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SYSTEM 90 INTELLIGENT MAINFRAME™

USER'S MANUAL

SSC LABORATORY
SYSTEM 90 TYPE I
NO: 1238190TI-1

TRACEWELL ENCLOSURES, INC.
567 Enterprise Drive
Columbus, OH 43081
(614) 846-6175

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1.0 INTRODUCTION

Tracewell System 90 series intelligent VXI mainframes introduce a revolutionary approach to computer systems packaging technology that safeguards your VXI modules.

VXI mainframes demand tight control of power supply outputs, cooling performance and enclosure construction techniques to ensure the proper operating environment for your instrumentation system modules.

Tracewell System 90 series intelligent mainframe supervisory panel scans all power supply outputs, the air flow sensor and standby battery for out of specification conditions. Detection of a fault condition triggers both visual and audible alarms alerting system operators.

System 90 series intelligent mainframes are an active component of your overall VXI instrumentation system providing both the OEM and end-user with the leading "edge" in packaging technology.

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1.1 Safety Terms Used in this Manual

WARNING statements identify potential conditions, procedure or practices that could result in serious personal injury or loss of life.

CAUTION statements identify conditions, procedures or practices that could result in damage to the equipment or other property, and in minor or moderate injury.

1.1.1 Terms as Marked on Equipment

WARNING indicates a hazard. It calls attention to a condition, procedure or practice which, if not correctly performed or adhered to, could result in serious injury or loss of life.

CAUTION denotes a hazard. It calls attention to an operation, condition, procedure or practice, which if not correctly performed or adhered to, could result in damage or to destruction of part or all of the equipment, and in minor or moderate injury.

1.1.2 Symbols as Marked on Equipment







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1.1.3 System Components

The system components are identified in a cut-away view of the system on the following page. Wiring schematics are contained in Appendix A.

1.2 Installation

After unpacking the System 90, verify that it has been configured correctly for the intended operating voltage. Unless the system has been special ordered for a different voltage, the System 90 will be wired for 120 VAC operation **ONLY**. The voltage selector plug on the main power supply should be checked just as a precaution. Remove the power supply access panel from the rear of the system located just below the fans to gain access to the main power supply. The arrow on the power supply points to the selected operating voltage. See Section 3.2.3.1 for details on the jumper plug location and on how to change the voltage selection.

1.3 Cable Routing and I/O Connector Panel

The System 90 has a cable-way mounted in the bottom to confine the cables that must run from the module fronts to the rear of the system. It insures that proper air flow is maintained inside of the system by keeping the cables away from the bottom of the card guides where they have the potential of blocking off air to a module.

Full access to the cable-way is gained by removing the bottom cover. Use of adhesive backed cable hold-downs is recommended, especially for ribbon cables since they are apt to get pinched when the cover is reinstalled.

The cable-way measures 0.75 inches High x 6.00 inches Wide.

The I/O connector panel mounted on the back of the System 90 measures 2U High x 51T Wide. It is punched to accomodate 2 - DB25 connectors and 2 IEEE-488 connectors.

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2.0 SYSTEM LEVEL SPECIFICATIONS

The specifications given in this section of the manual are overall system specifications, or summary specifications for the System 90. These summary specifications are to be used in determining mounting locations, power requirements and general environmental considerations.

The detailed specifications covering all aspects of the system contained in Section 3. The system specifications are identical for both "Type 1" and "Type 2" systems except where noted. A Type 1 system conforms to the VXIbus Specification Rev. 1.3, Rules B.7.1, B.7.3 and 7.4 for "C-size" modules while a Type 2 system conforms to the specification for "D-size" modules.

2.1 Mechanical Specifications

The System 90 is designed to be rack mounted in a standard 19 inch NEMA rack (EIA RS-310, ANSI C83.9-1972).

If placed on a stand or counter top, consideration must be given to the mounting location so that proper airflow is assured. At least 6 inches must be allowed along BOTH sides for proper air intake. The fans exhaust air out of the back of the system. A distance of at least 9 inches must be left between the back of the system and any wall or similar obstruction. If a wall exists behind the system, then there must be at least 12 inches of headroom above the system allowing the exhaust air to escape. If there is open space behind the system, then the headroom above the system can be just high enough for the system.

	Type 1	Type 2
Height:	16.0 inches	21.25 inches
Width :	17.5 inches	17.5 inches
Depth:	26.0 inches	26.0 inches
Weight: (w/o modules)	54 lbs.	75 lbs.

Access to the front of the system should be sufficient to remove a module without moving the system. A practical minimum distance from the front of the system to the opposing wall is 24 inches. This will allow a "user" or "operator" to stand in front of the system while servicing the modules.

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2.2 System Air Flow

The System 90 is cooled by 3 variable speed fans. Each fan contains its own temperature sensor that senses the temperature of the exhausted air. As the exhaust air temperature rises above 37°C, the fans speed up to increase the volume of air flowing through the system. This feature greatly reduces the noise level of the System 90 and increases the MTBF of the fans in systems that run cool enough to take advantage of this feature. The air intakes are located along the bottom of the system on both sides. The air filters are accessible from the front and slide forward. The filter media is a washable dry type foam with 20 pores per inch. It is UL listed Class 2, R5147(N). The system cooling conforms to the VXIbus Specification Rev. 1.3, Rules B.7.54 and B.7.55.

2.3 System Environmental Specifications

TBD

2.4 Electrical Specifications

The electrical specifications in this section are general specifications for utility planning, and for maximum DC loading. Detailed specifications are given in section 3.0.

2.4.1 System 90 Power Requirements

The System 90 contains 2 switching type power supplies. One supply powers the power monitoring PCB and is described in Section 3.3.3. The main power supply is a 7 output, 1200 Watt unit that powers the modules and the fans. The following table gives the System 90 electrical requirements.

Input Power:	1 phase 120(90 to 132) VAC @ 15A 47-63 Hz or 1 ph. 208/240(180 to 264) VAC @ 7.5A 47-63 Hz Brown-out down to 80/160 VAC for 10 min.
Inrush Current:	Less than 75A peak from cold start for units that have been off for at least one-half hour

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2.4.2 DC Outputs

In accordance with the VXIbus Specification Rev. 1.3, the required 8 voltages are available in the System 90. The following table also lists the current available for each voltage in the System 90. The system is labeled per the VXIbus Specification Rev. 1.3, Recommendation B.7.18 on the back panel.

VOLTAGE	SYSTEM 90 CURRENT
-2 VDC	30 Amps
+5 VDC	60 Amps
-5.2 VDC	28.8 Amps
+12 VDC	16.7 Amps
-12 VDC	16.7 Amps
+24 VDC	8.3 Amps
-24 VDC	8.3 Amps
+5VSTB	0.2 mA

2.5 Power and Air Flow Monitoring Subsystem

The System 90 contains a microprocessor based power and air flow monitoring subsystem which samples each power supply voltage and compares it to the VXIbus Specification Rev. 1.3 limits. In addition, a solid-state air flow sensor is monitored which indicates if there is sufficient air flowing through the system.

Each monitored signal is represented by a lighted pushbutton on the front panel. There are red and green LED's mounted inside each pushbutton. If the monitored signal is within limits, the green LED is lighted, if an out of limits condition is detected, it is indicated by flashing the red LED. In addition, an audible alarm is sounded which can be silenced by pressing the corresponding reset pushbutton or permanently silenced by an on-off switch mounted beside the alarm transducer. The alarm will clear only if the condition causing the alarm is corrected.

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3.0 DETAILED SPECIFICATIONS

This section is intended to give the systems integrator all of the data required about the System 90 that is needed to build a system. The subsections contain references to the internal wiring drawings in Appendix A. Slot power limits are given and worst case slot cooling graphs are supplied as specified in the VXIbus Specification Rev. 1.3, Rule B.7.56.

3.1 Power Entrance

The System 90 is supplied with a shielded 3-conductor detachable line cord. A chassis mounted AC IEC connector with fuse(s) is provided per the VXIbus Specification Rev. 1.3. The earth ground is connected to a ground stud inside the system per UL requirements. A ground wire is connected from the ground stud to terminal 2 of the terminal strip on the back of the system. A wire from the power supply common is connected to terminal 1. This facilitates the VXIbus Specification Rev. 1.3 Observation B.7.22 for providing a means of connecting signal ground to earth ground.

The power on-off switch is mounted on the front of the system below the module access door. Both sides of the AC line are switched. Power "on" is indicated by an LED mounted directly above the power switch. The LED is driven from the "power good" signal provided by the main power supply. The power good signal is derived from the +5 VDC output of the power supply. If the supply voltage is within 90% to 120% of nominal, then the LED is lighted.

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3.1.1 Power Entry Component Ratings

The following table gives the manufacturer's component ratings and safety certifications for the power entry components.

Component	MFG	P/N	Ratings	Listed
Power Cord	Belden	17604	14 Ga. - 1875 W	UL
			60°C	CSA
			Molded Grounding Plug PH-173	
			Molded Grounding Connector PH-386E, IEC320-C13	
			6 Ft. 7 In. length	

Component	MFG	P/N	Ratings	Listed
IEC Conn	Schurter	4303.0033		
		120 VAC	15A/250V	UL
		4303.0003		
		240 VAC	16A/250V	1-pole CSA
			10A/250V	2-pole CSA
			10A/250V	VDE
			10A/250V	SEMKO
			10A/250V	SEV

Component	MFG	P/N	Ratings	Listed
Power Sw	Carling	RGSCC701/711	20A 125VAC	UL
			15A 250VAC	CSA
				VDE

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3.2 Main Power Supply

The main power supply used in the System 90 is a high reliability, 500,000 hour MTBF, multi-output type that provides all seven of the required VXIbus voltages. The supply contains its own fan for cooling and built-in thermal protection. The unit is manufactured by WESTCOR and is referred to in this manual by its trade name, StakPAC.

3.2.1 Safety Summary

The following safety rules must be observed during all phases of installation, operation and service of the StakPAC power supply. Failure to comply with these precautions or with specific warnings violates safety standards of design, manufacture and intended use. Westcor assumes no liability for the customer's failure to comply with these requirements.

3.2.1.1 Specific Safety Warnings

The StakPAC power supply is not intended to be opened. No maintenance or repair is intended within the StakPAC by the user. If the StakPAC is to be opened(this will void the warranty), input power must be disconnected. Always power down the system and wait at least 5 minutes before attempting repairs, maintenance or working within the power supply unit in any manner.

Do not install substitute parts or perform any unauthorized modifications to the StakPAC. Customer modification of the StakPAC may constitute a hazard, is not recommended and will void the StakPAC warranty.

Internal fuses are not user replaceable. For continued protection against fire never change fuses.

Never operate the StakPAC with tools, instruments, or flammable materials on top of it.

Do not obstruct incoming or the exhaust air to the power supply inside the System 90 as this may degrade thermal management of the StakPAC.

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3.2.2 Main Power Supply Description

The StakPAC is a multiple output switcher capable of providing 1200 Watts of output power and is designed to operate over wide input voltage and output load conditions.

3.2.2.1 Theory of Operation

The EMI filter built into the StakPAC reduces line-conducted EMI from the StakPAC to Class A FCC and VDE limits. From the output of EMI filter the AC power is fed to power rectification circuitry that provides a 300VDC unregulated high voltage bus and voltage to high bias power supplies. The high voltage bus provides input power for up to 8 Westcor Megahertz DC-to-DC converters. The output of these high efficiency converters is bussed together or used independently to provide 8 DC outputs. The bias power supply system provides 5V for secondary control circuitry and voltage to power the DC fan.

In the event of a fan failure or stalled fan, the unit is automatically disabled to prevent damage. Also, if the incoming air exceeds 50°C the general thermal shutdown circuitry will disable the unit. The unit will restart automatically when the over-temperature condition is rectified. In the event of general thermal protection circuitry failure, each converter is additionally self-protected against over-temperature with a built-in module thermal shutdown system. This second level of protection is overlapped by the previous ones.

The "power fail" circuitry, which uses a hysteresis detector, turns on a digital TTL "1" signal when the high voltage bus reaches the Low line condition during StakPAC power-up and switches to TTL "0" 5 milliseconds(typical) before loss of output regulation under loss of AC input power. The "power-fail" signal is referenced to the secondary side. The power rectification circuitry is equipped with power factor correction that increases the power factor to .75(.25W nominal line impedance) for a 120 VAC input. A plug-in voltage selector allows strappability for either 120 or 240 VAC input. A protective device prevents fire and the capacitors are vented should the unit be miswired (e.g. input of 240 VAC applied to unit strapped for 120 VAC).

3.2.2.2 Power Supply Specifications

Input Power:	1 phase 120(90 to 132) VAC @ 15A 47-63 Hz
	or
	1 phase 208/240(180 to 264) VAC @ 7.5A 47-63 Hz
	Brown-out down to 80/160 VAC for 10 min.

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Inrush Current:	Less than 75A peak from cold start for units that have been off for at least one-half hour
Efficiency:	80% typical to 85% max. depending on output voltages and loading
Acoustic Noise:	45 dBa(max.) at 3 feet.
Safety Agencies:	UL, CSA, VDE(TUV)
EMI:	VDE 0871 and FCC 20780 Class A
Hold-Up Time:	At least 20 ms from nominal line
Output Power:	1200 Watts at 40°C ambient, 1000 Watts at 50°C ambient

DC Outputs:

-Load Regulation:	0.1% (typ.)
-Line Regulation:	0.1% (typ.)
-Ripple and Noise:	All outputs: 1% or 50mV, whichever is greater (20 MHz B.W.L.) at full load

Note: There are two categories of noise: Common mode and differential mode. This noise is collectively known as periodic and random deviation (PARD) and can be either differential noise (on the output with respect to return) or common mode noise (both output and return with respect to chassis). PARD measurements should be made using a noise jack P/N 129-0701-301 manufactured by E.F. Johnson and an oscilloscope with the 20 MHz bandwidth limit function enabled. The wire lengths on the noise jack should be kept as short as possible to avoid incorrect measurements.

-OVP:	115 - 135% V_{nom} Recycle power to restart
-Current Limit:	105 - 125% I_{nom} Foldback current limit on 2 to 5.2 VDC output(active below 2 VDC). Straight line standard on all other output voltages. Output comes up at nominal when overcurrent condition is removed.
Thermal Regulation:	0.02% per degree C over operating range
Operating Temp:	-20°C to 40°C full load
Storage Temp:	-40°C to 85°C

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Dynamic Response:	+/- 25% load step from 75% of rated maximum current will cause a 3% deviation(typ.). Output will recover to 1% of nominal within 200 microseconds
Turn-on delay: (for logic enable)	10 ms
Weight:	11 lbs. max.
Thermal Shutdown:	In the event of over temperature condition, unit automatically shuts down.
Remote Sense Comp:	All outputs: 0.5 V max. (.25 V per leg)
Power Good Signal:	(DC OK) TTL Logic "1" for main output within from 90% to 120%(nom.)
Power Fail Warning:	(AC Fail) TTL signal 5 ms typical, 2 ms min. before loss of output regulation
Logic Enable/Disable:	TTL "1" enable for all outputs
MTBF:	Calculated at 500,000 hours per MIL-HDBK-217E, ground benign 35°C baseplate.

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3.2.2.3 Connector Pinouts

INPUT CONNECTORS
J13 (Uses 10 or 12AWG Wire)
See SYSTEM 90 WIRING - POWER ENTRANCE drawing (sheet 1)

PIN	FUNCTION
1	AC Neutral(L2/N)
2	AC Line(L1)
3	Earth Ground

OUTPUT CONNECTORS

Clustered Connectors
See SYSTEM 90 WIRING - MAIN POWER SUPPLY drawing (sheet 3)

J1 - J8 Remote Sense
Uses Molex #703-75-0001(mates with #50-57-9402)

PIN	FUNCTION
1	Sense+
2	Sense-

J12 Functions Connector
See SYSTEM 90 WIRING - MAIN POWER SUPPLY drawing (sheet 3)

PIN	FUNCTION
1	Power Fail Indication
2	Power Good Indication
3	Enable/Disable Position 8
4	Return
5	Not Used
6	Enable/Disable Position 4

3.2.3 Main Power Supply Installation

3.2.3.1 Input Connections

The AC power connection terminals and the voltage selector plug are located on the fan end of the StakPAC. All three inputs, protective ground, AC Hot L1 and AC Neutral L2 require one 10 or 12 AWG conductor for safe operation.

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TO AVOID ELECTRICAL SHOCK, THE StakPAC MUST BE GROUNDED BEFORE IT IS SWITCHED ON.

The input AC voltage selection (120 VAC or 240 VAC) is done via a plug-in selector. Two phillips head screws must be removed from the strapping plug before unplugging it. Do not overtighten screws; finger tight" is adequate. Be sure that the right input voltage value faces the arrow if input label. Make the selection before powering-up the StakPAC.



TO AVOID ELECTRICAL SHOCK AND UNIT DAMAGE NEVER REMOVE VOLTAGE SELECTOR PLUG-IN WHEN THE StakPAC IS POWERED UP.

3.2.3.2 Output Connections

Output connections are made through 8 pairs of 5/16-18UNC-2B brass studs. The output end of the StakPAC is represented on sheet 3 of the System 90 Wiring drawing. The top of the unit is the side with the labels. On each level there are up to 2 outputs (2 pairs of studs), two studs on the left for one output and two studs on the right for the other output. The right stud of a pair is the positive output and the left one is the negative output.

3.2.3.3 Remote Sense Connections

Each output is provided with remote sense connections (see sheet 3 of the System 90 wiring drawing). The remote sense connector J1 uses a Molex #707-75-0001 housing that mates with Molex #50-57-9402 plug-in connector. The housing is a 2-pair connector that always has the +RS on the right side and -RS on the left side. If the remote sense leads are not connected, the modules are internal "open-sense" protected. The output voltage will go up 5%(typ.).

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DO NOT REVERSE THE REMOTE SENSE CONNECTIONS, OUTPUT MAY SHUTDOWN AND POWER WILL NEED TO BE RECYCLED.

Keep the length of the remote sense leads as short as possible and also twist them.

3.2.3.4 Enable/Disable Connections

Each output channel can be enabled or disabled using a TTL "1" on the jack corresponding to the desired channel. The enable/disable connectors, from top to bottom, are J9, J10, J11 and J12 (see sheet 3 of the System 90 Wiring drawing). Each connector services two channels on the same level. For example, J9 connector services the top level two outputs. Pin 2 of J9, J10 and J11 is the common return for the enable/disable signal, pin 1 is used for the right channel and pin 3 is used for the left channel.

The J12 connector services the bottom level two channels. Pin 4 is the common return, pin 3 is used for the right channel and pin 6 is used for the left channel. TTL control signals are applied between the right or left channel inputs(1 or 3 for J9, J10, J11, and 3 or 6 for J12) and common return (2 for J9, J10, J11 and 4 for J12). The TTL enable/disable signal can be standard or open collector TTL with a max. 3.3 mA sink capability. A TTL "1" or an open circuit will enable the channel, while a TTL "0" or a short circuit will disable the channel.



CONTROL CIRCUITS CAPABLE OF SOURCING MORE THAN 20MA. SHOULD NOT BE USED. DAMAGE TO THE StakPAC CONTROL CIRCUITS MAY OCCUR.

3.2.3.5 Power Good Connections

The "power good" signal is available only for the main output (lower right corner channel, +/-P8, +5 VDC) and is used to provide a TTL signal for the main channel status. The signal is available at the J12 connector (see sheet 3 of the System 90 Wiring drawing). If the main output is within 90% to 120%(nominal) a positive TTL "1" is provided at pin 2 of J12 and being referenced to pin 4 (common return). If the main output is not within the above limits, a TTL "0" is provided at the same pin.

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3.2.3.6 Power Fail Connections

The "power fail" signal, available on the J12 connector at pin 1, referenced to pin 4 (common return), indicates the status of the AC input lines (see sheet 3 of the System 90 Wiring drawing). This signal is provided by power fail circuitry which uses a hysteresis detector that switches the pin 1 signal to TTL "1" when the high voltage bus reaches low-line condition during turn-on and switches it to TTL "0" 5 ms (typical) before loss of output regulation under loss of AC input power. A 22 ms (typical) hold-up time at nominal line and full load (1200W) is provided to cover at least a one cycle loss of AC input power.

3.2.4 Main Power Supply Operation

3.2.4.1 Initial Main Power Supply Set-Up

Unless otherwise specified replacement StakPACs are shipped from the factory configured for 120 VAC operation. ALWAYS check the input voltage jumper plug before installing a replacement StakPAC.

To prepare the StakPAC for your system follow this set of instructions:

A. Check to see that the voltage selector plug is in the correct position to match your input AC voltage. If not, change it according to the instructions in section 3.2.3.1.

B. Connect the AC power leads and the ground (earth) wire to the J13 block terminal as shown in Figure 3.

C. Connect the DC loads to the output studs in the same locations that they were removed from. Tighten nuts with a torque wrench to 70-100 in. lbs.

D. Insert the remote sense leads into their respective jacks.

3.2.5 Main Power Supply Maintenance

No maintenance or repair is intended within StakPAC. Internal fuses are not user replaceable. However, if the StakPAC is to be opened, input power must be disconnected.

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BEFORE ATTEMPTING ANY REPAIRS, MAINTENANCE OR WORKING WITH THE StakPAC IN ANY MANNER, ALWAYS POWER DOWN THE StakPAC AND WAIT AT LEAST 5 MINUTES.

3.2.6 Safety Agency Approvals

The StakPAC series has been submitted to the following safety agencies for approval:

UL Recognized: UL478 File No. E 123535
CSA Certified: CSA 22.2 No. 220 Bulletin 1402C File No. LR86497
TUV Approved: IEC 950, EN 60 950 License No. R 97567
StakPAC conducted noise meets or exceeds these guidelines:
FCC Rules, 153 Level A, Docket 20780
VDE 0871 Level A

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3.3 Power Monitor Circuit

3.3.1 Theory of Operation

The seven power supply outputs, the solid-state air flow sensor and the standby battery voltage are connected to the microprocessor based power monitor PCB in the System 90. Each monitored signal is represented by a lighted pushbutton on the front panel. There are red and green LED's mounted inside each pushbutton. If the monitored signal is within limits, the green LED is lighted, if an out of limits condition is detected, it is indicated by flashing the red LED. In addition, an audible alarm is sounded which can be silenced by pressing the corresponding reset pushbutton or permanently silenced by an on-off switch mounted beside the alarm transducer. The alarm will clear only if the condition causing the alarm is corrected.

An additional LED on the front panel indicates the status of the VXIbus SYSFAIL line. Also provided is a timed and debounced SYSRESET output line which is enabled by a momentary switch. The output is connected to the VXIbus backplane. The power monitor provides a +5 V battery backup that is connected to the backplane terminal +5VSTB. (see SYSTEM 90 WIRING - BACKPLANE drawing (sheet 2)) The batteries for the backup function are 2 - 'AA' NiCad cells and are located behind the front panel to the right of the pushbuttons. The batteries are recharged during normal system operation.

The sensing circuitry of the power monitor consists of an eight channel analog multiplexer and a twelve bit A/D converter. A microprocessor compares each voltage level with a stored reference. If too many out of range results are detected within a preset time, about 20-30 ms., a flag is set to turn off the green LED and flash the red LED that corresponds to the out of range signal. The flag gets reset when the pushbutton associated with the alarm is pushed. New samples are taken and if the out of spec condition has been corrected, the green LED stays lighted, otherwise the alarm state is reactivated.

The LEDs are multiplexed with a 7-segment sink driver and 3 PNP transistors acting as source drivers. This allows 21 LEDs to be separately controlled. The System 90 uses 19 LEDS, 18 in the pushbuttons and 1 for the SYSFAIL indicator. The switches are demultiplexed with the same 3 PNP transistors used to drive the LEDs and 4 optocouplers. This allows for 12 switches of which the System 90 uses 10. There are 2 NPN transistors used as drivers, 1 for the audible alarm transducer and one for driving the SYSRESET pin on the bus.

The +5VSTB circuit consists of 2 - 'AA' NiCad cells, a DC to DC converter IC and a storage capacitor. Under normal power-on conditions, power is supplied to the PCB and the batteries are kept charged by the power monitor power supply. In the event of

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lost power, either by shutting the system off or by loss of power from the source, the backplane will continue to receive 5 volts on the +5STB pin. The batteries are capable of providing 50 mA and have a capacity of approximately 0.2 Ah.

3.3.2 Power Monitor Limits

The voltages of the main power supply and the battery backup are checked per the VXIbus Specification Rev. 1.3. The following table lists those limits.

VOLTAGE	LIMITS
+5 V	+0.25/-0.125 V
+12 V	+0.60/-0.36 V
-12 V	-0.60/+0.36 V
+24 V	+1.20/-0.72 V
-24 V	-1.20/+0.72 V
-5.2 V	-0.26/+0.156 V
-2 V	-0.10/+0.10 V
+5VSTB	+0.25/-0.125 V

3.3.3 Power Monitor Power Supply

The power monitor PCB is powered by a separate 15 watt power supply. This isolation ensures that a failure of the main supply will be detected and alarmed.

3.3.3.1 Power Supply Specifications

Model:	Total Power International PMC15U-2-J
Input Power:	1 phase 85 W typ. 264 V/0.4 A typ. (AC_{in} = 100 V) 47 - 440 Hz
Inrush Current:	20 A typ. (AC_{in} = 100 V. I_{out} = 100%) at cold start
Efficiency:	65% typ. (AC_{in} = 100 V, I_{out} = 100%)
Safety Agencies:	Complies with UL 114,478 Complies with CSA C22, 2# 154 and VDE0806
EMI:	Complies with FCC-B

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MTBF: 262,000 Hours, (from field data)

Outputs:

Voltages (V):	+5 V	+15 V	-15 V
Current (A):	0.1-2.0 A	0-0.3 A	0-0.2 A
Regulation Line (mV):	20 max.	60 max.	60 max.
Regulation Load (mV):	100 max.	150 max.	150 max.
Ripple: (mVp-p):	100 max.	60 max.	60 max.
Noise: (mVp-p):	120 max.	150 max.	150 max.
Temp Drift (mV 0-50°C):	50 max.	350 max.	350 max.
Rise Time: (mS):	100 max. (AC_{in} = 85 V, I_{out} = 100%)		
Hold Time (mS):	10 typ. (AC_{in} = 85 V, I_{out} = 100%)		

Protection Circuit: Works at over 105% of rating and recovers automatically

Operating Temp. and Humidity: 0 to 50°C, 20 to 90% RH (Non condensing)

Storage Temp. and Humidity: -20°C to +75°C, 20 to 90% RH (Non condensing)

Vibration: 10 to 55 Hz at 2G 3 minutes period 30 minutes along X, Y and Z axis

Impact: 20G for 11+/-5 ms, once on each axis

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3.4 Slot Specifications

This section details the power management, cooling capability and bus electrical characteristics of the System 90.

3.4.1 Backplane Specifications

The backplane in the System 90 is a 12 layer stripline type. It was designed to VXIbus Specification Rev. 1.2. It features separate TTL and ECL layers to control impedance and keep propagation delays within spec. Stripline construction minimizes crosstalk on clock and trigger lines permitting extremely tight time coupling between modules. There are hook-up terminals provided for AC Fail, System Fail and System Reset. On-board termination of signal lines is provided to increase electrical performance. The DIN Connectors are pressed into the board which permit repair of a single contact if required.

The connectors meet or exceed the VXIbus Specification Rev. 1.3, Rule B.7.6. The locations conform to the specification Rules B.7.7 and B.7.8.

DIN Connector Specifications

Insulator:	Glass Filler Polyester UL94VO
Contact:	Copper Alloy - per Federal Specifications QQ-B-750
Plating:	Nickel per QQ-N-290 Gold per Mil-G-45024 Type 1 Tin per Mil-T-1027 Type 1
Current Rating:	2A per contact
Contact resistance:	less than or equal to 20 milliohms
Dielectric withstanding:	Greater than or equal to 500 VRMS, 60 Hz at sea level
Insulator resistance:	Greater than or equal to 10 megohms after environmental
Temperature rating:	-55°C to 120°C
Mating force:	3.5 oz. minimum per contact
Unmating force:	0.53 oz. minimum per contact

3.4.2 Slot Cooling

Testing to be performed per the VXIbus Specification Rev. 1.3 addendum when available. Target date for availability is 11/90.

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3.5 System Cooling Performance

The system cooling analysis was performed using a Dwyer Instruments Corp. micomanometer, tradename Microtector and a hot anemometer manufactured by TSI Incorporated, Model 8350. The anemometer calibration is traceable to NIST.

The overall cooling capacity testing was performed to determine the bounds of performance of the System 90. By finding the pressure drop and the air volume at the slowest and fastest fan speeds for an empty card cage and a fully blocked card cage, the limits of cooling performance can be ascertained. While the data given above for the worst case single slot will allow the systems integrator to verify the air flow for a particular module, the overall system cooling performance can be used to determine temperature rise inside the system for a known module complement.

The overall cooling capacity calculation for the System 90 involves several steps.

Step 1. Load the modules into the system and measure the pressure drop with the fans running at their slowest speed. The fans will not speed up until the temperature inside the system rises above 37°C or 98.6°F. The pressure drop is measured by installing a special top cover that contains 5 holes evenly spaced from side to side towards the back, near the fans. Each hole has an adapter mounted in it. This cover is available from Tracewell Enclosures, Inc. on a loan basis. The tubing leading from the 'Low' pressure side of the manometer must be connected to the adapters one at a time and the manometer reading noted. The tubing from the 'High' pressure side of the manometer should be attached to the side of the system such that the end of the tubing is across an air inlet slot.

Step 2. After the 5 air pressure readings have been taken, average them and locate the reading on the Y-axis on the following graph. Locate the point on the FAN V = 6 VOLTS curve and read the corresponding airflow in CFM from the X-axis.

Step 3. Interpolate the position of a point on the FAN V = 12 VOLTS curve, using the data points on either side of your data point on the FAN V = 6 VOLTS curve as a reference. Read the CFM value from the X axis for fans running at full speed (FAN V = 12 VOLTS).

Step 4. Once the airflow in CFM has been determined, the following formula can be applied to calculate the temperature rise inside the system for X watts or the allowable wattage for a certain temperature rise.

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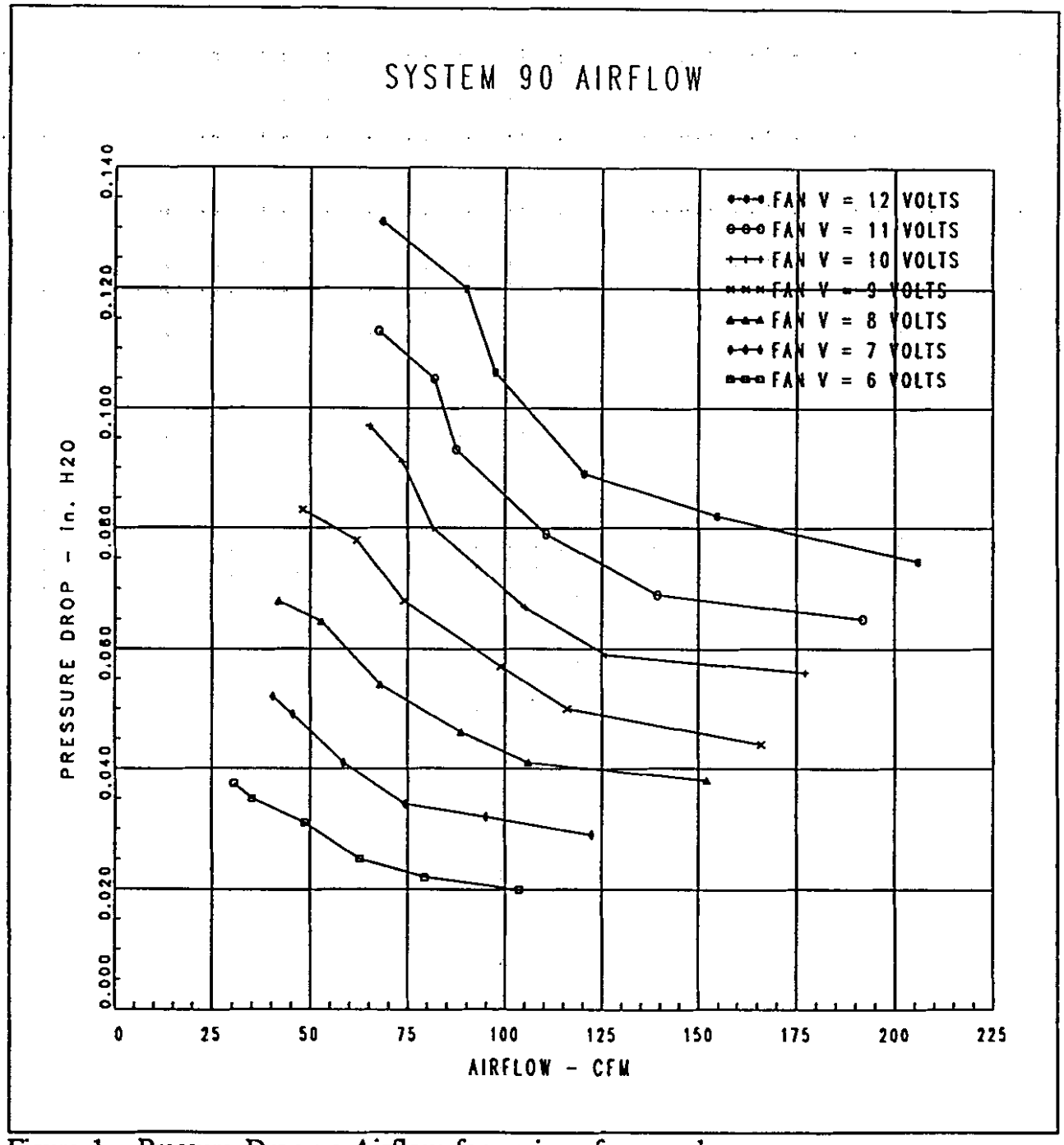


Figure 1 - Pressure Drop vs Airflow for various fan speeds

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$$\text{Temp. rise (°C)} = 1755 \times \text{Kilowatts/CFM}$$

or

$$\text{Kilowatts} = \frac{\text{CFM} \times \text{Temp. rise (°C)}}{1755}$$

EXAMPLE:
Test cards made up of resistive loads were inserted into the system. The pressure drop across the system was measured to be 0.020 in. H_2O. By locating 0.020 on the Y-axis in Figure 1 and finding where the FAN V = 6 VOLTS curve crosses 0.020 line, the CFM can be found from the X-axis and is about 105 CFM. The loads were then set to 250 Watts. From the above equation the theoretical temperature rise can be calculated to be:

$$\text{Temp. rise (°C)} = 1755 \times .250 \text{ Kilowatts/105 CFM}$$

$$\text{Temp. rise (°C)} = 4.2°C \text{ (250W, half speed fans)}$$

The right-most data point on the FAN V = 12 VOLTS curve shows the air flow to be about 205 CFM. Using 205 CFM in the equation above:

$$\text{Temp. rise (°C)} = 2.16°C \text{ (250W, full speed fans)}$$

Then using 1000 Watts of heat load:

$$\text{Temp. rise (°C)} = 16.7°C \text{ (1000W, half speed fans)}$$

$$\text{Temp. rise (°C)} = 8.55°C \text{ (1000W, full speed fans)}$$

The graph in Figure 2 shows the results of actual temperature measurements taken in the System 90 with the test cards. The actual temperature rise was close to the predicted values.

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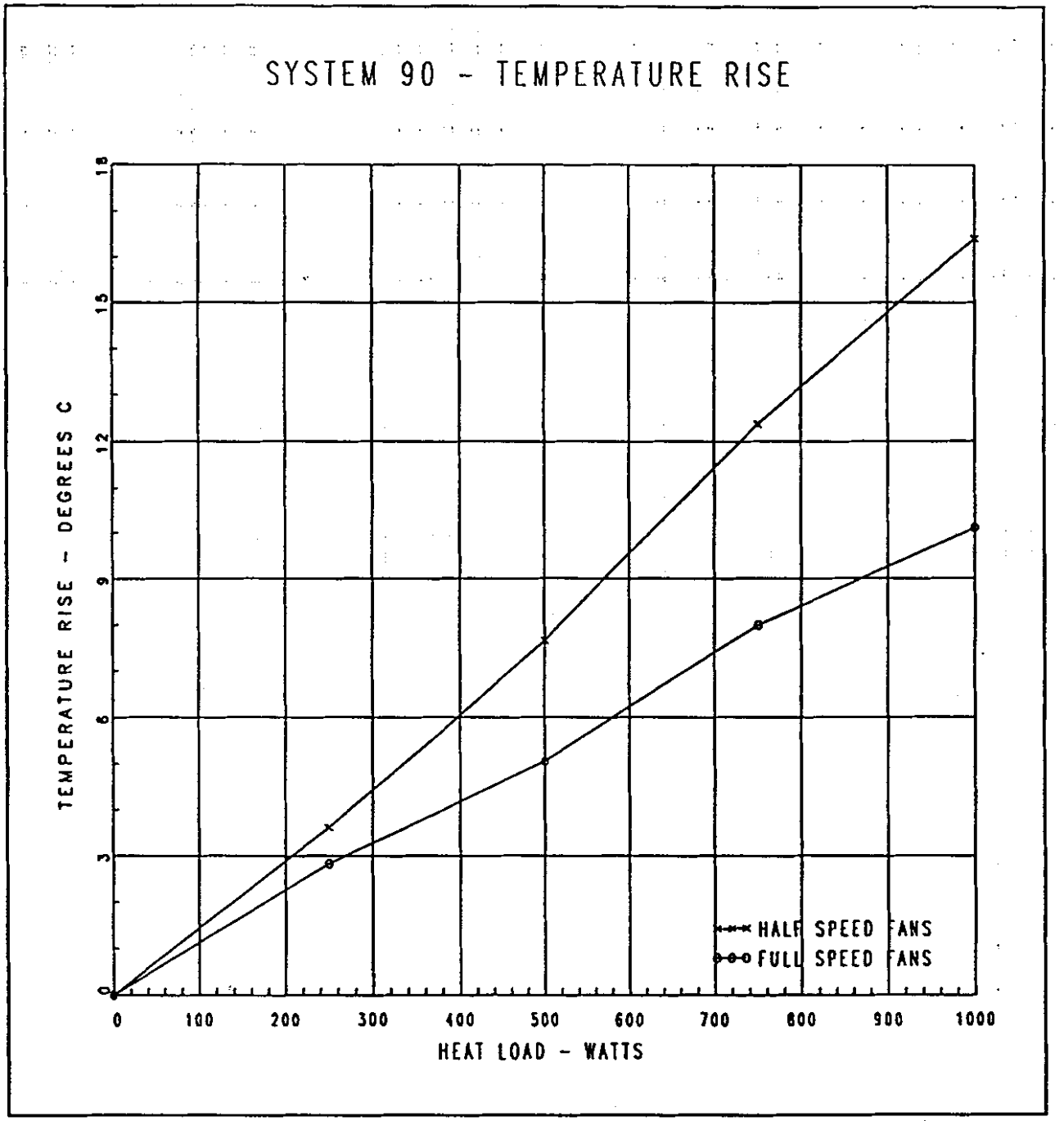


Figure 2 - Temperature rise for various heat loads at slow and fast fan speeds
Pressure drop = 0.020 at slow fan speed

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4.0 MAINTENANCE

4.1 Battery Replacement

If replacement of the 2 - 'AA' batteries for the standby 5 volts becomes necessary, turn off the system power. The batteries are located behind the switch panel at the top of the enclosure. Remove the 4 screws holding the pushbutton cover panel in place to gain access to the battery holder. Replace with 2 - 'AA' NiCad cells ONLY. Replace the 4 screws and turn power back on. The +5VSTB pushbutton will flash indicating that the voltage level is below an acceptable level. Turn off the audible alarm temporarily until the alarm can be stopped by pressing the +5VSTB pushbutton. Full charge will take about 16 hours.

4.2 Audible Alarm Level Adjustment

The audible alarm transducer has an adjustable baffle built into it which is used to adjust the volume level. To adjust, turn off the system power, then remove the 4 screws holding the pushbutton cover panel in place. Adjust the baffle and replace the pushbutton cover panel. Restore power to the system.

4.3 Air Filters

Periodic cleaning of the air filters is required to maintain air flow. The filters are located along the sides of the System 90 and are accessible from the front by grasping the blue handles and pulling the filters forward. Wash the filter pads with a mild soap warm water. Pat filters dry with a towel before re-installing.

4.4 Fans and Airflow Sensor

The airflow sensor is located on standoffs above the rear of the card cage. If the system is operating in a dirty environment, dirt may build up on the airflow sensor and fans. False alarms of insufficient airflow may result from a dirty airflow sensor.

To clean the airflow sensor and/or fans, turn off the system power. Remove the top cover and set it aside. Use a sponge or cloth dampened, NOT WET, with a mild soap solution. Wipe the airflow sensor and the fan finger guards. If the blades of the fans require cleaning, remove the finger guards and wipe the blades.

Remove the sheet metal panel on the back located directly below the fans to gain access to the main power supply. The main power supply does not receive filtered air,

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therefore dirt may build up at the vent slots and on the fan of the power supply. Wipe these areas clean with a damp sponge or cloth.

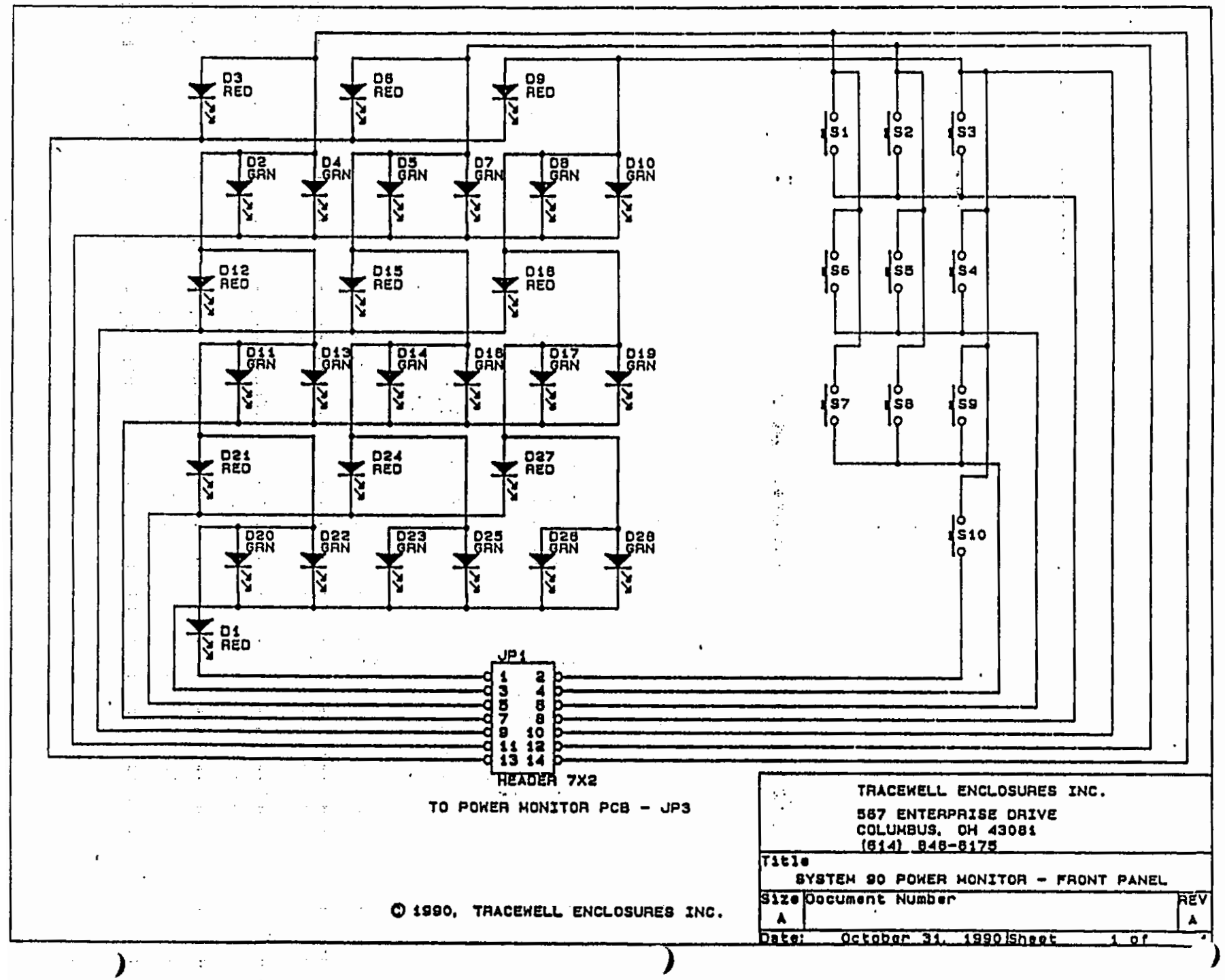


BEFORE ATTEMPTING ANY REPAIRS, MAINTENANCE OR WORKING WITH THE StakPAC IN ANY MANNER, ALWAYS POWER DOWN THE StakPAC AND WAIT AT LEAST 5 MINUTES.BE SURE POWER HAS BEEN DISCONNECTED FROM THE SOURCE BEFORE PERFORMING ANY MAINTENANCE!

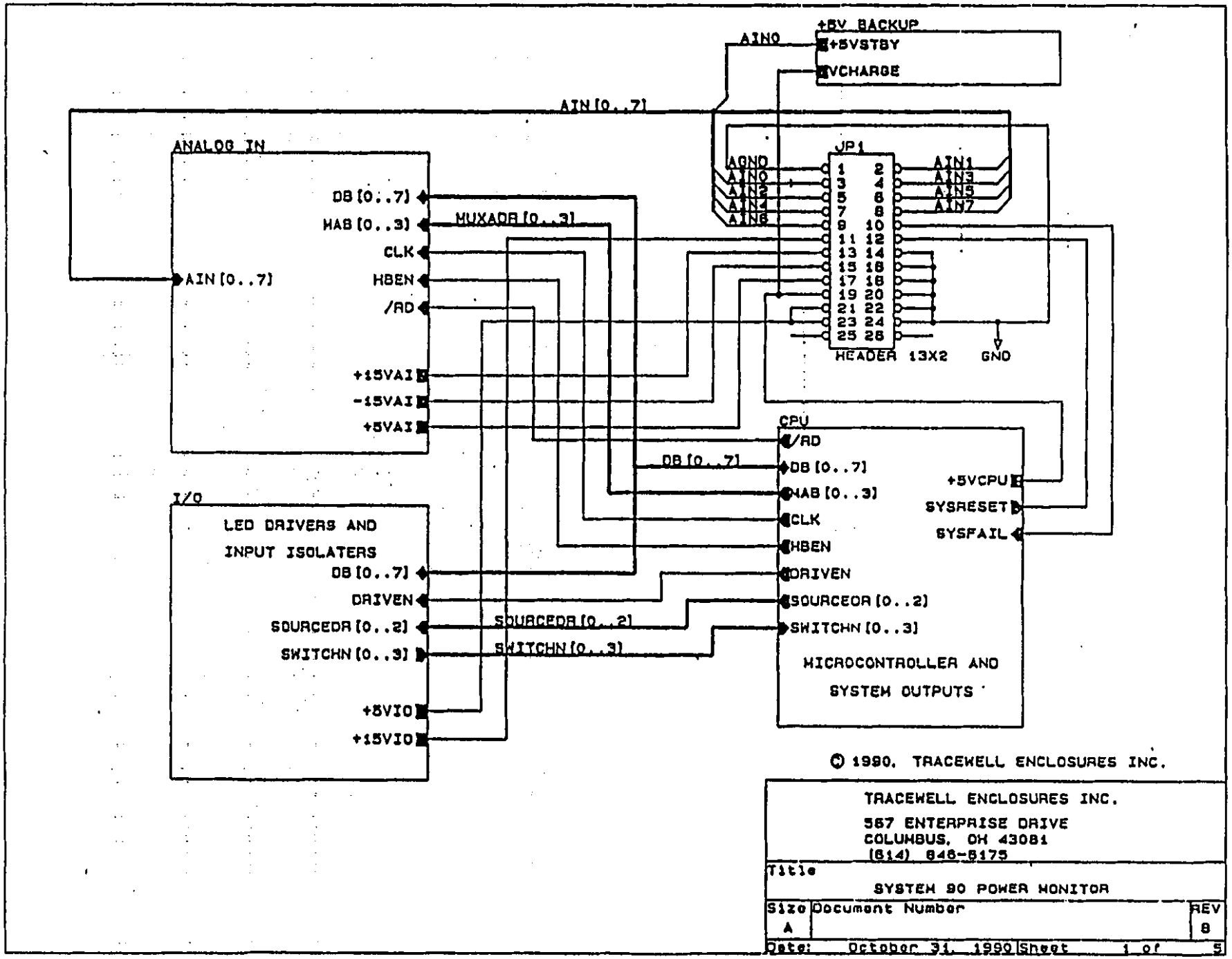
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APPENDIX A

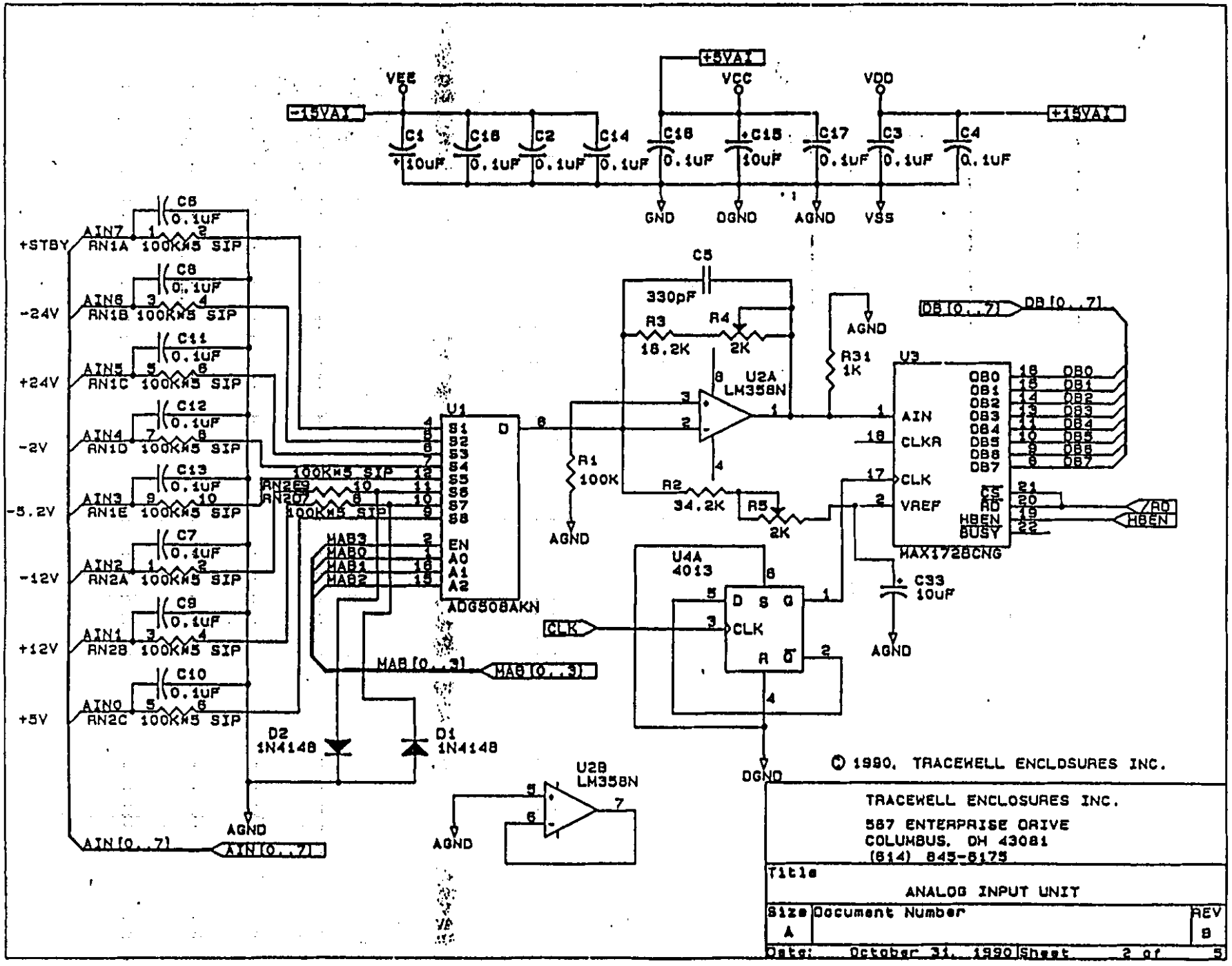
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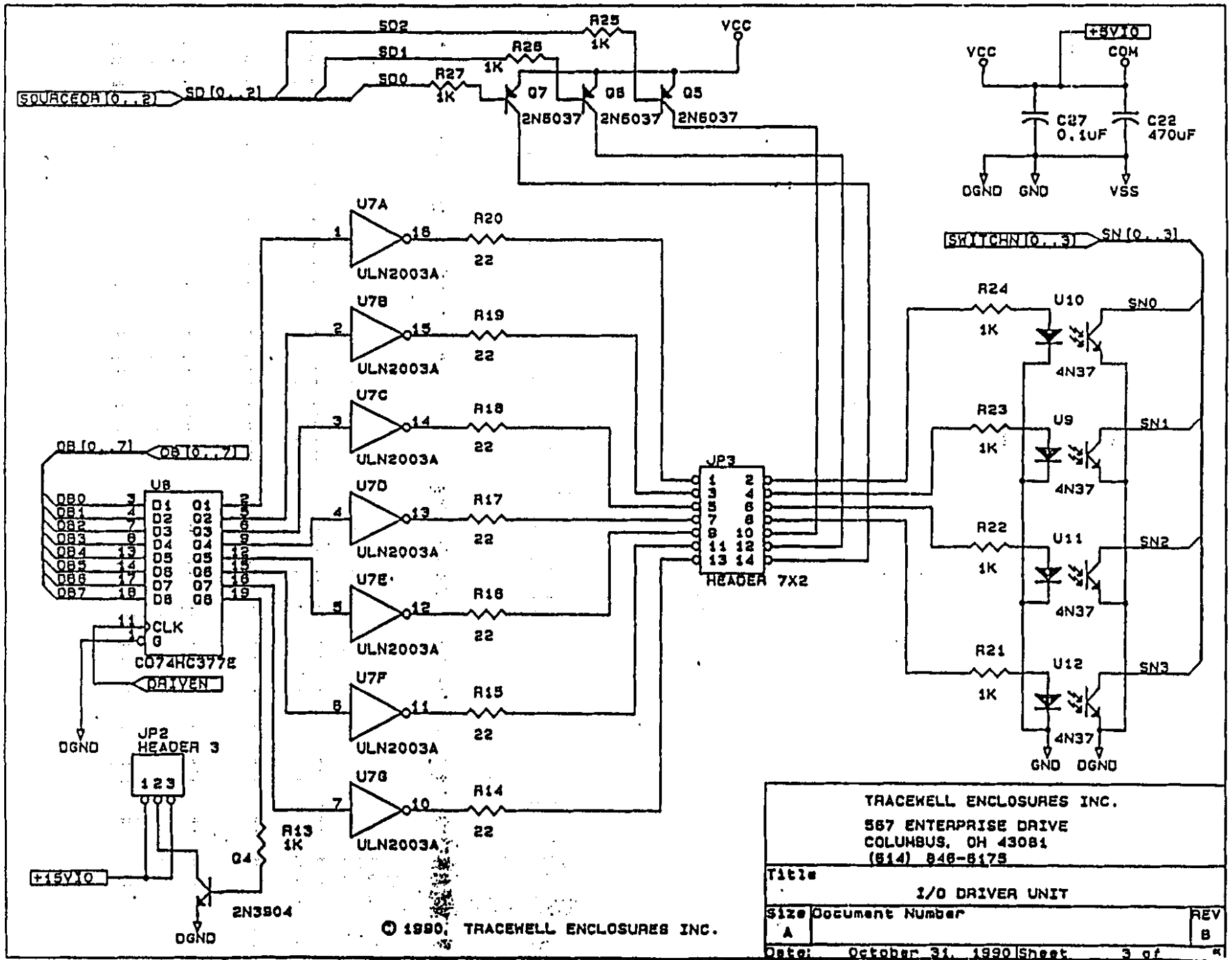
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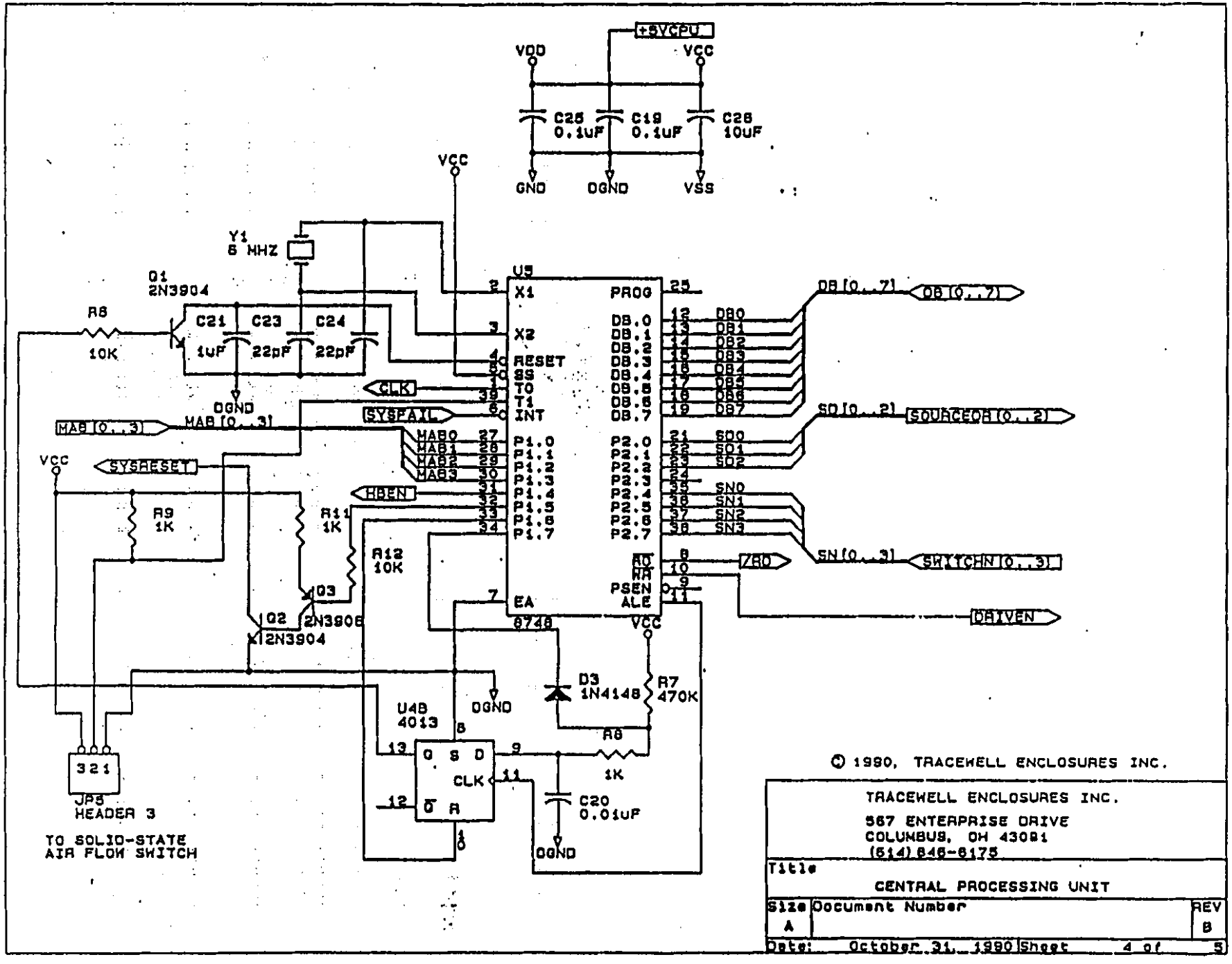
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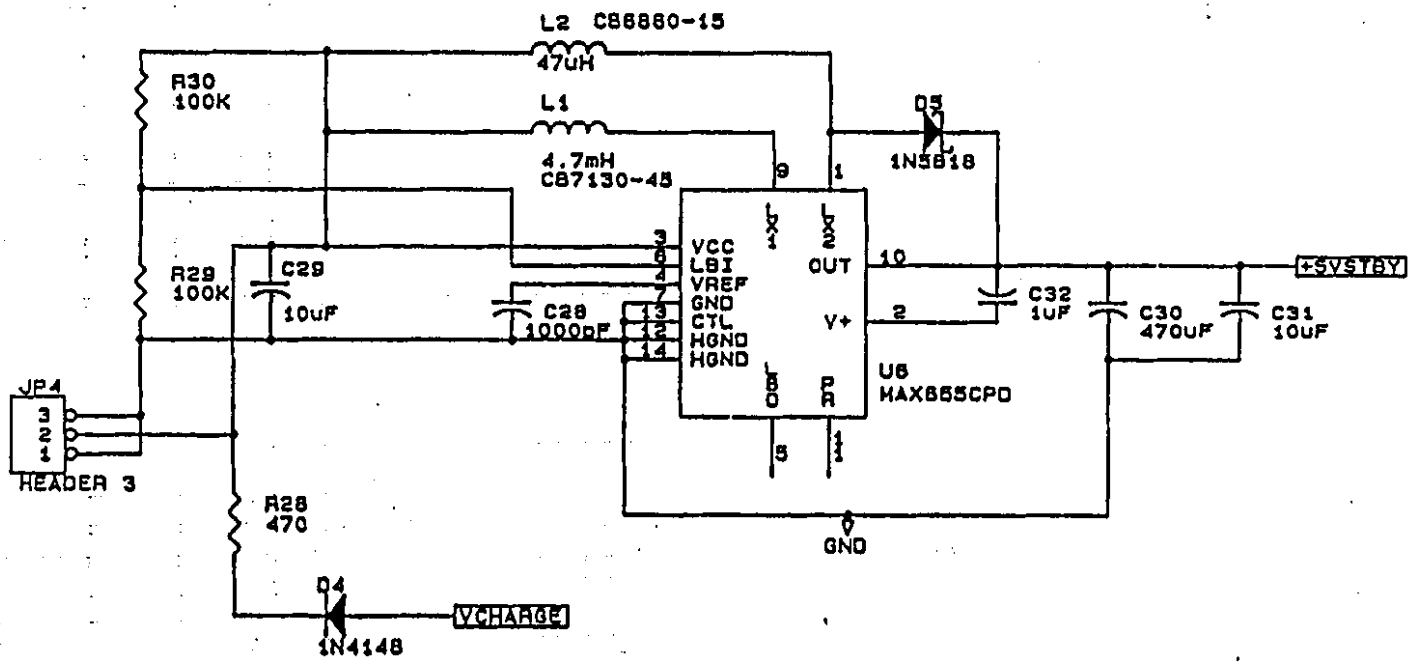
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567 ENTERPRISE DRIVE
COLUMBUS, OH 43081
(614)846-8175

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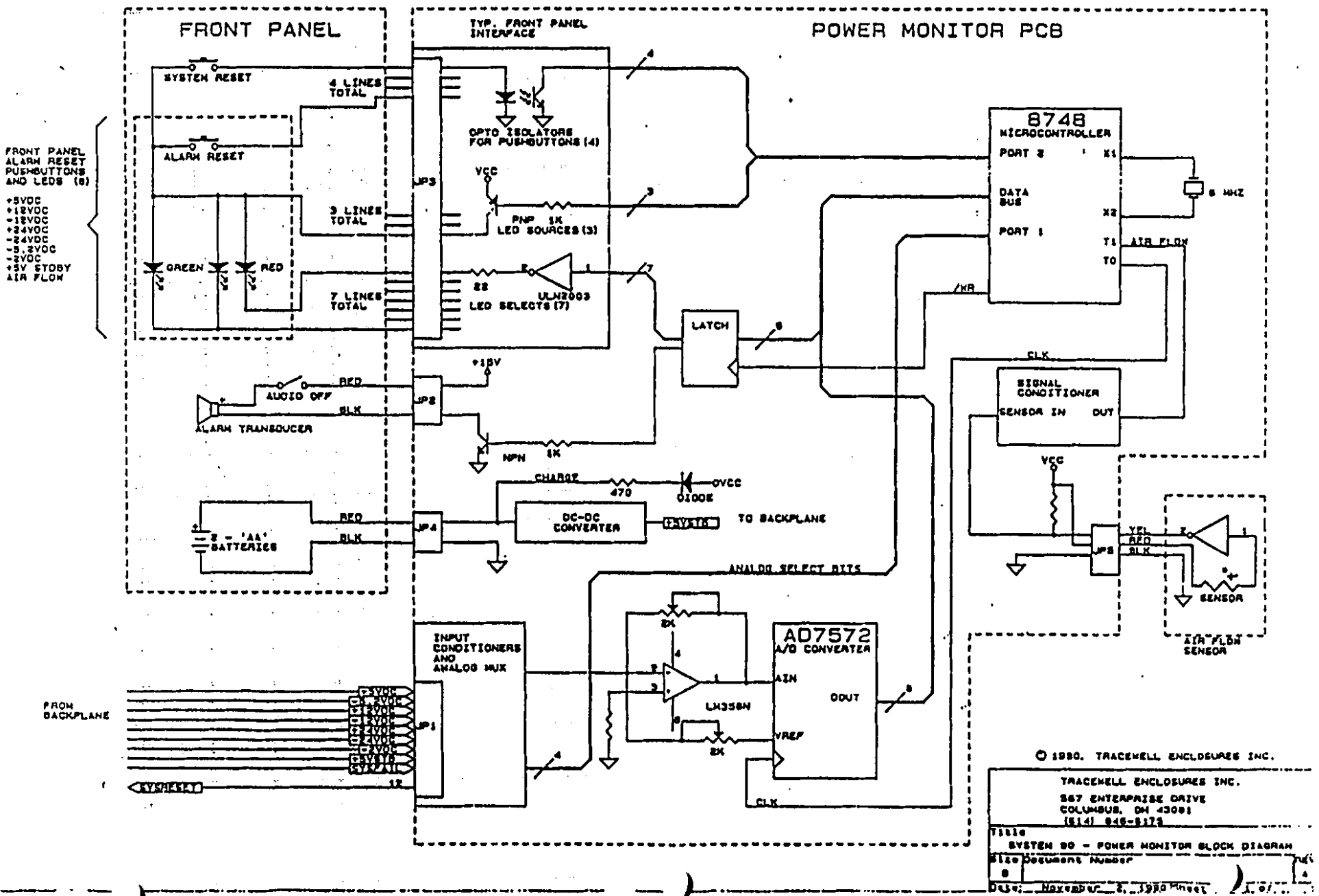


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Certificate of Compliance

To: SSC LABORATORY

Purchase Order No. 306283

Model/Description: SYSTEM 90 TYPE I

Serial Number: 1238190TI-1

It is certified that all items, in the quantities ordered, are in conformance with the requirements, specifications, and drawings called for in the above purchase order.

TRACEWELL ENCLOSURES, INC.

Signature

APRIL 30,1993
Date

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SYSTEM DOCUMENTATION

Customer : SSC LABORATORY
Description / model : SYSTEM 90 TYPE I

Documentation # 306283-SSCL
Serial No : 1238190TI-1

1. Power supply model (Primary) : WESTCOR SP7-1801 Serial No : 0425022
   Power supply output : +5V /+12V/+24V/-12V/-24V/ -2V/ -5.2V

   Power supply model (Secondary) : ELCO PMC15 Serial No : NONE
   Power supply output : +15V/ -15V/ +5V

2. Backplane description : TRACEWELL 13 SLOT J1,J2 Serial No : 0017 REV.B
   Backplane description : Serial No :
   Backplane description : Serial No :

3. Fan model : NMB SMART 4715MLQ12P54000 .5 AMP Rating per fan in CFM 105 @ FULL SPEED
   Fan model : Rating per fan in CFM

TEST & QC DATA

4. Tested at AC input voltage : 120VAC X 220VAC

5. Power-on visual check
   Switch function : X Fan rotation : X Reset module function : X

6. Check voltage on each supply output : PASS

7. 50% or 517 watt load test for 2 hours, check voltages : X

8. 100% or 1034 watt load test for 2 hours, check voltages : X

9. Special test as required :
   A.
   B.
   C.

10. Wired by : JC ID# 7615 Date : 5 / 4 / 1993

11. Power supply vendor data sheet provided with each unit : X

12. Documentation package provided : X

13. Final visual QC OK

Checked by : Date : 5 / 4 / 1993

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WESTCOR DIV.

TEST DATA

Model Number : SP7-1801 +25C
Serial Number: 425022
Date Tested .: 5 FEB 1992 9:02:33 PM
Lot Number :
Results : PASS

Program: STAKPAK.EXE Rev: 11 SEP 1990 2:56:44 PM
Vector: Rev: 11 SEP 1990 2:56:44 PM
Spec: Rev: 11 SEP 1990 2:56:44 PM
Tester: SARA

Bin Number : 1 - Another Fine Unit

Num	Test Name	Input Conditions		Sub	Parameter	Min	Actual	Max	
1	110V 60HZ Full Load	I1	60.134A	1.0	V1	4.950	4.972	5.050	V
		I2	16.715A	1.1	V2	11.880	12.072	12.120	V
		I3	8.316A	1.2	V3	23.760	24.067	24.240	V
		I4	28.799A	1.3	V4	5.150	5.197	5.250	V
		I5	29.974A	1.4	V5	1.980	2.003	2.020	V
		I6	16.715A	1.5	V6	11.880	12.002	12.120	V
		I7	8.316A	1.6	V7	23.760	23.911	24.240	V
2	90V 60HZ Full Load	I1	60.130A	2.0	V1	4.950	4.972	5.050	V
		I2	16.711A	2.1	V2	11.880	12.072	12.120	V
		I3	8.315A	2.2	V3	23.760	24.068	24.240	V
		I4	28.797A	2.3	V4	5.150	5.197	5.250	V
		I5	29.971A	2.4	V5	1.980	2.003	2.020	V
		I6	16.716A	2.5	V6	11.880	12.002	12.120	V
		I7	8.313A	2.6	V7	23.760	23.912	24.240	V
3	127V 60HZ 10% Load	I1	6.036A	3.0	V1	4.950	4.972	5.050	V
		I2	1.697A	3.1	V2	11.880	12.072	12.120	V
		I3	0.840A	3.2	V3	23.760	24.066	24.240	V
		I4	2.897A	3.3	V4	5.150	5.198	5.250	V
		I5	3.001A	3.4	V5	1.980	2.003	2.020	V
		I6	1.681A	3.5	V6	11.880	12.002	12.120	V
		I7	0.828A	3.6	V7	23.760	23.912	24.240	V
4	Efficiency @ 75% Load			4.0	Efficiency	65.000	74.350	90.000	%
5	Inhibit			5.0	V1 Inhibited	0.000	-0.001	0.500	V
				5.1	V1 Uninhibited	4.950	4.971	5.050	V
				5.2	V2 Inhibited	0.000	-0.000	0.500	V
				5.3	V2 Uninhibited	11.880	12.071	12.120	V
				5.4	V3 Inhibited	0.000	0.000	0.500	V
				5.5	V3 Uninhibited	23.760	24.060	24.240	V
				5.6	V4 Inhibited	0.000	-0.000	0.500	V
				5.7	V4 Uninhibited	5.150	5.197	5.250	V
				5.8	V5 Inhibited	0.000	-0.000	0.500	V
				5.9	V5 Uninhibited	1.980	2.003	2.020	V
				5.10	V6 Inhibited	0.000	-0.000	0.500	V
				5.11	V6 Uninhibited	11.880	12.000	12.120	V
				5.12	V7 Inhibited	0.000	0.000	0.500	V
				5.13	V7 Uninhibited	23.760	23.905	24.240	V

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WESTCOR DIV.

TEST DATA

Model Number : SP7-1801 +250
Serial Number: 425022
Date Tested : 5 FEB 1992 8:22:33 AM
Lot Number :
Results : PASS

Program: STARPAK.EXE Rev: 11 SEP 1990 2:56:44 PM
Vector: Rev: 11 SEP 1990 2:56:44 PM
Spec: Rev: 11 SEP 1990 2:56:44 PM
Tester: SARA

Bin Number : 1 - Another Fine Unit

Num	Test Name	Input Conditions		Sub	Parameter	Min	Actual	Max	
6	PowerFail			6.0	PwrFail Low	75.000	88.470	90.000	V
				6.1	PwrFail High	80.000	90.370	93.000	V
7	PowerGood			7.0	PwrGood Low	0.000	0.012	0.800	V
				7.1	PwrGood High	4.500	4.790	5.500	V
8	Vcc			8.0	VCC	4.000	4.792	5.500	V
9	254V 50HZ Full Load	I1	60.126A	9.0	V1	4.950	4.971	5.050	V
		I2	16.706A	9.1	V2	11.880	12.072	12.120	V
		I3	8.313A	9.2	V3	23.760	24.065	24.240	V
		I4	28.796A	9.3	V4	5.150	5.199	5.250	V
		I5	29.972A	9.4	V5	1.980	2.003	2.020	V
		I6	16.715A	9.5	V6	11.880	12.002	12.120	V
		I7	8.310A	9.6	V7	23.760	23.911	24.240	V
10	180V 60HZ Full Load	I1	60.128A	10.0	V1	4.950	4.971	5.050	V
		I2	16.709A	10.1	V2	11.880	12.072	12.120	V
		I3	8.313A	10.2	V3	23.760	24.065	24.240	V
		I4	28.796A	10.3	V4	5.150	5.197	5.250	V
		I5	29.972A	10.4	V5	1.980	2.003	2.020	V
		I6	16.715A	10.5	V6	11.880	12.001	12.120	V
		I7	8.312A	10.6	V7	23.760	23.909	24.240	V
11	Line/Load Reg			11.0	Line/Load	0.00	0.01	0.20	%
				11.1	Line/Load	0.00	0.01	0.20	%
				11.2	Line/Load	0.00	0.01	0.20	%
				11.3	Line/Load	0.00	0.02	0.20	%
				11.4	Line/Load	0.00	0.05	0.20	%
				11.5	Line/Load	0.00	0.00	0.20	%
				11.6	Line/Load	0.00	0.00	0.20	%
12	Current Limit			12.0	I1	63.000	73.500	87.000	A
				12.1	I2	17.535	21.627	24.215	A
				12.2	I3	8.715	11.122	12.035	A
				12.3	I4	30.240	36.864	41.760	A
				12.4	I5	31.500	38.850	43.500	A
				12.5	I6	17.535	20.124	24.215	A
				12.6	I7	8.715	10.168	12.035	A

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