## REVISIONS

| DCN | LTR | DESCRIPTION | DATE | CHANGED | CHECKED | APPROVED |
|---|---|---|---|---|---|---|
| | A | RELEASED FOR PRODUCTION | 980319 | SWR | | JS |
| 2288 | B | REVISED PER ECN | | | | |
| 2346 | C | REVISED PER ECN | 980320 | SWR | | JS |
| 2600 | D | REVISED PER ECN | 990216 | SA | | JS |
| 3027 | E | REVISED PER DCN | 000310 | SA | | JS |
| 4778 | F | REVISED PER DCN | 050720 | PJ | JR | TMA |
| 6991 | G | REVISED SECTION 4.3 (COOLING OPN) | 171016 | SA | | J.Richter |






| FILENAME | | | | | | | | 1 | SHT |
|---|---|---|---|---|---|---|---|---|---|
| 4952TG.doc | | | | | | | | G | REV |

UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN INCHES. ALL CAPACITANCE VALUES ARE IN MICROFARADS. ALL RESISTANCE VALUES ARE IN OHMS.

# ANALOG MODULES, INC.

*a HEICO company*

| DRAWN BY | DATE | CHECKED BY | DATE |
|---|---|---|---|
| S. REDMAN | 980319 | | |
| **LEAD APPROVAL** | **DATE** | **FINAL APPROVAL** | **DATE** |
| J. SULLIVAN | 980419 | C. SMITH | 980430 |

TOLERANCES
DECIMAL
.XX = N/A
.XXX = N/A

TITLE

OPERATING MANUAL
MODELS 5703, 5704

| ANGULAR | SCALE | SIZE | FSCM | SHEET | DRAWING NUMBER | REV. |
|---|---|---|---|---|---|---|
| X = N/A | N / A | A | 61651 | 1 OF -- | 4952T | G |

DWG#: 4952T
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FILE#: 4952TG.doc
DATE: 171016
DCN#: 6991

# OPERATING MANUAL
# FOR
# MODEL 5703, 5704

# CAPACITOR CHARGING POWER SUPPLY



**Analog Modules, Inc.**
**126 Baywood Avenue**
**Longwood, FL 32750**

**Approval:** _____
**Timothy Ayres, Product Manager**

_____
**Jeff Richter, Product Engineer**

DWG#: 4952T
REV: G
FILE#: 4952TG.doc
DATE: 171016
DCN#: 6991

# TABLE OF CONTENTS

DWG# 4952T
REV: G
FILE#: 4952TG.doc
DATE: 171016
DCN#: 6991

# MODEL 5703, 5704

# SPECIAL PRECAUTIONS

## CAUTION

- Read this manual carefully before attempting to install or operate the model 5703, 5704.
- This unit contains no user serviceable parts. Manufacturer's warranty is void if field serviced.
- Proper installation is necessary to limit access to lethal voltages.

# MODEL 5703, 5704

# Spezielle Vorsichtsmaβregein

## Achtung

- Lesen Sie bitte dieses Handbuch genau, bevor Sie das Modell 5703, 5704 anschlieβen oder in Betrieb nehmen.

- Reparaturen dürfen nur von autorisiertem Servicepersonal vorgenommen werden. Bei unbefugtem Öffnen des Gerätes erlischt die Herstellergarantie.

- Achtung: Teile können Hochspannung führen !!
  Eine einwandfrele Installation ist notwendig um das unbeabsichtigte Berühren von tödlichen Hochspannungen unmöglich zu machen.

# LABELS

Abbreviations:

| | |
|---|---|
| A | amperes |
| AC | alternating current |
| °C | degrees Celsius |
| CW | Continuous wave |
| Hz | hertz |
| IEC | International Electrotechnical Commission |
| kHz | kilohertz |
| kW | kilowatts |
| kΩ | kiloohms |
| (L) | line conductor, single phase system |
| mA | milliamp |
| mm | millimeter |
| mV | millivolt |
| (N) | neutral conductor, single phase system |
| V | volts |
| VAC | alternating voltage |
| VDC | direct voltage |
| W/°C | watts per degree Celsius |
| Z | impedance |
| OEM | original equipment manufacturer |
| PFN | pulse forming network |
| W | watts |
| pk | peak |
| HV | high voltage |
| RTN | return |
| N/C | no connection |
| f/s | full scale |
| Ω | ohms |

Symbols:

Protective Earth (ground) Terminal

Local signal reference

Alternating Current

Earth (ground)

Direct Current

Dangerous Voltage

# SECTION 1

# INTRODUCTION

## 1.0 INTRODUCTION

The 5700 series isolated switch-mode power modules use proprietary power conversion techniques to provide the highest power density of any power module currently on the market. All models are designed to meet the isolation and leakage current requirements for UL2601-1 and IEC 601-1.

All supplies feature open circuit, short circuit, and thermal overload protection. Modules may also be paralleled to obtain higher average power. Please refer to drawing #P4705 Master/Slave Configuration for proper set-up for parallel operation of the chargers.

All supplies are available with optional active power factor correction.

The Model 5703 is a capacitor-charging module designed to repeatedly charge energy storage capacitors for pulsed solid-state laser applications.

The Model 5704 is a capacitor charging module designed to charge energy storage capacitors to a specified voltage and to maintain this output level for switched, variable pulsewidth solid-state laser applications.

# SECTION 2

# ENVIRONMENTAL DATA

## 2.0 ENVIRONMENTAL DATA

### 2.1 Non-operating (transport and storage)

| | |
|---|---|
| Ambient Temperature: | -40°C to +70°C |
| Relative Humidity: | 10% to 100%, non-condensing |
| Atmospheric Pressure: | 500hPa to 1060hPa (7.25 to 15.37 psia) |

### 2.2 Environmental Risk

The substances used in the product pose no known health or environmental risk associated with the disposal of the product at the end of their useful lives.

# SECTION 3

# SET-UP AND INTERFACE

## 3.0 SET-UP AND INTERFACE

### 3.1 Mechanical Considerations

Installation begins with mounting the module in a suitable enclosure which complies with the following criteria:

A. Enclosure must provide protection against possible human contact with live parts.

B. Enclosure must be adequately grounded to protective earth to ensure operator safety, or constructed entirely of a non-conductive material. In the latter case, all internal exposed metal parts must be grounded to protective earth.

C. Enclosure must provide forced air cooling, 110 CFM minimum, through the module.

### 3.2 Electrical Connections

Electrical connections are made in three groups; the power input, HV output, and control interface groups. These groups are terminated in three different connectors.

#### 3.2.1 Power Input Group

The power-input connector is a Molex 19-09-1039, using Molex 02-09-1104 terminals. The mating connector is a Molex 19-09-2039, using Molex 02-09-2103 terminals.

IEC 601-1 requires that both line and neutral be fused. Therefore, fuses should be installed in series with both the high and low sides of the mains. Recommended values for each version of the supply are listed below:

Four power input options exist:

| | Part Number Suffix | Fuse Rating |
|---|---|---|
| 115VAC (full wave rectified) | -PFC-C | 15A |
| 230VAC (full wave rectified) | -PFC-D | 15A |
| 325VDC (rectified, filtered 230VAC) | -NPFC-D | 10A |
| 380-415VAC (full wave rectified 3$\phi$) | -PFC-E | 5A |

Input power requirements for the modules are typically 2150W for the 5704, and 1850W for the 5703.

### 3.2.2 HV Output Group

The HV output connector is a Molex 19-09-1032, using Molex 02-09-1104 terminals. The mating connector is a Molex 19-09-2032, using Molex 02-09-2103 terminals

The HV output (red wire) should connect to the load capacitor bank. The HV RTN (black wire) should connect to the flashlamp common star ground.

Typical output power for the modules is 1750W for the 5704(-PFC), and 1500W for the 5703(-PFC). Power output will decline for any charger that is not operated at its full output voltage. Please refer to the output power charts for reduction of output power with reduction of output voltage.

### 3.2.3 Control Interface Group

The Control Interface connector is a standard 2X8 DIN header. The 3M part # is 929836-01-08.

Please refer to drawing #P4705 Master/Slave Configuration in the back of the manual for proper connection of I/O for parallel operation of the chargers.

The reference figures for each signal are schematic representations of the interface, and may be found on the 5703/5704 Interface Circuits pages.

The following standard (-1) connections are available:

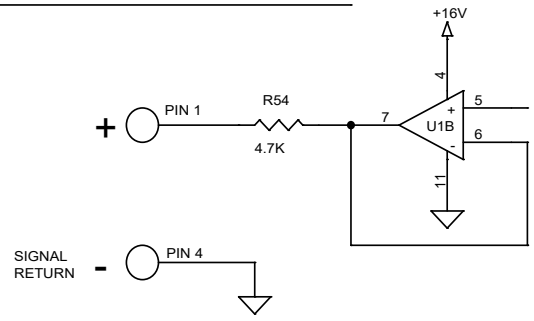
| PIN | Signal Name | Description |
|---|---|---|
| 1 | TEMPERATURE TEST POINT | Represents charger temperature as a DC voltage through 4.7kΩ of output impedance (reference figure 1). Refer to temperature test point data chart. Shutdown occurs at approximately 72°C. |
| 2 | PROGRAM RETURN | 0 to 10V control differential input return (reference Figure 2). |
| 3 | PROGRAM VOLTAGE | 0 to 10V control differential input (reference Figure 2). |
| 4 | SIGNAL RETURN | Used for low current signal output, and input returns. |
| 5 | 24V RETURN | Main 24V power return |
| 6 | 24V RETURN | Main 24V power return |
| 7 | PRIMARY INHIBIT | 3.5 to 30V input to inhibit charger. 10kΩ load impedance (reference Figure 3). |
| 8 | N/C RESERVED | Pin 8 is removed so that connector can be keyed for proper orientation. |
| 9 | 24 VOLT INPUT | 24V at 250mA required to power control board. |
| 10 | 24 VOLT INPUT | 24V at 250mA required to power control board. |

| | | |
|---|---|---|
| 11 | +5V REFERENCE | 5V reference with 100Ω source impedance. 10mA maximum current draw. Overload on this line could interfere with normal charger operation (reference Figure 4). |
| 12 | N/C RESERVED | NO CONNECTION |
| 13 | OVERTEMP OUT | (16V maximum) Open collector output rated to 16V and capable of sinking up to 15mA. Fault indicated by low output signal (reference Figure 5). |
| 14 | N/C RESERVED | NO CONNECTION |
| 15 | END OF CHARGE | Diode isolated output of 15.5V capable of sourcing up to 15mA. Charge complete indicated by high output signal (reference Figure 3). |
| 16 | SECONDARY INHIBIT | Connected to end of charge line for master slave operation. Independent or master units cannot be connected in this manner (reference Figure 3). |

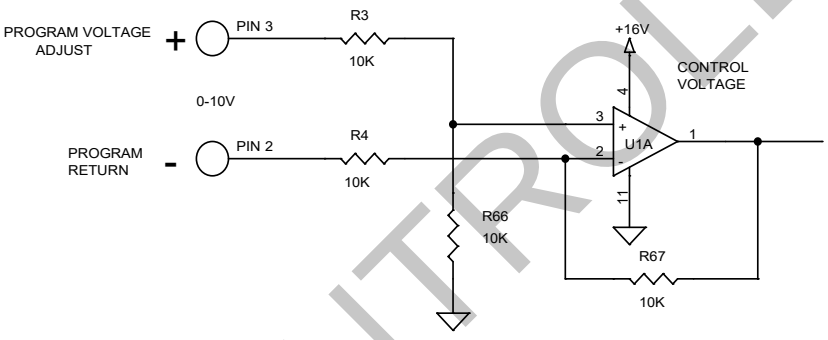
DWG# 4952T
REV: G
FILE#: 4952TG.doc
DATE: 171016
DCN#: 6991

# 5703/5704
# INTERFACE CIRCUITS

## FIG. 1 TEMPERATURE TEST POINT

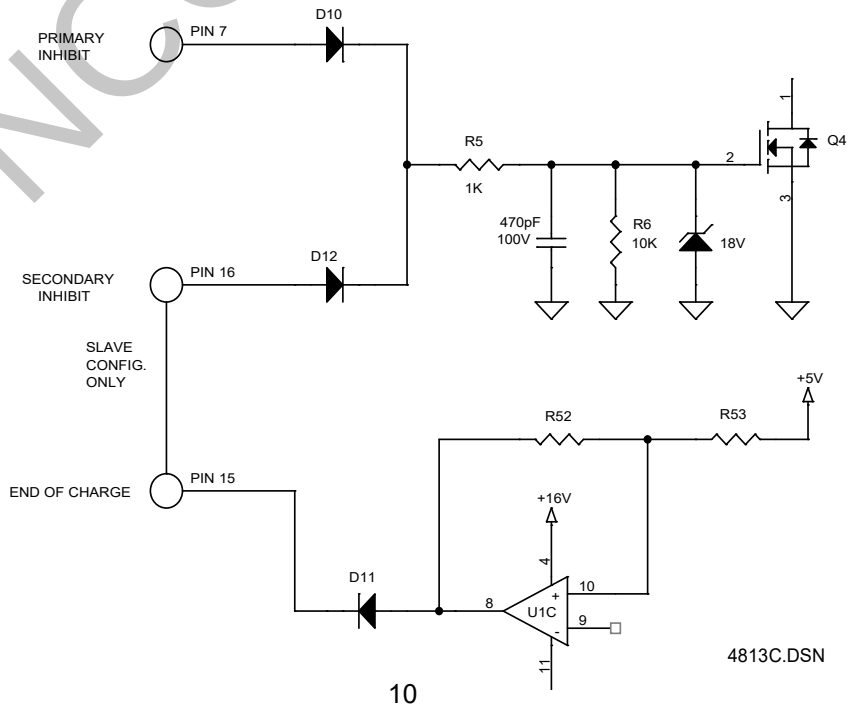



## FIG. 2 PROGRAM VOLTAGE




0-10V CONTROL R66,67 = 10K
0-5V CONTROL R66,67 = 20K

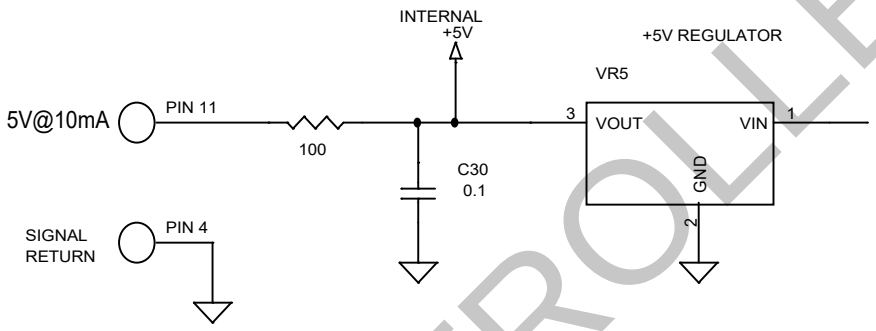
## FIG. 3 INHIBIT / END OF CHARGE



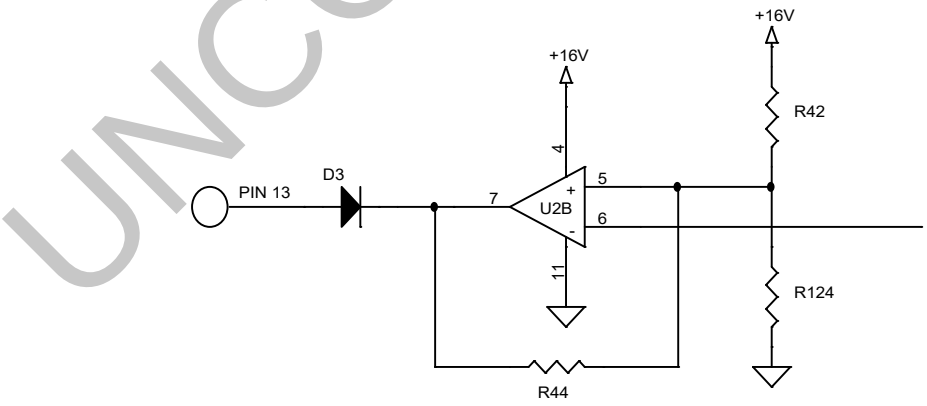

4813C.DSN

# 5703/5704
# INTERFACE CIRCUITS

## FIG. 4 +5V REFERENCE




## FIG. 5 OVER TEMP STATUS




4813C.DSN

# SECTION 4

# OPERATION



## 4.0 OPERATION

### 4.1 Power Up Sequence

Care must be exercised in the power up sequence. This is especially true with a microprocessor-controlled system. The proper power up sequence is as follows:

All external control circuitry should be powered up and stable before applying 24V to the power module. Fan(s) should also be running. Inhibit should be high and Program voltage should be 0V. Once these conditions are true, the 24V may be applied by the mains power input.

### 4.2 Power Down Sequence

Inhibit should be raised high and program voltage should be set to 0V. The 24V and mains power may then be removed.

### 4.3 Cooling

Adequate cooling must be maintained at all times the power module has power applied to it. An inadequate airflow will result in the temporary shutdown of one or more power modules. A fan with a minimum airflow of 110CFM ($180m^3/h$) is recommended.

Ducting should be fabricated to ensure the maximum airflow through the power module. The switching FET heat sinks, which are visible on the end opposite the I/O connector, should be oriented toward the cooler air.

# SECTION 5

# MAINTENANCE

## 5.0 MAINTENANCE

No maintenance is required.

## CAUTION

***To prevent electric shock, do not remove screws. There are no user serviceable parts inside. Refer all servicing to factory qualified service personnel.***

# SECTION 6

# DOCUMENTATION

## 6.0 DOCUMENTATION

Temperature Test Point Data

Power Declination Curves

Master – Slave Configuration (Dwg. 4705)

Declaration of Conformity

International Representatives

DWG#: 4952T
REV: G
FILE#: 4952TG.doc
DATE: 171016
DCN#: 6991

# TEMPERATURE TEST POINT DATA

| TEMPERATURE IN CENTIGRADE | TEST POINT VOLTAGE | TEMPERATURE IN CENTIGRADE | TEST POINT VOLTAGE |
|---|---|---|---|
| 25° | 5.28V | 50° | 7.23V |
| 26° | 5.38V | 51° | 7.29V |
| 27° | 5.48V | 52° | 7.34V |
| 28° | 5.57V | 53° | 7.39V |
| 29° | 5.66V | 54° | 7.44V |
| 30° | 5.76V | 55° | 7.49V |
| 31° | 5.85V | 56° | 7.55V |
| 32° | 5.94V | 57° | 7.58V |
| 33° | 6.03V | 58° | 7.62V |
| 34° | 6.11V | 59° | 7.67V |
| 35° | 6.20V | 60° | 7.71V |
| 36° | 6.29V | 61° | 7.75V |
| 37° | 6.36V | 62° | 7.79V |
| 38° | 6.44V | 63° | 7.82V |
| 39° | 6.51V | 64° | 7.85V |
| 40° | 6.59V | 65° | 7.89V |
| 41° | 6.67V | 66° | 7.92V |
| 42° | 6.74V | 67° | 7.95V |
| 43° | 6.81V | 68° | 7.99V |
| 44° | 6.88V | 69° | 8.02V |
| 45° | 6.94V | 70° | 8.05V |
| 46° | 7.00V | 71° | 8.07V |
| 47° | 7.06V | 72° | 8.10V |
| 48° | 7.12V | 73° | 8.13V |
| 49° | 7.17V | 74° | 8.15V |

DWG#: 4952T
REV: G
FILE#: 4952TG.doc
DATE: 171016
DCN#: 6991