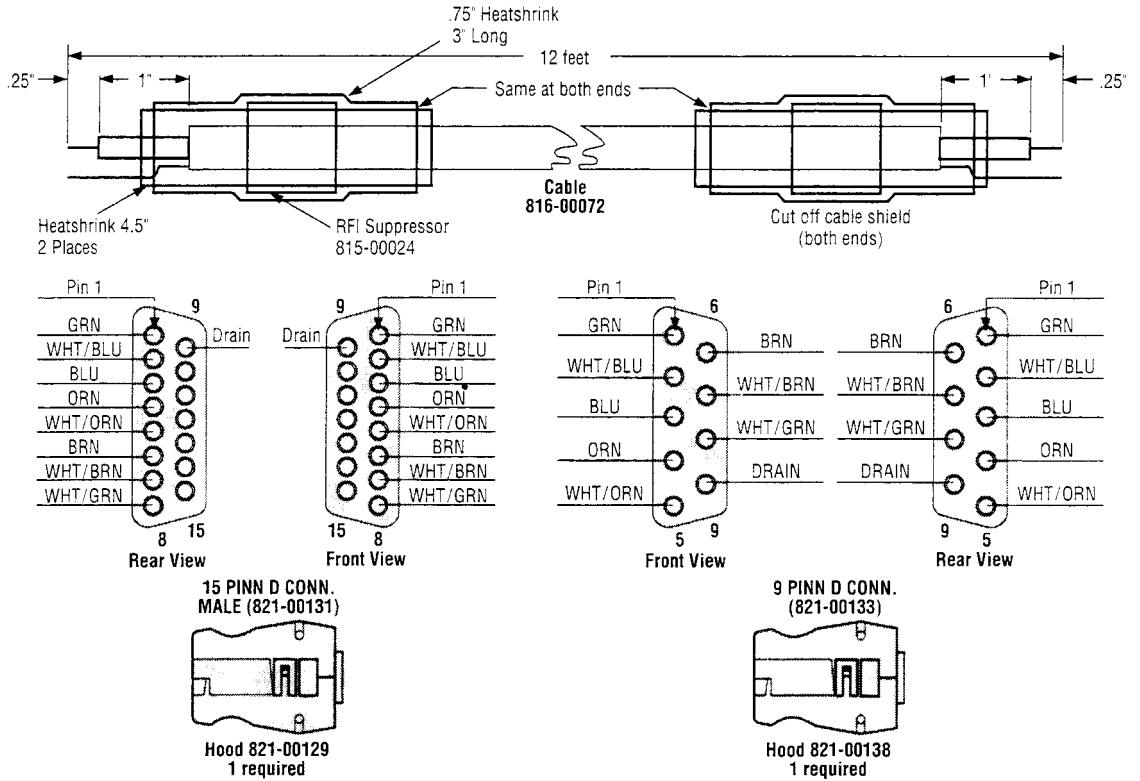
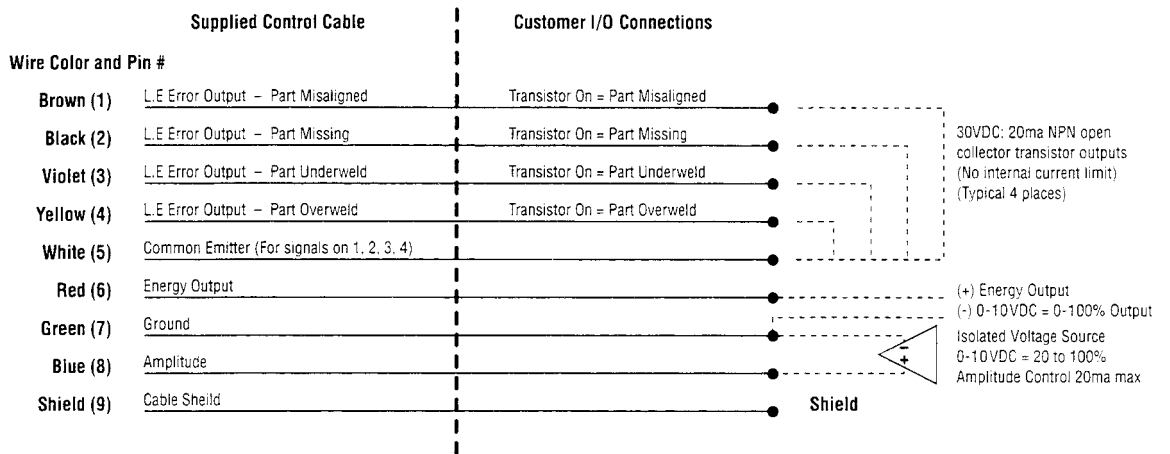


Figure 2-3.  
Linear Encoder Cable

**Assembly Notes For RFI Suppressor:**

1. Do not apply heatshrink tubing over ferrite until epoxied and closing of connector.
2. Position ferrite 1" from back end of connector. Shrink large heatshrink over ferrite, be sure smaller heatshrink is not longer than larger heatshrink. If occurs, remove excess with razor blade.

## Control Cable Functions



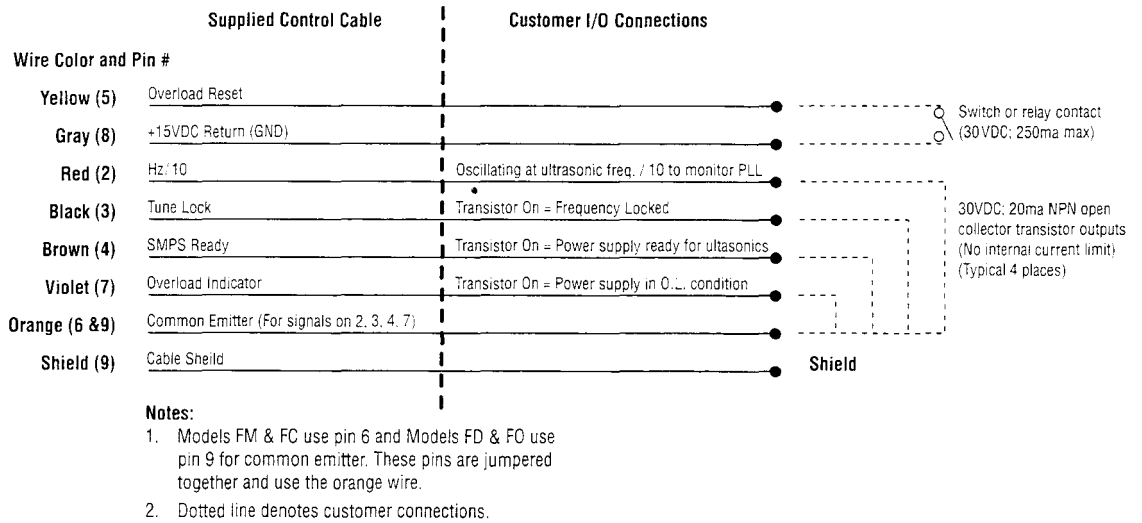
**Notes:**

1. Models FM & FC use pin 6 and Models FD & FO use pin 9 for common emitter. These pins are jumpered together and use the orange wire.
2. Dotted line denotes customer connections.
3. Used with Model FD having linear encoder option.

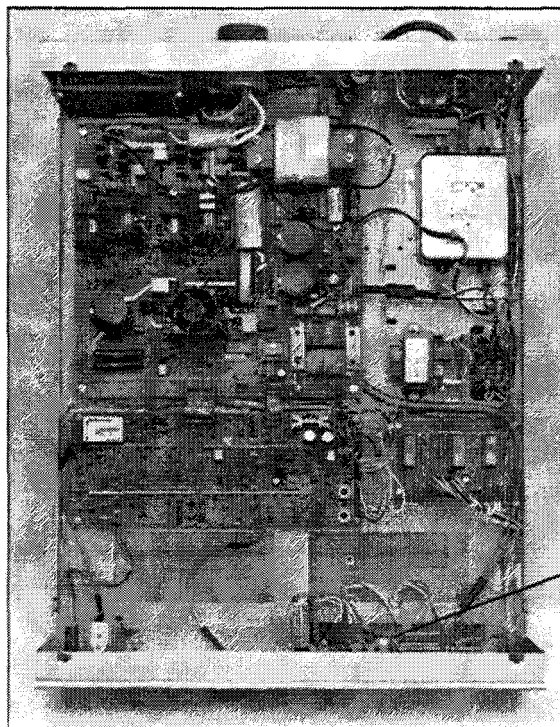
Figure 2-4.  
Encoder Window  
Outputs Cable

# Installation

## Control Cable Functions



**Figure 2-5.**  
I/O Control Cable



**Linear Encoder Enable Switch S1**

	On	Off
<b>S1-4</b>	Not used	
<b>S1-3</b>	LE Off	LE On
<b>S1-2</b>	Enter to Start	Auto On
<b>S1-1</b>	English	Metric

**Figure 2-6.**  
DIP Switch Identification

## Installation

### 2-12. Internal Switch Settings.

**2-13.** The controller/power supply contains four internal DIP switches (**Figure 2-6**), which are set in accordance with ordering information prior to shipment. The switch functions are as follows:

Switch No.	On	Off
1	Metric	English
2	Non-enter	Enter
3	Linear Encoder Installed	No Linear Encoder Installed
4	Not used	

**2-14.** On model FD with an installed linear encoder only, DIP switch 1 allows for selection of either metric or English measurement units. If it is desired to change from the current measurement mode (metric or English) to the alternate mode, proceed as follows:

- a. Using the ON/OFF switch, turn off the controller/power supply and disconnect the line cord from the electrical power source.
- b. Remove the controller/power supply cover.
- c. Set DIP switch 1 to the ON position for metric, or to the OFF position for English measurement units.



*Changing measurement units will cause all previously stored values to be cleared. Reprogramming of the controller/power supply will be required.*

- f. Install the controller/power supply cover and plug the line cord into the electrical power outlet.

**2-15.** The model FD can operate with or without a linear encoder bar. When a linear encoder is **not** in use, the setup procedure is as follows:



*Do not use a Model FD controller/power supply with a non-encoder stand unless DIP switch 3 is properly set in accordance with the following instructions.*

- a. Using the ON/OFF switch, turn off the controller/power supply and disconnect the line cord from the electrical power source.
- b. Remove the controller/power supply cover.
- c. Set DIP switch 3 to the ON position if the controller/power supply is to be used with a non-encoder stand. Ensure that this switch is set to the OFF position if the controller/power supply is to be used with a stand equipped with a digital encoder.
- d. Install the controller/power supply cover and plug the line cord into the electrical power outlet.

# PROGRAMMING & SETUP

## Section III

### 3-1. Introduction.

**3-2.** This section contains instructions for setting the system parameters for the assembly operations to be performed. No special programming expertise is required.

### 3-3. Functions Of Controls, Indicators, And Connectors.

**3-4.** The controls, indicators, and connectors of the controller/power supply are shown in **Figures 3-1, and 3-2**. The functions of these items are as follows:

#### a. LOADING Meter.

This meter (**1, Figure 3-1**) is a bar type meter that is used to observe the controller/power supply operation.

#### b. OUTPUT Control.

OUTPUT control (**2, Figure 3-1**) allows the operator to make fine adjustment of the amplitude of the system high-frequency vibrations. (Major amplitude adjustments are made by selecting the proper system booster.)

#### c. Numerical Keyboard.

Numerical keyboard (**3, Figure 3-1**) allows the operator to enter numerical values for selected setup parameters. The keyboard may be locked out electronically (refer to paragraph 3-10) to prevent tampering or inadvertent changes in operating parameter values.

#### d. LCD Display.

LCD display (**4, Figure 3-1**) provides a visual alphanumeric display of selected functions and numerical values during system parameter setup or review.

#### e. EXIT Key.

EXIT key (**5, Figure 3-1**) allows the operator to exit from a selected function.

#### f. TIMERS Key.

TIMERS key (**6, Figure 3-1**) selects the timers function for parameter setup. The timer function utilizes three separate screens on LCD display (**4**); cycling through the screens is accomplished by repeat pressing of the TIMERS key.



*The TIMERS key and other function keys contain an LED. The LED lights when the corresponding function is active.*

#### g. TEST Key.

TEST key (**7, Figure 3-1**), when pressed, turns on the ultrasonics to allow matching of the controller/power supply.

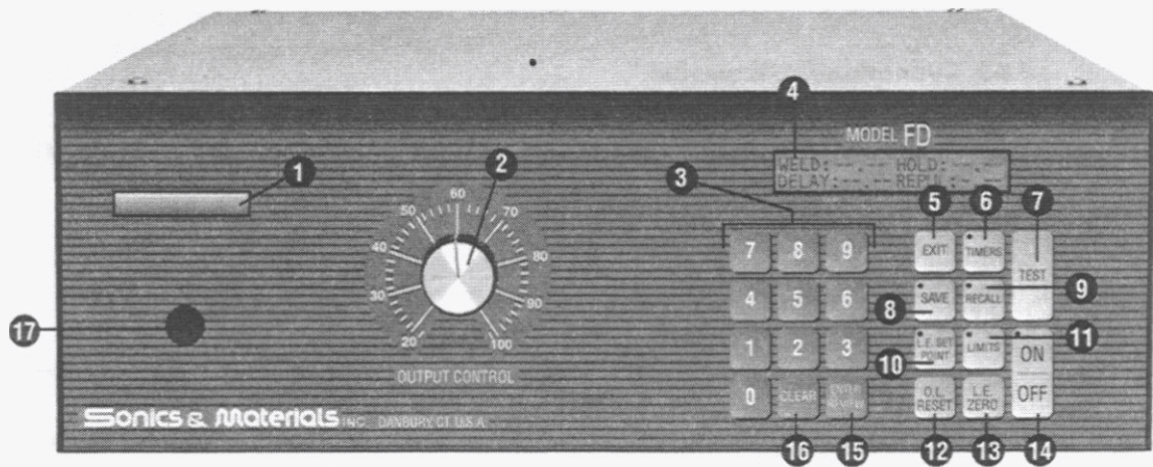
#### h. SAVE Key.

SAVE key (**8, Figure 3-1**) enables the operator to store a complete setup for later recall, thereby eliminating the need for reprogramming. Up to nine complete setups can be stored.

#### i. RECALL Key.

RECALL key (**9, Figure 3-1**) is used to recall stored system setups.

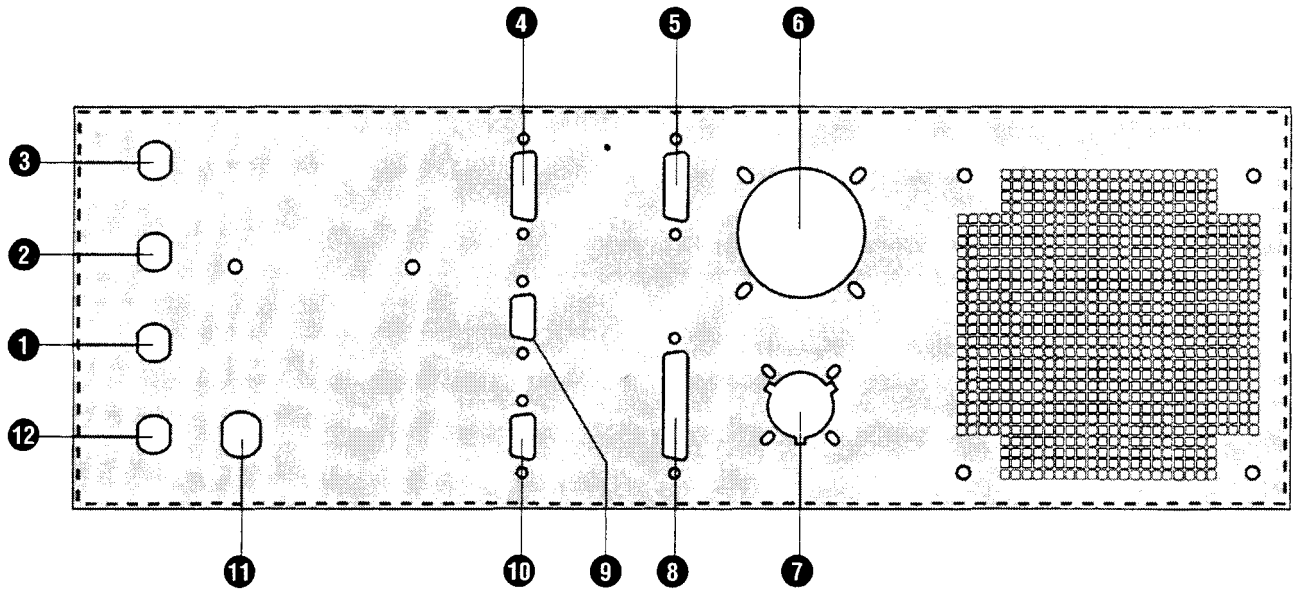
Programming and Setup



- |                                      |                                 |
|--------------------------------------|---------------------------------|
| 1 Load Meter                         | 11 Error Limits                 |
| 2 Output Control                     | 12 Overload Reset               |
| 3 Numerical Keys                     | 13 Linear Encoder Counter Reset |
| 4 LCD Display                        | 14 Power Switch                 |
| 5 Menu Exit Key                      | 15 Enter / Review               |
| 6 Timer Functions                    | 16 Clear                        |
| 7 Test (Activates Sonics)            | 17 Stack Match Control          |
| 8 Save (Job Storage)                 |                                 |
| 9 Recall (Job Storage)               |                                 |
| 10 Increments or Absolute Set Points |                                 |

Figure 3-I.  
Model  
Controller/Power  
Supply, Front View

Section **III**  
**Programming and Setup**



- ① Fuse F2
- ② Fuse F3
- ③ Fuse F4
- ④ Linear Encoder J9
- ⑤ *Not Used*
- ⑥ RF Interconnect J1
- ⑦ Base Cable or Impulse Actuation J2
- ⑧ *Not Used*
- ⑨ PLC Input /Output J8
- ⑩ Encoder Window Output J7
- ⑪ Power Input
- ⑫ *Not Used*

**Figure 3-2.**  
 Controller/  
 Power Supply,  
 Rear View

## Programming and Setup

- j. L.E. SET POINT Key.**  
 L.E. SET POINT key (10, Figure 3-1), with linear encoder bar option only, allows the operator to select the linear encoder set point function for entry of the desired absolute or incremental numerical value of weld depth.
- k. LIMITS Key.**  
 LIMITS key (11, Figure 3-1), with linear encoder bar option only, allows the operator to select the limits function for entry of desired pre-weld and absolute or incremental post-weld limit values. Absolute pre-weld, absolute post-weld, and incremental post-weld display screens are accessed by repeated key actuation.
- l. O.L. RESET Key.**  
 O.L. RESET key (12, Figure 3-1), when pressed, restores controller/power supply operation after an overload. Overload is indicated by blinking of the LED in the ON/OFF key and an "OVERLOAD!" indication on LCD display (4).
- m. L.E. ZERO Key.**  
 L.E. ZERO key (13, Figure 3-1) is used with linear encoder bar option only. When pressed, it resets the linear encoder distance to zero with the head in the up position.
- n. ON/OFF Switch.**  
 ON/OFF switch (14, Figure 3-1) is an alternate action switch that turns the controller/power supply on and off. An LED in the switch lights when the controller/power supply is on.
- o. ENTER / REVIEW Key.**  
 ENTER/REVIEW key (15, Figure 3-1) is a dual function key. When any programming function is active, pressing this key accepts the numerical value indicated by a cursor on the LCD display (4) screen as the active value for that function, and advances the cursor to the next numerical entry parameter. When no programming function is active, this key is used to access informational screens on the LCD display to review active programmed values.
- p. CLEAR Key.**  
 CLEAR key (16, Figure 3-1) enables the operator to clear numerical values from the LCD display screens during data entry. It can also be used at power up to enable clearing of numerical values for all functions simultaneously.
- q. STACK MATCH control.**  
 The model FD is an automatic controller/power supply. The stack match control (17, Figure 3-1) enables the matching of the horn to the model FD. Remove the front panel plug and rotate the screw adjustment (while depressing TEST button 17) until the lowest value is obtained on the LOADING meter.
- r. Fuses.**  
 Fuses (1, 2 & 3, Figure 3-2) protect against electrical overloads in the controller/power supply circuits. Fuse ratings differ with the various models, as follows:

Output Power	Fuse Ratings		
	F2	F3	F4
700W, 1000W - 220 VAC	10A	10A	1/2A
700W - 120 VAC	15A	15A	1/2A
1000W - 120 VAC	20A	20A	1/2A
1500W, 2000W - 220 VAC	15A	15A	1/2A

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**Programming and Setup**

- s. **Linear Encoder Connector.**  
Linear encoder connector (**4, Figure 3-2**), is used only when linear bar encoder option is installed, is used to connect the controller/power supply to the system linear encoder.
- t. **RF Connector.**  
RF connector (**6, Figure 3-2**) is used to connect the ultrasonic electrical output of the controller/power supply to the welding system converter.
- u. **Actuation Connector.**  
Actuation connector (**7, Figure 3-2**) is used to connect the controller/power supply to the control switch in the pneumatic press or to a remote start device.
- v. **PLC Connector.**  
PLC connector (**9, Figure 3-2**) is used to connect the controller/power supply to an external PLC device.
- w. **Error Output Connector.**  
Error output connector (**10, Figure 3-2**) is used only when linear bar encoder option is installed. It is used to supply an output signal to an external monitoring device when the system head detects missing or misaligned parts during the assembly process, or when parts are poorly welded (over weld/under weld).
- x. **Line Cord.**  
Line cord (**11, Figure 3-2**) connects the controller/power supply to the electrical power source.

**3-5. Controller / Power Supply Turn On And Shutdown**

**3-6.** To turn on the controller/power supply, press ON/OFF switch (**14, Figure 3-1**). The LED in the switch will light and the message "Sonics & Materials Timer" will be displayed on LCD display (**4**); when the linear bar option is enabled, the message "Sonics & Materials Digital Timer - English" or "Sonics & Materials Digital Timer - Metric", depending on the selected measurement mode, will be displayed. This message will be followed by the message "press ENTER to start welder". When ENTER/REVIEW key (**15**) is pressed, the LCD display will revert to the last informational screen that had been selected prior to the previous shutdown.

**3-7.** To shut down the controller/power supply, press the ON/OFF switch again. The LED in the switch will go off and LCD display (**4**) will go blank.

## Programming and Setup



*If the meter should deflect to full scale when the TEST key is pressed, release the TEST key. Nominal setups require less than 20% deflection of the meter when tested in air. Check for faults if full scale in air is observed. If an overload condition occurs, press O.L. RESET key (13) to clear the overload condition.*

### 3-8. Review Of Active Setup Parameter Values.

3-9. A series of informational display screens (also referred to as the ready screens) may be accessed for review of active setup parameter values. The display screens are informational only; no numerical values may be entered during the review process. The setup parameter review sequence is arranged in the form of a loop, and differs for models containing the linear encoder option. (See Figure 3-3.) The first LCD display that will appear in the sequence is the last informational screen viewed prior to the last shutdown or programming function selection. The selected screen is also displayed during the weld cycle to allow the operator to view specific data during a weld. The weld cycle can be started only from a ready screen, not from any editing screen. To review the active setup parameter values, proceed as follows:

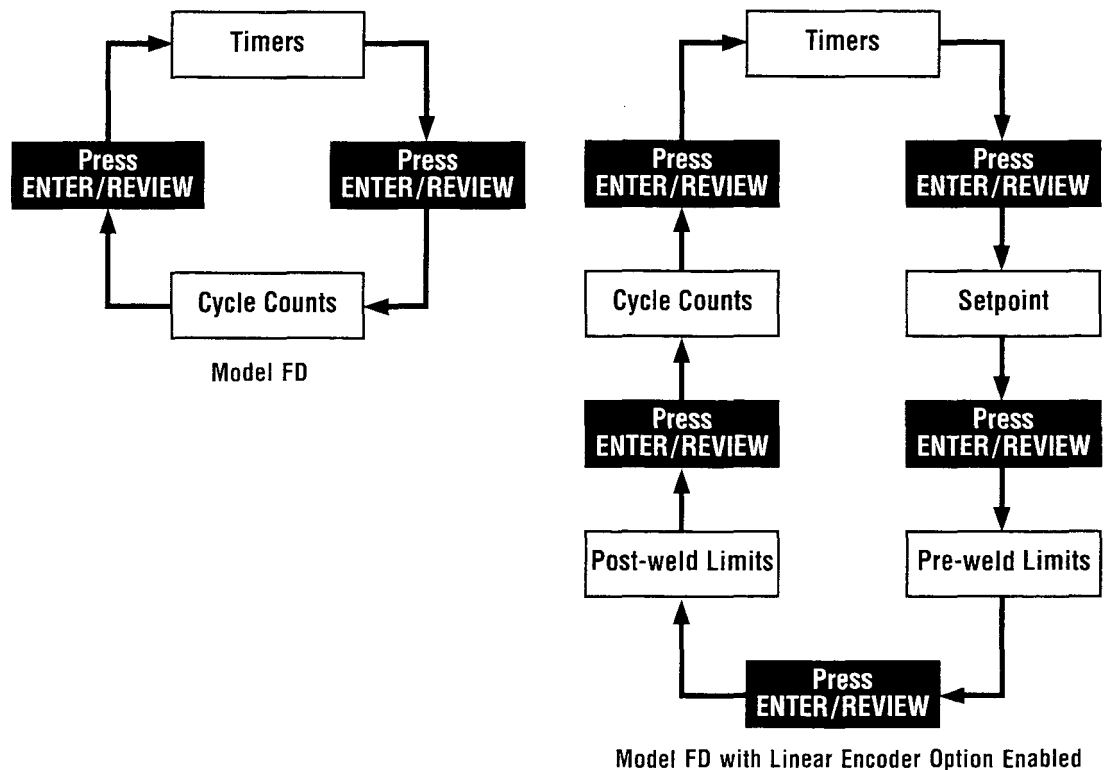


Figure 3-3.  
Informational Display  
Sequence Diagram

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**Programming and Setup**

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*For purposes of the following discussion, it is assumed that the TIMERS function display appears on the LCD display initially.*

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- a. Review the active weld time, hold time, delay time, and repulse time parameter values shown on the LCD display. To advance to the next informational screen on the model FD, proceed to step **e**; model FD with linear option enabled, perform all of the following steps in the given sequence.
- b. On the model FD with linear option enabled, press ENTER/REVIEW key **(15)**. The LCD display screen will show the currently active absolute or incremental setpoint and distance values, depending on which mode (absolute or incremental) has been programmed.
- c. On the model FD with linear option enabled, press ENTER/REVIEW key **(15)**. The LCD display screen will show the current pre-weld minimum, maximum, and distance values.
- d. On the model FD with linear option enabled, press ENTER/REVIEW key **(15)**. The LCD display screen will show the current post-weld minimum, post-weld maximum, and maximum distance values.
- e. Press ENTER/REVIEW key **(15)**. The LCD display screen will show the number of completed operating cycles performed since the current program count was initiated, and will cue the operator on how to reset the cycle counter to zero.
- f. Press ENTER/REVIEW key **(15)**. The LCD display will return to the TIMERS display screen.

**3-10. Keyboard Lock / Unlock.**

**3-11.** The numerical keyboard of the controller/power supply can be locked electronically to prevent tampering or inadvertent disturbance of parameter settings. It must be unlocked for entry of new settings. To lock or unlock the numerical keyboard, proceed as follows:

- a. Turn off the controller/power supply.
- b. While pressing the 7 key on numerical keyboard **(3, Figure 3-1)**, turn the controller/power supply back on. LCD display **(4)** will show the current numerical keyboard status (i.e., "KEYBOARD: LOCKED" or "KEYBOARD: UNLOCKED").
- c. To change the numerical keyboard status from locked to unlocked, or vice versa, key in 007 on numerical keyboard **(3)** and press ENTER/REVIEW key **(15)**. This must be done in less than 1 second. The LCD display will toggle from the current status to the opposite status.

**3-12. Entering Parameter Values.**

**3-13. General Instructions.** Unless otherwise directed via the LCD display, use the following general instructions to select system operating functions and enter desired numerical values:

- a. Ensure that the numerical keyboard is unlocked.
- b. Select the function to be programmed by pressing the corresponding function key. The LED in the key will light while the selected function is active.
- c. The LCD display screen will show the current active value(s) for the selected function. If the screen shows two parameter values, a cursor will be positioned opposite the value that can be programmed.

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**Programming and Setup**

- d. If the displayed value marked by the cursor is not the desired value, the displayed value can either be erased or written over at the operator's discretion. Erasing the incorrect value may reduce confusion; overwriting may be faster. To erase an incorrect entry, press CLEAR key (**16**, **Figure 3-1**). To enter the new value, use the numerical keyboard. If an error is made during data entry, press the CLEAR key and repeat the entry process. When the desired value is displayed, press ENTER/REVIEW key (**15**). The cursor will move to the next parameter value on the LCD display screen. Use the same procedure to enter the desired value for the indicated parameter.
- e. Some functions (i.e., TIMERS) employ a number of LCD display screens. In such cases, advancing to the next screen is accomplished by pressing the applicable function key again after all values on the currently displayed screen have been entered.
- f. To exit from any function, press EXIT key (**5**). The LCD display will revert to the last informational display (ready) screen shown before the programming function was selected.



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*The values to be entered during programming vary from application to application. If the application has been processed in our laboratory, consult our report for recommended parameter values. Otherwise, optimum parameter values must be determined by actual trial. Each variable should be studied independently by welding several groups of parts at a number of settings, while the other variables are held constant. The results of each weld operation should be observed, and the optimum setting for that variable recorded. Only one variable should be changed at a time. When optimum values for all variables have been determined, the settings may be stored in the controller/power supply memory for subsequent recall, or recorded for future use in identical applications.*

*To simplify the programming procedures in the following paragraphs, incorrect values will be erased, rather than overwritten. Keep in mind, however, that overwriting can be done, if preferred.*

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**Programming and Setup****3-14. TIMERS Function.****a. General Information.**

The TIMERS function is used to select time durations for specific assembly operations and to select the applicable horn pre-trigger state. A typical welding operation consists of four principal steps. First, the horn is lowered to contact the parts to be assembled and pressure is applied to the parts. **Delay time** is the time allotted for pressure to build up after the parts have been contacted and before the application of ultrasonic vibrations to the horn. After this delay period, ultrasonic vibrations are applied to the parts for the time period designated as the **weld time**. After the weld time period, pressure is maintained to ensure proper bonding of the parts; **hold time** is the length of time allotted for this step. The final step is an application of ultrasonic vibrations to the horn to ensure that the parts being assembled do not adhere to the horn; the time period for this step is the **repulse time**. When welding large pieces, it is sometimes necessary to pre-trigger the horn; the **pre-trigger** can be turned on and off using the TIMERS function.

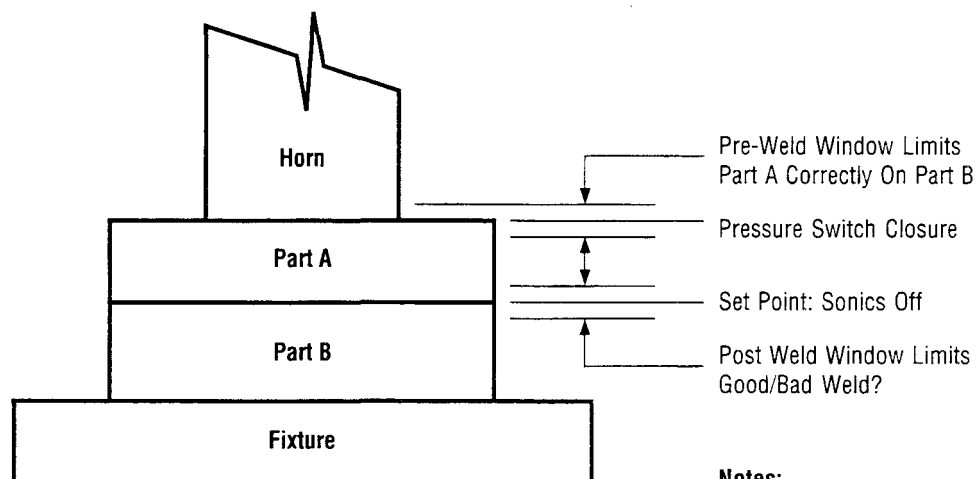
**b. TIMERS Programming Procedure.**

- (1) Select the TIMERS function by pressing TIMERS key (**6**, **Figure 3-1**). The LED in the key will light, and LCD display (**4**) will show one of three windows.
- (2) If the displayed screen is not the weld/hold time screen, press the TIMERS key as needed until this screen is displayed. The cursor on the screen will point to the weld time function.
- (3) Note the displayed weld time. If the displayed time is the desired value, press ENTER/REVIEW key (**15**). If it is not the desired weld time, press CLEAR key (**16**); then, enter the desired weld time via numerical keyboard (**3**) and press the ENTER/REVIEW key. The cursor will move down to the next parameter on the screen when the ENTER/REVIEW key is pressed.
- (4) Select the desired hold time using the same procedure as in preceding step (**2**).
- (5) Press TIMERS key (**6**) to advance to the next screen. The cursor will point to the first parameter on the screen, the delay time.
- (6) Select the desired delay time using the same procedure as in step (**2**) above. The cursor will move down to the repulse time parameter.
- (7) Select the desired repulse time using the same procedure as in step (**2**) above.
- (8) Press TIMERS key (**6**) again to advance to the pre-trigger screen. This screen will show whether the pre-trigger is on or off. If it necessary to change the pre-trigger state, press ENTER/REVIEW key (**15**) so that the desired pre-trigger state is shown on the screen. (Pressing the ENTER/REVIEW key repeatedly toggles the pre-trigger state on and off.)
- (9) Press EXIT key (**5**) to exit from the TIMERS function. The LED in TIMERS key (**6**) will go off.

**Programming and Setup**

**3-15. L.E. SET POINT Function.** The L.E. SET POINT function, available when the linear encoder feature is enabled and a linear encoder bar is installed, is used to enter the desired digital encoder mode, absolute or incremental setpoint (one or the other, not both). In the incremental mode, the setpoint is the distance from the point where the system horn contacts the parts being assembled to the final travel limit of the horn. In the absolute mode, the setpoint value is the total travel distance of the horn. To enter the desired setpoint, proceed as follows:

- a. Press L.E. SET POINT key (**10**, **Figure 3-1**). The LED in this function key will light, and the LCD display screen will show absolute and incremental setpoint parameters, with the cursor opposite the absolute setpoint.
- b. If the absolute mode is the desired operating mode and the displayed setpoint value is correct, press ENTER/REVIEW key (**15**). If the absolute mode
- c. Use a procedure similar to that in preceding **step b** to select the incremental setpoint value.
- d. Press EXIT key (**5**) to exit from the L.E. SET POINT function. The LCD display will revert to the last informational (ready) screen (ready) viewed prior to the L.E. SET POINT function selection.



**Figure 3-4.**  
Linear Encoder  
Limits

**Notes:**

1. In absolute mode, all options are available but are not required for welding.
2. In incremental mode, pre-weld window limits are not available due to the nature of the function. Pressure switch zeros linear encoder.

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**Programming and Setup**

**3-16. LIMITS Function.** The LIMITS function, available only on units with the linear encoder function installed, is used for entry of pre-weld and post-weld minimum and maximum limits. (See Figure 3-4). To set these limits, proceed as follows:

- a. Press LIMITS key (**11**, Figure 3-1). The LED in the key will light and the LCD display screen will show the current absolute pre-weld minimum and maximum values, with the cursor opposite the minimum value.
- b. If the displayed minimum value is not the desired minimum, press CLEAR key (**16**). Then, enter the desired absolute pre-weld minimum value via numerical keyboard (**3**) and press ENTER/REVIEW key (**15**). The cursor will move to the pre-weld maximum parameter.
- c. Use a procedure similar to that in preceding step b to set the desired pre-weld maximum limit.
- d. Press LIMITS key (**11**) again. The LED display will advance to the next screen, showing absolute post-weld minimum and maximum parameters.
- e. If the absolute mode is to be used for the assembly process, set the absolute post-weld minimum and maximum values using procedures similar to those in steps b and c above. If the absolute mode is not to be used, clear any displayed minimum and maximum values using CLEAR (**16**) and ENTER/REVIEW (**15**) keys.
- f. Press LIMITS key (**11**) again. The LED display will advance to the next screen, showing incremental post-weld minimum and maximum limits, with the cursor at the minimum parameter.

- g. If the incremental mode is to be used for the assembly process, set the incremental post-weld minimum and maximum limits to the desired values using procedures similar to those in steps b and c above. If the incremental mode is not the desired operating mode, clear the displayed minimum and maximum values using the CLEAR and ENTER/REVIEW keys.
- h. Press EXIT key (**5**) to exit from the LIMITS function.

**3-17. L.E. ZERO Function.** The L.E. ZERO function, available only on units with the linear encoder function installed, is used to reset the linear encoder. When L.E. ZERO key (**13**, Figure 3-1) is pressed, the linear encoder is zeroed if the system head is up, and the LED display screen shows the absolute setpoint value and a distance of 000.00mm or 0.000 in.; if the head is not in the up position, the LCD display will show the peak distance traveled since the linear encoder was zeroed.

## Programming and Setup

### 3-18. Saving Controller / Power Supply Setups.

**3-19.** Once the correct operating values for all variables have been entered, the complete setup can be stored in the controller/power supply memory. This eliminates the need for complete reprogramming for the same assembly process at some later date. Up to 9 complete setups can be stored. The procedure is as follows:

- a. Ensure that correct values have been entered for all variables.
- b. Press SAVE key (**8, Figure 3-1**). The LED in the key will light, and the LCD display screen will show the following:

```
FREE JOBS: 1 2 3 4 5 6 7 8 9
SAVE JOB #
```

The free jobs numbers indicate the available storage addresses; if a storage location is already in use, the number of that location will not appear in the free jobs display.

- c. Select one of the free jobs numbers from the LCD display and enter that number via numerical keyboard (**3**). The selected number will appear in the SAVE JOB # entry. Press ENTER/REVIEW key (**15**) to store the current setup in the selected location. The LCD display will revert to the last informational display (ready) screen viewed prior to the SAVE function selection.



*Record the selected job number for the stored setup. It will be necessary to use that number when the stored setup is to be recalled.*

### 3-20. Recalling Stored Setups.

**3-21.** To recall a complete setup from storage for use in a current assembly application, proceed as follows:

- a. Determine the job number under which the desired setup has been stored.
- b. Press RECALL key (**9, Figure 3-1**). The LED in the key will light and the LCD display screen will show the following:  
STORED JOBS: \_ \_ \_ \_ \_  
LOAD JOB #

The STORED JOBS entry will show all available stored jobs as numbers. If one of the stored jobs is to be recalled for use, proceed to step c; if it is to be deleted from storage, proceed to step d.

- c. Select the desired job number and key in that number as the LOAD JOB # entry via numerical keyboard (**3**). Then, press ENTER/REVIEW key (**15**). The LCD display will revert to the last informational (ready) screen viewed prior to the RECALL function selection.
- d. To delete a job from storage, select the desired job number and key in that number as the LOAD JOB # entry via numerical keyboard (**3**). Then press the CLEAR key. The LCD display screen will show the message PRESS ENTER to delete job # \_ \_ \_ \_ \_ . If the displayed job number is the one to be deleted, press ENTER/REVIEW key (**15**). The LCD display will revert to the last informational (ready) screen viewed prior to the RECALL function selection.

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## **Programming and Setup**

### **3-22. Clearing All Numerical Entries.**

**3-23.** To eliminate time consuming individual clearing of numerical entries during programming, a simultaneous numerical value clearing feature is available. This feature can be used only with the numerical keyboard unlocked. To clear all numerical entries simultaneously, proceed as follows:

- a.** Using ON/OFF key (**14, Figure 3-1**), turn off the controller/power supply.
- b.** Hold down CLEAR key (**16**) and turn the controller/power supply back on. The LED display will cue the operator to press the ENTER/REVIEW key to delete all settings.
- c.** Press ENTER/REVIEW key (**15**).  
All current numerical entries will be cleared.

### **3-24. Overload Reset.**

**3-25.** The overload protection circuits of the controller/power supply will terminate the welding cycle when the system is operated under adverse conditions (i.e., incorrect tuning, excessive controller/power supply loading, loose or failed system components), thereby protecting the controller/power supply and other system components against damage. When an overload condition occurs, the LED in the ON/OFF key flashes and an "OVERLOAD!" message is displayed on the LCD display. To clear an overload condition, press O.L. RESET key (**12, Figure 3-1**). Note, however, that the overload condition will recur until the problem has been corrected.

# APPENDIX

## Manufacturers Of Hearing Protectors

### **David Clark Company**

P.O. Box 155  
Worcester, MA 01613-0155

### **Direct Safety Company**

Dept. 5  
7815 S. 546th Street  
Phoenix, AZ 85044

### **Flents Products Company, Inc.**

14 Orchard Street  
Norwalk, CT 06850

### **Industrial Safety and Security Company**

1386 Newbrech Street  
Lima, OH 45801

### **Jackson Products**

5801 Safety Dr. N.E.  
Belmont, MI 49306

### **Regis Industrial Supply Company**

727 Eric Street at Ontario  
Grafton, OH 44044

### **Safety Services, Inc.**

5288 Wynn Rd.  
Kalamazoo, MI 49005

## Manufacturers Of Sound Absorbing Material

### **AirTex Industries, Inc.**

3558 Second Street North & 36 Ave.  
Minneapolis, MN 55412

### **American Acoustical Products**

Division of Ward Process  
9-T Cochituate Street  
Natick, MA 01760

### **Cabot Corporation**

E.A.R. Division  
7911 Zionsville Road  
Indianapolis, IN 46268

### **Delaware Valley Corporation**

502 Broadway  
Lawrence, MA 01841

### **Ferro Corporation**

Composites Division  
34 Smith Street  
Norwalk, CT 06856

### **Hendrick Manufacturing Company**

7th Avenue & Elidco Drive  
Carbondale, PA 18407

### **Illbruck, Inc.**

3810 Washington Avenue North  
Minneapolis, MN 55412

### **Scott**

Foam Division  
1500 East Second Street  
Chester, PA 19013

### **Specialty Composites Corporation**

Delaware Industrial Park  
650 Dawson Drive  
Newark, DE 19713

### **The Soundcoat Company, Inc.**

3002-T Croddy Way  
Santa Ana, CA 92704

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