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Model 3703A
Remote Processor

Instruction Manual

Product Overview	**1**
Unpacking and Setting Up	**2**
Operating the Remote Processor	**3**
Computer Interface	**4**
Specifications	**5**
Schematics	**6**

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Manual History

The following is a manual history of the Model 3703A Remote Processor Instruction Manual, P/N 1933773.

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In revision A, support was added for the Model 3762 Condensation Particle Counter.

In revision B, TSI's "Limitation of Warranty and Liability" on page iii was updated.

In October 1999, TSI's area code was changed from 612 to 651.

In revision C, TSI's Limitation of Warranty and Liability was updated.

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Part Number 1933773 / Revision C / August 2000

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(effective July 2000)

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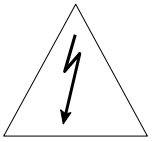
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Safety



WARNING
Opening the unit with the power on could expose electrical hazards. Only trained personnel should attempt to service the unit, and only with the power turned off and the power cord disconnected.

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Contents

Manual History ii

Safety v

About This Manual ix
- Purpose ix
- Organization ix
- Related Product Literature x
- Reusing and Recycling x
- Getting Help x
- Submitting Comments xi

Chapters

1 Product Overview 1-1
- Quick Steps to Operation 1-1

2 Unpacking and Setting Up 2-1
- What You Received 2-1
- Setting the Line Voltage 2-1
- Connecting the Sensors 2-4
- Analog Output 2-5
- Alarms 2-5

3 Operating the Remote Processor 3-1
- Operating Modes of the Remote Processor 3-1
- Setup Mode 3-2
  - Selecting the Sensor 3-3
  - Selecting the Analog Output 3-4
  - Setting the Totalizer Particle Counter's Time 3-4
  - Setting the Alarm Threshold 3-5
- Run Mode 3-7
  - Internal Averaging Time 3-8
- Display Button 3-9
- Total Button 3-9
- Clear Button 3-9
- Alarm Button 3-10

4 Computer Interface 4-1
- Pin Connectors 4-1
- Baud Rate 4-2
- Parity (7-Bits Even) 4-2
- Sensor Data Processing 4-3
- Computer Commands 4-3
- Sample Program 4-5

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5 Specifications 5-1

6 Schematics 6-1

Figures

1-1 TSI Model 3703A Remote Processor 1-1

2-1 Orientation of the Voltage-Selector Card 2-2
2-2 Fuse Block/Cover Assembly 2-3
2-3 European Fusing Arrangement 2-3
2-4 North American Fusing Arrangement 2-3
2-5 Back Panel of the Processor 2-4

3-1 Front Panel of the Remote Processor 3-1

4-1 COM PORT Pin Designations 4-1

Tables

2-1 Components of the Remote Processor 2-1

3-1 Control Buttons 3-3

4-1 Signal Connections for RS-232 Configurations 4-1
4-2 Sensor Types 4-4
4-3 RP3703A.BAS Program Listing 4-5

5-1 Specifications of the Model 3703A Remote Processor 5-1

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About This Manual

Purpose

The Model 3703A Remote Processor Instruction Manual is written for the user and the service technician.

Organization

The following is a guide to the organization of this manual:

- **Chapter 1: Product Overview**
  This chapter introduces the Remote Processor and lists some quick steps for its operation.

- **Chapter 2: Unpacking and Setting Up**
  This chapter deals with the unpacking of the processor and sensor connection.

- **Chapter 3: Operating the Remote Processor**
  This chapter helps you set up and operate the Remote Processor.

- **Chapter 4: Computer Interface**
  This chapter is an advanced chapter primarily intended for those interested in doing their own computer software and/or interfacing.

- **Chapter 5: Specifications**
  This chapter lists the instrument's specifications.

- **Chapter 6: Schematics**
  This chapter includes schematics for the Remote Processor.

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Related Product Literature

- **Model 3753A Laser Particle Counter Instruction Manual** (part number 1933771) TSI Incorporated
- **Model 3760A/3762 High Flow Condensation Particle Counter Instruction Manual** (part number 1933772) TSI Incorporated

Reusing and Recycling



As part of TSI Incorporated's effort to have a minimal negative impact on the communities in which its products are manufactured and used:

- This manual uses recyclable paper.
- This manual has been shipped, along with the instrument, in a reusable carton.

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CHAPTER 1

Product Overview

The Model 3703A Remote Processor, shown in Figure 1-1, provides digital display and computer interface for the Model 3753A Laser Particle Counter (LPC) and Model 3760A or Model 3762 Condensation Particle Counters (CPC). An alarm function can be programmed to sound when a preset level is exceeded. The Remote Processor also provides an analog output.

The Remote Processor has a connection for a single sensor; through it, the processor not only receives data but can also supply power to a sensor, such as the Model 3753A LPC. The Remote Processor's on-board microcomputer compiles the data it receives from the sensor on a second-by-second basis, which can be viewed on the alphanumeric display in particles per cubic centimeter. A computer interface port makes the data available for subsequent processing.

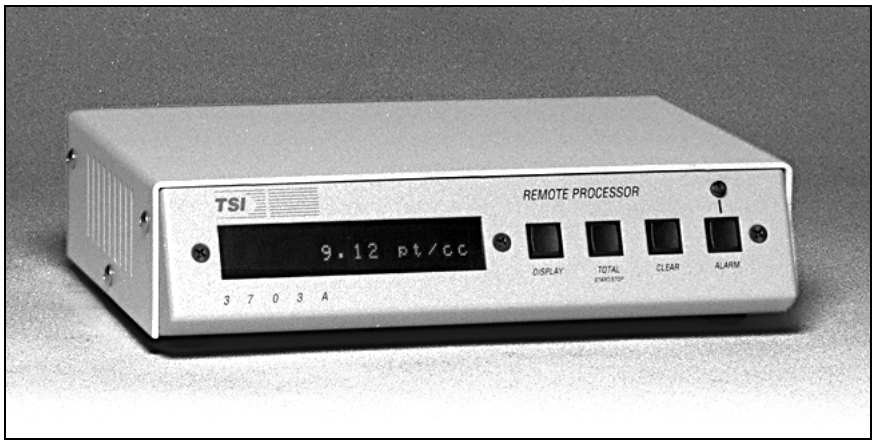


Figure 1-1
TSI Model 3703A Remote Processor

Quick Steps to Operation

Follow these steps to get the Remote Processor running as quickly as possible:

1. Unpack the Remote Processor and check the line voltage on the back (see "Line Voltages" in Chapter 2).
2. Use the supplied power cord to connect the Remote Processor to AC power.

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3. Use the supplied BNC cable to connect the Model 3753A LPC, Model 3760A CPC or Model 3762 CPC to the Remote Processor's "sensor" BNC connector (see "Connecting the Sensors" in Chapter 2).

4. While holding down the Alarm button, press the power switch on the back panel to switch on the processor. It automatically comes on in the setup mode.

5. The display should read "Model? 3760A." Press the Total button to toggle between the 3760A, 3762 and 3753A sensors.

6. Press the Display button: it should read "A out 100 pt/cc" (or another choice). Press Total to change the value or press Display to enter your choice and move on to the next setting.

7. To leave the setup mode, press the Clear button repeatedly. For more information, see "Setup Mode" in Chapter 3.

   When you see the last message "Press Clear/Rst," you will know that you are entering the run mode.

8. When you leave the setup mode, the Remote Processor automatically enters the run mode and displays values that are appropriate for the type of sensor you selected. After initial setup, the processor remembers the sensor type and other parameters you have set for future use, even after it is shut off. For more information on the run mode and the operation of the buttons, refer to the sections "Run Mode" through "Alarm Button" in Chapter 3.

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CHAPTER 2

Unpacking and Setting Up

This chapter contains a packing list for the Remote Processor and setup instructions.

What You Received

As you unpack the Model 3703A Remote Processor, you should have these items:

Table 2-1
Components of the Remote Processor

Qty.	Description	Part Number
1	Model 3703A Remote Processor	370307
1	Model 3703A Instruction Manual	1933773
1	12-foot, 9-pin (M/F) interface cable	962002
1	25-pin (F) to 9-pin (M) cable adapter	962003
1	2-Meter BNC cable	101144
1	Line cord 120V AC, or	1303053
	240V AC	1303075
1	3703A Remote Processor software	1906125

Carefully unpack the hardware and software that you received.

Setting the Line Voltage

Refer to the back panel of the Remote Processor and Figures 2-1 through 2-4 to verify that the correct line voltage configuration matches local line voltages.

1. Remove the fuse block/cover assembly from the back panel using a small-blade screwdriver or similar tool. Set aside the cover and fuse block assembly.
2. Use the indicator pin to pull the voltage-selector card straight out of the housing.
3. Orient the card so that you can read the desired voltage at the bottom of the card (see Figure 2-1).

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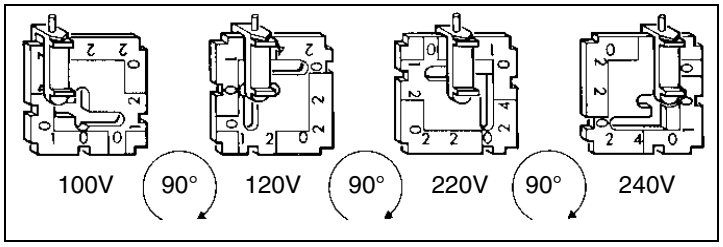


Figure 2-1
Orientation of the Voltage-Selector Card

4. Now rotate the indicator* pin so that it points up when you read the desired voltage at the bottom of the card.
5. Insert the card back into the housing, leading with the edge of the card that bears the desired voltage. Make sure that the printed side of the card faces the IEC connector.
6. Replace the fuse block/cover assembly and verify that the indicator pin shows the desired voltage.

To change from North American to European fusing,** or simply to replace a blown fuse, follow these six steps:

1. Remove the fuse block/cover assembly from the back panel using a small-blade screwdriver or similar tool.
2. Loosen the Phillips-head screw one turn.
3. Remove the fuse block by sliding up and away from the Phillips-head screw and then lifting up from the pedestal.
4. Now change the fuses, noting that *two* European fuses are required (see Figures 2-3 and 2-4).
5. Invert the fuse block and slide it back onto the Phillips-head screw and pedestal (see Figure 2-2).
6. Tighten the screw and replace the fuse block/cover assembly. Note that the fuse(s) that enters the housing first is the active fuse.

*If the indicator pin is fixed, you can select higher voltage levels by rotating the card 90° clockwise.
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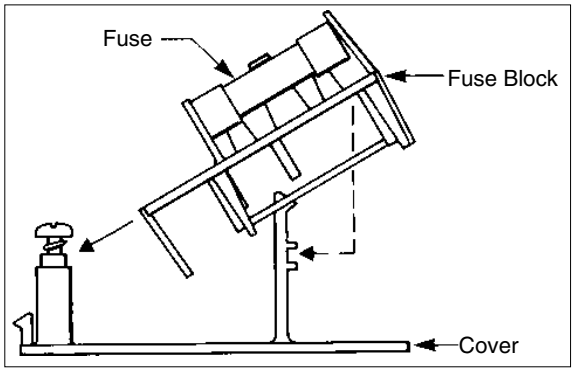


Figure 2-2
Fuse Block/Cover Assembly

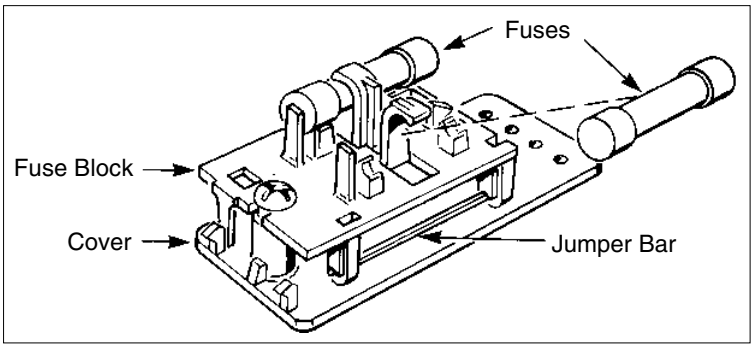


Figure 2-3
European Fusing Arrangement

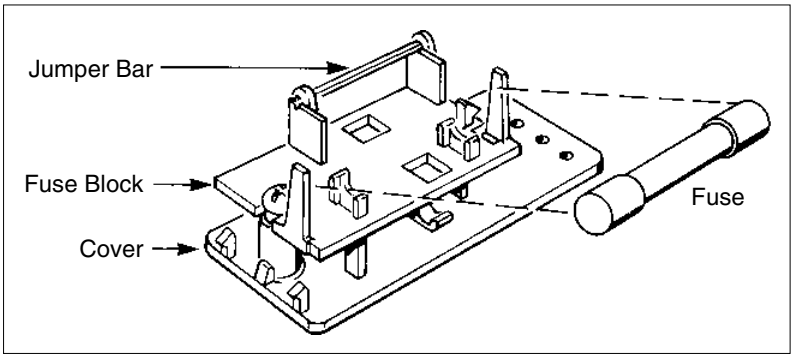


Figure 2-4
North American Fusing Arrangement

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Connecting the Sensors

The Remote Processor has two coaxial connectors on its back panel (see Figure 2-5). The connector labeled Sensor allows you to connect the Model 3753A LPC, Model 3760A CPC or Model 3762 CPC sensor; the one labeled Analog Out provides an analog output of 0 to 10 volts. The back panel provides an additional connector for computer interfacing and will be described later.

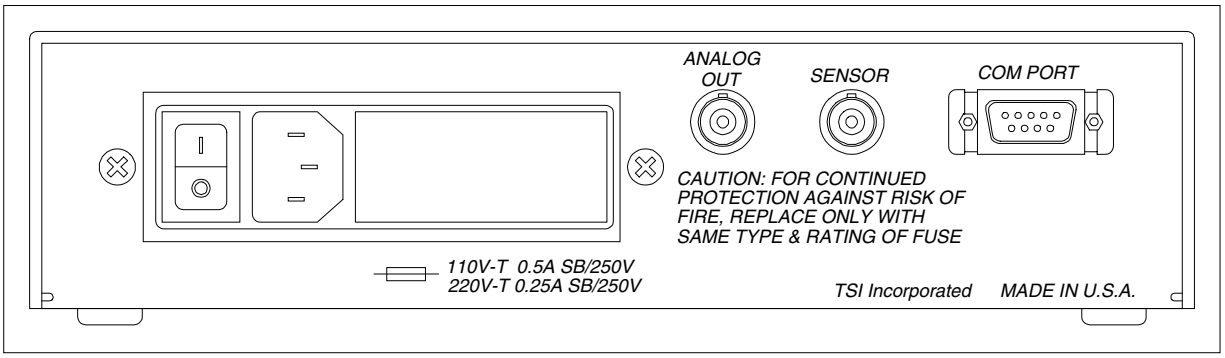
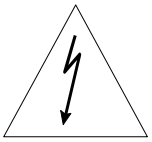


Figure 2-5
Back Panel of the Processor

Before you connect the sensor's cable to the Sensor connector, be sure to switch off the power to the Remote Processor. Although it is unlikely that damage would occur if the power were left on, spurious counts would likely be made and the Remote Processor might reset itself.

The electrical connection to the sensor provides two functions. First, it transmits power to the sensor that needs it (Model 3753A LPC); second, it receives pulse data from the sensor, which is then accumulated by the internal microprocessor. The Remote Processor converts the data to values that are displayed on the front panel. (For more details on installing the processor, refer to the manual that covers the type of sensor you are using.)



WARNING
Opening the unit with the power on could expose electrical hazards. Only trained personnel should attempt to service the unit, and only with the power turned off and the power cord disconnected.

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Analog Output

A programmable 0 to 10 volt analog output (8 bit) is available through a BNC connector on the back of the Remote Processor. You can send this analog output to a chart recorder, a data logger, a data analysis computer, or a similar device. The analog output voltage level is proportional to the value displayed on the Remote Processor, and the scaling can be adjusted during the setup mode. For example, data from a particle counter can be scaled so that the analog output voltage will reach 10 volts when the concentration reading is either 1, 10, 100, 1000, or 10,000 particles/cc. This allows you to optimize the analog output resolution because you are able to program the scaling based on the particle concentration you expect.

When you connect a device to the analog output, keep in mind that the common (the shield of the coaxial BNC connector) is at “chassis ground” and at “earth ground” through the Remote Processor’s power cord. Any device connected to the analog output must not require an isolated or floating connection. Also keep in mind that the output impedance (electrical resistance) is about 1000 ohms. This should present no problems for most devices (such as chart recorders, which have very high input impedances—1 megohm, typically), but if the device has a low input impedance (less than 100 kilohms), the output voltage will be reduced by the load.

To avoid excessive signal noise and voltage drop due to cable resistance, make sure that the cable connected to the analog output is less than 16 feet (5 meters).

Alarms

The Model 3703A Remote Processor has a built-in audio alarm that you can use with either LPC or CPC sensor. Analog output can be set to be external electrical alarm:

- ❑ 0V = No alarm
- ❑ 5V = Alarm conditions

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CHAPTER 3

Operating the Remote Processor

This chapter explains how to operate the Remote Processor.

Operating Modes of the Remote Processor

The Remote Processor has two modes of operation: setup and run. Since there are two types of sensors, the processor needs information about how to interpret the data for a given sensor. Use the setup mode to define the type of sensor that is connected to the processor and to enter other information that is required for properly processing data.

When you change the setup mode to the run mode, the sensor type is automatically stored in nonvolatile memory inside the Remote Processor; this means that the processor remembers the sensor type and other parameters even when it is switched off.

The normal mode of operation is the run mode, where the data from the sensor is displayed in its appropriate units. An alarm can be active in this mode too. The rest of this chapter describes in detail both the setup and the run modes.

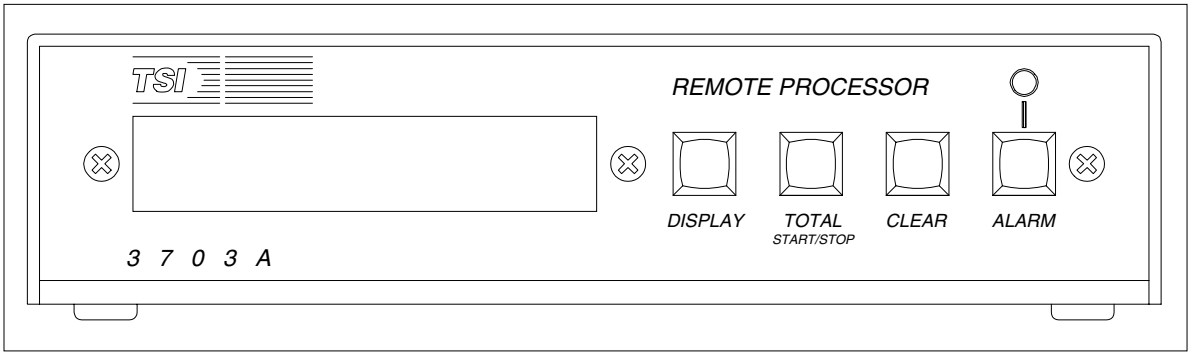


Figure 3-1
Front Panel of the Remote Processor

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Setup Mode

To enter the setup mode, hold in the Alarm button when you switch on the power. Another way to enter the setup mode is to simultaneously press the Display and Alarm buttons while the power is on. The alarm LED flashes until you leave the setup mode at the end of the setup session (by pressing the Clear button).

In the setup mode, a series of questions is presented. These questions allow you to adjust the following variables: sensor model number, analog output, totalizer time and alarm levels. Use the Total button to change the current value; then use the Display button to record your answer and proceed to the next question. If you accidentally store an incorrect answer by pressing the Display button, perform one of the following:

- ❑ Simply restart the setup mode by switching off the Remote Processor and holding in the Alarm button while switching the processor power back on

  or

- ❑ Simultaneously press the Display and Alarm buttons while the power is on.

The following table summarizes the purpose of each control button in the run and setup modes. Once you master the use of these four buttons, you will be fully able to control the display of the Remote Processor in the run mode or to change the configuration parameters in the setup mode. The specific details on what parameters must be set and what displays are available will be given in the remaining part of this chapter.

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Table 3-1
Control Buttons

Button Label	Run Mode Function	Setup Mode Function
Display	Toggles screen display between total concentration and large particle concentration, and total pulse count value *	Enters currently displayed value into nonvolatile memory and steps to the next character or question
Total Start/Stop	Starts and stops the totalizer	Changes or toggles the value that is currently displayed
Clear	Clears average values and totalizer count value from memory	Enters currently displayed value into nonvolatile memory and skips to the next question
Alarm	Toggles audible and visual alarm on and off; also switches Remote Processor from run mode to setup mode if Alarm and Display are pressed simultaneously or if Alarm is pressed while power is switched on	Not Applicable

***Note**: *Model 3760A and 3762 sensors do not have a large particle concentration value.*

Selecting the Sensor

The first question asks which sensor you want to connect to the Remote Processor. Press the Total button to toggle between 3753A and 3760A or 3762 model numbers.

Question	Answer	Explanation
`Model?`	3753A	Model 3753A LPC is connected to Remote Processor.
`Model?`	3760A	Model 3760A CPC is connected to Remote Processor.
`Model?`	3762	Model 3762 CPC is connected to Remote Processor.

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Selecting the Analog Output

After you press the Display button, the Remote Processor prompts you to set the analog output. If you are not using the analog output, press the Display button again to go on to the next question. Otherwise, use the Total button to select the proper output.

For example, if the display reads “A out 1k pt/cc,” then 10 volts are output for measured concentrations that are 1000 pt/cc and above. For particle counters, the displayed scaling in the setup mode indicates the 10-volt full-scale condition. The Model 3760A or Model 3762 CPC sensor has higher measurement capabilities than the 3753A LPC sensor. Choose ranges that are appropriate to the sensor connected.

If either Model 3753A, 3760A or 3762 is selected:

Question	Answer	Explanation
A Out	1 pt/cc	0–1 particle/cc = 0–10 volts
A Out	10 pt/cc	0–10 particles/cc = 0–10 volts
A Out	100 pt/cc	0–100 particles/cc = 0–10 volts
A Out	1k pt/cc	0–1k particles/cc = 0–10 volts
A Out	10k pt/cc	0–10k particles/cc = 0–10 volts
A Out =	Host	0–10 volts may be set by “V” computer command (see Chapter 4)
A Out =	Alarm	No alarm = 0 volt, alarm condition = 5 volts

Press the Display button to select the desired analog output range.

Setting the Totalizer Particle Counter’s Time

The Remote Processor will prompt you to select a *totalizer time*. The totalizer time is used to determine the maximum sampling interval. The totalizer allows individual particle counts to be displayed cumulatively as they are detected (as opposed to an average concentration reading).

All particles are totalized. The large particle channel of the LPC cannot be totalized.

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A timing clock is also provided with the total counts as a reference for displaying particle count values within a specific time interval. The total time value that you set up now specifies the length of this sampling time interval.

To properly set the time interval you want, use the Total button to change the value of the blinking digit, or use the Display button to enter the blinking number and move on to the next digit. If the current total time is correct when the question first appears, use the Clear button to accept this value and move on to the next question (the Clear button allows you to move more rapidly through the setup mode, but the Display button is sometimes necessary to access certain numerical values).

The total time can be set between 0 and 9,999 seconds. Entering a value of 0 implies that the timer has no limit, which means that the Remote Processor will accumulate particle counts for an indefinite time period until the particle count value has reached its limit of 999,999,999.

Question	Answer	Explanation
`Tot Time?`	0000	No limit (default)
`Tot Time?`	0001–9999	1–9999 seconds total accumulative time set

Setting the Alarm Threshold

The next four questions deal with the local alarm thresholds. The number of questions that are displayed depends on the type (model) of sensor selected.

For the Model 3753A Laser Particle Counter that has two size channels, two alarm questions are asked. The alarm thresholds are triggered when the average of either the large size channel concentration or the total particle concentration exceeds its limit. To ensure that you understand which alarm level you are setting, the alarm question for each of the two settings (alarm large and alarm total) is preceded by a message.

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If Model 3753A is selected:

Question	Answer	Explanation
`Alarm Large?`	(none)	Announces large particle alarm set mode
`Alarm L?`	0–99999.999	Sets alarm threshold in particles/cc
`Alarm Total?`	(none)	Announces total particle alarm set mode
`Alarm T?`	0–99999.9	Sets alarm threshold in particles/cc

The “Alarm Large?” message tells you that you are about to set the alarm threshold for the large particle channel of the sensor. To move past any of the four messages, press Display or Clear. The “Alarm L? 0–99999.999” question allows you to change the current alarm value for the concentration of large particles. Similarly, a message and a question about the alarm for total particle concentration appear next. A setting of zero for either alarm threshold will disable the alarm for that size channel. The “Alarm Large” threshold may never be greater than the “Alarm Total” threshold (because the large particle counts are also included in the total particles counted).

For example, a Remote Processor is set to use a standard Model 3753A Laser Particle Counter, which measures the total number concentration and the number concentration of large particles. If the Alarm T threshold is set to 5 and the Alarm L value is set to 1, the alarm will sound when the total measured concentration of particles exceeds 5.0 particles/cubic centimeter or the concentration of large particles is higher than 1.00 particles/cubic centimeter.

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For Model 3760A or 3762 CPC, only one question is used and is presented as:

Question	Answer	Explanation
`CPC Alarm Total?`	(none)	Announces alarm set mode
`Alarm T?`	0–99999.999	Sets alarm threshold in particles/cc.

After the alarm question is finished, a message appears saying, “Press Clear/Rst.” You have now cycled through the setup mode, and once you press the Clear button, the Remote Processor enters the run mode. Remember, if you accidentally entered an incorrect value, you reenter the setup mode and correct your mistake by simultaneously pressing the Display and Alarm buttons. You can also quickly check to see if all of the current Setup variables are correct by paging through the setup mode with the Clear button.

Run Mode

The run mode is the normal mode of operation for the Remote Processor; it comes up when you switch on the processor and enables both the display of sensor data and arming of the alarm. A total particle counter for particle count accumulation can also be displayed.

The following data lists examples of what the display might read for the two sensors.

For the Model 3753A:

Display	Explanation
`12.3 >tot/cc`	Concentration of particles larger than 0.3 µm per cc of air, the LPC model
`0.000 > lrg/cc`	Concentration of particles larger than 3.0 µm per cc of air
`12345678p 1234s`	Total particle counts and elapsed time
`12345678 part.`	Total particle counts with no time limit for particle counters

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For the Model 3760A or 3762:

Display	Explanation
99.9 part/cc	Total concentration of particles
12345678p 1234s	Total particle counts and elapsed time
12345678 part.	Total particle counts with no time limit for particle counters

Internal Averaging Time

The displayed particle concentration value is determined from one of three averaging (or sample) times, depending on the actual concentration. Internally, the Remote Processor keeps running averages of 1, 4 and 40 seconds. Every second, the Remote Processor calculates the particle concentration based on the 1-second average. If the concentration is at least 10 particles/cc, that value is displayed as the concentration. Otherwise, the 4-second average is tested and if that particle concentration is 0.1 particles/cc or greater, then the 4-second concentration is displayed. If the concentration is below 0.1 particles/cc, the 40-second averaging time is used to calculate the displayed concentration.

Concentration	Averaging Time Used
≥10 pt/cc	1 sec
9.99–0.1 pt/cc	4 sec
<0.1 pt/cc	40 sec

By automatically changing the averaging time based on the concentration, the response time of the displayed concentration is enhanced. When a rapidly-decreasing concentration is measured by the Remote Processor (such as when a filter is placed on the sensor inlet), the display may pause at 9.99 or 0.099 particle/cc. This occurs while longer averaging time buffers hold the history of higher concentrations. The pause can be eliminated by pressing the Clear button, which will zero the averaging buffers.

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Display Button

The Display button selects the data you want to appear. For the LPC, three different displays of data are possible; for the CPC, only two are allowed.

The LPC displays two types of data: total particle concentration and total accumulated counts. It also offers two particle size ranges for display. The size channel currently displayed is indicated on the right of the display by a 7-digit label which represents the particle size channel. For example, the Model 3753A LPC displays the labels “tot/cc” for the total concentration of particles or “larg/cc” for the concentration of large particles.

Total Button

As the name implies, the Total Start/Stop button is used to start or stop the accumulation of particle counts within the Remote Processor. The button starts or stops the process regardless of the data currently displayed. Once started, the accumulation process continues until (a) the total time you programmed in the setup mode is reached; (b) the total particle count reaches 999,999,999; or (c) you press the Total Start/Stop button to stop accumulating counts.

Clear Button

The Clear button clears out (or zeroes) the averaged data and the totaled particle data.

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Alarm Button

The Alarm button enables and disables the alarm. Pressing Alarm toggles the Alarm Light (LED) *on*, indicating that the alarm is active. If data from any particle-counting sensor then exceeds its set threshold (as programmed in the setup mode), the alarm is triggered. The audio alarm and alarm light pulsate. If the analog output has been set to "Alarm," the electrical alarm output is switched on (see "Selecting the Analog Output," earlier in this chapter). When the data from the particle sensor falls below its threshold, the alarm is no longer triggered and the audio and electrical alarms cease.

Once an alarm is triggered, disable it by pressing the Alarm switch (LED switches *off*). Pressing the Clear button stops the alarm until the displayed concentration is again larger than the preset threshold.

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CHAPTER 4

Computer Interface

This chapter contains information you need if you are writing your own software for a computer or data acquisition system. The main sections are:

- Pin connectors
- Baud rate
- Parity
- Sensor data processing
- Command definitions, syntax and examples, as well as input and troubleshooting directions.

Pin Connectors

The Model 3703A Remote Processor has a single 9-pin, D-subminiature connector port on the back panel labeled COM PORT (Figure 4-1). This communication port is configured at the factory to work with RS-232 type devices. Table 4-1 gives the signal connections.

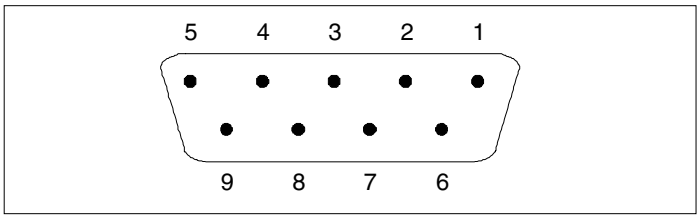


Figure 4-1
COM PORT Pin Designations

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Table 4-1
Signal Connections for RS-232 Configurations

Pin Number	RS-232 Signal
1	—
2	Transmit Output
3	Receive Input
4	—
5	GND
6	—
7	—
8	—
9	—

Baud Rate

The baud-rate setting is the rate of communication in terms of bits per second (baud). The Remote Processor uses a baud rate setting of 9600. For proper communications, make sure that all software used with the instrument is also set at this rate.

Parity (7-Bits Even)

Parity is the additional bit that accompanies the seven data bits to confirm that they are transmitted correctly. It is set so that the number of "1" bits (high) in a transmitted character is always an even number. The Remote Processor uses even parity as the only setting.

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Sensor Data Processing

Sensor data is received by the Remote Processor and processed separately for the display and for the computer interface. All sensor data is transmitted to the Remote Processor as a series of pulses. The data's value is determined by the rate of the pulses. Two different pulse widths, or times, are transmitted by the sensors providing two data ranges or channels. The small (short) pulses are 6.4 microseconds long while the large (long) pulses are 16 microseconds long.

The CPC has one pulse width, ≈200 ns, which is processed the same as the 6.4 µs pulse from the LPC.

For example, the Model 3753A LPC sends a small pulse for each particle between 0.3 micrometer and 0.5 micrometer, and a large pulse (16 microseconds) for each particle greater than 0.5 micrometer. In this way, two types of data may be received by one channel. The Remote Processor keeps track of two types of sample time and the number of pulses (large and small) measured in that time. The D (dump) command, described below, explains how this data is transferred to the computer.

Computer Commands

The Remote Processor uses an ASCII-based communications protocol that utilizes the RS-232 port of a computer to transmit commands in the form of strings.

No line feed (LF) characters are transmitted. Either the requested data or an "OK" is returned if the command is understood. The word "ERROR" is returned if the command is not understood or if the command has an invalid parameter.

Command definitions, syntax, and examples appear below. Directions for entering commands and troubleshooting commands are given at the end of this section.

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Table 4-2
Computer Commands

ASCII Label	Command Name	ASCII Response	Description
D	Dump	Time Counts 0,0123456,78 0,0 . (15 lines) . . 0,0	The Dump command initiates a dump of the time and count data. The currently saved accumulator data is transferred to the serial port. "Time" is the number of seconds since the last **D** command (99,999,999 maximum). When this command is sent, the Remote Processor returns the sample time and total particle counts since the last "D" command (or power-up), the large particle counts since the last "D" command, and then 15 additional lines of zeros. The zeros maintain compatibility with older TSI products. ***Note:*** *The Dump command sends two numbers for the LPC sensor pulse data. The first number is the total number of small and large pulses; the second is the total number of large pulses counted. This means that if you want to know the number of small pulses counted, the second number must be subtracted from the first. The CPC sends only total pulse counts so the value of large counts is always zero.*
S	Sensors	3 0 . . (15 lines) . 0	The Sensor command sends data on the current saved sensor. Sensor type 2 is for the Model 3760A CPC. Type 9 is for the Model 3753A LPC. Type 62 is for the Model 3762 CPC. There are 16 lines total, the last 15 of which are zeros. The Sensor command is useful for determining what sensors were defined when the Remote Processor was in the setup mode. External software can then transform the sensor data into the correct units.
RD	Read total concentration	12.3	Reads the concentration as it appears on the LCD display.
RL	Read Large particle concentration	12.3	Reads large particle concentration data only when a LPC is connected to the Remote Processor. The CPC does not measure large particle concentration.
Vxxxxx	Set Analog Voltage	OK	Sets analog output to voltage: V0 = 0 volts; V10000 = 10.0 volts.

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Sample Program

The disk included with the Remote Processor (TSI #1906125) contains a sample program that demonstrates communications with a computer. The program is written in QuickBASIC® and a listing of the program is given in Table 4-3. The program disks contains the following files:

RP3703A.BAS	Sample program written in QuickBASIC®
RP3703A.EXE	Sample program as a compiled executable
TERM.BAS	Terminal emulation program.

Note: *Do not confuse this program with CPCount Software, which has a separate disk and separate instruction manual.*

To run the sample program, connect a serial cable between the Remote Processor and the COM1 port on your computer. Insert the program disk into your computer drive A: (or B:) and type A:RP3703A (or B:RP3703A). To modify the program you need the Microsoft QuickBASIC® compiler.

Note: *TSI does not accept responsibility for modified software.*

The TERM.BAS program can be run using QBASIC available on most PCs. This is a very simple program that allows you to type commands directly to the Remote Processor and see the responses.

Table 4-3
RP3703A.BAS Program Listing

```
flag$ = "READ"                                          'declare flag for reading concentration
CPort = 1
AVGTime = 2                                             'set concentration averaging time (minimum = 1)
model = 0       'unknown

'default to COM1
OPEN "COM1:9600,E,7,1,RS,CS,DS,CD,RB3200" FOR RANDOM AS #1     'open CPC com port

GOSUB RdSnsrType

CLS
Menu:                                                   'main menu section
LOCATE 1, 1                                                    'clear screen
PRINT "************************************************************"
PRINT "*   RP3073A.BAS               (c)1994 TSI Incorporated   *"
PRINT "*   Version 1.0                                          *"
PRINT "*   A Simple program to read Particle Concentration from  *"
```

(continued)

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Table 4-3
RP3703A.BAS Program Listing (*continued*)

```
PRINT "*    either 3760A or 3753A through 3703A remote processor *"
PRINT "*****************************************************"
PRINT
LOCATE 9, 1
PRINT "[1]...Check Device Connection"                    'print menu
PRINT "[2]...COM Port"
PRINT "[3]...Averaging Time"
PRINT
PRINT "[4]...Read Particle Concentration"
PRINT
PRINT "[Q]...Quit program"
PRINT
PRINT
PRINT "< Select a number 1-4 or Q >"

    SELECT CASE model
    CASE 1
       LOCATE 9, 35: PRINT "(Model 3760A)"
    CASE 2
       LOCATE 9, 35: PRINT "(Model 3753A)"
    CASE 0
       LOCATE 9, 35: PRINT "(Unknown    )"
    END SELECT

    LOCATE 10, 35: PRINT "(COM" + LTRIM$(STR$(CPort)) + ")"
    LOCATE 11, 35: PRINT "(" + LTRIM$(STR$(AVGTime)) + " sec.)"

WHILE 1                                                  'go until quit is selected
choice$ = INKEY$                                         'read the keyboard
  IF UCASE$(choice$) = "Q" THEN                          'if Q is selected
    GOTO Logout                                          '  then quit the program

  ELSEIF choice$ = "3" THEN                              'if 1 is selected
    IF (AVGTime >= 5) THEN
       AVGTime = 1
    ELSE
       AVGTime = AVGTime + 1
    END IF
    GOTO Menu

  ELSEIF choice$ = "2" THEN                              'if 1 is selected
    IF (CPort >= 2) THEN
       CPort = 1
    ELSE
       CPort = CPort + 1
    END IF
    CLOSE 1
    ComStr$ = "COM" + LTRIM$(STR$(CPort)) + ":9600,E,7,1,RS,CS,DS,CD,RB3200"
    OPEN ComStr$ FOR RANDOM AS #1     'open CPC com port
    GOTO Menu

  ELSEIF choice$ = "1" THEN                              'if 1 is selected
```

(continued)

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Table 4-3
RP3703A.BAS Program Listing (*continued*)

```
    GOSUB RdSnsrType

   ' LOCATE 10, 1: INPUT "Hit <Enter> to continue", ans$         'print return message
    GOTO Menu   'return to menu

  ELSEIF choice$ = "4" THEN                                      'if 4 is selected
    CLS
    PRINT USING "Reading Counter at ### sec intervals ..."; AVGTime '  print message on screen
    LOCATE 10, 1: PRINT "Hit <Enter> to stop reading"             'print return message

    'PRINT #1, "RD": GOSUB CPCread:      ' read once to clear counts
    WHILE INKEY$ = ""                   '  repeat this loop until a key is hit
      begintime = TIMER                 '    store the beginning time
      PRINT #1, "RD"                    '    read the counts
      GOSUB CPCread
      count = VAL(temp2$)               '    store the elapsed time

      PRINT #1, "RL"
      GOSUB CPCread
      Lgcount = VAL(temp2$)             '    store the counts
      'FOR i = 1 TO 15: GOSUB CPCread: NEXT i                    '    read all the zeros
      LOCATE 5, 1                                                '    set the screen location
      'PRINT USING "Particle concentration is: ##.##^^^^ particles/cc"; count * 60 / (eltime * 1000)
'print the concentration

      PRINT USING "Particle concentration is: ##.##^^^^ particles/cc"; count

      WHILE (TIMER - begintime < AVGTime): WEND                  '    until the avgtime has passed, wait
    WEND
    CLS
    GOTO Menu                                                    'return to menu
  END IF                                                         'end of menu reading loop
WEND

CPCread:                                                         'subroutine to read CPC
  temp1$ = ""
  temp2$ = ""
  i = 0                              'initialize temporary variables
  WHILE i < 1000
    'IF LOC(1) > 0 THEN
    IF (EOF(1) = 0) THEN
       temp1$ = INPUT$(1, #1)
       i = 0            'if a character is there, store in temp1
       'IF temp1$ = CHR$(13) THEN RETURN                            'screen out carriage returns
       IF temp1$ <> CHR$(10) AND temp1$ <> "" THEN
          temp2$ = temp2$ + temp1$
       END IF
       temp1$ = ""                                                  'reset temp1
    END IF
    i = i + 1                                                    'increment loop counter
  WEND                                                           'end of loop
RETURN                                                           'return from subroutine
```

(continued)

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Table 4-3
RP3703A.BAS Program Listing (*continued*)

```
RdSnsrType:

    PRINT #1, "S":
    GOSUB CPCread
    SnsrType$ = MID$(temp2$, 1, 1)
    SELECT CASE SnsrType$
    CASE "2"
        model = 1
        LOCATE 22, 1: PRINT "                                    "
    CASE "9"
        LOCATE 22, 1: PRINT "                                    "
        model = 2
    CASE ""
        model = 0
        LOCATE 22, 1: PRINT "Unable to communicate to 3703A "
    CASE ELSE
        model = 0
    END SELECT

RETURN

Logout:

CLOSE 1         'close COM port
END             'exit program
```


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CHAPTER 5

Specifications

The following specifications—which are subject to change—describe the most important data of the instrument's major components.

Table 5-1
Specifications of the Model 3703A Remote Processor

Size (WDH)	22.5 × 17 × 6 cm (8.85 × 6.75 × 2.5 in.); front panel slopes back 25°
Weight	2.3 kg (5 lbs.)
Display	16-character, red LED, 5 × 7 matrix
Control Buttons	Display, Total, Clear, Alarm
Power	100/120/220/240 volts AC, user-selectable. 50 to 60 hertz, 20 watts
Operating Conditions	0 to 40°C (32 to 104°F) at 0 to 95% RH
Computer Interface	9-pin D-subminiature
Analog Output	0 to 10 volts (8 bit), user-selectable scaling
Alarm	Audio, LED light and electrical output; 0–5V DC, 10 mA's
Sensor Power	24 volts DC at 190 mA max for LPC

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CHAPTER 6

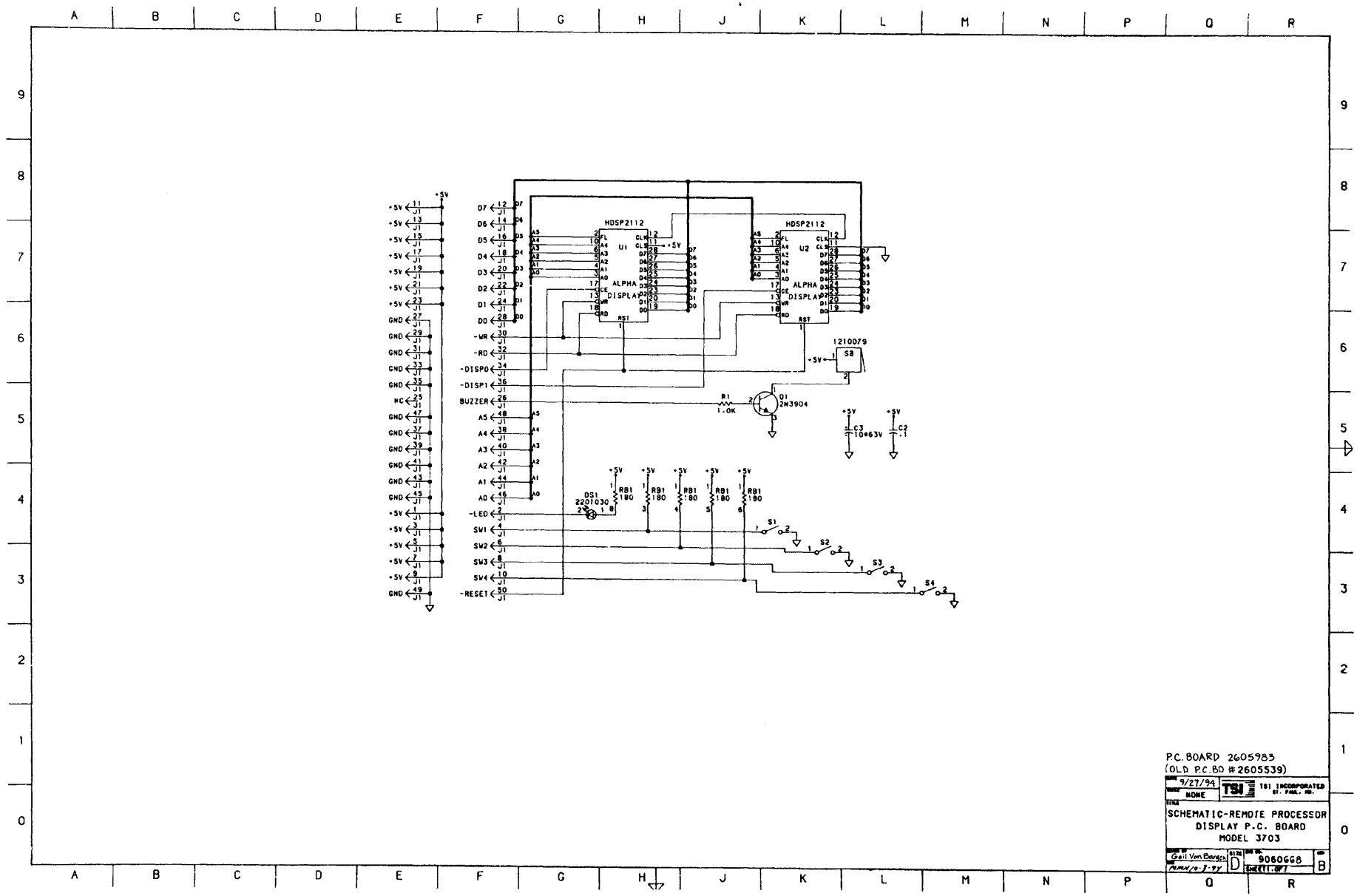
Schematics

The following schematics are included:

9060668, revision B
9060669, 2 sheets
9082233

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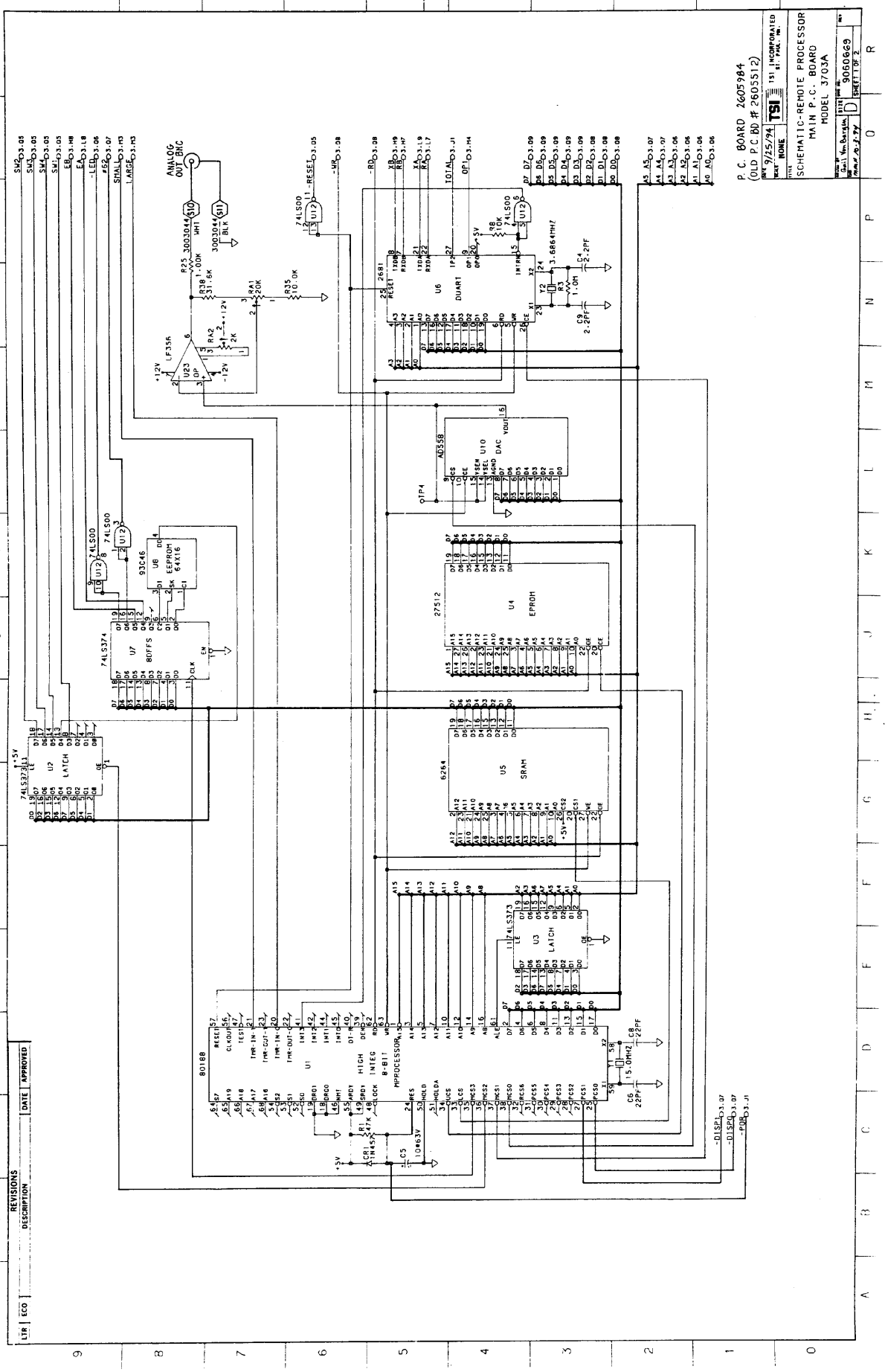
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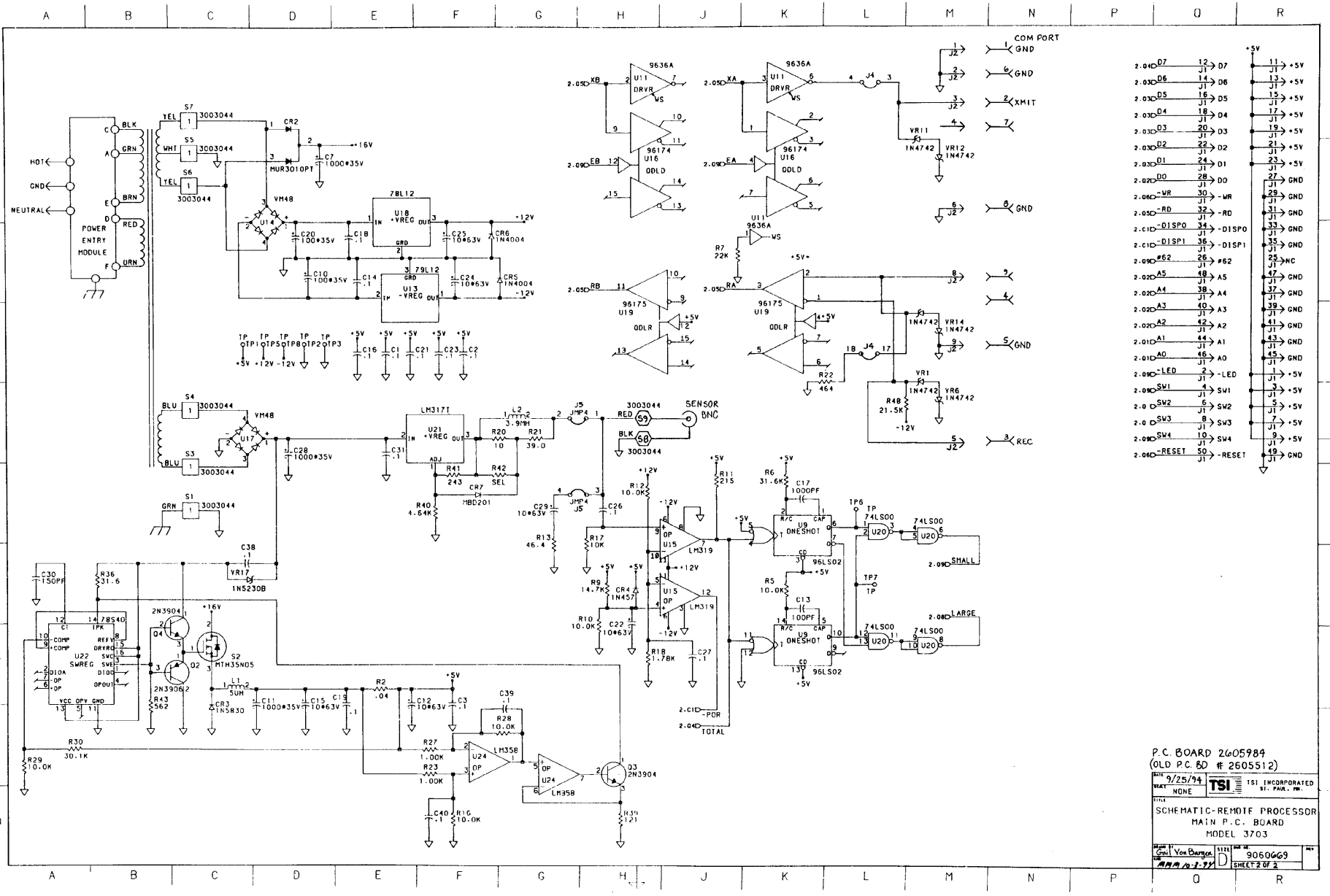
P.C.BOARD 2605983
(OLD P.C.BD #2605539)

9/27/94	TSI INCORPORATED ST. PAUL, MN.	
NONE		
SCHEMATIC-REMOTE PROCESSOR DISPLAY P.C. BOARD MODEL 3703		
Gail Von Bargen	D	9060668 B
9-2-94	SHEET 1 OF 1	

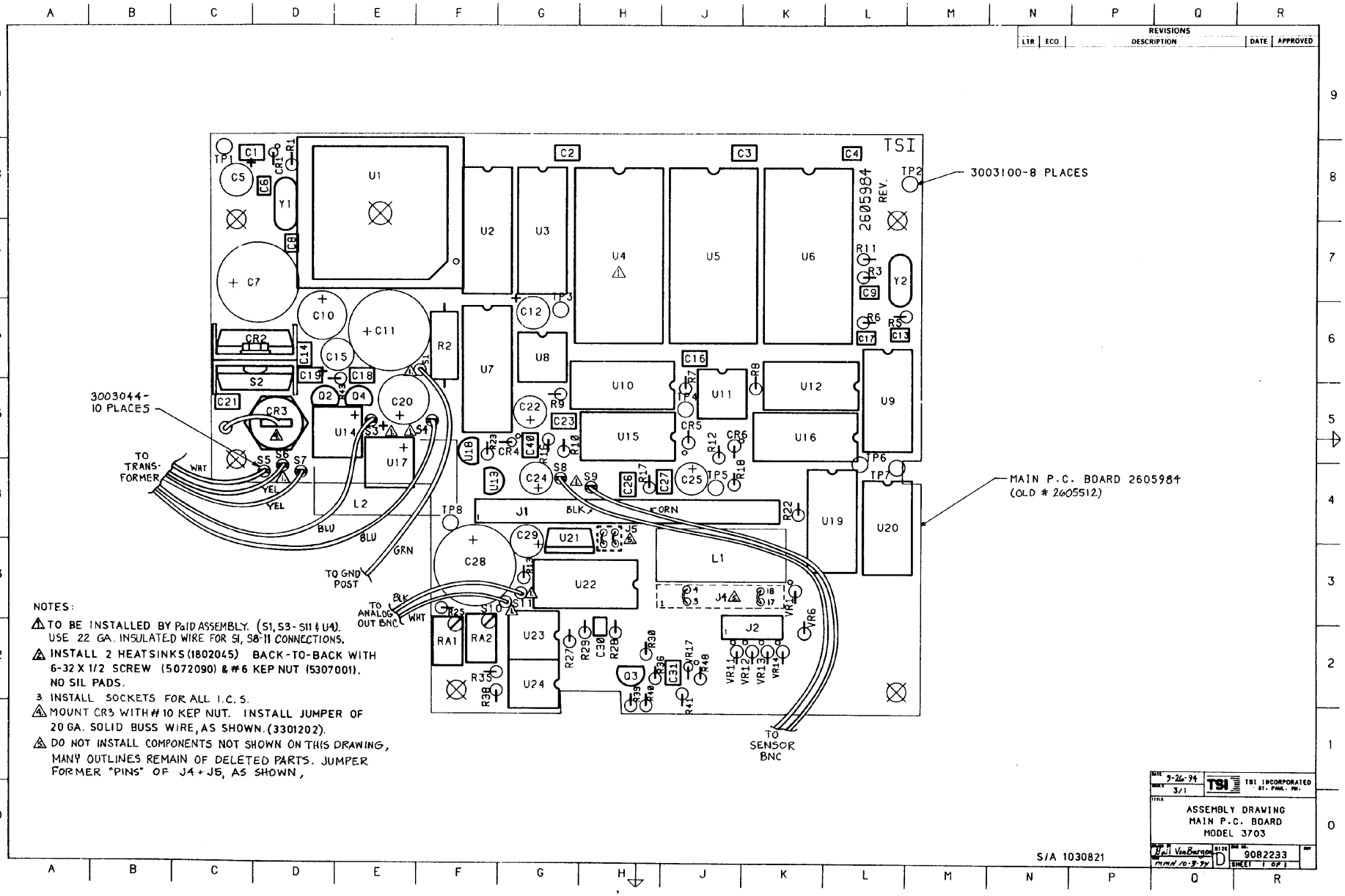
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