

DOE/NASA CONTRACTOR REPORT

DOE/NASA CR-150771

SOLAR CONTROL DESIGN PACKAGE

Prepared from documents provided by

Solar Control Corporation
5595 Arapahoe Road
Boulder, Colorado 80302

Under Contract NAS8-32258 with

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

For the U. S. Department of Energy

(NASA-CR-150771) SOLAR CONTROL DESIGN
PACKAGE (Solar Control Corp., Boulder,
Colo.) 57 p HC A04/MF A01 CSCI 10A

N78-31535

Unclas
G3/44 30266

U.S. Department of Energy

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SPRINGFIELD, VA. 22161



Solar Energy

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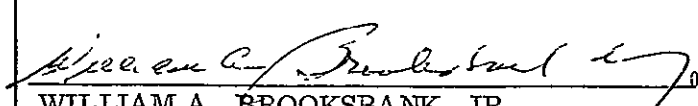
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|---|--|---|
| 1. REPORT NO. DOE/NASA CR-150771 | 2. GOVERNMENT ACCESSION NO. | 3. RECIPIENT'S CATALOG NO. |
| 4. TITLE AND SUBTITLE Solar Control Design Package | | 5. REPORT DATE August 1978 |
| | | 6. PERFORMING ORGANIZATION CODE |
| 7. AUTHOR(S) | | 8. PERFORMING ORGANIZATION REPORT # |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS Solar Control Corporation 5595 Arapahoe Road Boulder, CO 80302 | | 10. WORK UNIT NO. |
| | | 11. CONTRACT OR GRANT NO. NAS8-32258 |
| 12. SPONSORING AGENCY NAME AND ADDRESS National Aeronautics and Space Administration Washington, D. C. 20546 | | 13. TYPE OF REPORT & PERIOD COVERED Contractor Report |
| | | 14. SPONSORING AGENCY CODE |
| 15. SUPPLEMENTARY NOTES This work was done under the technical management of Mr. James Hankins, George C. Marshall Space Flight Center, Alabama. | | |
| 16. ABSTRACT This report contains information used in the evaluation of design of Solar Control's solar heating and cooling system controller and the Solarstat. Some of the information includes system performance specifications, design data brochures, and detailed design drawings. Slight modifications have been made for clarification only. | | |
| 17. KEY WORDS | | 18. DISTRIBUTION STATEMENT Unclassified-Unlimited  WILLIAM A. BROOKSBANK, JR. Mgr, Solar Heating and Cooling Project Office |
| 19. SECURITY CLASSIF. (of this report) Unclassified | 20. SECURITY CLASSIF. (of this page) Unclassified | |

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SUBSYSTEM PERFORMANCE SPECIFICATION

Specification No. SHC-3064

Page Date 3-9-77

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1.0 INTRODUCTION

This Performance Specification establishes the requirements for the design and performance of the subsystem. It designates the Interim Performance Criteria applicable to the subsystem and defines the deviations.

2.0 APPLICABLE DOCUMENTS

2.1 Government Documents

See Appendix F

2.2 Contractor Documents

-Application Note 74-116 for Solar Heating and Cooling, 1974.

-Zia Four Mode Controllers - #75-140 and #75-160, 1975.

-Zia Modular Controllers - #75-170 Series, 1975.

-Zia #75-150 Solar Air Handling Moduls (SAM), 1975.

2.3 Other Documents

-Proceedings of the Solar Heating and Cooling For Buildings

Workshop, Part I: Technical Sessions, March 21 and 22, NSF/RA/N-

73-004.

-Solar Heating Handbook For Los Alamos, LA-5967 May 1975.

3.0 APPLICATION OF INTERIM PERFORMANCE CRITERIA

The application of each paragraph of the Interim Performance Criteria to the subsystem is provided in the following table, Number 1.

4.0 DEVIATIONS FROM INTERIM PERFORMANCE CRITERIA

None

SUBSYSTEM PERFORMANCE SPECIFICATION

Specification No. SHC-3064

Page Date 3-9-77

Page _____ of _____

5.0 GOVERNMENT FURNISHED PROPERTY

: None

6.0 GOVERNMENT DIRECTED REQUIREMENTS

7.0 SUBSYSTEM GENERAL SPECIFICATION AND FEATURES

The following _____ page delineates the general specifications and features of the Series 75-170, Modular-Control Subsystem.

Modular Controller Series 75-170

Table I

Residential subsystems: Interim Performance Criteria Summary

The following Interim Performance Criteria paragraphs are applicable:

- 1.7 Control
 - 1.7.1 Installation and Maintenance
 - 1.7.3 Inhabited Space Temperature
- 2.5 Subsystem Isolation
 - 2.5.1 Shutdown in Multi-Family Housing
- 4.1 Plumbing and Electrical Installation
 - 4.1.2 Electrical Codes
- 4.2 Fail-Safe Controls
 - 4.2.1 System Failure Prevention
- 5.2 Temperature and Pressure Resistance
 - 5.2.1 Thermal Degradation
- 6.1 Accessibility for Maintenance
 - 6.1.1 Access for System Maintenance
 - 6.1.2 Access for System Monitoring
- 6.2 Installation, Operation, and Maintenance Manual
 - 6.2.1 Installation Instructions
 - 6.2.2 Maintenance and Operation Instructions
 - 6.2.3 Maintenance Plan
 - 6.2.4 Replacement Parts
- 6.3 Repair and Service Personnel
 - 6.3.1 Maintenance of H and HC Systems
- 11.3.1 Material Compatibility

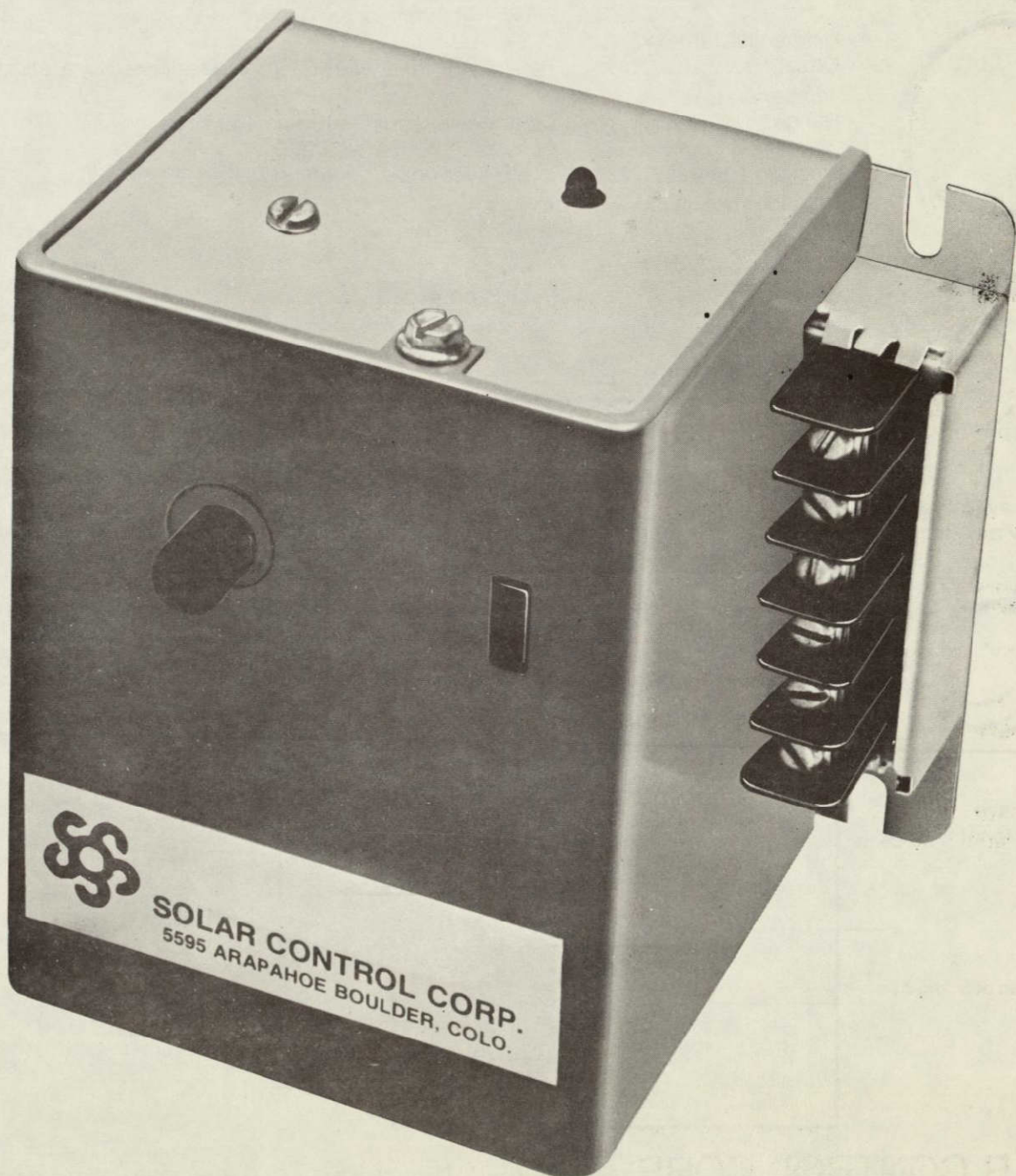
SCC 75-171 Solid State Solar Differential Controller

General Specifications:

| | |
|---|--|
| 1. Input Voltage: | Either 120 VAC \pm 10 V or 24 VAC \pm 4 V |
| 2. Input Power: | 3 watts (no-load) |
| 3. Outputs | DPDT (3PDT available) |
| 4. Output Current | 10 amp (resistive) at 28 VDC or 120 VAC (higher ratings available) |
| 5. Output Voltage | Either 120 VAC or 24 VAC |
| 6. Sensors | Matched thermistors, $\pm 1^\circ\text{C}$ over range from 0°C to $+100^\circ\text{C}$ in a metal housing with high temperature teflon leads |
| 7. Differential Turnoff Offset | Typically $4^\circ\text{F} \pm 2^\circ$ @ 100°F (can be custom adjusted by a resistor change) |
| 8. Differential Turnon Offset | Typically $20^\circ\text{F} \pm 2^\circ$ @ 100°F (can be custom adjusted by a resistor change) |
| 9. Operating Temperature Range | Controller chassis: 0°F to 140°F Sensors: -40°F to 300°F |
| 10. Tracking Accuracy | $\pm 5^\circ\text{F}$ over entire operating range |
| 11. Isolation Protection | 1500 V |
| 12. Size | Basic Module about 4" x 4" x 3½" |
| 13. Weight | Less than 2 lb. |
| 14. Multichannel Priority | 24 VAC interconnect logic |
| 15. Mounting | Mount on "J" box or on wall or pump housing |
| 16. Collector freeze protect (differential signal "on" typically; remote signal also available) | At $40^\circ\text{F} \pm 5^\circ$ |
| 17. Manual "on" Button | |
| 18. Operating Light | 100,000 hr. LED illuminates to indicate operation |
| 19. Distribution Channel and Auxiliary Heater Control | For 75-172, 75-173 configuration |
| 20. Multi-Tank Control | For 75-175 configuration |



SOLID STATE SOLAR HOT WATER CONTROLLER

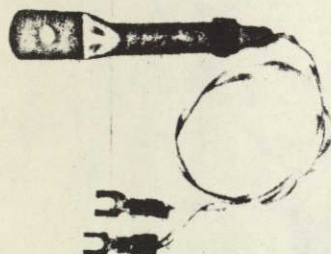
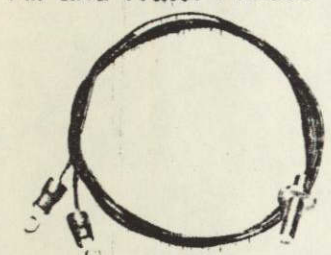


Model 77-171 Solid-State Solar Hot Water Controller

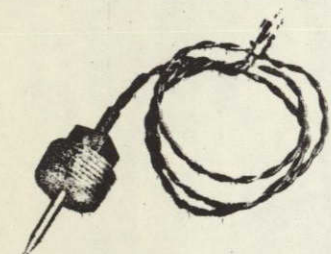
Description

The model 77-171 is a solid-state differential thermostat capable of fully controlling a solar hot water heating system. The unit is designed for a lifetime of maintenance free service, and incorporates freeze and boil protect circuitry.

Air and Water Probes



Air probes are available for clamp or screw mounting.



Water probes have 1/2" NPC thread, in lengths from 23/4" to 28".

Specifications

Input Voltage Either 120 VAC $\pm 10\text{V}$ or 24 VAC $\pm 4\text{V}$.

Input Power 3 watts, no load.

Control Relay SPDT, 10A. (resistive) at 28 VDC or 120 VAC. Higher ratings available.

Output Voltage Either 120 VAC or 24 VAC.

Sensors Matched thermistors, ($\pm 1^\circ\text{C}$ over range from 0°C to $+100^\circ\text{C}$)
in a metal housing, with high temperature teflon leads.

Differential Turn-off

Offset Typically $4^{\circ}\text{F} \pm 2^{\circ}$ @ 100°F , (can be adjusted by a resistor change).

Differential Turn-on

Offset Typically $20^{\circ}\text{F} \pm 2^{\circ}$ @ 100°F , (can be adjusted by a resistor change).

Temperature

Range Controller chassis: -40°F to 140°F
Sensors: -40°F to +300°F

Tracking Accuracy $\pm 5^{\circ}\text{F}$ over entire operating range.

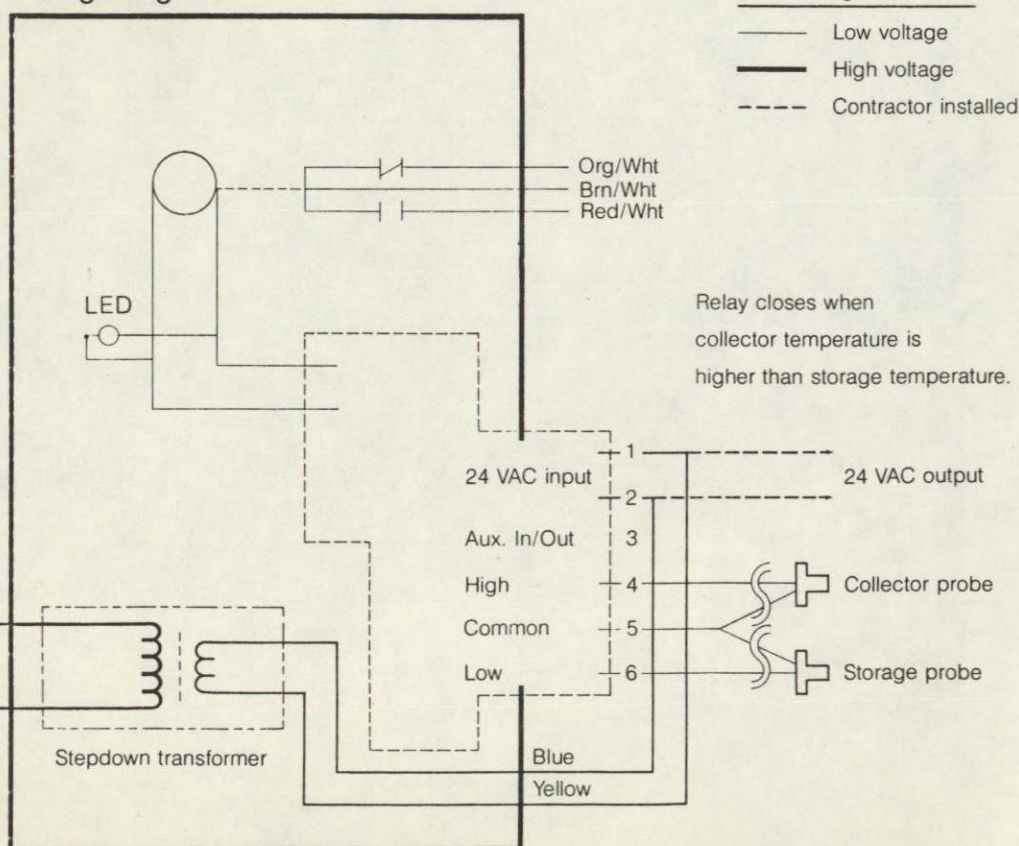
Isolation Protection 1500 V

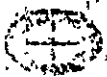
Size 4" x 4" x 3½"

Weight 2 lbs.

Mounting Mounts on 4" x 4" "J" box.

Wiring Diagram





CIA ASSOCIATES INC.

BOULDER COLORADO

CODE IDENT NO 52060

SHEET

DOC NO

10 171

DATE

REV

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DR. HENRY GARDNER

171 601 1000 1000 1000

75-171

PREPARED BY D AUGUSTO DRAWING BREAKDOWN

PAGE 2 OF 2

DATE _____ PROJECT 171 CONTROLLER (NASA)

NUMBER 76-999

| SIZE | DRAWING NUMBER | DRAWING LEVEL | | | | | | | | DOCUMENT TITLE | EXPECTED RELEASE DATE | REMARKS |
|---------------------|----------------|---------------|---|---|---|---|---|---|---|---------------------------|-----------------------|---------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | |
| D | 2816-A ✓ | X | | | | | | | | AT CONTROLLER ASSY | 2/23/77 | |
| C | 2777-C | | | X | | | | | | PWB AT | 2/22/77 | |
| C | 2801-B | | X | | | | | | | PWA AT | 2/16/77 | |
| D | 2807 | | | X | | | | | | SILK SCREEN (PWA) | 2/16/77 | |
| C | 2776-A | | | | | | | | | SCHEMATIC AT CONTROLLER | 12/13/76 | |
| C | 2803 | | | | | | | | | WIRING DIAGRAM 171 | 2/23/77 | |
| | 2804 | | | | | | | | | " " 172 | | |
| C | 2805A | | | | | | | | | " " 173 | 2/23/77 | |
| | 2806 | | | | | | | | | " " 174 | | |
| D | 2807 ✓ | | | | | | | | | " " 175 | | |
| D | 2817 ✓ | X | | | | | | | | MOD. CHASSIS BOX | 2/23/77 | |
| A | 2816-LPL | | | | | | | | | PARTS LIST | | |
| C | 2790-A ✓ | X | | | | | | | | INTERNAL WIRING | 3/7/77 | |
| C | 2764-B ✓ | X | | | | | | | | AT CONTROLLER PROBE | 12/10/76 | |
| C | 2763 ✓ | X | | | | | | | | PROBE HOUSING | 12/4/76 | |
| D | 2835 ✓ | X | | | | | | | | BASE, BOX, 171 CONTROLLER | 3/31/77 | |
| A | 2839 ✓ | | | | | | | | | AT Test Procedure | 4/4/77 | |
| C | 2876 | | | | | | | | | Test Fixture | 5/24/77 | |
| C | 2886 ✓ | | | | | | | | | Relay Assembly | 6/8/77 | |
| Prepared for: | | | | | | | | | | | | |
| SOLAR CONTROL CORP. | | | | | | | | | | | | |
| 5595 ARAPAHOE ROAD | | | | | | | | | | | | |
| BOULDER COLORADO | | | | | | | | | | | | |

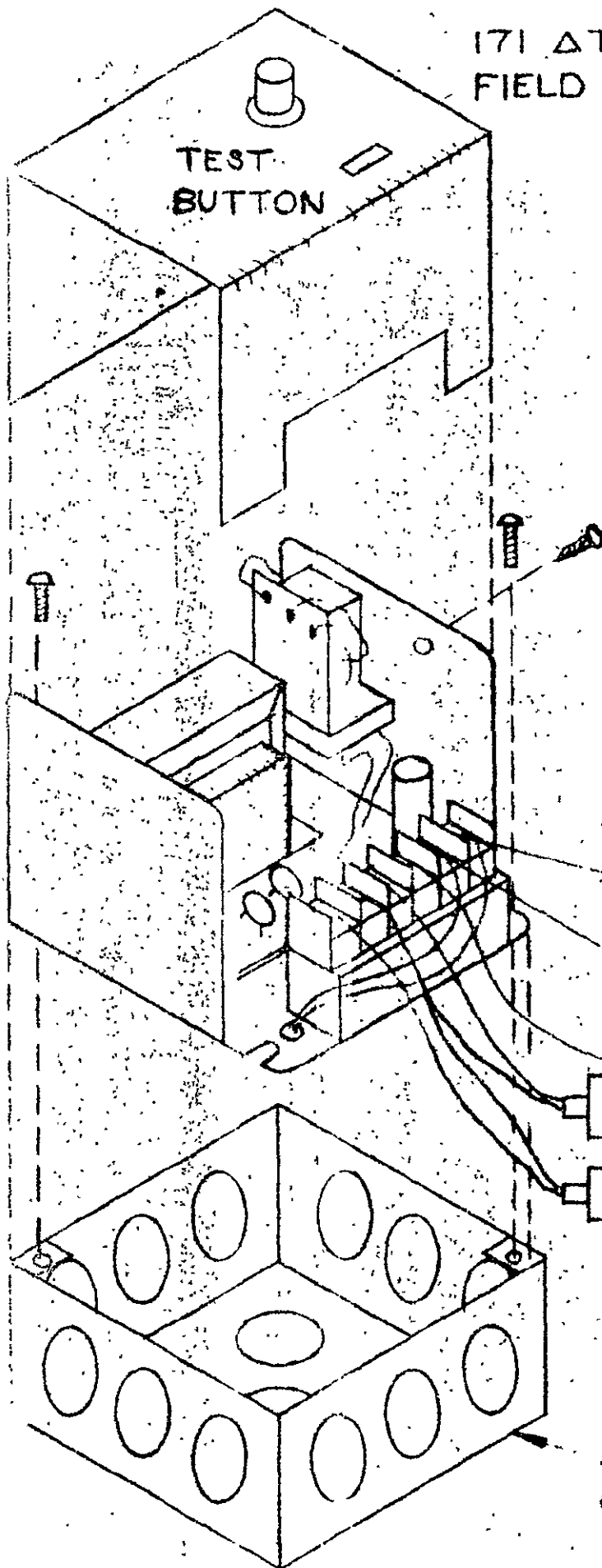
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|---------------------------------|--|
| ZIA ASSOCIATES INC. COLORADO | |
| 171 AT CONTROLLER | |
| Installation | |
| 2593 | |

171 AT CONTROLLER FIELD INSTALLATION DIAGRAM



RELAY WIRES

| | |
|--------|-------------|
| NC | RED/BLACK |
| COMMON | RED |
| NO | RED/WHITE |
| NC | BROWN/BLACK |
| COMMON | BROWN |
| NO | BROWN/WHITE |
| NC | ORG/BLACK |
| COMMON | ORG |
| NO | ORG/WHITE |

TERM'S

1 BLU

2 YEL

FROM 24V AC
TRANSFORMER

3 AUX, OUTPUT

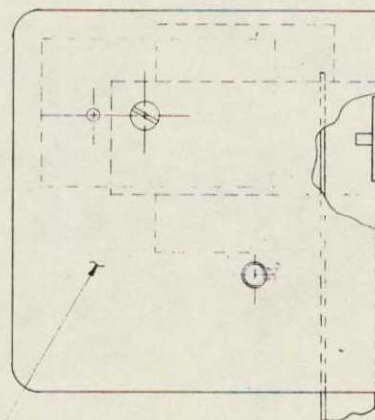
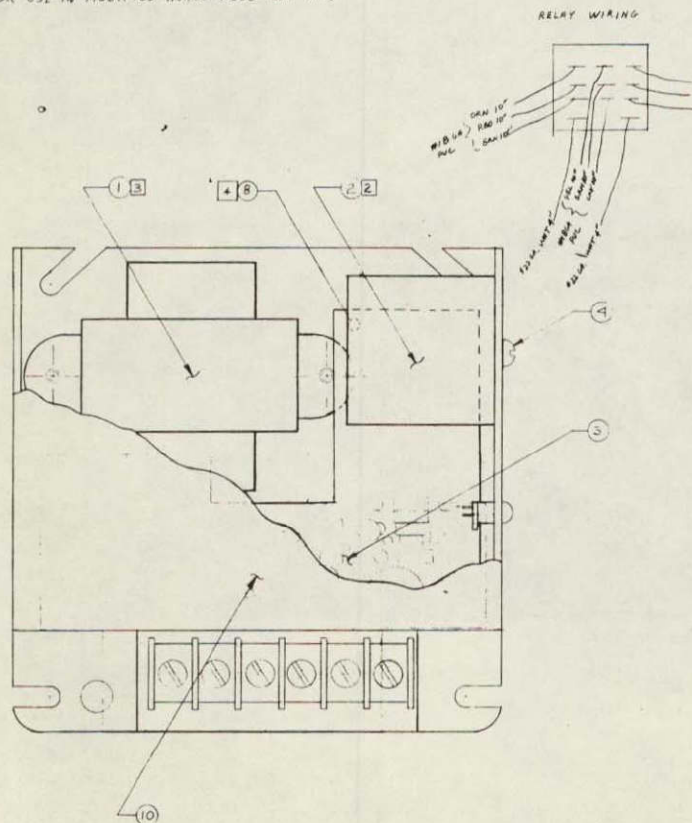
4 COLLECTOR PROBE

5 COMMON

6 STORAGE PROBE

4" X 4"
OUTLET BOX

1 SUPPLIED WITH ITEMS
2 OPTION-4 REPLACE RELAY#5XB20 (ITEM 2) WITH RELAY#5XB17
3 OPTION-5 TRANSFORMER INCLUDED IN ASSY.
4 FOR USE IN MODIFIED HONNETWELL BOX ONLY



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| REVISIONS | | | |
|-----------|---|---------|--------|
| LT# | DESCRIPTION | DATE | APPROV |
| A | DELETED ITEMS 7, 8, 9 INCREASED LENGTH OF CKT BOARD UNDER RELAY | 3/14/77 | ja |

| WIRE: | | | | | |
|-------|--------|-----|-------|----|--------|
| 20" | 18 GA. | PVC | 600 V | | DRAGON |
| 22 | 21 | 21 | 21 | 21 | RED |
| 22 | 21 | 21 | 21 | 21 | BAN |
| 22 | 21 | 21 | 21 | 21 | VELA |
| 22 | 21 | 21 | 21 | 21 | BAN |
| 22 | 21 | 21 | 21 | 21 | DEEP |
| 22 | 21 | 21 | 21 | 21 | WINT |

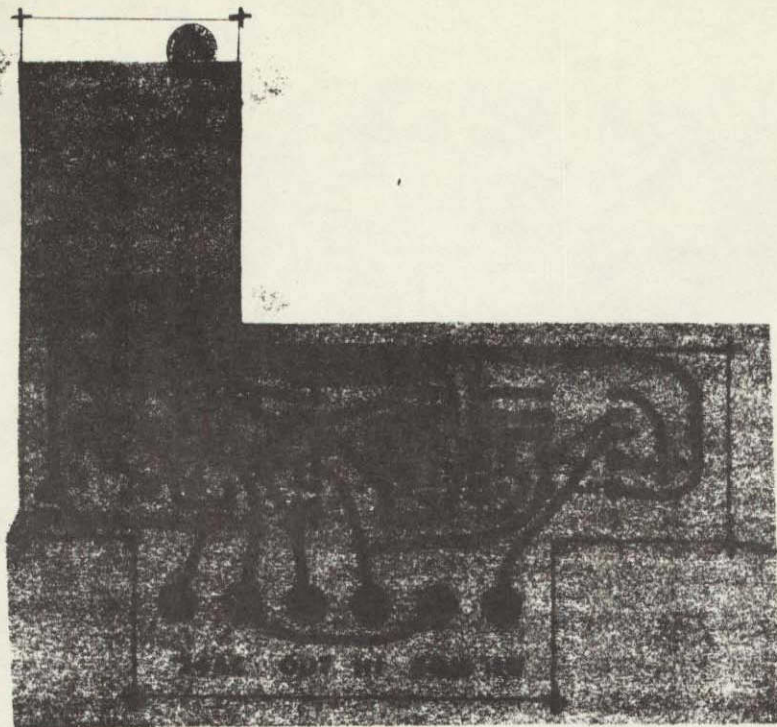
| | | | | | | |
|-----|---------|------------|-----------------|----------|------------|---|
| 1 | 10 | | COVER | | | |
| 1 | 9 | | NUT HEX | 6-32 | | |
| 1 | 8 | | STAND OFF | | | |
| 1 | 7 | | B.H. SCREW | 6-32-1 | | |
| 2 | 6 | AD99ABS | POP RIVET | | | USM |
| 1 | 5 | 2B17 | CHASSIS BOX NUT | | | |
| 1 | 4 | | B.H. SCREW | 6-32-3/8 | | |
| 1 | 3 | 2B01 | 1714T PWA | | | |
| 1 | 2 | 5X220 | RELAY [2] | | | |
| 1 | 1 | AT20A123 | TRANSFORMER [3] | | | |
| Sub | ITEM NO | CODE IDENT | PART NO | QUANTITY | STOCK SIZE | MATERIAL DESCRIPTION REFERENCE DRAWING OR LOG NO |
| | | | | | | MATERIAL SPECIFICATION |

[illegible]

GENERAL NOTES: UNLESS OTHERWISE SPECIFIED.

1. MATERIAL: 062 GLASS EPOXY 2 OZ SINGLE SIDE
2. TIN LEAD PER MIL-STD-275
3. FOIL SIDE SHOWN
4. SILKSCREEN PER ARTWORK 2800

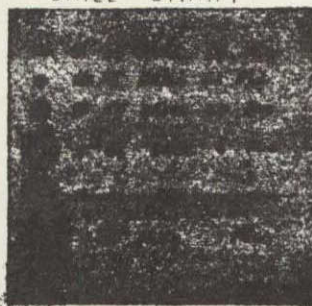
| REVISIONS | | | |
|-----------|--|---------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| B | CHANGED TERMINAL DESCRIPTIONS | 2/22/77 | DL |
| C | LENGTHENED BOARD ADDED PASS #3 AND #4 | 4/8/77 | DL |
| D | Shear Marks Moved Slightly Inward Changed Mounting hole from 5/16" to #28 | 4/27/77 | D.S. |



SHEAR MARK TYP.
10 P.L.C.

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DRILL CHART



| REVISION | SHEET NO | PART NO | NEXT ASSY | USED ON | APPLICATION |
|----------|----------|---------|-----------|---------|-------------|
| 1 | 2801 | 171 | | | |

| | | | | | | |
|---|------------|---------|--------------|------------|--|------------------------|
| ITEM NO | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION REFERENCE DESIGNATION ELEC DWG | MATERIAL SPECIFICATION |
| CONTRACT NO | | | APPROVED | | DATE | |
| UNLESS OTHERWISE SPECIFIED | | | PREP BY | | 4/8/77 | |
| DIMENSIONS ARE IN INCHES TOLERANCES | | | DESIGNER | | 4/8/77 | |
| XX XXX X" = .02 = .010 = .1" | | | GROUP ENG | | 4/2/77 | |
| BREAK ALL SHARP EDGES 005/015 MIL-STD 12, 15 | | | CHECKED | | | |
| USASI Y3216, B46.1, Y14.5 | | | | | | |
| SHOP STANDARDS 2060 | | | | | | |
| THREADS PER N-28 | | | | | | |
| SURFACE FINISH L28 EXCEPT AS NOTED | | | | | | |
| MULTIPLE SHEETS REVISION STATUS | | | SIZE | | CODE IDENT NO | |
| | | | C | | 52060 | |
| | | | | | 2777 | |
| | | | | | REV | |
| | | | | | D | |
| | | | SCALE 2/1 | | WT | |
| | | | | | SHEET 1 OF 1 | |



ZIA ASSOCIATES INC.

BOULDER

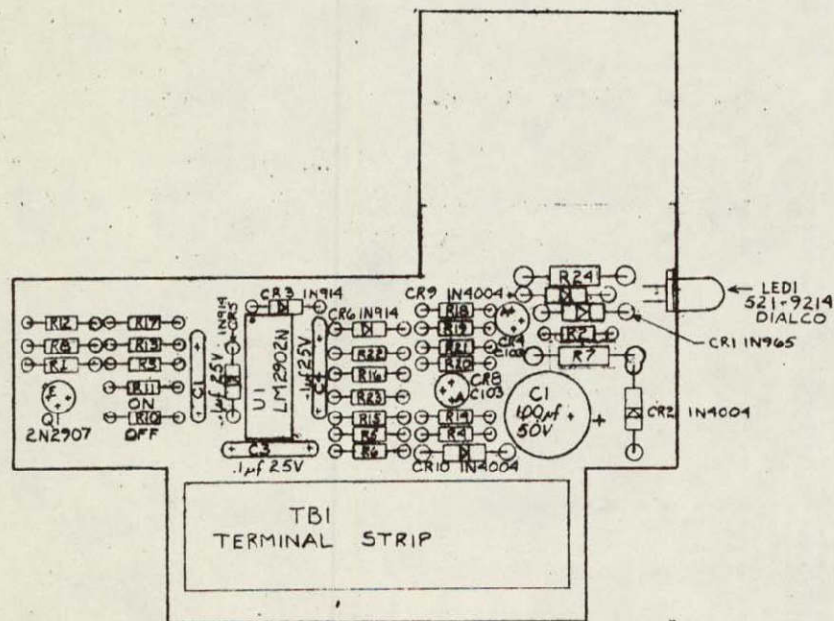
COLORADO

171 AT CONTROLLER
PWB DRILL CHART

2777 D

GENERAL NOTES: UNLESS OTHERWISE SPECIFIED.

1. TO DISABLE FASER PROTECT: CLIP OUT CR6
2. TO DISABLE BNL PROTECT: CLIP OUT CR5



| REF DES | DESCRIPTION | QTY |
|-------------|-----------------|-----|
| R2 | 330Ω 5% 1/4W | 1 |
| R18,17 | 10K 5% 1/4W | 2 |
| R12, R19 | 1K 5% 1/4W | 2 |
| R3,4,13,423 | 33K 5% 1/4W | 5 |
| R22 | 10M 5% 1/4W | 1 |
| R5 | 2.05 1% 1/4W | 1 |
| R14,8 | 10K 1% 1/4W | 3 |
| R10 | 105K 1% 1/4W | 1 |
| R11 | 19.1K 1% 1/4W | 1 |
| R15 | 88.7K 1% 1/4W | 1 |
| R7 | 820Ω 5% 1/4W | 1 |
| C1 | 100µF 150V ALUM | 1 |
| C2,3,4 | .1µF 125V DISC | 3 |
| CR1 | IN965 | 1 |
| CR2,9 | IN4004 | 2 |
| CR3,5,6 | IN914 | 3 |
| CR4 | SCR GE-C103 | 1 |
| Q1 | 2N2907 | 1 |
| U1 | LM2902N | 1 |
| TBI | TERMINAL STRIP | 1 |
| R14 | 6.98K 1% 1/4W | 1 |

OPTION -1 (LED)

| | | |
|-------|-----------------|---|
| LED-1 | DIALCO 521-9214 | 1 |
| R24 | 1K 5% 1/4W | 1 |

OPTION -2 (AUX FREEZE OUTPUT)

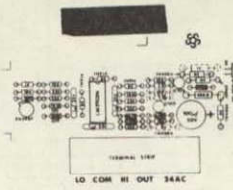
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|------|-------------|---|
| R20 | 1K 5% 1/4W | 1 |
| R21 | 10K 5% 1/4W | 1 |
| CR8 | SCR GE-C103 | 1 |
| CR10 | IN4004 | 1 |

OPTION -3 (15 OPTIONS-1 & -2 TOGETHER)

| | | | | | | | |
|------------------------------------|--|-------------------------------|---------|---------------------|------------|----------------------|------------------------|
| ITEM NO | | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION | MATERIAL SPECIFICATION |
| QTY PER ASSY | | CONTRACT NO | | APPROVED | DATE | ZIA ASSOCIATES INC. | |
| UNLESS OTHERWISE SPECIFIED | | DIMENSIONS ARE IN INCHES | | DESIGNER | | BOULDER COLORADO | |
| TOLERANCES | | XX .XXX X" | | GROUP ENG | | PWA ΔT | |
| XX .02 .010 .1" | | BREAK ALL SHARP EDGES 005/015 | | CHECKED | | 171 CONTROLLER | |
| MIL-STD 12.15 | | USASI Y32.16, 946.1, Y14.5 | | Prepared for | | SIZE CODE IDENT NO | |
| SHOP STANDARDS 2060 | | THREADS PER N-28 | | SOLAR CONTROL CORP. | | C 52060 | |
| SURFACE FINISH 125 EXCEPT AS NOTED | | APPLICATION | | 5505 ARAPAHO ROAD | | 2801 | |
| REVISION | | PART NO | | BOULDER COLORADO | | SCALE 2/1 WT | |
| 1 SHEET NO 501 | | 2816 | | 76-934 | | D | |
| NEXT ASS'Y | | USED ON | | SCALE 2/1 WT | | SHEET 1 OF 1 | |

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GENERAL NOTES: UNLESS OTHERWISE SPECIFIED

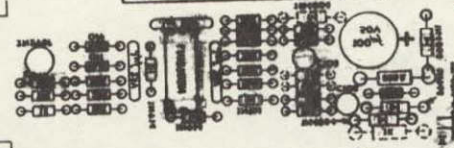


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211

51
5800 C.

10 COM HI OUT 34AC

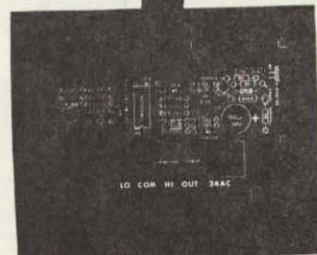
10000000 2100



10 COM HI OUT 34AC



10 COM HI OUT 34AC



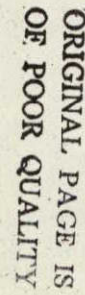
10 COM HI OUT 34AC

| ITEM | | QUANTITY | UNIT | REMARKS |
|------|----------------------------|----------|------|---------|
| 1 | CONTRACT NO. | | | |
| 2 | UNLESS OTHERWISE SPECIFIED | | | |
| 3 | DIMENSIONS ARE IN INCHES | | | |
| 4 | TOLERANCE | | | |
| 5 | WARRANTY | | | |
| 6 | DATE | | | |
| 7 | APPROVED | | | |
| 8 | DATE | | | |
| 9 | PARTS LIST | | | |
| 10 | ZIA ASSOCIATES INC | | | |
| 11 | BOULDER | | | |
| 12 | 171 AT COM | | | |
| 13 | PWA SILK | | | |
| 14 | D 52060 | | | |
| 15 | 2800 | | | |

| REVISION | SHEET NO | MULTIPLE SHEETS | REVISION STATUS |
|----------|----------|-----------------|-----------------|
| 1 | 1 | 1 | 1 |

| APPLICATION |
|-------------|
| 1 |

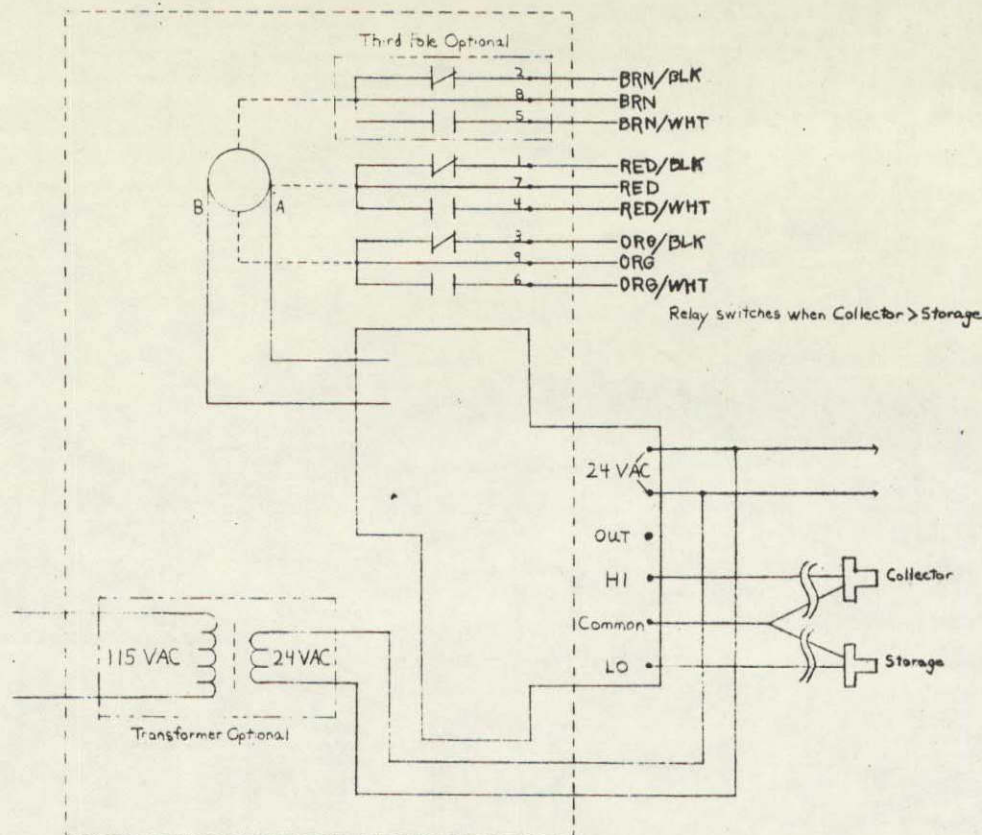
| | |
|----|-----------------------|
| 1 | NAME |
| 2 | DATE OF BIRTH |
| 3 | PLACE OF BIRTH |
| 4 | EDUCATION |
| 5 | OCCUPATION |
| 6 | MARRIAGE |
| 7 | RELIGION |
| 8 | POLITICAL AFFILIATION |
| 9 | SOCIAL BACKGROUND |
| 10 | OTHER INFORMATION |



| | | |
|-------|---|----------|
| 180°F | = | 2.498 K |
| 719°F | = | 10.35 K |
| 700°F | = | 16.86 K |
| 32°F | = | 20.176 K |

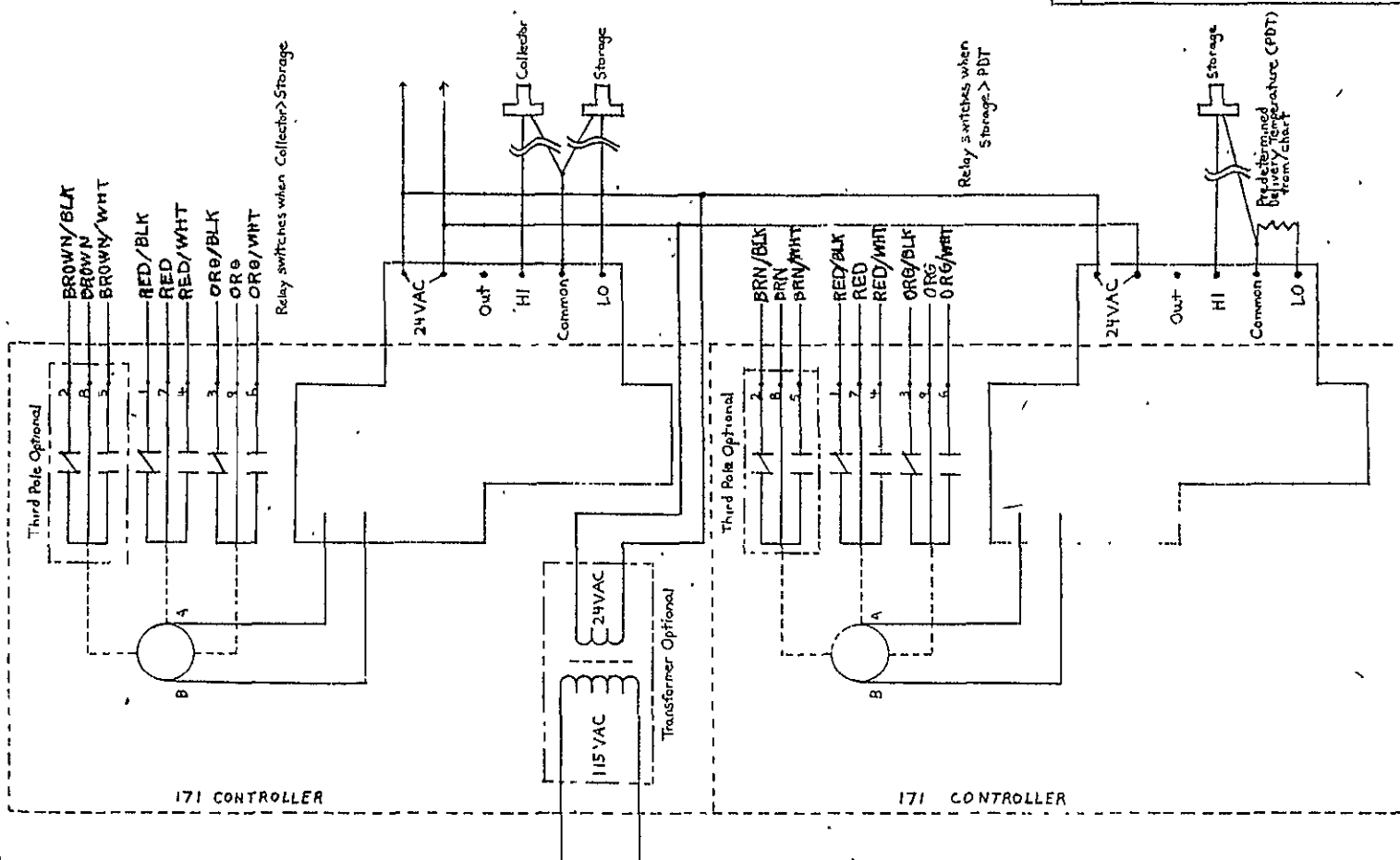
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| REVISIONS | | | |
|-----------|-------------|------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |

[illegible]

GENERAL NOTES: UNLESS OTHERWISE SPECIFIED

| REVISIONS | | | |
|-----------|-------------------------------------|---------|----------|
| LT# | DESCRIPTION | DATE | APPROVED |
| A | ADDED "171 CONTROLLER" DESIGNATIONS | 3/30/77 | Sal |



| QTY PER ASST | ITEM NO | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION REFERENCE INFORMATION ELEC DWG | MATERIAL SPECIFICATION |
|-----------------------------------|---------|------------|---------|--------------|------------|--|------------------------|
| 000 DASH NUMBERED PARTS SHOWN | | | | | | | |
| PARTS LIST | | | | | | | |
| EVEN DASH NUMBERED PARTS OPPOSITE | | | | | | | |

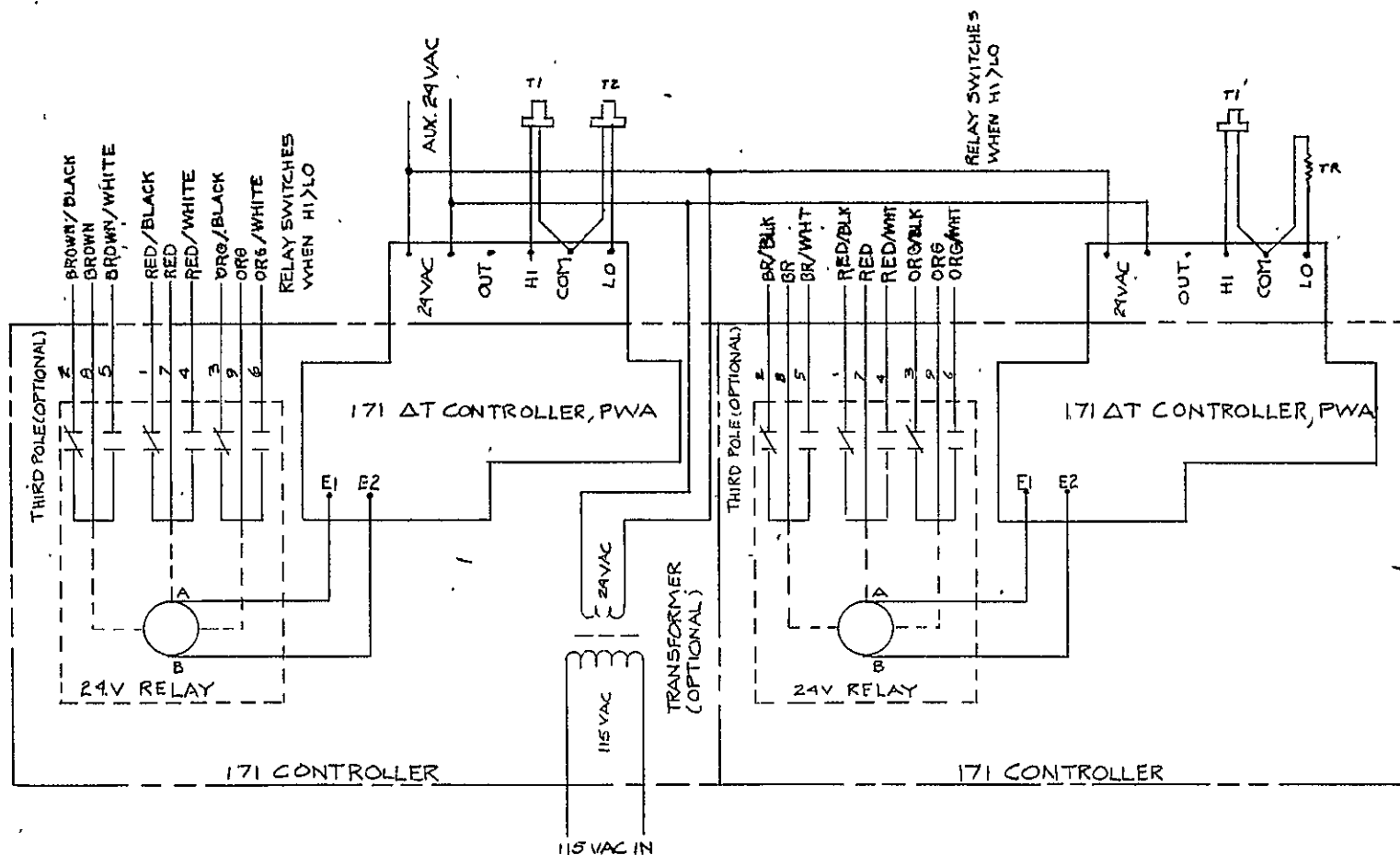
| | | | | | | | |
|------------------------------------|--|--|--|--|--|---------------|--|
| REVISION | | CONTRACT NO | | APPROVED | | DATE | |
| 1 | | UNLESS OTHERWISE SPECIFIED | | J. Duffon | | 2/23/77 | |
| SHEET NO | | DIMENSIONS ARE IN INCHES TOLERANCES XX ± .02 .XX ± .010 X' ± .1' | | DESIGNER | | | |
| MULTIPLE SHEETS REVISION STATUS | | BREAK ALL SHARP EDGES 005/015 MIL STD 12, 19 USASI Y32 16 848 1, Y14.5 SHOP STANDARDS 2040 THREADS PER N 28 SURFACE FINISH 125 EXCEPT AS NOTED ✓ | | GROUP ENG J. SPANIAS | | 3/30/77 | |
| PART NO | | NEXT ASS'Y | | CHECKED | | | |
| APPLICATION | | 76-934 | | Prepared for | | | |
| | | | | SOLAR CONTROL CORP. | | SIZE | |
| | | | | 5579 ADAPAHOE ROAD BOULDER COLORADO | | CODE IDENT NO | |
| | | | | | | C 52060 | |
| | | | | | | 2805 | |
| | | | | | | A | |
| | | | | | | SCALE NONE | |
| | | | | | | SHEET 1 OF 1 | |

ZIA ASSOCIATES INC.
BOULDER COLORADO

173 Wiring Diagram

GENERAL NOTES: UNLESS OTHERWISE SPECIFIED

| REVISIONS | | | |
|-----------|-------------|------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |



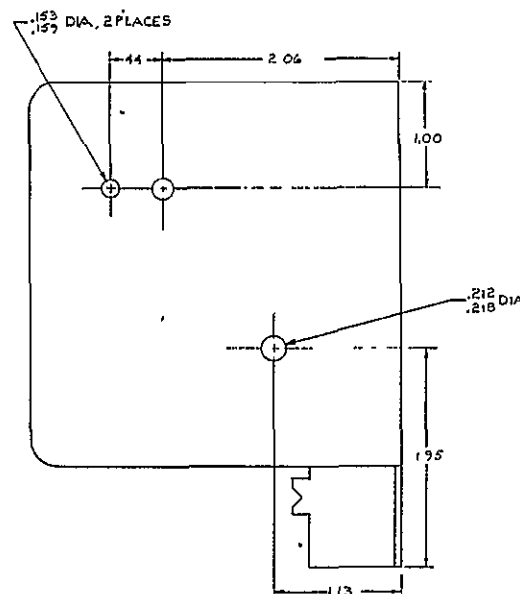
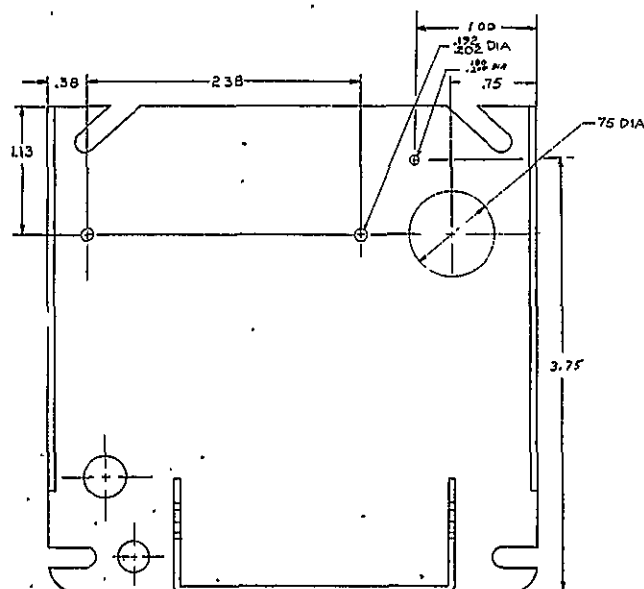
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4082

| ITEM NO | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION REFERENCE DESIGNATION ELEC PWR | MATERIAL SPECIFICATION |
|-----------------------------------|------------|---------|---------------------|------------|--|------------------------|
| PARTS LIST | | | | | | |
| EVEN DASH NUMBERED PARTS OPPOSITE | | | | | | |
| CONTRACT NO. | | | APPROVED | DATE | ZIA ASSOCIATES INC. | |
| UNLESS OTHERWISE SPECIFIED | | | PREP | DESIGNER | BOULDER COLORADO | |
| DIMENSIONS ARE IN INCHES | | | GROUP ENG | CHECKED | 175 WIRING DIAGRAM | |
| TOLERANCES | | | Prepared for: | | 171 CONTROLLER | |
| XX ± 0.2 | | | | | | |
| XXX ± 0.10 | | | | | | |
| X* ± 1" | | | | | | |
| BREAK ALL SHARP EDGES 005/015 | | | | | | |
| MIL STD 32, 35 | | | | | | |
| USASI Y32 16 844 1, V14 5 | | | | | | |
| SHOP STANDARDS 2060 | | | | | | |
| THREADS PER H 20 | | | | | | |
| SURFACE FINISH 125 | | | | | | |
| EXCEPT AS NOTED | | | | | | |
| REVISION | | | SOLAR CONTROL CORP. | | SIZE | CODE IDENT NO |
| 1 SHEET NO | | | 3595 ARAPAHOE ROAD | | C | 52060 |
| 76-934 | | | BOULDER COLORADO | | 2807 | REV NC |
| MULTIPLE SHEETS | | | SCALE NONE | | WT | SHEET 1 OF 1 |
| REVISION STATUS | | | | | | |
| APPLICATION | | | | | | |

GENERAL NOTES: UNLESS OTHERWISE SPECIFIED

| REVISIONS | | |
|-----------|-----------------------------|--------|
| NO. | DESCRIPTION | DATE |
| A | CH | 1/1/66 |
| B | CHANGE OF DIM 1.2 | |
| C | CHANGE LOCATION OF .212 DIA | |



| | | | | | | | |
|----------------------------|--|---------------------|----------|-------------|---------------------|----------------------|------------------------|
| ITEM NO. | | CODE POINT | PART NO. | DESCRIPTION | STOCK SIZE | MATERIAL DESCRIPTION | MATERIAL SPECIFICATION |
| MOD CHASSIS BOX | | | | | | | |
| CONTRACT NO. | | APPROVED | | DATE | ZIA ASSOCIATES INC. | | |
| UNLESS OTHERWISE SPECIFIED | | PART BY | | DATE | COLORADO | | |
| DIMENSIONS ARE IN INCHES | | DESIGNED | | DATE | MODIFIED | | |
| TOLERANCES | | GROUP 1 | | DATE | CHASSIS BOX | | |
| FRACTIONAL DIMENSIONS | | CHECKED | | DATE | | | |
| UNLESS OTHERWISE SPECIFIED | | PREPARED FOR | | DATE | | | |
| DIMENSIONS ARE IN INCHES | | SOLAR CONTROL CORP. | | DATE | | | |
| TOLERANCES | | 3335 ARAPAHO ROAD | | DATE | | | |
| FRACTIONAL DIMENSIONS | | BOULDER | | DATE | | | |
| UNLESS OTHERWISE SPECIFIED | | 2817 | | DATE | | | |
| DIMENSIONS ARE IN INCHES | | C | | DATE | | | |
| TOLERANCES | | | | DATE | | | |
| FRACTIONAL DIMENSIONS | | | | DATE | | | |


| APPLICATION | | | REVISIONS | | | |
|-------------|-----------|---------|-----------|--------------------------|---------|----------|
| PART NO | TEXT ASSY | USED ON | LTR | DESCRIPTION | DATE | APPROVED |
| | | | B. | CHANGED FORECAST & ADDED | 1/14/77 | SA |
| | | | C | ADDED WIRE | 3/14/77 | SA |
| | | | D | RIA WAS 15 6.98K 150 | 4/14/77 | SA |
| | | | E | R19, 20 were 47 K | 4/27/77 | D. S. |
| | | | F | REMOVED ON NEW FORM | 9/20/77 | SA |

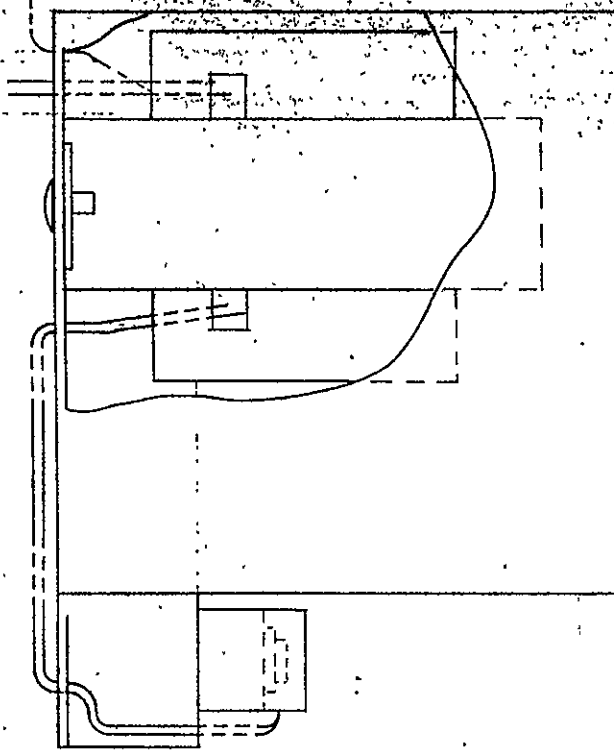
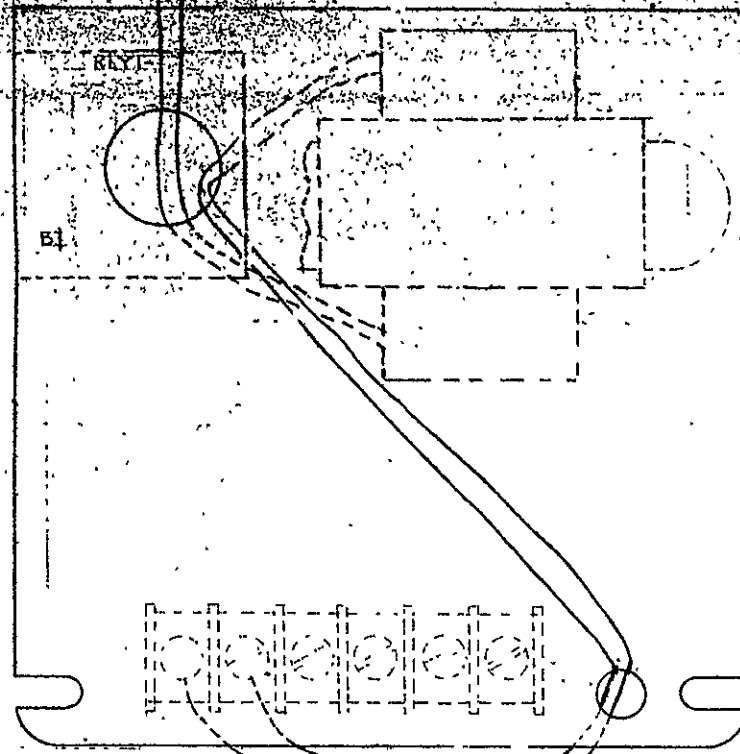
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Prepared for:

SOLAR CONTROL CORP.

5595 ARAPAHOE ROAD
BOULDER COLORADO

| | | | | |
|--|-----------|-------------|--|------------|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES | | RELIABILITY |  ZIA ASSOCIATES INC. BOULDER COLORADO | |
| JXX ± | JXX ±.010 | X° ±1° | | 171 |
| CONTRACT NO | | DESIGNER | | PARTS LIST |
| | | CHECKED | | |
| | | PREP BY | | |
| EMC | | | SIZE | |
| WEIGHTS | | | CODE IDENT NO | |
| STRESS | | | 2816-PL/E | |
| THERMAL | | | SCALE | |
| | | | NA | |
| | | | SHEET 1/5 | |



| FROM | TO | LUG |
|-----------|-----------------|-------|
| RLY1-A | PWA-E1 | |
| RLY1-B | PWA-E2 | |
| RLY1-1 | 9" RED/BLK LEAD | |
| RLY1-2 | 9" OR/BLK LEAD | |
| RLY1-3 | 9" BR/BLK LEAD | |
| RLY1-4 | 9" RED/WH LEAD | |
| RLY1-5 | 9" OR/WH LEAD | |
| RLY1-6 | 9" BR/WH LEAD | |
| RLY1-7 | 9" RED LEAD | |
| RLY1-8 | 9" ORANGE LEAD | |
| RLY1-9 | 9" BR LEAD | |
| T1-BLUE | AC TERMINAL | SPADE |
| T2-YELLOW | AC TERMINAL | SPADE |
| T3-BLACK | | |
| T4-WHITE | | |

| REVISION | SHEET NO |
|------------------------------------|----------|
| 1 | 171 |
| MULTIPLE SHEETS REVISION STATUS | |

| PART NO | NEXT ASSY | USED ON |
|---------|-----------|-------------|
| | | APPLICATION |

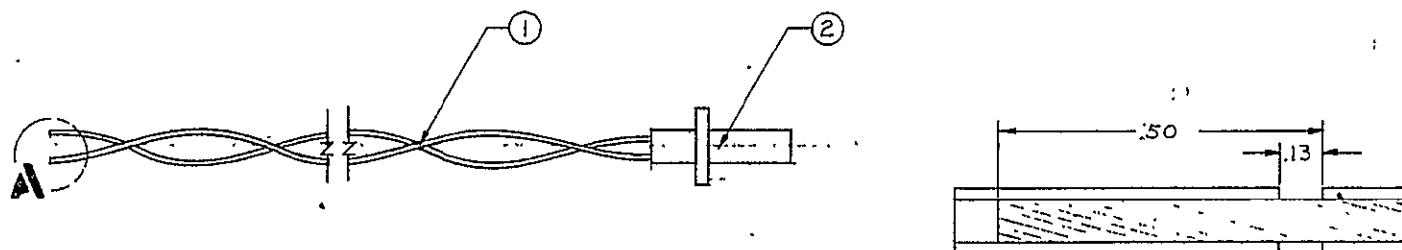
| | | | | | | |
|-----------------------------------|------------|---------|-----------------------------|------------|--|------------------------|
| ITEM NO | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION <small>REFERENCE DIMENSIONS ELSE IND</small> | MATERIAL SPECIFICATION |
| QTY PER ASSY | | | | | | |
| QND DASH NUMBERED PARTS SHOWN | | | | | | |
| PARTS LIST | | | | | | |
| EVEN DASH NUMBERED PARTS OPPOSITE | | | | | | |
| CONTRACT NO | | | APPROVED | | DATE | |
| UNLESS OTHERWISE SPECIFIED | | | PREP BY <i>Sanger, J.W.</i> | | 9/7/77 | |
| DIMENSIONS ARE IN INCHES | | | DESIGNER | | | |
| TOLERANCES | | | GROUP ENG | | | |
| XX ± .02 | | | CHECKED | | | |
| X ± .010 | | | Prepared for: | | | |
| X ± .015 | | | SOLAR CONTROL CORP. | | | |
| BREAK ALL SHARP EDGES 005/015 | | | 5595 ARAPAHOE ROAD | | | |
| MIL STD 12.15 | | | BOULDER | | | |
| USASI Y32.16, 34.1, 714.5 | | | COLORADO | | | |
| SHOP STANDARDS 2290 | | | SIZE | | CODE IDENT NO | |
| THREADS PER INCH | | | C | | 52060 | |
| SURFACE FINISH 125 | | | 2790 | | REV | |
| CHECKY AS NOTED | | | A | | | |
| APPLICATION | | | SCALE 2/1 | | SHEET 1 OF 1 | |

2790 A

GENERAL NOTES, UNLESS OTHERWISE SPECIFIED.

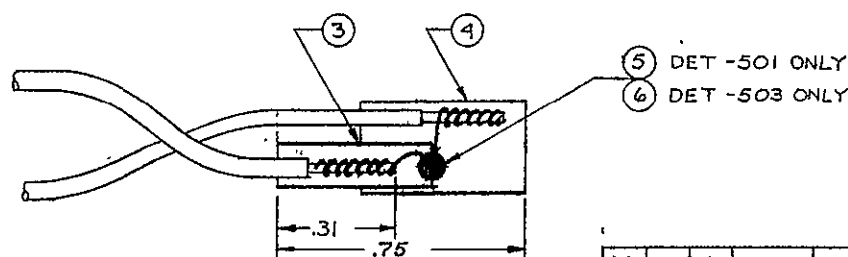
- 1 FENWAL ELECTRONICS FRAMINGHAM, MASS.
- 2 POT. PROBE INTO HOUSING WITH CASTALL 301 RESIN. CURE WITH RT7 CATALYST AT 25°C FOR 24 HRS.

| REVISIONS | | | |
|-----------|--|---------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | ADD DET-503 | 3/1/72 | Sam J.W. |
| B | ADD DESCRIPTION TO DETAIL A ADD NOTE 2. | 3/30/72 | pd |



DETAIL A
PRE-STRIP DIM TYP.

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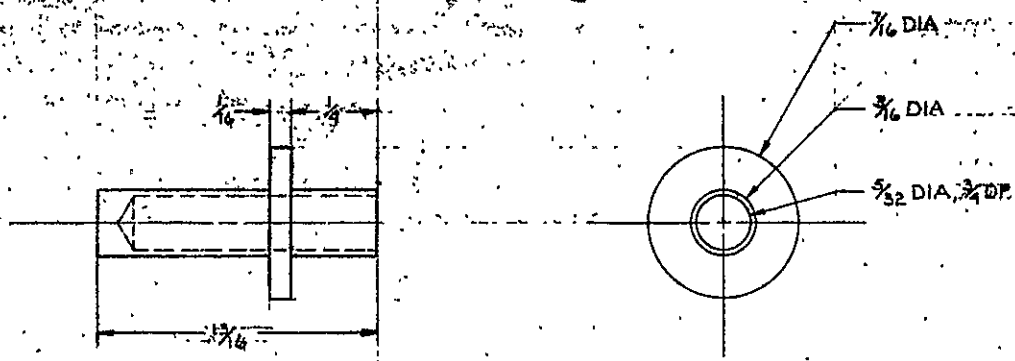


THERMISTOR DETAIL

| | | | | | | | |
|-----|-----|-------------|------------|-----------------------------------|--------------|------------|---|
| 1 | - | 6 | UUT-35-J1 | THERMISTOR | | | |
| - | 1 | 5 | UUT-43-J1 | THERMISTOR | | | |
| 1 | 1 | 4 | | HEAT SHRINK | 3/16 X 5/8 | | |
| 1 | 1 | 3 | | HEAT SHRINK | 3/32 X 3/8 | | |
| 1 | 1 | 2 | 2763-1 | HOUSING | | | |
| 1 | 1 | 1 | | TWISTED PAIR TEFLON INSUL WIRE | 22GAX24" | | |
| 503 | 501 | ITEM NO. | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION REFERENCE STANDARD ELEC. CODE |

| | | | | | |
|--|--|--------------------------------|--|-------------------------|--|
| CONTRACT NO. | | APPROVED | | DATE | |
| UNLESS OTHERWISE SPECIFIED | | PREP BY Sam J.W. | | 3/1/72 | |
| DIMENSIONS ARE IN INCHES TOLERANCES XX ± .02 XXX ± .010 X* ± .1" | | DESIGNER | | | |
| BREAK ALL SHARP EDGES 905/015 MIL-STD 12.15 USASI Y32.16 846.1, Y14.5 SHOP STANDARDS 2040 THREADS PER UN-28 SURFACE FINISH 125 EXCEPT AS NOTED | | GROUP ENG pd | | 3/2/72 | |
| CHECKED | | Prepared for: | | | |
| REVISION 503 | | DATE 3/1/72 | | ZIA ASSOCIATES INC. | |
| SHEET NO 501 | | DATE 3/1/72 | | BOULDER COLORADO | |
| MULTIPLE SHEETS REVISION STATUS | | APPLICATION | | ΔT. CONTROLLER PROBE | |
| PART NO. NEXT ASSY USED ON | | SOLAR CONTROL CORP. | | SIZE CODE IDENT NO | |
| | | 5575 A-SPANOS ROAD COLORADO | | C 52060 | |
| | | | | 2764 | |
| | | | | B | |
| | | | | SHEET 1 OF 1 | |

2764 B

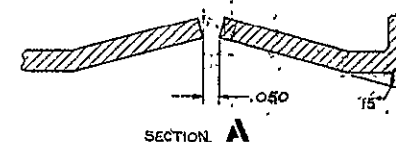
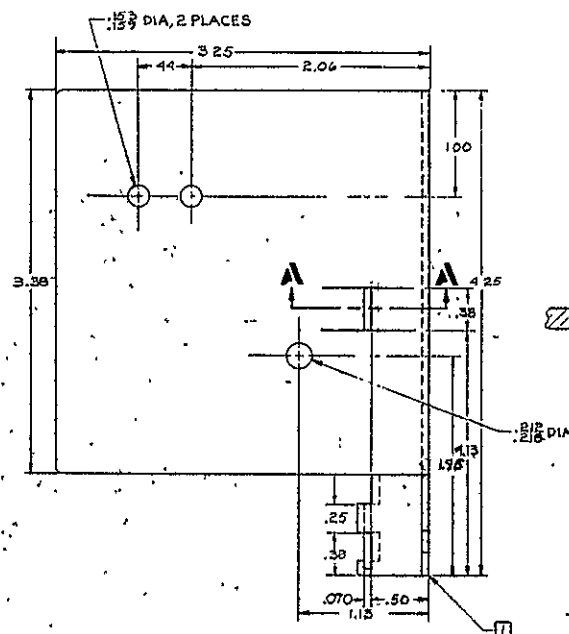


| | | | | | |
|----------------------------|--|---------------------------|--|----------------------|--|
| CONTRACT NO. | | APPROVED | | DATE | |
| UNLESS OTHERWISE SPECIFIED | | PREP BY: [Signature] | | 12/3/76 | |
| DIMENSIONS ARE IN INCHES | | DRAWN BY: [Signature] | | 12/3/76 | |
| TOLERANCES | | GROUP ENG | | CHECKED | |
| .XXX = .010 | | X" = .1" | | Y" = .05" | |
| BREAK ALL SHARP EDGES | | 005/015 | | ZIA ASSOCIATES, INC. | |
| SH. STD 12, 15 | | 02451 Y32 14, 346.2, Y148 | | 2763 | |
| SHOP STANDARDS | | 2046 | | THREADS PER N 78 | |
| SURFACE FINISH 125 | | EXCEPT AS NOTED | | SOLAR CONTROL CORP. | |
| 5555 JEFFERSON ROAD | | BOULDER, COLORADO | | SCALE 2/1 1/2 | |
| SHEET 1 OF 1 | | 2763 | | 2763 | |

| | | | |
|-----------------|------------|-----------------|---|
| REVISION | 1 | SHEET NO. | 1 |
| MULTIPLE SHEETS | | REVISION STATUS | |
| PART NO. | NEXT ASSY. | USED ON | |
| APPLICATION | | | |

7 SO FLANGE BEND FROM MAIN BODY OR MAKE SEPARATELY WITH FLANGES AND SPOT WELD ON.

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| | | | |
|------|---------|------|----------|
| DATE | 12/1/47 | DATE | APPROVED |
| | | | |
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| | | | |
| | | | |

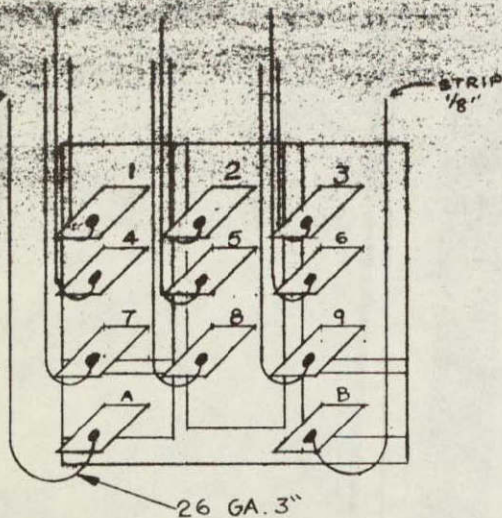
CONSISTS OF:

1) COVER SHEET

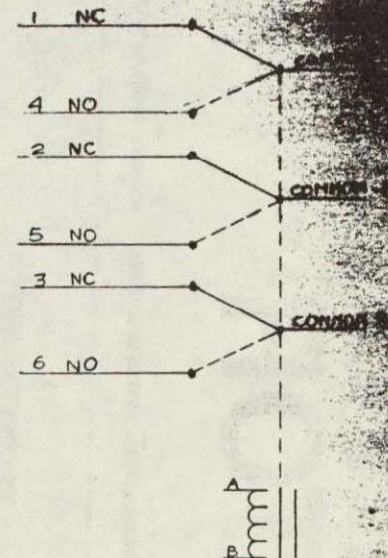
2) SHEETS 1 of 2
2 of 2

3) TITLE PAGE

| | |
|--|---|
| DATE 12/1/47 TIME 10:10 AM BY D.J. FOR D.J. | ZIA ASSOCIATES INC. 76-1710T DIFFERENTIAL TEMP CONTROLLER, TEST PROCEDURE 2839 N/A COVER |
|--|---|



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Note

For SPDT Omit 2, 3, 5, 6, 8, 9

For DPDT Omit 2, 5, 8

For 3PDT Omit No wires

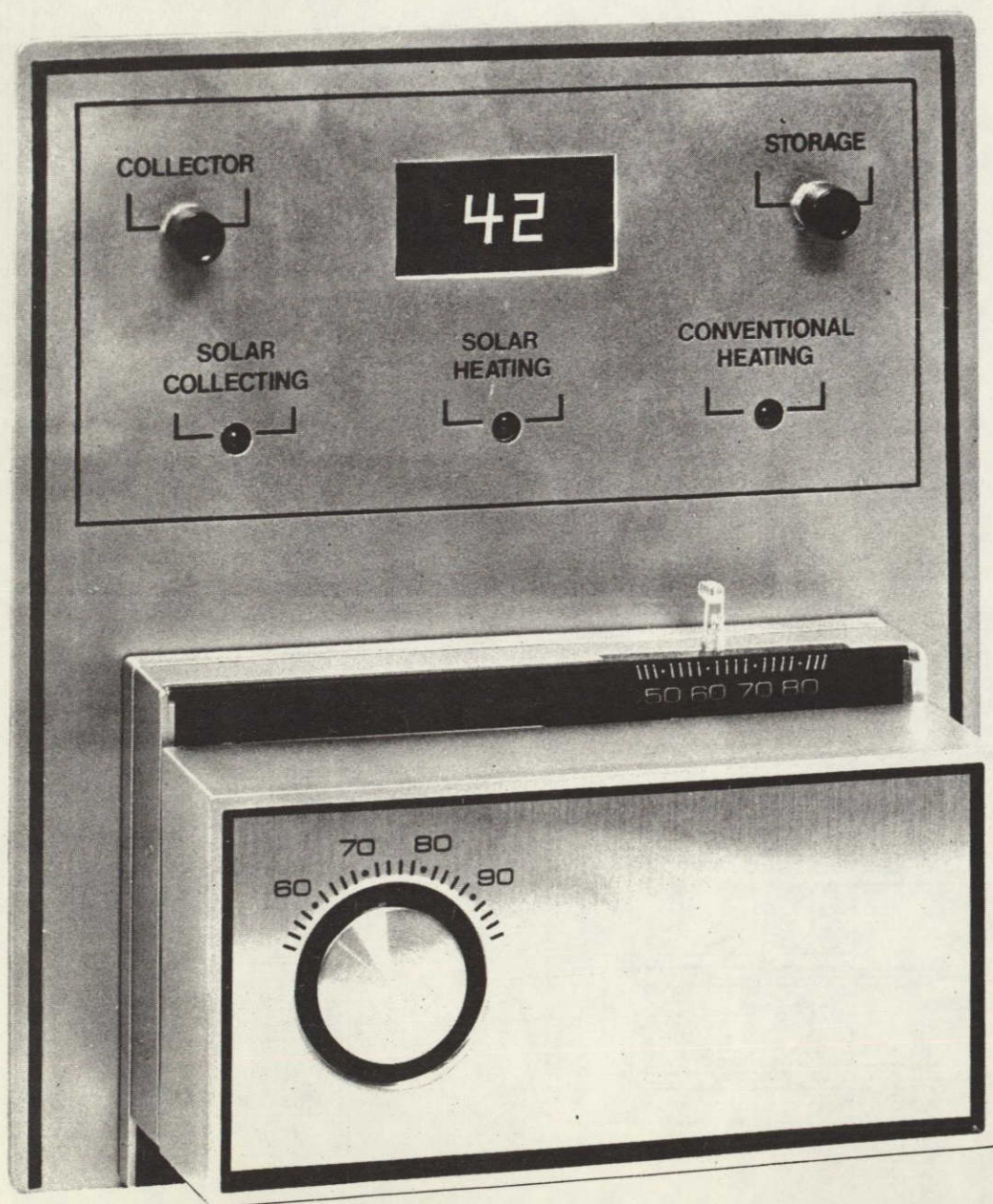
16 GA. 10"

| PIN | COLOR | STRIP | CNTS |
|-----|-------|-------|-------|
| 1 | RED | BLACK | NC |
| 2 | BROWN | " | " |
| 3 | ORG | " | " |
| 4 | RED | WHITE | NO |
| 5 | BROWN | " | " |
| 6 | ORG | " | " |
| 7 | RED | NO | COMM. |
| 8 | BROWN | " | " |
| 9 | ORG | " | " |

| | | | | | |
|------------------------------------|--|------------|---------|---------------------|------------|
| ITEM NO. | | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE |
| QTY PER ASSY | | PARTS LIST | | | |
| CONTRACT NO. | | | | | |
| UNLESS OTHERWISE SPECIFIED | | | | | |
| DIMENSIONS ARE IN INCHES | | | | | |
| TOLERANCES | | | | | |
| XX ± .02 XXX ± .010 X" ± .1" | | | | | |
| BREAK ALL SHARP EDGES .005/.015 | | | | | |
| MIL STD 12, 15 | | | | | |
| USASI Y32.16, B46.1, Y14.5 | | | | | |
| SHOP STANDARDS 2060 | | | | | |
| THREADS PER H-28 | | | | | |
| SURFACE FINISH 125 EXCEPT AS NOTED | | | | | |
| REVISION | | APPROVED | | DATE | |
| I SHEET NO | | DOUG R. | | 6/4/77 | |
| MULTIPLE SHEETS | | DESIGNER | | ZIA ASSOCIATES INC. | |
| REVISION STATUS | | GROUP ENG | | 171 AT Controls | |
| PART NO | | CHECKED | | Relay Assembly | |
| NEXT ASSY | | D. S. | | SIZE CODE IDENT NO | |
| USED ON | | 6/4/77 | | C 52060 2886 | |
| APPLICATION | | | | SCALE WT | |



SOLARSTAT SOLID STATE SOLAR SYSTEM MONITOR



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APPLICATION

REVISIONS

| PART NO. | NEXT ASSY. | USED ON | LTR | DESCRIPTION | DATE | APPROVED |
|----------|------------|---------|-----|-------------|------|----------|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES

.XX .XXX X°
± ±.010 ±1°

CONTRACT NO

EMC

WEIGHTS

STRESS

THERMAL

RELIABILITY

MATL & PROC

GROUP ENG

DESIGNER

CHECKED

PREP BY



ZIA ASSOCIATES INC.

BOULDER

COLORADO

DRAWING BREAKDOWN,
SOLAR-STAD (NASH)

SIZE

A

CODE IDENT NO

52060

SCALE

SHEET 1 OF 2

PREPARED BY D AUGUSTO

DRAWING BREAKDOWN

PAGE 2DATE 1/21/77PROJECT Solarstat (NASA)NUMBER 76-937

| ZE | DRAWING NUMBER | DRAWING LEVEL | | | | | | | | DOCUMENT TITLE | EXPECTED RELEASE DATE | REMARKS |
|---------------------|----------------|---------------|---|---|---|---|---|---|---|--|--------------------------|---------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | |
| D | 2788-A | X | | | | | | | | TOP ASSEMBLY SOLARSTAT & FINAL PARTS LIST | 2/28/77 | |
| C | 2791-A | | | | | | | | | FRONT PANEL Solarstat | 2/22/77 | |
| C | 2792-D | | | | | | | | | SCHEMATIC | 12/14/76 | |
| C | 2766-B | | | | | | | | | PWB SENSOR DRILL CHART | 1/77 | |
| C | 2794-B | | | | | | | | | PWA SENSOR | 2/28/77 | |
| C | 2765-B | | | | | | | | | PWB RETROFIT DRILL CHART | 1/77 | |
| C | 2796-C | | | | | | | | | PWA | 2-28-77 | |
| A | 2796&2794-FL | | | | | | | | | PARTS LIST, PVAS | 1/77 | |
| C | 2797-C | | | | | | | | | SOLARSTAT DIODE PROBE | 3/1/77 | |
| C | 2798-C | | | | | | | | | WIRING DIAGRAM | 3/1/77 | |
| C | 2838 | X | | | | | | | | HOOK UP INSTRUCTIONS | | |
| D | 2837 | X | | | | | | | | SILNSCREEN, FRONT PANEL | 4/4/77 | |
| C | 2799-B | | | | | | | | | ARTWORK, FRONT PANEL | 4/4/77 | AW |
| A | 2866 | | | | | | | | | TERMINAL BOARD CONNECTIONS | 4/14/77 | |
| A | 2873 | | | | | | | | | Test Procedure | 4/12/77 | |
| | | | | | | | | | | Solarstat Heat Sink | 5/18/77 | |
| Prepared for: | | | | | | | | | | | | |
| SOLAR CONTROL CORP. | | | | | | | | | | | | |
| 5595 ARAPAHOE ROAD | | | | | | | | | | | | |
| BOULDER COLORADO | | | | | | | | | | | | |

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REVISIONS

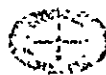
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| | | | | |
| | | | | |

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES

XXX .XXX .X
010 .1

CONTRACT NO

| | |
|----------|--|
| REVISION | |
| MATERIAL | |
| QUANTITY | |
| DATE | |
| BY | |
| | |



ZIA ASSOCIATES INC.

BOULDER

COLORADO

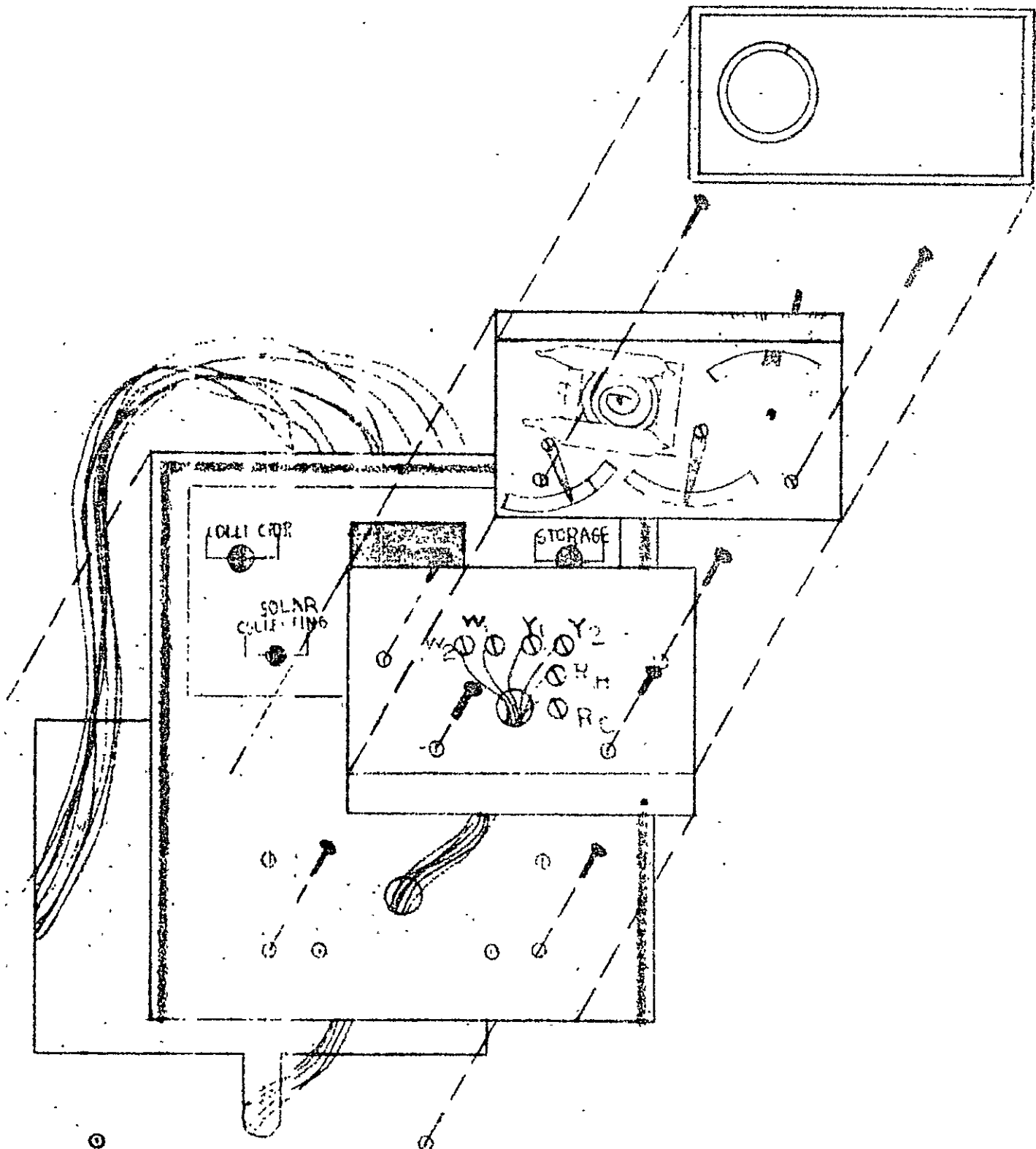
SOLARSTAT FIELD
INSTALLATION DIAGRAM

DATE: 5-1-79

2594

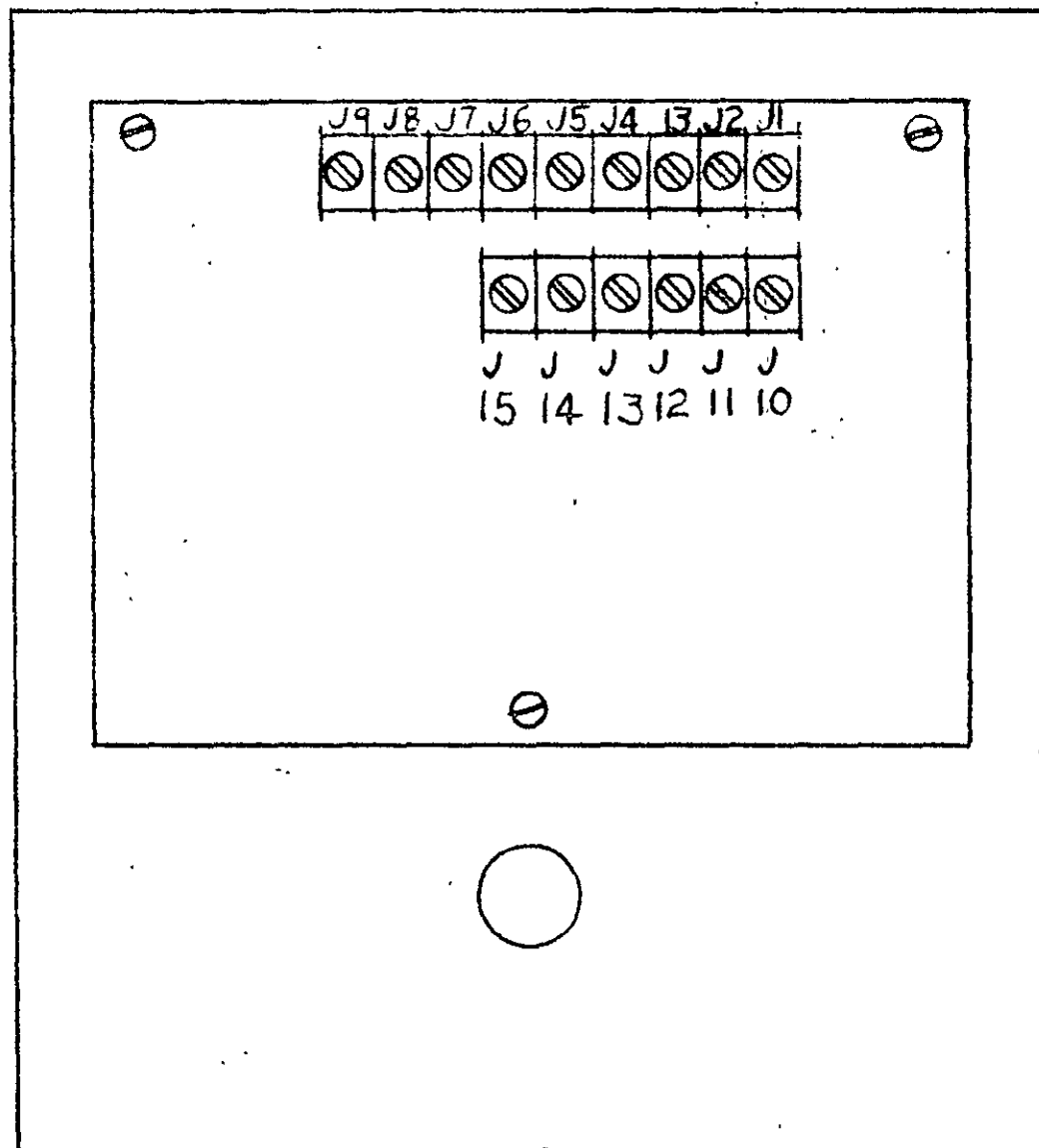
SOLARSTAT FIELD INSTALLATION DIAGRAM

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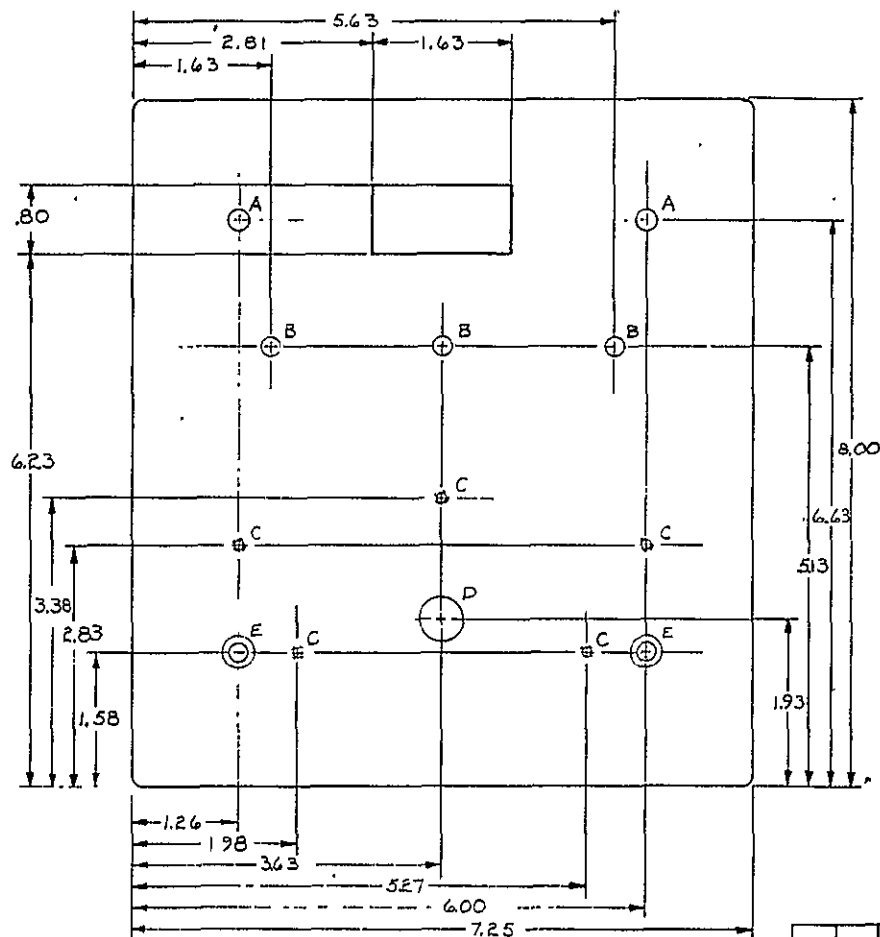
SOLARSTAT REAR TERMINATIONS

| "J" CONNECTOR | INTERFACE |
|------------------|--|
| J1 | 24 VAC |
| J2 | 24 VAC |
| J3 | GROUND |
| J4 | STORAGE PROBE |
| J5 | STORAGE PROBE NEG. |
| J6 | COLLECTOR PROBE |
| J7 | COLLECTOR PROBE NEG. |
| J8 | NORMAL PROBE |
| J9 | NORMAL PROBE NEG. |
| J10 | SOLAR COLLECTING RELAY- 24 VAC OR POS DC |
| J11 | SOLAR COLLECTING RELAY- 24 VAC OR NEG DC |
| J12 | SOLAR HEATING RELAY 24 VAC OR POS. DC |
| J13 | SOLAR HEATING RELAY 24 VAC OR NEG DC. |
| J14 | CONVENTIONAL HEATING RELAY-24VAC OR POS. DC |
| J15 | CONVENTIONAL HEATING RELAY-24VAC OR NEG. DC |



GENERAL NOTES: UNLESS OTHERWISE SPECIFIED
1. FINISH: IRRIDITE, GOLD PAINT

| REVISIONS | | | |
|-----------|-------------|--------|----------|
| LT# | DESCRIPTION | DATE | APPROVED |
| A | ADD NOTE 1 | 4/8/71 | |



| | SIZE | QTY |
|---|---------------------|-----|
| A | .249 .255 | 2 |
| B | .212 .218 | 3 |
| C | #6-32-UNC | 5 |
| D | .50 | 1 |
| E | 1.56 DIA 38x45CS | 2 |

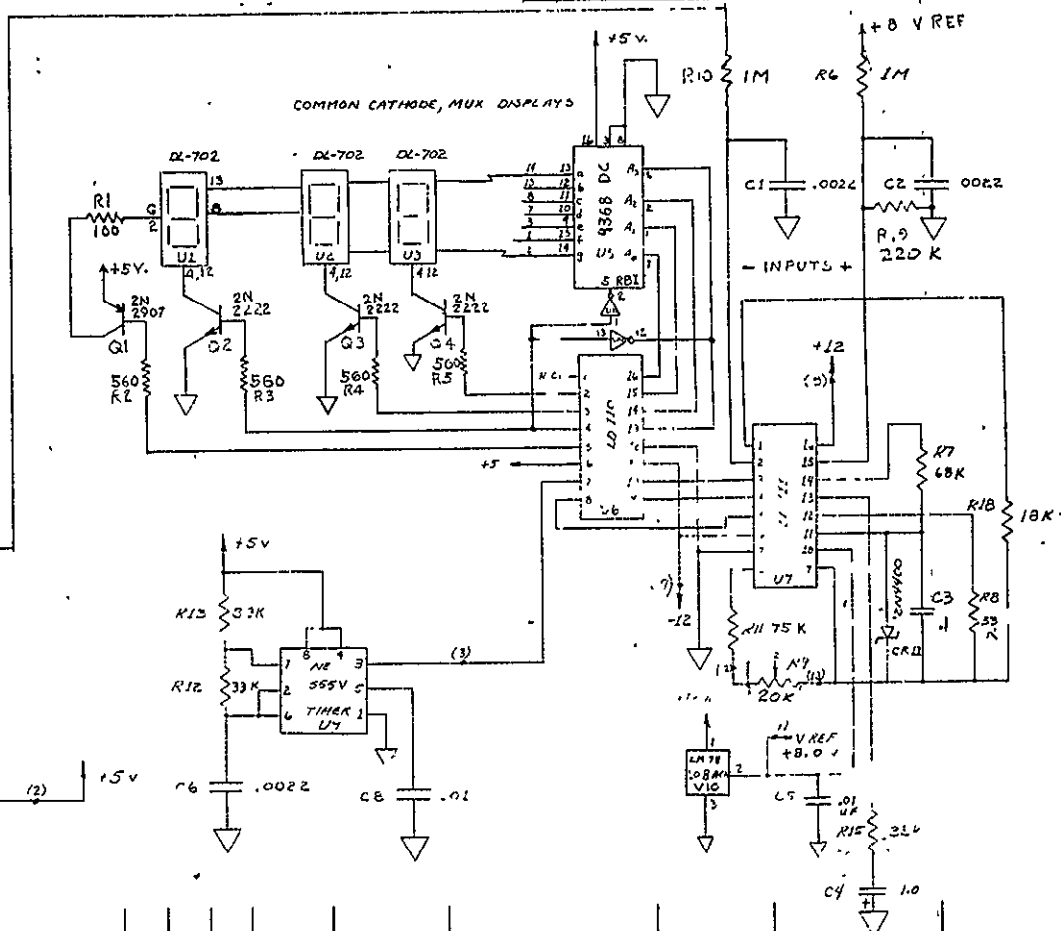
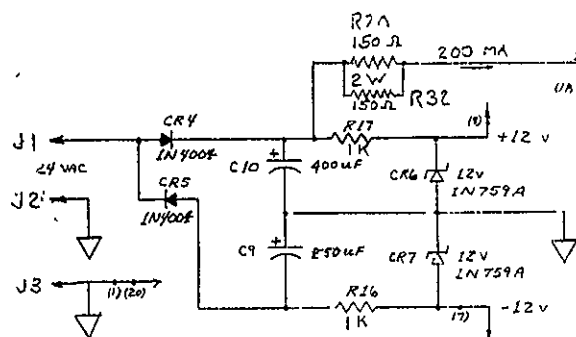
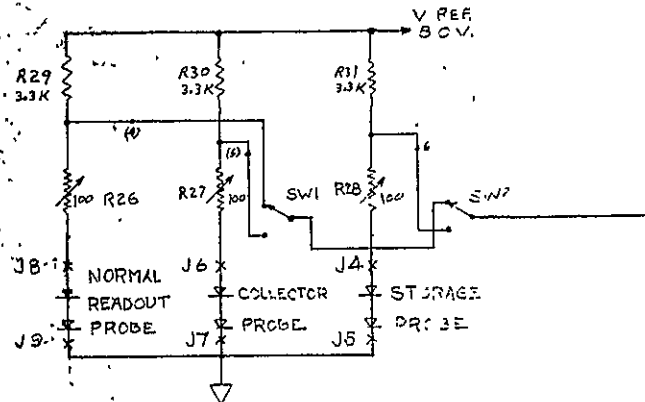
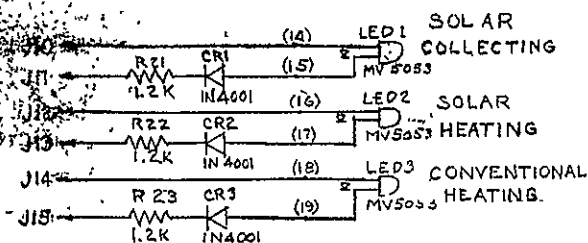
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| | | | | | | | |
|-------------------------------|--|-------------------------------|---------|---------------------|------------|-----------------------------------|------------------------|
| ITEM NO | | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION | MATERIAL SPECIFICATION |
| QTY PER ASSY | | ODD DASH NUMBERED PARTS SHOWN | | PARTS LIST | | EVEN DASH NUMBERED PARTS OPPOSITE | |
| CONTRACT NO | | | | APPROVED | DATE | ZIA ASSOCIATES INC. | |
| UNLESS OTHERWISE SPECIFIED | | | | PREP BY | DATE | BOULDER COLORADO | |
| DIMENSIONS ARE IN INCHES | | | | DESIGNER | | FRONT PANEL | |
| TOLERANCES | | | | GROUP ENG | | SOLARSTAT | |
| XX = .02 | | | | CHECKED | | | |
| XXX = .010 | | | | Prepared for: | | | |
| X* = .015 | | | | SOLAR CONTROL CORP. | SIZE | CODE IDENT NO | |
| BREAK ALL SHARP EDGES 005/015 | | | | 5595 ARAPAHO ROAD | C | 52060 | 2791 |
| MIL STD 12.15 | | | | COLORADO | SCALE | 1/1 | WT |
| USAF Y32 16 R46 1 Y14 5 | | | | | | | |
| SHOP STANDARDS 2040 | | | | | | | |
| THREADS PER IN 20 | | | | | | | |
| SURFACE FINISH 125 | | | | | | | |
| EXCEPT AS NOTED | | | | | | | |

| REVISION | SHEET NO | PART NO | NEXT ASSY | USED ON | APPLICATION |
|----------|----------|---------|-----------|---------|-------------|
| 1 | 1 | 2890 | 76-937 | | |

2. ALL RESISTANCE IN OHMS & CAPACITANCE IN μF
2. VIO VS. 5V186, HIGH VOLTAGE OUTPUT OF HEX INV
NUMBERS IN PARENTHESIS ARE BOARD INTERCONNECTIONS
TO NEAREST TERMINAL BOARD

| REVISIONS | | | |
|-----------|--|---------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | ADDED VALUE TO R19 ADDED "SCHEMATIC" TO TITLE BLOCK | 1/30/77 | Self |
| B | R18 WAS 27K IS 18K, R40 WAS 5K IS 33K R20 WAS 2.5 IS 1.5K R21 WAS 10K IS 10K R22 WAS 10K IS 10K R23 WAS 10K IS 10K R24 WAS 10K IS 10K R25 WAS 10K IS 10K R26 WAS 10K IS 10K R27 WAS 10K IS 10K R28 WAS 10K IS 10K R29 WAS 10K IS 10K R30 WAS 10K IS 10K R31 WAS 10K IS 10K R32 WAS 10K IS 10K R33 WAS 10K IS 10K R34 WAS 10K IS 10K R35 WAS 10K IS 10K R36 WAS 10K IS 10K R37 WAS 10K IS 10K R38 WAS 10K IS 10K R39 WAS 10K IS 10K R40 WAS 5K IS 33K R41 WAS 10K IS 10K R42 WAS 10K IS 10K R43 WAS 10K IS 10K R44 WAS 10K IS 10K R45 WAS 10K IS 10K R46 WAS 10K IS 10K R47 WAS 10K IS 10K R48 WAS 10K IS 10K R49 WAS 10K IS 10K R50 WAS 10K IS 10K R51 WAS 10K IS 10K R52 WAS 10K IS 10K R53 WAS 10K IS 10K R54 WAS 10K IS 10K R55 WAS 10K IS 10K R56 WAS 10K IS 10K R57 WAS 10K IS 10K R58 WAS 10K IS 10K R59 WAS 10K IS 10K R60 WAS 10K IS 10K R61 WAS 10K IS 10K R62 WAS 10K IS 10K R63 WAS 10K IS 10K R64 WAS 10K IS 10K R65 WAS 10K IS 10K R66 WAS 10K IS 10K R67 WAS 10K IS 10K R68 WAS 10K IS 10K R69 WAS 10K IS 10K R70 WAS 10K IS 10K R71 WAS 10K IS 10K R72 WAS 10K IS 10K R73 WAS 10K IS 10K R74 WAS 10K IS 10K R75 WAS 10K IS 10K R76 WAS 10K IS 10K R77 WAS 10K IS 10K R78 WAS 10K IS 10K R79 WAS 10K IS 10K R80 WAS 10K IS 10K R81 WAS 10K IS 10K R82 WAS 10K IS 10K R83 WAS 10K IS 10K R84 WAS 10K IS 10K R85 WAS 10K IS 10K R86 WAS 10K IS 10K R87 WAS 10K IS 10K R88 WAS 10K IS 10K R89 WAS 10K IS 10K R90 WAS 10K IS 10K R91 WAS 10K IS 10K R92 WAS 10K IS 10K R93 WAS 10K IS 10K R94 WAS 10K IS 10K R95 WAS 10K IS 10K R96 WAS 10K IS 10K R97 WAS 10K IS 10K R98 WAS 10K IS 10K R99 WAS 10K IS 10K R100 WAS 10K IS 10K | 1/12/77 | Self |



| | | | | | | | | | |
|--------------|--|-------------------------------|------------|---------|--------------|---|--|------------------------|--|
| | | | | | |  | | | |
| | | ITEM NO | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION HITACHI DESIGNATION LITE 806 | MATERIAL SPECIFICATION | |
| QTY PER ASST | | CDD DASH NUMBERED PARTS SHOWN | | | PARTS LIST | | EVEN DASH NUMBERED PARTS OPPOSITE | | |

| | | | | | | | | | | | |
|-------------|--|--|----------------------------|--|--|-----------------------|--|--|--------------------|--|--|
| | | | CONTRACT NO | | | APPROVED | | | DATE | | |
| | | | UNLESS OTHERWISE SPECIFIED | | | PREP BY | | | 12/16/77 | | |
| | | | DIMENSIONS ARE IN INCHES | | | DESIGNER | | | | | |
| | | | TOLERANCES | | | GROUP ENG. J. SPADWEL | | | 1/19/78 | | |
| | | | XX ±.02 | | | XXX ±.010 | | | X* ±.1" | | |
| | | | BREAK ALL SHARP EDGES | | | 005/015 | | | CHECKED | | |
| | | | MIL STO 12 15 | | | | | | | | |
| | | | USAS Y32 16 B46 I Y14 5 | | | | | | P - 101 | | |
| | | | SHOP STANDARDS | | | 2060 | | | | | |
| | | | THREADS PER INCH | | | | | | | | |
| PART NO | | | NEXT ASSY | | | USED ON | | | 101 AR CONTROL CO. | | |
| APPLICATION | | | SURFACE FINISH 125 | | | ✓ | | | 101 AR CONTROL CO. | | |
| | | | (EXCEPT AS NOTED) | | | | | | | | |

| | | | | | | |
|------------------------------------|--------|---|----------|-------------|------------|---------|
| REVISED | 2/1/77 | 1 | REVISION | | | |
| | | 1 | SHEET NO | | | 2788 |
| MULTIPLE SHEETS REVISION STATUS | | | | PART NO | NEXT ASS Y | USED ON |
| | | | | APPLICATION | | |

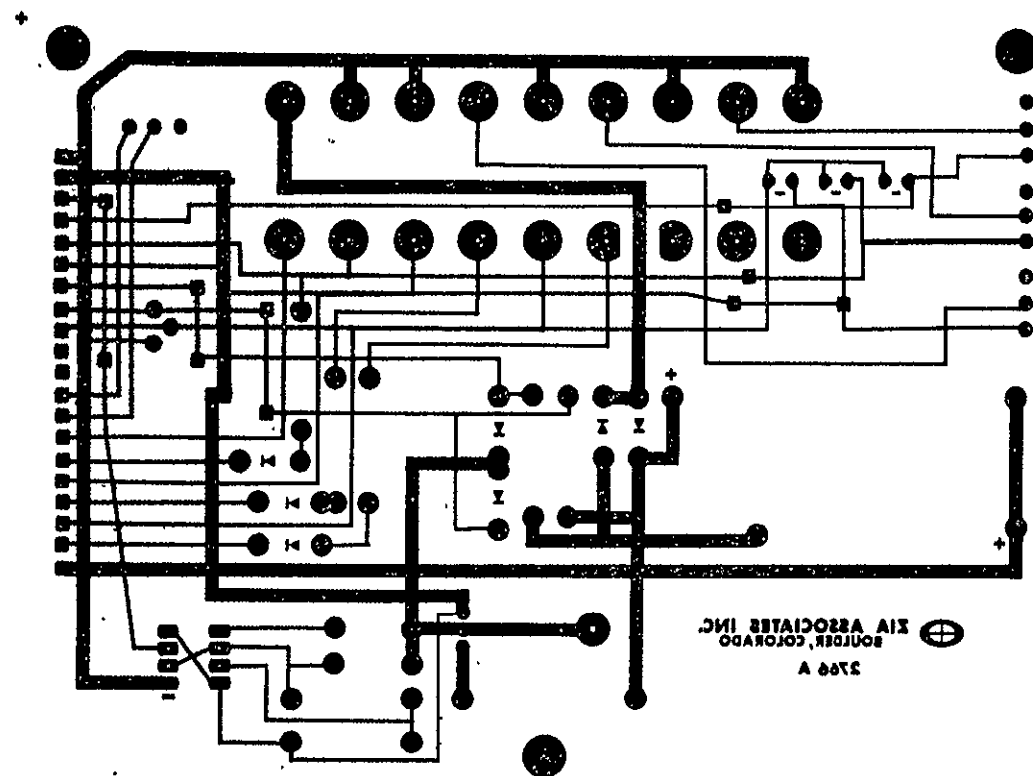
| | |
|-------------------------------|---------------|
| ZIA ASSOCIATES INC. | |
| BOULDER | COLORADO |
| SOLAR: -T DIGITAL TEMP DISPLA | |
| SCHEMATIC | |
| SIZE | CODE IDENT NO |
| C | 52060 |
| 2772 | |
| REV | |
| D | |
| SCALE | WT |
| 1/4 | |
| SHEET 1 OF 1 | |

CRUNING 312421

GENERAL NOTES UNLESS OTHERWISE SPECIFIED

1. MATERIAL - 0.13 GLASS EPOXY 2 OZ COPPER
2. ALL HOLES PLATED THRU
3. TIN/LEAD PER MIL-STD 275

| REVISIONS | | | |
|-----------|----------|----|-----|
| REV | DATE | BY | APP |
| 1 | 10/17/64 | | |



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ZIA ASSOCIATES INC
BOULDER, COLORADO
A 3075

- 3 #26 18 #44 6 #65 1, #26 38 #45 8, #45 15 #65
33 #65

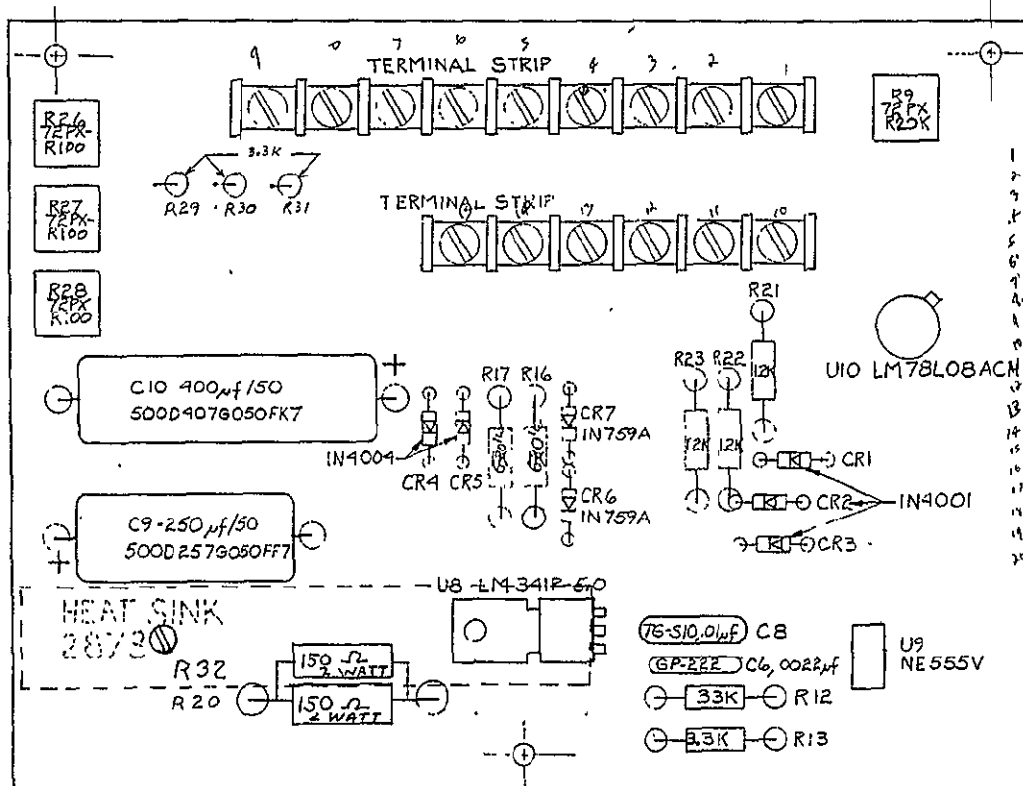
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|-------------------------------|-------------------------------|---------|--------------|-------------|--|------------------------|
| ITEM NO | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION REFERENCE DESIGNATION ELEC DWG | MATERIAL SPECIFICATION |
| QTY PER ASSY | ODD DASH NUMBERED PARTS SHOWN | | | PARTS LIST | | |
| CONTRACT NO | | | APPROVED | DATE | ZIA ASSOCIATES INC BOULDER COLORADO | |
| UNLESS OTHERWISE SPECIFIED | | | PREP BY | | PWB - DP-LL-4747 | |
| DIMENSIONS ARE IN INCHES | | | DESIGNER | | EFN:JAN, 1964 | |
| TOLERANCES | | | GROUP ENG | J. SPANGLER | | |
| XX = 02 | | | CHECKED | | | |
| XXX 010 | | | DESIGNED | | | |
| X* = 1* | | | | | | |
| BREAK ALL SHARP EDGES 005/011 | | | SIZE | C | CODE IDENT NO | 52060 |
| MIL STD 12 15 | | | SCALE | | WT | |
| USASI Y32 16 846 2 Y14 5 | | | | | | |
| SHOP STANDARDS | | | | | | |
| THREADS PER IN 28 | | | | | | |
| SURFACE FINISH 125 | | | | | | |
| EXCEPT AS NOTED | | | | | | |

| | |
|-------------|---|
| REVISION | |
| SHEET NO | 1 |
| PART NO | 1 |
| NEXT ASSY | 1 |
| USED ON | |
| APPLICATION | |

MULTIPLE SHEETS
REVISION STATUS

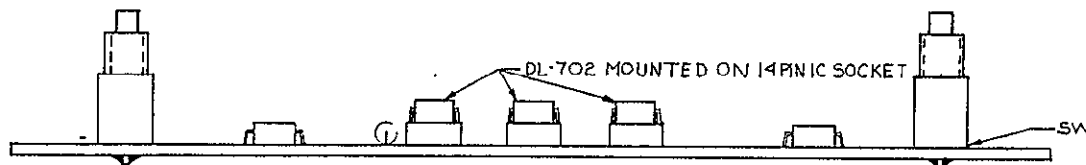
GENERAL NOTES. UNLESS OTHERWISE SPECIFIED

| REVISIONS | | | |
|-----------|---|---------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | CR1, CR2, CR3 REVERSED, REPOSITIONED R20 R13 WAS 3K IS 3.3K, R26, 27, 28 WAS 1K IS 100 CR8, 9, 10 DELETED. REPLACED BY R29, R30, R31 3.3K RESISTORS | 4/2/77 | JAL |
| B | R20 WAS 82Ω R9 WAS 10K | 5/13/77 | JAL |
| C | R16, R17 WERE 1K IS 680 1W | | |

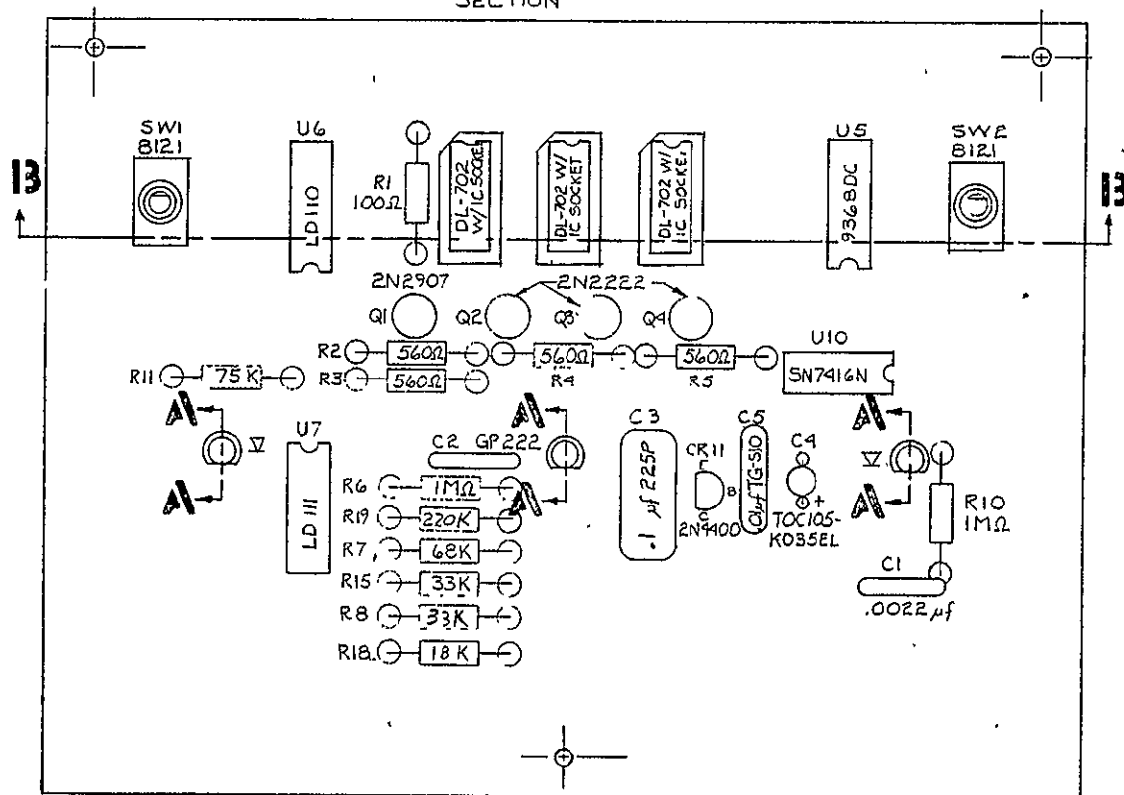


| | | | | | | | |
|----------------------------|--|---------------------------|---------|---------------------|---------------|----------------------|------------------------|
| ITEM NO | | CODE IDENT | PART NO | PWA | STOCK SIZE | MATERIAL DESCRIPTION | MATERIAL SPECIFICATION |
| QTY PER ASSY | | CONTRACT NO | | APPROVED | DATE | ZIA ASSOCIATES INC. | |
| UNLESS OTHERWISE SPECIFIED | | DIMENSIONS ARE IN INCHES | | DESIGNER | GROUP ENG | BOULDER COLORADO | |
| TOLERANCES | | XXX ± 0.10 | | CHECKED | Prepared for: | SOLAR STAT | |
| BREAK ALL SHARP EDGES | | 005/015 | | SOLAR CONTROL CORP. | | PWA, SENSOR | |
| MIN STD 12, 15 | | USASI Y32 16 B46 1, Y14 5 | | 5595 ARAPAHOE ROAD | | 2794 | |
| SHOP STANDARDS | | THREADS PER H 28 | | BOULDER COLORADO | | SCALE 2/1 WT | |
| SURFACE FINISH 125 | | EXCEPT AS NOTED | | C 52060 | | REV BC | |
| REVISION | | SHEET NO 501 | | PART NO 2788 | | 76937 | |
| MULTIPLE SHEETS | | REVISION STATUS | | APPLICATION | | SHEET 1 OF 1 | |

GENERAL NOTES UNLESS OTHERWISE SPECIFIED



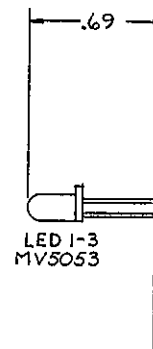
SECTION



| REVISIONS | | | |
|-----------|---|---------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | REVERSED DIRECTION OF "B" ARROWS - ADDED VALUE TO R19 | 3/10/77 | JAL |
| B | REVERSED POSITION OF DL-702 THREE PLACES - R18 WAS 27K IS 33K - R19 WAS 27K IS 18K - C3 WAS 105V6 IS 41V6 | 4/2/77 | JAL |
| C | R11 WAS 100K | 5/13/77 | JAL |

FLAT ON BOARD

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LED 1-3
MV5053

SECTION A A


| | | | | | | | | | | | | | | | |
|----------------------------|--|--------------------------|--|-------------|--|--------------------|--|--------------------|--|------------|--|----------------------|--|------------------------|--|
| PWA | | ITEM NO | | CODE IDENT | | PART NO | | NOMENCLATURE | | STOCK SIZE | | MATERIAL DESCRIPTION | | MATERIAL SPECIFICATION | |
| QTY PER ASY | | CONTRACT NO | | APPROVED | | DATE | | DESIGNER | | GROUP ENG | | CHECKED | | PREPARED FOR | |
| UNLESS OTHERWISE SPECIFIED | | DIMENSIONS ARE IN INCHES | | TOLERANCES | | XX | | XX | | XX | | XX | | XX | |
| BREAK ALL SHARP EDGES | | 004/018 | | 004/018 | | 004/018 | | 004/018 | | 004/018 | | 004/018 | | 004/018 | |
| SHEET NO | | SD1 2788 | | 76-937 | | 2000 | | SOLAR CONTROL CORP | | SHEET | | C 52060 | | 2796 | |
| MULTIPLE SHEETS | | REVISION STATUS | | APPLICATION | | SOLAR CONTROL CORP | | SHEET | | C 52060 | | 2796 | | C | |

| APPLICATION | | | REVISIONS | | | |
|-------------|------------|---------|-----------|---|---------|----------|
| PART NO | NEXT ASS Y | USED ON | LTR | DESCRIPTION | DATE | APPROVED |
| | | | A | ADDED DESCRIPTION TO R19 | 3/20/77 | |
| | | | B | DELETE CR 8, CR 9, CR 10 ADD R29, R30, R31 3.3K CHANGE R20 FROM 27 Ω TO 82 Ω CHANGE R26, 27, 28 FROM 72PARK TO 72PK R100 R18 WAS 27K IS 18K R8 WAS 56K IS 33K | 4/2/77 | |
| | | | D | CHANGE R20 TO 150 Ω Add R32 150 Ω CHANGE R9 FROM 10K TO 20K | | |
| | | | C | R11 WAS 100K IS 75K J NOS REVISED R21, 22, 23 CR1, 2, 3 PUT IN OTHER LEAD | 7/26/77 | |

Prepared for:

SOLAR CONTROL CORP.

5595 ARAPAHOE ROAD
BOULDER COLORADO

| | | | | |
|--|--|---------------|----------------|--|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES .XX .XXX X° ± ±.010 ±1° | | RELIABILITY | |  ZIA ASSOCIATES INC. BOULDER COLORADO |
| | | MATL & PROC | | |
| | | GROUP ENG | | |
| | | DESIGNER | | |
| | | CHECKED | | |
| CONTRACT NO | | PREP BY | S. W. | PARTS LIST SOLAR STAT |
| EMC | | SIZE | A | |
| WEIGHTS | | CODE IDENT NO | 52060 | |
| STRESS | | | 2796 & 2794 PL | |
| THERMAL | | SCALE | N.A. | |
| | | 42 | | SHEET 1/4 |



ZIA ASSOCIATES INC. (SOLARSTAT)

DISPLAY

DWG. NO.

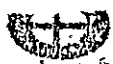
2774-2796

BOULDER COLORADO

CODE IDENT NO. 52060

SHEET 2 OF 9 REV. P

| REFERENCE DESIGNATOR | DESCRIPTION | TOTAL QTY. | MFG. CODE | MFG. PART NO. |
|------------------------------------|---------------------------------|------------|-----------|---------------|
| RESISTOR, 1/2 WATT, 5% FIXED COMP. | | | | |
| R1 | 100 Ω | 1 | | |
| ORIGINAL PAGE IS OF POOR QUALITY | | | | |
| R2, R3, R4, R5 | 560 Ω | 4 | | |
| R6, R10 | 1 M | 2 | | |
| R11 | 75 K | 1 | | |
| R8, R15, R12 | 33 K | 3 | | |
| R18 | 18 K | 1 | | |
| R19 | 220 K | 1 | | |
| R7 | 68 K | 1 | | |
| R16, R17 | 1 K | 2 | | |
| R21, R22, R23 | 1.2 K | 3 | | |
| R29, R30, R31, R13 | 3.3 K | 4 | | |
| R26, R27, R28 | TRIMPOT, 100 Ω PCB MOUNT | 3 | Beckman | 72 PX R100 |
| R9 | 20 K | 1 | 11 | 72 PX R10K |
| R20, R32 | 2W 5% 150 Ω | 2 | | |



ZIA ASSOCIATES INC.

DWG. NO. 67-77-2176 PL

BOULDER COLORADO

CODE IDENT NO. 52060SHEET 3 of 4 REV. D

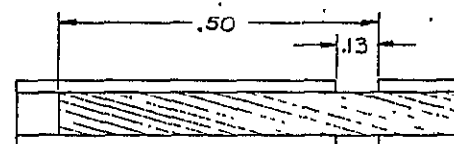
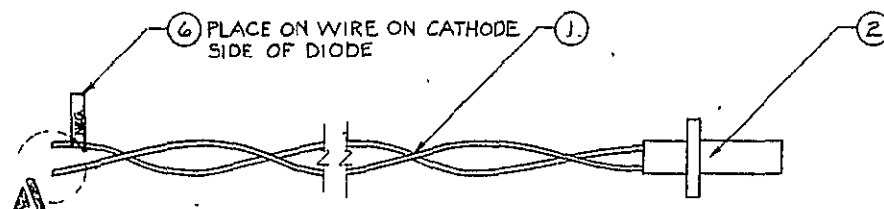
| REFERENCE DESIGNATOR | DESCRIPTION | TOTAL QTY. | MFG. CODE | MFG. PART NO. |
|---------------------------------|-----------------------------------|------------|-----------|----------------------|
| CAPACITOR, DISC CERAMIC | | | | |
| C1, C2, C6 | .0022 μ F | 3 | Mallory | GP 222 |
| C5, C8 | .01 μ F | 2 | SPRAGUE | TG-S10 |
| C3 | .1 μ F | 1 | " | 225P |
| ZIA PART NO. 2873 HEAT SINK | | | | |
| | | | | |
| P.C. card NO. -B 766 | | 1 | | |
| P.C. card NO. -B 2765 | | 1 | | |
| | | | | |
| CAPACITOR, ELECTROLYTIC (ALUM.) | | | | |
| C9 | 250 μ F/50V 500D | 1 | SPRAGUE | 500D 2576 050FF2 |
| C4 | 1/35 TANTALUM | 1 | Mallory | TOC105K035EL |
| C10 | 400/50 500D | 1 | SPRAGUE | 500D 4076 050FFK7 |
| | | | | |
| LED1, LED2, LED3 | MV 5053 | 3 | MONSARTO | |
| | | | | |
| CR11 | ZENER | 1 | JEDEC | 2N4400 |
| CR1, CR2, CR3 | DIODE | 3 | JEDEC | 1N4001 |
| CR4, CR5 | RECTIFIER DIODE | 2 | JEDEC | 1N4004 |
| CR6, CR7 | ZENER, 12VOLT | 2 | JEDEC | 1N759A |
| CR8, CR9, CR10 | DIODE ^{constant current} | 3 | SINCONIX | ES07 |
| Q1 | PNP TRANSISTOR | 1 | JEDEC | 2N2907 |
| Q2, Q3, Q4 | NPN " | 3 | " | 2N2222 |

| REFERENCE DESIGNATOR | DESCRIPTION | TOTAL QTY. | MFG. CODE | MFG. PART NO. |
|-------------------------|-------------------------------------|------------|-------------------|---------------|
| INTEGRATED CKT, DIGITAL | | | | |
| | ORIGINAL PAGE IS OF POOR QUALITY | | | |
| U2, U3, Q1 | 7 SEG. LED DISPLAY | 3 | LITRONIX | DL-702 |
| U5 | BCD TO 7 SEGMENT | 1 | FAIRCHILD | 9368 DC |
| U6 | A/D DIGITAL CHIP | 1 | SILICONIX | LD110 |
| U10 | HEX BUFFER INV. | 1 | TI | SN7416N |
| | | | | |
| | | | | |
| INTEGRATED CKT, LINEAR | | | | |
| U7 | A/D ANALOG CHIP | 1 | SKICONIX | LD111 |
| U8 | VOLTAGE REG. | 1 | NATIONAL | LM 341P-5.0 |
| U9 | TIMER 555 | 1 | SIGNETICS | NE555V |
| U10 | VOLTAGE REG | 1 | NATIONAL | LM 78L08 ACN |
| | | | | |
| SW1, SW2 | SPDT, MOM. CONTACT | 2 | C&K | B121 |
| | PWB, SENSOR | 1 | ZIA | 2766A |
| | PWB, READOUT | 1 | ZIA | 2765A |
| DIP 14 PIN | SOCKET | 3 | | |
| | | | | |
| Terminal Bd 9 Term | BEAU | 1 | Beau Vernitron | 72709-50-C |
| Terminal Bd 6 Term | BEAU | 1 | Beau Vernitron | 72706-50-C |
| FLEX CABLE | 20 CONDUCTOR | 1 | ANSLEY | FSM-31A-20 |

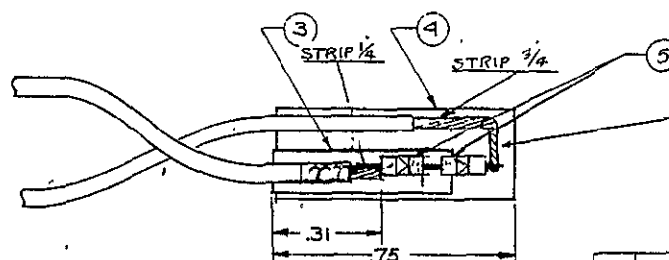
GENERAL NOTES: UNLESS OTHERWISE SPECIFIED.

- 1 IDEAL INDUSTRIES, INC., SYCAMORE, ILLINOIS.
- 2 POT DIODE ASSY. INTO HOUSING WITH CASTALL 301 RESIN. CURE WITH RT7 CATALYST FOR 24 HRS. AT 25°C
- 3 FOR DIODE PROBES, USE GREEN TWISTED PAIR

| REVISIONS | | | |
|-----------|--|---------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | ADD DESCRIPTION TO DETAIL A ADD NOTE 2. | 7/14/77 | MC |
| B | Wire Color added | 4/5/79 | MC |
| C | 2-GRN 364 SIZES CHANGED SOLDER INSTRUCTIONS ADDED | 4/2/77 | MC |



DETAIL A
PRE-STRIP DIM. TYP



WIRING DETAIL

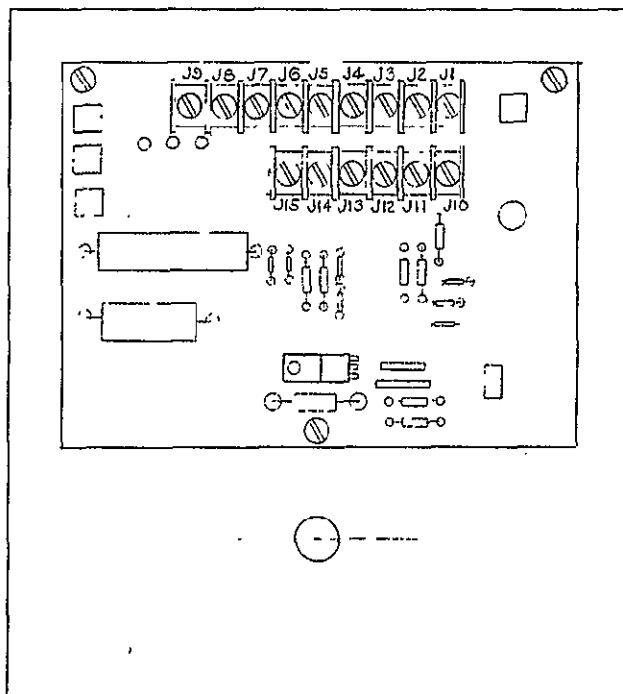
SOLDER TWO DIODES TOGETHER
SOLDER 1/4 END TO BACK DIODE
PLACE ITEM 3
WRAP 1/2 TURN OF 1/4 STRIPPED WIRE ON DIODE
WIRE. PULL TIGHT TO GLASS AND SOLDER
TRM. ADD ITEM 4. SHRINK. POT.

| | | | | | | |
|-----|---------|------------|-----------------------------------|--------------|------------|--|
| 1 | 6 | 43-830 | NEG. WIRE LABEL | | NOTE 1 | |
| 2 | 5 | IN914 | SIGNAL DIODE | | | |
| 1 | 4 | | HEAT SHRINK | 3/2 X 3/4 | | |
| 1 | 3 | | HEAT SHRINK | 1/6 X 5/8 | | |
| 1 | 2 | 2763-1 | HOUSING | | | |
| 1 | 1 | | TWISTED PAIR TEFLON INSUL WIRE | 22GAX24 | NOTE 3 | |
| 501 | ITEM NO | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION QUANTITY INFORMATION ELSE INDICATE |

| | | | | | |
|---|--------------|--|--------|---------------------|---------------|
| CONTRACT NO | | APPROVED | DATE | ZIA ASSOCIATES INC. | |
| UNLESS OTHERWISE SPECIFIED | | DESIGNER | 7/1/77 | BOULDER COLORADO | |
| DIMENSIONS ARE IN INCHES TOLERANCES XX .02 XXX .010 X* .1* | | GROUP ENG | 7/1/77 | SOLAR STAT | |
| BREAK ALL SHARP EDGES 003/015 MIL STD 12, 15 USASI Y32 16 840 1, Y14 S SHOP STANDARDS 2060 THREADS PER IN 28 SURFACE FINISH 115 EXCEPT AS NOTED | | CHECKED | | DIODE PROBE | |
| REVISION | | Prepared for: | | SIZE | CODE IDENT NO |
| 1 | SHEET NO 501 | SOLAR CONTROL CORP | | C | 52060 |
| MULTIPLE SHEETS REVISION STATUS | | 5595 ARAPAHOE ROAD BOULDER COLORADO | | SCALE NONE | REV C |
| APPLICATION | | | | | |

GENERAL NOTES: UNLESS OTHERWISE SPECIFIED.

| REVISIONS | | | |
|-----------|---|---------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | ADD USE CODE | 3/30/77 | D. J. |
| B | NUMBERS REVISED. SPARES REMOVED 4/14/77 | | D. J. |
| C | CHANGED CONNECTORS J3,4,5,6,7,8,9 | 7/28/77 | D. J. |



| "J" CONNECTOR | INTERFACE |
|---------------|--|
| J1 | 24 VAC |
| J2 | 24VAC LO |
| J3 | GROUND |
| J4 | STORAGE PROBE |
| J5 | STORAGE PROBE NEG |
| J6 | COLLECTOR PROBE |
| J7 | COLLECTOR PROBE NEG |
| J8 | NORMAL PROBE |
| J9 | NORMAL PROBE NEG |
| J10 | SOLAR COLLECTING RELAY-24VAC OR POS DC |
| J11 | SOLAR COLLECTING RELAY-24VAC OR NEG DC |
| J12 | SOLAR HEATING RELAY-24VAC OR POS DC |
| J13 | SOLAR HEATING RELAY-24VAC OR NEG DC |
| J14 | CONVENTIONAL HEATING RELAY-24VAC OR POS DC |
| J15 | CONVENTIONAL HEATING RELAY-24VAC OR NEG DC |

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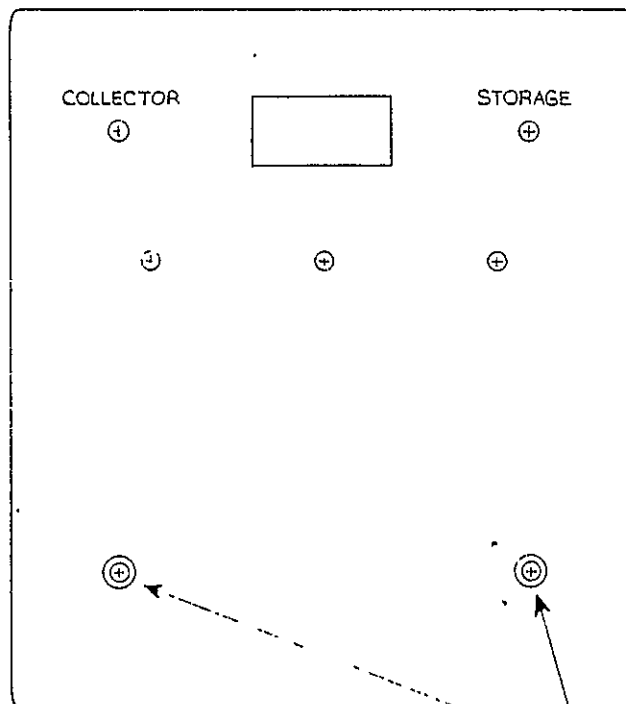
* RECOMMENDED FOR OUTDOOR TEMPERATURE

| | | | | | | | |
|------------------------------------|--|-------------------------------|----------|---------------------|------------|-----------------------------------|------------------------|
| ITEM NO. | | CODE IDENT | PART NO. | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION | MATERIAL SPECIFICATION |
| QTY PER ASY | | ODD DASH NUMBERED PARTS SHOWN | | PARTS LIST | | EVEN DASH NUMBERED PARTS OPPOSITE | |
| CONTRACT NO. | | | | APPROVED | DATE | ZIA ASSOCIATES INC. | |
| UNLESS OTHERWISE SPECIFIED | | | | DESIGNER | | BOULDER, COLORADO | |
| DIMENSIONS ARE IN INCHES | | | | GROUP ENG | | WIRING DIAGRAM | |
| TOLERANCES | | | | CHECKED | | HOOK-UP INSTRUCTIONS | |
| XX = .02, X = .010, X = .015 | | | | Prepared for: | | SIZE | CODE IDENT NO. |
| BREAK ALL SHARP EDGES 008/015 | | | | SOLAR CONTROL CORP. | | C | 52060 |
| MIL STD 12.15 | | | | 5595 ARAPAHOE ROAD | | 2798 | |
| CLASS Y32 IN. 044.1, Y14 S | | | | BOULDER, COLORADO | | C | |
| /BNOF STANDARDS 1000 | | | | | | | |
| THREADS PER IN 20 | | | | | | | |
| SURFACE FINISH 125 EXCEPT AS NOTED | | | | | | | |
| REVISION | | PART NO. | | NEXT ASSY | | USED ON | |
| I SHEET NO. | | 76-937 | | | | | |
| MULTIPLE SHEETS REVISION STATUS | | APPLICATION | | | | | |


GENERAL NOTES: UNLESS OTHERWISE SPECIFIED

Artwork Number 2837

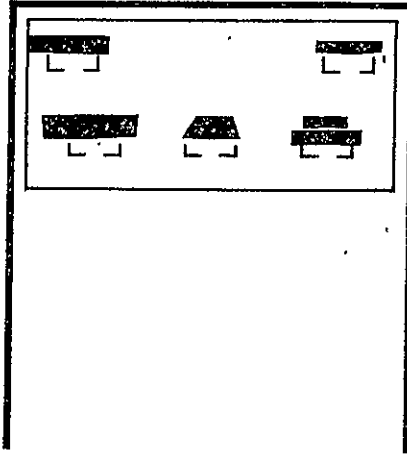
| REVISIONS | | | |
|-----------|-------------|------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |



Counterbore holes this side

| | | | | | | |
|--|--|-------------------------------|---------|---------------|---|--|
| ITEM NO | | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION MATERIAL SPECIFICATION |
| QTY PER ASSY | | 000 DASH NUMBERED PARTS SHOWN | | | PARTS LIST EVEN DASH NUMBERED PARTS OFFSHORE | |
| CONTRACT NO | | | | APPROVED | DATE |  ZIA ASSOCIATES INC. BOULDER COLORADO |
| UNLESS OTHERWISE SPECIFIED | | | | PREP BY | | |
| DIMENSIONS ARE IN INCHES | | | | DESIGNER | | |
| TOLERANCES | | | | GROUP ENG | | |
| 3X .02 .010 .1" | | | | CHECKED | | |
| BREAK ALL SHARP EDGES .005/.015 MIL STD 12-15 USASI Y32 16 846 1 Y14 5 SHOP STANDARDS 2060 THREADS PER INCH SURFACE FINISH 125 EXCEPT AS NOTED | | | | | | |
| REVISION | | SHEET NO | | APPLICATION | | SIZE C |
| MULTIPLE SHEETS REVISION STATUS | | 2788 Solarstat | | CODE IDENT NO | | 52060 |
| | | | | SCALE | | 2838 |

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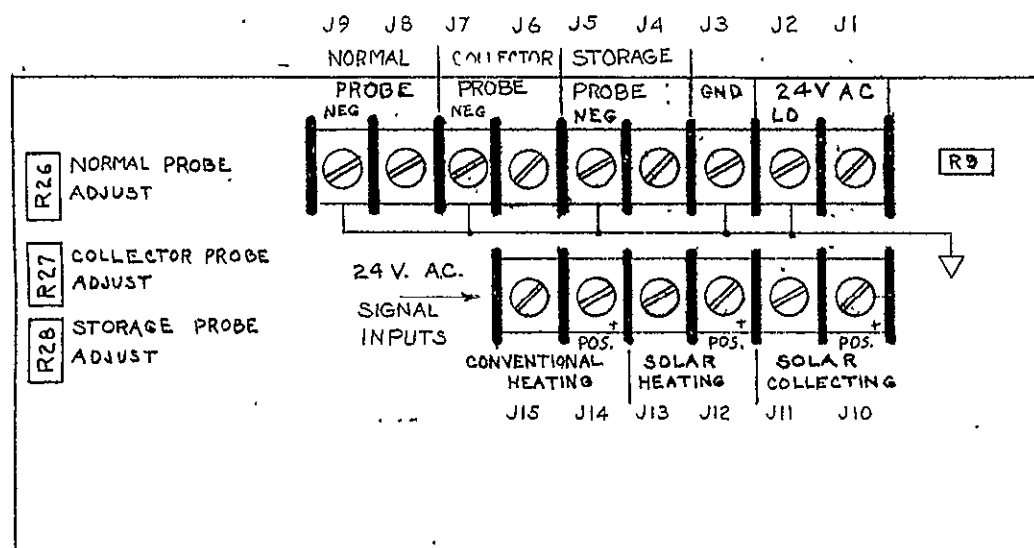
Front Panel Whitewash Silkscreen, Colorado
5837

110 111
5000 11
1100 1111
5141250000

| | |
|--------------------|------------------------|
| ZIA ASSOCIATES INC | |
| BOULDER COLORADO | |
| SIZE D | CODE IDENT NO 52060 |
| 28 57 | |
| SCALE | SHEET OF |

GENERAL NOTES UNLESS OTHERWISE SPECIFIED

| REVISIONS | | | |
|-----------|---------------------------|---------|----------|
| LTN | DESCRIPTION | DATE | APPROVED |
| A | NUMBERS & NAMES CHANGED | 4/26/77 | D.J. |
| B | ADDED POS ID TO J10,12,14 | 7/27/77 | D.R. |



2766A

| | | | | | | | | | |
|----------------------------------|--|---------|------------|---------|--------------|------------|----------------------|----------------------------------|-----------------------|
| QTY PER ASSY | | ITEM NO | CODE IDENT | PART NO | NOMENCLATURE | STOCK SIZE | MATERIAL DESCRIPTION | REFERENCE SPECIFICATION FILE NO. | APPROVED FOR PURCHASE |
| CONTRACT NO | | | | | | | | | |
| UNLESS OTHERWISE SPECIFIED | | | | | | | | | |
| DIMENSIONS ARE IN INCHES | | | | | | | | | |
| TOLERANCES | | | | | | | | | |
| XXX ± .02 X ± .010 X ± .01 | | | | | | | | | |
| BREAK ALL SHARP EDGES .008/.005" | | | | | | | | | |
| H/A STD 12, 15 | | | | | | | | | |
| USAS1 V22 16, 244.1, 174.5 | | | | | | | | | |
| SHOP STANDARDS 9640 | | | | | | | | | |
| THICKNESS PER H-25 | | | | | | | | | |
| SURFACE FINISH YES | | | | | | | | | |
| CHECKED BY | | | | | | | | | |
| PREP BY <i>KR Wandelt</i> | | | | | | | | | |
| DATE <i>4/26/77</i> | | | | | | | | | |
| DESIGNER | | | | | | | | | |
| GROUP ENG | | | | | | | | | |
| CHECKED | | | | | | | | | |
| ZIA ASSOCIATES, INC. | | | | | | | | | |
| SOLARSTAT | | | | | | | | | |
| TERMINAL BOARD | | | | | | | | | |
| CONNECTIONS | | | | | | | | | |
| SIZE CODE IDENT NO | | | | | | | | | |
| C 2766A 2766A | | | | | | | | | |
| DATE | | | | | | | | | |

| | | | |
|-----------------|---|----------|---|
| REVISION | 1 | SHEET NO | 1 |
| MULTIPLE SHEETS | | | |
| REVISION STATUS | | | |
| APPLICATION | | | |

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ZIA ASSOCIATES INC.

NASA Solarstat
Test Procedure

2866

Rev
A

N/A

1/3

SOLARSTAT
Test Procedure

I. Equipment Needed

- A. 3 1/2 Digit Digital Voltmeter ($\pm 1\%$ accuracy)
- B. 24 volt at 1 amp transformer
- C. Three dual diode temperature probes
- D. Approximately one quart ice-water bath (32°F)
- E. Approximately one quart hot water bath (150°F)
- F. 0° to 200°F thermometer ($\pm 2\%$ accuracy)

II. Procedure

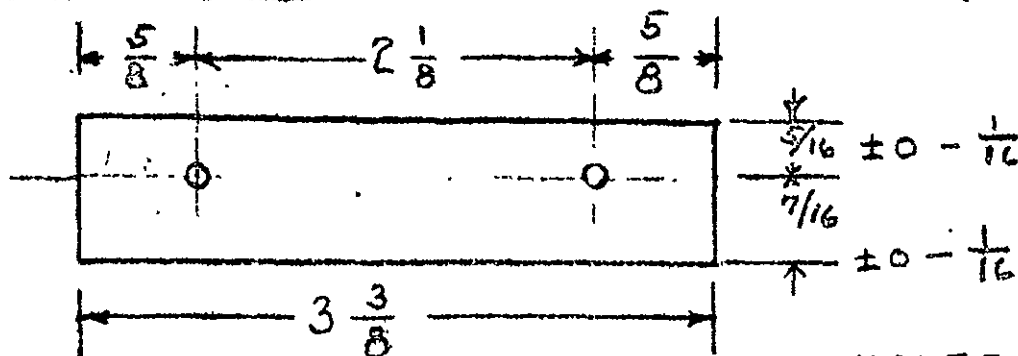
- A. Connect the 24 volt transformer secondary leads to the terminal block screws J1 (Hi) and J2 (ground). (Refer to Drawing Number 2799 for terminal locations.)
- B. Connect the three temperature probes to the terminal block screws J4 and J5, J6 and J7, and J8 and J9.
- C. Center the three variable resistors on the bottom printed circuit board.
- D. Connect the negative (-) (blk) Digital voltmeter lead to the negative (-) side of the 400 micro farad capacitor (C_{10}).
- E. Connect the 24 volt transformer primary leads to a 110 volt-AC source. Allow two minutes before proceeding.
- F. Using the Digital voltmeter positive (+) (red) lead, verify the following voltages: (refer to drawing number 2794A for component location on sensor (lower) board, and 2796C for locations on the readout (upper) board)
 - a. U6 pin 8 -- $+5V \pm .20$
 - b. U6 pin 11 -- $-12V \pm 1.2V$
 - c. U7 pin 15 -- $+12V \pm 1.2V$
 - d. U7 pin 15 -- $+1.44 \pm .07V$
 - e. U7 pin 10 -- $+8V \pm .3V$

- G. Remove the Digital voltmeter connection.
- H. Place the three temperature probes and thermometer in the ice water bath. Allow five minutes before proceeding.
- I. Verify 32°F on the thermometer.
- J. While observing the LED temperature display, adjust R₂₅ for a display of 32°F.
- K. While pressing the left hand push button, adjust R₂₇ for a display of 32°F.
- L. While pressing the right hand push button, adjust R₂₈ for a display of 32°F.
- M. Transfer the three temperature probes and thermometer to the hot water bath. Allow five minutes before proceeding.
- N. Note the thermometer reading.
- O. Adjust R₉ for a temperature display equal to the thermometer reading.
- P. Verify the same display reading (± 1 degree) when the left and right hand push buttons are pressed.
- Q. Repeat steps H through P until all three temperature displays match the thermometer readings for the ice water bath and hot water bath ± 1 degree.
- R. Jumper the 24V from J₁ and J₂ to J₁₀ and J₁₁. The solar collecting LED should light. (left) Jumper J₁ and J₂ to J₁₂ and J₁₃. The solar heating (center) LED should light. Finally, jumper J₁ and J₂ to J₁₄ and J₁₅. The conventional heating (right) LED should light.

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| DATE | BY | USED ON | DATE | APPROVED |
|------|----|---------|------|----------|
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2 HOLES # 25
M'T'L: ALUMINUM $\frac{3}{32}$ THK
FINISH: FLAT BLACK
LACQUER

ASSEMBLE UNDER 5V REGULATOR BETWEEN
BOARDS WITH $\frac{5}{16}$ SIDE TOWARD EDGE

| | | | | | | |
|--|-------|-------|---|--|--|--|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES | | | RELIABILITY PART NO. QTY. ORDERED BY DATE | | ZIA ASSOCIATES INC. BOUNDER SOLARSTAT HEAT SINK | |
| XX | XX | XX | <i>K.R. Wendt</i> <i>Joh</i> | | 2873 | |
| ±.010 | ±.010 | ±.010 | U.S. GOVERNMENT PRINTING OFFICE 1978-740-193/127 REGION NO. 4 | | 54 | |