Model FC Power Supply

INSTRUCTION MANUAL

SONICS

Sonics & Materials, Inc.

WARNING

SAFETY PRECAUTIONS
READ BEFORE INSTALLING OR USING THE 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 plug before removing cover or servicing.

– Make sure equipment is properly grounded with a 3-prong plug. Before plugging in equipment, test 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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Printed in U.S.A.

Part No. 381-0031

TABLE OF CONTENTS

IMPORTANT SERVICE LITERATURE 4
Manual Change Information 4

UNPACKING AND INSPECTION 5
Visible Loss or Damage 5
Concealed Loss or Damage 5

INTRODUCTION 6

OVERVIEW OF ULTRASONIC PLASTICS ASSEMBLY 6
What is Ultrasonics? 6
Principal of Ultrasonic Assembly 6
Ultrasonic Assembly Systems 6

GLOSSARY OF ULTRASONIC TERMS 8

INSTALLATION 9
Electrical Power Requirements 9
Setting Up 9
Electrical Connections 10
Cable Connections 11

OPERATING PROCEDURES 13
Front Panel Controls 13
Starting up the Power Supply 14
Initial Operation 14
Overload Protection 15

MAINTENANCE 16
General 16
Repairs / Service 16

WARRANTY 17
Limitation of Warranty 17

APPENDIX 18

IMPORTANT SERVICE LITERATURE

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

The system 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 be at the forefront of 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.

UNPACKING AND INSPECTION

NOTE: *We recommend keeping all carton(s) and packing material in case it might be necessary to move the equipment, or to ship it for repair.*

Before unpacking the equipment, check the shipping carton for any visible damage. If you see any, be sure to follow the procedures described below under "Visible Loss or Damage." Otherwise, proceed to remove the equipment from the carton. Before storing any packing material, check it carefully for small parts. Then perform a visual inspection of the equipment to detect any evidence of damage which might have occurred during shipment. Check the following:

1. all components against the enclosed packing list,
2. all module plug-in units,
3. all wire plug-in connections.

The equipment was carefully packed and thoroughly inspected before leaving our factory. All units are tested and checked for problems prior to shipping. It is asked that when a problem does occur that all parts and components be inspected for damage (especially when the unit is not in working order when received). Responsibility for safe delivery was assumed by the carrier upon acceptance of the shipment. Claims for loss of damage sustained in transit must therefore be made upon the carrier, as follows:

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 such a claim will be supplied by the carrier.

CONCEALED LOSS OR DAMAGE

Concealed loss or damage means loss or damage which does not become apparent until the merchandise has been unpacked. The contents might have been damaged in transit due to rough handling even though the container may not show external damage. When the 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 such damage is the carrier's responsibility. 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 their inspection.

If the system or any unit is damaged, notify "Sonics." "Sonics" will arrange for repair or replacement of damaged equipment without waiting for the claim against the carrier to be settled, provided a new purchase order is issued to cover the repair or replacement costs. Should any damage, shortage or discrepancy exist, please notify us immediately.

INTRODUCTION

The FC model power supply is an auto-tuned ultrasonic generator that can be operated on a continuous basis, or pulsed via an outside control. This power supply can be used with a stand-alone converter, or with a pneumatic actuator. The FC does not offer time or energy-based control.

OVERVIEW OF ULTRASONIC PLASTICS ASSEMBLY

WHAT IS ULTRASONICS?

Ultrasonics refers to vibrational waves with a frequency above the human audible range which is usually above 18,000 cycles per second (Hz).

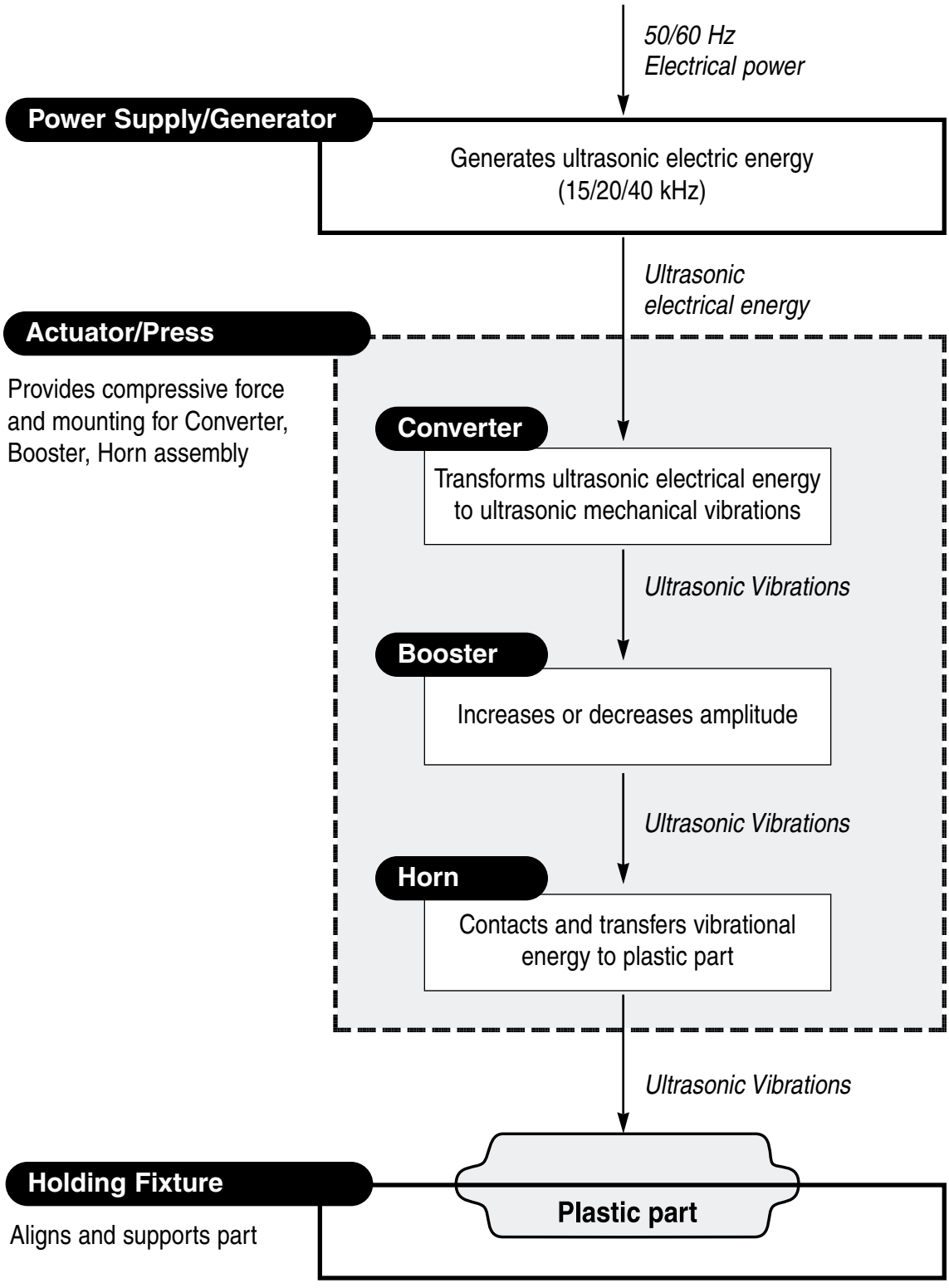
PRINCIPLE OF ULTRASONIC ASSEMBLY

The basic principle of ultrasonic assembly involves conversion of high frequency electrical energy to high frequency mechanical energy in the form of reciprocating vertical motion which, when applied to a thermoplastic, generates frictional heat at the plastic/plastic or plastic/metal interface. In ultrasonic welding, this frictional heat melts the plastic, allowing the two surfaces to fuse together; 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).

ULTRASONIC ASSEMBLY SYSTEMS

"Sonics" ultrasonic assembly systems are generally composed of the following major elements: a power supply, converter, booster, horn, pneumatic press and holding fixture, as detailed in the diagram on the next page. A review of this diagram will help you understand the basic elements involved in the assembly process and their relation to each other.

"SONICS" ULTRASONIC ASSEMBLY SYSTEMS



GLOSSARY OF ULTRASONIC TERMS

POWER SUPPLY/GENERATOR – The solid state power supply converts standard 50/60 Hz electrical energy to 15,000 Hz, 20,000 Hz or 40,000 Hz (15/20/40 kHz) electrical energy.

ACTUATOR/PRESS – The pneumatic actuator provides compressive force and mounting for the converter, booster and horn assembly. The tabletop press consists of a base assembly, column and actuator (head).

CONVERTER – The converter changes the high frequency electrical energy supplied by the power supply to high frequency mechanical vibrations.

BOOSTER – Successful ultrasonic welding often depends on having the right amplitude at the horn face. Often it is not possible to design a horn which has both the necessary shape and required gain (ratios of input amplitude to output amplitude). In such cases, a booster is placed between the converter and the horn to either increase or decrease the amplitude of the horn. In addition to changing/maintaining the amplitude, the booster provides support and alignment in the welding system.

HORN – The horn is a tuned component of the system which comes in contact with the parts to be assembled. The horn 1) transfers the ultrasonic vibrations produced from the converter to the parts being welded, and 2) applies necessary force to the assembly while the material resolidifies.

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

NOTE: *For additional information on set-up and adjustment of the converter / booster / horn / holding fixture, refer to the Welding Press Instruction Manual.*

INSTALLATION

WARNING

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.

ELECTRICAL POWER REQUIREMENTS

The power supply requires a fused, single-phase, standard 3-terminal grounding type receptacle capable of supplying the requisite voltage and current. Refer to the table below for power specification.

POWER SPECIFICATIONS

Model	Power Rating	115 vac	230 vac
FC740	700w	15 amps	10 amps
FC1020	1000w	15 amps	10 amps
FC1520	1500w	N/A	15 amps
FC2020	2000w	N/A	20 amps

SETTING UP

The 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. The selected installation site should be near the electrical power source and away from equipment that generates abnormally high electrical transients. Observe the following additional instructions when installing the equipment:

a. Allow at least 6 inches (152.4mm) at the rear of the power supply for cable connections.

b. Position the power supply so that the front panel controls are visible and readily accessible.

c. The power supply is air cooled; allow sufficient space around the assembly to ensure adequate ventilation. If the power supply must be housed in a confined space, forced air cooling may be necessary to keep surrounding air within acceptable ambient temperature limits. Periodically check the ventilation grille and clean as necessary.

NOTE: *If power supply is to be run continuously, air cooling of the converter and horn is required. Use clean, dry compressed air filtered down to 5 microns (supplied to converter fitting – see page 11).*

NOTE: *Do not plug the power supply into an electrical outlet until all other connections have been made.*

ELECTRICAL CONNECTIONS

The standard cable supplied with a “Sonics” press is 10 feet. Optional extension cables are available up to 15 feet without modification.

When making the initial electrical connections, make sure the power is disconnected and follow these precautions.

1. Do not strain or kink the cables. When going around corners, allow as wide a bend as possible. Do not run the cables parallel to any power line within a distance of less than 1 foot (305mm).
2. To prevent the possibility of an electrical shock, ensure that the power supply line cord is properly grounded. Also make sure that the voltage rating of the electrical power source matches the power supply requirement (refer to the “Power Specifications” table on preceding page).
3. Check with your electrician if you have any wiring questions.

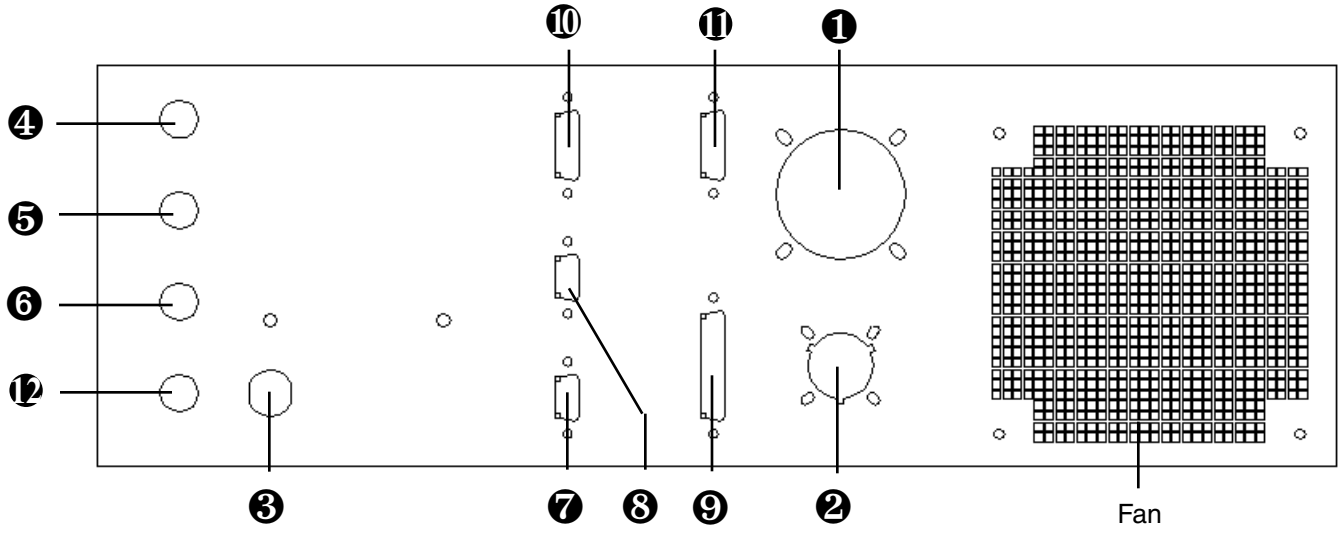
NOTE: *Detailed wiring diagrams are supplied in the Appendix at the back of this manual.*

CABLE CONNECTIONS:

Located at the rear of the power supply are the cable connections as illustrated below. (The interconnecting cables will be supplied with your system.)

1. A round, 12-pin RF cable that connects the welding press or converter to the power supply.
2. An actuation cable that connects the power supply to a trigger source (refer to wiring diagrams in Appendix).
3. The power line cord that plugs into the appropriate electrical outlet.

Once these connections have been made, the power supply is ready for operation. If applicable, be sure to consult your welding press instruction manual to insure that all connections on the press side are correct, and that the press is ready for operation.



NOTE: *To see a list of converters that can be connected to the power supply, see the table on the following page.*

Also located at the rear of the power supply are the following:

4. fuses (fixed 0.5 amp),
5. fuses (based on requirements listed in “Power Specifications” table, p. 8),
6. fuses (based on requirements listed in “Power Specifications” table, p. 8),
7. outputs J7 (see wiring diagrams in Appendix),
8. outputs J8 (see wiring diagrams in Appendix),

9-12. optional.

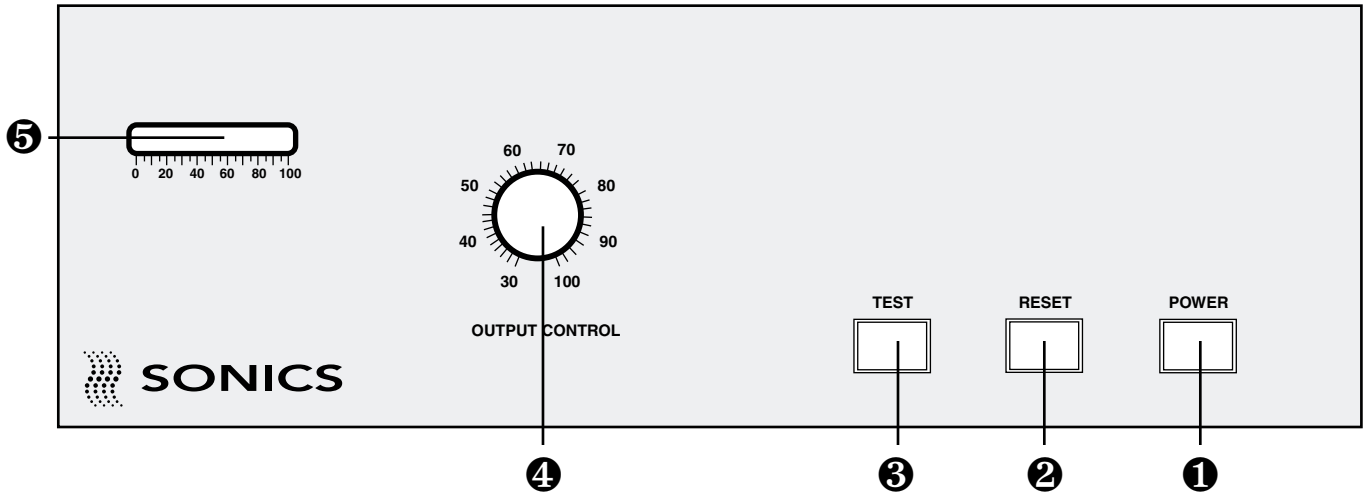
AVAILABLE CONVERTERS

Item No.	Description
CV00015	20 kHz with Button connector
CV00151	20 kHz with Lemo connector
CV00154	20 kHz with Lemo connector and fitting for air cooling
CV00157	20 kHz with Button connector and fitting for air cooling
CV00158	20 kHz Hand Gun with handles and cables
CV00331	20 kHz with Fischer connector
CV00334	20 kHz with Fischer connector and fitting for air cooling
CV00023	40 kHz with Button connector
CV00231	40 kHz with Lemo connector
CV00232	40 kHz with SHV connector side mounted
CV00234	40 kHz with Lemo connector and fitting for air cooling
CV00238	40 kHz Hand Gun with trigger switch and cable

OPERATING PROCEDURES

FRONT PANEL CONTROLS

Located on the front panel of the power supply are the following controls:



WARNING

The RESET button is a built-in safety feature. When the power supply is connected to a press, be sure the press head actuation signals are not activated (or closed). If they are activated, the press head will descend immediately when the RESET button is depressed.

1. Red **POWER** button which turns the unit on and off.
2. Yellow **RESET** button which resets the power supply following an overload condition. If an overload condition exists, the button lights up. In addition, the **RESET** button must be depressed after the unit is first turned on before any operation can proceed.
3. Green **TEST** button which can be used to test ultrasonic operation (pressing it only manually activates the ultrasonics).
4. **OUTPUT CONTROL DIAL** which controls *fine* adjustment of the amplitude of the system's high-frequency vibrations over the full operating range. (*Major* adjustments of amplitude are made through the use of different boosters – consult your press manual for further information.)
5. **LED LOAD METER** which indicates the level of ultrasonics that is being transmitted to the welding press.

STARTING UP THE POWER SUPPLY

Press the red **POWER** button to turn the power supply on. The **POWER** button will light up. The yellow **RESET** button will also come on and will remain lit.

INITIAL OPERATION

After the power supply is turned on (as described above), follow these steps:

1. Make sure that all necessary preparations have been made with regard to the ultrasonic system and tooling, and that the items to be welded are in position.
2. Before pressing the **RESET** button, make sure the press head actuation (cycle start) signals are not activated (or closed). Then, press the **RESET** button to activate power supply operation.
3. Press the **TEST** button. While depressing the **TEST** button, check the LED Load Meter reading to make sure that it does not exceed 20%.

a) If the meter reading is above 20%, contact Sonics immediately for further instructions before proceeding.

b) If the meter reading is below 20%, you can proceed with operation.

During the testing process, keep in mind that the ultrasonics are only activated as long as the **TEST** button is depressed – once you release the **TEST** button, ultrasonics is terminated.

4. The power supply is now in ready mode.

NOTE: *The TEST and Load Meter check should always be done for all cold start-ups, and for any start-up after the system has been idle for 20 minutes or more.*

OVERLOAD PROTECTION

The overload protection circuit will terminate the welding cycle when the system is operated under adverse conditions, i.e., improper tuning, excessive power supply loading, loose or failed horn or booster, thereby protecting the power supply and other system components. When an overload condition exists, the **RESET** button will illuminate and remain lit until the condition has been corrected and the button is pressed. If the condition is not corrected, the **RESET** button will remain lit. If a repeated overload condition exists, resolve the problem before a failure of the power supply occurs.

If an overload condition exists, try the following:

— decrease horn force

— decrease amplitude (change booster or decrease output control)

— decrease downspeed

— check for loose or broken studs

— check the coupling surfaces between horn/booster and booster/converter

— check for cracked horn or booster

— check to see if the load meter exceeds 100% during weld process (if so, a higher powered unit is needed)

If you cannot remedy the situation, contact Sonics.

MAINTENANCE

GENERAL

1. Always make sure the power supply has adequate ventilation by keeping sufficient space around the assembly.
2. Periodically check the ventilation grilles and clean as necessary.

If problems are encountered, contact our Service Department at 1-800-745-1105.

REPAIRS / SERVICE

If problems are encountered, contact our Service Department at 1-800-745-1105.

It is suggested that a system in need of repair be sent back to the factory with a written description pertaining to the nature of the problem.

Always contact the factory for return authorization before shipping any instrument. Include date of purchase, model number, and serial number. For units not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay. Care should be exercised to provide adequate packing to insure against possible damage in shipment. The system should be sent with all transportation charges prepaid and return method of shipment indicated.

NOTE: *If packing unit for return shipment, DO NOT use styrofoam "peanuts."*

WARRANTY

Sonics & Materials, Inc., hereinafter referred to as “Sonics,” warrants its products for a period of one year from the date of shipment against defect in material and workmanship under normal installation, use, and maintenance as described in the operating instructions which accompany such equipment. During the warranty period, “Sonics” 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. “Sonics” neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the sale of its products. “Sonics” hereby disclaims any warranty or 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 “Sonics” 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 “Sonics” product.

This warranty does not apply to equipment which has been subject to unauthorized repair, misuse, abuse, negligence or accident. Equipment which, in our judgment, 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.

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

“Sonics” reserves the right not to warrant horns of unusual or experimental design which in our judgment are more likely to fail in use.

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 “Sonics.”

APPENDIX

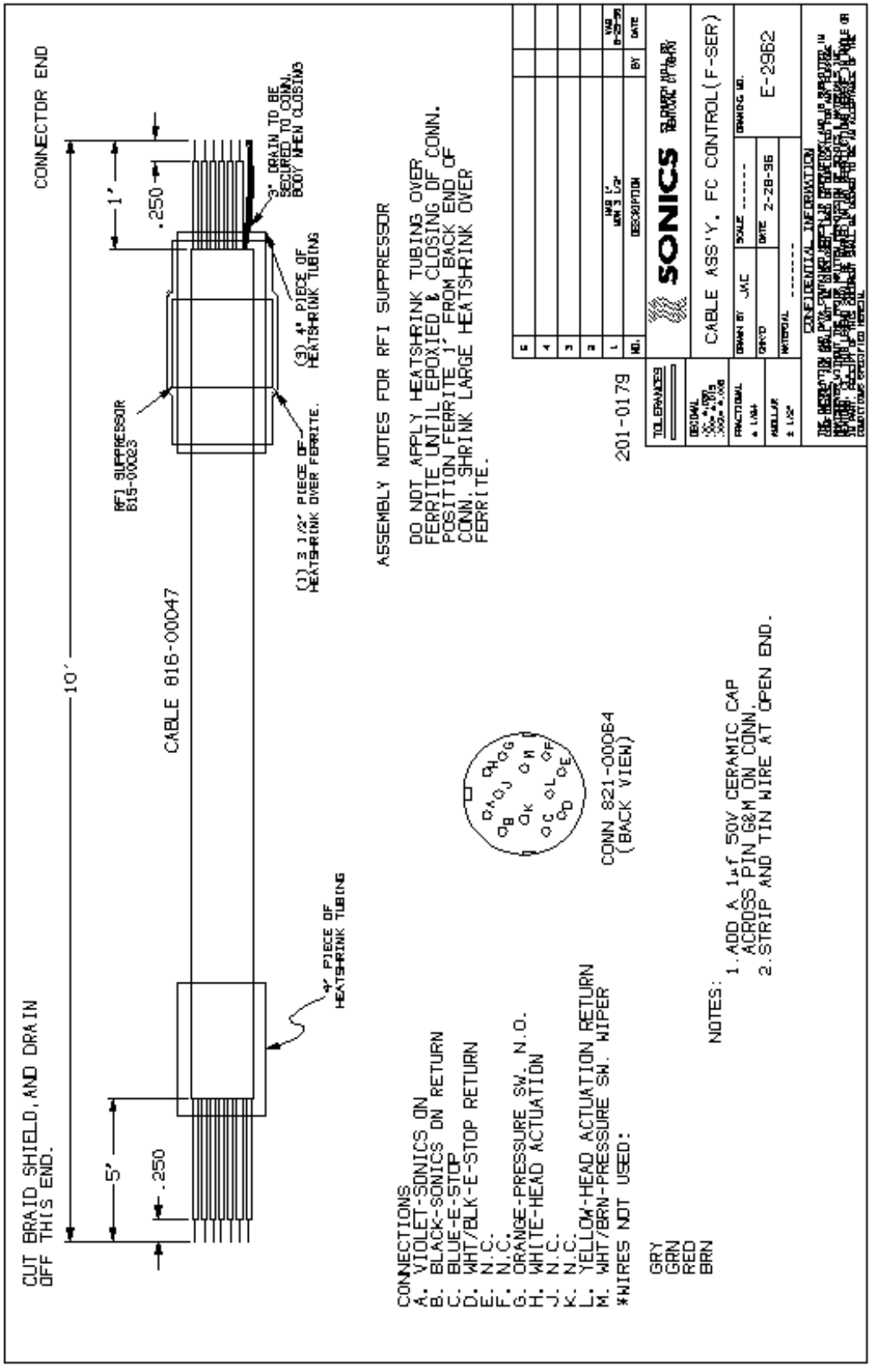
EQUIPMENT WIRING DIAGRAMS AND ASSOCIATED I/O

Model	Actuation J2	I/O J7	I/O J8
FC	E2962	E-3014	E-3013

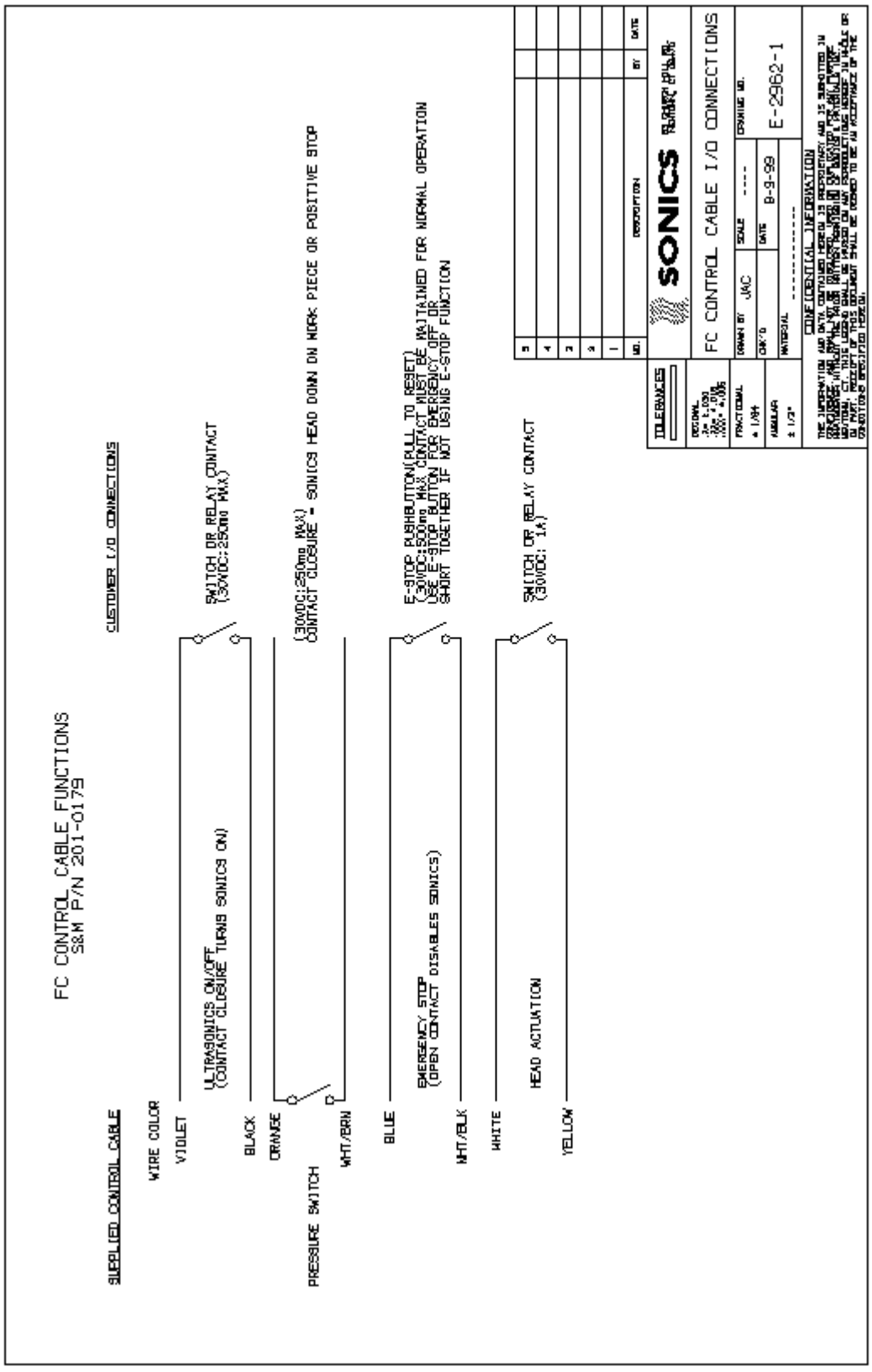
Drawing	Part No.	Description
E-2962*/2962-1*	201-0179	FC continuous duty cable
E-3013*	201-0206	F-Series general I/O
E-3014*	201-0207	F-Series General I/O

*See drawing on following pages.

APPENDIX

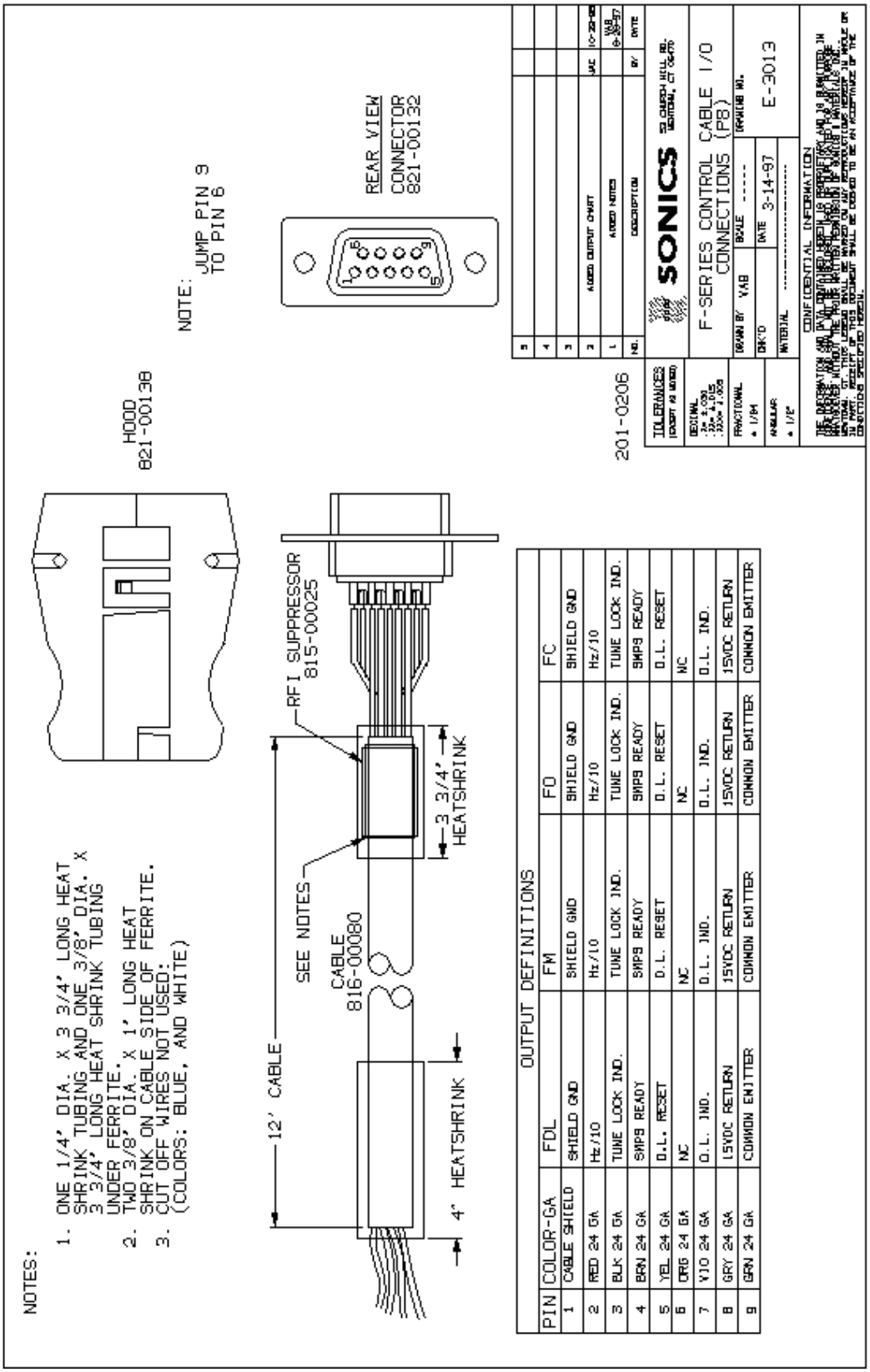

CUT BRAID SHIELD, AND DRAIN OFF THIS END.
CONNECTOR END
10'
5'
1'
.250
.250
CABLE 816-00047
RFI SUPPRESSOR 815-00023
3" DRAIN TO BE SECURED TO CONN. BODY WHEN CLOSING
(3) 4" PIECE OF HEATSHRINK TUBING
(1) 3 1/2" PIECE OF HEATSHRINK OVER FERRITE.
4" PIECE OF HEATSHRINK TUBING
CONNECTIONS
A. VIOLET-SONICS ON
B. BLACK-SONICS ON RETURN
C. BLUE-E-STOP
D. WHT/BLK-E-STOP RETURN
E. N.C.
F. N.C.
G. ORANGE-PRESSURE SW. N.O.
H. WHITE-HEAD ACTUATION
J. N.C.
K. N.C.
L. YELLOW-HEAD ACTUATION RETURN
M. WHT/BRN-PRESSURE SW. WIPER
*WIRES NOT USED:
GRY
GRN
RED
BRN
CONN 821-00064 (BACK VIEW)
NOTES:
1. ADD A 1µf 50V CERAMIC CAP ACROSS PIN G&M ON CONN.
2. STRIP AND TIN WIRE AT OPEN END.
ASSEMBLY NOTES FOR RFI SUPPRESSOR
DO NOT APPLY HEATSHRINK TUBING OVER FERRITE UNTIL EPOXIED & CLOSING OF CONN. POSITION FERRITE 1" FROM BACK END OF CONN. SHRINK LARGE HEATSHRINK OVER FERRITE.
201-0179
SONICS
CABLE ASS'Y, FC CONTROL (F-SER)
E-2962

APPENDIX

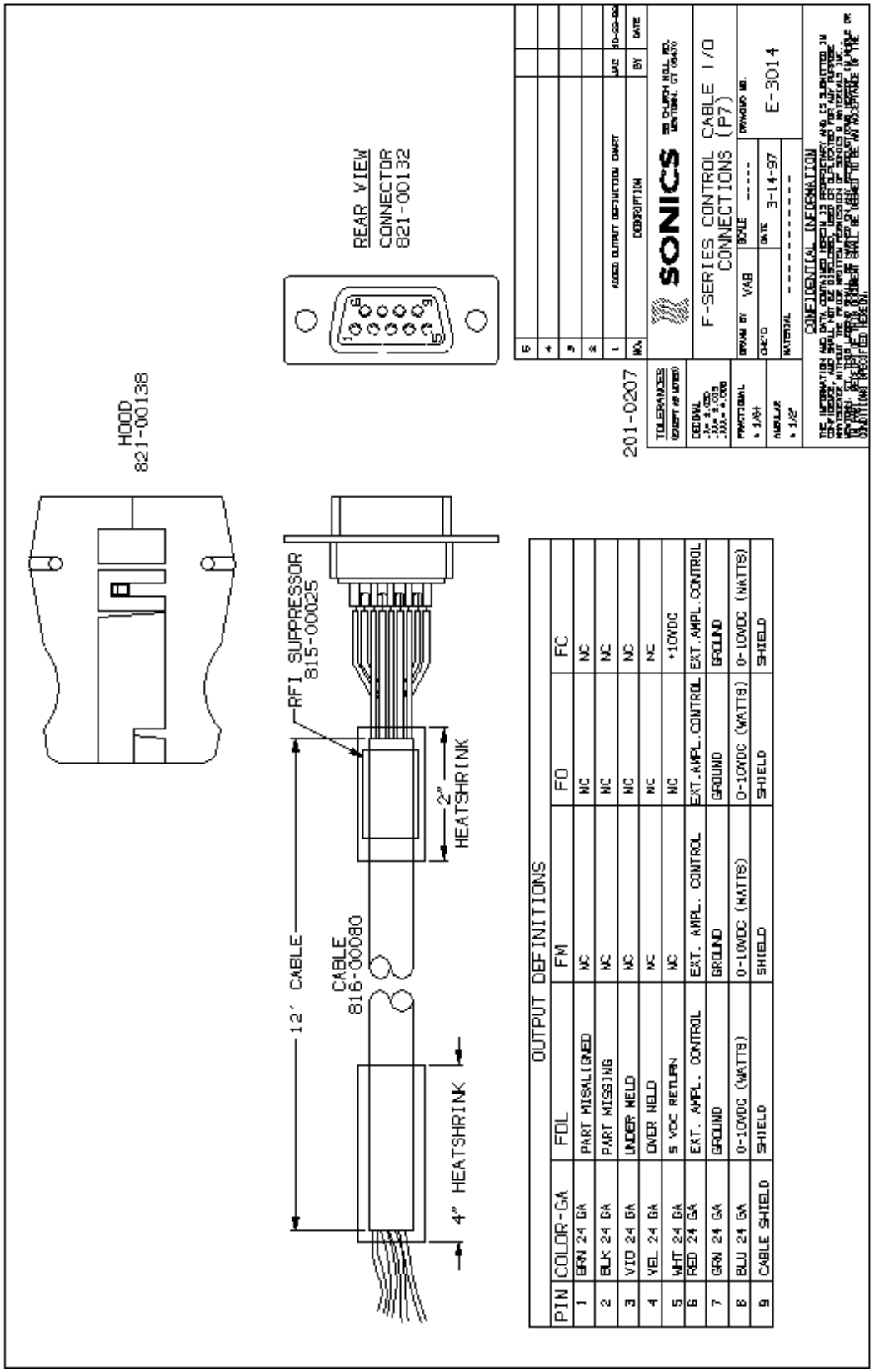


SONICS

APPENDIX


NOTES:
1. ONE 1/4" DIA. X 3 3/4" LONG HEAT SHRINK TUBING AND ONE 3/8" DIA. X 3 3/4" LONG HEAT SHRINK TUBING UNDER FERRITE.
2. TWO 3/8" DIA. X 1" LONG HEAT SHRINK ON CABLE SIDE OF FERRITE.
3. CUT OFF WIRES NOT USED: (COLORS: BLUE, AND WHITE)
NOTE: JUMP PIN 9 TO PIN 6
HOOD 821-00138
REAR VIEW
CONNECTOR 821-00132
RFI SUPPRESSOR 815-00025
SEE NOTES
CABLE 816-00080
12' CABLE
4' HEATSHRINK
3 3/4' HEATSHRINK
OUTPUT DEFINITIONS
PIN | COLOR-GA | FDL | FM | FO | FC
1 | CABLE SHIELD | SHIELD GND | SHIELD GND | SHIELD GND | SHIELD GND
2 | RED 24 GA | Hz/10 | Hz/10 | Hz/10 | Hz/10
3 | BLK 24 GA | TUNE LOCK IND. | TUNE LOCK IND. | TUNE LOCK IND. | TUNE LOCK IND.
4 | BRN 24 GA | SMPS READY | SMPS READY | SMPS READY | SMPS READY
5 | YEL 24 GA | D.L. RESET | D.L. RESET | D.L. RESET | D.L. RESET
6 | ORG 24 GA | NC | NC | NC | NC
7 | Y10 24 GA | D.L. IND. | D.L. IND. | D.L. IND. | D.L. IND.
8 | GRY 24 GA | 15VDC RETURN | 15VDC RETURN | 15VDC RETURN | 15VDC RETURN
9 | GRN 24 GA | COMMON EMITTER | COMMON EMITTER | COMMON EMITTER | COMMON EMITTER
201-0206
SONICS
F-SERIES CONTROL CABLE I/O CONNECTIONS (P8)
E-3013
CONFIDENTIAL INFORMATION

APPENDIX



PIN	COLOR-GA	FDL	FM	FO	FC
1	BRN 24 GA	PART MISALIGNED	NC	NC	NC
2	BLK 24 GA	PART MISSING	NC	NC	NC
3	VIO 24 GA	UNDER WELD	NC	NC	NC
4	YEL 24 GA	OVER WELD	NC	NC	NC
5	WHT 24 GA	5 VDC RETURN	NC	NC	+10VDC
6	RED 24 GA	EXT. AMPL. CONTROL	EXT. AMPL. CONTROL	EXT.AMPL.CONTROL	EXT.AMPL.CONTROL
7	GRN 24 GA	GROUND	GROUND	GROUND	GROUND
8	BLU 24 GA	0-10VDC (WATTS)	0-10VDC (WATTS)	0-10VDC (WATTS)	0-10VDC (WATTS)
9	CABLE SHIELD	SHIELD	SHIELD	SHIELD	SHIELD

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