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REPORT

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DOE/NASA CR-161558

DESIGN PACKAGE FOR SOLAR DOMESTIC HOT WATER SYSTEM

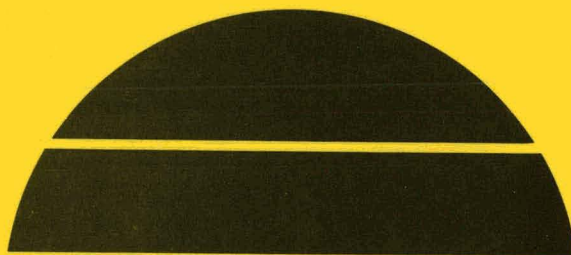
By Elcam, Inc.
5330 Debbie Lane
Santa Barbara, CA 93111

Under Contract NAS8-32245 with

National Aeronautics and Space Administration
George C. Marshall Space Flight Center, Alabama 35812

For the U. S. Department of Energy

MASTER



U.S. Department of Energy



Solar Energy

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16. ABSTRACT This document contains information used to evaluate the initial design of the Elcam, Inc., Solar Domestic Hot Water System. Included are such items as the system performance specification, detailed design drawings and other information. Elcam, Inc., has developed two solar heated prototype hot water systems and two heat exchangers. The hot water systems consist of the following subsystems: collector, storage, control, transport, auxiliary energy, and government-furnished Site Data Acquisition. The two systems are installed at Tempe, Arizona, and San Diego, California. The Final Design and Results are contained in documents DOE/NASA CR-161466 Solar Energy System Performance Evaluation-Seasonal Report for Elcam Tempe, Arizona State University, Tempe, Arizona; DOE/NASA CR-161481 Solar Energy System Performance Evaluation-Seasonal Report for Elcam San Diego, San Diego, California; and DOE/NASA CR-161492 Solar Energy System Evaluation-Final Report for Elcam-Tempe, Tempe, Arizona and Elcam-San Diego, San Diego, California.			
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1.0 INTRODUCTION

This Performance Specification establishes the requirements for the design and performance of the solar domestic hot water systems to be delivered. It designates the Interim Performance Criteria applicable to the above systems and defines any deviations, if required. The appendices specify the performance for each type and size system and the installation drawings.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents

Interim Performance Criteria for Solar Heating and Combined Heating/Cooling Systems and Dwellings, January 1, 1975. U.S. Department of Housing and Urban Development

2.2 Contractor Documents

Direct Heating System (Frost Cycle), Dwg. #ESS-3, 15 Nov 76.

Direct Dump Option, Dwg #ESS-5, 15 Nov 76.

2.3 Other Documents

3.0 APPLICATION OF INTERIM PERFORMANCE CRITERIA BY TYPE OF SYSTEM

The application of each paragraph of the Interim Performance Criteria to each type system is provided in the following table.

TABLE I

RESIDENTIAL SYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

SHEET 1 OF 6

APPLICATION

A - APPLICABLE TO SYSTEMS INDICATED
 I - APPLICABLE TO SYSTEM AND BUILDING
 NA - NOT APPLICABLE

TYPE SYSTEMS

H - HEATING
 HC - HEATING AND COOLING
 HW - HOT WATER

RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
1.1 H and HC System Performance	A	A	A	1.3.1 Collector Efficiency	A	A	A
1.1.1 Heating Design Temperatures	I	I	NA	1.4 Thermal Storage	A	A	A
1.1.2 Cooling Design Temperatures	NA	I	NA	1.4.1 Storage Capacity and Rate	A	A	A
1.1.3 Relative Humid- ity and Water Vapor Pressure	I	I	NA	1.5 Habitability of Occupied Spaces	A	A	A
1.1.4 Solar Contribution	A	A	A	1.5.1 Heat or Humidity Transfer Effects	I	I	I
1.1.5 Operation Impairment	A	A	A	1.6 Energy Transport Efficiency	A	A	A
1.2 HW System Subsystem Performance	A	A	A	1.6.1 Thermal Losses and Electrical Power	A	A	A
1.2.1 Water Design Temperature	I	I	I	1.7 Control	A	A	A
1.2.2 Storage Design Capacity	A	A	A	1.7.1 Installation and Maintenance	A	A	A
1.2.3 Solar Contribution	A	A	A	1.7.2 Manual Adjustment	A	A	A
1.2.4 Operational Impairment	A	A	A	1.7.3 Inhabited Space Temperature	A	A	NA
1.3 Collector Performance	A	A	A	1.7.4 Hot Water Temperature	A	A	A
				1.8 Auxiliary Energy	A	A	A
				1.8.1 Design Loads	A	A	A

TABLE I
 CONTINUATION SHEET

RESIDENTIAL SYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY							
SHEET <u>2</u> OF <u>6</u>							
RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
2.1 System Design Conditions	A	A	A	2.3.2 Pressure Test: Potable Water	A	A	A
2.1.1 Equipment Capabilities	A	A	A	2.3.3 Air Transport Systems	A	A	A
2.1.2 Noise or Erosion-Corrosion	A	A	A	2.4 Collector Adjustment	A	A	A
2.1.3 Operating Conditions	A	A	A	2.4.1 Orientation and Tilt	A	A	A
2.1.4 Fluid Flow in Collectors	A	A	A	2.4.2 Mutual Shadowing	A	A	A
2.1.5 Entrapped Air	A	A	A	2.5 Subsystem Isolation	A	A	A
2.1.6 Thermal Expansion of Fluids	A	A	A	2.5.1 Shutdown in Multi-family Housing	A	A	A
2.1.7 Pressure Drops	A	A	A	2.6 Heat Transfer Fluid Quality	A	A	A
2.1.8 Condensate Removal	NA	A	NA	2.6.1 Liquid Quality	A	A	A
2.2 Mechanical Stresses	A	A	A	2.6.2 Air Quality	A	A	A
2.2.1 Vibration Stress Levels	A	A	A	2.6.3 Fluid Quality	A	A	A
2.2.2 Vibration from Moving Parts	A	A	A	2.6.4 Freezing Protection	A	A	A
2.2.3 Water Hammer	A	A	A	2.7 Piping Supports	A	A	A
2.2.4 Vacuum Relief Protection	A	A	A	2.7.1 Applicable Plumbing Standards	A	A	A
2.2.5 Thermal Changes	A	A	A	2.8 Excessive Pressure and Temperature Protection	A	A	A
2.2.6 Flexible Joints	A	A	A	2.8.1 Relief Valves and Vents	A	A	A
2.3 Leakage Prevention	A	A	A	3.1 Structural Design Basis	A	A	A
2.3.1 Pressure Test: Nonpotable Fluids	A	A	A	3.1.1 Applicable Standards	A	A	A

TABLE I
 CONTINUATION SHEET

RESIDENTIAL SYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY							
RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
3.1.2 Service Loads	A	A	A	3.8.2 Constrain Loads	A	A	A
3.2 Failure Loads and Load Capacity	A	A	A	3.9 Ponding Condition	A	A	A
3.2.1 Ultimate Load Combinations	A	A	A	3.9.1 Design Provisions	A	A	A
3.2.2 Ice Loads	A	A	A	4.1 Plumbing and Electrical Installation	A	A	A
3.2.3 Vehicular Loads	I	I	I	4.1.1 Plumbing Codes	A	A	A
3.2.4 Load Capacity	A	A	A	4.1.2 Electrical Codes	A	A	A
3.3 Damage Control	A	A	A	4.2 Fail-Safe Controls	A	A	A
3.3.1 Resistance to Damage	A	A	A	4.2.1 System Failure Prevention	A	A	A
3.3.2 Glazing Design	A	A	A	4.2.2 Automatic Pressure Relief Valves	A	A	A
3.4 Cyclic Loads	A	A	A	4.3 Fire Safety	A	A	A
3.4.1 Deflection Limitations	A	A	A	4.3.1 Applicable Fire Standards	A	A	A
3.5 Cutting of Structural Elements	I	I	I	4.3.2 Penetrations through Fire Rated Assemblies	I	I	I
3.5.1 Design Provisions	I	I	I	4.4 Toxic	A	A	A
3.6 Creep and Residual Deflection	I	I	I	4.4.1 Provisions of Catch Basins	A	A	A
3.6.1 Deflection Limitations	I	I	I	4.4.2 Detection of Toxic and Flammable Fluids	A	A	A
3.7 Hail Resistance	A	A	A	4.5 Safety	I	I	I
3.7.1 Hail Size and Loading	A	A	A	4.5.1 Emergency Egress and Access	I	I	I
3.8 Constraint Loads	A	A	A	4.5.2 Identification and Location of Controls	A	A	A
3.8.1 Foundation Settlement	A	A	A	4.6 Protection of Potable Water and Circulated Air	A	A	A

TABLE I

RESIDENTIAL SYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

Sheet 4 of 6

APPLICATION

A - APPLICABLE TO SYSTEMS INDICATED
 I - APPLICABLE TO SYSTEM AND BUILDING
 NA - NOT APPLICABLE

TYPE SYSTEMS

H - HEATING
 HC - HEATING AND COOLING
 HW - HOT WATER

RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
4.6.1 Contamination by Materials	A	A	A	5.2.4 Leakage	A	A	A
4.6.2 Separation of Circulation Loops	A	A	A	5.2.5 Deterioration of Gaskets and Sealants	A	A	A
4.6.3 Backflow Prevention	A	A	A	5.2.6 Transmission Losses Due to Outgassing	A	A	A
4.6.4 Growth of Fungi	A	A	A	5.3 Chemical Compatibility of Components	A	A	A
4.7 Excessive Surface Temperatures	A	A	A	5.3.1 Materials/Transfer Fluid Compatibility	A	A	A
4.7.1 Protection from Heated Components	A	A	A	5.3.2 Corrosion of Dissimilar Materials	A	A	A
5.1 Effects of External Environment	A	A	A	5.3.3 Corrosion by Leachable Substance	A	A	A
5.1.1 Solar Degradation	A	A	A	5.3.4 Effects of Decon- position Products	A	A	A
5.1.2 Soil Corrosion	A	A	A	5.4 Components Involving Moving Parts	A	A	A
5.1.3 Airborne Pollutants	A	A	A	5.4.1 Wear and Fatigue	A	A	A
5.1.4 Dirt Retention on Cover Plate Surface	A	A	A	6.1 Accessibility for Maintenance	A	A	A
5.1.5 Abrasive Wear	A	A	A	6.1.1 Access for System Maintenance	A	A	A
5.1.6 Fluttering by Wind	A	A	A	6.1.2 Access for System Monitoring	A	A	A
5.2 Temperature and Pressure Resistance	A	A	A	6.1.3 Draining and Filling of Liquids	A	A	A
5.2.1 Thermal Degradation	A	A	A	6.1.4 Flushing of Liquids Subsystems	A	A	A
5.2.2 Deterioration of Heat Transfer Fluids	A	A	A	6.1.5 Filters	A	A	A
5.2.3 Thermal Cycling Stresses	A	A	A	6.1.6 Potable Water Shutoff	A	A	A

TABLE I

RESIDENTIAL SYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY

SHEET 3 OF 6

APPLICATION

A - APPLICABLE TO SYSTEMS INDICATED
 I - APPLICABLE TO SYSTEM AND BUILDING
 NA - NOT APPLICABLE

TYPE SYSTEMS

H - HEATING
 HC - HEATING AND COOLING
 HW - HOT WATER

RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
6.2 Installation, Operation and Maintenance Manual	A	A	A	7.3.1 Space Use	I	I	I
6.2.1 Installation Instructions	A	A	A	7.3.2 Shading of Adjacent Structures	I	I	I
6.2.2 Maintenance and Operation Instructions	A	A	A	7.3.3 Impact on Environment	I	I	I
6.2.3 Maintenance Plan	A	A	A	7.3.4 View	I	I	I
6.2.4 Replacement Parts	A	A	A	8.1 Interference with Mechanical Operation	I	I	I
6.3 Repair and Service Personnel	A	A	A	8.1.1 Blockage of Solar Subsystem	I	I	I
6.3.1 Maintenance of H and HC Systems	A	A	A	8.1.2 Shading of Collector	I	I	I
6.3.2 Maintenance of HW System	A	A	A	8.1.3 Sensor Location	I	I	I
7.1 Design	I	I	I	8.2 Mechanical and Electrical Functioning of Dwelling and Site	I	I	I
7.1.1 Dwelling Design	I	I	I	8.2.1 Exhaust and Venting	I	I	I
7.1.2 Mobile Home Design	I	I	I	8.2.2 Utilities	I	I	I
7.1.3 Site Design	I	I	I	8.3 Mechanical and Electrical Functioning of Connections	I	I	I
7.1.4 Passive Use of Solar Energy	I	I	I	8.3.1 Plumbing Connections	I	I	I
7.2 Adequate Space	I	I	I	8.3.2 Electrical Connections	I	I	I
7.2.1 Collector Area	I	I	I	9.1 Structural Integrity	I	I	I
7.2.2 Storage Area	I	I	I	9.1.1 Movement in Adjacent Structures	I	I	I
7.2.3 Utility Chases	I	I	I	9.2 Structural Integrity of Dwelling	I	I	I
7.3 Functioning of Dwelling Site	I	I	I				

TABLE I
 CONTINUATION SHEET

RESIDENTIAL SYSTEMS, INTERIM PERFORMANCE CRITERIA SUMMARY							
RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS			RESIDENTIAL INTERIM PERFORMANCE CRITERIA PARAGRAPH	TYPE SYSTEMS		
	H	HC	HW		H	HC	HW
9.2.1 Loads	I	I	I	11.3.1 Material Compatibility	A	A	A
9.2.2 Penetration of Structural Members	I	I	I	12.1 Maintainability of H, HC, HW Systems	I	I	I
9.3 Structural Connections	I	I	I	12.1.1 Accessibility	I	I	I
9.3.1 Structural Connections	I	I	I	12.1.2 Misuse	I	I	I
9.3.2 Brittle Sub- system	I	I	I	12.1.3 Permanent Mainte- nance Accessories	I	I	I
9.3.3 Strength and Stiffness	I	I	I	12.2 Maintainability of Dwelling and Site	I	I	I
10.1 Safety of Dwelling and Site	I	I	I	12.2.1 Accessibility	I	I	I
10.1.1 Fire	I	I	I	12.2.2 Ice Dams	I	I	I
10.1.2 Accidents	I	I	I	12.3 Connections	I	I	I
11.1 Durability	I	I	I	12.3.1 Accessibility	I	I	I
11.1.1 Vegetation	I	I	I	13.1 Visual Character- istics of Dwelling and Site	I	I	I
11.2 Durability and Reliability of Dwelling and Site	I	I	I	13.1.1 Dwelling	I	I	I
11.2.1 Chemical Corrosion	A	A	A	13.1.2 Neighborhood	I	I	I
11.2.2 Heat and Moisture	I	I	I				
11.2.3 Exterior Penetrations	I	I	I				
11.3 Durability and Reliability of Connections	A	A	A				

4.0 DEVIATIONS FROM INTERIM PERFORMANCE CRITERIA

No deviations required.

5.0 GOVERNMENT FURNISHED PROPERTY

5.1 Site Data Acquisition Subsystem (SDAS) to be furnished.

6.0 GOVERNMENT DIRECTED REQUIREMENTS

7.0 GEOGRAPHIC AREA

7.1 Domestic hot water systems for single family residences are for installation in any region of the United States. Operating altitude is not restricted.

8.0 SYSTEM APPENDICES

8.1 Appendix A - Direct Heating System, Single Family Residence, Model Number 250C with Direct Dump Option.

8.2 Appendix B - Direct Heating System, Single Family Residence, Model Number 250C with Direct Dump Option.

APPENDIX A

1.0 SYSTEM IDENTIFICATION

This Appendix defines the performance and installation drawings for domestic water heating systems, Model Number 250C with Direct Dump Option.

2.0 SYSTEM PERFORMANCE SHEETS

2.1 Site

The system is to be installed in a single family residence located at the Encinitas Road Station, in the County of San Diego, State of California.

2.2 Hot Water

Seventy-five gallons of potable hot water shall be delivered per day at temperatures no less than 140°F. Recovery rate shall be no less than 23.0 gallons/hour from 60°F. to 140°F. (based upon input to storage from the solar system and/or the operation of two installed 4.5 KW electric elements as necessary). The average hot water heating load will be 1.79×10^6 BTU/month of which no more than 30% is provided by auxiliary energy on an annualized basis.

2.3 Operating Requirements

The maximum electrical energy required to operate the complete solar system, excluding the two 4.5 KW elements, at its rated capacity shall be no greater than 0.150KW. The average yearly energy required to drive the system (including control energy) shall be no greater than 400 KWH.

* Note: This figure is an annualized average based on an expected average system efficiency of 40%, a fixed tilt angle of 30°, and insolation data from La Jolla, California.

2.4 Physical Data

The following subsystems shall have

	Design Life	Weight (filled)	Installation
	<u>no less than</u>	<u>no greater than</u>	<u>Dimension</u>
Collector	10 years	3.1 lb/ft ²	48-3/4"x96-3/4"x3-7/16"
Energy Transport Insulated Piping	10 years	.4 lb/li ft	1.625" dia
Pump	10 years	12 lb	4-7/8"x5"x7-5/16"
Controller	10 years	5 lb	6-3/4"x5-1/2"x2-1/4"
Pre-heat and Storage Tank	10 years	580 lb	58-1/4"x20-1/2"

3.0 INSTALLATION DRAWING SHEETS

<u>Drawing #</u>	<u>Title</u>
ESE-1	Collector
ESE-2	Solar Tank
ESE-3	Electric Tank
ESE-6	CASCADE Autocontrol
ESE-8	S106B Relay
ESE-9	CASCADE Valve
ESE-15	Pump - Grundfos 25-42-SF

4.0 EXISTING MODEL 250C consists of the following:

1. 64 sq. ft. total area (60 sq. ft. effective absorber area) in two collectors of header configuration with an efficiency as described in Figure 1.1, page 2 of the updated proposal dated 9 June 76.

2. 104 gallons of storage capacity in two tanks. The heat loss at design temperatures is 246 BTU/ hr. from each tank.

3. A control system as described in the proposal and update.

4. A transport system with approximately sixty feet of 3/4 in., Type M copper tubing (7/8 inch O.D.) covered with 1-5/8 inch O.D. insulation (3/8 inch wall). The flow rate is 2.5 gpm.

5. Direct Dump System which includes: three port DD valve; pressure switch; vacuum relief valve; check valve; air vent valve; Direct Dump electronics package.

5.0 Solar insolation for which the existing system is rated against are data from Santa Maria, California, found on page 17 of ASHRAE's Low Temperature Engineering Application of Solar Energy (1967). In addition, since 19 September 76, insolation in the plane of the collectors has been measured and recorded at the Operating Prototype.

APPENDIX B

1.0 SYSTEM IDENTIFICATION

This Appendix defines the performance and installation drawings for domestic water heating systems, Model Number 250C with Direct Dump Option.

2.0 SYSTEM PERFORMANCE SHEETS

2.1 Site

The system is to be installed at Arizona State University Farm House #1, Tempe, Arizona 85281.

2.2 Hot Water

Seventy-five gallons of potable hot water shall be delivered per day at temperatures no less than 140°F. Recovery rate shall be no less than 23.0 gallons/hour from 60°F. to 140°F. (based upon input to storage from the solar system and/or the operation of two installed 4.5KW electric elements as necessary). The average hot water heating load will be 1.79×10^6 BTU/month of which no more than 15%* is provided by auxiliary energy on an annualized basis.

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The maximum electrical energy required to operate the complete solar system, excluding the two 4.5 KW elements, at its rated capacity shall be no greater than 0.150 KW. The average yearly energy required to drive the system (including control energy) shall be no greater than 400 KWH.

* Note: This figure is an annualized average based on an expected average system efficiency of 40%, a fixed collector tilt angle of 30°, and insolation data from Phoenix, Arizona.

2.4 Physical Data

The following subsystems shall have

	Design Life	Weight (filled)	Installation
	<u>no less than</u>	<u>no greater than</u>	<u>Dimension</u>
Collector	10 years	3.1 lb/ft ²	48-3/4"x96-3/4"x3-7/16"
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Pump	10 years	12 lb	4-7/8"x5"x7-5/16"
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3.0 INSTALLATION DRAWING SHEETS

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ESE-9	CASCADE Valve
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Direct Dump electronics package.

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AS INSTALLED DRAWING LIST - PHOENIX

CONTRACT NAS8-32245

ESC-12

SUNSPOT CASCADE SOLAR DOMESTIC WATER HEATING SYSTEMS

ELCAM, INC.

SANTA BARBARA, CA.

AUGUST 1977

LEVEL S - SYSTEM CONFIGURATIONS

S5 Direct Dump Option

DRAWING NUMBER

ESS-5

PAGE NR

27

LEVEL E - ELEMENTS

E1 Collector

ESE-1

28/29

E2 Solar Tank

ESE-2

30

E3 Electric Tank

ESE-3

31

E9 CASCADE Valve

ESE-9

32

E15 Pump- Grundfos UP25-42SF

ESE-15

E18 Pump Assembly

ESE-18

E19 CASCADE Autocontrol Assembly

ESE-19

Drawing List
Contract NAS8-32245

LEVEL P - PARTSDRAWING NUMBER Page NrCOLLECTOR

CP1	Absorber Snap Fin	ESP-C1	33
CP2	Absorber Waterway	ESP-C2	34
CP3	Side Channel	ESP-C3	35
CP4	Cove Strip	ESP-C4	36
CP5	Cross Channel	ESP-C5	37
CP6	Absorber Restraint	ESP-C6	38
CP7	Gaskets	ESP-C7	39
CP8	Cover - Glasteel	ESP-C8	40
CP9	Fiberglass Cover Assembly	ESP-C9	41
CP10	Rubber Grommet	ESP-C10	42
CP11	Rear Insulation/Aluminum Sheet	ESP-C11	43
CP12	Side Insulation	ESP-C12	44
CP13	Pop Rivets	ESP-C13	45
CP14	Corner Brackets	ESP-C14	46
CP15	Label	ESP-C15	47
CP16	Waterway Cap	ESP-C16	48
CP17	Channel Box Assembly	ESP-C17	49/50
CP18	Backing Sheet	ESP-C18	51
CP19	Sealant	ESP-C19	52
CP20	Sealing Tape	ESP-C20	53

Drawing List
Contract NAS8-32245

<u>AUTOCONTROL</u>	<u>DRAWING NUMBER</u>	<u>Page Nr</u>
AP1 Cover	ESP-A1	54/55
AP2 Label - Autocontrol	ESP-A2	56
AP3 Base Plate	ESP-A3	57
AP4 Stand Off	ESP-A4	58
AP5 Heat Sink	ESP-A5	59
AP6 Screw - Self Tapping	ESP-A6	60
AP8 Printed Wiring Board Assembly	ESP-A8	61
AP9 I.C. Socket	ESP-A9	62
AP10 I.C. LM 324N - Quad Op Amp	ESP-A10	63
AP11 I.C. CD 4011 Logic Chip	ESP-A11	64
AP12 Transistor 2N 4401	ESP-A12	65
AP13 Transistor 2N4403	ESP-A13	66
AP14 Triac (Thyristor) 2N6070A	ESP-A14	67
AP15 Regulator UA7812	ESP-A15	68
AP16 Relay LCIC-UA-DC12	ESP-A16	69
AP17 Switch SPST	ESP-A17	70
AP18 Switch, Center Off SPDT	ESP-18	71
AP19 Diode IN 4002	ESP-A19	72
AP20 ZENER Diode IN 5231B	ESP-A20	73
AP21 LED Lamp	ESP-A21	74
AP23 Fuse	ESP-A23	75
AP24 Capacitor 1000 MF	ESP-A24	76
AP25 Capacitor 100 MF	ESP-A25	77
AP28 Resistor 20K	ESP-A28	78
AP29 Resistor 75K	ESP-A29	79

Drawing List
Contract NAS8-32245

AUTOCONTROL (continued)

AP30	Resistor 5.11K	ESP-A30	80
AP31	Resistor 0.8K	ESP-A31	
AP32	Resistor 2.0K	ESP-A32	81
AP33	Resistor 1.2K	ESP-A33	
AP34	Resistor 1.0K	ESP-A34	82
AP35	Resistor 10 K	ESP-A35	83
AP36	Resistor 0.39K	ESP-A36	84
AP37	Resistor 100K	ESP-A37	85
AP38	Resistor 2.2K	ESP-A38	86
AP39	Resistor 0.68K	ESP-A39	87
AP40	Resistor 2K	ESP-A40	
AP41	Resistor 4.75K	ESP-A41	88
AP42	Resistor 4.64K	ESP-A42	89
AP43	Resistor 4.87K	ESP-A43	
AP44	Resistor 160K	ESP-A44	90
AP45	Potentiometer	ESP-A45	91
AP46	Square Barrel Terminal	ESP-A46	92
AP48	Screw, Pan Head	ESP-A48	93
AP51	Nut Hex	ESP-A51	94
AP52	I.C. LM3911 Sensor	ESP-A52	95

Drawing List
NAS8-32245

AUTOCONTROL (continued)DRAWING NUMBERPage Nr.

AP53	Sensor Cartridge	ESP-A53	96
AP54	Resistor - Calibration	ESP-A54	97
AP57	Sensor Cable Assembly	ESP-A57	98
AP58	Flag Terminal	ESP-A58	99
AP60	Washer - Flat	ESP-A60	100
AP61	Insulation Shrinkable	ESP-A61	101
AP62	Cable	ESP-A62	102
AP63	Casting Compound - Epoxy	ESP-A63	103
AP64	Label Circuit Board	ESP-A64	104
AP65	Label, Control	ESP-A65	105
AP66	Washer, Flat	ESP-A66	106
AP67	Washer, Lock Spring	ESP-A67	107
AP68	Lead Set	ESP-A68	108/109
AP69	Mounting Bracket	ESP-A69	
AP71	Switch, Low Pressure	ESP-A71	110
AP72	Wiring Diagram, Direct Dump Valve	ESP-A72	111
AP73	Circuit Board Assembly, Direct Dump	ESP-A73	
AP75	Lead Set "A"	FSP-A75	
AP76	Standoff, Male-Female	ESP-A76	
AP77	Cable, Direct Dump	ESP-A77	
AP78	Cable, Pressure Switch	ESP-A78	
AP79	Fuseholder	ESP-A79	
AP80	Bracket Strain Relief	ESP-A80	
AP81	Capacitor, 2.2 MF	ESP-A81	
AP82	Capacitor, .012 MF	ESP-A82	
AP83	Capacitor, .033 MF	ESP-A83	

Drawing List
Contract NAS8-32245

AUTOCONTROL (Continued)DRAWING NUMBERPage Nr

AP84	Capacitor, 2200 MF	ESP-A84	
AP85	Resistor 3.3K	ESP-A85	
AP86	Resistor, 3.3M	ESP-A86	
AP87	Resistor, .12K	ESP-A87	
AP88	Transformer	ESP-A88	
AP89	Relay, DPDT	ESP-A89	
AP90	Box, Electric	ESP-A90	
AP91	Circuit Board Assembly	ESP-A91	
AP92	Circuit Board Assembly, Dump Option	ESP-A92	
AP93	Cable	ESP-A93	
AP94	Cable, Power, 24V	ESP-A94	

STORAGE TANK

TP2	Sensor Restraint Plate	ESP-T2	112
TP5	Gasket	ESP-T5	113

LEVEL I - INSTALLATION

11	Pipe Hanger	ESI-1	114
12	Check Valve	ESI-2	115
13	P & T Valve	ESI-3	116
15	Gate Valve	ESI-5	117
16	Pressure Relief Valve	ESI-6	118
17	Housing	ESI-7	119

LEVEL I - INSTALLATION (continued)**DRAWING NUMBER** **Page Nr****I10** Cable Connector**ESI-10****I12** Tempering Valve**ESI-12****120****I13** S106B Relay Assembly**ESI-13****I14** Vent Valve, Air**ESI-14****121****I15** Check Valve**ESI-15****122**

Drawing List
Contract NAS8-32245

SAN DIEGO
DRAWING LIST
CONTRACT NAS8-32245
ESC-7a-S.D.

SUNSPOT CASCADE SOLAR DOMESTIC WATER HEATING SYSTEM

ELCAM, INC.
SANTA BARBARA, CA
REVISED APRIL 1978

LEVEL S - SYSTEM CONFIGURATIONSDRAWING NUMBERPage Nr

✓ 58 SUNSPOT Gas Cascade

ESS-8

123

LEVEL E - ELEMENTS

✓ E1 Collector

ESE-1

28/29

E2 Solar Tank

ESE-2

30

E3 Electric Tank

ESE-3

31

E4 Gas Tank

ESE-4

124

E9 CASCADE Valve

ESE-9

32

E15 Pump - Grundfos UP25-42SF

ESE-15

E20 CASCADE Model #150 Autocontrol Assembly

ESE-20

Drawing List
Contract NAS8-32245

LEVEL P - PARTS**DRAWING NUMBER****Page Nr****COLLECTOR**

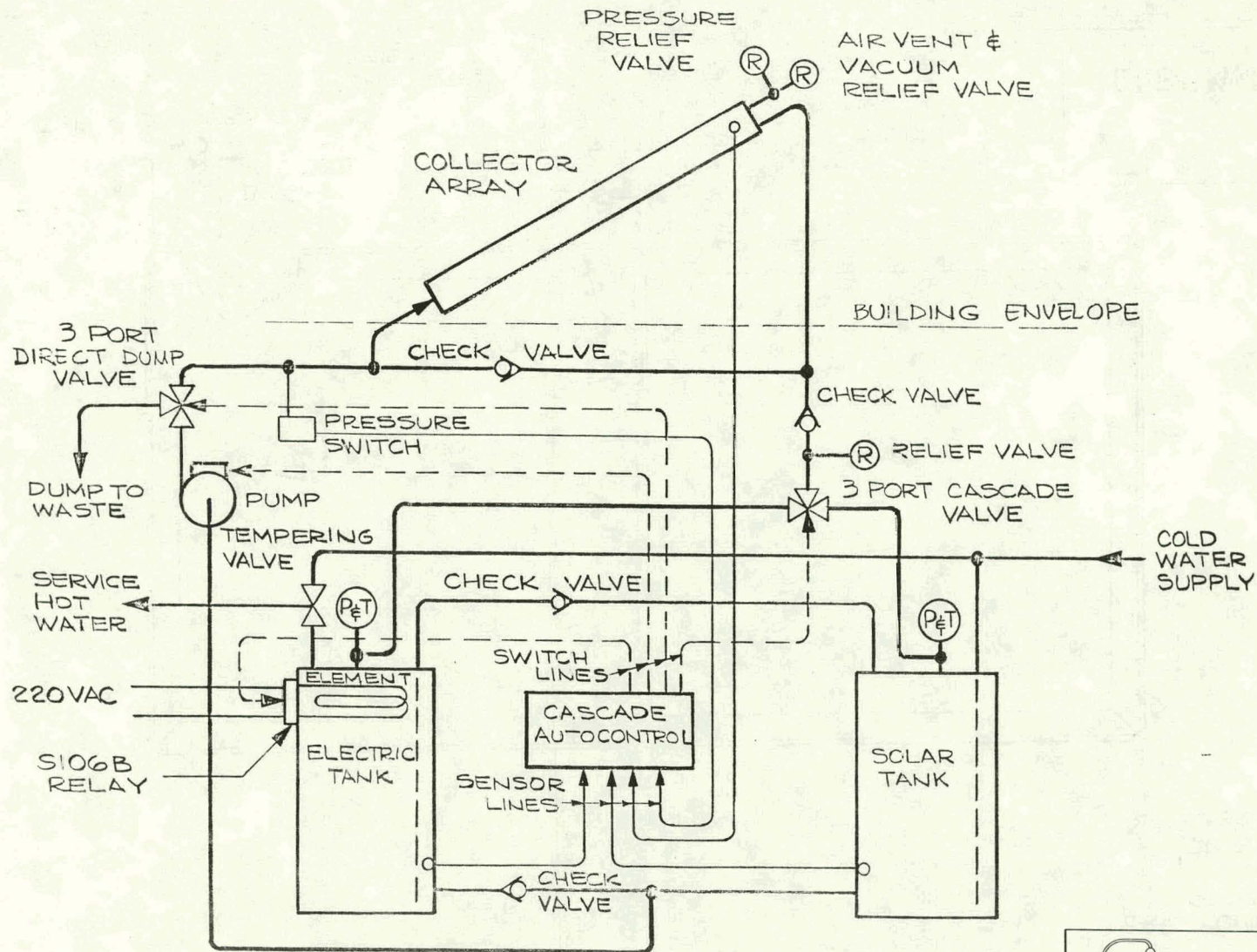
CP1	Absorber Snap Fin	ESP-C1	33
CP2	Absorber Waterway	ESP-C2	34
CP3	Side Channel	ESP-C3	35
CP4	Cove Strip	ESP-C4	36
CP5	Cross Channel	ESP-C5	37
CP6	Absorber Restraint	ESP-C6	38
CP7	Gaskets	ESP-C7	39
CP10	Rubber Grommet	ESP-C10	42
CP11	Rear Insulation/Aluminum Sheet	ESP-C11	43
CP12	Side Insulation	ESP-C12	44
CP13	Pop Rivets	ESP-C13	45
CP14	Corner Brackets	ESP-C14	46
CP15	Label	ESP-C15	47
CP16	Waterway Cap	ESP-C16	48
CP17	Channel Box Assembly	ESP-C17 2 sheets	49/50
CP18	Backing Sheet	ESP-C18	51
CP19	Sealant	ESP-19	52
CP20	Sealing Tape	ESP-C20	53
CP21	Glass Cover	ESP-C21	125

Drawing List
Contract NAS8-32245

LEVEL I - INSTALLATION

	<u>DRAWING NUMBER</u>	<u>Page Nr</u>
11 Pipe Hanger	ESI-1	114
12 Check Valve	ESI-2	115
13 P & T Valve	ESI-3	116
15 Gate Valve	ESI-5	117
16 Pressure Relief Valve	ESI-6	118
17 Housing	ESI-7	119
19 Flexible Connection	ESI-9	
110 Cable Connector	ESI-10	
114 Vent Valve, Air	ESI-14	121

Drawing List
Contract NAS8-32245



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964 8693

ELCAM, INC.

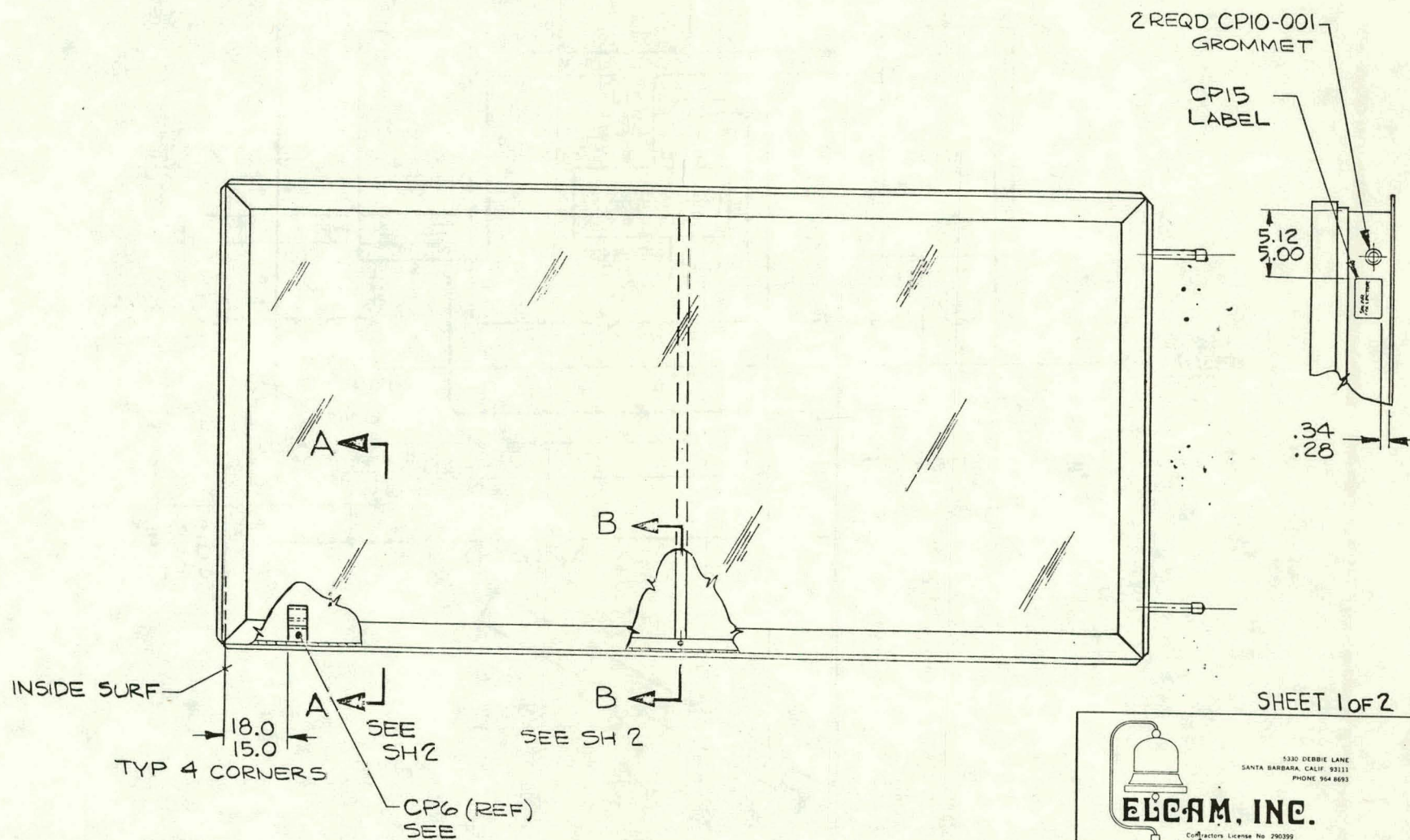
Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED	NO.	DATE	BY	PART NAME	MATERIAL
DECIMAL	1	10 DEC 76	THOMSON	DIRECT DUMP OPTION	-
XX ± 0.0	2	13 APR 77	THOMSON	SCALE: NONE	-
XXX ± 0.0	3			DRAWING NO.	
ANGULAR ±	4			DATE	
DRAFT	5			15 NOV 76	
	6			APP'D	

ESS-5

NOTES:

1. ASSEMBLE PER ENGINEERING SPEC
2. INSTALL LABEL IN LOCATION SHOWN
MARK WITH MOD NO. & SER NO.



SHEET 1 OF 2

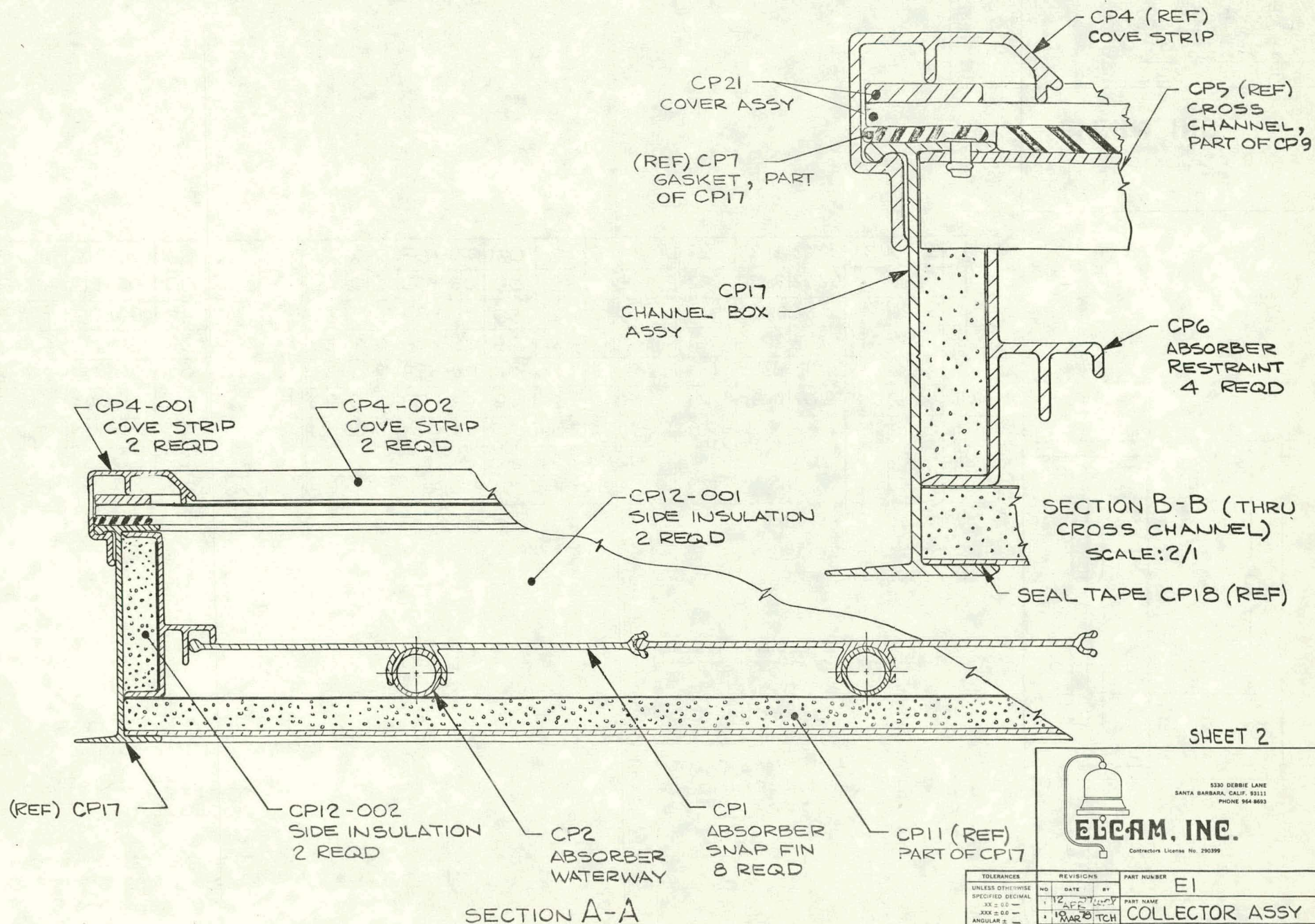


5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954 8093

ELCAM, INC.

Contractors License No 290399

TOLERANCES	REVISIONS	PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	NO. DATE BY	E1
XXX - CO -	1 12 APR 77 WJS	PART NAME
ANGULAR -	2	COLLECTOR ASSY
DRAFT	3	THOMSON SCALE NONE SEE F/D
	4	DATE NOV 76
	5	DRAWING NO. ESE-1



SHEET 2



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 564-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	E1
XX ± 0.0	1	12 APR 76	THOMSON	PART NAME
XXX ± 0.0	1	19 MAR 78	TCH	COLLECTOR ASSY
ANGULAR ±				SCALE FULL
DRAFT				MATERIAL SEE P/D
				DRAWING NO
				ESE-1
				TRACED
				DATE 20 NOV 76
				APP'D

NOTES:

1. MATERIAL:

GLASS-LINED TANK
STORAGE OR HEATER
MODEL, SEE TABLE I

2. VENDOR:

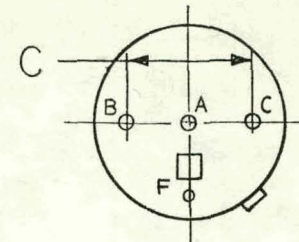
AO SMITH CORP
FSCM NO. 28611

3. PART NO. MUST INCLUDE
THE DASH NO.

ie: E2-001

CODE

A = RELIEF VALVE
OPENING 3/4 NPT
B = OUTLET 3/4 NPT
C = INLET 3/4 NPT
D = DRAIN VALVE
E = 3/4 FEMALE NPT
F = ELECTRICAL ENTRANCE
ESH MODELS



ESH MODELS
ELEMENT LOCATION

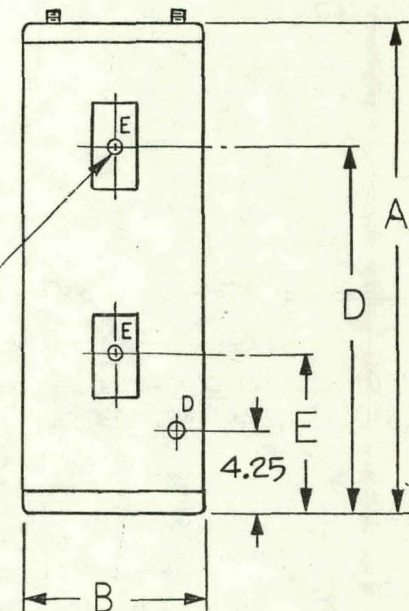
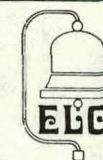


TABLE I

SOLAR STORAGE TANK			SOLAR ELECTRIC HEATER				APPROX SHIP WT/ LBS	A	B	C	D	E
PART NO.	MODEL	CAP U.S. GAL	PART NO.	MODEL	CAP U.S. GAL	MAX KW @ 120V 208V 240V 277V 480V						
E2-001	STJ-30	30	E2-011	ESH-30	30	3	111	49.12	20.5	8	31.94	7.75
E2-002	STJ-40	40	E2-012	ESH-40	40	3	134	47.88	21.75		31.75	
E2-003	STJ-52	52	E2-013	ESH-52	52	3	152	59.38	21.75		41.5	
E2-004	STJ-66	66	E2-014	ESH-66	66	3	196	63.88	24		46.75	
E2-005	STJ-80	80	E2-015	ESH-80	80	3	228	62.88	25.25		46.75	
E2-006	STJ-120	120	E2-016	ESH-120	120	3	355	62.12	29.38	16	46.75	

(ALL
ESH)
4500W
240V
1 PH
ELEMENT



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8893

ELECTAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO. DATE BY		E2	
XX ± 0.0		1		PART NAME	
XXX ± 0.0		2		SOLAR STORAGE AND	
ANGULAR ±		3		HEATER TANK	
DRAFT		4		THOMSON	
VENDOR'S		5		SCALE NONE	
TOL. APPLY		6		DATE NOV 76	
				DRAWING NO. ESE-2	

NOTES:

1. MATERIAL:

GLASS-LINED
WATER HEATER
MODEL, SEE TABLE I

2. VENDOR:

AO SMITH CORP
FSCM NO. 28611

NO. OF ELEMENTS = 2

MAX KW@ 240V = 12

DOUBLE ELEMENT =
4500W/4500W

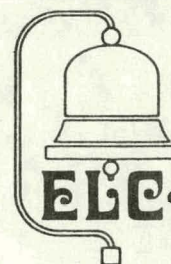
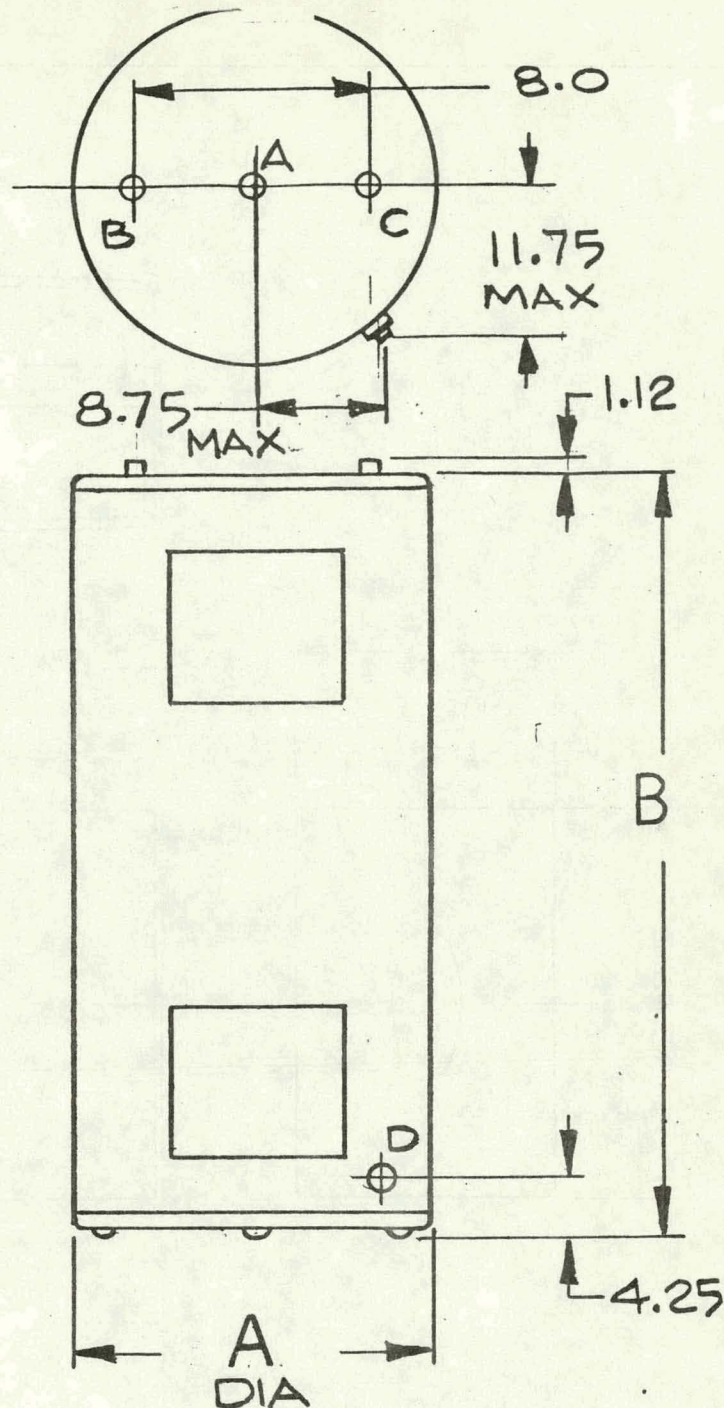
TABLE I

SPECS	-001	-002
MODEL	PEC-52	PEC-40
CAP IN GALS	52	40
SHIP WT/LBS	148	188
DIM A	20.5	24.0
DIM B	58.25	61.75

CODE

A = RELIEF VALVE
OPENING 3/4 NPT
B = OUTLET 3/4 NPT
C = INLET 3/4 NPT
D = DRAIN VALVE

NOTE: PART NO. MUST
INCL DASH NO.,
IE: E3-001



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
954-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	E3	
.XX ± 0.0		1			PART NAME	
.XXX ± 0.0		2			ELECTRIC TANK	
ANGULAR ±		3			DRAWN BY	
DRAFT		4			THOMSON	
VENDOR'S		5			SCALE	
TO APPLY					NONE	
					DATE	
					23 Nov 76	
					MATERIAL	
					SEE NOTE 1	
					DRAWING NO	
					E3E-3	
					APP'D	

NOTES:

1. MATERIAL:

GENERAL PURPOSE
WATER VALVE, MOTOR DRIVEN
MODEL 7618

2. VENDOR:

BARBER-COLMAN CO.
FSCM NO. 05624

3. SPECIFICATIONS:

FOR 40°F TO 120°F WATER

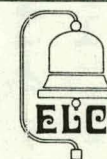
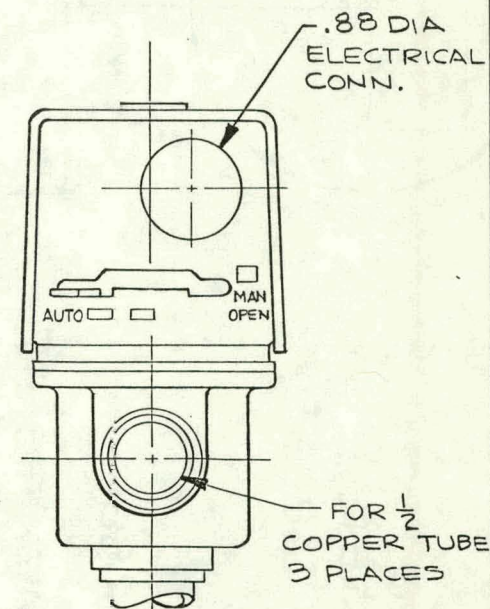
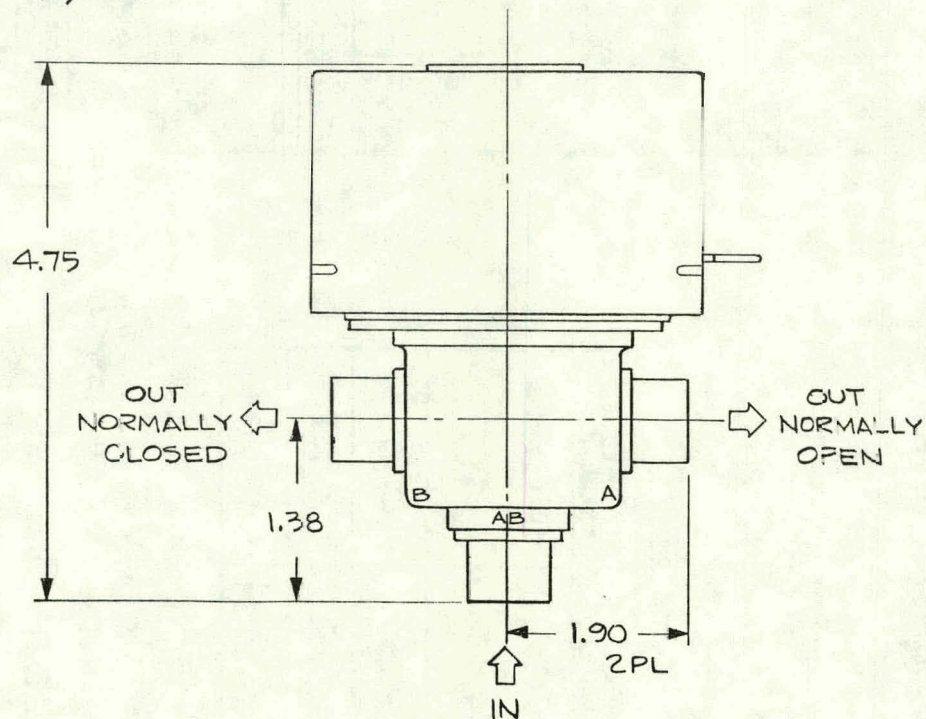
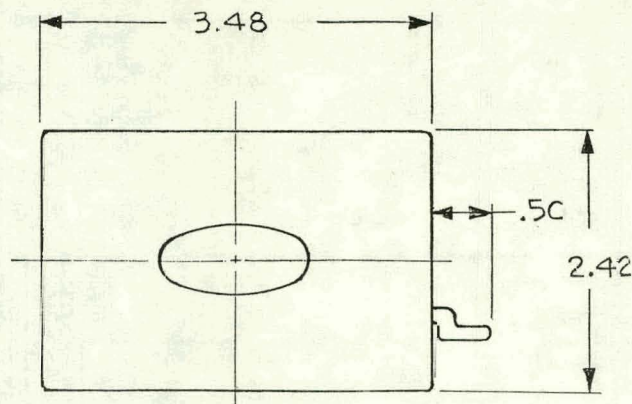
125°F MAX AMBIENT

MOTOR 24VAC 60 HZ

5W 6RPM

MAX DIFFERENTIAL PRESS 10PSI

MAX STATIC PRESSURE 125PSI



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964 8653

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	E9	
XX ± .00		1			PART NAME	
XXX ± .00		2			CASCADE VALVE	
ANGULAR ±		3			DRAWN BY	
DRAFT		4			THOMSON	
VENDOR'S		5			SCALE FULL	
TOL APPLY		6			DATE 26 NOV 76	
		7			DRAWING NO	
		8			APP'D	
		9			TRACED	
		10			ESE-9	

NOTES:

1. MATERIAL:

ALUMINUM ALLOY EXTRUSION
CMPSN 6063 TEMPER T5
DIE SECTION 66890

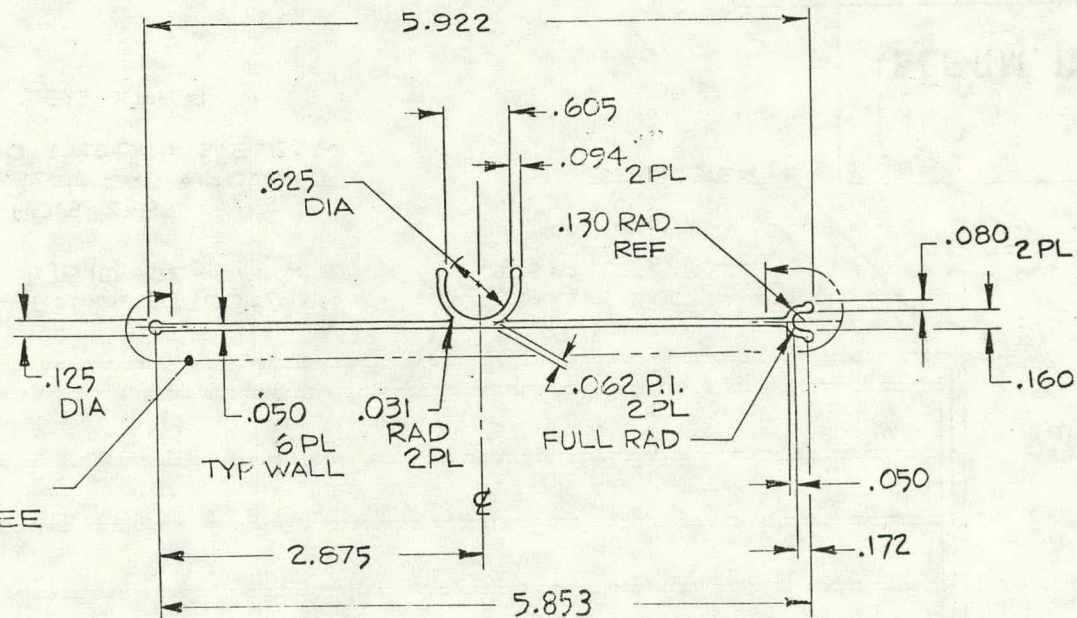
2. VENDOR:

REYNOLDS METALS CO.
FSCM NO.

3. PROTECTIVE FINISH:

CHEM FILM (ALODINE) ENTIRE
PART, FINISH COAT WITH MARTIN NO.23
(LUSTERLESS BLACK) ON
INDICATED AREA.

BLACK
FINISH THIS
SURFACE, SEE
NOTE 3



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8893

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	CPI	
XX ± .00	1	4-7-77	HJR	PART NAME	
XXX ± .00	2			AESORBER SNAP FIN	
ANGULAR ±	3			DRAWN BY	
DRAFT	4			THOMSON	
VENDOR'S	5			SCALE FULL	
STD TOL				DATE NOV 76	
APPLY				DRAWING NO	
				ESP-CI	

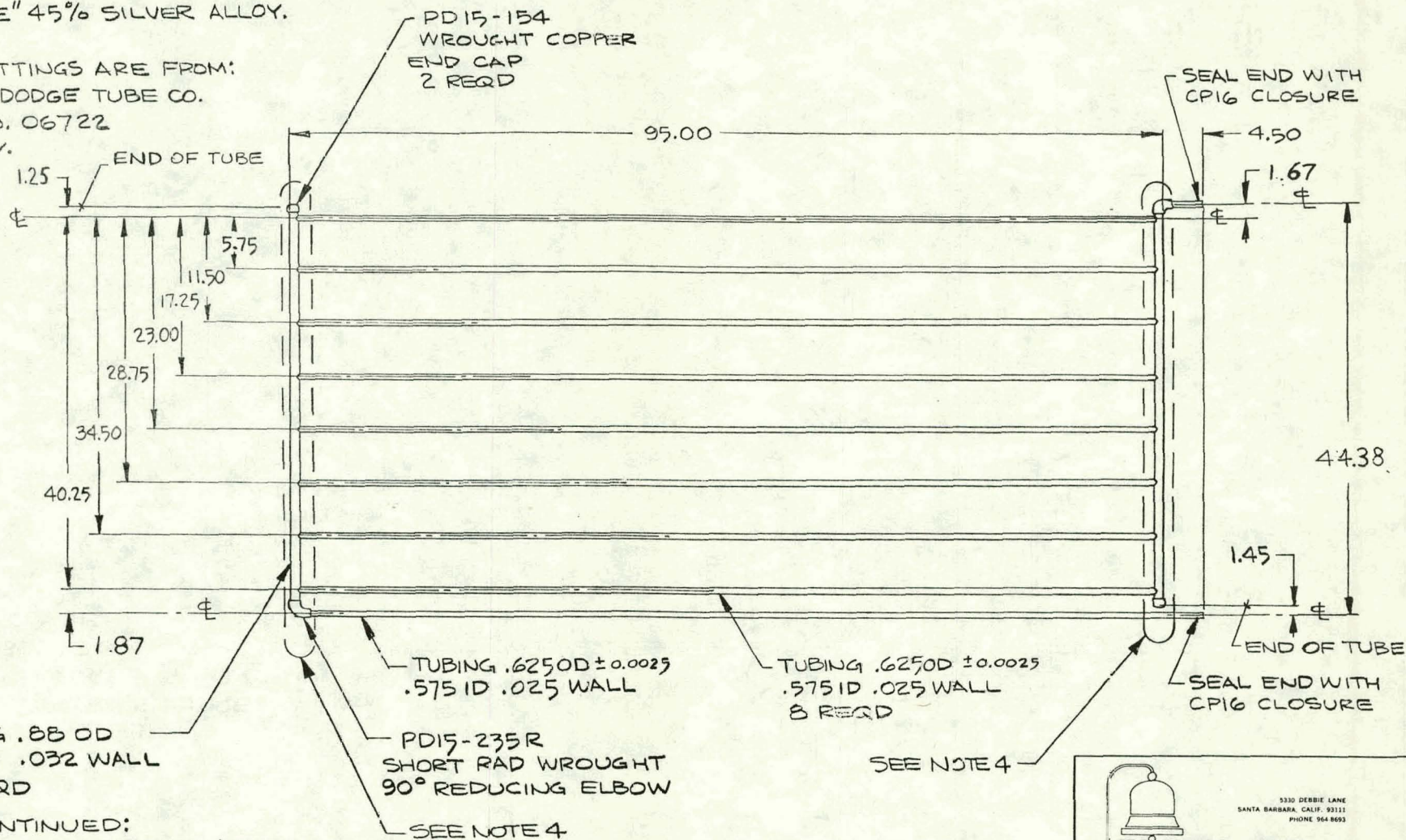
NOTES:

1. MATERIAL:

COPPER TUBE, ROUND SEAMLESS, HARD
DRAWN, TYPE M - OPTION ALLOY 330.

2. ALL SEAMS SHALL BE BRAZED USING
"UNIBRAZE" 45% SILVER ALLOY.

3. PD15 FITTINGS ARE FROM:
PHELPS-DODGE TUBE CO.
FSCM NO. 06722
OR EQUIV.



NOTES CONTINUED:

4. AFTER FABRICATION & TESTING
TREAT INDICATED AREAS PER
ENGINEERING SPEC



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 564-8603

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	CP2	
XX ± 0.006	1	26 FEB 76	WES	PART NAME	ABSORBER WATERWAY
XX ± 0.0	2	8 APR 77	HJR	THOMPSON	SCALE 1/10
ANGULAR $\pm$	3			CHR D	12 NOV 76
DRAFT	4			HJR	ESP-C2
	5			TRACED	

1. MATERIAL:

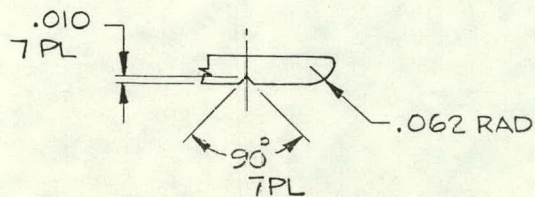
2. VENDOR:

3. PROTECTIVE FINISH:

Technical drawing of a mechanical part, likely a bracket or support, showing dimensions and labels. The drawing includes a central vertical axis and a horizontal axis intersecting at a point labeled "REF".

Key dimensions and labels:

- Top Section:**
 - Overall width: $.834$
 - Distance from center to top edge: $.266$
 - Distance from center to right edge: $.500$
 - Distance from center to right edge (inner): $.250$
 - Radius of top edge: $.068$
 - Radius of inner corner: $.010$ RAD
 - Radius of outer corner: $.062$
 - Label: "FULL RAD" pointing to the outer corner.
- Middle Section:**
 - Distance from center to left edge: $.375$
 - Distance from center to left edge (inner): $.125$ DIA
 - Radius of left edge: $.031$ RAD
 - Distance from center to right edge: $.500$
 - Distance from center to right edge (inner): $.1332$
 - Distance from center to right edge (outer): $.062$
 - Distance from center to right edge (inner): $.100$
 - Radius of inner corner: $.010$ RAD
 - Radius of outer corner: $.031$ RAD
- Bottom Section:**
 - Angle: 5°
 - Distance from center to left edge: $.250$
 - Distance from center to left edge (inner): $.022$ RAD
 - Distance from center to right edge: $.188$
 - Distance from center to right edge (inner): $.500$
 - Distance from center to right edge (outer): $.062$
 - Label: "SEE VIEW A" pointing to the right edge.
- Overall Dimensions:**
 - Overall height: 2.750
 - Overall width: 1.125



VIEW A
SCALE: 4/1

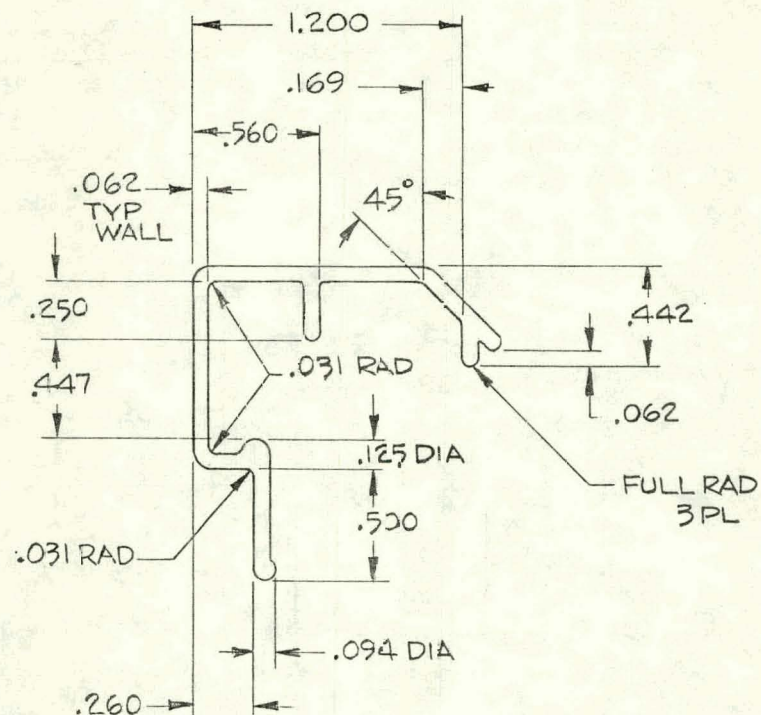
			5330 DEBBIE LANE SANTA BARBARA, CALIF. 93111 PHONE 964-6693																			
ELECAM, INC.			Contractors License No. 290399																			
TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 .XXX ± 0.0 ANGULAR ± DRAFT VENDORS' STD TOL APPLY			REVISIONS <table border="1"> <thead> <tr> <th>NO</th> <th>DATE</th> <th>BY</th> </tr> </thead> <tbody> <tr><td>1</td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td></tr> </tbody> </table>		NO	DATE	BY	1			2			3			4			5		
NO	DATE	BY																				
1																						
2																						
3																						
4																						
5																						
PART NUMBER CP3			PART NAME SIDE CHANNEL																			
DRAWN BY THOMPSON			SCALE FULL																			
CHECKED BY HJR			DATE 13 NOV 76																			
TRACED AFD			DRAWING NO ESP-C3																			

36

2. VENDOR:

3. PROTECTIVE FINISH:

ELECTRO-DEPOSITED
COMMERCIAL DARK
BROWN



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8692

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		DATE		CP4	
.XX ± 0.0		1	REV	PART NAME	
.XXX ± 0.0		2		COVE STRIP	
ANGULAR ±		3			
DRAFT		4		DRAWN BY	
STP TO		5		CHECKED	
APPLY		6		DATE	
		7		TRACED	
		8		APP'D	
				SCALE	
				2/1	
				SERIAL	
				DRAWING NO	
				ESP-W-C4	

NOTES:

1. MATERIAL:

ALUMINUM ALLOY EXTRUSION
CMPSN 6063 TEMPER T52
DIE SECTION NO. 8997(ALCOA)

2. VENDOR:

DUCOMMUN METALS & SUPPLY
FSCM NO. 18708

3. PROTECTIVE FINISH:

ELECTRO-DEPOSITED
COMMERCIAL DARK
BRONZE.

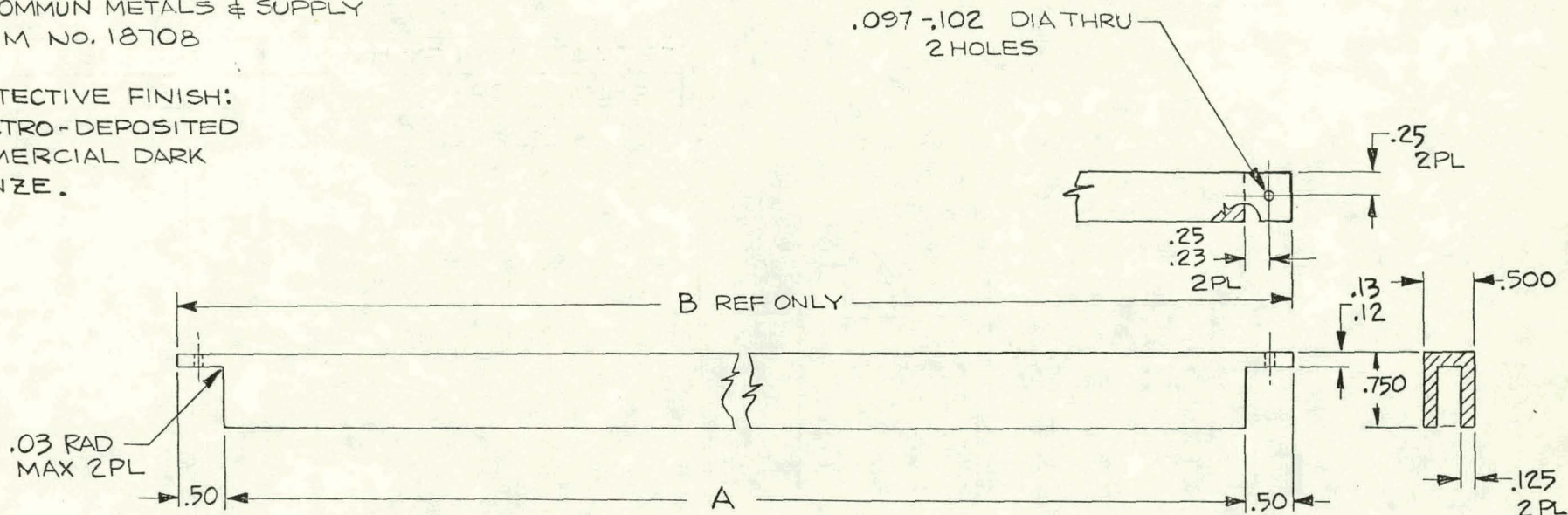


TABLE I

PART NO.	NOTCHED LENGTH A	CUT LENGTH B REF	REMARKS
CP5-001	46.79	47.76	



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954 8693

ELECAM, INC.

Contractors License No. 290399

TOLERANCES	NO	DATE	BY	PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	1	22 NOV 76	HJR	CP5
XX = .002	2	8 APR 77	HJR	CROSS CHANNEL
XXX = .001	3			
ANGULAR =	4			
DRAFT	5			
SECTION				
TOL =				
VENDOR STD				

NOTES:

1. MATERIAL:

ALUMINUM ALLY EXTRUSION
CMP5N 6063 TEMPER T5
DIE SECTION NO. 67106

2. VENDOR:

REYNOLDS METALS CO.
FSCM NO. 09983

3. PROTECTIVE FINISH:

NONE

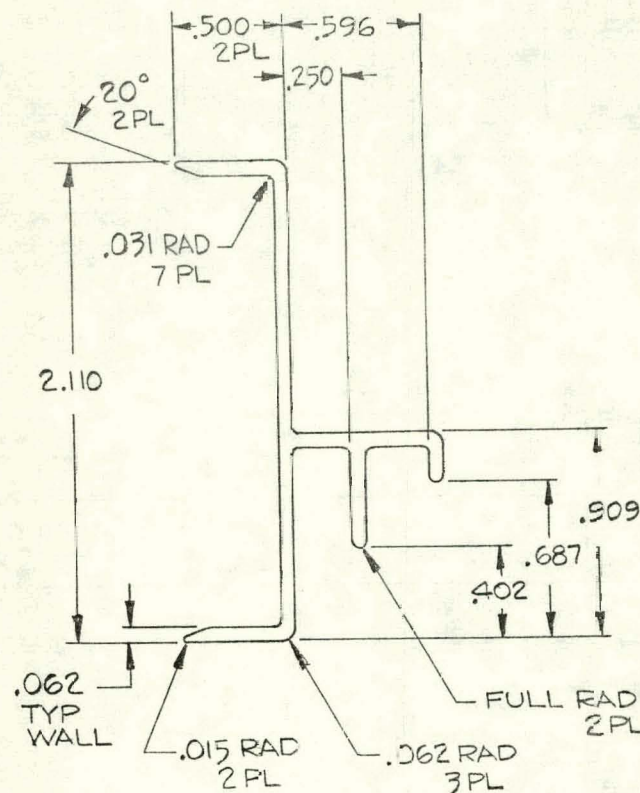
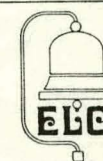


TABLE I

PART NO.	REMARKS
CP6 -001	CUT INTO .80-.86 LENGTHS
CP6 -002	LENGTH AS MILL SUPPLIED



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954 8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	CP6	
XX ± .00		1	22 NOV 76	PART NAME	
XXX ± .00		2		ABSORBER RESTRAINT	
ANGULAR ±		3		DRAWN BY	
DRAFT		4		THOMSON	
VENDORS STD TOL. APPLY		5		SCALE	
		6		2/1	
				DATE	
				13 NOV 76	
				DRAWING NO	
				ESP-06	

NOTES:

1. MATERIAL:

VYNIL RUBBER STRIP.

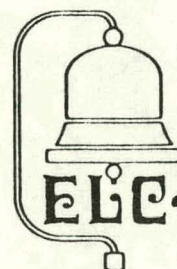
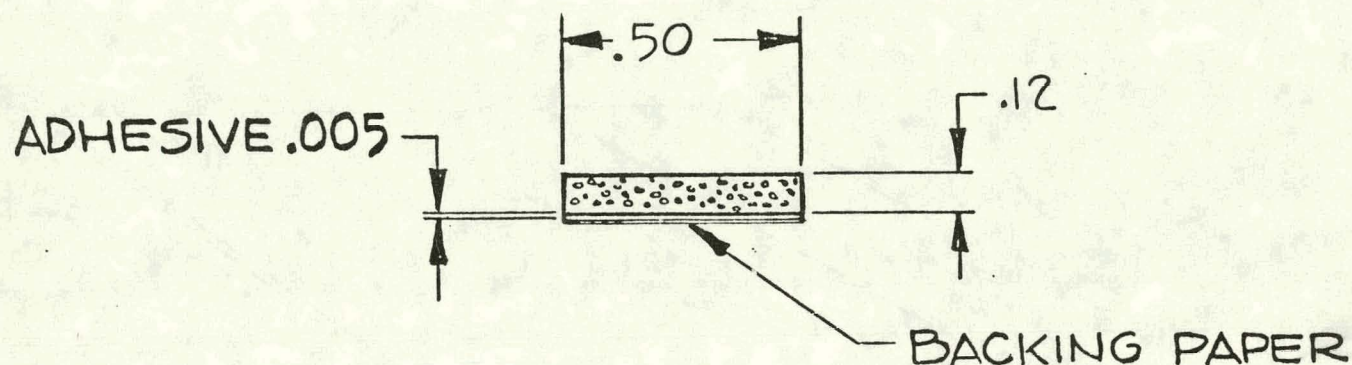
CLOSED CELL SPONGE

DUROMETER 40-50

COLOR BLACK. PRESSURE-SENSITIVE

ADHESIVE BACKED WITH

PROTECTIVE BACKING PAPER.



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP7		
XX ± 0.0		1			PART NAME		
XXX ± 0.0		2			GASKET		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
		5			SCALE NONE		
					DATE 14 NOV 76		
					APP'D		
					ESP-C7		

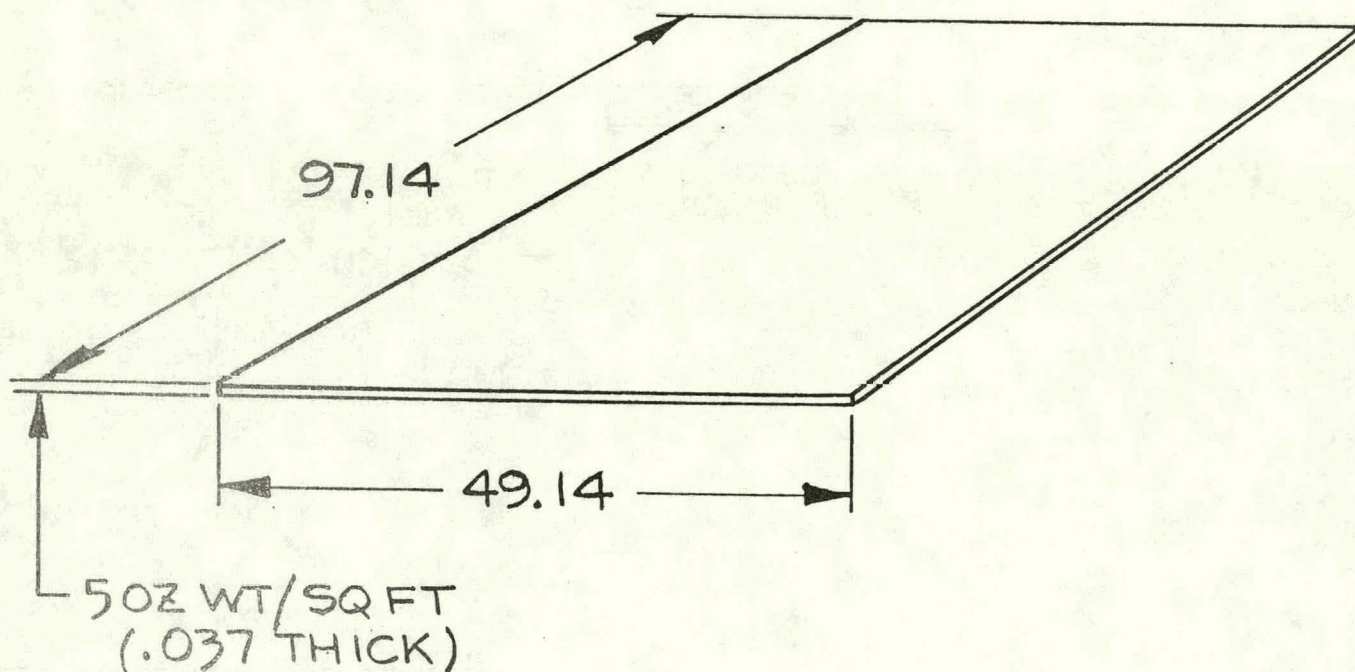
NOTES:

1. MATERIAL:

ACRYLIC FORTIFIED POLYESTER
RESIN REINFORCED WITH FIBERGLASS.
PROTECTED WITH 1 MIL COATING OF
DUPONT'S TEDLAR POLYVINYL FLUORIDE
ONE SURFACE.
COLOR - CRYSTAL CLEAR

2. VENDOR:

GLASTEEL INC.
1727 BUENA VISTA
DUARTE, CALIF. 91010



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964 8693

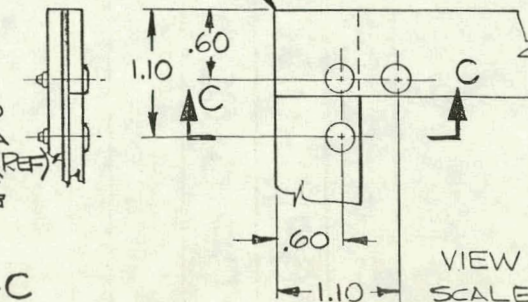
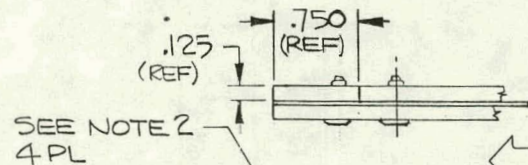
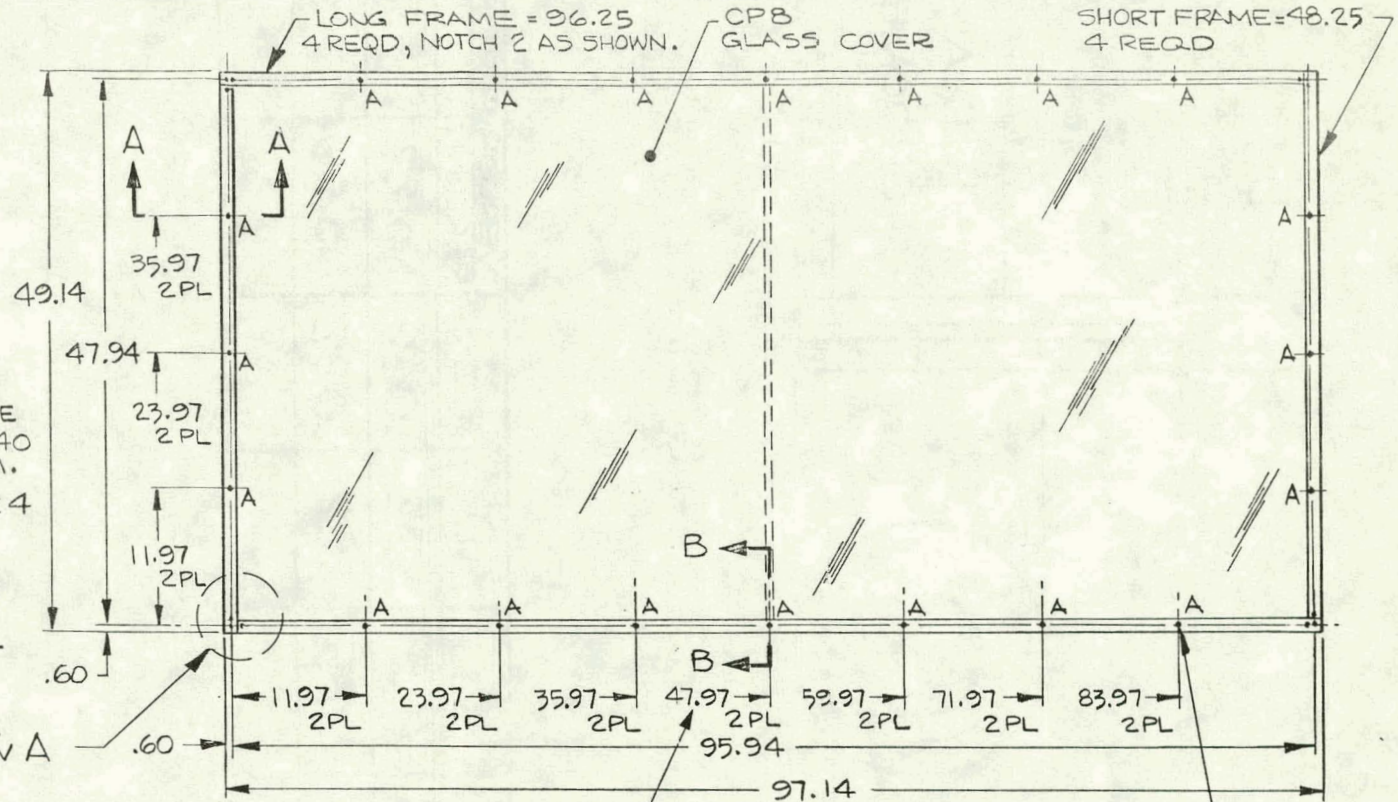
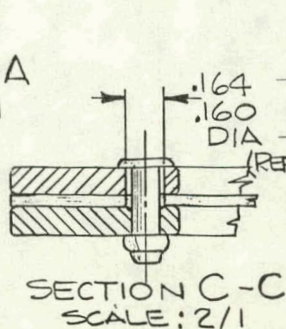
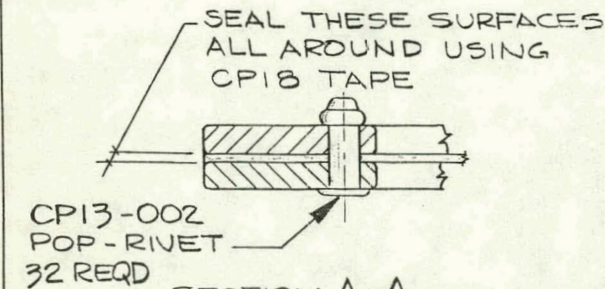
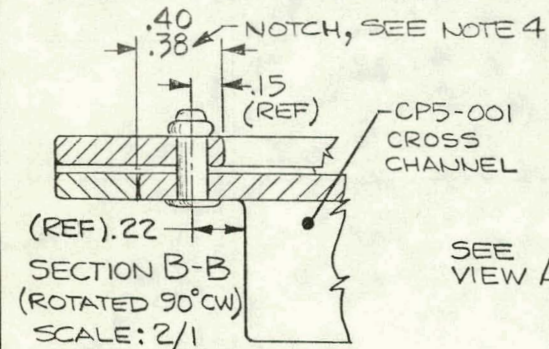
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP8
XX ± 0.0		1			PART NAME
XXX ± 0.0		2			FIBERGLASS COVER
ANGULAR ±		3			THOMSON
DRAFT		4			SCALE NONE
		5			DATE 19 NOV 76
					MATERIAL SEE NOTE 1
					DRAWING NO
					ESP-C8

NOTES:

1. RIVET SECURELY USING MFRS TOOLS & PROCEDURES. DOME RIVET HEADS MUST BE ON ONE SIDE.
2. CORNERS MUST BE FREE FROM BURRS AND SHARP EDGES.
3. FRAME MEMBERS ARE MADE FROM AL ALLOY 2024-T4 RECTANGLE BARS .125 X .75 COLD FINISHED & ROLLED.
4. LOWER LONG FRAME MUST HAVE 2 NOTCHES .50-.52 WIDE X .38-.40 DEEP CENTERED ON 47.90 DIM.



Holes marked "A"
INSTALLATION HOLES:
.129-.133 (#30) DIA THRU
ALL 3 PIECES - 20 HOLES
UNMARKED HOLES:
.129-.133 (#30) DIA THRU
CDRILL .160-.164 (#20) DIA TO
DEPTH SHOWN IN SECTION C-C
12 HOLES

CAUTION:
FRAME MEMBERS
MUST FOLLOW
OVER-LAP PATTERN
AS SHOWN AT
ALL 4 CORNERS



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954 8053

Contractors License No. 290399

TOLERANCES	NO	DATE	BY	PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL XX = 00 3	1	2 APR 77	WPT	CP9
ANGULAR ± DRAFT	2			FIBERGLASS COVER ASSY
	3			THOMPSON
	4			CHK'D HJR
	5			DATE 21 Nov 76
	6			APP'D ESP-C9

NOTES:

1. MATERIAL:

RUBBER, SYNTHETIC
COLOR BLACK, DURO 55

2. VENDOR(S)

RUBBERCRAFT CORP
FSCM NO. 77969

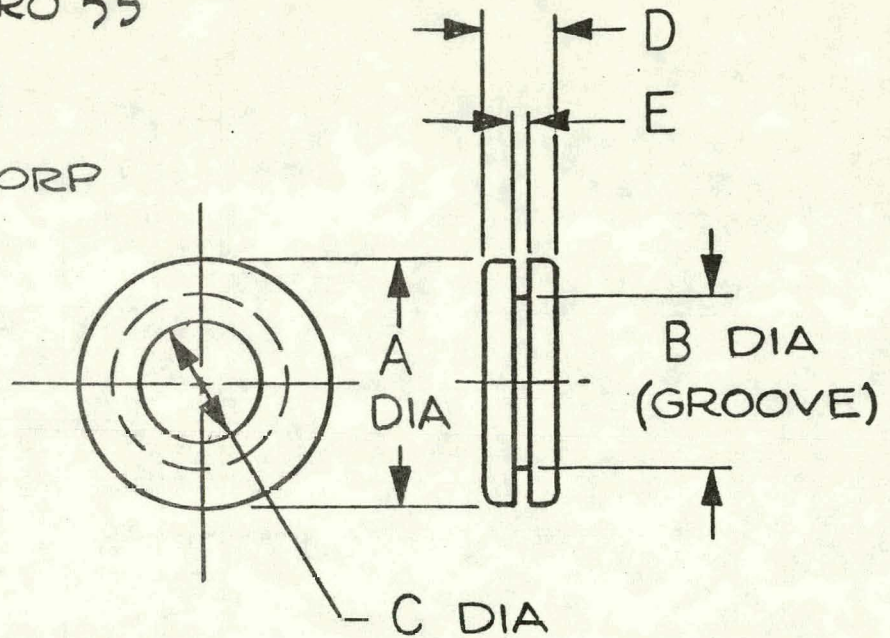


TABLE I

PART NO.	A	B	C	D	E	VENDOR PART NO.	
						RBR CRAFT	
CP10-001	1.12	.875	.625	.32	.062	NO.22	
CP10-002	.44	.312	.125	.22	.062	NO.59	



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CPI0	
.XX ± 0.03		1				
.XXX ± 0.015		2			RUBBER GROMMET	
ANGULAR ±		3				
DRAFT		4			DRAWN BY THOMSON CHK'D 4JR TRACED	
		5				
					SCALE NONE	MATERIAL SEE NOTE 1
					DATE 14 NOV 76	DRAWING NO
					APP'D	ESP-C10

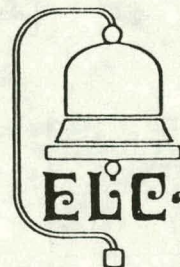
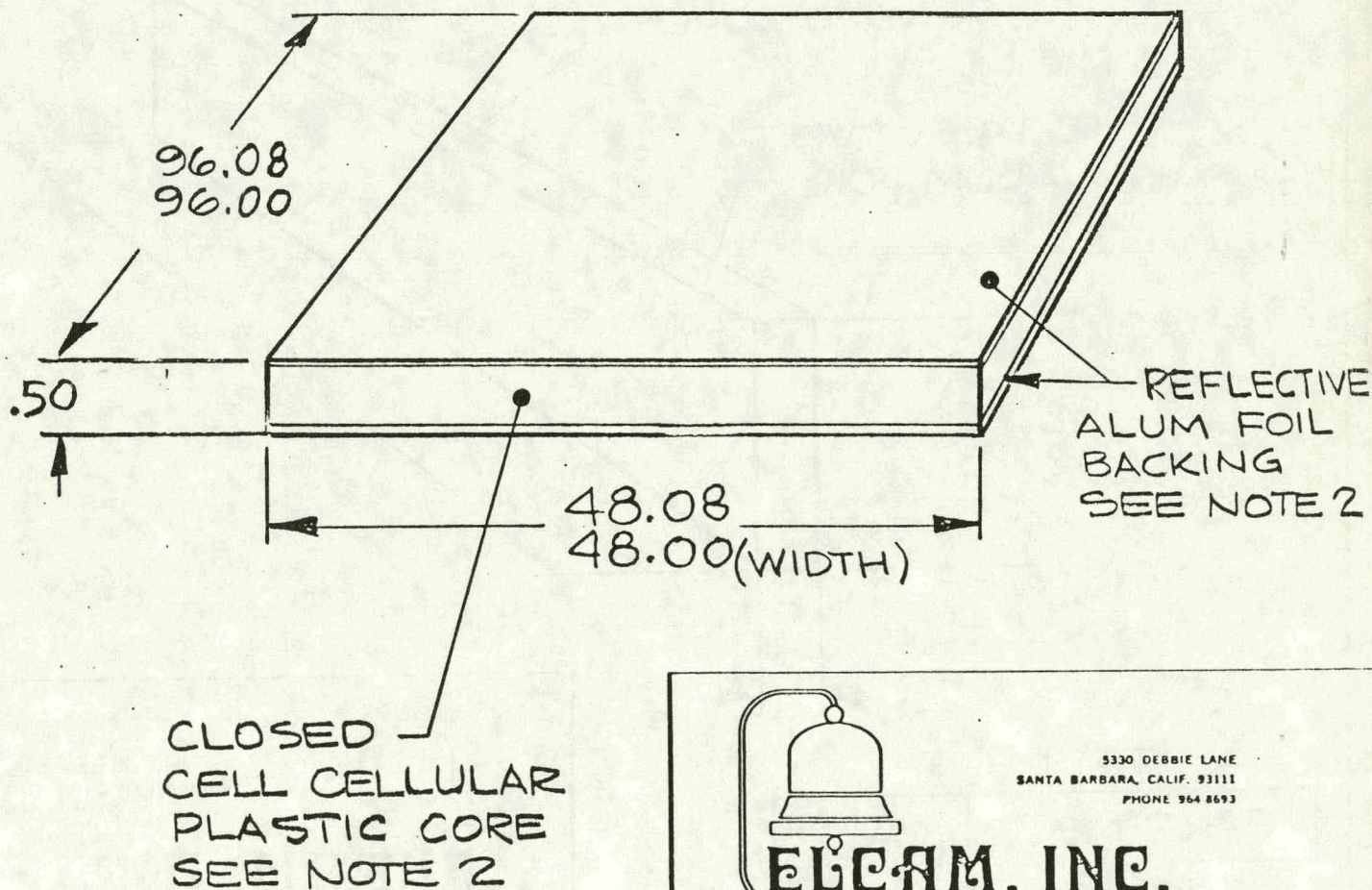
NOTES:

1. MATERIAL:

INSULATION BOARD, RIGID CELLULAR PLASTIC CORE,
LAMINATED CONSTRUCTION WITH
ALUM ALLOY FOIL BOTH SIDES (CELOTEX CORP)
ALUM SHEET ON ONE SIDE BY ELCAM, INC.

2. VENDOR:

THE CELOTEX CORP.
FSCM NO. 86105
PART NO. TF-400



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964 8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP11	
XX ± .00 2		1			PART NAME	
XXX ± .00 CA		2			REAR INSULATION	
ANGULAR ± -		3			DRAWN BY	
DRAFT		4			THOMSON	
		5			SCALE	
					HJR	
					DATE	
					18 NOV 76	
					MATERIAL	
					SEE NOTE 1	
					DRAWING NO	
					ESP-C11	

NOTES:

1. MATERIAL:

INSULATION BOARD, RIGID CELLULAR PLASTIC CORE.
SINGLE FACE CONSTRUCTION.
ALUM FOIL BOTH SIDES.

2. VENDOR:

THE CELOTEX CORP.
FSCM NO. 86105
PART NO. TF-400

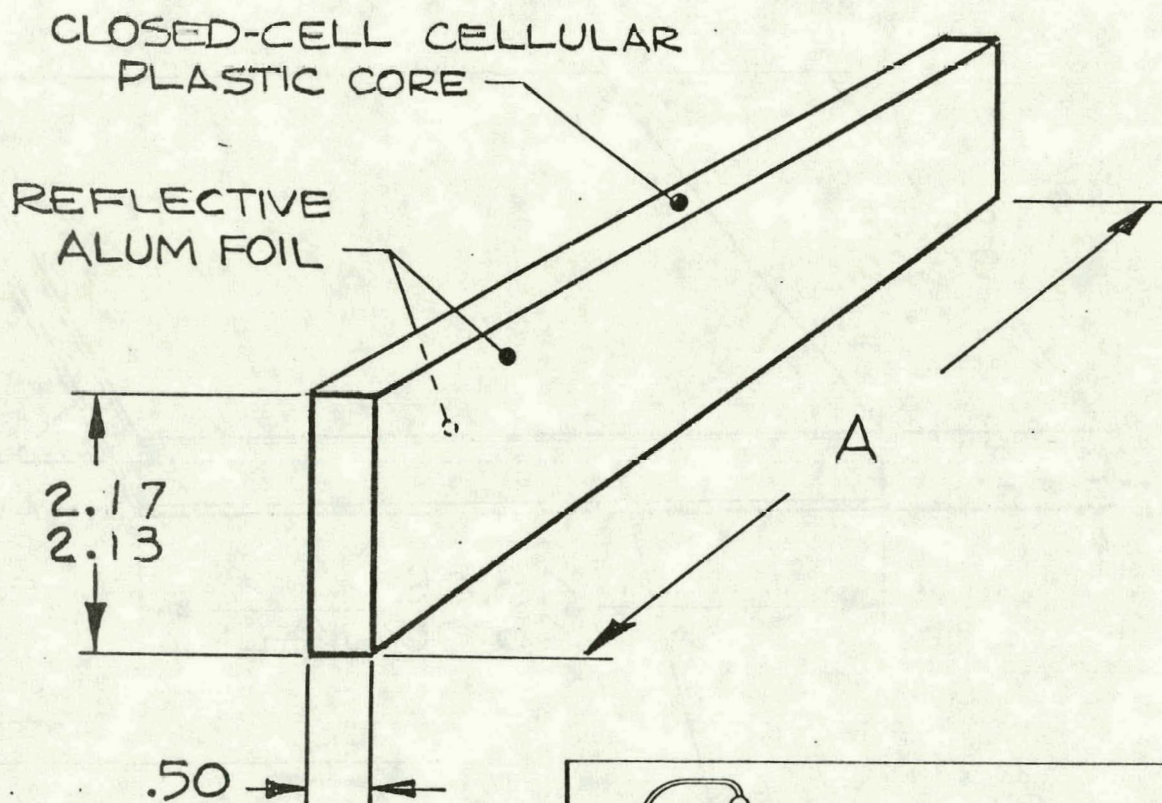


TABLE I

PART NO.	A
CPI2-001	96.60
CPI2-002	47.13



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CPI2		
XX ± 0.0		1			PART NAME		
XXX ± 0.0		2			SIDE INSULATION		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
		5			CHK'D		
		6			HJR		
					DATE		
					18 NOV 76		
					APP'D		
					TRACED		
					SCALE		
					NOTE		
					SEE NOTE 1		
					DRAWING NO		
					ESP-C12		

NOTES:

1. MATERIAL:

ALUMINUM ALLOY BLIND
RIVET, SEE VENDOR SPEC.

2. VENDOR:

USM CORP, "POP" RIVET DIV
FSCM NO. 07707

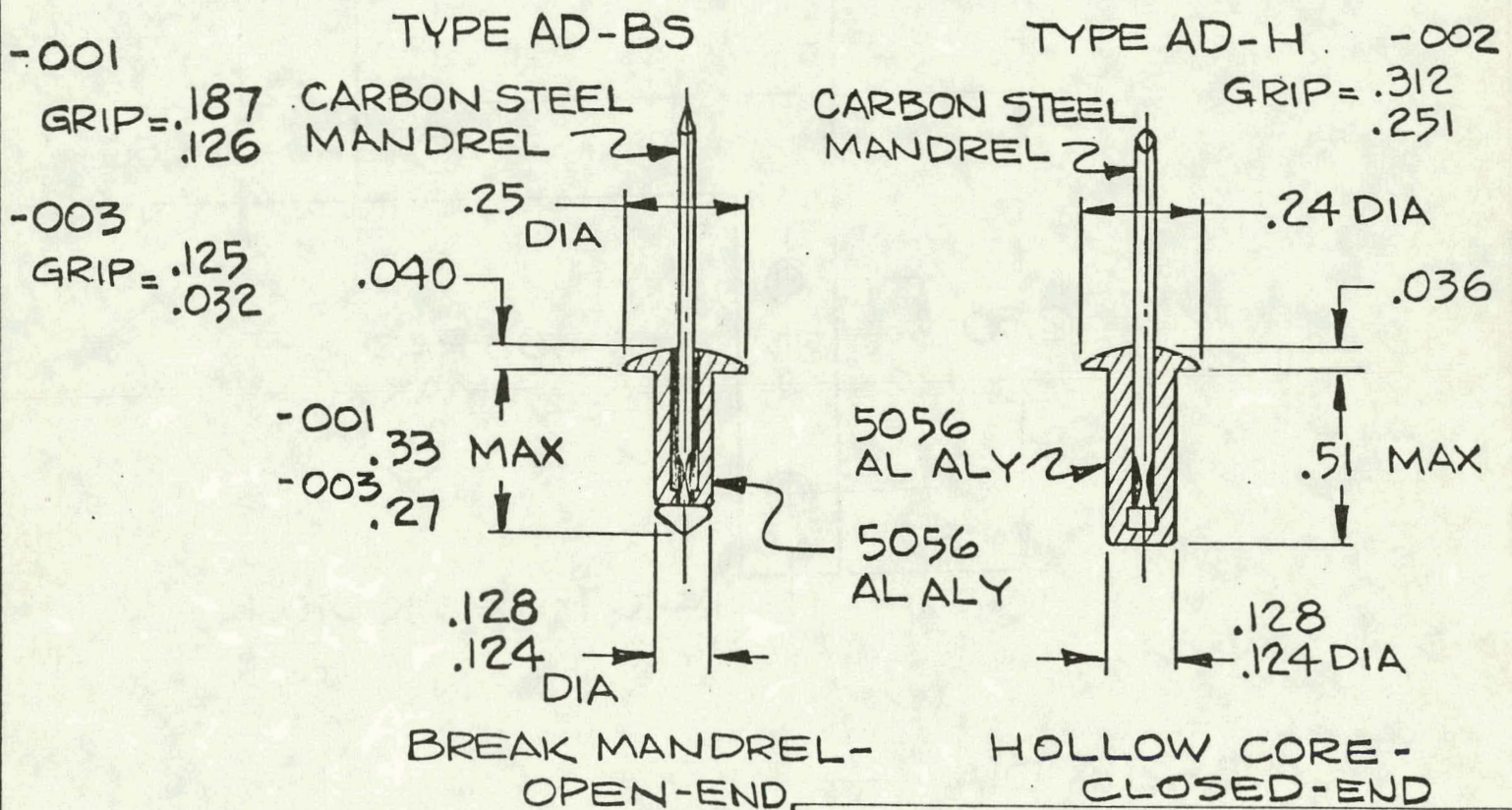


TABLE I

PART NO.	VENDOR PART NO.
CPI3-001	AD43 BS
CPI3-002	AD45 H.
CPI3-003	AD42 BS



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CPI3		
XX ± .00		1			PART NAME		
XXX ± .00		2			POP RIVET		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
VENDOR'S		5			CHK'D HJR		
STD TOL					SCALE NONE		
APPLY					DATE NOV 76		
					MATERIAL NOTE!		
					DRAWING NO		
					ESP-C13		

NOTES:

1. MATERIAL:

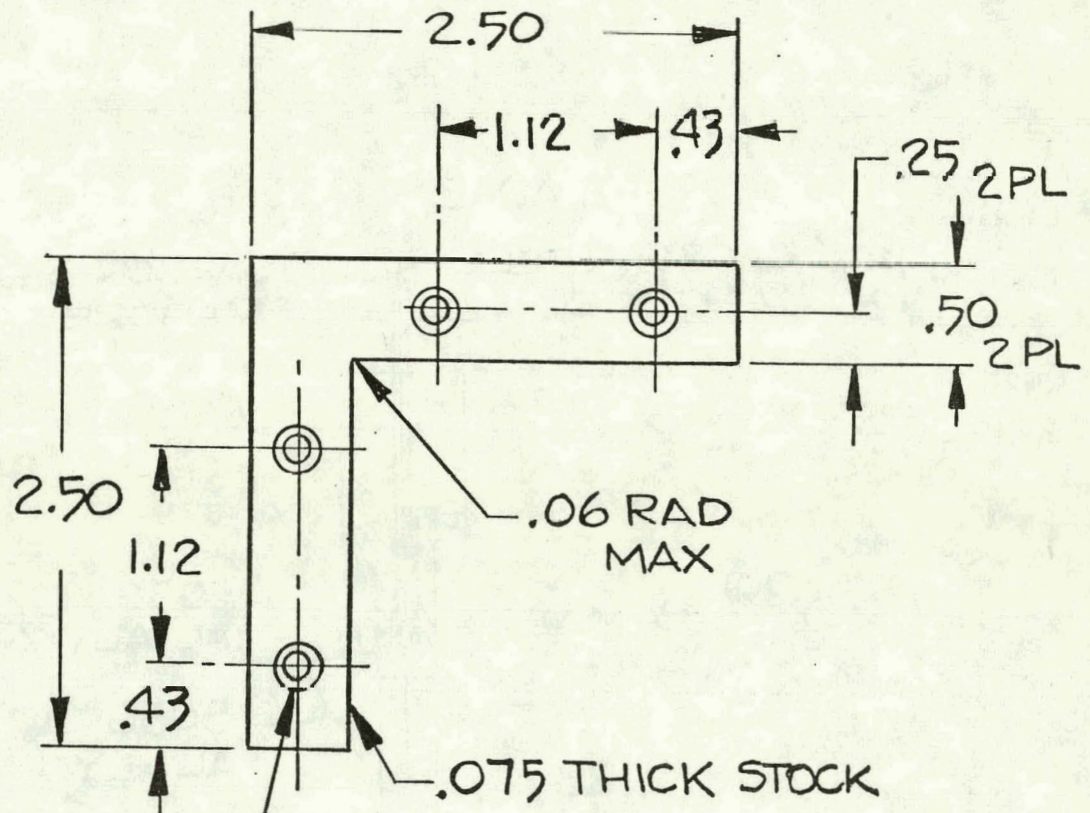
CARBON STEEL

2. PROTECTIVE FINISH:

ZINC PLATE

3. MFG PART NO.

STANLEY NO. 999



.198-.204 DIA
CSK 120° TO .25 DIA
4 HOLES



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964 8693

ELCAM, INC.

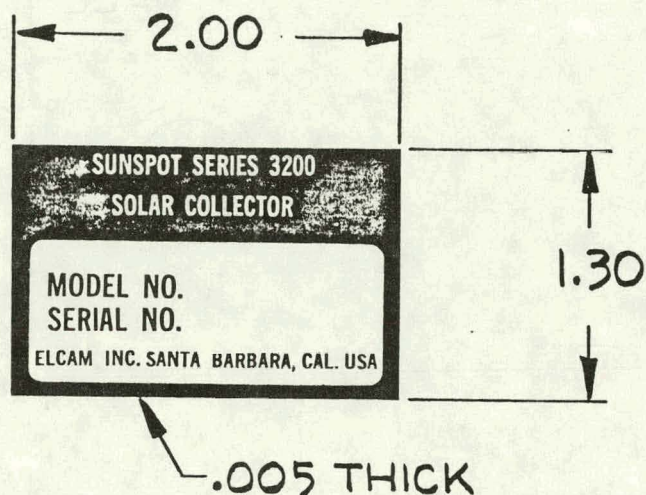
Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP 14		
XX ± 0.0		1			PART NAME CORNER BRACKET		
XXX ± 0.0		2					
ANGULAR ±		3					
DRAFT		4					
		5					
					DRAWN BY THOMSON	SCALE FULL	MATERIAL SEE NOTE 1
					CHK'D HJR	DATE 14 NOV 76	DRAWING NO
					TRACED	APP'D	ESP-C14

NOTES:

1. MATERIAL:

PHOTOGRAPHIC PAPER.
PRESSURE-SENSITIVE
ADHESIVE BACKED WITH
PROTECTIVE BACKING
PAPER.



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER		
	NO	DATE	BY	CP15		
UNLESS OTHERWISE SPECIFIED DECIMAL	1			PART NAME		
XX ± 0.0	2			LABEL, COLLECTOR		
XXX ± 0.0	3			DRAWN BY		
ANGULAR ±	4			THOMSON		
DRAFT	5			SCALE FULL		
				DATE 14 Nov 76		
				SEE NOTE 1		
				ESP-C15		

NOTES:

1. MATERIAL:

VINYL PLASTIC

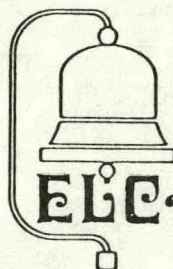
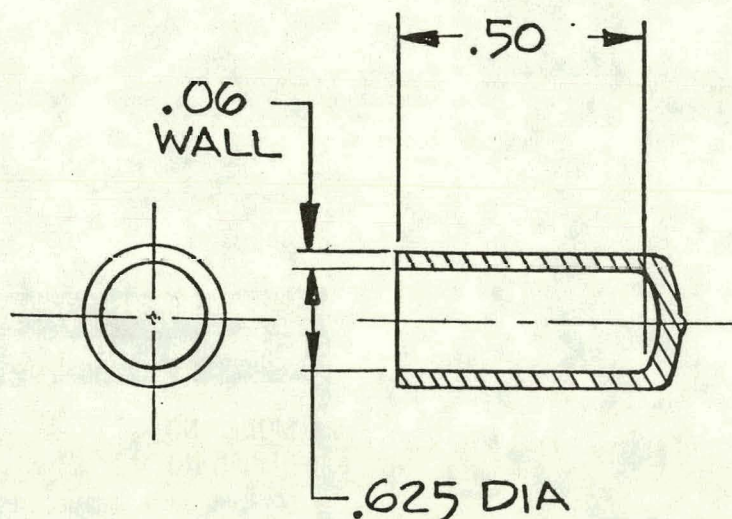
COLOR RED

2. VENDOR:

SINCLAIR & RUSH INC.

FSCM NO

PART NO. 625-8



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964 8693

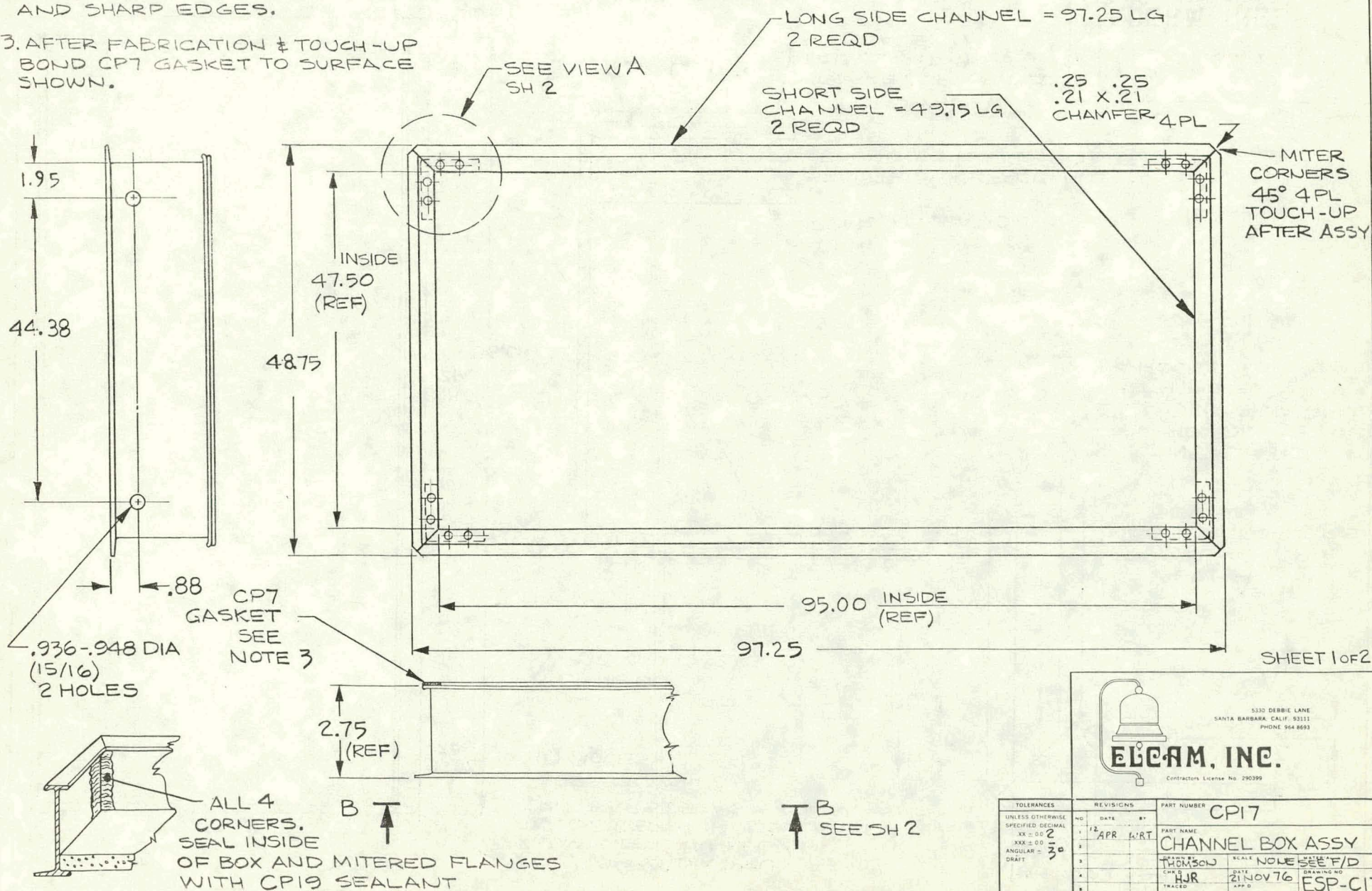
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP16		
XX ± 0.0		1			PART NAME		
XXX ± 0.0		2			VINYL CLOSURE		
ANGULAR ±		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
		5			CHK'D	DATE	DRAWING NO
					TRACED	APP'D	ESP-C16

1. RIVET SECURELY USING MFRS TOOLS AND PROCEDURES. DOME RIVET HEADS MUST BE ON SIDES SHOWN IN SECTION A-A.

3. AFTER FABRICATION & TOUCH-UP
BOND CP7 GASKET TO SURFACE
SHOWN.



SHEET 1 OF 2



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8661

Contractors License No. 2903

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO.	DATE	CP17	
X2 = .002		1	APR 6 RT	PART NAME	
X32 = .00		2		CHANNEL BOX ASSY	
ANGULAR = 30		3		THOMPSON	
DRAFT		4		SCALE	NOTE SEE F/D
		5		CHECK IN	DATE
		6		HJR	NOV 76
		7		TRACED	APP D
		8			DRAWING NO
					ESP-C1

.129-.130(#30) DIA THRU
ALUM SIDE CHANNEL AND
TO .62 DEPTH IN INSULATION
CPI1 FAR SIDE AS SHOWN,
SEE SECTION A-A
10 HOLES

95.02
2PL

CPI3-001
POP- RIVET, 32 REQD
.25 REF

CPI4
CORNER BRKT
8 REQD

48.00
2PL

96.00

CPI1
REAR INSULATION

SEAL THIS SURFACE ALL
AROUND USING CPI8 TAPE

SECTION A-A
(GASKET CPT OMITTED
FOR CLARITY)
SCALE: 2/1

CPI4 CORNER
BRKT-NOT
SHOWN IN
TRUE VIEW
(REF)

CPI3-003
POP- RIVET
10 REQD

VIEW B-B

BOTTOM HOLE PATTERN
(ROTATED 90° CW) SCALE: NONE

47.52
2PL

48.00

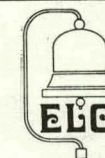
.48
2PL

.48
2PL

.188

1.90
.90
.25
.90
1.90
.25
VIEW A
TYPICAL 4 TOP &
BOTTOM CORNERS
SCALE: 1/1
INSTALLATION
HOLES:
.129-.133(#30) DIA THRU
BOTH PIECES
4 HOLES

SH 2



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES			REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED	DECIMAL		NO	DATE	BY	
XX ± 0.0	2		1	APR 71	WFR	
XXX ± 0.0			2			
ANGULAR ±	3°		3			
DRAFT			4			
			5			
			PART NAME		CHANNEL BOX ASSY	
			DESIGNED BY		THOMSON	
			SCALE		NONE	
			CHK'D		HJR	
			DATE		21 NOV 76	
			TRACED		ESP-C17	

NOTES:

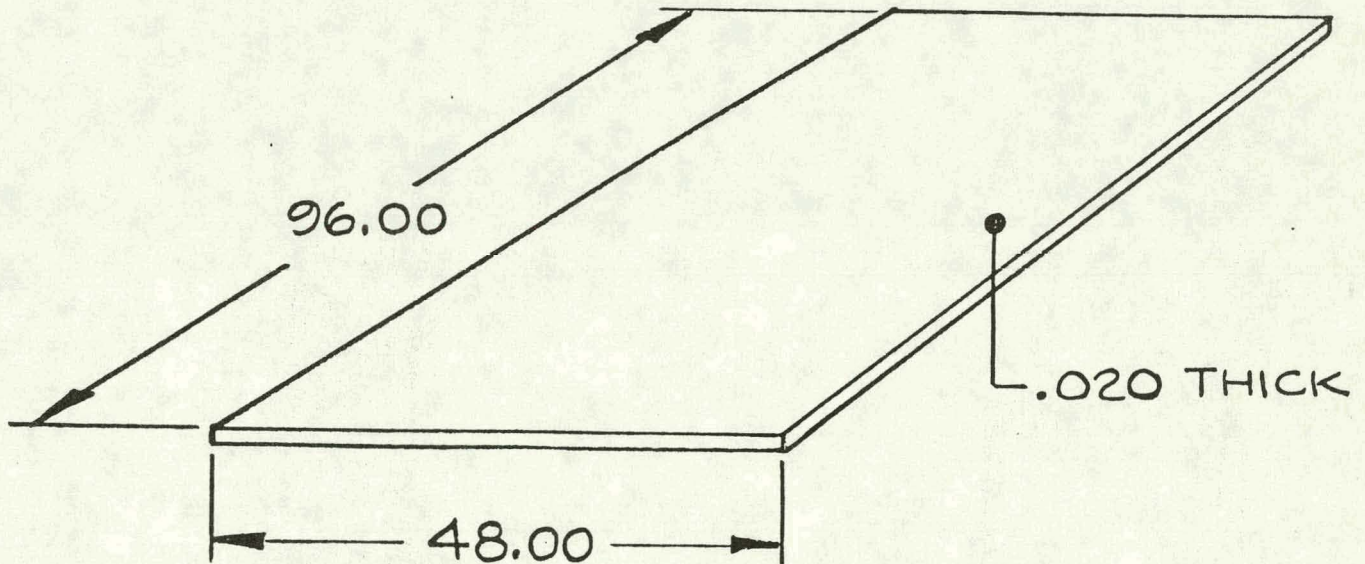
1. MATERIAL:

ALUMINUM ALLOY SHEET
CMPN 6061 TEMPER T6

2. VENDOR:

REYNOLDS METALS CO.
FSCM NO. 09983

3. PROTECTIVE FINISH:
NONE



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP 18	
.XX ± 0.0		1			PART NAME	
.XXX ± 0.0		2			BACKING SHEET	
ANGULAR ±		3			DRAWN BY	SCALE
DRAFT		4			THOMSON	NONE
VENDOR'S		5			DATE	MATERIAL
STD TOL					12 APR 77	SEE NOTE 1
APPLY					TRACED	DRAWING NO
						ESP-C18

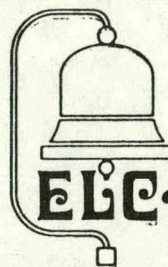
NOTES:

1. MATERIAL:

ADHESIVE SEALANT
SILASTIC RTV 732
COLOR, CLEAR

2. VENDOR:

DOW - CORNING CORP
FSCM NO. 71984



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	PART NAME	
.XX ± 0.0	—	1			CP19	
.XXX ± 0.0	—	2			SEALANT	
ANGULAR ±		3			DRAWN BY THOMPSON	
DRAFT		4			CHK'D HJR	
		5			DATE 26 NOV 76	
					APP'D	
					MATERIAL SEE NOTE 1	
					DRAWING NO ESP-C19	

NOTES:

1. MATERIAL:

CLEAR FILM TAPE (5 MIL THICK)

DOUBLE ADHESIVE COATED

TAPE NO. 666

"SCOTCH" BRAND

3/4 WIDE X 36 YARD ROLL

2. VENDOR:

MINN MINING & MFG CO.

FSCM NO. 26066



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 — .XXX ± 0.0 — ANGULAR ± — DRAFT	REVISIONS			PART NUMBER		
	NO	DATE	BY	CP20		
	1			PART NAME SEALING TAPE		
	2					
	3			DRAWN BY THOMSON	SCALE NONE	MATERIAL SEE NOTE 1
	4			CHK'D HJR	DATE 23 NOV 76	DRAWING NO ESP-C20
5			TRACED	APP'D		

1. MATERIAL:

B.F. GOODRICH FLAME

RETARDED ABS

2. PART SHALL BE FREE OF CUTS, TEARS, OR FLASH EXCEEDING .01.

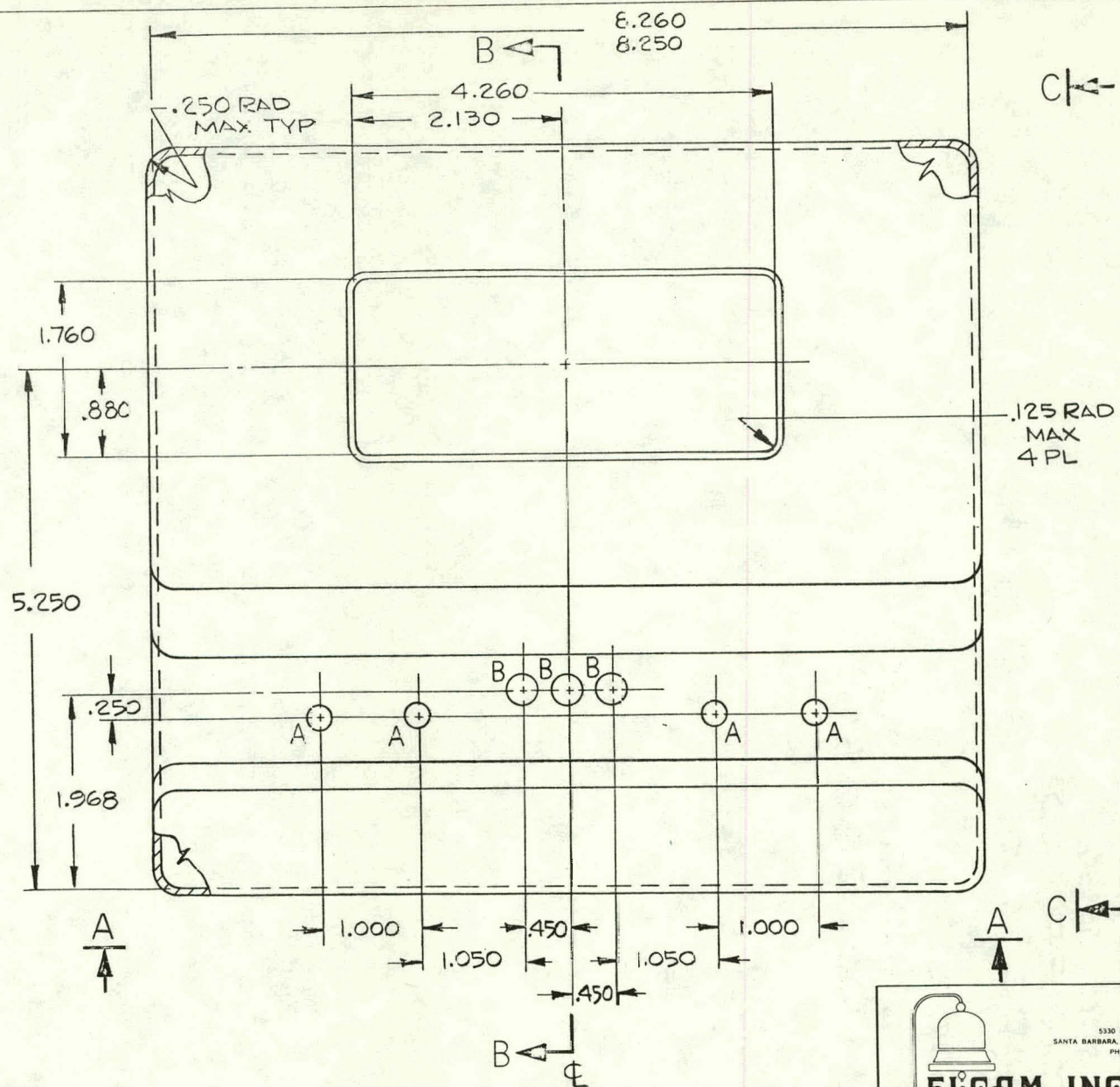
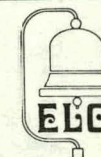


TABLE I

LTR	SIZE	QTY
A	.250-.257 DIA	4
B	.310-.317 DIA	3

SH 1 OF 2

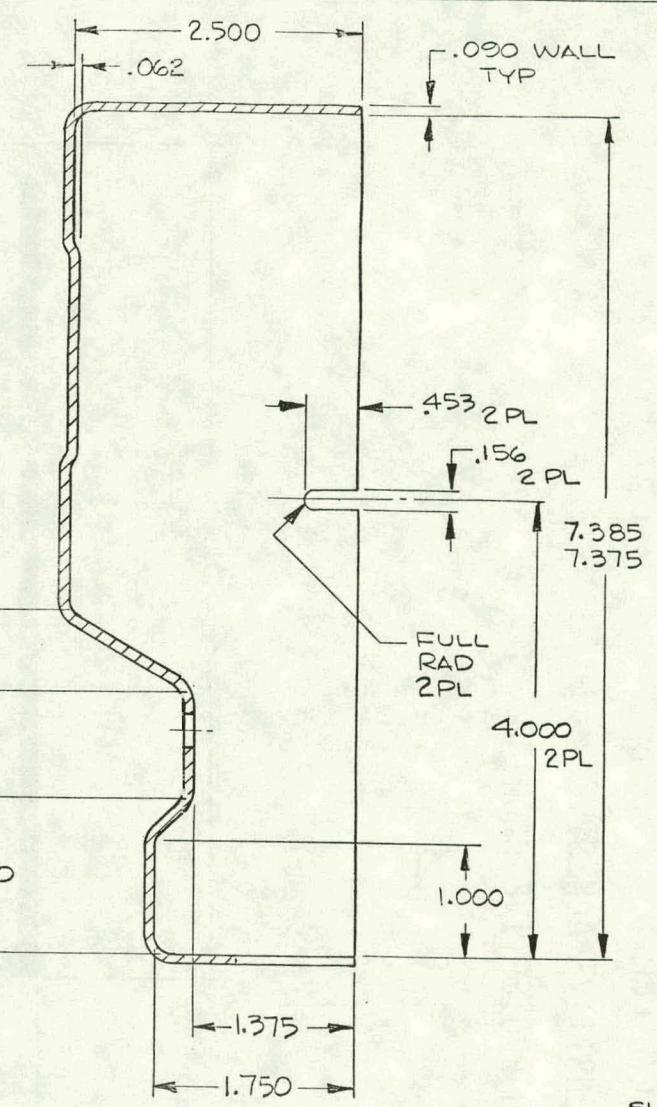
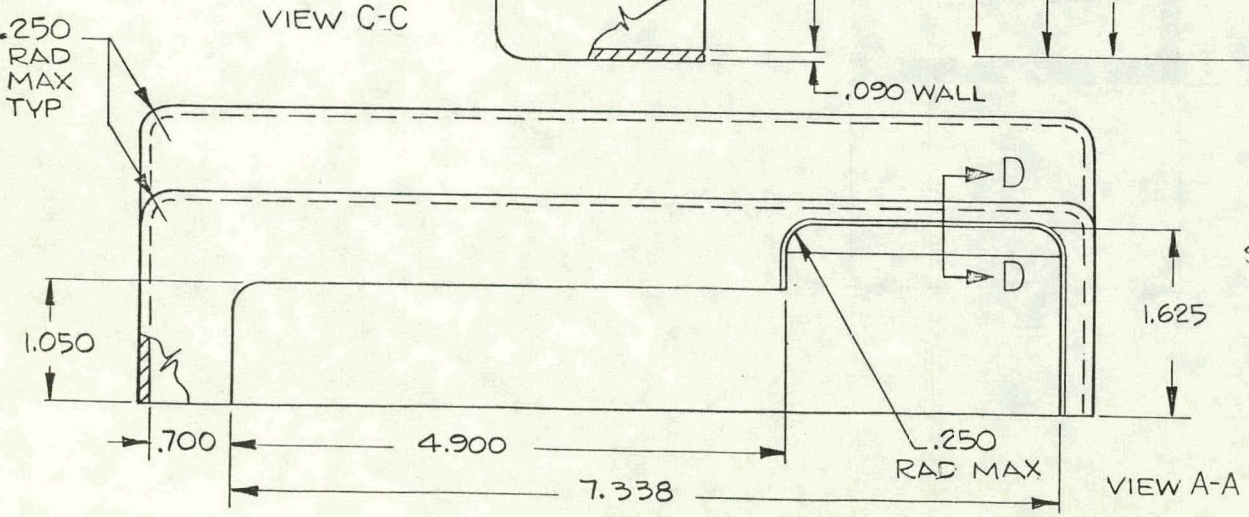
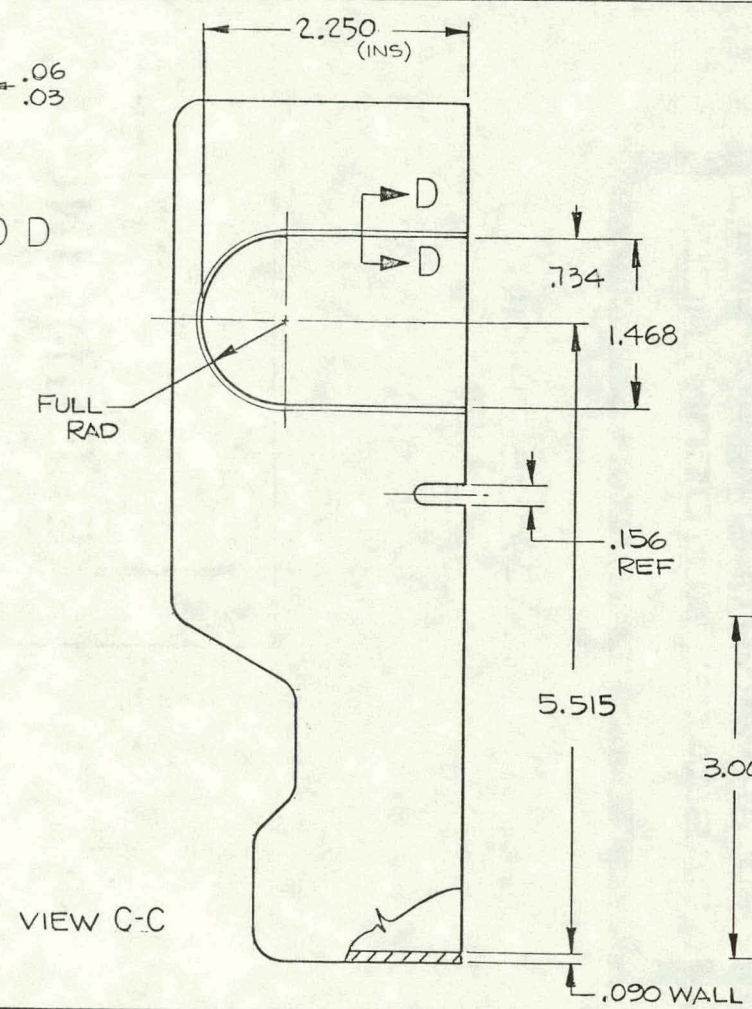
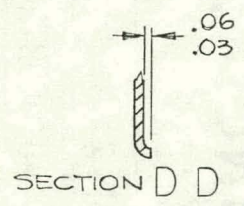


5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

Contractors License No. 290391

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	API
XX ± .00		1			PART NAME
XXX ± .00		2			COVER
XXXX ± .00		3			
DRAFT ± .20		4			
		5			
		6			
		7			
		8			
		9			
		10			
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		100			

55



SHEET 2



5330 DEBBIE LANE
SANTA BARBARA CALIF 93111
PHONE 954-8553

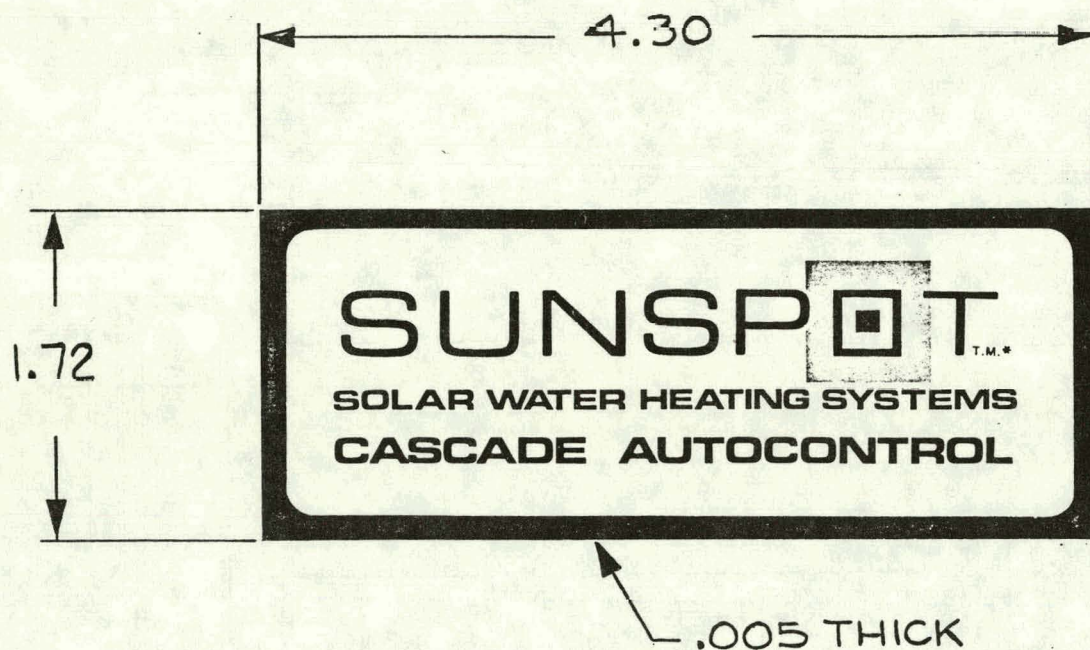
ELCAM, INC.

Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER
	NO	DATE	BY	
UNLESS OTHERWISE SPECIFIED DECIMAL	1			PART NAME
XX ± .00	2			
XXX ± .00	3			DRAWN BY
ANGULAR ±	4			SCALE FULL
DRAFT	5			DATE 7 DEC 76
	6			TRACED
				MATERIAL
				DRAWING NO
				APP'D
				ESP-AI

NOTES:

1. MATERIAL:
 PHOTOGRAPHIC PAPER
 PRESSURE SENSITIVE ADHESIVE
 BACKED WITH PROTECTIVE BACKING
 PAPER.

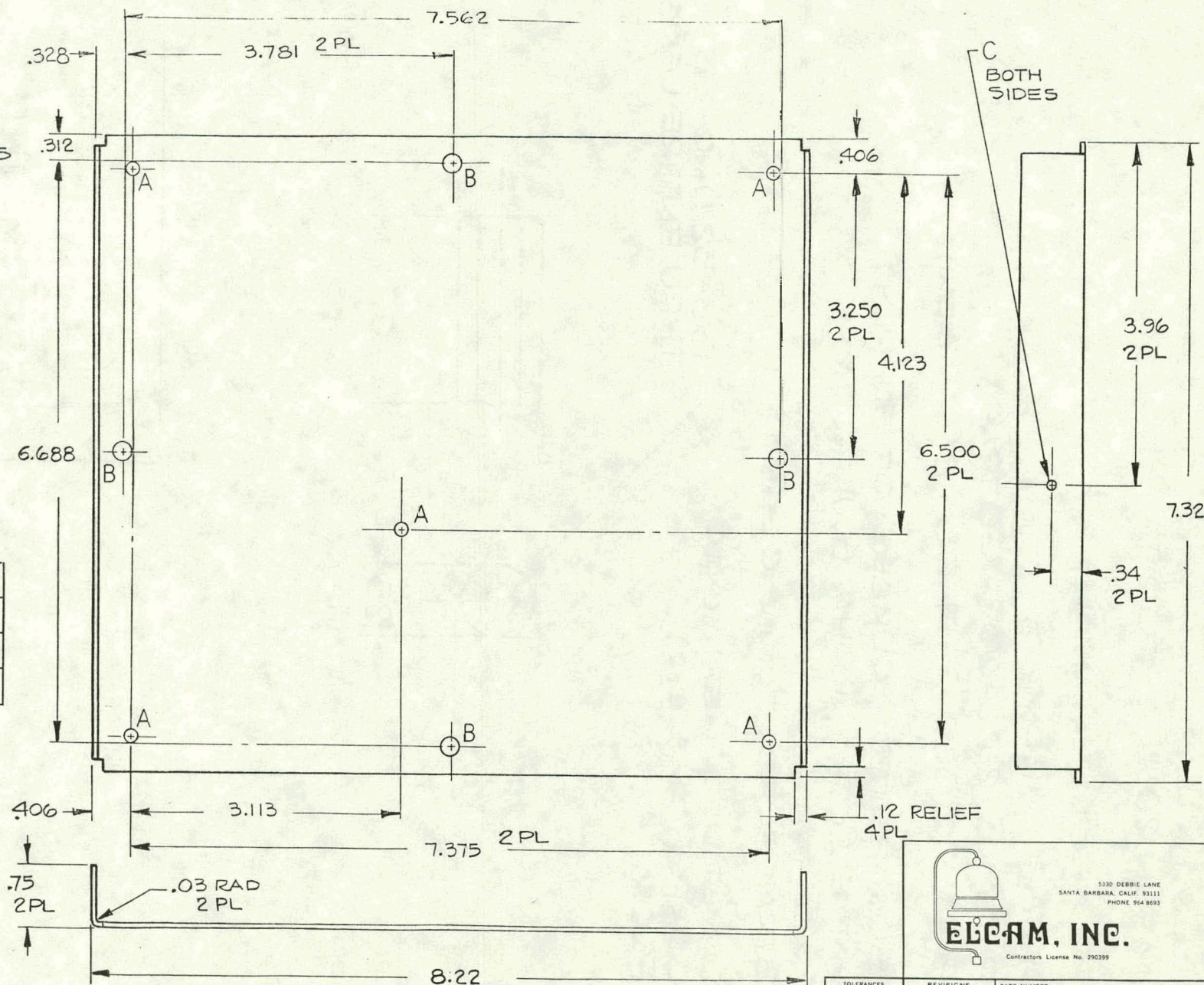


 ELCAM, INC. Contractors License No. 290399		5330 DEBBIE LANE SANTA BARBARA, CALIF. 93111 PHONE 964-8693																														
TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 2 .XXX ± 0.0 - ANGULAR ± - DRAFT		REVISIONS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">NO</th> <th style="width: 20%;">DATE</th> <th style="width: 15%;">BY</th> </tr> </thead> <tbody> <tr><td>1</td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td></tr> </tbody> </table>		NO	DATE	BY	1			2			3			4			5			PART NUMBER AP 2 PART NAME LABEL, AUTOCONTROL <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; font-size: x-small;">DRAWN BY THOMSON</td> <td style="width: 30%; font-size: x-small;">SCALE FULL</td> <td style="width: 40%; font-size: x-small;">MATERIAL SEE NOTE 1</td> </tr> <tr> <td style="font-size: x-small;">CHK'D</td> <td style="font-size: x-small;">DATE 5 DEC 76</td> <td style="font-size: x-small;">DRAWING NO ESP- A2</td> </tr> <tr> <td style="font-size: x-small;">TRACED</td> <td style="font-size: x-small;">APP'D</td> <td></td> </tr> </table>		DRAWN BY THOMSON	SCALE FULL	MATERIAL SEE NOTE 1	CHK'D	DATE 5 DEC 76	DRAWING NO ESP- A2	TRACED	APP'D	
NO	DATE	BY																														
1																																
2																																
3																																
4																																
5																																
DRAWN BY THOMSON	SCALE FULL	MATERIAL SEE NOTE 1																														
CHK'D	DATE 5 DEC 76	DRAWING NO ESP- A2																														
TRACED	APP'D																															

1. MATERIAL:
STEEL, CARBON
CMPSN 1010 TEMP 4
NO. 18 GA (.048)

2. PROTECTIVE FINISH:
ZINC PLATE
.0002 MIN THICKNESS
CLEAR CHROMATE
SPEC QQ-Z-325

LTR	SIZE	QTY
A	.156-.162	4
B	.203-.209	5
C	.108-.113	2



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964 8692

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL XX - 0.01 XXX - 0.05 ANGULAR - DRAFT		NO.	DATE	BY	AP3
		1			PART NAME
		2			BASE PLATE
		3			
		4			DESIGNED BY: J. DAWSON
		5			CHECKED BY: C. M. D.
		6			SCALE: FULL
		7			DATE: DEC 76
		8			TRACED BY: J. P. D.
					DRAWING NO: ESP-A3
					MATERIAL: ALUMINUM

NOTES:

1. MATERIAL:

ALUM ALLOY

CMPSN 2011, TEMPER T3

2. PROTECTIVE FINISH:

CLEAR CHROMATE

3. PART NO. 2106-632-A-0 (RAF)

PART NO. 350-7417-08-19 (CAMBION)

4. SUGGESTED SOURCE(S) OF SUPPLY:

RAF ELECTRONIC HARDWARE INC

260 HATHAWAY

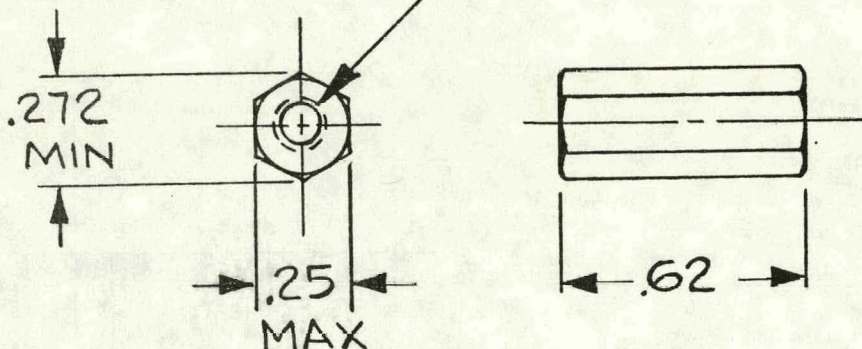
STRATFORD, CONN. 06497

CAMBRIDGE THERMIONIC

CORP (CAMBION)

FSCM 71279

.138-32 UNC-2B
THRU ENTIRE LENGTH



5330 DEBBIE LANE
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964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP4		
.XX ± 0.0		1			PART NAME		
.XXX ± 0.0		2			STANDOFF		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
		5			CHK'D		
					DATE		
					5 DEC 76		
					APP'D		
					TRACED		
					SCALE 2/1		
					MATERIAL		
					SEE NOTE 1		
					DRAWING NO		
					ESP-A4		

NOTES:

1. MATERIAL:

ALUMINUM ALLOY

CMPSN 6063 TEMPER T5

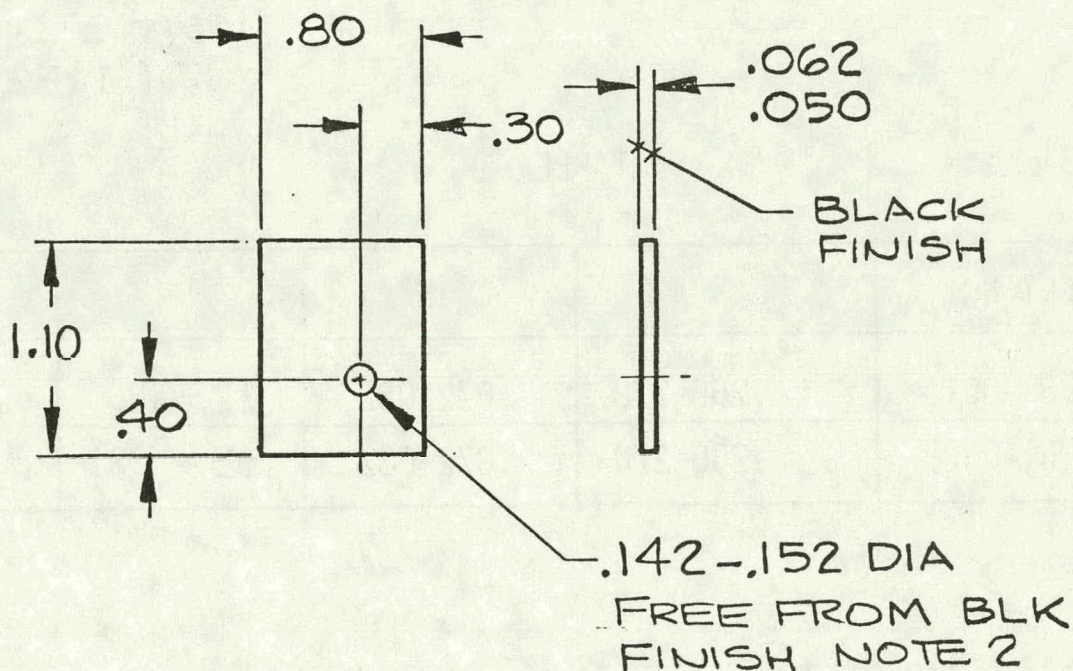
2. PROTECTIVE FINISH:

CHEM FILM (ALODINE)

FINISH COAT WITH MARTIN

NO. 23 (LUSTER-LESS BLACK)

ON INDICATED SURFACES.



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964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP5
.XX ± 0.0		1			PART NAME
.XXX ± 0.0		2			HEAT SINK
ANGULAR ±		3			DRAWN BY
DRAFT		4			THOMSON
		5			CHK'D
					SCALE FULL
					DATE 4 DEC 76
					TRACED
					APP'D
				MATERIAL SEE NOTE 1	
				DRAWING NO	
				ESP-A5	

NOTES:

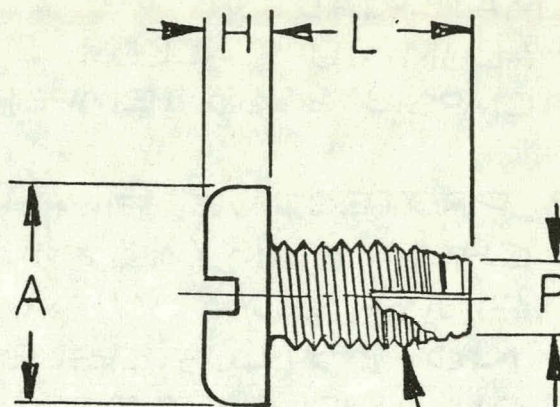
I. MATERIAL:

TAPPING SCREW,

SLOTTED PAN HEAD,

STEEL, CARBON

AISI 1016 TO 1024



.138-32
USA STD TYPE T
(TYPE 23)

TABLE I

PART NO.	A	H	L	P
AP6 -001	.256-.270	.072-.082	.22 - .25	.095-.106
AP6 -002	.256-.270	.072-.082	.35 - .38	.095-.106

TABLE II

DESIGN RECOMMENDATION

THICKNESS	HOLE SIZES FOR	
	STEEL	ALUM
.060	.113 (#33)	.109 (7/64)
.083	.116 (#32)	.111 (#34)



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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 — .XXX ± 0.0 — ANGULAR ± DRAFT		NO	DATE	BY	AP 6		
		1			PART NAME		
		2			SCREW, SELF TAPPING		
		3			DRAWN BY THOMSON	SCALE NONE	MATERIAL SEE NOTE 1
		4			CHK D	DATE 4 DEC 76	DRAWING NO
60		5			TRACED	APP D	ESP- A6

NOTES:

1. MATERIAL:
EPOXY RESIN PLASTIC
LAM GLASS BASE, COPPER
CLAD ONE SIDE, 1 OZ MIN.

2. MUST BE FREE FROM
BURRS & SHARP EDGES.

3. DO NOT DEBURR COPPER
FOIL.

6. SOLDER COAT 60/40
.0005 MIN AND FUSED.

7. LOCATED UNDIM HOLES
FROM ETCHED PATTERN.

8. HOLES SHALL NOT
BREAK OUT OF TERMINAL
CIRCUIT PATH.

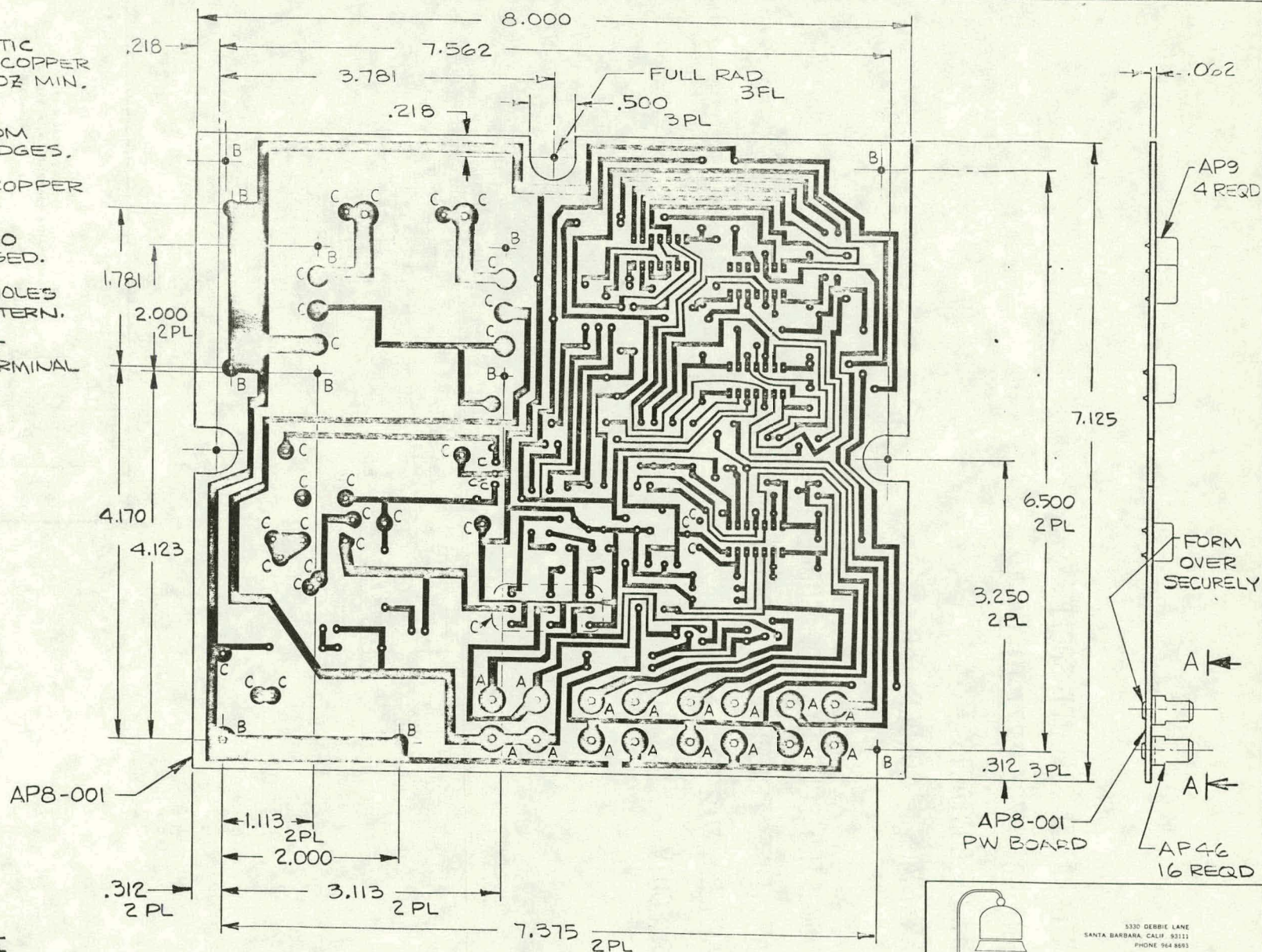
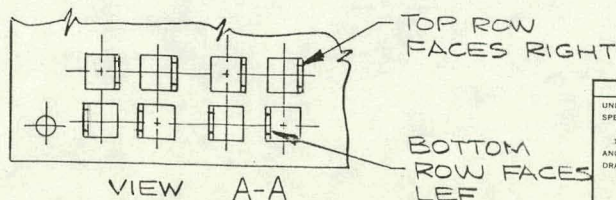


TABLE I

LTR	HOLE SIZE	QTY
A	.150-.157	16
B	.156-.162	11
C	.056-.062	41
UNMARKED	.034-.038	TYP



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PHONE 964 8693

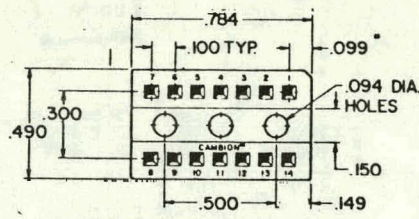
ELEM, INC.

Contractors License No. 290399

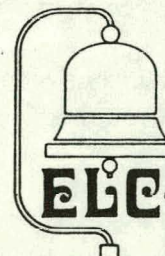
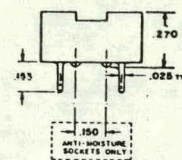
TOLERANCES			REVISONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL	XX - .05	XXX - .0005	NO	DATE	BY	AP8	
ANGULAR	—	DRAFT	1			PART NAME	
			2			PRINTED WIRING BOARD ASSY	
			3			THOMSON	SCALE FULL
			4			11 DEC 76	NOTE 1
			5			TRACED	ESP-A8

NOTES:

1. INTEGRATED CIRCUIT SOCKET
PART NO. =703-3777-01-04-12
NO. OF CONTACTS = 14
TERMINALS = SOLDER TAB
2. SUGGESTED SOURCE(S) OF SUPPLY:
CAMBRIDGE THERMIONIC CORP (CAMBION)
FSCM NO. 71279
OR EQUIV



Solder Tab with Anti-Moisture Bosses
Dimensions



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER		
	NO.	DATE	BY	AP 9		
UNLESS OTHERWISE SPECIFIED DECIMAL	1			PART NAME		
.XX ± 0.0 —	2			I.C. SOCKET		
.XXX ± 0.0 —	3			DRAWN BY	SCALE	MATERIAL
ANGULAR ±	4			THOMSON	NONE	SEE NOTE 1
DRAFT	5			CHK'D	DATE	DRAWING NO.
					DEC 76	ESP-A9
				TRACED	APP'D	

NOTES:

1. INTEGRATED CIRCUIT

PART NO. LM324N

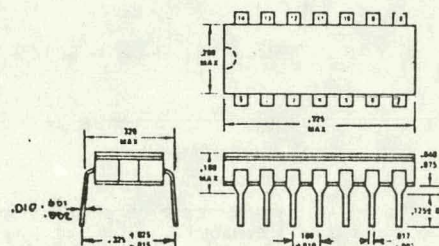
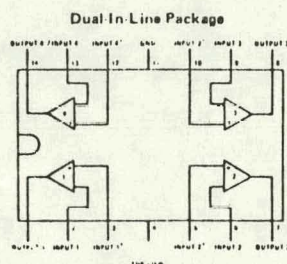
OPERATIONAL AMPLIFIER

2. SUGGESTED SOURCE(S) OF SUPPLY:

NATIONAL SEM-COND CORP

FSCM NO.27014

OR EQUIV



14 LEAD CAVITY DIP



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SANTA BARBARA, CALIF. 93111
964-8676

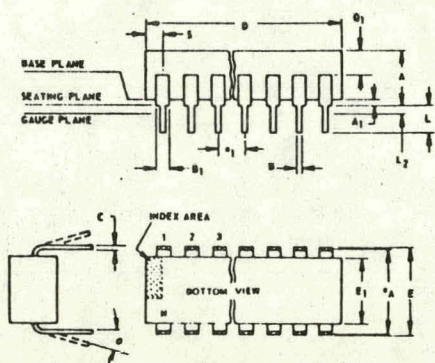
Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 10	
.XX ± 0.0		1			PART NAME	
.XXX ± 0.0		2			I.C. LM324N OPER-AMPL	
ANGULAR ±		3			DRAWN BY	SCALE
DRAFT		4			THOMPSON	NONE
		5			CHK'D	DATE
					TRACED	1 DEC 76
						APP'D
						MATERIAL
						SEE NOTE 1
						DRAWING NO
						ESP-A10

NOTES:

1. DIGITAL INTEGRATED CIRCUIT
PART NO. CD4011 A/E, QUAD 2 INPUT

2. SUGGESTED SOURCE(S) OF SUPPLY:
R.C.A. CORP SOLID STATE DIV
FSCM NO. 18714
OR EQUIV



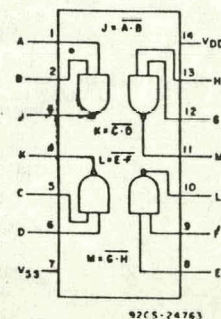
(E), Suffixes
JEDEC MO-001-AB
14-Lead

SYMBOL	INCHES		NOTE
	MIN.	MAX.	
A	0.155	0.200	
A1	0.020	0.050	
B	0.014	0.020	
B1	0.050	0.065	
C	0.008	0.012	1
D	0.745	0.770	
E	0.300	0.325	
E1	0.240	0.260	
*1	0.100 TP		2
*A	0.300 TP		2, 3
L	0.125	0.150	
L2	0.000	0.030	
a	0°	15°	4
N	14		5
N1	0		6
Q1	0.040	0.075	
S	0.065	0.090	

NOTES:

Refer to Rules for Dimensioning (JEDEC Publication No. 13) for Axial Lead Product Outlines.

- When this device is supplied solder dipped, the maximum lead thickness (narrow portion) will not exceed 0.013" (0.33 mm).
- Leads within 0.005" (0.12 mm) radius of True Position (TP) at gauge plane with maximum material condition and unit installed.
- *A applies in zone L2 when unit installed.
- a applies to spread leads prior to installation.
- N is the maximum quantity of lead positions.
- N1 is the quantity of allowable missing leads.



CD4011AE

PLASTIC PACKAGE
(E SUFFIX)



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SANTA BARBARA, CALIF. 93111
964-8676

Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER		
	NO	DATE	BY	AP 11		
UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 — .XXX ± 0.0 — ANGULAR ± DRAFT	1			PART NAME		
	2			IC-CD4011 LOGIC CHIP		
	3			DRAWN BY	SCALE	MATERIAL
	4			THOMSON	NONE	SEE NOTE 1
	5			CHK'D	DATE	DRAWING NO
				TRACED	DEC 76	ESP-A11
					APP'D	

NOTES:

1. TRANSISTOR

PART NO. 2N4401

2. SUGGESTED SOURCE(S) OF SUPPLY:

FAIRCHILD SEMI-COND

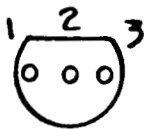
FSCM 07263

OR EQUIV

TABLE I

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

RATING	SYMBOL	VALUE	UNIT
COLLECTOR - EMITTER VOLTAGE	V_{CE0}	40	VDC
COLLECTOR BASE VOLTAGE	V_{CB}	60	VDC
EMITTER BASE VOLTAGE	V_{EB}	60	VDC
COLLECTOR CURRENT-CONTINUOUS	I_C	600	MA DC
TOTAL DEVICE DISSIPATION $T_A = 25^\circ\text{C}$ DERATE ABOVE 25°C	P_D	310 2.81	MW MW/ $^\circ\text{C}$
OPERATING & STORAGE JUNCTION TEMPERATURE RANGE	T_J T_{STG}	-55 TO $+135$	$^\circ\text{C}$



STYLE 1

PIN 1 EMITTER

PIN 2 BASE

PIN 3 COLLECTOR



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
954-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	AP 12
.XX $\pm$ 0.0 —	1			PART NAME
.XXX $\pm$ 0.0 —	2			TRANSISTOR 2N4401.
ANGULAR $\pm$	3			DRAWN BY
DRAFT	4			THOMSON
	5			SCALE NONE
				DATE 1 DEC 76
				DRAWING NO
				ESP-A12
				TRACED
				APP'D

NOTES:

1; TRANSISTOR

PART NO. 2N4403

2. SUGGESTED SOURCE(S) OF SUPPLY:

FAIRCHILD SEMI-COND

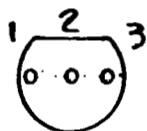
FSCM 07263

OR EQUIV

TABLE I

MAXIMUM RATINGS. ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

RATING	SYMBOL	VALUE	UNIT
COLLECTOR - EMITTER VOLTAGE	V_{CE0}	40	V_{DC}
COLLECTOR - BASE VOLTAGE	V_{CB}	40	V_{DC}
EMITTER - BASE VOLTAGE	V_{EB}	5.0	V_{DC}
COLLECTOR CURRENT - CONTINUOUS	I_C	600	mA_{DC}
TOTAL DEVICE DISSIPATION $T_A=25^\circ\text{C}$ DERATE ABOVE 25°C	P_D	310 2.81	MW $MW/^\circ\text{C}$
OPERATING & STORAGE JUNCTION TEMPERATURE RANGE	T_J, T_{STG}	-55 TO $+135$	$^\circ\text{C}$



STYLE 1

PIN 1 EMITTER

PIN 2 BASE

PIN 3 COLLECTOR



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SANTA BARBARA, CALIF. 93111
854-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	AP 13	
.XX ± 0.0		1		PART NAME	
.XXX ± 0.0		2		TRANSISTOR 2N4403	
ANGULAR ±		3		DRAWN BY	SCALE
DRAFT		4		THOMSON	NONE
		5		CHK'D	DATE
				TRACED	2 DEC 76
					APP'D
					MATERIAL
					SEE NOTE 1
					DRAWING NO
					ESP -A13

NOTES:

1. TRIAC (THYRISTOR)
PART NO. GENERAL ELECTRIC SC137-A
OR
PART NO. MOTOROLA 2N6070A
2. SUGGESTED SOURCE(S) OF SUPPLY:
MOTOROLA INC SEMI-COND PRODUCTS DIV
FSCM NO. 04713

GENERAL ELECTRIC CO. SEMI-CONDUCTOR
FSCM NO. 09214

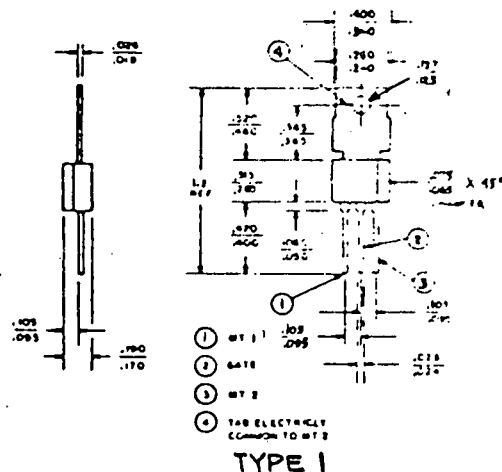
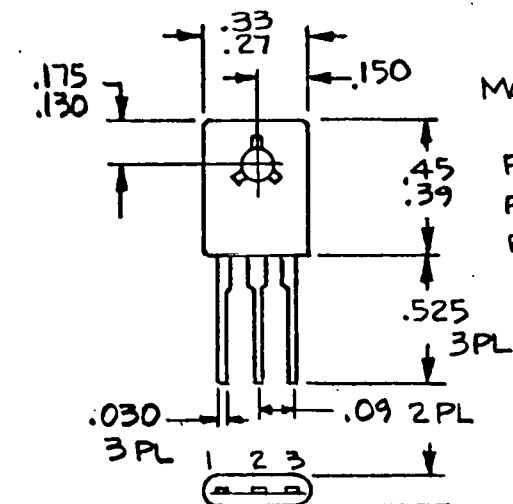


TABLE I

PART NO.	VENDOR PART NO.	
	MOTOROLA	GENERAL ELECTRIC
AP 14	2N6070A	SC137A

TABLE II ELECTRICAL SPECIFICATIONS

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
PEAK ON-STATE SURGE CURRENT ONE FULL CYCLE (NON REP)	ITSM	—	—	30	AMPS
REPETITIVE OFF-STATE VOLTAGE	VDRM	—	—	100	VOLTS
RMS ON-STATE CURRENT 360° CONDUCTION	IT (RMS)	—	—	3	AMPS
PEAK GATE TRIGGER CURRENT	QUADRANT	I	II	III	IV
MAXIMUM VALUE (MA)	ICTM @TJ 25°C	10	10	10	10



MOTOROLA
STYLE 5
PIN 1 MT1
PIN 2 MT2
PIN 3 GATE



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964-8676

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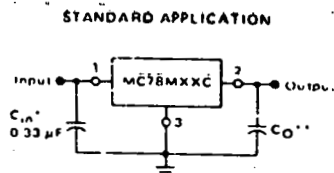
TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 14		
.XX ± 0.0 —		1			PART NAME TRIAC (THYRISTOR)		
.XXX ± 0.0 —		2					
ANGULAR ±		3			DRAWN BY THOMSON		
DRAFT		4			CHK'D DATE 2 DEC 76		
		5			TRACED APP'D		
					MATERIAL SEE NOTE 1		
					DRAWING NO ESP-A14		

HEAT-SINK
CONTACT AREA
(BOTTOM)

CASE 77-02

NOTES:

- VOLTAGE REGULATOR
PART NO. FUA 7812UC
- SUGGESTED SOURCE(S) OF SUPPLY:
FAIRCHILD SEMI-COND
FSCM 07263
OR EQUIV.

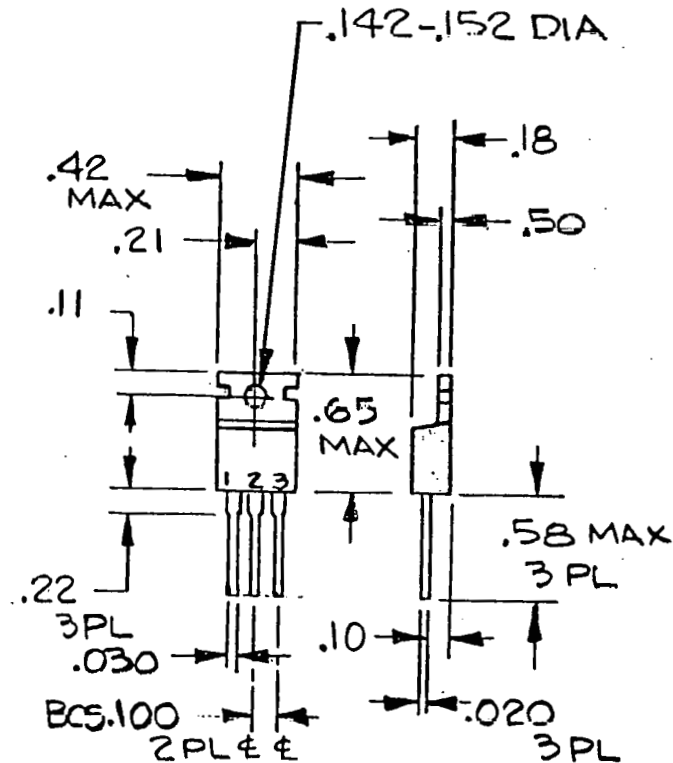


A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

XX - these two digits of the type number indicate voltage.

* C_{in} is required if regulator is located an appreciable distance from power supply filter.

** C_O improves stability and transient response.



HEAT SINK SURFACE CONNECTED TO PIN 3



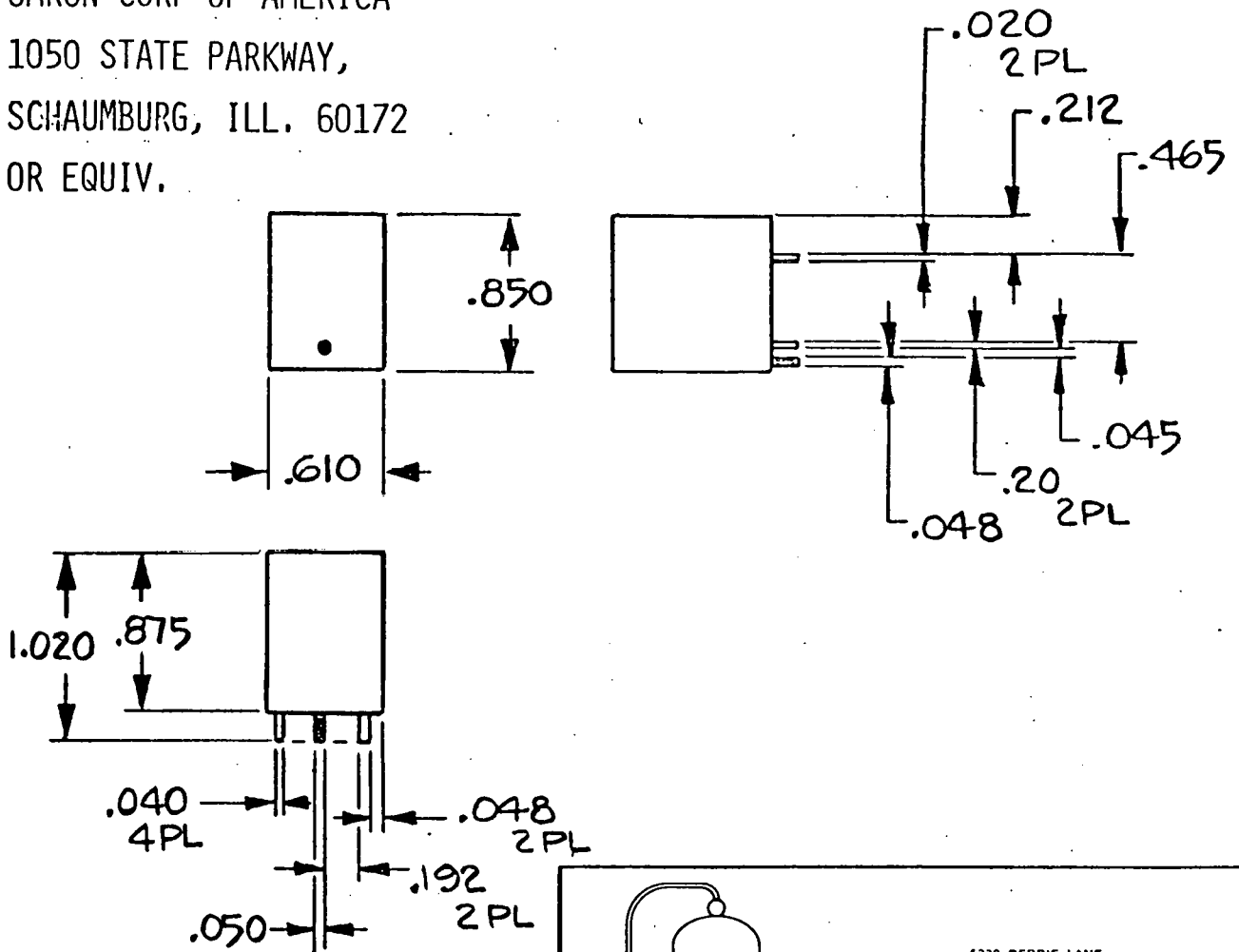
5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8678

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 15		
.XX ± 0.0 -		1			PART NAME		
.XXX ± 0.0 -		2			UA 7812 VOLTAGE REGULATOR		
ANGULAR ±		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
VENDOR'S		5			CHK'D	DATE	DRAWING NO
TOL		6				2 DEC 76	ESP-A15
APPLY		7			TRACED	APP'D	

NOTES:

1. LCIC-UADC12 RELAY
PART NO. LCIC-UADC12
2. SUGGESTED SOURCE(S) OF SUPPLY:
OMRON CORP OF AMERICA
1050 STATE PARKWAY,
SCHAUMBURG, ILL. 60172
OR EQUIV.



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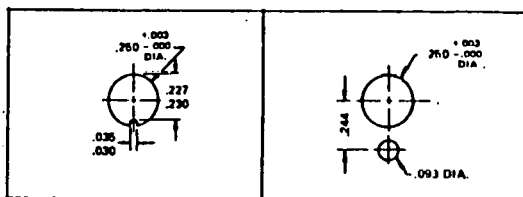
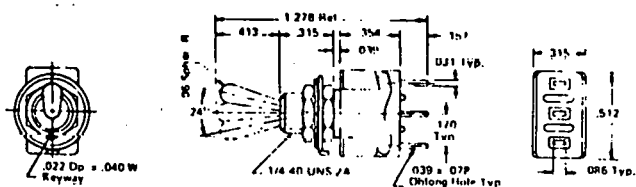
ELCAM, INC.

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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 16		
.XX ± 0.0 —		1			PART NAME		
.XXX ± 0.008		2			LCIC-UADC12 RELAY		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
		5			SCALE FULL		
					DATE 20 NOV 76		
					MATERIAL SEE NOTE 1		
					DRAWING NO		
					ESP-A16		

NOTES:

1. SPST SWITCH
PART NO. MTA-106D
TYPE-SPST , 6AMP@125 VAC
2. SUGGESTED SOURCE(S) OF SUPPLY:
ALCO ELECTRONIC PRODUCTS INC
FSCM NO. 95146
OR EQUIV



RECOMMENDED PANEL CUTOUTS



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ELCAM, INC.

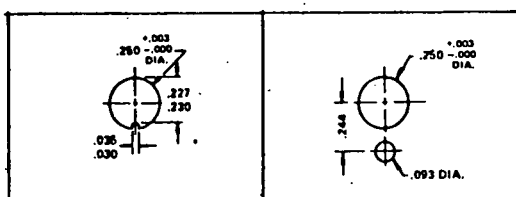
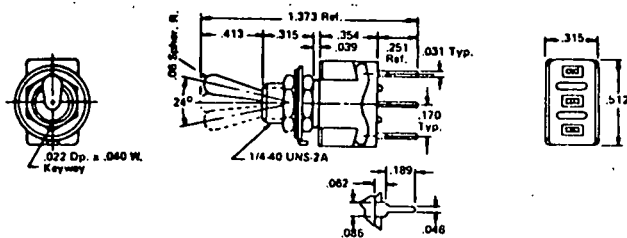
Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 — .XXX ± 0.0 — ANGULAR ± DRAFT	NO	DATE	BY	AP 17		
	1			PART NAME		
	2			SPST SWITCH		
	3			DRAWN BY THOMSON	SCALE NONE	MATERIAL SEE NOTE 1 DRAWING NO ESP-A17
	4			CWD	DATE 30 NOV 76	
5			TRACED	APP'D		

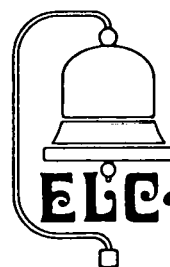
NOTES:

1. SPST SWITCH-CENTER OFF
PART NO.= MTA-106E-PC
TYPE-SPDT, 6 AMP @ 125 VAC
2. SUGGESTED SOURCE(S) OF SUPPLY:
ALCO ELECTRONIC PRODUCTS INC
FSCM NO.95146

OR EQUIV



RECOMMENDED PANEL
CUTOUTS



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SANTA BARBARA, CALIF. 93111
954-8676

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 18		
.XX ± 0.0 —		1			PART NAME		
.XXX ± 0.0 —		2			SPDT SWITCH -CENTER OFF		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
		5			CHK'D		
		6			DATE		
		7			30 NOV 76		
		8			TRACED		
					SCALE NONE		
					MATERIAL SEE NOTE 1		
					DRAWING NO		
					APP'D		
					ESP-A18		

NOTES:

1. DIODE

PART NO. IN4002

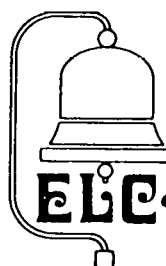
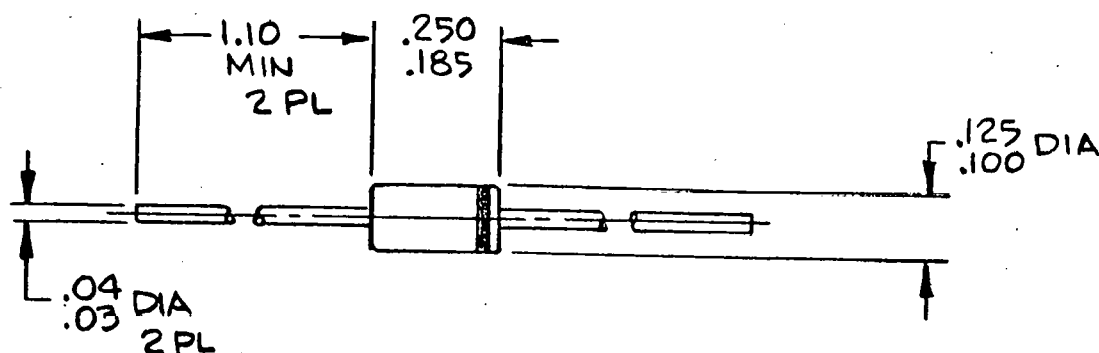
2. SUGGESTED SOURCE(S) OF SUPPLY:

MOTOROLA INC. SEMI-COND PRODUCTS DIV

FSCM NO. 04713

OR EQUIV

3. NON-REPETITIVE PEAK SURGE CURRENT ($I_{FM}[SURGE]$) = 30A (FOR 1 CYCLE) @ 75°C AMB
4. AVERAGE RECTIFIED FORWARD CURRENT (I_o) = 1.0 AMP AT 75°C AMBIENT
5. PEAK REPETITIVE REVERSE VOLTAGE ($V_{RM}[REP]$) = 100VDC
6. MIN. FORWARD VOLTAGE (V_F MIN) = 0.7 V AT 0.1 AMP, 25°C
7. MAX. FORWARD VOLTAGE (V_F MAX) = 1.1 V AT 1.0 AMP, 25°C
8. MAX. REVERSE CURRENT (I_R MAX) = 10 μ A, 25°C AT 100V



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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 19		
.XX ± 0.0		1			PART NAME		
.XXX ± 0.0		2			IN4002 DIODE		
ANGULAR ±		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
		5			CHK'D	DATE	DRAWING NO
		6			TRACED	2 DEC 76	ESP-A19
		7				APP'D	

NOTES:

1. ZENER DIODE

TYPE IN5231B

2. ZENER REGULATOR VOLTAGE (V_Z) = 5.1 VDC $\pm 5\%$

3. TEST CURRENT (I_Z) = 20 mA

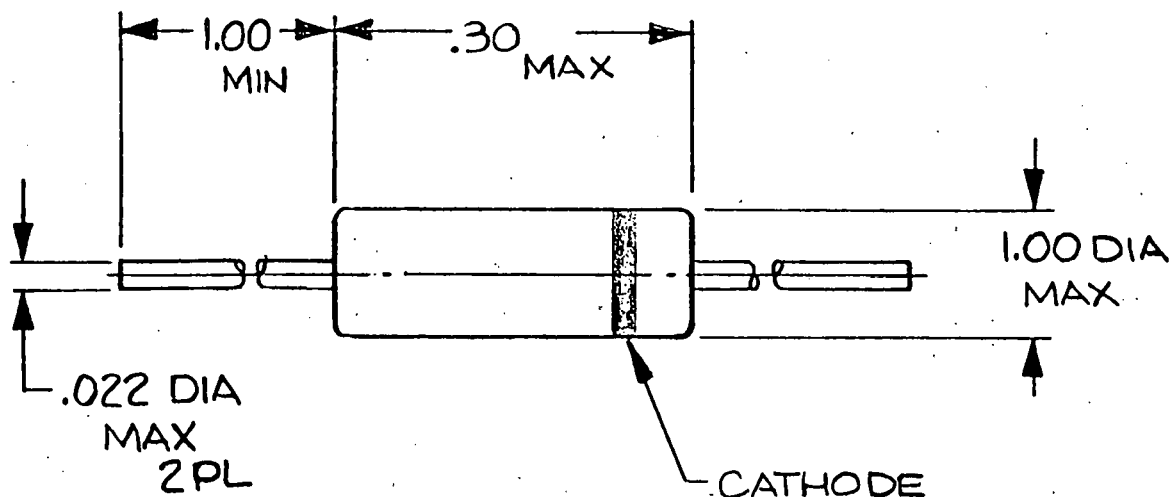
4. MAXIMUM ZENER REGULATOR CURRENT (I_{ZM}) = 200 mA

5. POWER DISSIPATION (P_T) = 500 mW

6. SUGGESTED SOURCE(S) OF SUPPLY:

TEXAS INSTRUMENTS INC

FSCM NO. 01295



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TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 20	
.XX $\pm$ 0.0		1			PART NAME	
.XXX $\pm$ 0.0		2			IN5231B ZENER DIODE	
ANGULAR $\pm$		3			DRAWN BY	SCALE
DRAFT		4			THOMSON	NONE
		5			CHK'D	DATE
					TRACED	3 DEC 76
						APP'D
						MATERIAL
						SEE NOTE 1
						DRAWING NO
						ESP-A20

NOTES:

1. AC-DC LED LAMP
28 VOLTS
COLOR = GREEN
2. SUGGESTED SOURCE(S) OF SUPPLY:
I.D.I. ELECTRIC CANADA LTD
FSCM NO. 51144,
XCITON CORP
FSCM NO. 53184
OR EQUIV

TABLE I

PART NO.	VENDOR PART NO.	
	IDI	XCITON
AP 21	B4304 HI	XC556 OR XC 5053



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TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 21
.XX ± 0.0 -		1	4/15/77	J.C.	PART NAME LED-LAMP
.XXX ± 0.0 -		2			
ANGULAR ±		3			DRAWN BY THOMSON
DRAFT		4			
		5			SCALE NONE
					DATE 3 DEC 76
					MATERIAL SEE NOTE 1
					DRAWING NO
					FSP-A21

NOTES:

1. FUSE

CURRENT RATING = 3AMP, 250V

PART NO. 312003

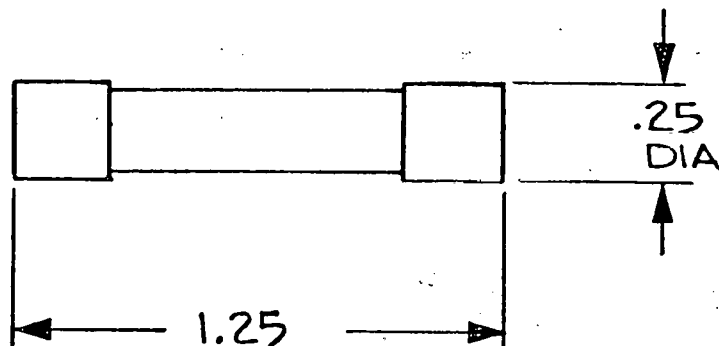
TYPE 3AG

2. SUGGESTED SOURCE(S) OF SUPPLY:

LITTLEFUSE INC

FSCM NO. 75915

OR EQUIV



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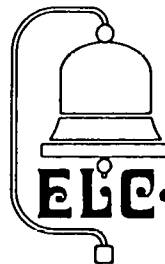
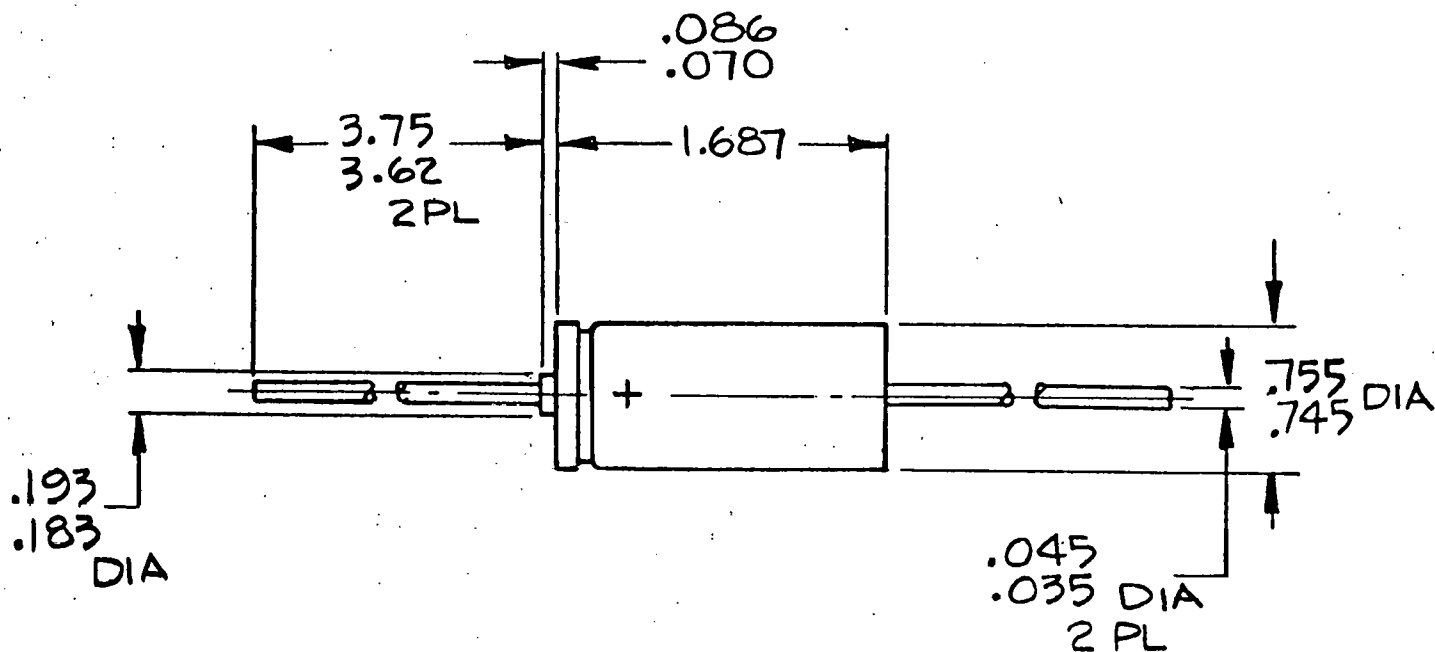
ELCAM, INC.

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TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 23
.XX ± 0.0		1			PART NAME
.XXX ± 0.0		2			FUSE
ANGULAR ±		3			DRAWN BY
DRAFT		4			THOMSON
75		5			CHK'D
		6			TRACED
		SCALE		2/1	MATERIAL
		DATE		3 DEC 76	SEE NOTE 1
		APP'D			DRAWING NO
					ESP-A23

NOTES:

1. CAPACITOR, TANTALUM
PART NO. WBR 1000-25
1000 MF, 25VDC,
2. SUGGESTED SOURCE(S) OF SUPPLY:
CORNING-DUBILIER ELECTRONICS
FSCM NO. 09023
OR EQUIV



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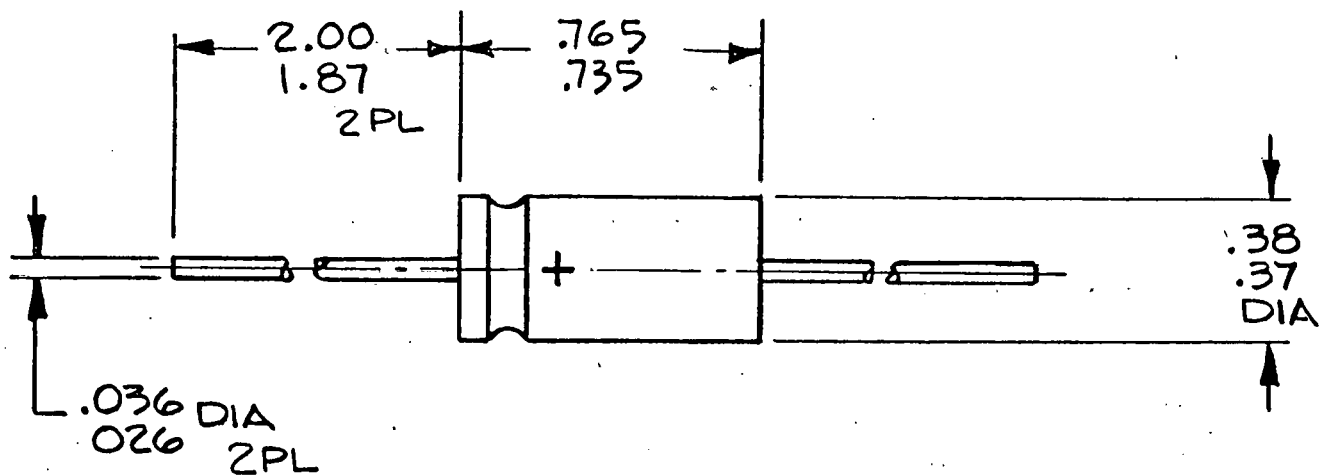
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 24		
.XX ± 0.0		1			PART NAME		
.XXX ± 0.0		2			CAPACITOR, 1000MF		
ANGULAR ±		3			DRAWN BY		SCALE FULL
DRAFT		4			THOMSON		
		5			CHK'D		DATE 3 DEC 76
		6			TRACED		
					APP'D		DRAWING NO
							ESP-A24

NOTES:

1. CAPACITOR, TANTALUM
PART NO. WBR 100-25
100 MF, 25V
2. SUGGESTED SOURCE(S) OF SUPPLY:
CORNING-DUBILIER ELECTRONICS
FSCM NO. 09023
OR EQUIV



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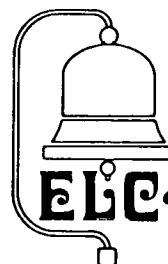
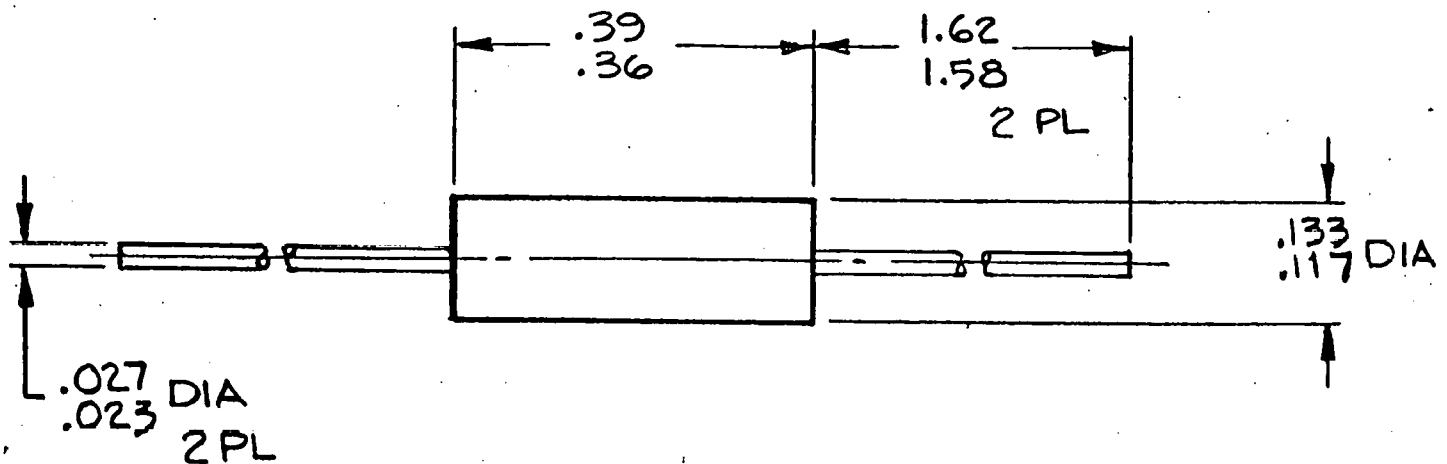
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TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 25	
.XX ± 0.0		1			CAPACITOR, 100 MF	
.XXX ± 0.0		2				
ANGULAR ±		3				
DRAFT		4				
		5				
		DRAWN BY THOMSON			SCALE 2/1	MATERIAL SEE NOTE 1
		CHK'D			DATE 3 DEC 76	DRAWING NO
		TRACED			APP'D	ESP-A25

NOTES:

1. RESISTOR, FIXED
20 K $\pm 1\%$, .25 WATT,
TYPE, CERMET FILM
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



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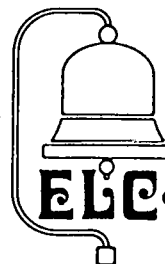
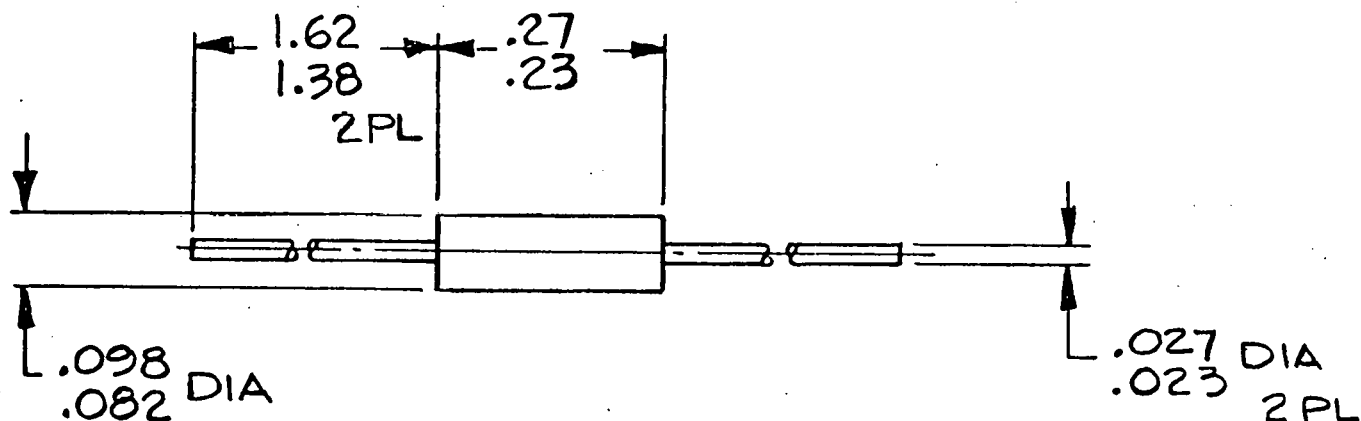
ELCAM, INC.

Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER	
	NO	DATE	BY		
UNLESS OTHERWISE SPECIFIED DECIMAL	1			AP 28	
.XX $\pm$ 0.0 —	2			PART NAME	
.XXX $\pm$ 0.0 —	3			RESISTOR, 20K	
ANGULAR $\pm$	4			DRAWN BY	SCALE
DRAFT	5			THOMSON	—
				CHK'D	DATE
					3 DEC 76
				TRACED	APP'D
					SEE NOTE 1
					DRAWING NO
					ESP-A28

NOTES:

1. RESISTOR, FIXED
75K, $\pm 5\%$, .25 WATT
TYPE, CERMET FILM
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



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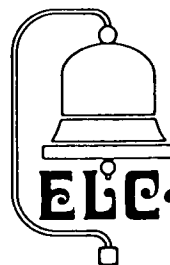
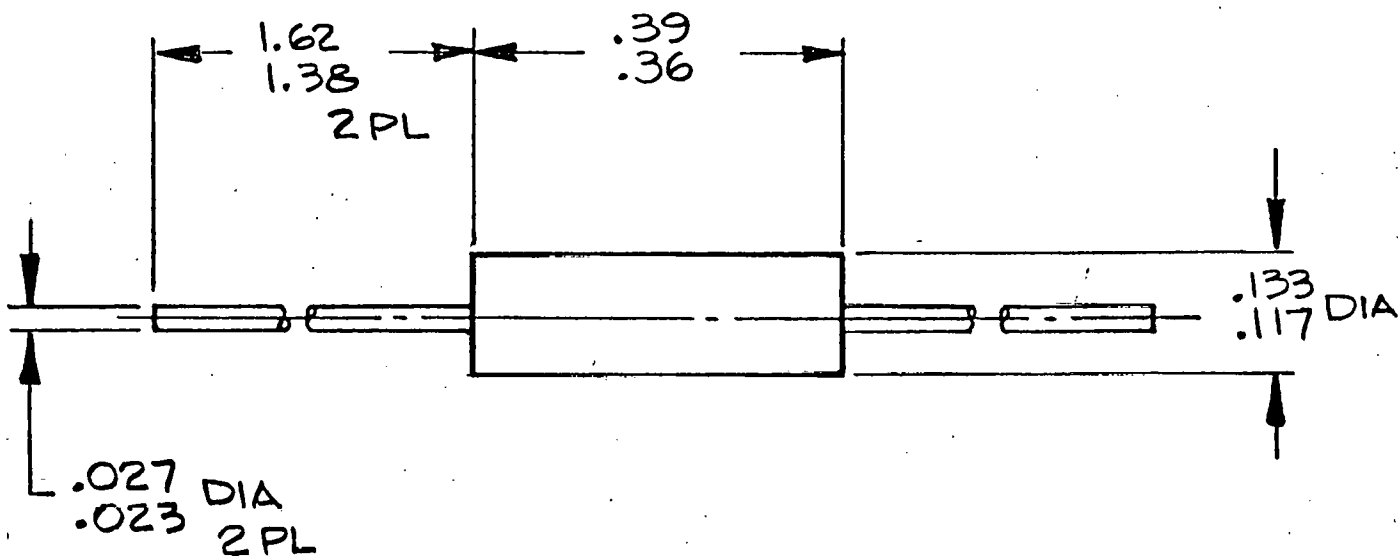
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TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL .XX $\pm$ 0.0 — .XXX $\pm$ 0.0 — ANGULAR $\pm$ DRAFT		REVISIONS		PART NUMBER AP 29	
		NO 1 2 3 4 5	DATE 	BY 	PART NAME RESISTOR, 75K
79		DRAWN BY THOMSON		SCALE NONE	MATERIAL SEE NOTE 1
		CHK'D 	DATE 3 DEC 76	DRAWING NO ESP-A29	
		TRACED 		APP'D 	

NOTES:

1. RESISTOR, FIXED
5.11K, $\pm 1\%$.25 WATT
TYPE, CERMET FILM
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



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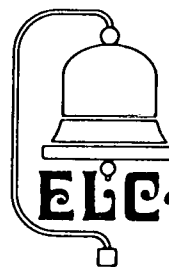
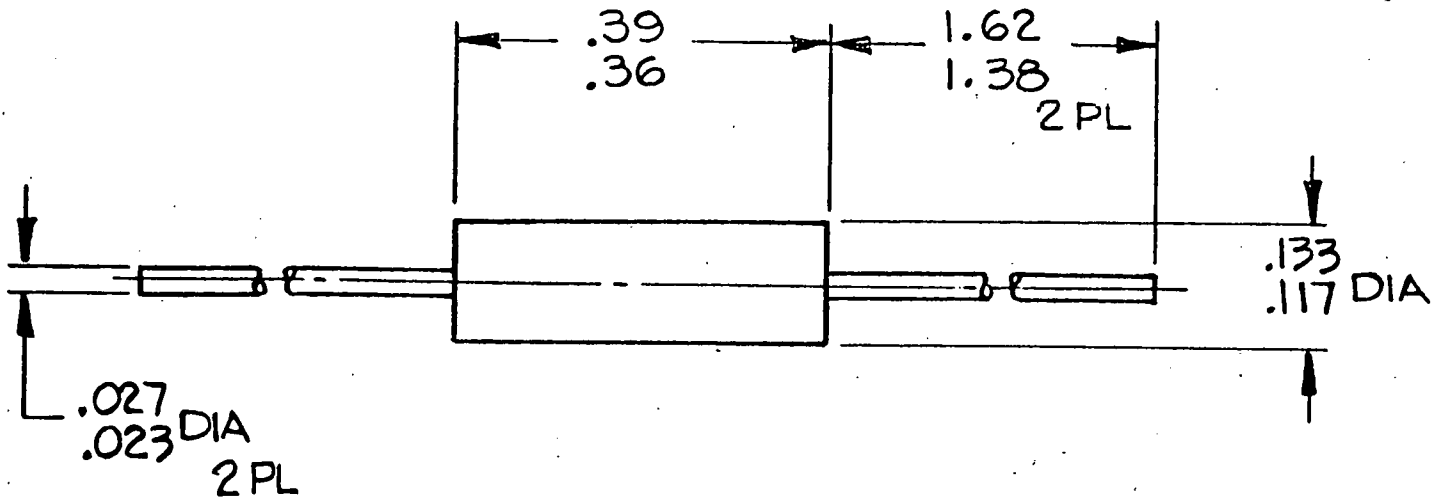
ELCAM, INC.

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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 30		
.XX $\pm$ 0.0 —		1			PART NAME RESISTOR, 5.11K		
.XXX $\pm$ 0.0 —		2					
ANGULAR $\pm$		3			DRAWN BY THOMSON	SCALE NONE	MATERIAL SEE NOTE 1
DRAFT		4			DATE 4 DEC 76	DRAWING NO. ESP-A30	
		5			TRACED	APP D	

NOTES:

1. RESISTOR, FIXED
2K, $\pm 1\%$, .25 WATT
TYPE, CERMET FILM
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



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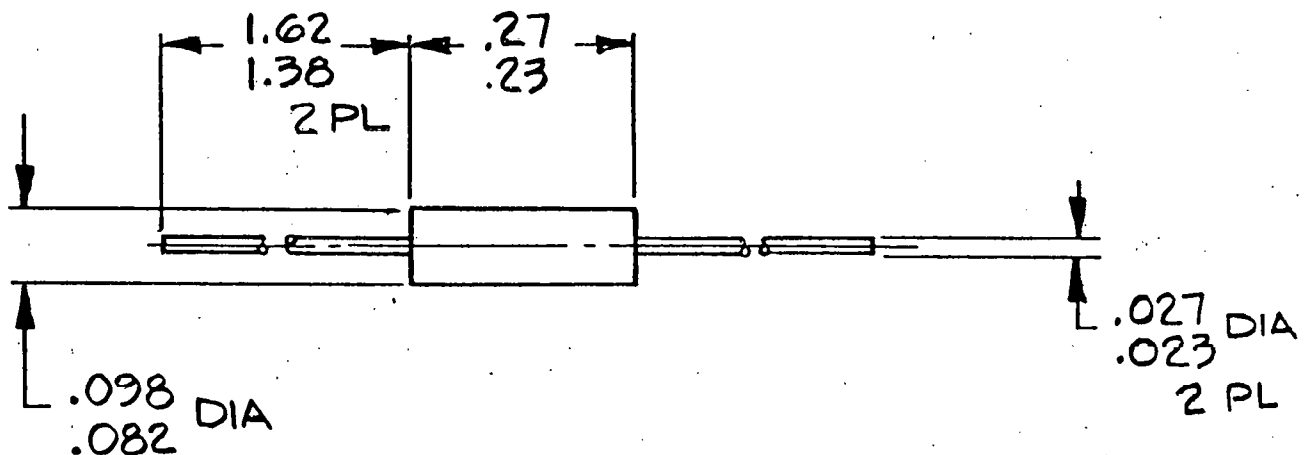
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TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 32	
.XX $\pm$ 0.0		1			PART NAME	
.XXX $\pm$ 0.0		2			RESISTOR, 2K	
ANGULAR $\pm$		3			DRAWN BY	THOMSON
DRAFT		4			SCALE	NONE
		5			DATE	4 DEC 76
					TRACED	APP'D
						MATERIAL
						DRAWING NO
						ESP-32

NOTES:

1. RESISTOR, FIXED
1.0K, $\pm 5\%$, .25 WATT
TYPE, CB
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



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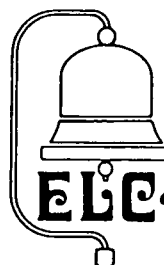
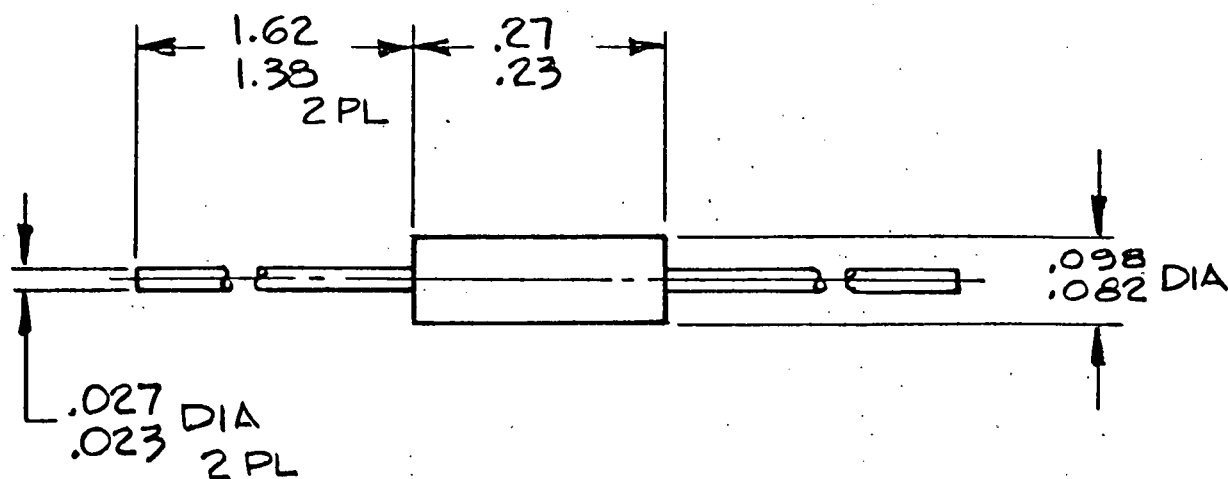
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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 34		
.XX $\pm$ 0.0		1			PART NAME		
.XXX $\pm$ 0.0		2			RESISTOR, 1.0K		
ANGULAR $\pm$		3			DRAWN BY		
DRAFT		4			THOMSON		
		5			SCALE		
					NONE		
					DATE		
					4 DEC 76		
					MATERIAL		
					SEE NOTE 1		
					DRAWING NO		
					ESP-34		

NOTES:

1. RESISTOR, FIXED
10K, $\pm 5\%$, .25 WATT
TYPE, CB
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



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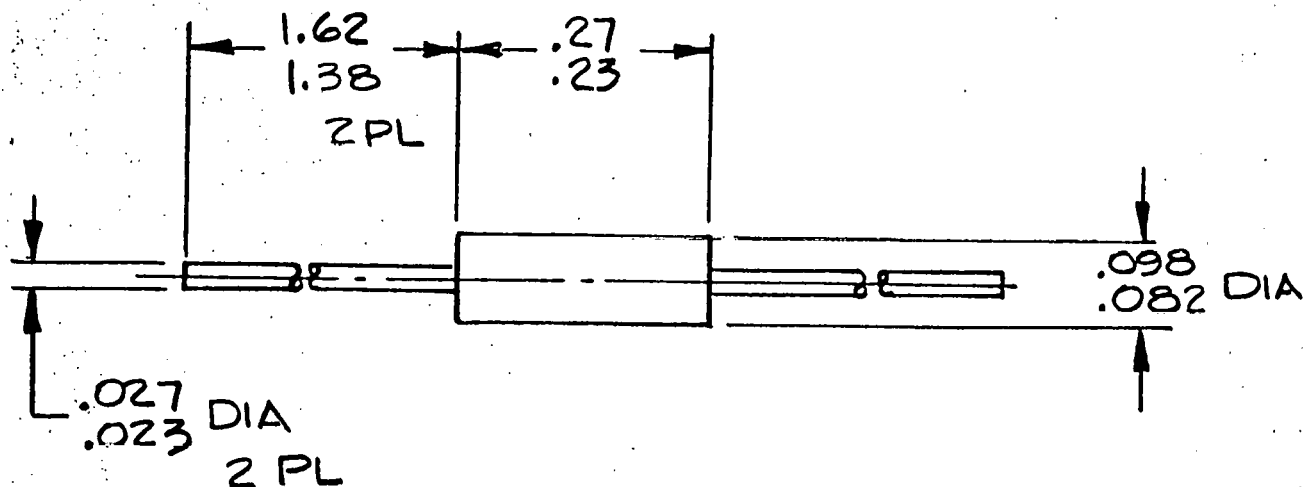
ELCAM, INC.

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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 35		
.XX $\pm$ 0.0		1			PART NAME RESISTOR, 10K		
.XXX $\pm$ 0.0		2					
ANGULAR $\pm$		3			DRAWN BY THOMSON		
DRAFT		4			CHK'D		
		5			DATE 4 DEC 76		
		6			TRACED		
		7			APP'D		

NOTES:

1. RESISTOR, FIXED
390 OHMS, $\pm 10\%$, .25 WATT
TYPE CB
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



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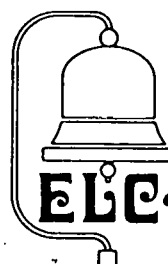
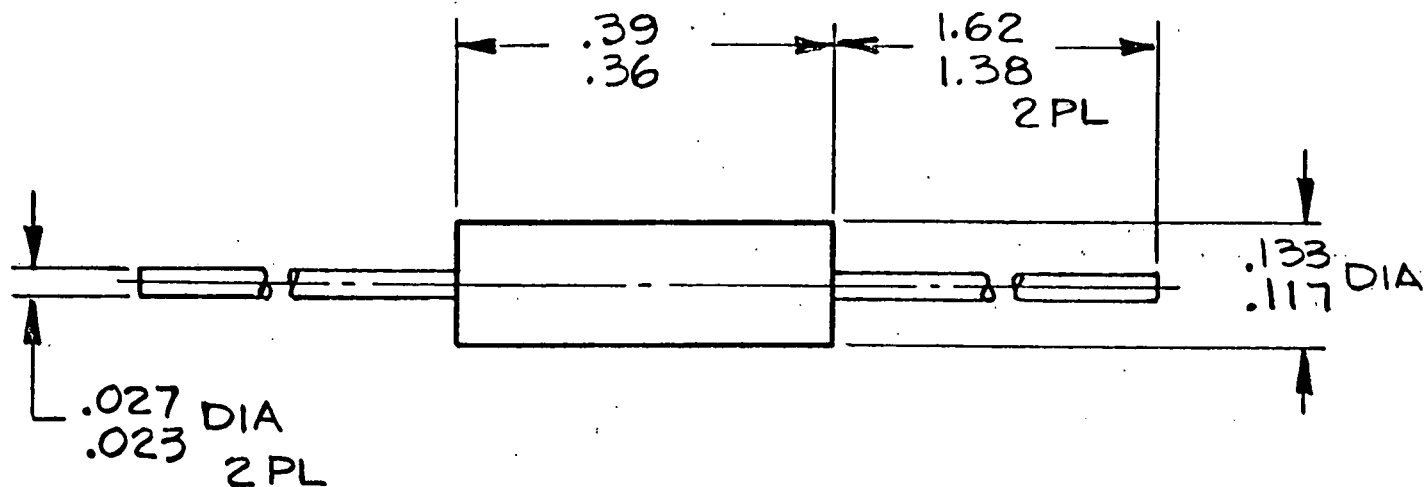
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Contractors License No. 290399

TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL .XX $\pm$ 0.0 .XXX $\pm$ 0.0 ANGULAR $\pm$ DRAFT	REVISIONS			PART NUMBER AP 36	
	NO	DATE	BY	PART NAME RESISTOR, 390 Ω	
	1				
	2				
	3				
	4			DRAWN BY THOMSON	SCALE NONE
	5			CHK'D	DATE 4 DEC 76
	6			TRACED	APP'D
84				MATERIAL SEE NOTE 1	
			DRAWING NO ESP-A36		

NOTES:

1. RESISTOR, FIXED
100K, $\pm 1\%$, .25 WATT
TYPE, CERMET FILM
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



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964-8676

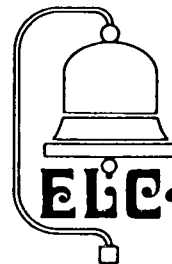
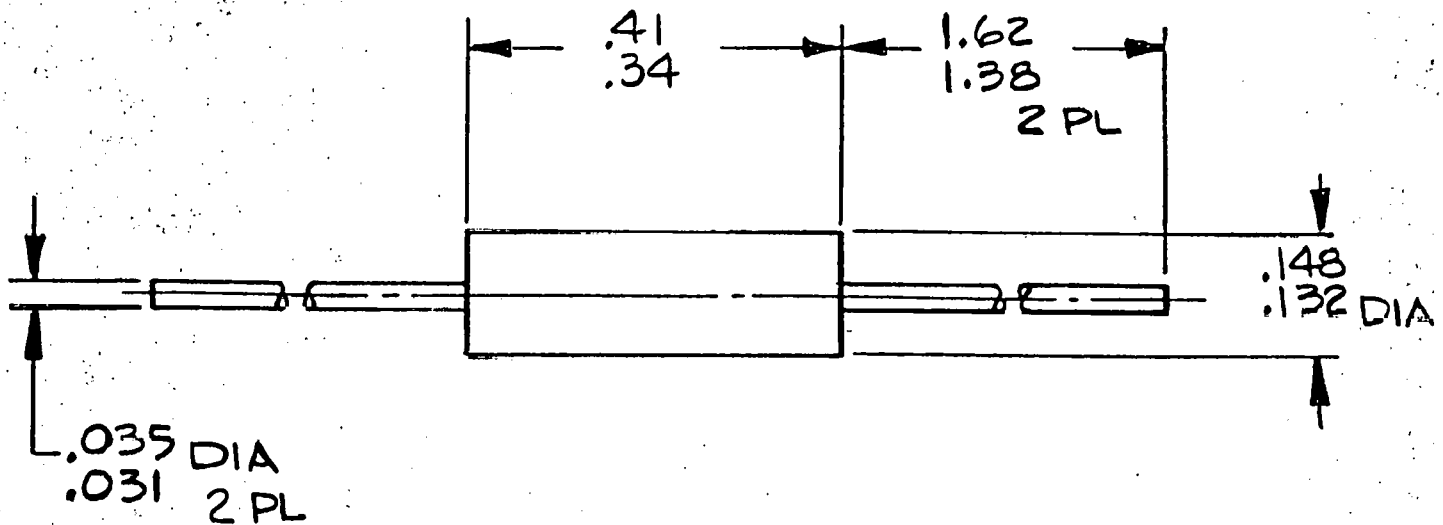
ELECAM, INC.

Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER		
	NO	DATE	BY	AP 37		
UNLESS OTHERWISE SPECIFIED DECIMAL	1			RESISTOR, 100K		
.XX $\pm$ 0.0 —	2					
.XXX $\pm$ 0.0 —	3			DRAWN BY THOMSON		
ANGULAR $\pm$	4			SCALE NONE		
DRAFT	5			DATE 2 DEC 76		
				MATERIAL SEE NOTE 1		
				DRAWING NO ESP-A37		
				TRACED		

NOTES:

1. RESISTOR, FIXED
2.2K, $\pm 5\%$, .50 WATT
TYPE, EB
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

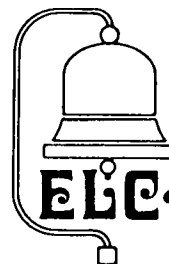
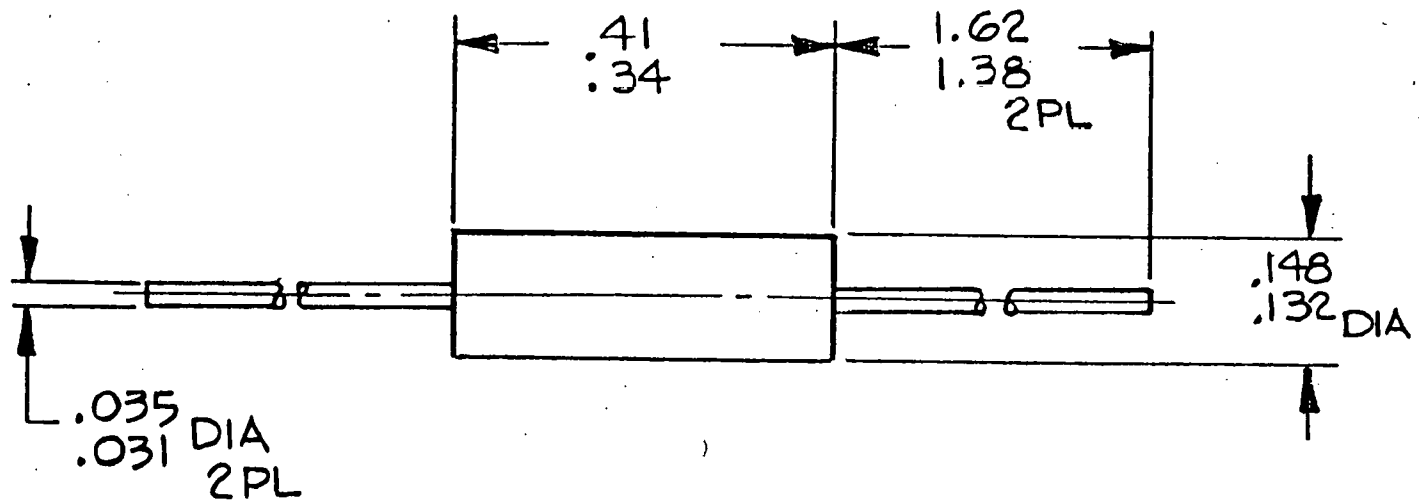
Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 38		
.XX $\pm$ 0.0		1			PART NAME		
.XXX $\pm$ 0.0		2			RESISTOR, 2.2K		
ANGULAR $\pm$		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
		5			CHK'D	4 DEC 76	DRAWING NO
					TRACED	APP'D	ESP-A38

NOTES:

1. RESISTOR, FIXED
680 OHMS, $\pm 10\%$, .50 WATT
TYPE, EB
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121

OR EQUIV



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

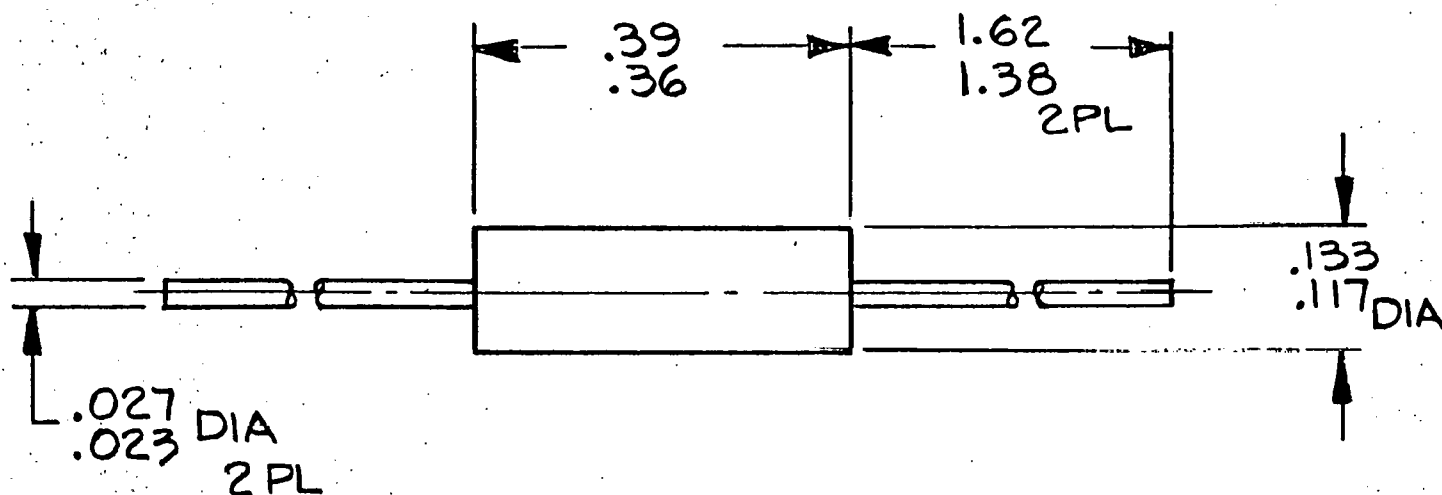
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 39		
.XX $\pm$ 0.0 —		1			PART NAME		
.XXX $\pm$ 0.0 —		2			RESISTOR, 680 Ω		
ANGULAR $\pm$		3			DRAWN BY	THOMSON	SCALE NONE
DRAFT		4			CHE'D	DATE 4 DEC 76	MATERIAL SEE NOTE 1
		5			TRACED	APP'D	DRAWING NO
							ESP-A39

NOTES:

1. RESISTOR, FIXED
4.75K, $\pm 1\%$, .25 WATT
TYPE, CERMET FILM
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8876

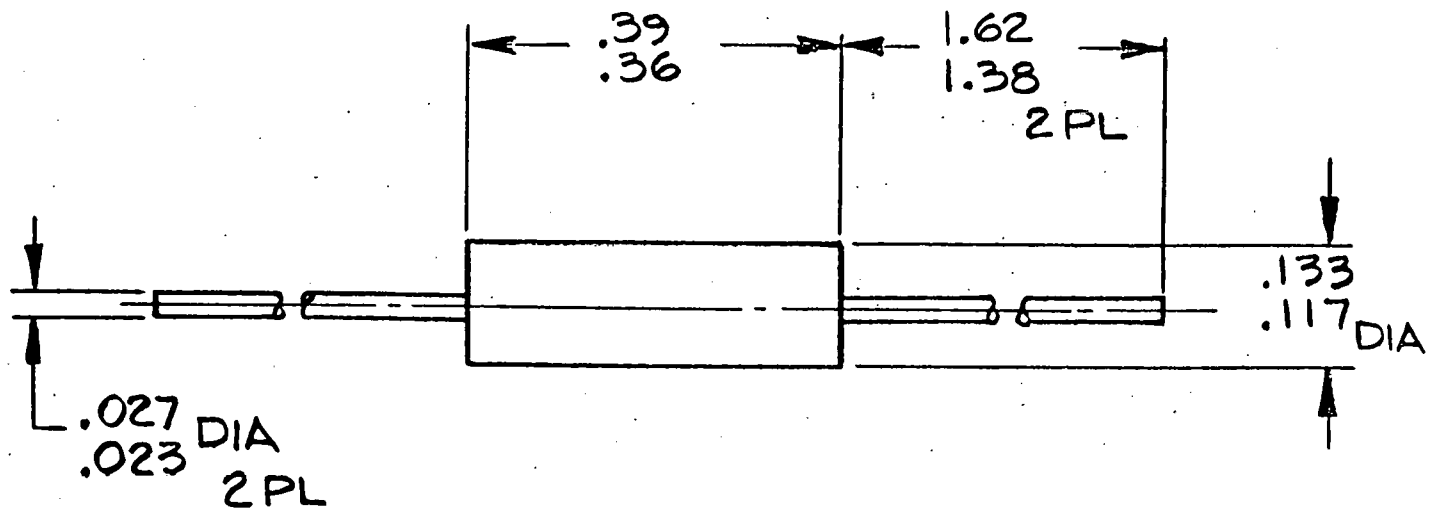
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 41		
.XX $\pm$ 0.0 —		1			PART NAME		
.XXX $\pm$ 0.0 —		2			RESISTOR, 4.75K		
ANGULAR $\pm$		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
		5			CHK'D	DATE	DRAWING NO
		6			TRACED	4 DEC 76	ESP-A41
						APP'D	

NOTES:

1. RESISTOR, FIXED
4.64K, $\pm 1\%$, .25 WATT
TYPE, CERMET FILM
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
984-8676

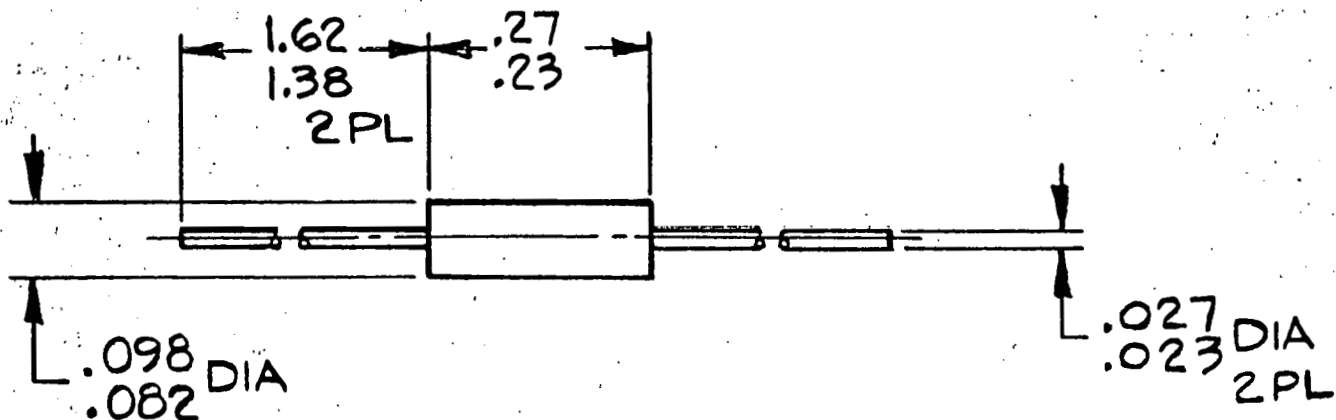
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 42		
.XX $\pm$ 0.0		1	1/1/77	GC	PART NAME		
.XXX $\pm$ 0.0		2			RESISTOR, 4.64K		
ANGULAR $\pm$		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
		5			CHK'D	DATE	DRAWING NO
		6				4 DEC 76	
					TRACED	APP'D	
							ESP-A42

NOTES:

1. RESISTOR, FIXED
160K, $\pm 5\%$.25 WATT.
2. CONTINUOUS AMBIENT TEMP
70°C WITHOUT POWER DERATING
3. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO.
FSCM NO. 01121
OR EQUIV



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
864-8876

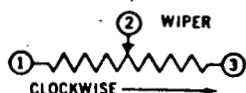
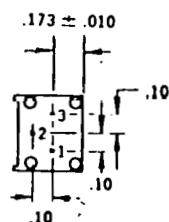
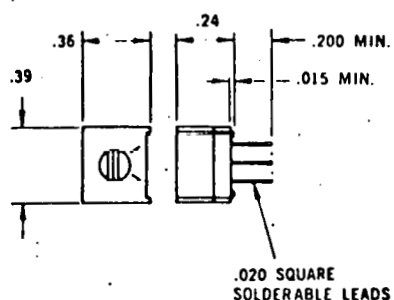
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 44
.XX $\pm$ 0.0		1			PART NAME
.XXX $\pm$ 0.0		2			RESISTOR, 160K
ANGULAR $\pm$		3			DRAWN BY
DRAFT		4			THOMSON
		5			SCALE
					NONE
					DATE
					4 DEC 76
					DRAWING NO
					ESP-A44

NOTES:

1. POTENTIOMETER
TOP ADJUST
10K, $\pm 20\%$, .25 WATT
PART NO. 3389P-1-103
2. SUGGESTED SOURCE(S) OF SUPPLY:
BOURNS INC. TRIMPOT
FSCM NO. 32997
OR EQUIV



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SANTA BARBARA, CALIF. 93111
964-8676

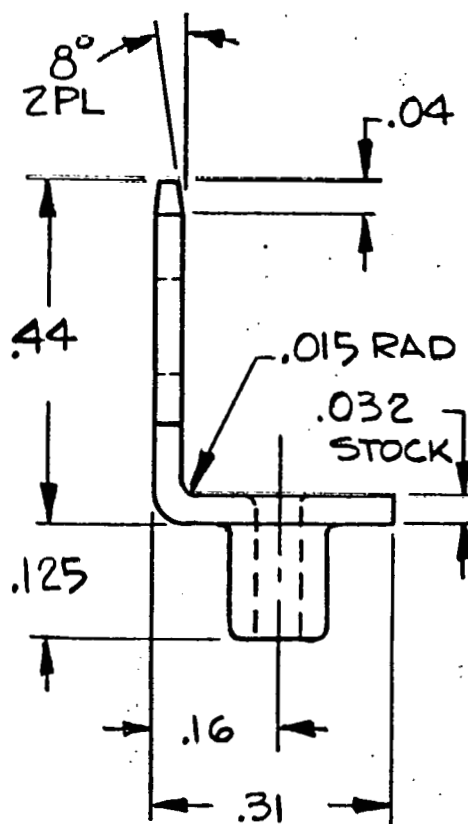
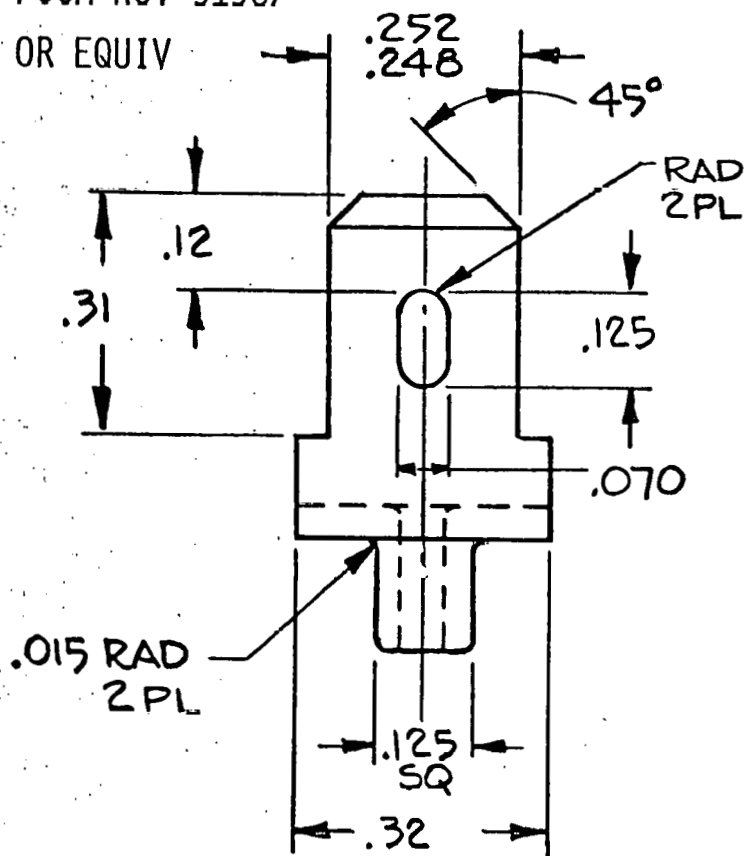
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 45		
.XX $\pm$ 0.01		1			PART NAME		
.XXX $\pm$ 0.005		2			POTENTIOMETER		
ANGULAR $\pm$		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
		5			CHK'D	DATE	DRAWING NO
					TRACED	4 DEC 76	ESP-A45
						APP'D	

NOTES:

1. TERMINAL, SQUARE BARREL
BRASS, TIN PLATED
PART NO. 4484
2. SUGGESTED SOURCE(S) OF SUPPLY:
NATIONAL TEL-TRONICS DIV,
EASTERN AIR DEVICES INC
FSCM NO. 91967
OR EQUIV



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SANTA BARBARA, CALIF. 93111
984-8676

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Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 46		
.XX ± 0.01		1			PART NAME		
.XXX ± 0.005		2			TERMINAL, SQUARE BARREL		
ANGULAR ± 0°30'		3			THOMSON	SCALE 4/1	MATERIAL SEE NOTE 1
DRAFT		4			CHK'D	DATE 4 DEC 76	DRAWING NO
		5			TRACED	APP'D	ESP-A46

NOTES:

1. MATERIAL

STEEL, ZINC CHROMATE
FINISH. CADMIUM OPTIONAL

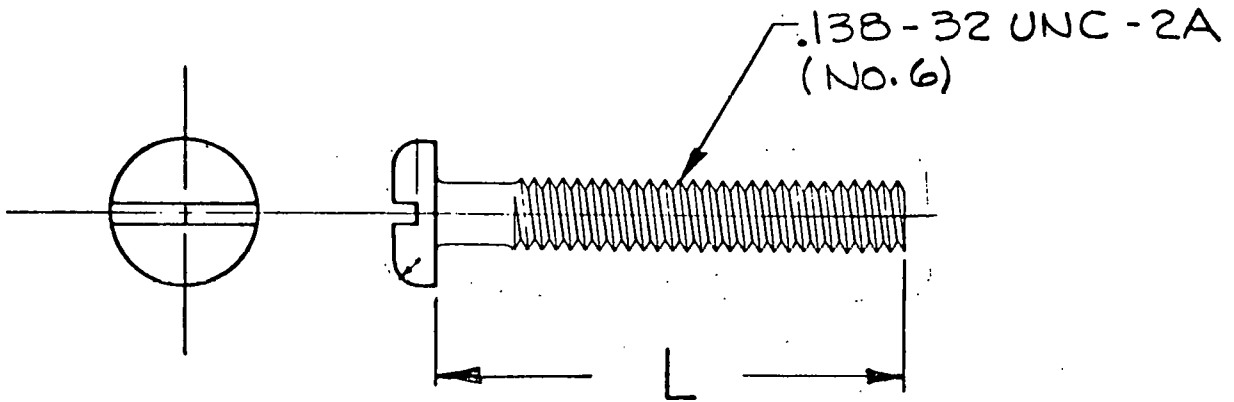
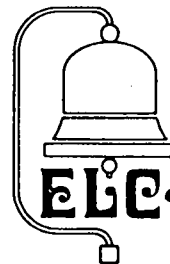


TABLE I

PART NO.	L
AP48-001	.25
AP48-002	.32
AP48-003	.38
AP48-004	.44



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

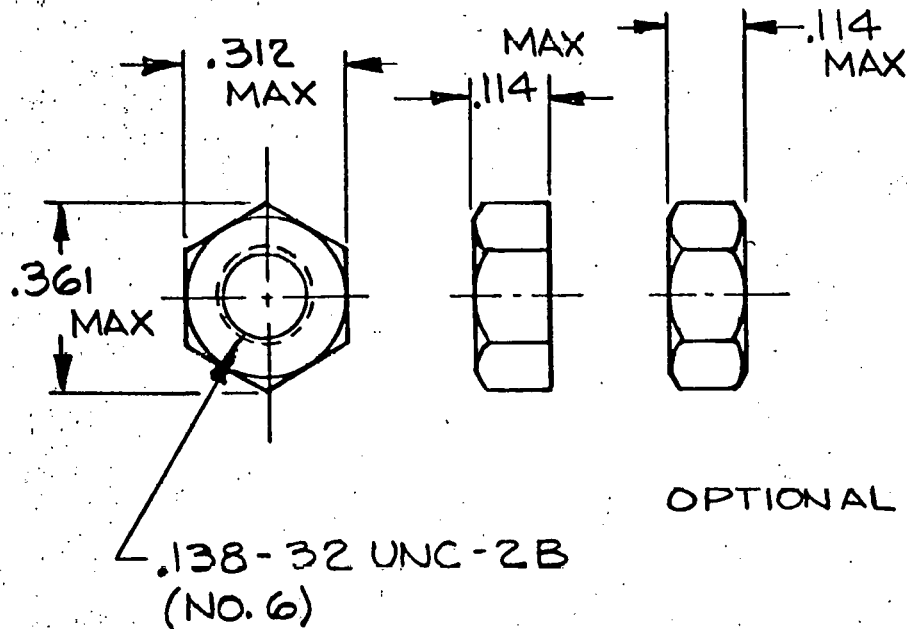
Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP48		
.XX ± 0.0 —		1			PART NAME		
.XXX ± 0.0 —		2			SCREW, PAN HD		
ANGULAR ±		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
		5			CHK'D	DATE	DRAWING NO
		6			TRACED	4 DEC 76	ESP-48
					APP'D		

NOTES:

1. MATERIAL:

STEEL, ZINC CHROMATE
PLATED. CADMIUM OPTIONAL



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SANTA BARBARA, CALIF. 93111
954-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP51		
.XX ± 0.0 -		1			PART NAME		
.XXX ± 0.0 -		2			NUT, HEX		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
		5			SCALE		
					NONE		
					DATE		
					5 DEC 76		
					MATERIAL		
					SEE NOTE 1		
					DRAWING NO		
					ESP-A51		

NOTES:

1. LM3911 TEMPERATURE
CONTROLLER IC
SINGLE MONOLITHIC CHIP
OPER TEMP RANGE - 25°C-+85°C
2. SUGGESTED SOURCE(S) OF SUPPLY:
NATIONAL SEMICOND CORP
FSCM NO.27014
OR EQUIV.



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

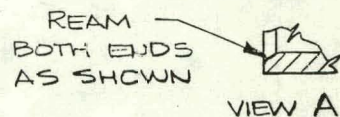
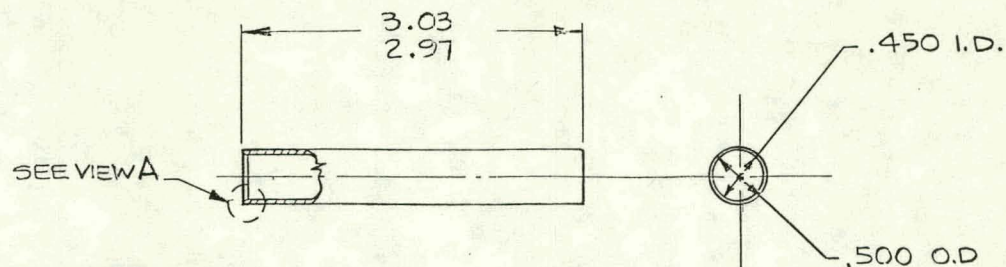
ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 52	
.XX ± 0.0 =		1			PART NAME	
.XXX ± 0.0 =		2			LM3911 TEMP CONT IC	
ANGULAR ±		3			DRAWN BY THOMSON	
DRAFT		4			SCALE NOTE	
95		5			DATE 30 NOV 76	
					MATERIAL SEE NOTE 1	
					DRAWING NO ESP-A52	
					TRACED APP'D	

NOTES:

1. COMPOUND MUST BE FLUSH TO .01 BELOW SHELL SURFACE.
2. ASSEMBLE COMPONENTS PER ENGINEERING SPEC.

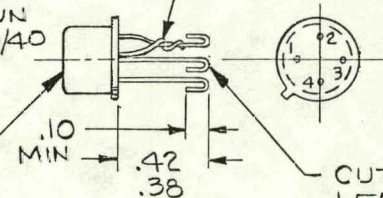


MATERIAL:
COPPER TUBE .50 DIA
TYPE M

CARTRIDGE SHELL AP53-001
SCALE: FULL

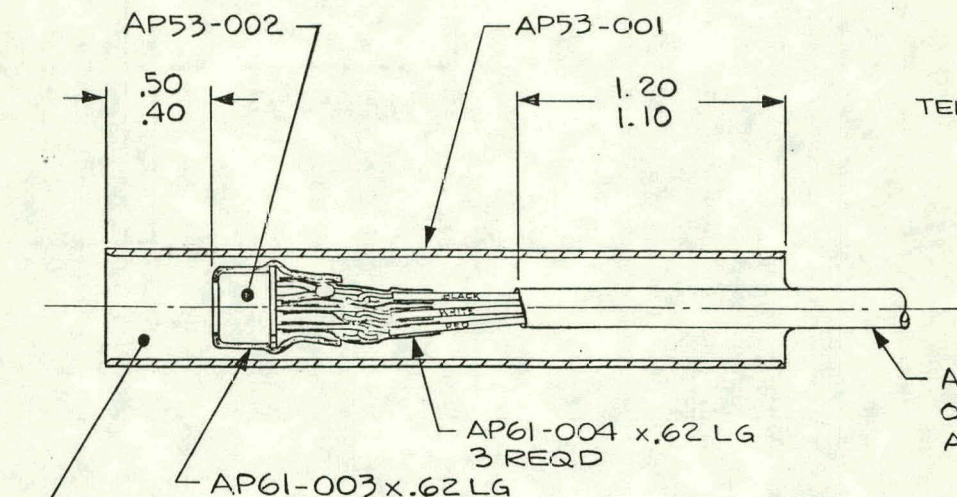
TIE PIN 1 & 2
TOGETHER
AS SHOWN
USING 60/40
SOLDER

AP-52
TEMP CONT I.C.

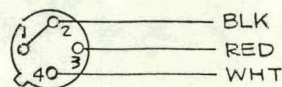


CUT AND LOOP
LEADS AS SHOWN

MODIFIED LM3911 TEMP CONT I.C.
AP53-002
SCALE: 2/1



AP62 CABLE FOR REF
ONLY - SEE ASSY
AP57



AP63 CASTING COMPOUND
RIGID MIX:
100 PARTS 2741LV
50 PARTS 15LV

SENSOR CARTRIDGE

 ELECAM, INC. 5330 DEBBIE LANE SANTA BARBARA, CALIF. 93111 PHONE 964-8893		PART NUMBER		AP53	
		PART NAME		SUB-SENSOR CARTRIDGE ASSY	
DESIGNED BY		SCALE		2/1	
CHECKED		DATE		DRAWING NO.	
TRACED		APP'D		ESP-A53	

TOLERANCES	REV	SIGNS	NO	DATE	BY
UNLESS OTHERWISE SPECIFIED DECIMAL	1				
XX ± 0.0	2				
XXX ± 0.0	3				
ANGULAR ±	4				
DRAFT	5				

NOTES:

1. RESISTOR, FIXED
.25 WATT, $\pm 10\%$
TYPE, CB
2. AT ASSEMBLY - SELECT ONE FROM THE
FOLLOWING VALUES IN TABLE I.
3. CALIBRATE SENSOR ASSEMBLY PER
ENGINEERING SPEC.
4. SUGGESTED SOURCE(S) OF SUPPLY:
ALLEN BRADLEY CO,
FSCM NO. 01121
OR EQUIV

TABLE I
(SEE NOTE 2)

PART NO.	VALUE IN OHMS
AP 54 - 001	2.7
AP 54 - 002	3.0
AP 54 - 003	3.3
AP 54 - 004	3.9
AP 54 - 005	4.7
AP 54 - 006	5.1
AP 54 - 007	5.6
AP 54 - 008	6.8
AP 54 - 009	8.2
AP 54 - 010	9.1
AP 54 - 011	10
AP 54 - 012	15
AP 54 - 013	20

TABLE I CONTINUED

PART NO.	VALUE IN OHMS
AP 54 - 014	22
AP 54 - 015	27
AP 54 - 016	30
AP 54 - 017	33
AP 54 - 018	39
AP 54 - 019	47
AP 54 - 020	51
AP 54 - 021	56
AP 54 - 022	68
AP 54 - 023	75
AP 54 - 024	82
AP 54 - 025	100
AP 54 - 026	110
AP 54 - 027	120
AP 54 - 028	150



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 54
.XX $\pm$ 0.0		1			PART NAME
.XXX $\pm$ 0.0		2			RESISTOR, CALIBRATION
ANGULAR $\pm$		3			DRAWN BY
DRAFT		4			THOMSON
		5			CHK'D
					TRACED
					SCALE
					NONE
					MATERIAL
					SEE NOTE 1
					DRAWING NO
					5 DEC 76
					APP'D
					ESP-A54

NOTES:

1. STRIP ENDS OF LEADS .25-.30
AND SOLDER TO TERMINALS
USING 60-40 SOLDER.

2. AFTER ASSEMBLE CHECK
CABLE PER ENGINEERING
SPEC.

SERIALIZE
SEE TABLE I

CREPE PAPER TAPE
.50 WIDE, MIN 2 WRAPS

SENSOR CARTRIDGE
AP53

3 CONDUCTOR
CABLE
AP62

FEMALE TERMINAL
FLAG TYPE
AP58-001
4 REQD

SEE VIEW A

WIRE 22 AWG
PVC INSUL, COLOR
YELLOW

TABLE II

COLOR	LENGTH BEYOND SLV
WHT	1.8-1.9
BLK	1.8-1.9
RED	1.3-1.4

GROMMET
CP10-002

SLEEVE,
HEAT SHRINKABLE
AP61-001

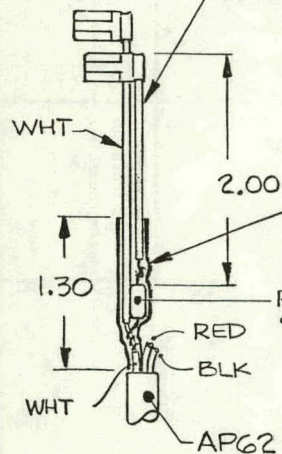
SLEEVE
AP61-004

RESISTOR
SEE TABLE I

RED

BLK

AP62



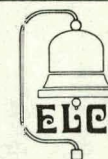
VIEW A

TABLE I

PART NO.	CABLE LENGTH	MARK IDENT LABEL	REMARKS
AP57-001	120"-124"	DAY-MONTH-YEAR 12:211176-SXX	SELECT TRIM RES AP54 TO CALIBRATE PER ENGR SPEC

CABLE
LENGTH

TO END OF
SENSOR



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954-8853

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL XX ± .006 XXX ± .005 ANGULAR ± .005 DRAFT		NO.	DATE BY	AP57
		1		PART NAME
		2		SENSOR CABLE ASSY
		3		DESIGNED BY THOMPSON
		4		SCALE FULL SEE F/D
		5		CHK D 92 NOV 78
		6		APP D DRAWING NO.
		7		TRACED ESP A57

NOTES:

1. MATERIAL:

FLAG TERMINAL

FEMALE QUICK SLIDE

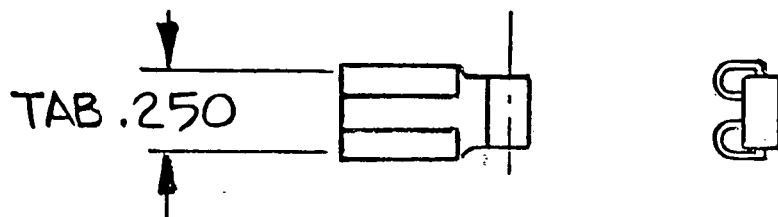
NON-INSULATED

PART NO. SEE TABLE I

2. VENDOR(S):

MINNESOTA MINING & MFG CO. (3M)

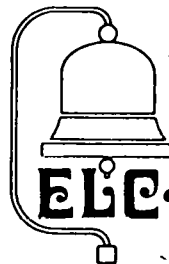
FSCM 75037



TAB THICKNESS .030-.032

TABLE I

PART NO.	WIRE RANGE	3M CAT NO.		
AP58-001	22-18	B32-001		



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SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP58		
.XX ± 0.0 —		1			PART NAME		
.XXX ± 0.0 —		2			FLAG TERMINAL		
ANGULAR ±		3			DRAWN BY	SCALE	MATERIAL
DRAFT		4			THOMSON	NONE	SEE NOTE 1
VENDOR'S		5			CHK D	23 NOV 76	DRAWING NO
TOL APPLY					TRACED	APP D	ESP-A58

NOTES:

1. MATERIAL:

STEEL, CARBON

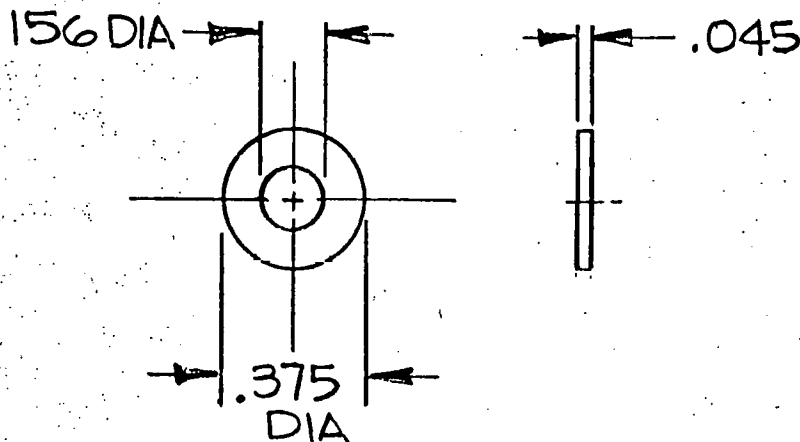
2. PROTECTIVE FINISH:

ZINC PLATE

.0002 MIN THICKNESS

CLEAR CHROMATE

SPEC QQ-Z-325



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
954-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP60		
.XX ± 0.0 —		1			PART NAME WASHER, FLAT		
.XXX ± 0.0 —		2					
ANGULAR ±		3			DRAWN BY THOMSON	SCALE	MATERIAL SEE NOTE 1
DRAFT		4			CHECKED	DATE 6 DEC 76	DRAWING NO
VENDOR'S		5			TRACED	APP'D	ESP-A60
TOL APPLY							

NOTES:

1. MATERIAL:

INSULATION, HEAT-SHRINKABLE
POLYVINYL CHLORIDE (PVC)

COLOR, SEE TABLE I

SIZE, SEE TABLE I

2. VENDOR:

PORT PLASTICS INC.

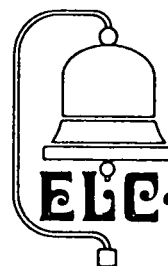
8037 E. SLAUSON AVE

MONTEBELLO, CA. 90640

TABLE I

PART NO.	VENDOR NO.	I D.	WALL	COLOR
AP61-001	FP 301-.093	.093	.020	CLEAR
AP61-002	FP 301-.187	.188	.025	CLEAR
AP61-003	FP 301-.375	.375	.030	CLEAR
AP61-004	FP 301-.093	.093	.020	BLACK
AP61-005	FP 301 -		.	

NOTE: RECOVERY I.D.
AFTER SHRINKAGE
IS APPROX $\frac{1}{2}$ OF I.D.
GIVEN.



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8678

ELCAM, INC.

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TOLERANCES	REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	AP61		
.XX ± 0.0 —	1			PART NAME		
.XXX ± 0.0 —	2			INSULATION, SHRINKABLE		
ANGULAR ±	3			DRAWN BY	SCALE	MATERIAL
DRAFT	4			THOMSON	NONE	SEE NOTE 1
VENDOR'S	5			CHK'D	DATE	DRAWING NO
TOL APPLY				TRACED	27 NOV 76	ESP-A61
					APP'D	

NOTES:

1. MATERIAL:

CABLE, UNSHIELDED MULTI-CONDUCTOR.
THREE CONDCT: WHT, BLK, & RED - PVC INSULATION.
22 AWG, STRANDED 7/30 NOM OD .145 OVER JKT.
JACKET INSULATION - GRAY VINYL.

2. VENDOR(S):

STANDARD WIRE & CABLE
FSCM NO. 04946

ALPHA WIRE
FSCM NO. 92194



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
954-8676

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Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	PART NAME	
.XX ± 0.0	-	1			AP62	
.XXX ± 0.0	-	2			CABLE	
ANGULAR ±		3			DRAWN BY THOMSON	
DRAFT		4			SCALE NONE	
VENDOR'S		5			DATE 27 NOV 76	
TOL					DRAWING NO	
APPLY					ESP-A62	
					TRACED	
					APP'D	

NOTES:

1. MATERIAL:

- A. STYCAST 2741LV IS AN EPOXIDE CASTING RESIN AND SEALING COMPOUND OF CONTROLLED FLEXIBILITY, IT IS USED FOR ELECTRONIC EMBEDMENT AND IN SEALING OR CEMENTING OF METALS, CERAMICS AND PLASTICS. STYCAST 2741LV IS SUPPLIED AS A FREE FLOWING LIQUID. IT IS USED IN CONJUNCTION WITH CATALYST 15, ALSO A LIQUID. COLOR IS BLACK.

STYCAST 2741LV CAN BE CURED AT ROOM TEMPERATURE, OR AT ELEVATED TEMPERATURE IN A SHORT PERIOD OF TIME. POT LIFE OF THE CATALYZED RESIN IS AT LEAST TWO HOURS. THE FLEXIBILITY AND HARDNESS OF CURED STYCAST 2741LV IS CONTROLLED BY THE PROPORTION OF CATALYST 15LV WHICH IS USED.

FOR A FLEXIBLE MATERIAL (SHORE DUROMETER HARDNESS 30) USE:

100 PARTS STYCAST 2741LV
150 PARTS CATALYST 15LV

FOR A SEM-RIGID MATERIAL (SHORE DUROMETER HARDNESS 50) USE:

100 PARTS STYCAST 2741LV
100 PARTS CATALYST 15LV

FOR A RIGID MATERIAL USE;

100 PARTS STYCAST 2741LV
50 PARTS CATALYST 15LV

- B. CATALYST 15LV IS A FLEXIBLE HARDNER. COLOR BLACK. TEMPERATURES ABOVE 250° F SHOULD BE ORDINARILY AVOIDED.

2. SOURCE(S) OF SUPPLY:

EMERSON & CUMING INC

FSCM NO. 04522

 5330 DEBBIE LANE SANTA BARBARA, CALIF. 93111 964-8676 ELCAM, INC. Contractors License No. 290399		PART NUMBER	
		AP 63	
PART NAME		CASTING COMPOUND, EPOXY	
DRAWN BY		SCALE	MATERIAL
THOMSON		NONE	SEE NOTE 1
CHK'D		DATE	DRAWING NO
		DEC 76	ESP-A63
TRACED		APP'D	

TOLERANCES	
UNLESS OTHERWISE SPECIFIED DECIMAL	
.XX ± 0.0 -	
.XXX ± 0.0 -	
ANGULAR ±	
DRAFT	

REVISIONS		
NO	DATE	BY
1		
2		
3		
4		
5		

NOTES:

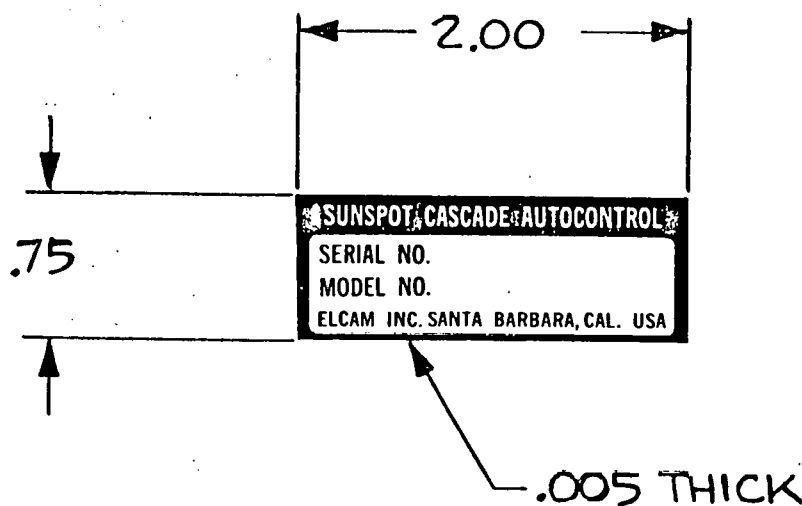
1. MATERIAL:

PHOTOGRAPHIC PAPER

PRESSURE SENSITIVE ADHESIVE

BACKED WITH PROTECTIVE BACKING

PAPER.



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	AP 64		
.XX ± 0.0	1			PART NAME LABEL, CIRCUIT CARD		
.XXX ± 0.0	2					
ANGULAR ±	3			DRAWN BY THOMSON	SCALE FULL	MATERIAL SEE NOTE 1
DRAFT	4			CHK'D	DTE 5 DEC 76	DRAWING NO. ESP- A64
	5			TRACED	APP'D	

NOTES:

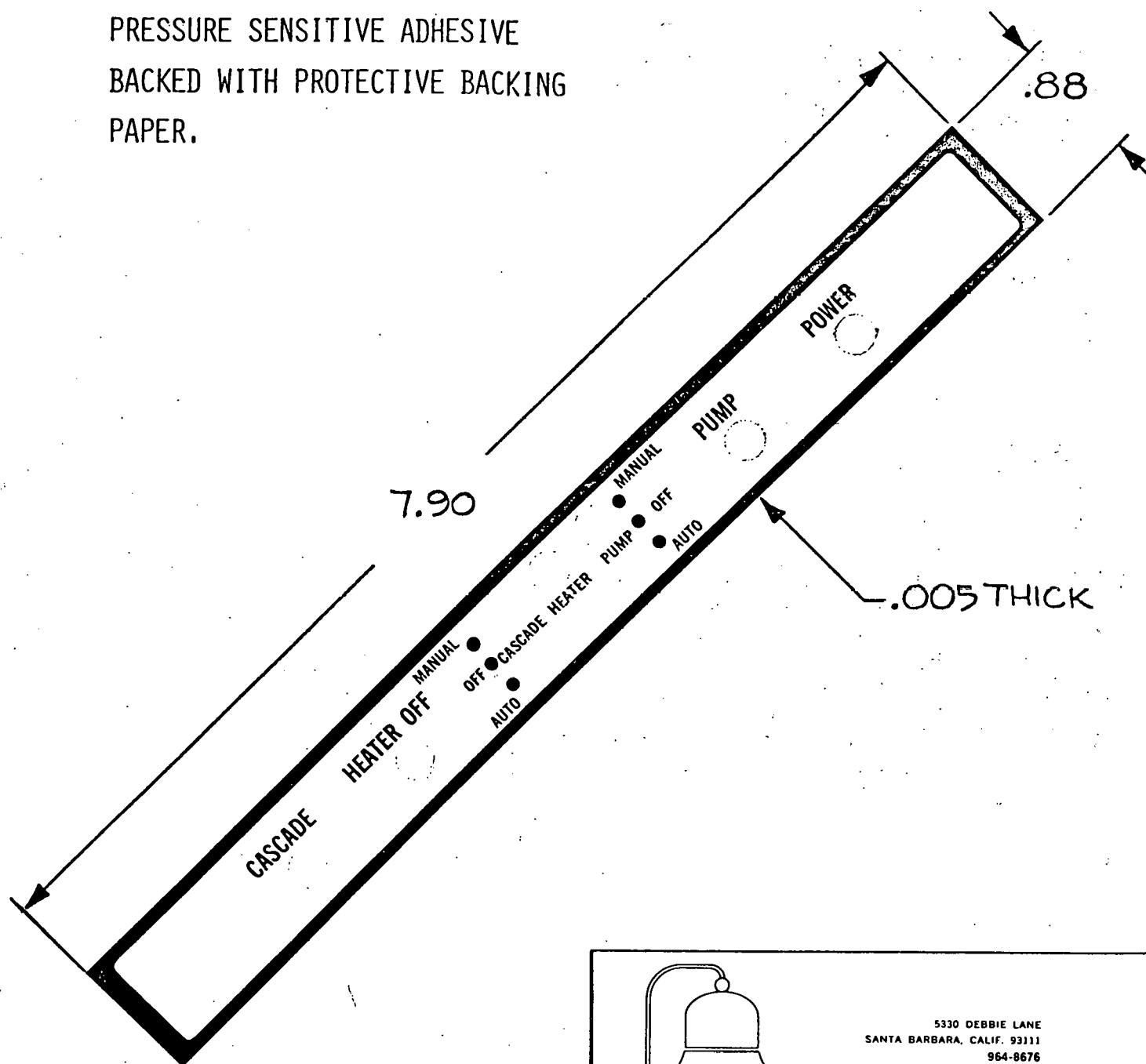
1. MATERIAL:

PHOTOGRAPHIC PAPER

PRESSURE SENSITIVE ADHESIVE

BACKED WITH PROTECTIVE BACKING

PAPER.



5330 DEBBIE LANE
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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 65		
.XX ± 0.0		1			PART NAME LABEL, CONTROL		
.XXX ± 0.0		2					
ANGULAR ±		3			DRAWN BY THOMSON		
DRAFT		4			SCALE FULL		
		5			DATE 5 DEC 76		
					MATERIAL SEE NOTE 1		
					ESP-A65		

NOTES:

1. MATERIAL:

LOW CARBON STEEL

COLD ROLLED COMMERCIAL

QUALITY NO. 1, FULL HARD TEMPER

2. PROTECTIVE FINISH:

CADMIUM PLATE,

ZINC CHROMATE OPTIONAL.

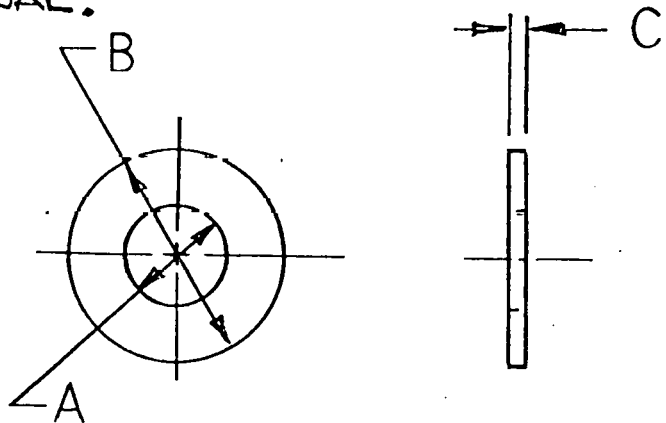
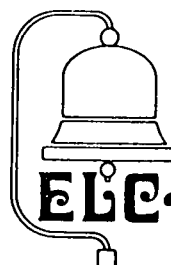


TABLE I

PART NO.	SCR SIZE	A	B	C
AP66-001	4	.120-.125	.245-.250	.017-.028
AP66-002	6	.151-.164	.307-.320	.027-.048
AP66-003	8	.183-.196	.370-.390	.036-.065



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TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 — .XXX ± 0.0 — ANGULAR ± DRAFT 106	REVISIONS			PART NUMBER	
	NO	DATE	BY	AP66	
	1			PART NAME	
	2			WASHER, FLAT	
	3			DRAWN BY THOMSON SCALE NONE MATERIAL SEE NOTE 1 DATE 14 DEC 74 DRAWING NO ESP-A66 TRACED APP D	

NOTES:

1. MATERIAL:

STEEL, CARBON
C1060 TO C1080
ROCKWELL "C" 45-53.

2. PROTECTIVE FINISH:

CADMIUM PLATE.

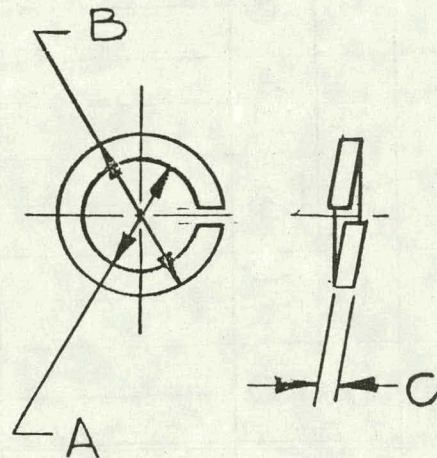


TABLE I

PART NO.	SCR SIZE	A	B	C
AP67-001	4	.115-.121	.209 MAX	.025 MIN
AP67-002	6	.141-.148	.250 MAX	.031 MIN
AP67-003	8	.168-.175	.293 MAX	.040 MIN



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TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	
.XX ± 0.0		1			
.XXX ± 0.0		2			
ANGULAR ±		3			
DRAFT		4			
		5			
		DRAWN BY		AP67	
		CHK'D		WASHER, LOCK SPRING	
		TRACED		SCALE NONE	
				DATE 13 DEC 76	
				MATERIAL SEE NOTE 1	
				DRAWING NO	
				ESP-A67	

LEAD ITEM	WIRE MATL ITEM	LEAD LGTH	CIRCUIT POINT FROM (A) TO (B)	TERM AREA NO	JACK STRIP LGTH	SHLD STRIP LGTH	LEAD CUT LGTH	INSUL STRIP LGTH	TIN	NOTE ONE FIG	ACCESSORY ITEMS
J1	1	1.0									
J2	1	1.0									
J3	2	1.4						.20			
J4	1	.7						.20			
J5	1	.8									
J6	1	.8									
J7	2	1.3						.20			
J8	1	.7						.20			
J9	1	1.0									
J10	1	.7									
J11	1	.7									
J12	1	.7									
J13	1	.7									

NOTES:

1. AWG 24 SOLID COPPER WIRE TYPES, SOFT, LEAD ALLOY COATED.
2. AWG 24 HOOK-UP WIRE TEFLON INSUL, COLOR WHT, SOLID WIRE
3. AWG 18 HOOK-UP WIRE, TEFLON INSUL, COLOR BLACK, STRANDED WIRE.

NOTES CONT ON SH2

SHEET 1 OF 2



5330 DEBBIE LANE
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ELECAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	AP68	
XX ± 0.0 -		1		PART NAME	
XXX ± 0.0 -		2		LEAD SET	
ANGULAR ±		3		DRAWN BY THOMSON	
DRAFT		4		SCALE NONE	
TOL: X ± .06		5		DATE 14 DEC 76	
				DRAWING NO	
				ESP-A68	

LEAD ITEM	WIRE MATL ITEM	LEAD LGTH	CIRCUIT POINT FROM (A) TO (B)	TERM AREA NO	JACK STRIP LGTH	SHLD STRIP LGTH	LEAD CUT LGTH	INSUL STRIP LGTH	TIN	NOTE ONE FIG	ACCESSORY ITEMS
J14	1	.7									
J15	3	6.8						.20			
								.20			
J16	4	6.8						.20			
								.20			
J17	4	5.3						.20			
								.38			
J18	3	8.5						.38			
								.20			
J19	3	6.6						.20			
								.38			
J20	3	3.6						.38			
								.38			
J21	1	.7									
J22	2	2.3						.20			
								.20			

SHEET 2

NOTES:(CONTINUED)

4. AWG 18 HOOK-UP WIRE
TEFLON INSUL, COLOR WHT,
STRANDED WIRE

5. SOLDER USING 60/40
SOLDER



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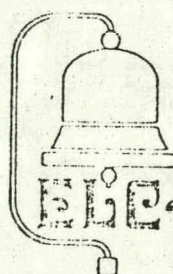
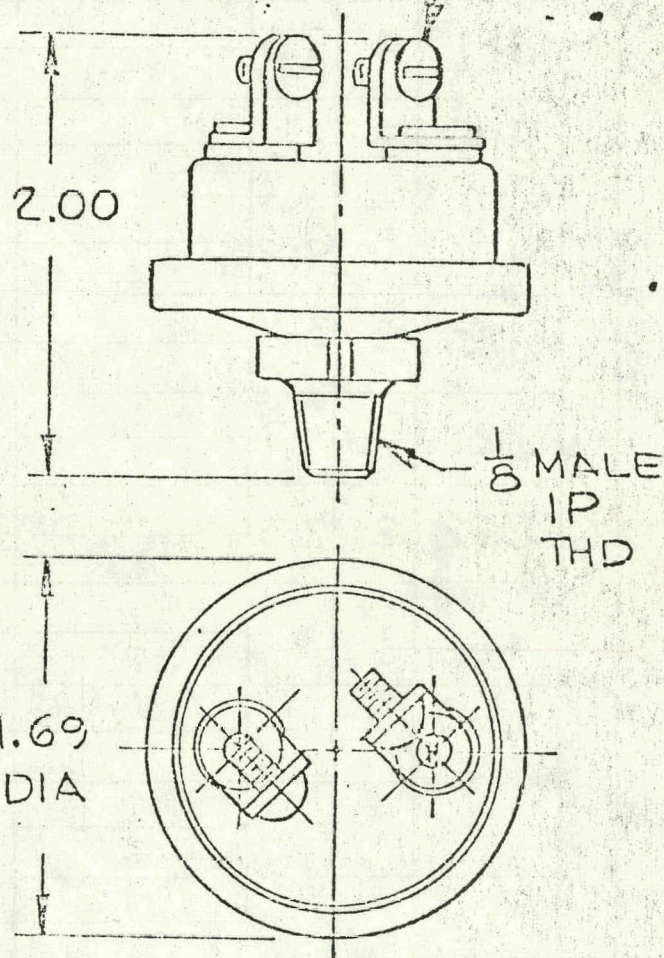
TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP68
.XX ± 0.0		1			PART NAME
.XXX ± 0.0		2			
ANGULAR ±		3			DRAWN BY
DRAFT		4			SCALE
		5			DATE
					TRACED
					APP'D
					DRAWING NO
					ESP-A68

NOTES:

1. SWITCH, LOW PRESSURE
NORMALLY CLOSED
SINGLE CIRCUIT
4 PSI - 150 PSI OPER MAX
PART NO. M-4007

2. SUGGESTED SOURCE(S)
OF SUPPLY:
STEWART-WARNER CORP
HOBBS DIVISION
FSCM NO. 74400

2 TERMINALS:
INSULATED
.164-32 THD



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964-8676

ELEM, INC.

Contractors License No 290395

Figure 2.1.2

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP71	
XX ± 0.0	—	1			PART NAME SWITCH, LOW PRESS.	
XXX ± 0.0	—	2				
ANGULAR ±	—	3				
DRAFT		4				
		5				
110					DRAWN BY THOMSON	SCALE NONE
					DATE 11 MAY 77	NOTE 1
					TRACED	ESP-A71

NOTES:

1. VALVE, GENERAL PURPOSE
THREE-WAY NORMALLY OPEN
OPER PRESS DIFFERENTIAL:

150 PSI MAX

10 PSI MIN

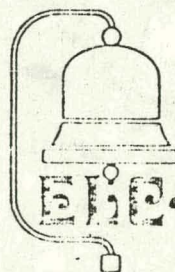
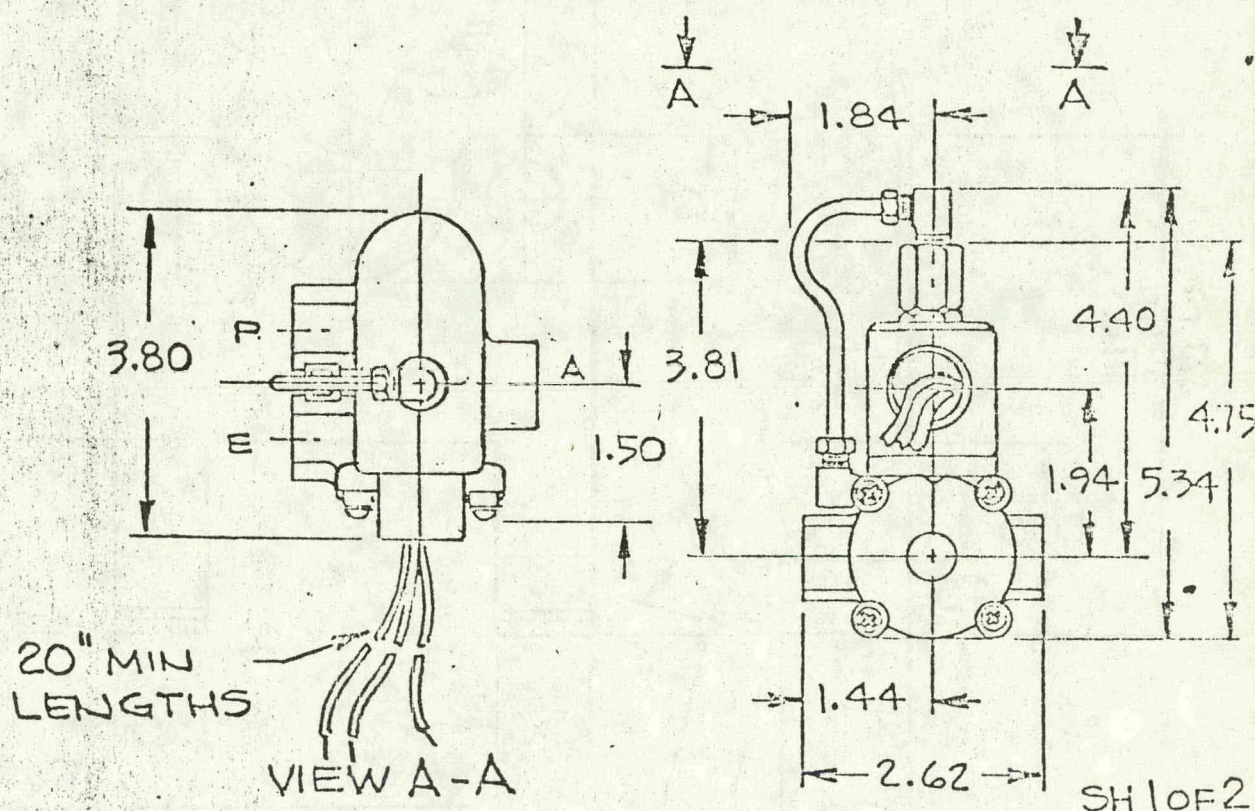
PART NO. LP8RBMX37.

24 VDC VOLTAGE

2. SUGGESTED SOURCE(S)
OF SUPPLY:

SKINNER PRECISION INDUSTRIES INC.

FSCM NO. 55130



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964-8676

EBERM, INC.

Contractors License No 290399

Figure 2.1.1

TOLERANCES		REVISIONS			PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	AP 72
XX ± 0.0		1			PART NAME VALVE, THREE-WAY
XXX ± 0.0		2			
ANGULAR ±		3			
DRAFT		4			
VENDOR'S TOLERANCE APPLY		111			THOMSON
					SCALE NONE
					DATE 11 MAY 72
					APPD
					TRACED
					MATERIAL SEE NOTE 1
					DRAWING NO ESP-A72

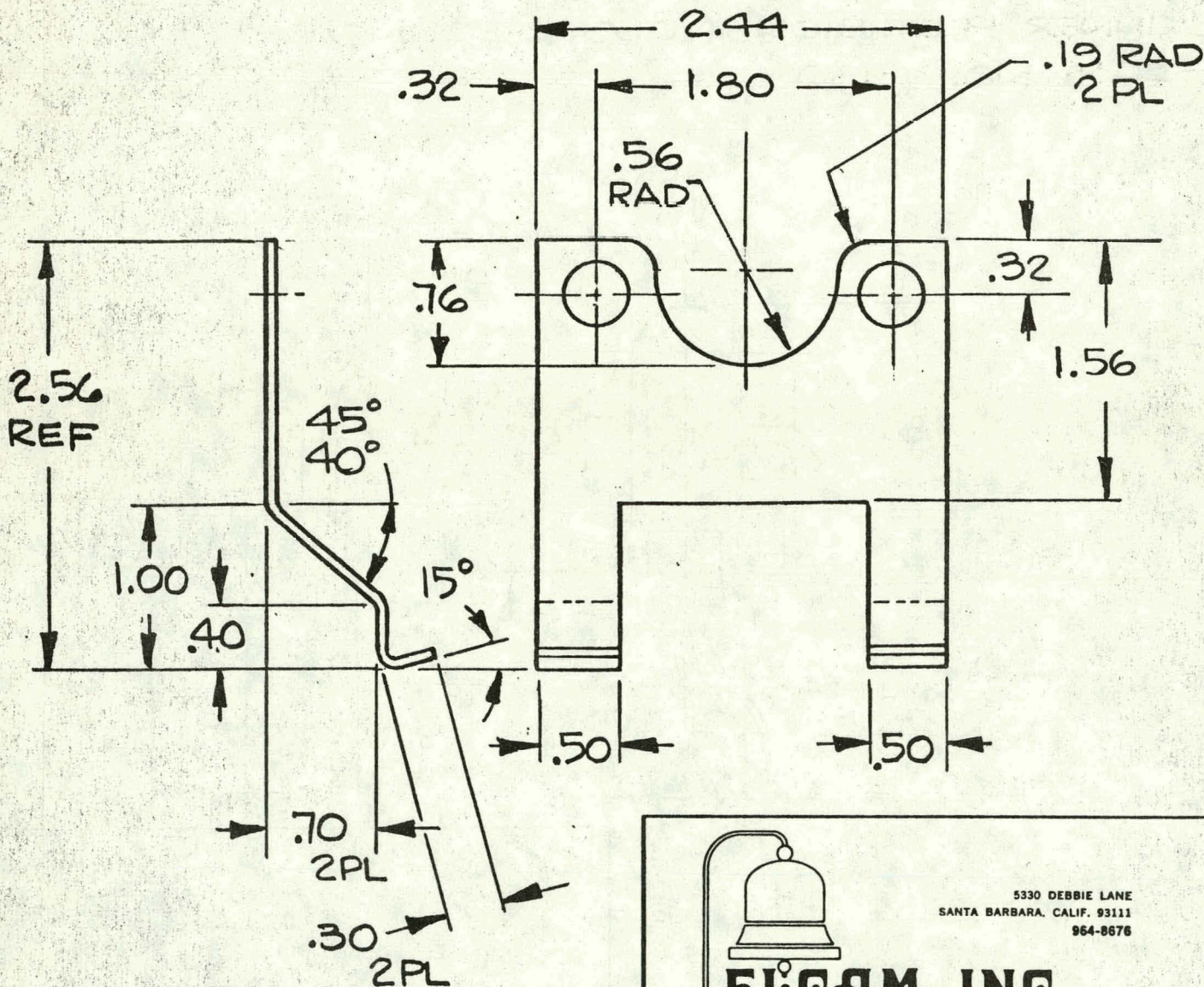
NOTES:

1. MATERIAL:

STEEL, CARBON
CMP5N 1010, TEMPER NO. 4
NO. 18 GA (.048)

2. PROTECTIVE FINISH:

ZINC PLATE
.0002 MIN THICKNESS
CLEAR CHROMATE
SPEC QQ-Z-325



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964-8676

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TOLERANCES		REVISIONS			PART NUMBER TP2		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	PART NAME		
.XX ± 0.0		1			RESTRAINT PLATE, SENSOR		
.XXX ± 0.0		2					
ANGULAR ± 30		3					
DRAFT		4					
		5					
		DRAWN BY THOMSON			SCALE	FULL	MATERIAL SEE NOTE 1
		CHK D			DATE	6 DEC 76	DRAWING NO
		TRACED			APP D		ESP-T2

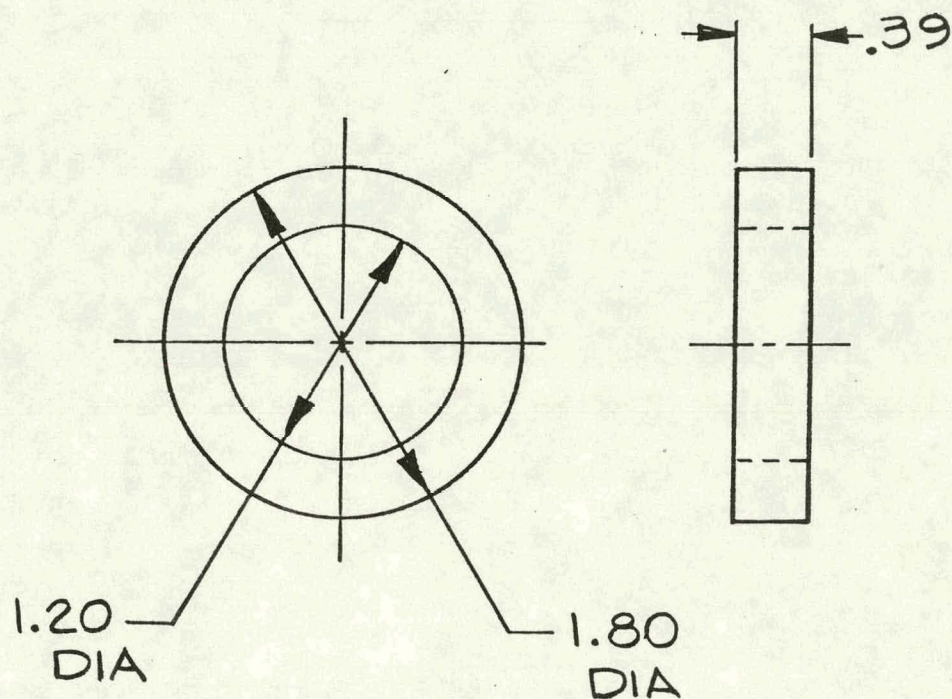
NOTES:

1. MATERIAL:

RUBBER, BUNA N
DUROMETER 55-65
(FIRM)
COLOR BLACK

2. SUGGESTED SOURCE(S) OF SUPPLY:

AO SMITH CORP
FSCM 28611
PART NO. 37819
OR EQUIV



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Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	TP5		
.XX ± 0.0		1			PART NAME GASKET		
.XXX ± 0.0		2					
ANGULAR ±		3			DRAWN BY THOMSON		
DRAFT		4			SCALE FULL		
VENDORS		5			DATE 6 DEC 76		
TOL APPLY					MATERIAL SEE NOTE 1		
					DRAWING NO		
					TRACED		
					APP D		
					ESP-T5		

NOTES:

1. MATERIAL:

ALUMINUM ALLOY EXTRUSION
CMPSN 6063 TEMPER T5
DIE SECTION 66876

2. VENDOR:

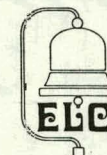
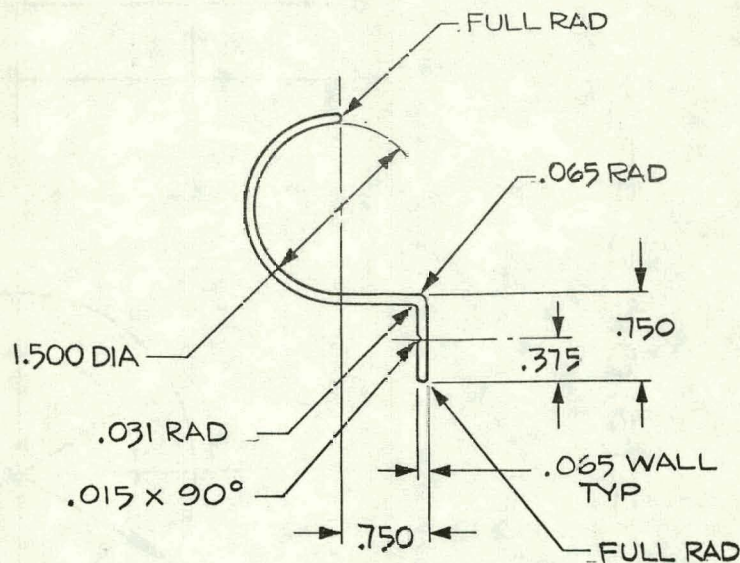
REYNOLDS METALS CO.
FSCM NO. 09983

3. PROTECTIVE FINISH:

NONE

TABLE I

PART NO.	LENGTH	REMARKS
I1-001	CUT TO 1.74-1.75	
I1-002	AS SUPPLIED	



5330 DEBBIE LANE
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PHONE 964-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	I1
XX ± 0.0	1			PART NAME
XXX ± 0.0	2			PIPE HANGER
ANGULAR ±	3			DRAWN BY THOMPSON
DRAFT	4			CHECKED
VENDORS STD TOL APPLY	5			DATE 27 NOV 76
	6			APPROVED
				TRACED
				DRAWING NO. ESI-1

NOTES:

1. MATERIAL:

BRASS SOLDER-JOINT

SWING CHECK VALVE - TEFLON SEAT

WORKING PRESS. 125 LBS

TEMP. 200° F MIN

2. SUGGESTED SOURCE(S)

OF SUPPLY:

CRANE CO.

FSCM NO. 14959

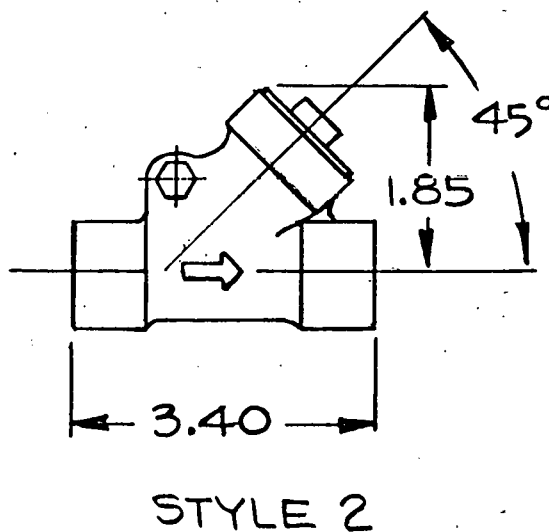
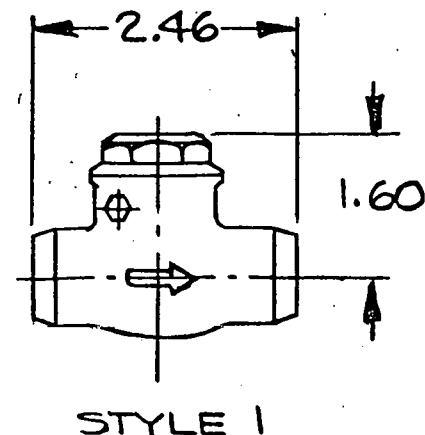
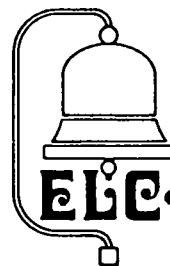


TABLE I

PART NO.	STYLE	SIZE
I2-001	1	1/2
I2-002	2	3/4



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954-8676

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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	I2		
.XX ± 0.0 —		1			PART NAME		
.XXX ± 0.0 —		2			CHECK VALVE		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
VENDOR'S TOL APPLY		5	115		SCALE		
					NONE		
					DATE		
					15 DEC 76		
					MATERIAL		
					SEE NOTE 1		
					DRAWING NO		
					ESI - 2		

NOTES:

1. MATERIAL:

PRESSURE & TEMPERATURE
RELIEF VALVE.

AUTOMATIC-RESEATING
COMBINATION TYPE.
BRASS CONSTRUCTION
NO. 100XL

PSI SET 150 LBS

TEMP SET 210°F

2. SUGGESTED SOURCE(S) OF SUPPLY:

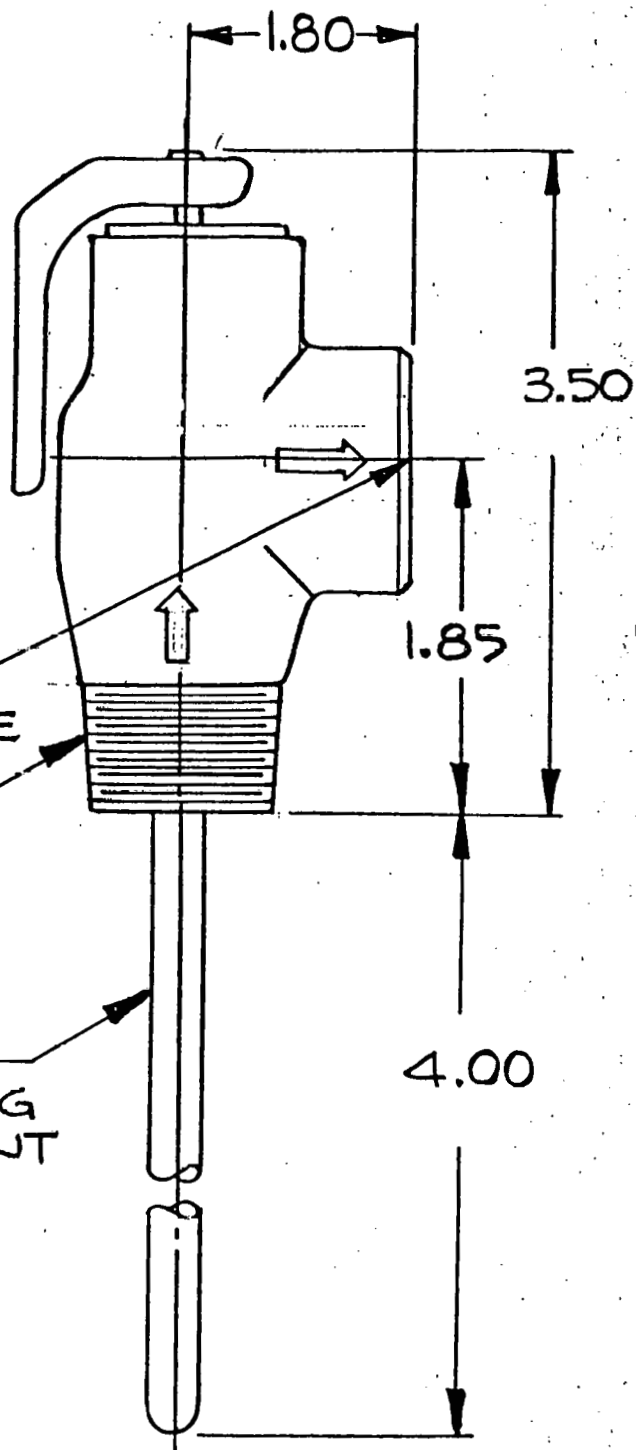
WATTS

REGULATOR CO.

FSCM NO. 79227

3/4 NPT FEMALE
3/4 NPT MALE

TEMP
SENSING
ELEMENT



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ELCAM, INC.

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TOLERANCES	REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	I3		
.XX ± 0.0	1			PART NAME		
.XXX ± 0.0	2			PRESS & TEMP VALVE		
ANGULAR ±	3			DRAWN BY	SCALE	MATERIAL
DRAFT	4			THOMSON	FULL	SEE NOTE 1
VENDOR'S	5			CHK'D	DATE	DRAWING NO
TOL APPLY	116			TRACED	15 DEC 76	ESI-3
					APP'D	

NOTES:

1. MATERIAL:

BRASS SOLDER JOINT

GATE VALVE

NON-RISING STEM

SOLID WEDGE

WORKING PRESS, 125 LBS

TEMP. 200°F MIN

2. SUGGESTED SOURCE(S)

OF SUPPLY:

CRANE CO.

FSCM NO. 14959

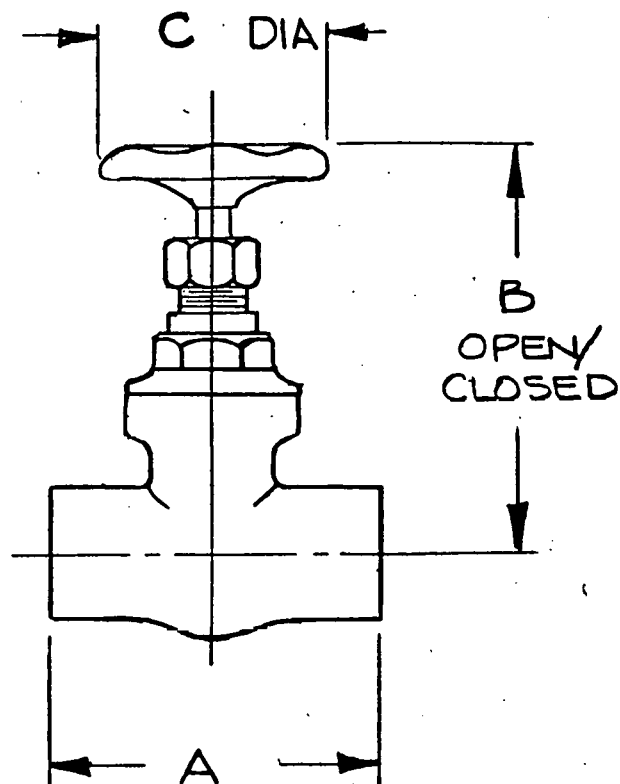


TABLE I

PART NO.	A	B	C	SIZE
I5-001	1.85	3.20	1.88	1/2
I5-002	2.50	3.40	2.16	3/4



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TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	I5		
.XX ± 0.0 -		1.			PART NAME		
.XXX ± 0.0 -		2.			GATE VALVE		
ANGULAR ±		3.			DRAWN BY	SCALE	MATERIAL
DRAFT		4.			THOMSON	NONE	SEE NOTE 1
VENDOR'S		5.			CHK'D	15 DEC 76	DRAWING NO
TOL			117		TRACED	APP'D	ESI-5
APPLY							

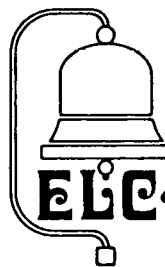
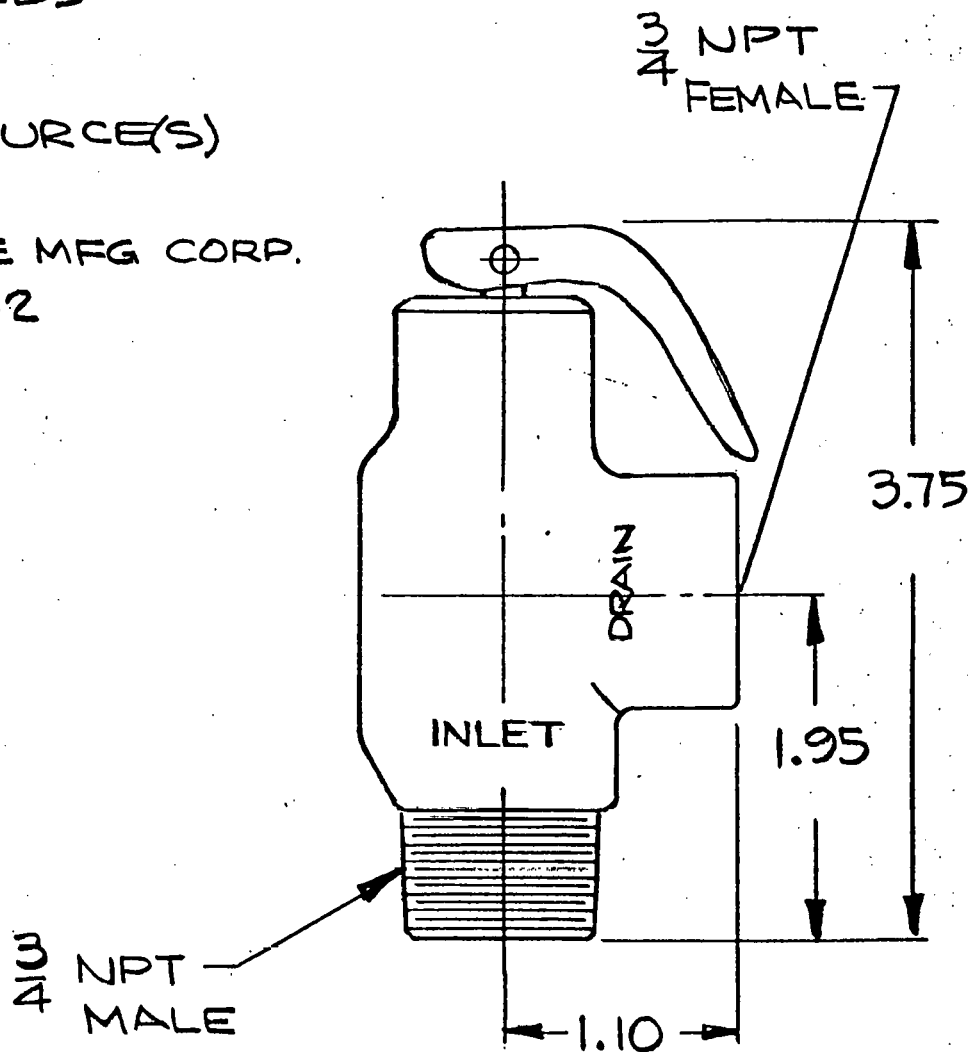
NOTES:

1. MATERIAL:

PRESSURE RELIEF VALVE
WITH TEST LEVER
BRASS CONSTRUCTION
TYPE FWL-2
PSI SET 150 LBS

2. SUGGESTED SOURCE(S) OF SUPPLY:

CASH A.W. VALVE MFG CORP.
FSCM NO. 71342



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964-8676

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Contractors License No. 290399

TOLERANCES	REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	I 6		
.XX ± 0.0	1			PART NAME		
.XXX ± 0.0	2			PRESSURE RELIEF VALVE		
ANGULAR ±	3			DRAWN BY	SCALE	MATERIAL
DRAFT	4			THOMSON	FULL	SEE NOTE 1
VENDOR'S	5			CHK'D	DATE	DRAWING NO
TOL					15 DEC 76	
APPLY				TRACED	APP'D	ESI-6
		118				

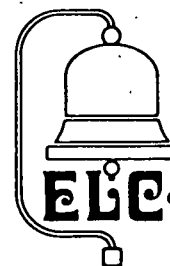
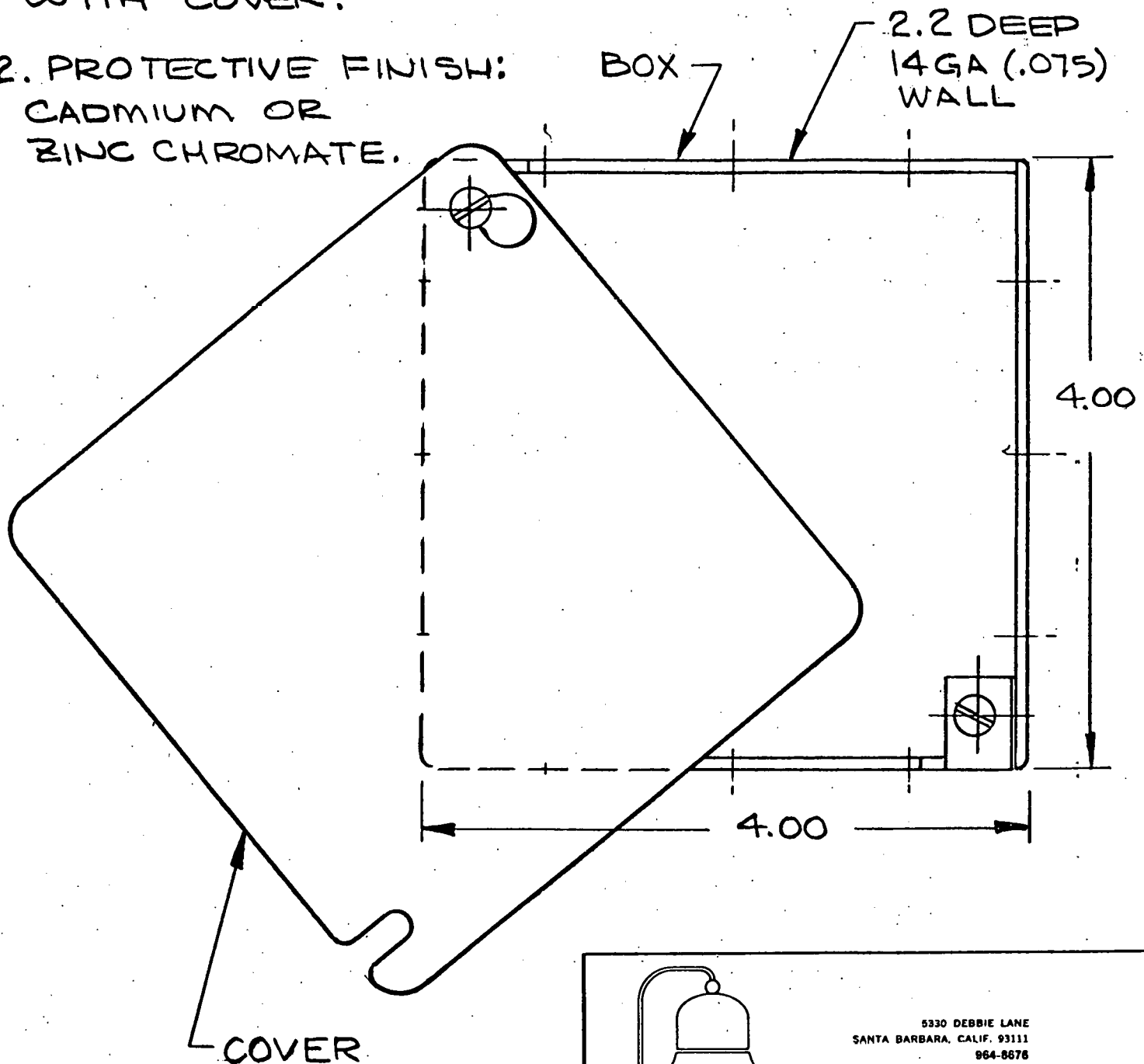
NOTES:

1. MATERIAL:

CARBON STEEL STANDARD
ELECTRICAL JUNCTION BOX
WITH COVER.

2. PROTECTIVE FINISH:

CADMIUM OR
ZINC CHROMATE.



5330 DEBBIE LANE
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964-8678

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO.	DATE	BY	I7	
.XX ± 0.0 —		1			PART NAME	
.XXX ± 0.0 —		2				
ANGULAR ±		3			HOUSING	
DRAFT		4				
VENDOR'S		5	11/9		DRAWN BY	THOMSON
TOL APPLY					CHK'D	16 DEC 76
					TRACED	DATE
						SCALE FULL
						MATERIAL SEE NOTE 1
						DRAWING NO
						ESI-7

NOTES:

1. MATERIAL:

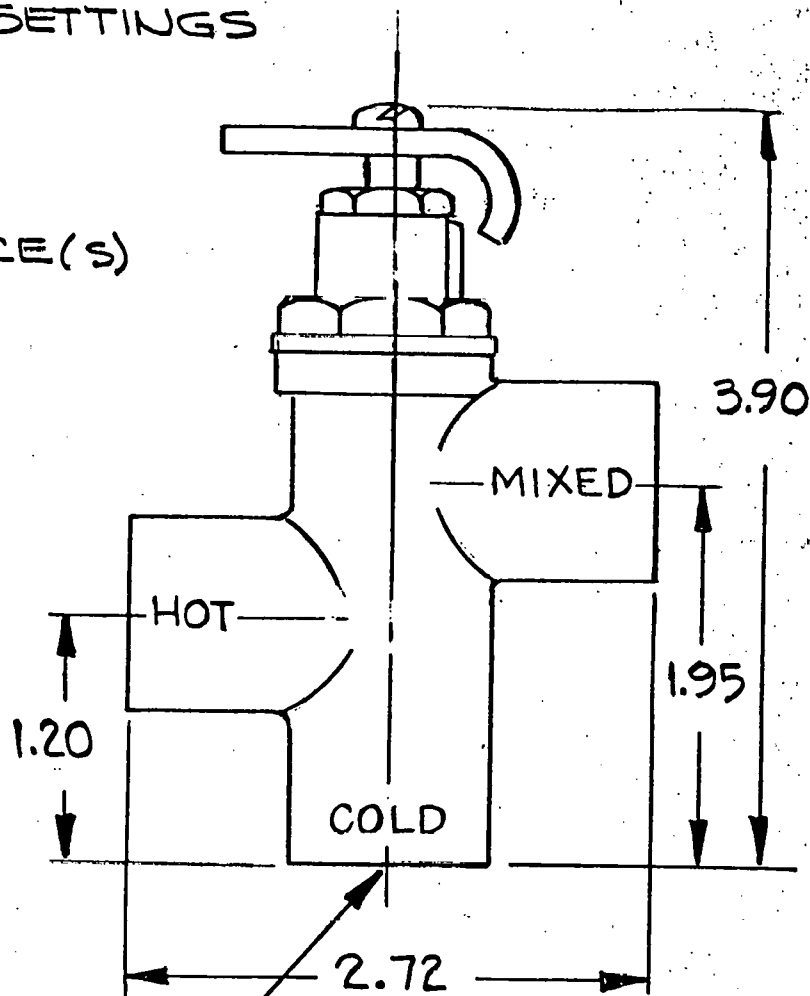
BRASS SOLDER JOINT
TEMPERING VALVE WITH
EXTERNAL ADJUSTMENT
120° - 140° - 160° F SETTINGS
NO. 526

2. SUGGESTED SOURCE(S)

OF SUPPLY:

TACO INC.

FSCM NO. 59015



3/4 SOLDER
JOINT
3 PLACES



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964-8676

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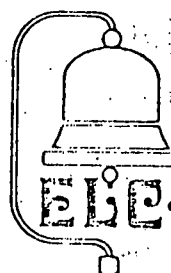
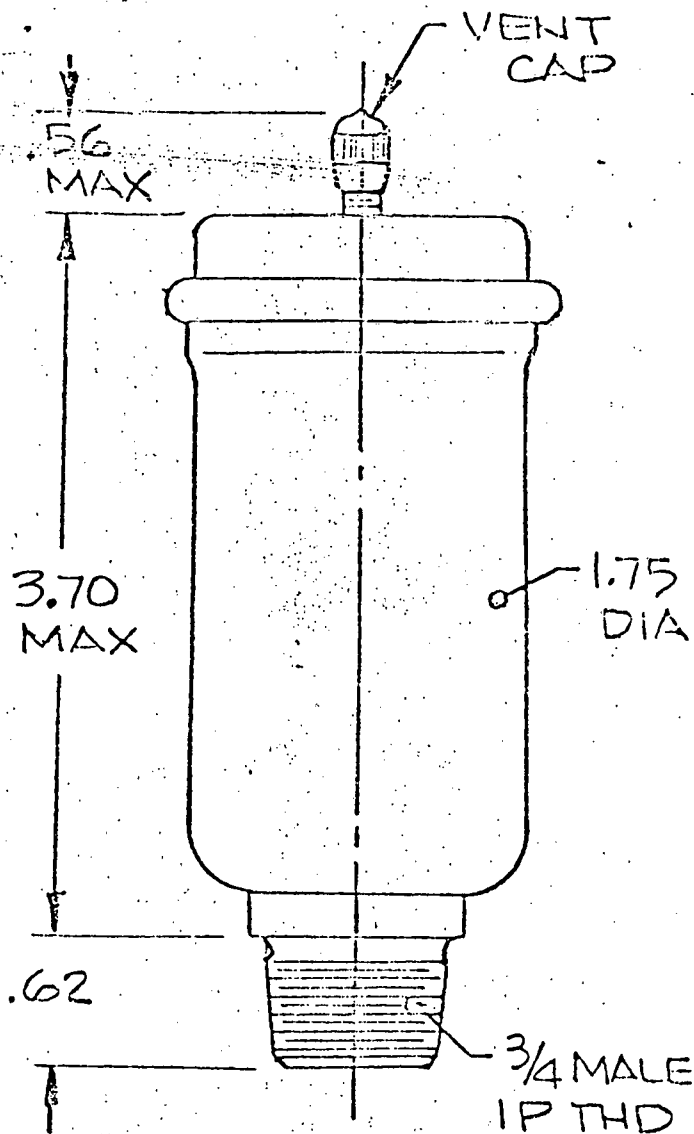
TOLERANCES	REVISIONS			PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	I12
.XX ± 0.0 —	1			PART NAME
.XXX ± 0.0 —	2			TEMPERING VALVE
ANGULAR ±	3			DRAWN BY
DRAFT	4			THOMSON
VENDOR'S	5	120		SCALE FULL
TO APPLY				DATE 16 DEC 76
				MATERIAL SEE NOTE 1
				DRAWING NO
				EST-12

NOTES:

1. VALVE, VENT, AIR
BRASS
FLOAT TYPE
MAX WORKING PRESS 150 PSI

2. PART NO. 87

3. SUGGESTED SOURCE(S)
OF SUPPLY:
ITT-BELL & GOSSETT DIV
FSCM 06631



5330 DERRIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

ELEM, INC.

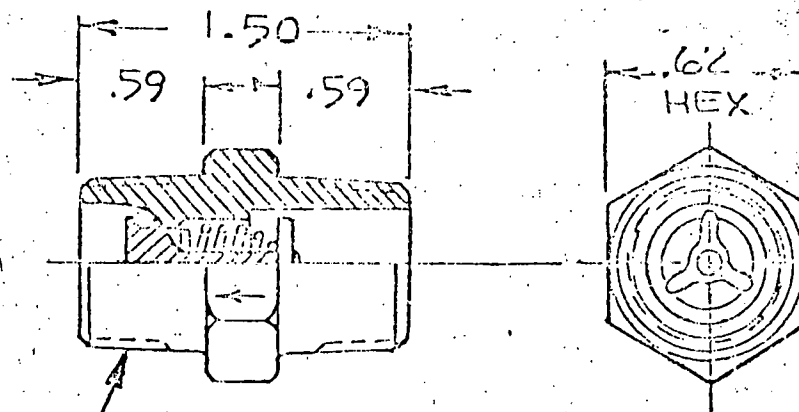
Contractors License No. 290399

Figure 2.1.5

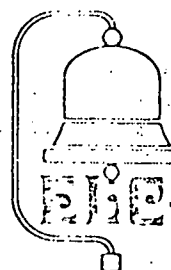
TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	I-14	
.XX ± 0.0 —		1			PART NAME	
.XXX ± 0.0 —		2			VENT VALVE, AIR	
ANGULAR ±		3			DRAWN BY	
DRAFT		4			THOMSON	
VENDOR'S TOLER		5	121		SCALE	
APPLY					NONE	
					DATE	
					1 JUNE 77	
					APP'D	
					NOTE 1	
					ESI-14	

NOTES:

1. VALVE, CHECK
BRASS
OPER TEMP -40° TO 250°F
CRACKING PRESS 1 PSI NOM
2. PART NO.
2259 B-2MM
3. SUGGESTED SOURCE(S)
OF SUPPLY:
CIRCLE SEAL CORP
FSCM NO. 27409



1/4 IPS
THD BOTH ENDS



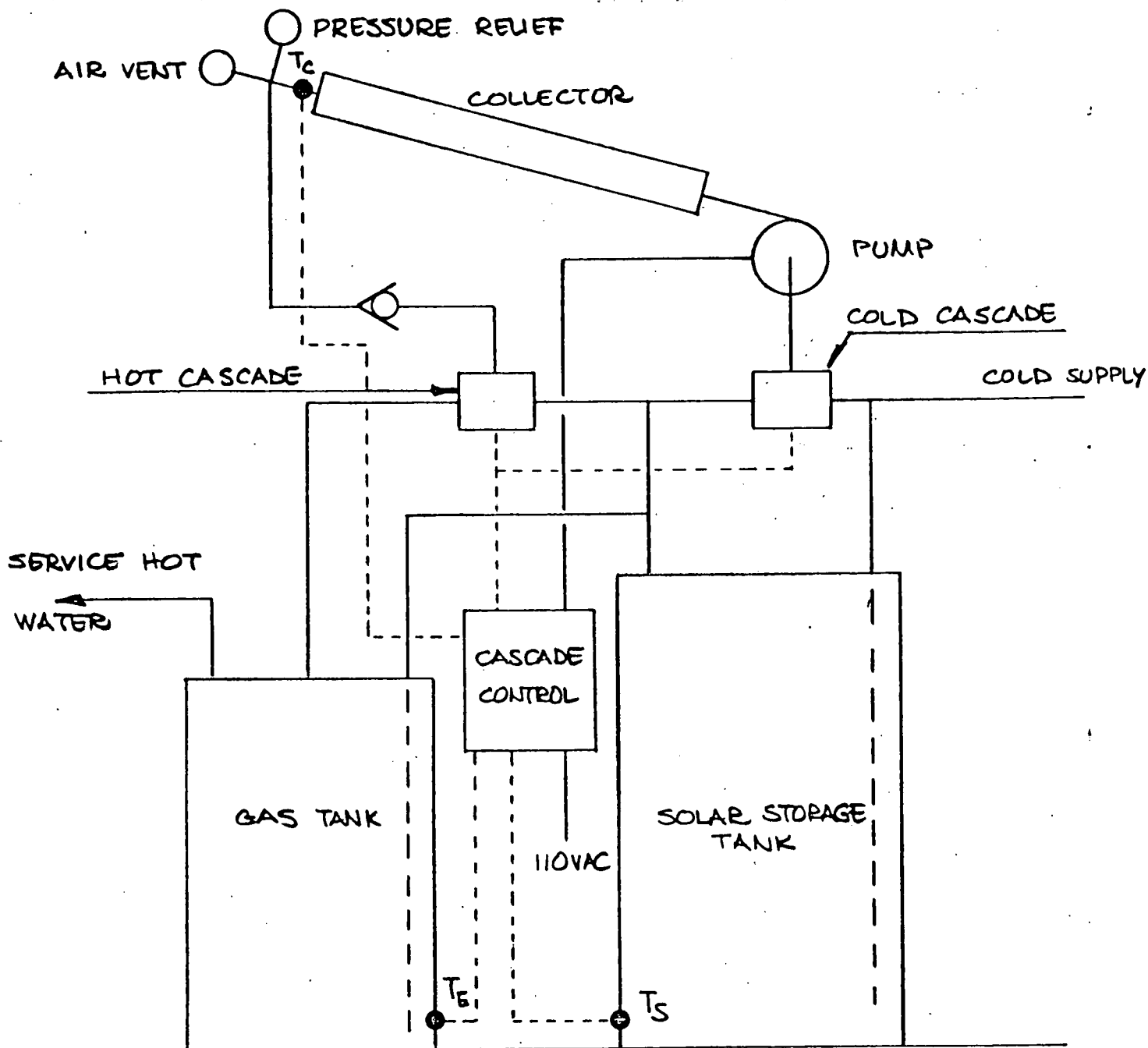
5330 DERRIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

EICM, INC.

Contractors License No. 740390

TOLERANCES		REVISIONS		PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	I-15
XX ± .00 -	1			PART NAME
XXX + .00 -	1			CHECK VALVE
ANGULAR ±	1			THICKEN
DRAFT	1			NONE
WELDERS TOLER APPLY	1	122		DATE 21 MAY 77
				NOTES ESI-15

Figure 2.1.4



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 .XXX ± 0.0 ANGULAR ± DRAFT		NO	DATE	BY	PART NAME		
		1			GAS CASCADE SCHEMATIC		
		2					
		3			DRAWN BY	TCB	SCALE -
		4			CHK'D	DATE 3-10-78	DRAWING NO
		5	123		TRACED	APP'D	ESS-8

NOTES:

1. MATERIAL:

GLASS-LINED
WATER HEATER
MODEL, SEE TABLE I

2. VENDOR:

AO SMITH CORP
FSCM NO. 28611
TABLE I

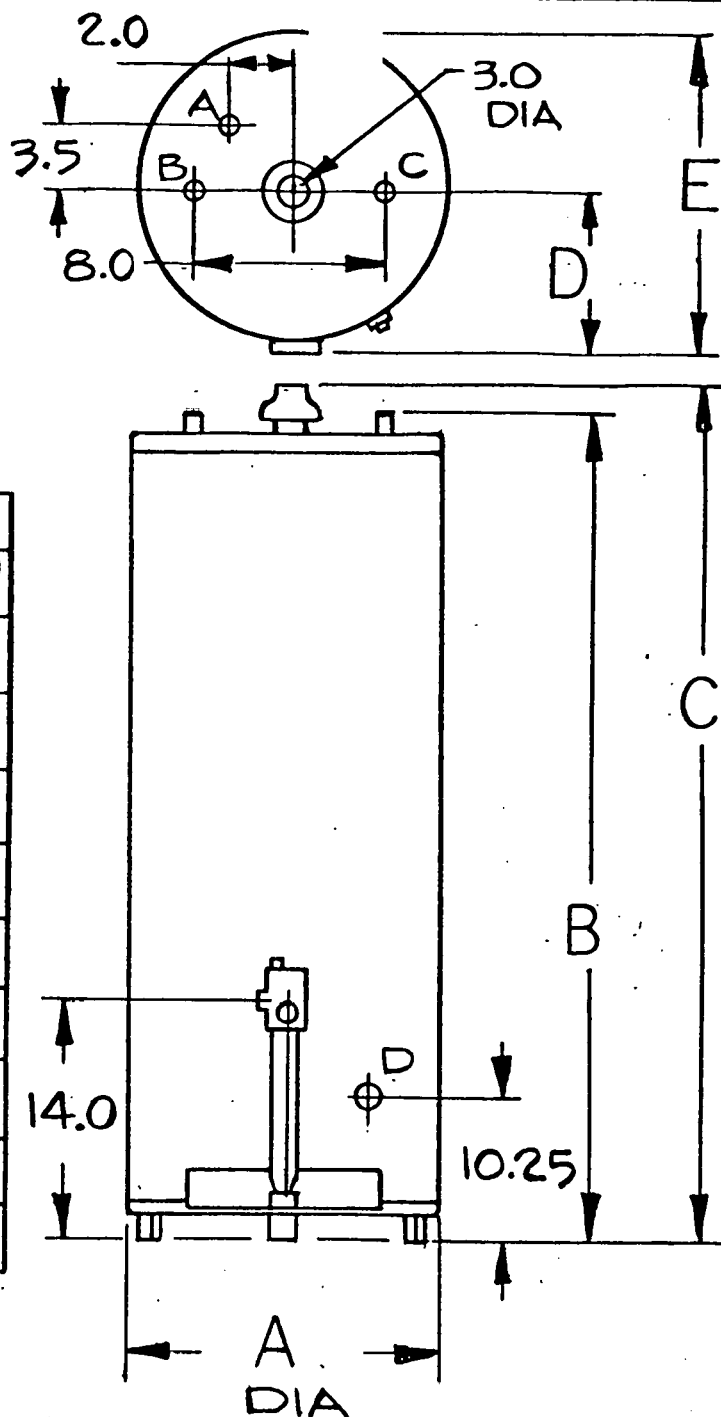
SPECS	-001	-002	-003	-004
MODEL	PGC-40 NAT	PGC-40 L.P.	PGC-50 NAT	PGC-50 L.P.
CAP IN GALS	40	40	50	50
INPUT BTU/HR	32,500	37,000	44,000	40,000
REC GPH/ 100° RISE	29.3	31.1	39.6	33.6
SHIP WT/LBS	129	138	166	166
DIM A	18.25	18.25	20.25	20.25
B	55.12	54.50	59	59
C	57.62	61.62	65.5	65.5
D	10.62	10.62	11.62	11.62
E	21.75	21.75	23.75	23.75

CODE

A = RELIEF VALVE
OPENING 3/4 NPT
B = OUTLET 3/4 NPT
C = INLET 3/4 NPT
D = DRAIN VALVE

NOTE: PART NO. MUST
INCL DASH NO.

ie: E4-001



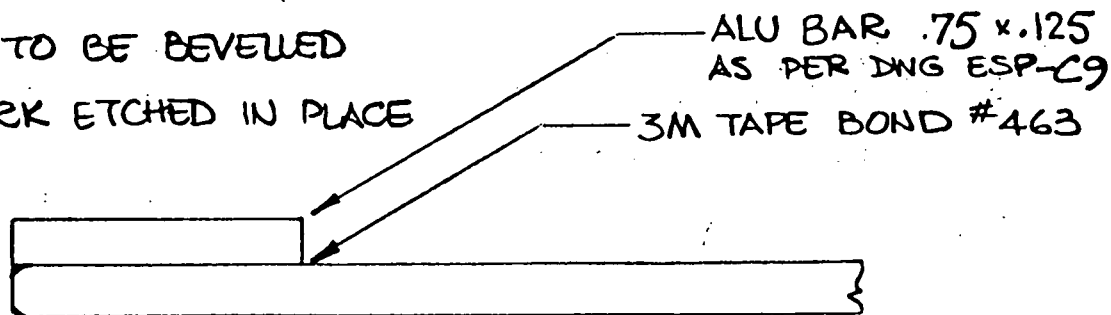
5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
964-8676

Contractors License No. 290399

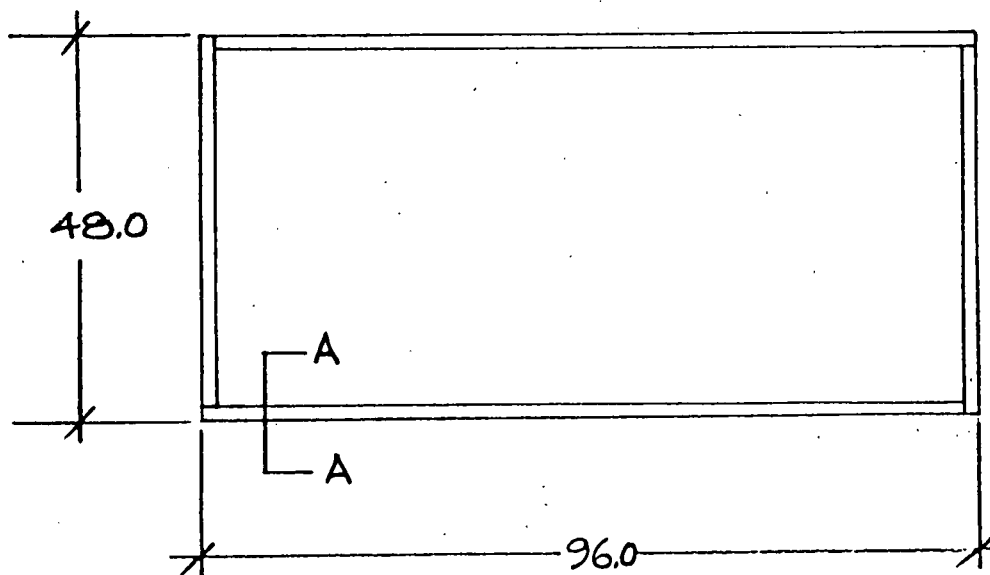
TOLERANCES	REVISIONS			PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	E4
.XX ± 0.0	1			PART NAME
.XXX ± 0.0	2			GAS TANK
ANGULAR ±	3			DRAWN BY
DRAFT	4			THOMSON
VENDOR'S	5	124		SCALE
TOL APPLY				NONE
				DATE
				29 NOV 76
				MATERIAL
				SEE NOTE 1
				DRAWING NO
				ESE-4

NOTES :

1. GLASS : 1/8" TEMPERED
2. ALL EDGES TO BE BEVELLED
3. SAFETY MARK ETCHED IN PLACE



SECTION AA SCALE 2:1



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8676

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL .XX ± 0.0 .XXX ± 0.0 ANGULAR ± DRAFT		NO	DATE	BY	CP-21		
		1			PART NAME		
		2			GLASS COVER ASSY.		
		3			DRAWN BY	TCH	SCALE —
		4			CHK'D	DATE	3-10-78
		5	125		TRACED	APP'D	ESP-C21
					MATERIAL NOTED		



EL CAMINO POOLS 964-6929
EL CAMINO SOLAR SYSTEMS 964-8676

5330 DEBBIE LN., SANTA BARBARA, CALIFORNIA 93111

November 19, 1976

NASA
Marshall Space Flight Center
Alabama 35812

Attention: Mr. Mitchell Cash

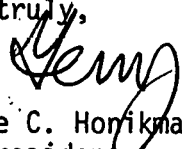
Dear Mitch:

We hereby transmit the documents required for review prior to PDR1, according to Contract NAS8-32245, TD2 and TD3. Executed originals and two copies of TD2 and TD3 are being mailed to you under separate cover.

For your information we have also included three copies of our collector data sheet which has just come off the press.

We look forward to your comments and review.

Yours truly,


Terence C. Horikman
Vice President

Enclosures: 10 copies, ESC-2, Verification Plan
10 copies, ESC-7a, Drawing List
10 copies, ESC-7b, Suggested Prototype Design Review Data
2 copies, 1 reproducible, ESC-7c System Drawings
10 copies, ESC-7d, Autocontrol Logic
10 copies, ESC-7e, Measurement Definitions (Mini-P.I.P.)
10 copies, ESC-7f, Proposed Modifications to SUNSPOT CASCADE
10 copies, ESC-7g, List of Materials in Contact with Potable Water
10 copies, ESC-15, Special Handling, Installation & Maintenance
Tools List
10 copies, ESC-18 Hazards Analysis

Distribution, except for drawings, as follows:

1 copy to Contracting Officer/AP32
2 copies to Technical Manager/FA32
7 copies to SH&C Change Integration/FA02B

NOTES:

1. MATERIAL:

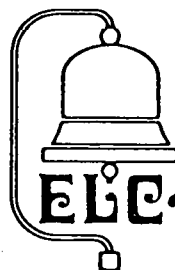
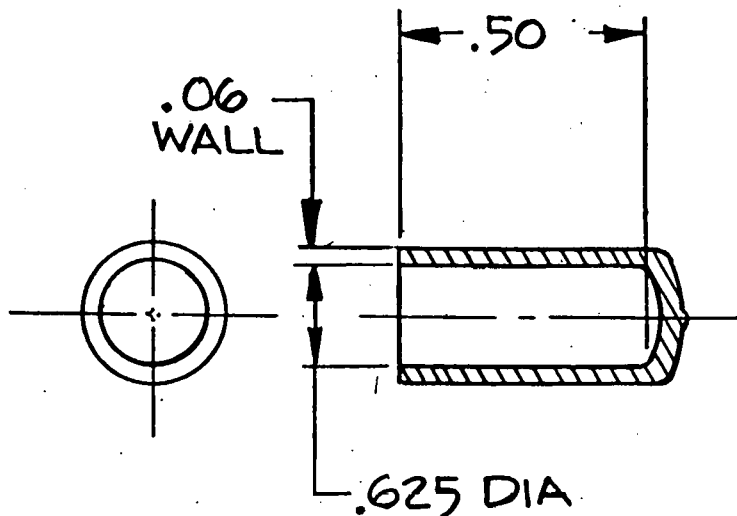
VINYL PLASTIC
COLOR RED

2. VENDOR:

SINCLAIR & RUSH INC.

FSCM NO

PART NO. 625-8



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

Contractors License No. 290399

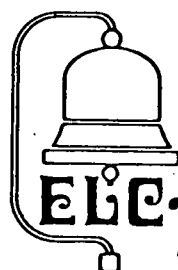
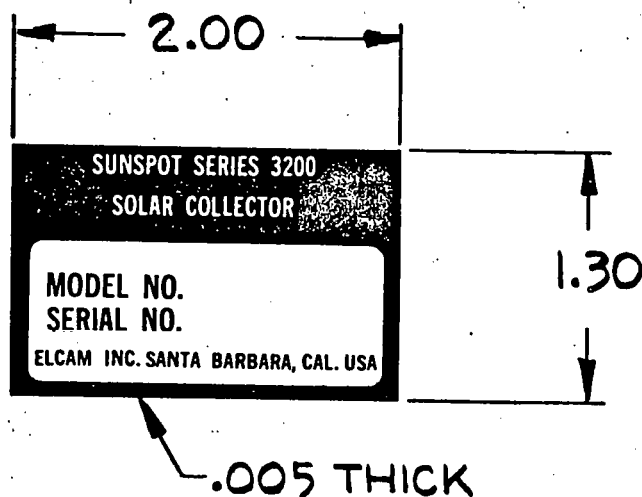
TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CPI6		
XX ± 0.0		1			PART NAME		
XXX ± 0.0		2			VINYL CLOSURE		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
		5			SCALE		
		6			NONE		
		7			DATE		
		8			APP D		
		9	127		TRACED		
		10			DRAWING NO		
		11			ESP-C16		

SEE NOTE 1

NOTES:

1. MATERIAL:

PHOTOGRAPHIC PAPER.
PRESSURE-SENSITIVE
ADHESIVE BACKED WITH
PROTECTIVE BACKING
PAPER.



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL XX ± 0.0 XXX ± 0.0 ANGULAR ± DRAFT	REVISIONS			PART NUMBER		
	NO	DATE	BY	CP15		
	1			PART NAME		
	2			LABEL, COLLECTOR		
	3			DRAWN BY		
	4			THOMSON		
	5	128		SCALE	FULL	MATERIAL
				DATE	14 NOV 76	SEE NOTE 1
				APP'D		DRAWING NO
				TRACED		ESP-C15

NOTES:

1. MATERIAL:

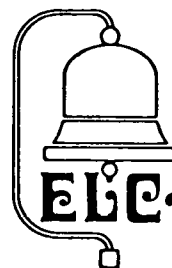
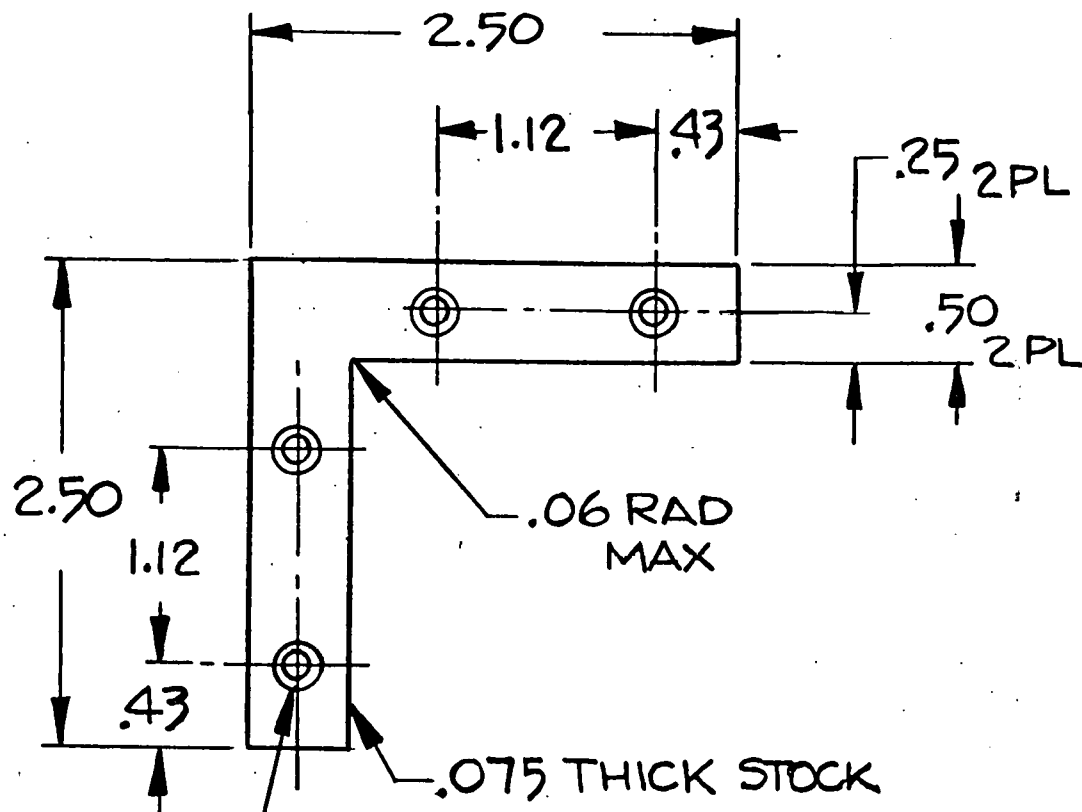
CARBON STEEL

2. PROTECTIVE FINISH:

ZINC PLATE

3. MFG PART NO.

STANLEY NO. 999



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

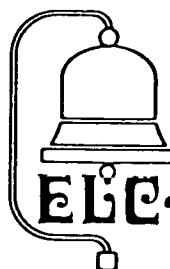
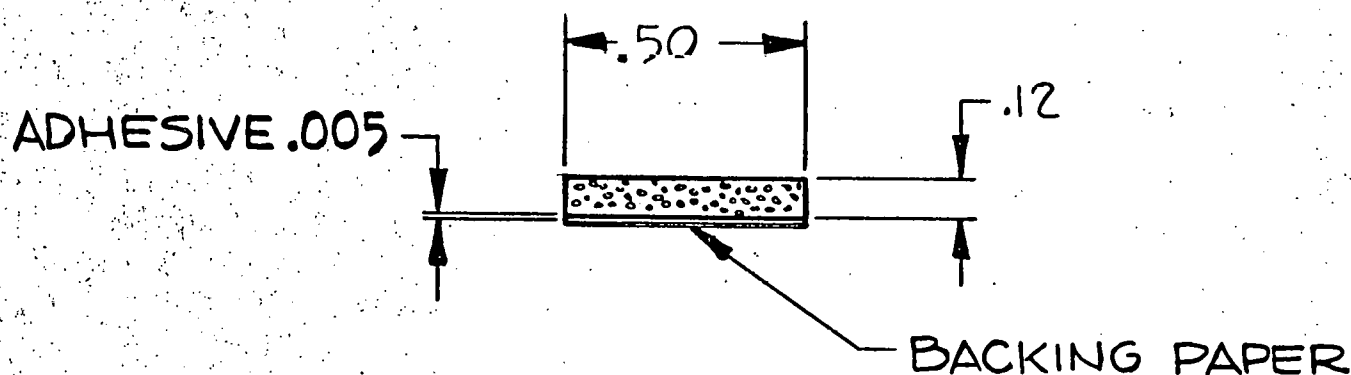
Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP 14	
.XX ± 0.0		1			PART NAME	
.XXX ± 0.0		2			CORNER BRACKET	
ANGULAR ±		3			DRAWN BY	SCALE
DRAFT		4			THOMSON	FULL
		5	129		CHK D	DATE
					TRACED	14 NOV 76
						DRAWING NO
						ESP-C14

NOTES:

1. MATERIAL:

VYNIL RUBBER STRIP.
CLOSED CELL SPONGE
DUROMETER 40-50
COLOR BLACK. PRESSURE-SENSITIVE
ADHESIVE BACKED WITH
PROTECTIVE BACKING PAPER.



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP7		
XX ± 0.0		1			PART NAME		
XXX ± 0.0		2					
ANGULAR ±		3			GASKET		
DRAFT		4					
		5	130		DRAWN BY	SCALE	MATERIAL
					THOMSON	NONE	SEE NOTE 1
					CHK'D	DATE	DRAWING NO
						14 NOV 76	
					TRACED	APP'D	ESP-C7

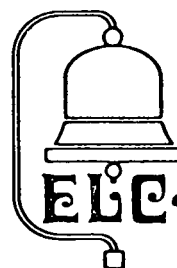
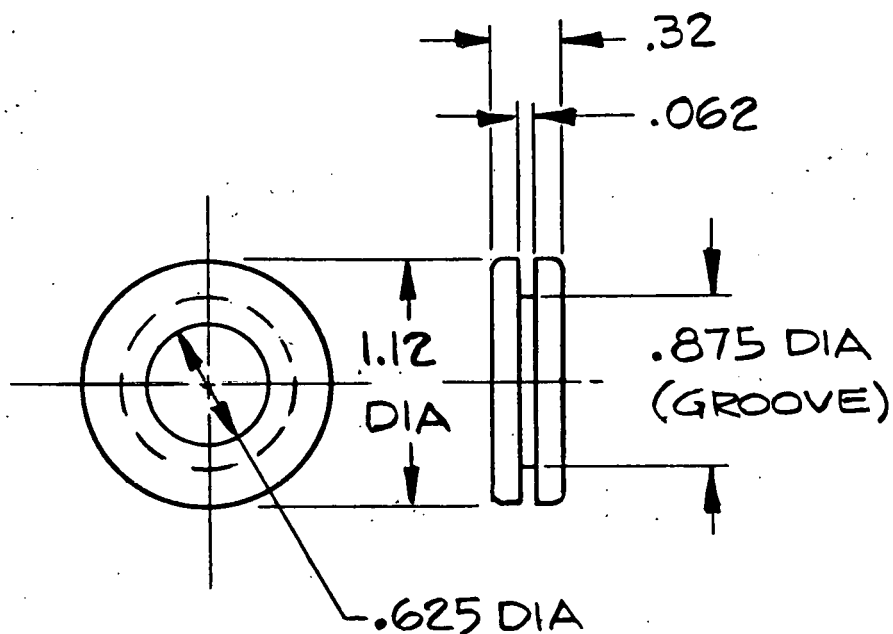
NOTES:

1. MATERIAL:

RUBBER, SYNTHETIC
COLOR BLACK

2. VENDOR(S)

RUBBERCRAFT

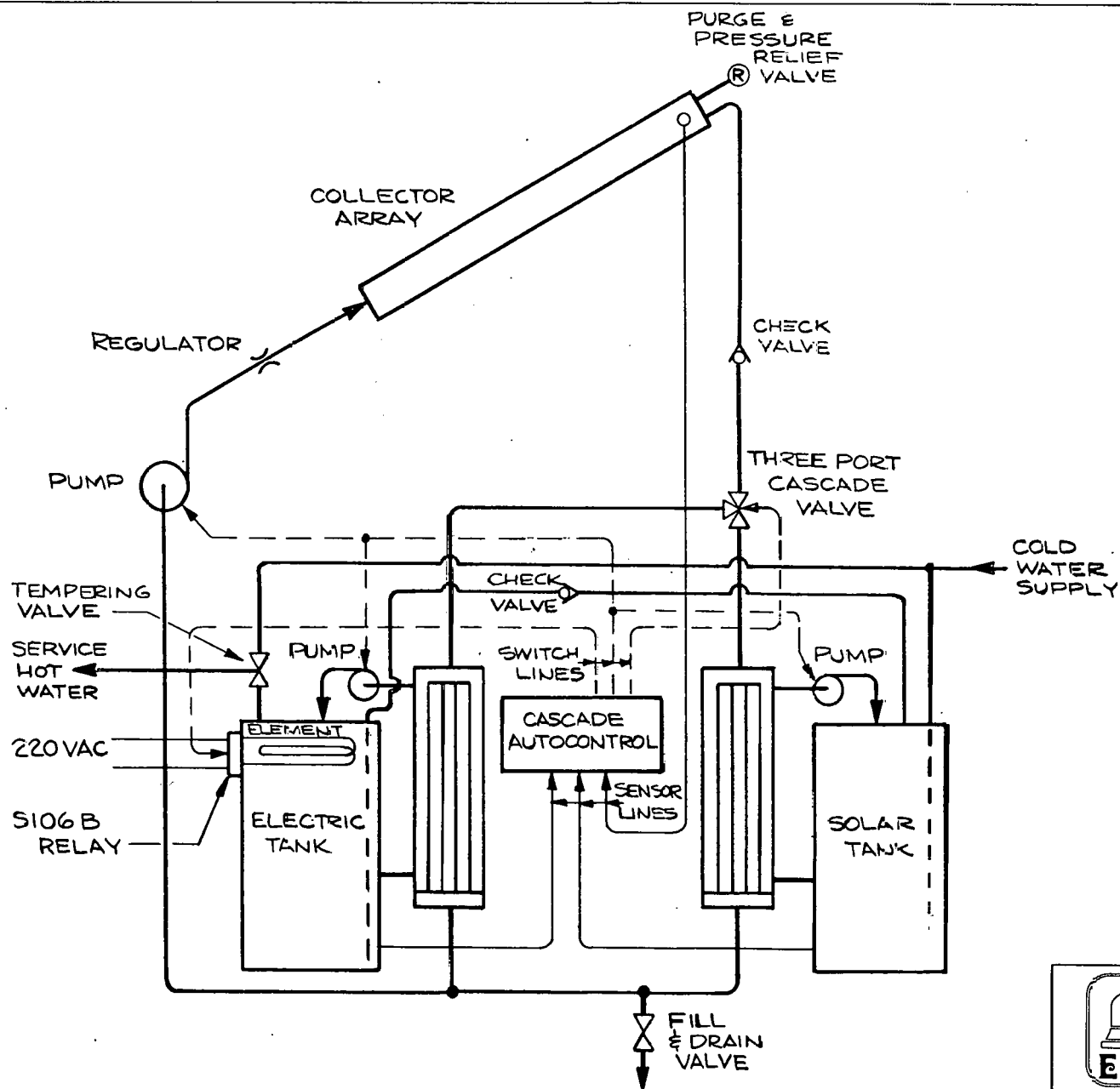


5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

ELCAM, INC.

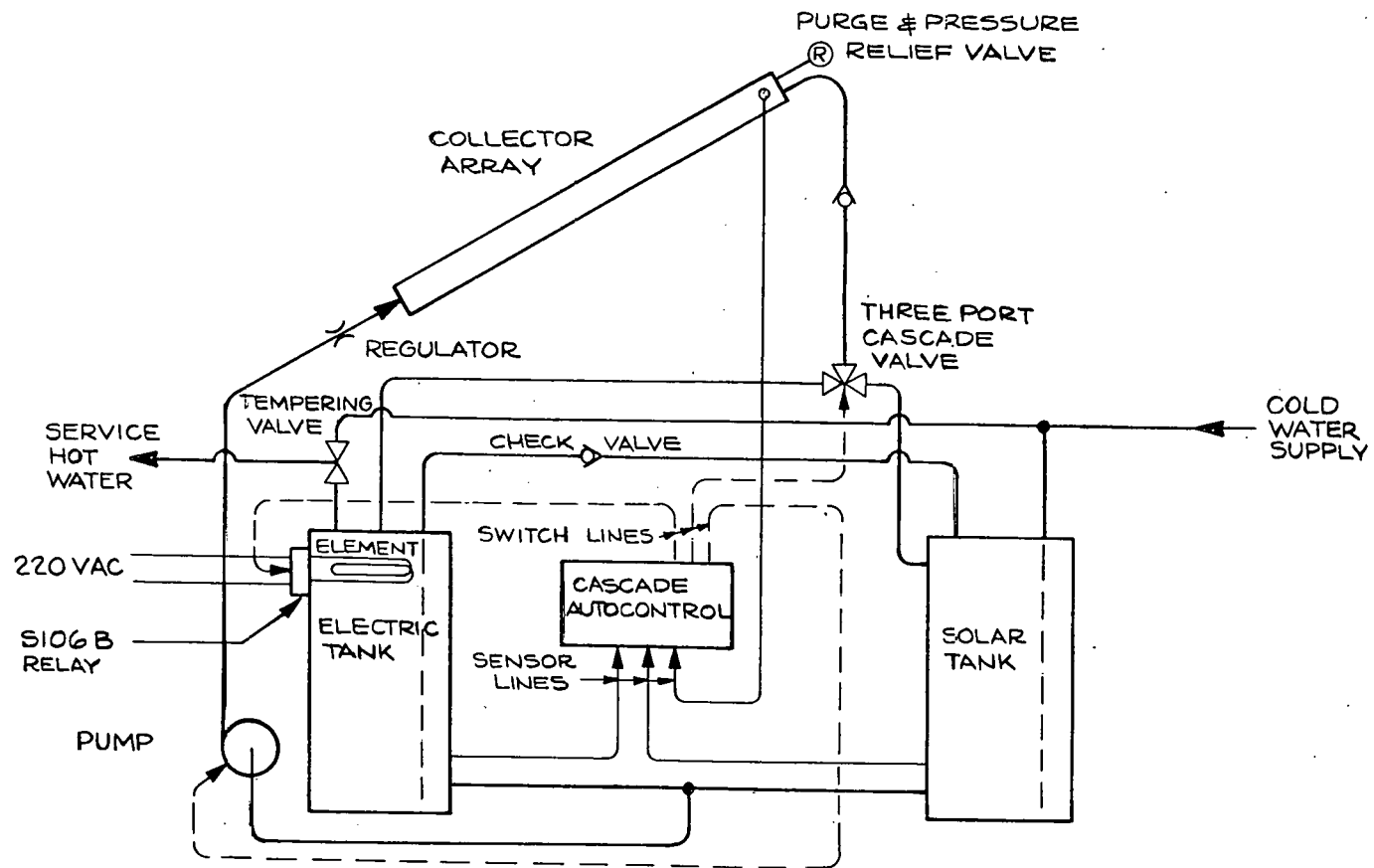
Contractors License No. 290399

TOLERANCES		REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP10		
XX ± 0.0		1			PART NAME		
XXX ± 0.01		2			RUBBER GROMMET		
ANGULAR ±		3			DRAWN BY		
DRAFT		4			THOMSON		
		5	131		SCALE		
					FULL		
					DATE		
					14 NOV 76		
					MATERIAL		
					SEE NOTE 1		
					DRAWING NO		
					ESP-C10		



 ELECAM, INC. Contractors License No. 290299		5330 DEBBIE LANE SANTA BARBARA, CALIF. 93111 PHONE 964-0653			
TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	PART NAME
.XX ± 0.0 mm		1			EXTERNAL HEAT EXCHANGER
.XXX ± 0.0 mm		2			
ANGULAR ±		3			
DRAFT		4			
		5			
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ESS-2

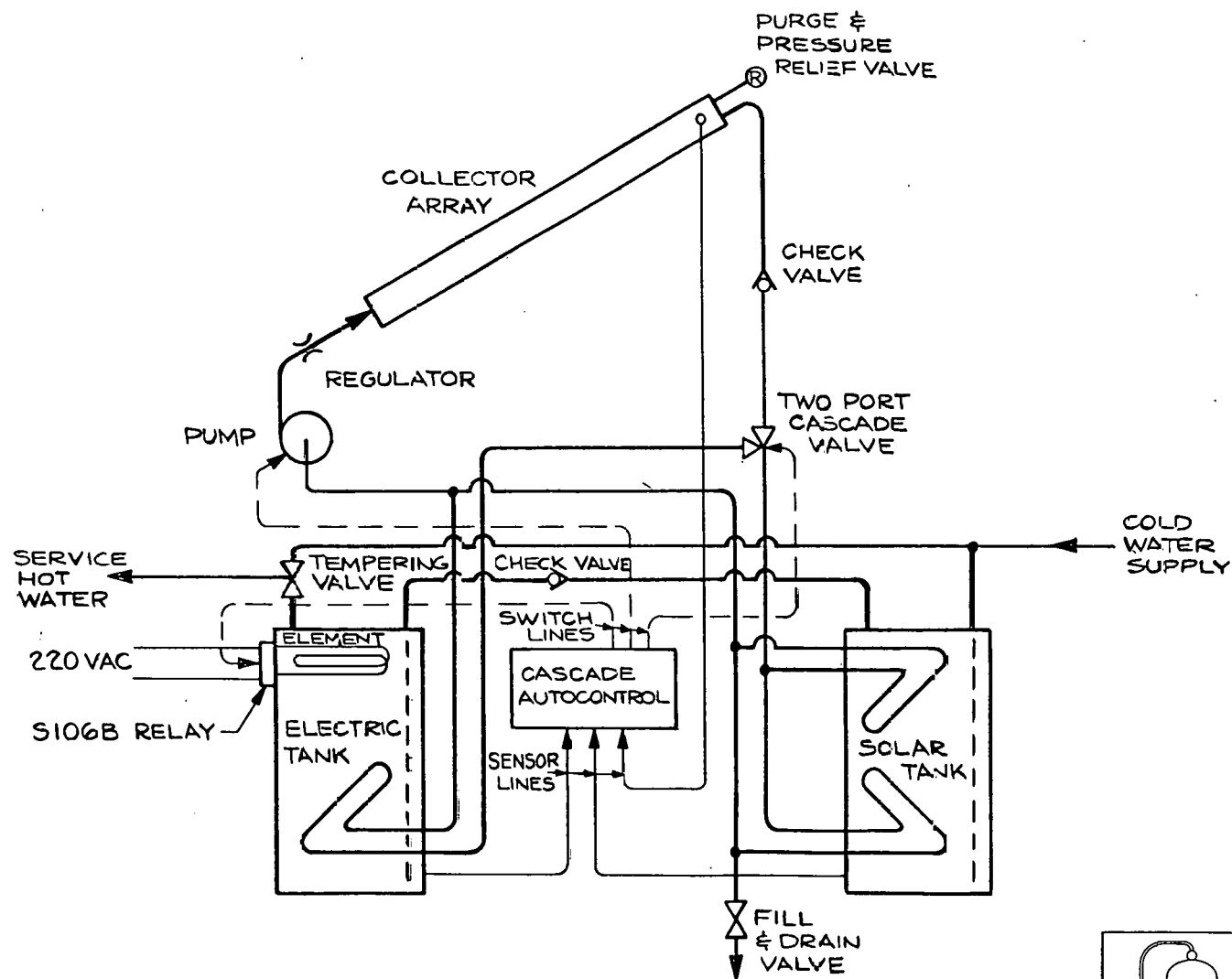


5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8803

ELECAM, INC.

Contractors License No. 790299

TOLERANCES	REVISIONS			PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	PART NAME
.XXX ± .00	1			DIRECT HEATING SYSTEM
.XXX ± .00	2			THOMSON
ANGULAR ±	3			SCALE NONE
DRAFT	4			MATERIAL -
	5			15 NOV 76
	6			ESS-3

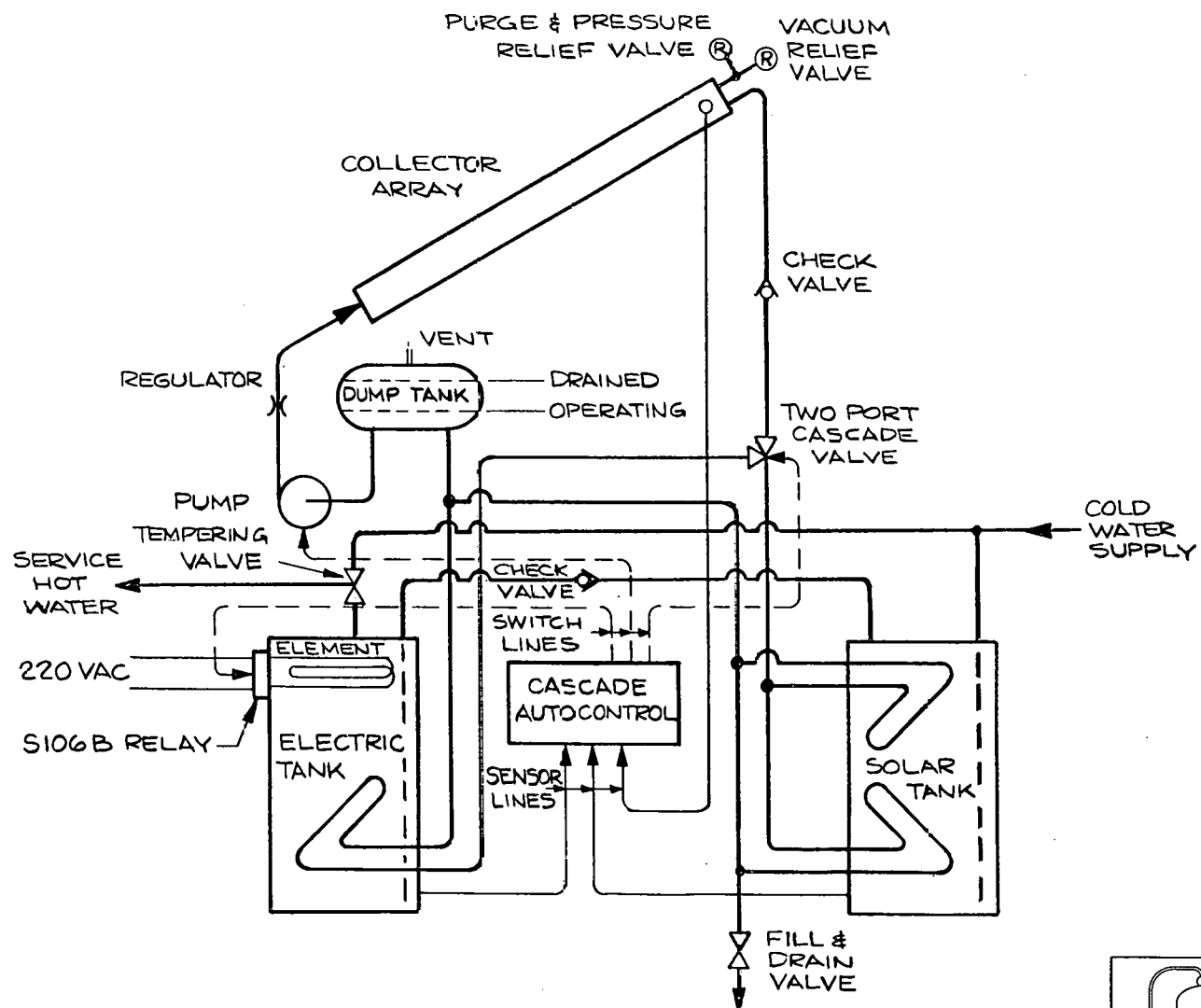


5330 DESSIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8853

ELCAM, INC.

Contractors License No. 790399

TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL	REVISIONS			PART NUMBER	
	NO	DATE	BY	PART NAME	
.XX ± .00	1			INTERNAL HEAT EXCHANGER	
.XXX ± .00	2				
ANGULAR ±	3				
DRAFT	4				
	5				
	6			DRAWN BY THOMSON	SCALE NONE
				CHECKED 16 NOV 76	MATERIAL —
				TRACED	DATE 16 NOV 76
					APP'D ESS-1

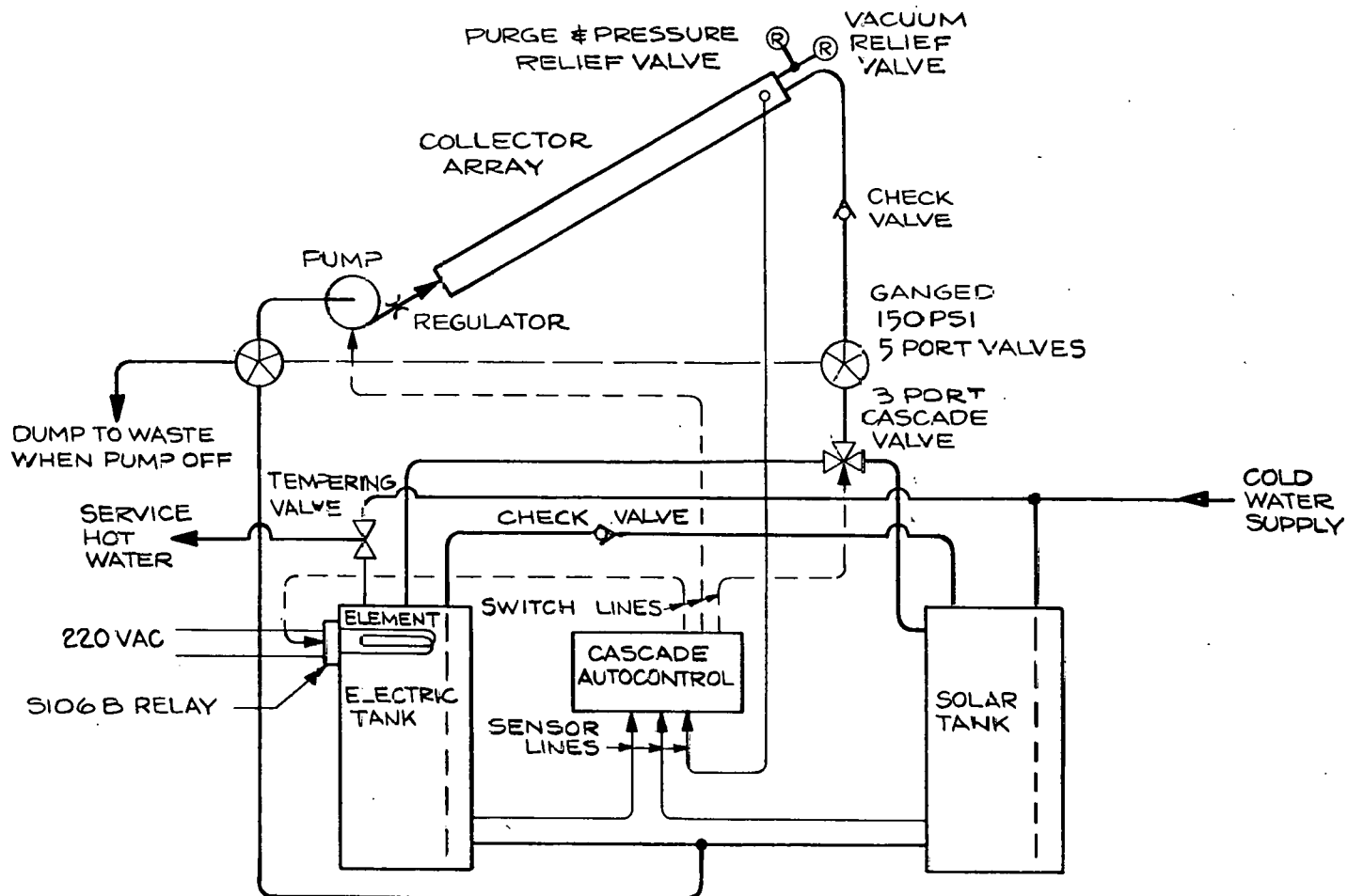


5230 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 804-8053

ELCAM, INC.

Contractor's License No. 290399

TOLERANCES	NO	DATE	BY	PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL	1			PART NAME DUMP TANK WITH
.XX ± 0.0	2			INTERNAL HEAT EXCHANGER
.XXX ± 0.0	3			THOMPSON SCALE NONE MATERIAL
ANGULAR ±	4			CHD 14 NOV 76 DRAWING NO
DRAFT	5			TRACED 1000 ESS-4

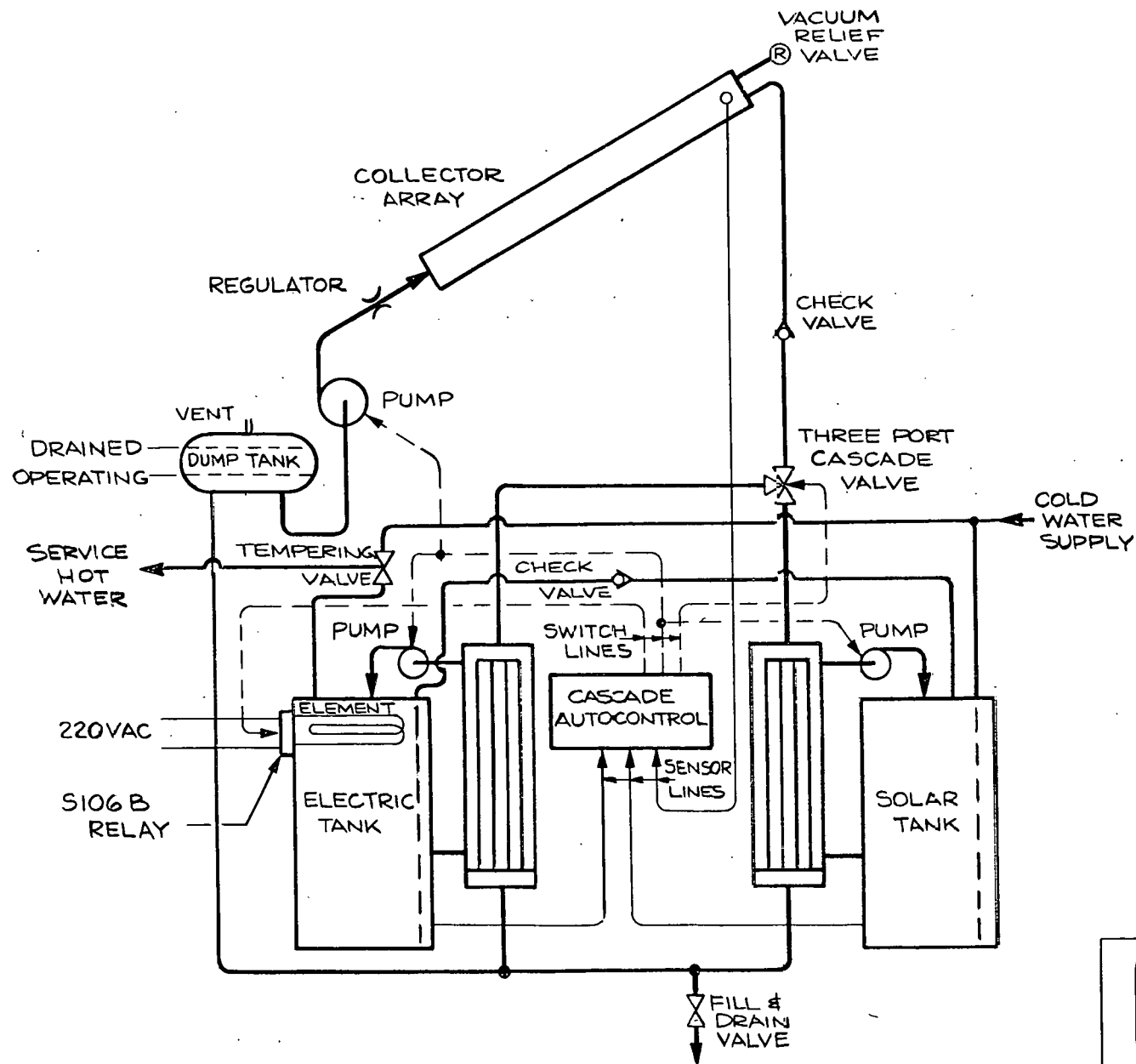


5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954-9855

ELCAM, INC.

Contractors License No. 290299

TOLERANCES	REV. SIGNS			PART NUMBER
	NO	DATE	BY	
UNLESS OTHERWISE SPECIFIED DECIMAL	1			PART NAME
.XX ± .00	1			DIRECT DUMP OPTION
.XXX ± .00	1			DESIGNED BY
ANGULAR ±	1			THOMSON
DRAFT	1			SCALE
	1			NONE
	1			MATERIAL
	1			-
	1			DATE
	1			15 NOV 76
	1			DRAWING NO.
	1			ESS-5
	1			TRACED



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8693

Contractors License No 79039

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	PART NAME	
.XX ± .00 —	1			DUMP TANK WITH	
.XXX ± .00 —	2			EXTERNAL HEAT EXCHANGER	
ANGULAR 2 DRAFT	3			THOMSON	MATERIAL
	4			CHS D	SC 115 NONE
	5			THXCD	ISS NOV 76
	6				DRAWING NO
					ESS-6

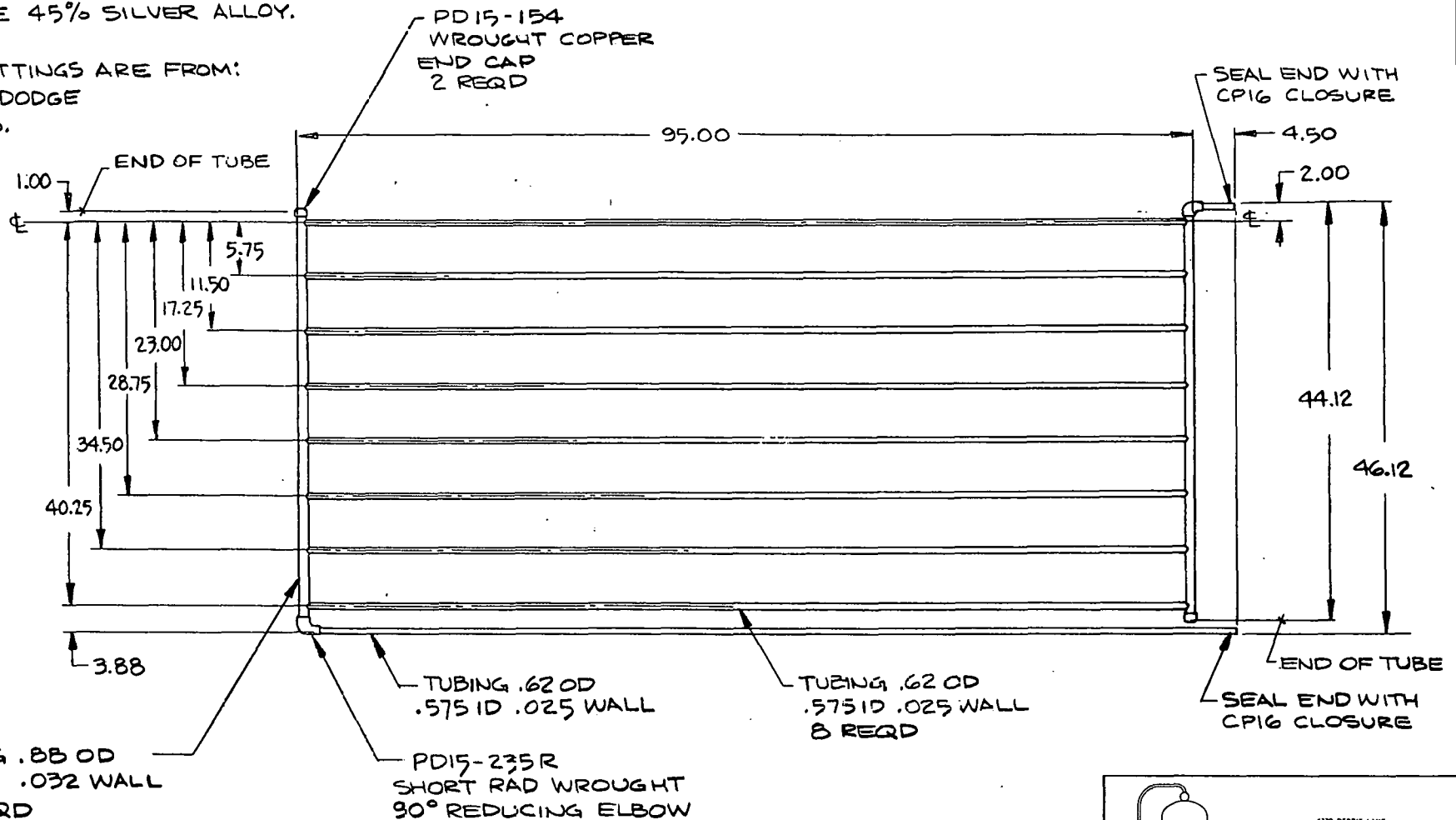
NOTES:

1. MATERIAL:

COPPER TUBE, ROUND SEAMLESS, HARD
DRAWN, TYPE M - OPTION ALLOY 330.

2. ALL SEAMS SHALL BE BRAZED USING
UNIBRAZE 45% SILVER ALLOY.

3. PD15 FITTINGS ARE FROM:
PHELPS - DODGE
PSCM NO.



8330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-0883

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY
.XX ± .006		1		
.XXX ± .00		2		
ANGULAR ±		3		
DRAFT		4		
		5		
				CP2
				PART NAME
				ABSORBER WATERWAY
THOMPSON		SCALE	1/10	SHEET NOTE 1
CNS		DATE	14 NOV 76	
TRACED		APP'D		ESP-C2

NOTES:

1. MATERIAL:

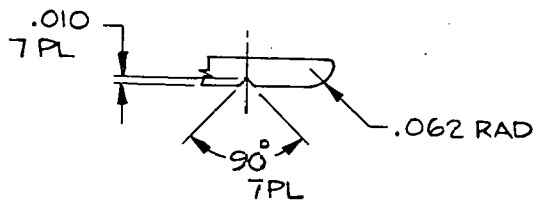
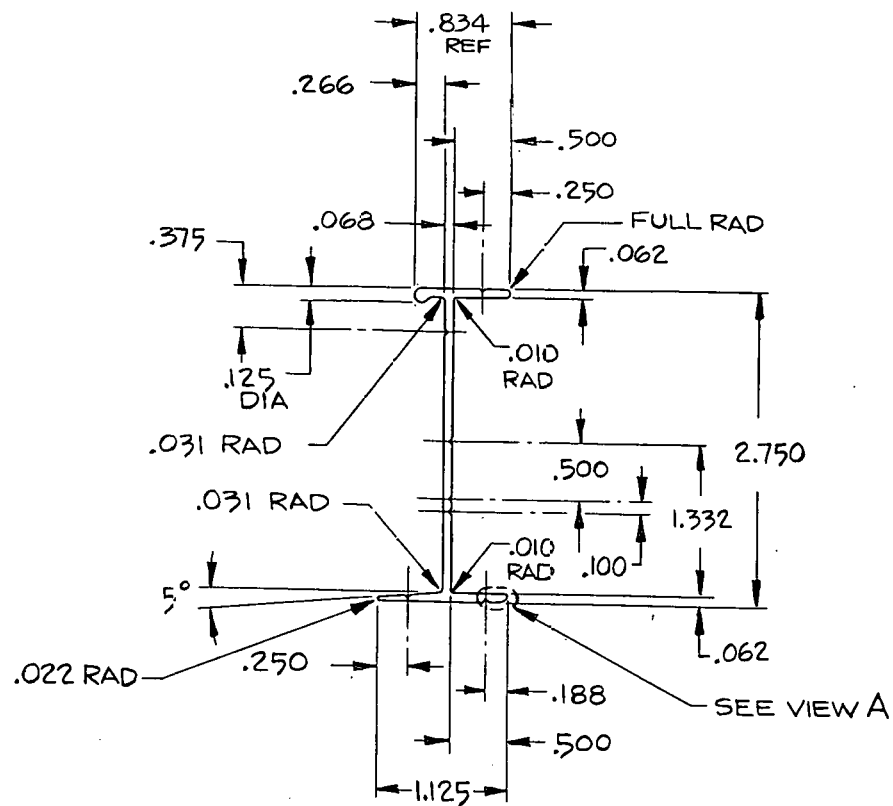
ALUMINUM ALLOY EXTRUSION
CMPSN 6063 TEMPER T5
DIE SECTION 67026 -A

2. VENDOR:

REYNOLDS METALS CO.
FSCM NO.

3. PROTECTIVE FINISH:

ELECTRO-DEPOSITED
COMMERCIAL DARK
BROWN



VIEW A
SCALE: 4/1



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964 8693

Contractors License No. 790399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		DATE		CP3	
.X15 = .005		1		PART NAME	
.X11 = .00		2		SIDE CHANNEL	
ANGULAR =		3		DRAWING NO	
DRAFT		4		DRAWING NO	
VENDOR'S		5		DATE	
STD TOL		6		13 NOV 16	
APPLY		7		ESP-C3	

1. MATERIAL:

2. VENDOR:

3. PROTECTIVE FINISH:

[illegible]

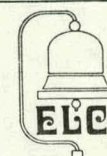
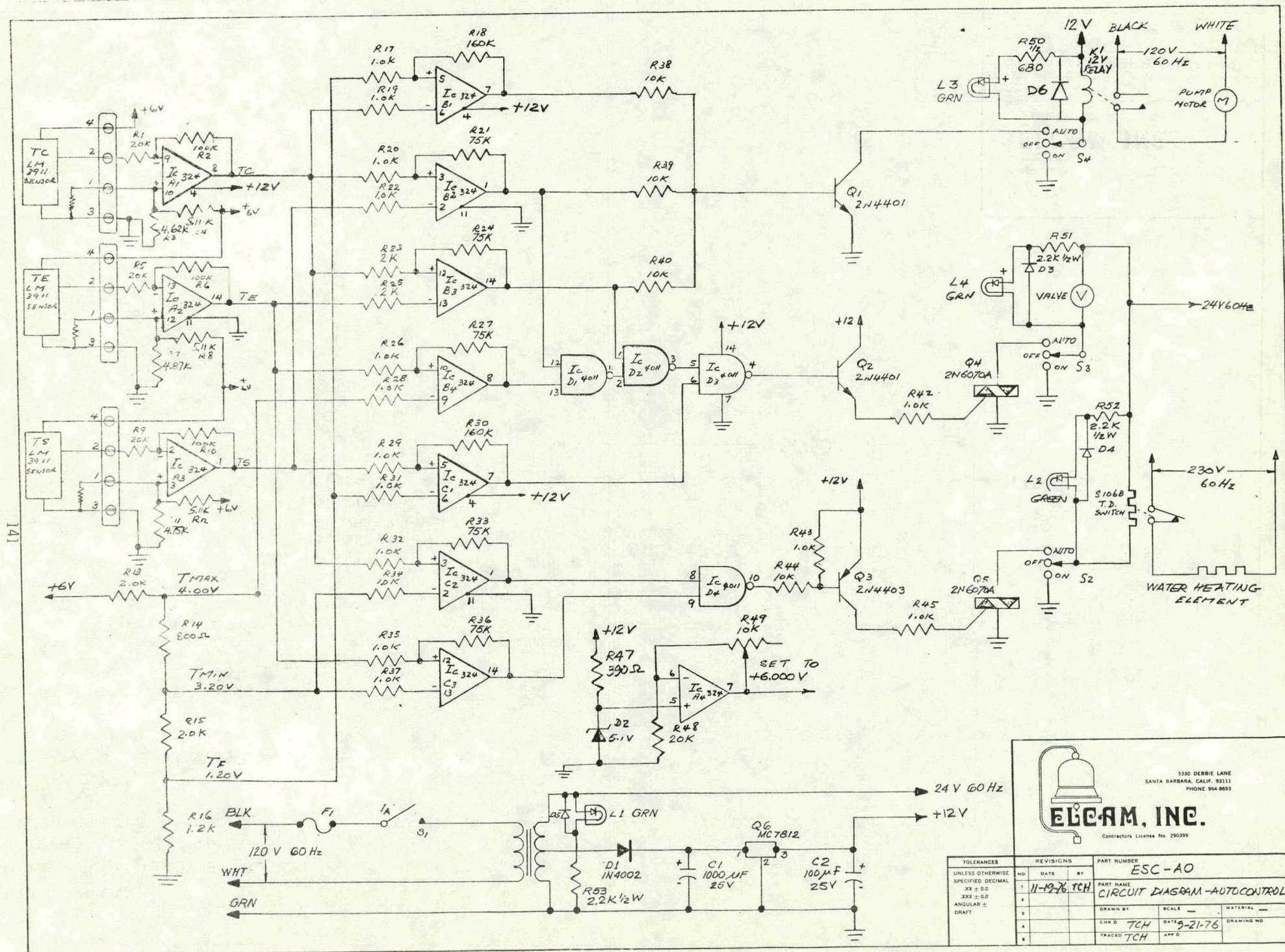
140



ELCAM, INC.

Contracting License No. 22024

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP4
.XX ± 0.0		1			PART NAME
.XAX ± 0.05		2			COVE STRIP
ANGULAR ±		3			
DRAFT		4			
STAMP		5			
STAMP		6			
STAMP		7			
STAMP		8			
STAMP		9			
STAMP		10			
STAMP		11			
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5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954-8693

ELECAM, INC.

Contractors License No. 290399

TOLERANCES			REVISIONS			PART NUMBER		
UNLESS OTHERWISE SPECIFIED	DECIMAL		NO.	DATE	BY	ESC-AO		
XX ± 50			1	11-19-76	TCH	PART NAME		
XXX ± 50			2			CIRCUIT DIAGRAM-AUTOCONTROL		
ANGULAR ±			3			DRAWN BY	SCALE	MATERIAL
DRAFT			4			CHK'D	DATE	DRAWING NO.
			5			TRACED	APP'D	

NOTES:

1. MATERIAL:

ALUMINUM ALLOY EXTRUSION
CMP5N 6063 TEMPER T5
DIE SECTION 66890

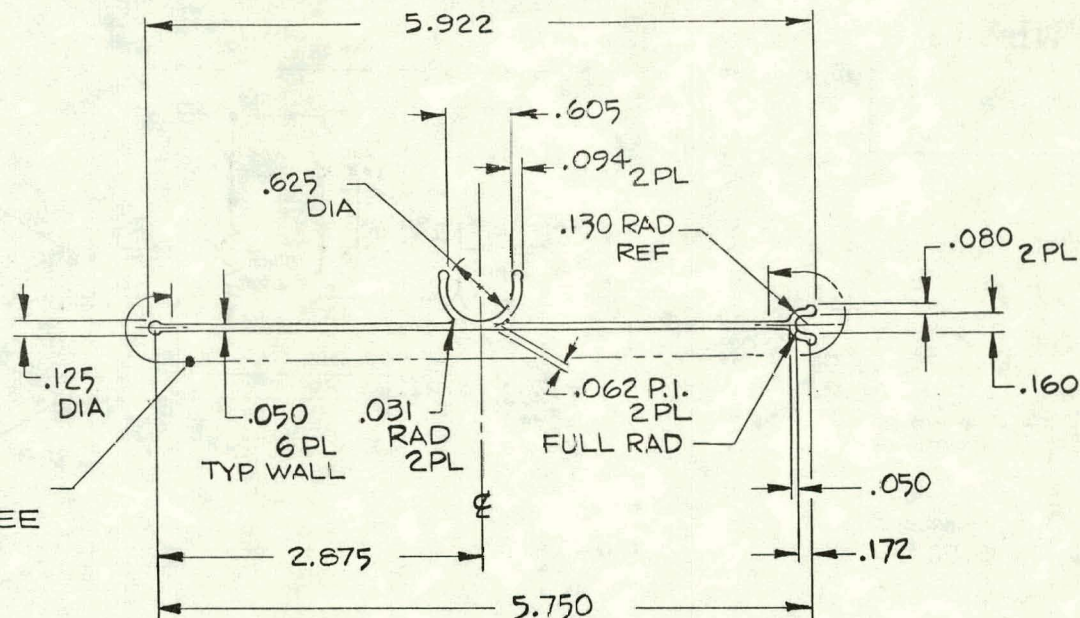
2. VENDOR:

REYNOLDS METALS CO.
FSCM NO.

3. PROTECTIVE FINISH:

CHEM FILM (ALODINE) ENTIRE
PART, FINISH COAT WITH MARTIN NO.23
(LUSTERLESS BLACK) ON
INDICATED AREA.

BLACK
FINISH THIS
SURFACE, SEE
NOTE 3



142



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8093

ELCAM, INC.

Contractors License No. 290399

TOLERANCES		REV SIGNS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	
XX ± .00		1			
XXX ± .00		2			
ANGULAR ±		3			
DRAFT		4			
VENDOR'S STD TOL APPLY		5			
				PART NAME	
				CPI	
				PART NAME	
				AESORBER SNAP FIN	
				DRAWN BY	
				THOMSON	
				SCALE	
				FULL	
				DATE	
				12 NOV 76	
				DRAWING NO	
				ESP-C1	
				TRACED	
				APP D	

NOTES:

1. MATERIAL:

ALUMINUM ALLOY EXTRUSION

CMPSN 6063 TEMPER T5

DIE SECTION NO.

2. VENDOR:

3. PROTECTIVE FINISH:

ELECTRO-DEPOSITED

COMMERCIAL DARK

BROWN

.097-.102 DIATHRU
2 HOLES

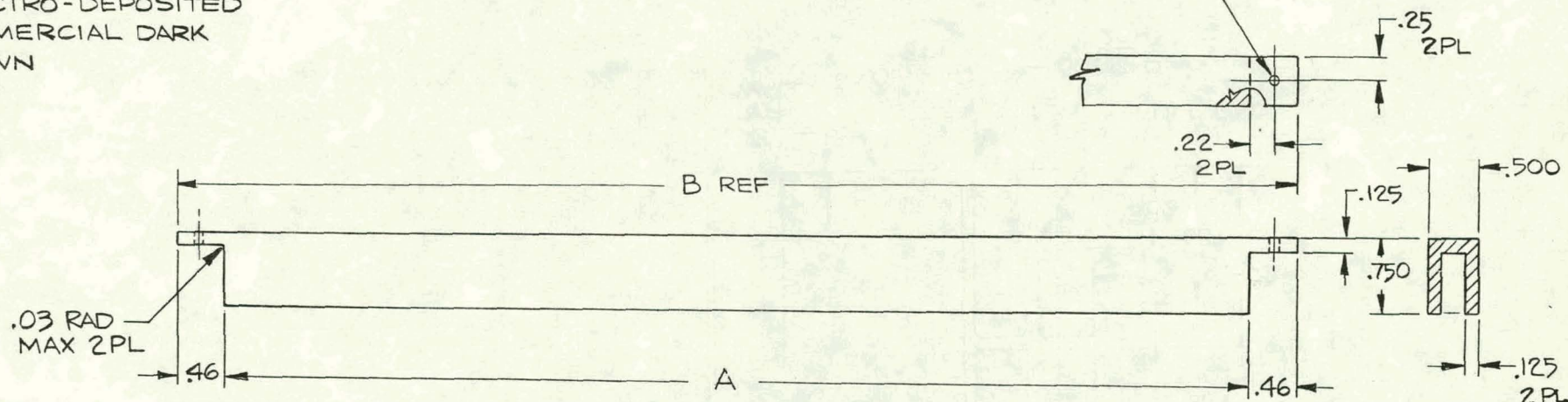
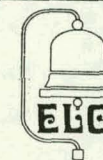


TABLE I

PART NO.	NOTCHED LENGTH A	CUT LENGTH B REF	REMARKS
CP5-001	47.38	48.30	



5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 964-8553

Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL		NO	DATE	BY	CP5
XX ± 0.02		1			PART NAME
XXX ± 0.0		2			CROSS CHANNEL
ANGULAR ±		3			SCALE: FULL
DRAFT		4			DATE: 13 NOV 76
SECTION		5			DRAWING NO: ESP-C5
TOL ±		TRACED			
VENDOR 31D					

NOTES:

1. MATERIAL:

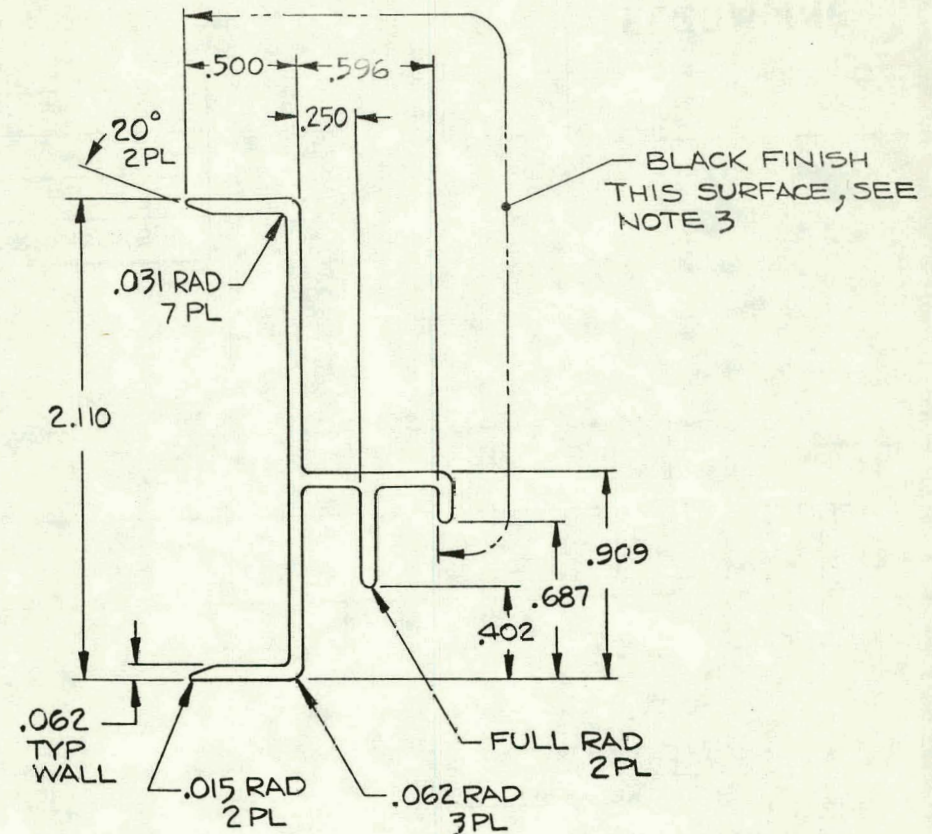
ALUMINUM ALLY EXTRUSION
CMPSN 6063 TEMPER T5
DIE SECTION NO. 67106

2. VENDOR:

REYNOLDS METALS CO.
FSCM NO.

3. PROTECTIVE FINISH:

CHEM FILM (ALODINE) ENTIRE PART,
COAT INDICATED AREA WITH
MARTIN NO. 4 (LUSTERLESS BLACK)
AIRDY.

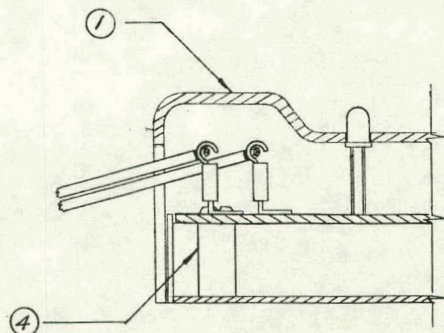
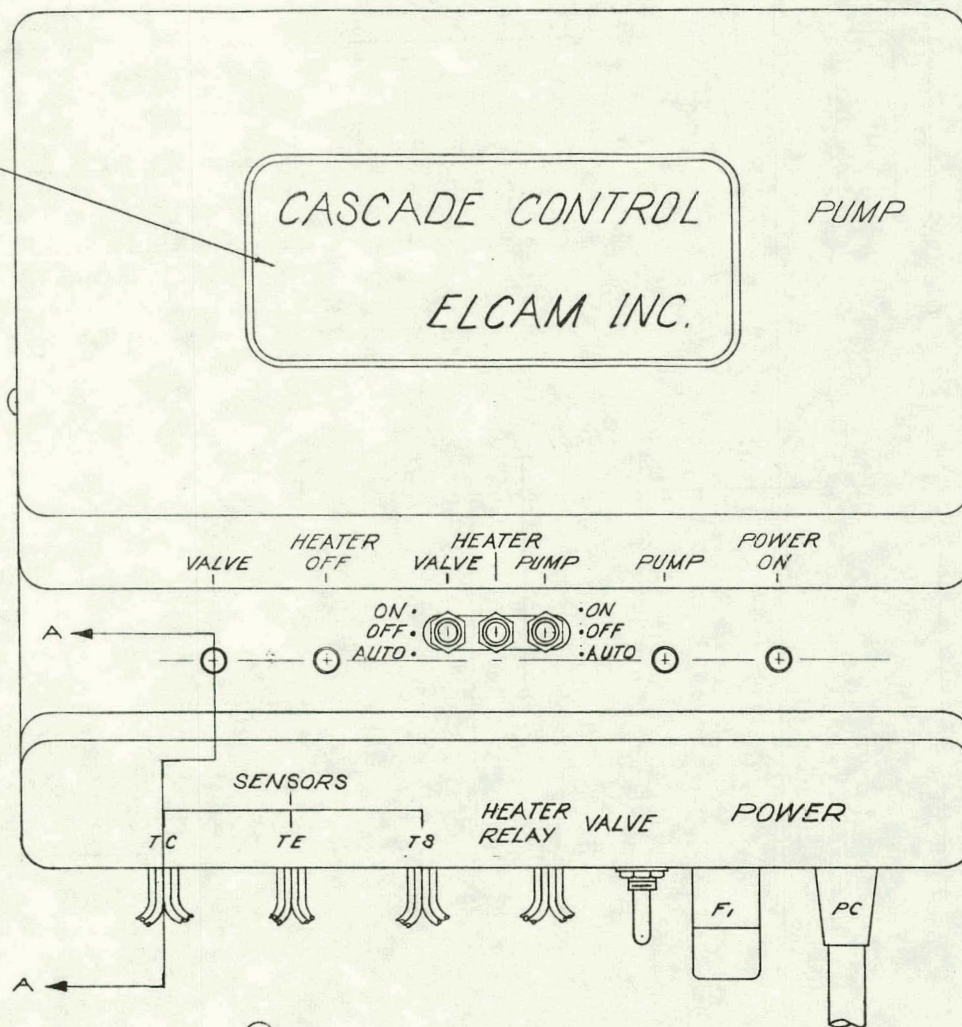


5330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 954 8603

ELCAM, INC.

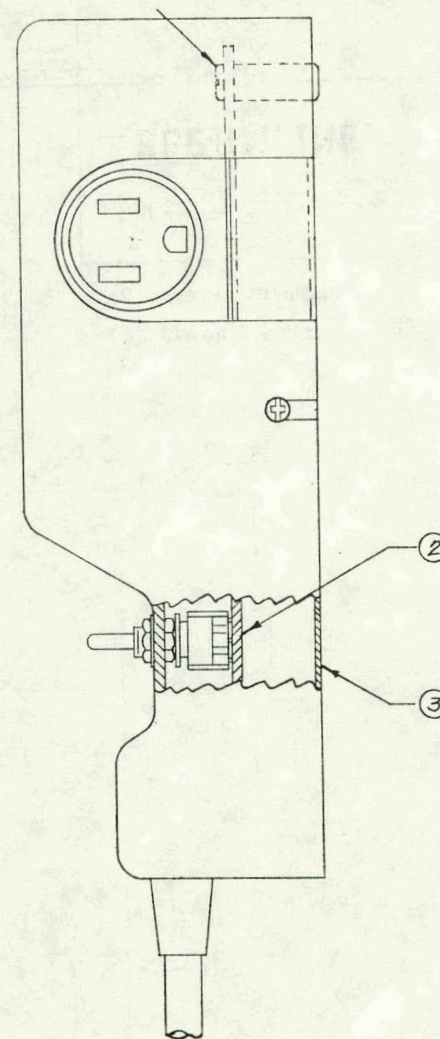
Contractors License No. 290399

TOLERANCES		REVISIONS		PART NUMBER
NO.	DATE	BY		CP6
UNLESS OTHERWISE SPECIFIED DECIMAL				
1				PART NAME
2				ABSORBER RESTRAINT
3				THOMSON
4				SCALE 2/1 SEE NOTE 1
5				DATE 13 NOV 76
6				DRAWING NO. ESP-06
7				TRACED
8				APP'D



SECTION A-A

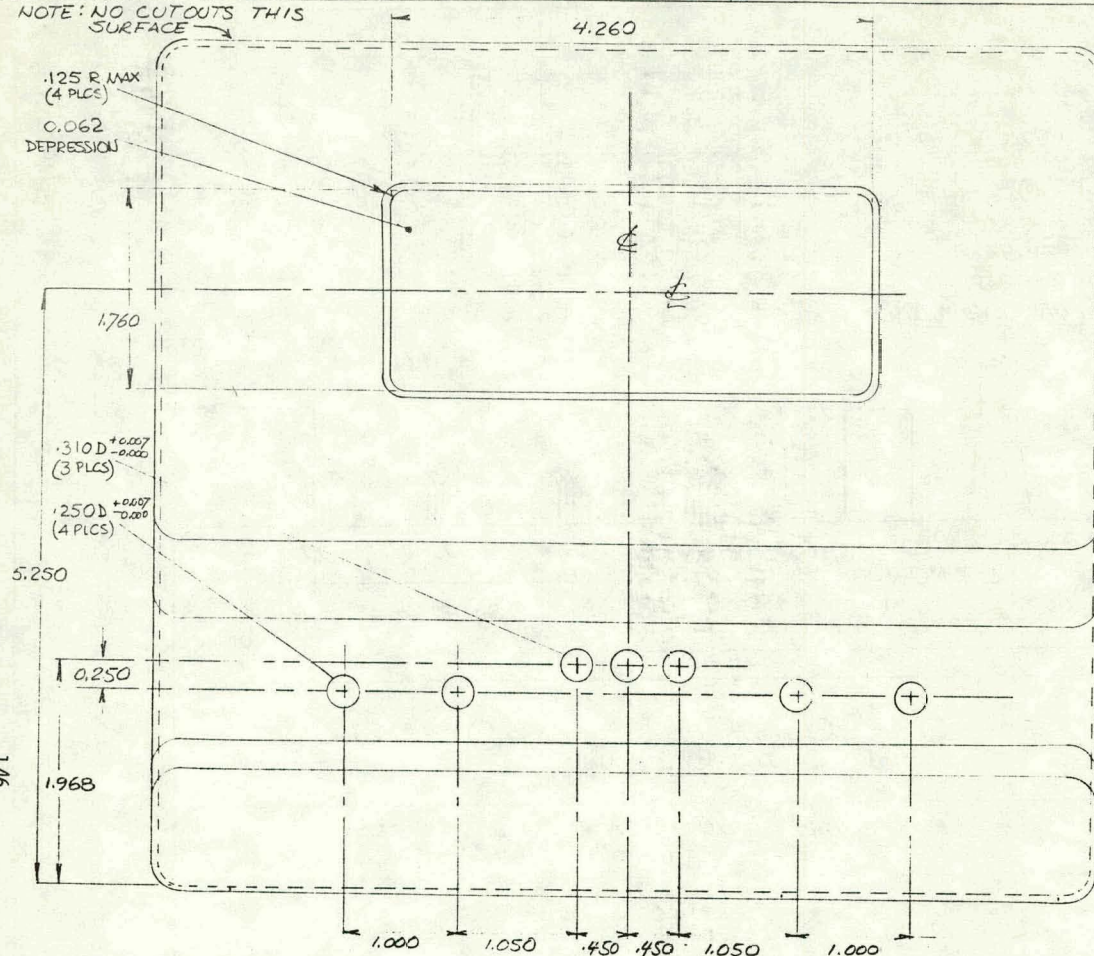
ITEM	PART NO.	DESCRIPTION	QTY
1	X5280-2	COVER	1
2	X5280-2A	CIRCUIT BOARD ASSY.	1
3	X5280-4	BASE PLATE	1
4	X5280-41	STAND-OFF	5
5	X5280-40	SCREW	5
6	68-0708-0	SCREW	2
7	X5280-50	LOGO	1



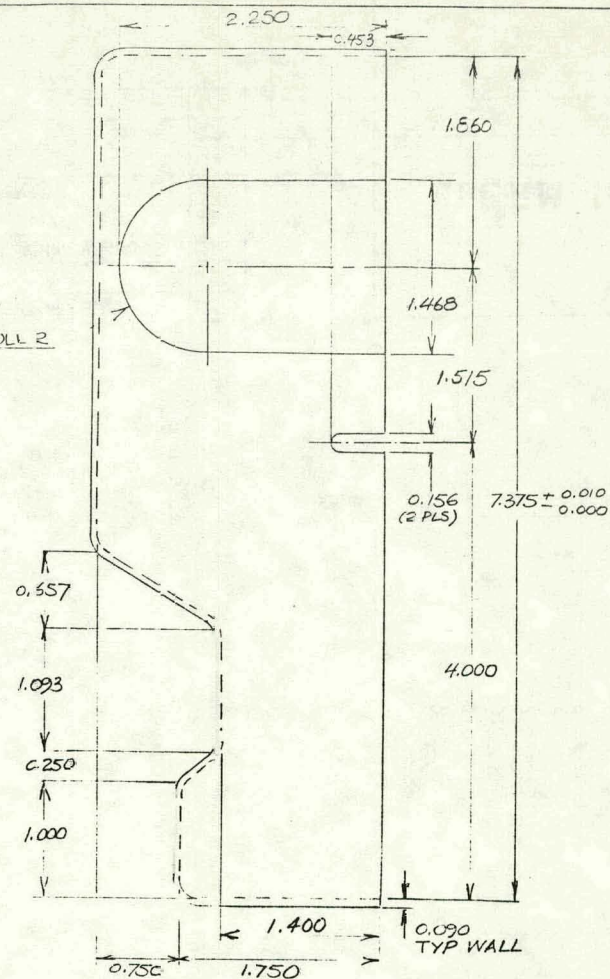
 ELCAM, INC. Contractors License No. 290399		5330 DEBBIE LANE SANTA BARBARA, CALIF. 93111 PHONE 964 8693	
TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL XX ± 0.0 XXX ± 0.0 ANGULAR ± DRAFT		REVISIONS NO. DATE BY	
PART NAME AUTOCONTROL ASSEMBLY		SCALE 1:1 MATERIAL	
DRAWN BY TDF		DATE 9-22-76	
CHK'D TCH		APP'D	
TRACED		DRAWING NO.	

NOTE: NO CUTOUTS THIS SURFACE

.125 R MAX
(4 PLCS)
0.062
DEPRESSION



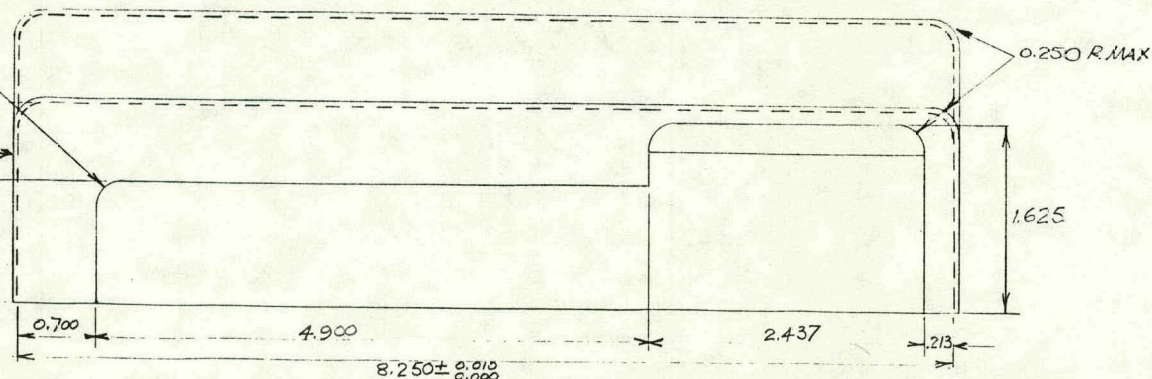
FULL 2



0.250 R

NOTE: ONLY ONE CUTOUT THIS SURFACE (156 SLOT)

1.050



② COLOR: BLACK

① FINISH: HAIRCELL



3330 DEBBIE LANE
SANTA BARBARA, CALIF. 93111
PHONE 914 8693

Contractors License No. 290395

TOLERANCES		REVISIONS		PART NUMBER	
UNLESS OTHERWISE SPECIFIED DECIMAL	NO	DATE	BY	ESC-A2	
XX ± 0.0	1	9-24-76	TCH	COVER - AUTOCONTROL	
XXX ± 0.008	2			DRAWN BY TCH SCALE 1:1	
ANGULAR ±	3			DATE 9-21-76	
CRAFT ± 2°	4			CHK'D WKM	
	5			TRACED	
	6			APP'D	