

601PRO SERIES_{XL} INTERNATIONAL SAFETY

SERVICE MANUAL



601PRO_{XL}

601PRO Series_{XL}

International Safety Analyzer
Service Manual

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Notices

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Revision History

Revision	Date	Change
A	1/00	First Issue
B	12/00	Chapter 2: Revised Functional Test Description/Outlet Control procedures Chapter 4: • Removed Test Procedures: – 6040005-TP – 6030410-TP – 6030401-TP – 6040400-TP – 6030529-TP • Added Service Calibration and Test Procedure and Service Data Sheet: – 6040005-ST – 6040005-SD Chapter 9: • Replaced parts lists and drawings • Added Reference Designators to Bills of Materials
C	01/02	• Updated Drawings and BOM's • Updated multiple chapters for the keyboard redesign.

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General Information

This chapter presents the purpose and scope of this manual.

Purpose and Scope

The purpose of this manual is to provide information that will enable a technician to service the 601PRO Series_{XL}. Previous versions of the 601PRO are not described in this manual. The instrument is available with the following configurations. This manual provides a detailed description of the ISA601PROXLUSP.

Language Overlay	Printer	Circuit Breaker	Outlet & Line Cord	P/N
German	Yes	15A	Schuko	ISA601PROXLGP
German	No	15A	Schuko	ISA601PROXLG
English	Yes	15A	Schuko	ISA601PROXLEP
English	No	15A	Schuko	ISA601PROXLE
English	Yes	15A	Nema	ISA601PROXLUSP
English	No	15A	Nema	ISA601PROXLUS
English	Yes	10A	Australian	ISA601PROXLAP
English	No	10A	Australian	ISA601PROXLA
English	Yes	15A	UK	ISA601PROXLUKP
English	No	15A	UK	ISA601PROXLUK

Abbreviations and Symbols

This section describes the safety symbols used within the manual.

The following warning and informational symbols may be found in various locations on the 601PRO. Only qualified personnel who recognize shock hazards and are familiar with the safety precautions should use this instrument. Read the manual carefully before operating this instrument.



Alternating current
Courant alternatif
Dreiphasen-Wechselstrom
Corriente Alterna
Corrente alternata



Direct current
Courant continue
Gleichstrom
Corriente continua
Corrente continua



Both direct and alternating current
Courant continu et courant alternatif
Allstrom (Gleich - und Wechselstrom)
Corriente continua y corriente alterna
Corrente continua e corrente alternata



Earth ground terminal
Borne de terre
Erde (Betriebserde)
Borne de Tierra
Terra (di funzionamento)



Protective conductor terminal
Borne de terre de protection
Schutzleiteranschluss
Borne de Tierra de Protección
Terra di protezione



On (Supply)
Marche (alimentation)
Ein (Verbindung mit dem Netz)
Connectado
Chiuso

**Off (Supply)**

Arrest (alimentation)

Aus (Trennung vom Netz)

Desconectado

Aperto (sconnessione dalla rete di alimentazione)

**Caution (refer to accompanying documents)**

Attention (voir documents d'accompagnement)

Achtung siehe Begleitpapiere

Atención (vease los documentos incluidos)

Attenzione, consultare la doc annessa

**Caution, risk of electric shock**

Attention, risque de choc électrique

Gefährliche elektrische Spannung

Atención, riesgo de sacudida eléctrica

Alta tensione (in questo documento Alta tensione non significa “tensione pericolosa” come definito in IEC 417)

Relationship of This Manual to Other Publications

This document does not contain a description of operating controls or operating instructions. The reader should refer to the Operator's Manual (BTI part number 6041000) for this information.

Equipment Description

The 601PRO Series_{XL} International Safety Analyzer is an automated electrical safety analyzer that meets international standards for electrical safety testing of hospital electromechanical equipment.

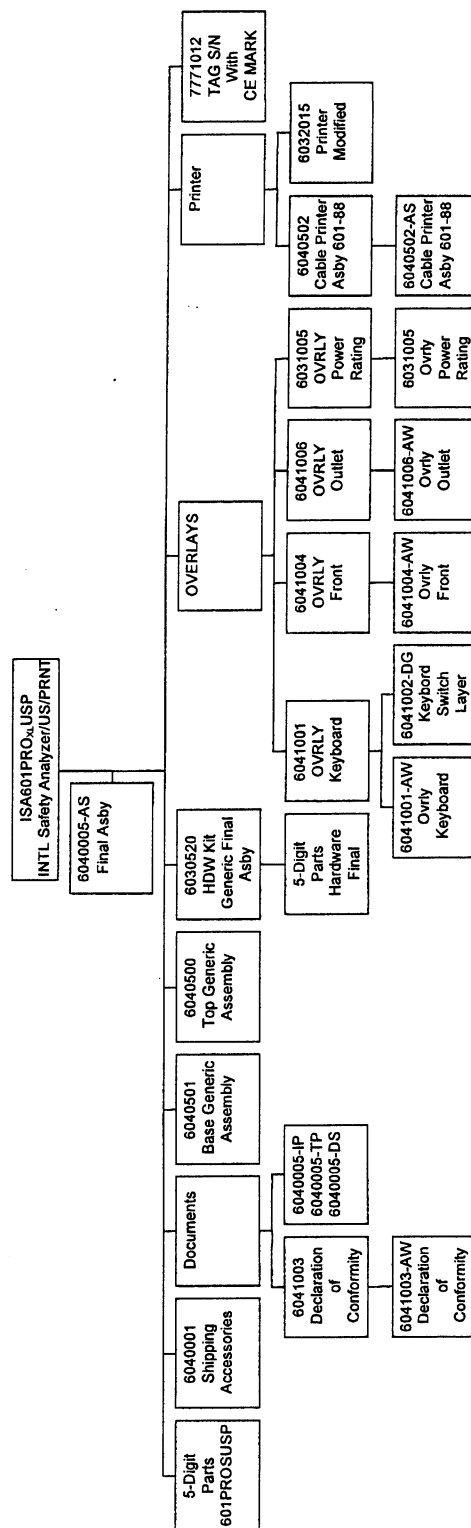
The 601PRO Series_{XL} conducts electrical safety testing in accordance with IEC 601-1, VDE 751.1, VDE 701, IEC 1010, AAMI and HEI-95 requirements, flags failures, and simulates performance, ECG, and arrhythmia wave forms. Test results, which are automatically analyzed and saved in non-volatile memory, can be printed using the internal ZY column thermal printer, an attached external printer, or transferred to a PC via the serial port.

The 601PRO Series_{XL} offers automatic, manual, or step-mode operation. Manual mode allows any specific test to be performed continuously. Serial operation is also provided.

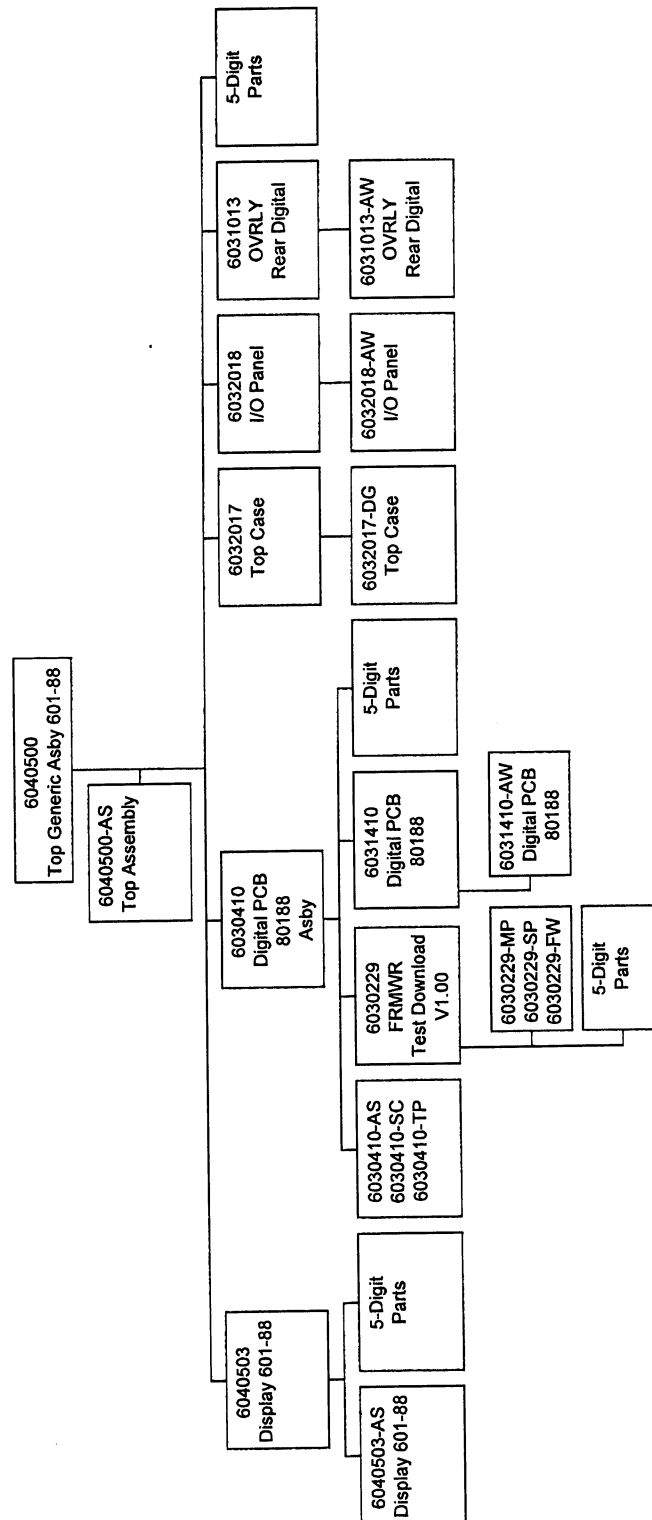
The 601PRO Series_{XL} will accept input from an external keyboard, integrated keyboard, keyboard barcode wedge, or an external RS232 device.

Equipment Relationship Illustration

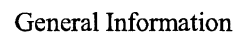
ISA601PRO_{XL}USP



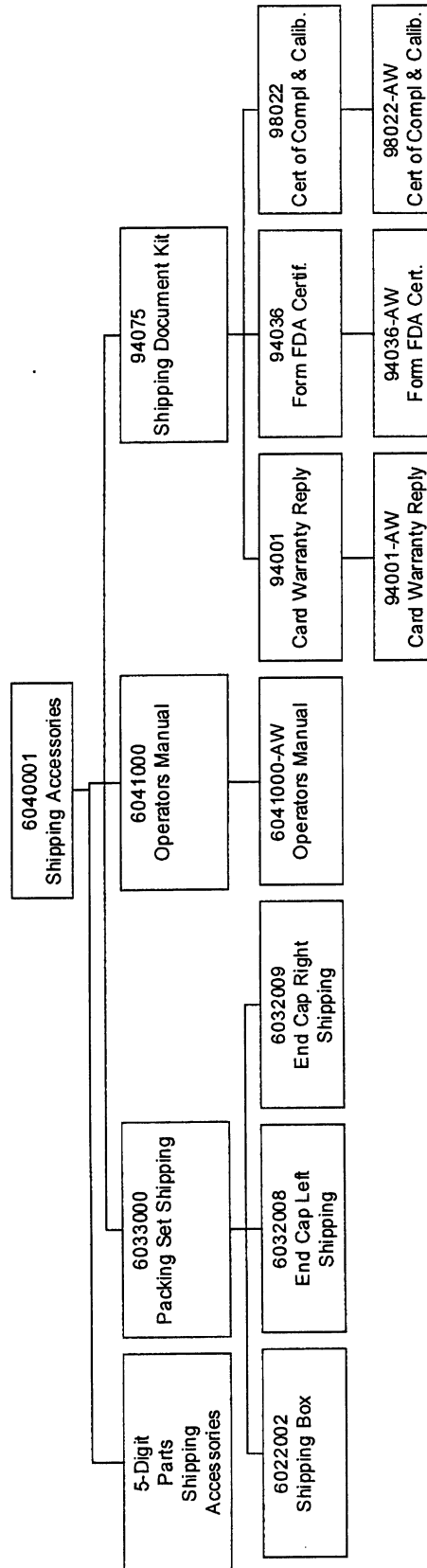
6040500



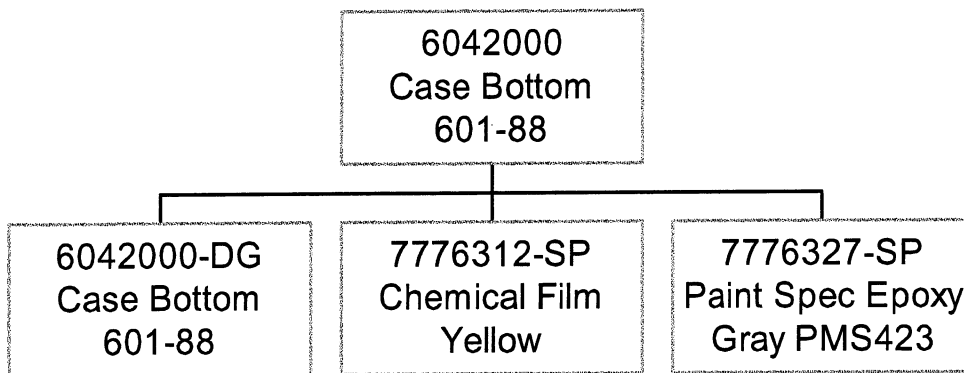
1-6



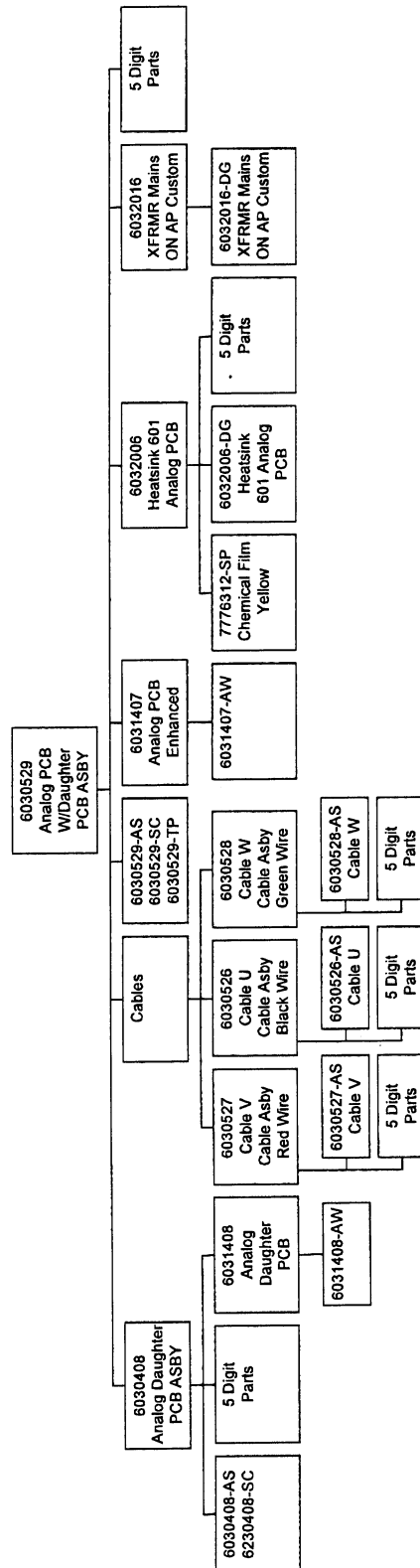
6040001



6042000



6030529



Functional Description

This chapter provides information to support troubleshooting and equipment maintenance.

Theory of Operation

This chapter includes the theory of operation. All of the major and supporting functions (e.g., power and control) of the 601PRO Series_{XL} are described herein.

Circuit Description

The 601PRO Series_{XL} contains a new digital assembly and a modified measurement assembly. The digital assembly uses a newer and more powerful microprocessor (Intel 80C188EB) and replaces the battery backed Static RAM with Flash RAM that does not require battery power for nonvolatile memory. A low pass filter has been added to the measurement assembly for the DC only function. Additional adjustments have been added to the measurement assembly to accommodate a less expensive instrumentation amplifier. The Digital PCB Assembly used in the 601PRO Series_{XL}, has been assigned a new part number (6030410). The AC Power Switching PCB Assembly and the large Analog PCB assembly are unchanged from the previous version of the 601PRO Series.

Input Power

The 601PRO Series_{XL} is externally powered by AC line voltage and will operate from 80 to 145 and from 170 to 270VAC (50-60Hz) IEC use is defined from 90-132 and 180-240VAC. The 601PRO Series_{XL} makes a voltage measurement when it is turned on, and determines the mains voltage, and sets the primary of the Protective earth Current transformer accordingly. Also, this voltage measurement adjusts calibration factors for various tests (such as Mains on applied parts, and VDE tests.) If the 601PRO Series_{XL} is being used with an adjustable input mains voltage (such as a variac), the 601PRO Series_{XL} should be turned off, the voltage adjusted and then turned on, (cycle power off then on, if a significant adjustment of mains voltage is made.) The 601PRO's accuracy is affected or the unit could be damaged (i.e. 120VAC at turn on, and changed to 240VAC) if the mains voltage is altered after power on. There are no user replaceable fuses. There is a circuit breaker incorporated into the power switch on the front of the unit. Further non user accessible circuit protection is accomplished internally by using PTC resistors.

Internal Power Supplies

The 601PRO Series_{XL} has a universal input power module providing +/-12VDC and +5 VDC; a power supply for providing 6VAC max at no load, and up to 24amps for earth resistance measurement (which uses 2 12VDC-12VDC converters for control isolation); and 12VDC to 500VDC power supplies for the 500VDC insulation resistance test; a 12VDC to +/-15VDC converter is an isolated supply for the floating measurement front end; and 110% of mains supply; and a battery for the real time clock.

+/-12 Volts, 5 Volts

NOTE: The line voltage from 80VAC to 270VAC, 50 or 60Hz, is connected to a universal input power module, which in turn provides the control and measurement power supplies as follows:

- 1) +5VDC is the logic supply voltage; and provides power to the LED display backlight.
- 2) +12VDC provides power to the relays, and several dc to dc converters, used for isolation in the measurement front end, and the protective earth resistance circuit, and the 500VDC insulation resistance test.
- 3) -12 VDC to the ecg amplifier.
FB1,2,3 provide noise isolation between supplies shown on Analog schematic-SC, page 1, and 6030401-SC, page 1 (FB1).

VCC +5 Logic Voltage

This is the logic power for instrument. In addition, it is used for RS232 +/- supply, via U4 (MAX208E) on 6030410-SC page 1, and also to generate -(minus) 5VDC via U17 (7662A) voltage converter on 6030410-SC sheet 3 for the D/A converter that generates ECG signals. The +5 logic voltage monitored by U2 on 6030410-SC page 1 and will reset the microprocessor if the power supply voltage drops below 4.25 to 4.50 volts DC. The clock chip, U3 has its own 3Volt lithium battery BT1.

+ 12VDC Relay Power

Relays are powered by 12VDC. The smaller signal relays are controlled primarily by Sprague UCN5841 relay driver IC's on Analog schematic page 1 (U21 through 26). The larger relays are controlled by a parallel latched output port on 6030410-SC page 6 (U28,29) on to 6030401 page 1 of 1, power switching board via opto isolators U1,2,3 and relay drivers U4 and U5.

± and - 12Volts

This is used on:

- 6030529-SC page 4 shows an isolated supply from U7, a 12VDC to 12VDC converter and also U11, a 12VDC to +/-12VDC isolated supply, both used (Analog PCB pages 4 and 5) in the protective earth 25/1 Amp current source circuit (U4,5,6,7,8,9,10,11,12,13,14,15,PTC 3,4,5, 9,Q5,Q10,Q11, 17,etc.)
- +12VDC to 500VDC isolated supply, controlled by (Q1,2, U1) on Analog schematic p 3.
- +12VDC to +/-15VDC isolated supply which powers the floating measurement front end
6040410 p1, 12.
- -12VDC is used to power the ECG differential amplifier Analog schematic p1, U17 and Current transformer measurement amplifier, U3.

Mains Voltage Selection Relay (Software Controlled)

After measuring the mains voltage at power on, if the voltage is in the proper operating range (see preceding section), RY 40 is set to the proper primary voltage on the earth continuity transformer Analog schematic p 2.

The Protective Earth Continuity Current Source

The circuitry shown on Analog schematic p 4 and p 5 is a regulated current source. It is supplied by the large transformer connected through J5 and J6 shown on Analog schematic page 4. The 601PRO Series_{XL} measures the mains voltage at power up, and energizes RY40(p2) if the voltage is below 145 VAC, to provide the proper primary voltage to this transformer. The primary of this transformer is selected to use the 230VAC series winding connection if RY 40 is left normally open, or if energized, 115 volt parallel primary windings. The resistance (ohms) displayed in this test is the resistance which is connected between the red lead and Device Under Test (DUT) ground. The displayed resistance is the voltage from the red lead to DUT ground connection, divided by the current flowing out of the red lead (the DUT ground and the green jack on the front panel are internally wired together). The resistance calibration allows the user to subtract the resistance of the test leads.

The following is the circuit description: briefly: the big transformer can provide around 10VAC at 24AMPS. The test current is determined by measuring the AC voltage across .01 ohms in series with the test current. This voltage goes to an RMS to DC converter which again represents the amount of test current, which is compared to a precision DC reference, and this comparison determines the amount of drive on the FETs which control the amount of current which flows from the big transformer. To make sure the voltage doesn't get too high when little current is flowing, the Voltage from the transformer is monitored, and the drive to the FETs is reduced (clamped). If the FETs get too hot, a thermal switch opens the current path via two series relays, K52 and K51.

Details of the Protective Earth Current Source Circuit

Note:

In addition, the following applies:

- 1) Additional series resistance used for the 1 amp measurements (R28A&B and PTC6),
- 2) Gain changes to accommodate the different R's (via R55)
- 3) Changes in VSCYCLE detection by filtering the inductive kick right after the zero cross point. This allows measurement of grounds with inductance up to 500mH. This is done via a small add on board: 6030408.

The Circuit Description

U12 and U9 provide precision +/- 5 (labeled 5VA and -5VA) volts reference shown on Analog schematic p 4. (This is derived from the isolated 12 volt supply, hence is isolated from the line. The largest transformer in the unit is controlled to provide about 6VAC and 24 Amps, or 1 amp. The current control is done via a feedback loop made by the current measured by R45,46,47,48 and U15 on Analog schematic p 4, and RMS converter U13 (p5). This is compared and controlled by the components on page 5, ultimately back to POSFET and NEGFET signals on page 4 to Q5 and Q11. When 24 amps of current flows through R45,46,47,48 it produces .24 volts, which is scaled at U15 programmable gain instrumentation amplifier, set for times 1 (or times 24 if 1 amp testing) via K50. (The same control mechanism is used for either 1 amp or 24 amps test current, however, the 1 amp test has additional current limiting resistance switched into the circuit.) U13 is an RMS to DC converter, which takes the ac voltage output from U15 (A voltage representing the current flowing through the red lead to DUT earth, [scaled up times 24 if using the 1 amp range]), and converts it to DC at U13 pin 6. This voltage, through R44 (12K), is compared to the reference voltage formed by R42 (499K resistor) from the -5VA at U9.

The current for the positive and negative cycle are controlled by separate FETS, but the total positive and negative phase current is summed by the RMS to DC converter. The phase is determined by U4 (output on pin 1) on page 4, which creates signal VSCYCLE. This signal is rectified by U4 (output on p14) and D1 and D3 to produce the control for the POSFET. U4 output on pin 7 is an inverter, and U4 (output on pin 8) and D2 and D4 produce the Negative FET control signal gate NEGFET.

Let's follow the control path of the positive half of the cycle. U6 pins 5 and 6 are compared to allow only drive when needed on the positive half of the voltage. A negative voltage output (pin 7) here would be a request for more current in the loop, on this positive half cycle (from the Protective earth resistance transformer). U6 pin 7 Analog schematic p 5) is connected to optoisolator U10 (Analog schematic p 4) to Q9 and Q5, driven by pull-ups RN 3 to +12VF. +12VF is a dedicated, isolated supply for the protective earth FET drive circuit. In the same way, the negative half of the cycle is controlled via U6 pin 2 and 3 to pin 1, and through the other side U10 (dual optoisolator) to RN3 and Q10 and Q11.

In order to make sure the output voltage doesn't get too high, the output drive voltage is sensed, and when too high, the drive to loop is clamped. This happens at U5 and the output of U8. (In the latest version of analog assembly 6030529 U8 is replaced with daughter board 6030408. The circuit is functionally the same but some additional filtering, and a little delaying of the zero cross point avoids noise caused by inductive components at the zero crossover point.) The clamping action occurs by driving U9 pin 2 high to clamp off the current comparator U9, and thus cause a reduction in drive voltage to the FETs by raising POSFET and NEGFET signal levels (they are analog and more active low), which shuts down current to the protective earth circuit.

Software Notes

- The measurement range for 1 Amp and 25 Amps is 0-2.999 ohms. Over-range for both is 10 Ohms. Maximum calibration limit for lead calibration is 0.150 ohms.
- The manual test will prompt the user to calibrate the leads, if a negative ohm reading is made (a low ohms reading, with a larger ohms cal value). The auto/step test assumes the user has done a lead cal, prior to running the auto/step test, but if an invalid lead calibration value is in memory, when the protective earth test is run, it will display an error saying the leads need calibrating.

The 500VDC Supply

Located on the analog board schematic Analog schematic sheet 3. U1 is an isolated 12 VDC to 500VDC supply for insulation resistance testing. The 500VDC is turned on by driving IRY39 active low. Q2 is an inverter which drives Q1 which in turns U1 on or off. This arrangement makes sure that the 500VDC supply is off when the 601PRO Series_{XL} turns on, since the relay drivers are inactive high (12VDC) at turn on (Q2 turns on, turning Q1 off, and keeping U1 off). The 500VDC supply output drives two caps and R4 (which is a 158K bleeder resistor). One side of R4 goes to R5 (2.49Meg resistor) which is in series with the Protective earth, and R3 (2.49Meg resistor) is in series with test load. This serves to limit the current (and shock potential.).

The Isolated 110% of Mains Power Source

The Isolated 110% of Mains Power Source is Supplied by XT1, which is located on the analog board schematic sheet 2. It is an isolation transformer used for mains on applied part testing, and VDE equivalent device and equivalent patient leakage tests. The power to the primary is protected on the pcb by a PTC resistor (F1) Power to the primary is turned off and on by IRY25 (active low) to U2 and FETs, Q3 and Q4. U2 is an opto-isolated, photovoltaic driver. IRY18 (active low) is applied to K7, which is used to reverse the polarity (phase) of the applied ac voltage. A fixed load resistor R6, combined with the transformer windings and core, act to limit the current. An additional winding on XT1 (and other parts) are used to offset internal capacitive leakages. The "other parts" (which control the amount of leakage) are K55, K56 and C78, 79, 80, & 81.

Floating Power Supply

The ability to make floating measurements comes from U12, an isolated 12VDC to +/-15VDC converter and Q1, 5V regulator found on the measurement board schematic 6030410 sheet1. The I denotes isolated supplies.

DC Only

The DC only feature consists of a low pass filter on the Measurement PCB Assembly (6040400-SC p2) that can be switched into the leakage channel for DC Only measurements. The 4-pole RC filter (R37..R40 & C38.. C41) is placed in or out of the circuit with relays K10 and K11. A bi-directional transient suppresser across the input to the filter limits the voltage to protect the capacitors.

Measurement Front End Isolation

Refer to 6040400-SC measurement board p1. There are 7 dual opto-isolators U2,3,4,5,6,7 which have their internal LED's powered through RN1 by filtered digital 5 Volts (+5DFM). The output of the opto-isolators are powered by the isolated 5 Volts (5I) on the floating front end, and RN2 is used to pull up the signals to +5I. (6030410 p5) U20 & p6 U27 are the source for the CPU controlled signals for the measurement front end Gain Control, and A/D control and data transfer.

CPU and Support Circuitry

The microprocessor is an Intel 80C188EB (U1) with a 32MHz clock input (Y1). This processor uses an 8-bit external data bus and can directly address 1Mbyte of memory through external address latches (U11, U12). A separate I/O space is decoded by U8. All memory runs with 0 wait states. I/O wait states are listed on the schematic.

Memory

The memory types, and sizes are shown on page 4 of 6030410-SC. Although it is under program control (the microprocessor can dynamically change the memory chip select address decoding), the EPROM is generally at the top (32K) of the 1Mbyte address range. The Static RAM is at the bottom (32K) of the address range, and the remaining portions are occupied by flash memory. The flash memory is used to hold the program code, including language strings as well as test results and device information. The EPROM contains a test program for the digital board (access with dip switch #1 but only when the board is on the digital board test station) and a program for downloading the rest of the code from a computer via the serial port. Downloading must be done with the Bio-Tek program intended for this purpose. This program also allows the operator to select the language file to use. Upon power up, the EPROM code checks for the presence of a valid program (by calculating a checksum and comparing it with a stored value. If no program is present, the download mode is entered. Alternatively,

to force a download (of a new version for example) pressing the "Previous" key within the first three seconds will also force entry to the download mode. If the download mode is entered, but a download is not desired, powering down the unit will not cause a loss of any data. The boundary between program memory and nonvolatile data memory is not necessarily split into the two flash ICs, but generally, the lower half of memory (U7) contains program memory, and the upper half of memory (U18) contains nonvolatile data.

Display

Refer to 6030410-SC sheet 5 to see the connections (J5) to the display module. The display is an 4 line by 40 character LCD display with and LED backlight, It has separate control lines for the upper 2 lines and the lower 2 lines of the display. 8 bit characters are sent to the display. The display module handles the bit manipulation required to get the correct pixels displayed. The backlight current is approximately 415mA. The display contrast is adjusted by RT2 (which is a 2K potentiometer which adjusts from 0 to about 1.5VDC.) All are found on 6030410 page 5.

I/O Ports

Relay Control Ports

Control for RY1 through RY55 originate from the CPU on 6030410 p6 controlling the parallel outputs of U26 and U28. These signals are inverted and buffered by U27 and U29, then pass through a noise filter (so relay transients can't upset the digital board). The RY1 through RY 48 control is performed through serial control signals RYDATA, RYCLOCK, RYSTRB, and RYENB. These signals are found on the analog board Analog schematic, p 1, connected to the relay drivers: U24,23,22,25,26,22. Note that the RYDATA goes only to SDIN of U24 pin 3, and the SDOUT of U24 pin 6 goes to SDIN of U23 pin 3, etc. through U22, U25, U26, U21. U24 controls RY1 through RY7, U23 controls RY8 through RY15, U22 controls RY16 through RY23, U23 controls RY8 through RY15, U25 controls RY24 through RY31, U26 controls RY32 through RY39, U22 controls RY40 through RY47. Each time one or several relays need to be changed, the Microprocessor serially sets the proper bits for the 6 serially connected relay drivers which in puts all 48 relays at the proper on or off state. This allows 4 signal lines to control up to 48 relays. IRY46 and IRY47 select the amount of current needed to zero the mains on applied parts leakage measurement. During mains on applied parts and some VDE tests, IRY47 applies this corrective current into the LEAK+ front end measurement input, and IRY46 is closed for additional corrective current to zero the front end at 177VAC and above.

Referring to the power switching board, 6030401 p 1, U1,2,3,4 and 5 for RY49 through RY55, which are the heavy duty relays which control the mains connection to the DUT. (As explained in the previous paragraph, these 5 relays are directly controlled by the CPU writing an 8 bit pattern 6030410 p6, U28 [1=on, 0 = off]). The power switching board puts these 5 relay signals through optoisolators, and 2 relay drivers (needed to make sure power up starts without turning on the outlet of the 601PRO).

As an example, we will describe turning on RY40, which sets the primary voltage to the Protective earth resistance transformer. (Note the exact high and low levels may not be totally accurate, however this is written to describe the mechanism for turning the relays to the proper state.) The CPU had accomplished this by writing an 8 bit pattern to the latch U26, the lowest 4 bits are used for serial control of the 48 relays. the strobe (bit2) is brought high to enable the relay drivers U21 through U 28 to accept the serial pulses, and bit 2 is held high while in the next write from the CPU, the RYDATA (bit0) is set low for turning the 48th relay off. Next the CPU leaves bit 0 and bit 2 the same and toggles the clock line high, then in the next write, low. Then the RYDATA (bit0) is set high (or low) to turn the 47th relay on or off, then the RYCLOCK is toggled again. After repeating this operation, through RY40, the next write will cause the state of RY47 to go into the next relay drivers SDIN on U23.....etc. until all 48 relay states are setting in all 6 relay driver chips. Then the RYSTROBE is set low, and the relay outputs are driven to

the proper state. RY40 is driven on or off (the relay driver chip has built in flyback diodes to suppress transients from the relay turning off).

Printer and Serial Ports

6030410 page 2 shows connections for the two printers the serial port and the external keyboard connections.

Printer Ports

See 6030410 page 2. The internal 24 column thermal printer is connected to P5. Outgoing characters are latched at U31, (it has a parallel connection), with a busy line monitored as an input, read at U21 pin 19, (6030410 p5). The external printer is connected to P3 (25 pin D female D-subminiature). Outgoing characters are latched at U30 (page 2), a BUSY, PRINTER (printer connected and powered) and ONLINE signal inputs, read at U21 port C (page 5).

Serial Ports

The 601PRO Series_{XL} conforms to the Bio-Tek Serial Interface Standard (R&D OP11), which should be referred to for more information. The 601PRO Series_{XL} has one, 9 pin serial port located on the rear panel of the instrument. The female 9-pin D sub-miniature serial connector (P2) is a serial port, DTE configuration.

Input Signals

Printer status signals and the SW1 dipswitch positions are shown on 6030410 p 5. The first position on the dipswitch is used to select the digital board subassembly test program (when the board is on the digital board test station). SW1 position 2 is not used. SW1 position 3 is not used. The internal printer is an option, and dipswitch position 4 is opened when no internal printer is installed. This removes the choice of internal printer selection from several menus. Closing that switch restores the menu choices for the internal printer. These signals are read by the CPU as an I/O input strobing in the 8 bits from U21.

Beeper

The sound generator BP1 is driven by U24. Input to the driver are from the octal latch U33 which also contains some LCD display control signals.

Front Panel Keyboard (Output and Input Scanning)

The front panel keyboard connection (J6) is also shown on 6030410, page 5. The switches are connected through FB1 through FB10 ferrite beads to suppress any high-speed transients from getting back into the 601PRO. The switches are arranged in a 5 by 5 matrix, which is scanned by U21 ports A and B. Port A activates each line in turn, and port B inputs 5 lines for each Port A output, to determine which, if any, keys are pressed.

External Keyboard

The original keyboard interface (6040401), which provides the interface and functionality to the external keyboard of the 601Pro XL, has been replaced (the IC is no longer manufactured). A new design (6040403), based on the PIC 16C57C processor, has been released. The 601Pro XL firmware works the same independently of the hardware.

In order for the 601Pro XL to recognize the 6040403 design, SW1 position 3 must be set in the "OPEN" position.

The new keyboard interface (6040403) consists of a PIC 16C57C micro controller. Upon a key press of the external keyboard the PIC generates an interrupt signal. The 6040403 daughter board has hand shaking capability with the 80C188EB processor. A D flip flop and a nand gate accomplish this. The PIC, after transmitting a scan code will wait for the 80C188EB processor to change the state of the D flip flop via the RD and the PCKYBD chip select. The PIC cannot receive any data from the external keyboard until the main processor sets the D flip flop. The PIC software resets the D flip flop after each scan code is transmitted. If, for example, a multiscan coded transmission is initiated (like the INSERT key which has the following code serial transmission 0xE0 0x70 0xE0 0xF0 0xE0) then the external keyboard will hold each scan code in its output buffer until the PIC releases the CLOCK and DATA lines. The PIC will only release the CLOCK and DATA lines after the 80C188EB main processor answers the PIC's interrupt request.

6030410, sheet 2, shows the external keyboard interface where the keyboard plugs into the 5-pin DIN connector. The external keyboard interface is designed to function with IBM-compatible Personal Computer PC-AT style keyboards. When a key press is made, the keyboard chip U13, pin 35, issues an interrupt request to the microprocessor U1, pin 31. NOTE: In some units, the keyboard controller IC is replaced with a small PCB assembly containing the controller IC (U1) and an oscillator (U2). The microprocessor can then read and write to the keyboard chip, and input the key code of the key that is pressed. If a "wedge" style of barcode reader is connected to the keyboard interface, signals from the barcode reader will then be interpreted as if they were keyboard signals. Five-volt power for the keyboard and/or barcode wedge is limited by PTC2.

External Keyboards, page 13-1 contains details regarding external keyboards. *(If you are viewing this document electronically, you may click on the link External Keyboards.)*

Functional Test Description

This section will describe the process of relay switching required to execute a particular test, as related from the 601PRO Series_{XL} internal relays to the Test description by the selected test standard. The outlet control is used by almost all tests, and will be described generically first.

Outlet Control

General: The test standards require turning the outlet off and on and off, etc., and also opening L2, and earth, and reversing the L1 and L2 connections (which simulate possible failure conditions). The loads that must be switched can be a wide variety of loads, including purely resistive to motor loads. Particular care is taken when turning the 601PRO Series_{XL} outlet off, to avoid generating excessive arcing and circuit transients. This makes the switching relays last longer, and increases reliability. The 601PRO Series_{XL} uses a mix of solid-state and mechanical switching to perform a zero-crossing turnoff of the Device Under Test. Time delays built into the relay switching sequence reduce possible transients. A 25-millisecond delay follows every line in the relay sequences. The schematic of the power switching section is on 6030401, page 1.

Power Switching Components

Mains power comes in through the rear panel and is connected to the circuit breaker/switch on the front panel, then to J3 (6030401, page 1). Then the power circuit goes through the primary power switches K1 (IRY49) and K2 (IRY50), and then to K3 (IRY53) and K4 (IRY52) which provide open L2 capability (even when L2 has been switched to the other line), then to K5 (IRY51) and K6 (also IRY51) which reverses L1 and L2, then K7 (IRY55) and K8 (also IRY55) which are provided to allow the DUT L1 and DUT L2 lines to be shorted (for VDE testing), then to the Device Under Test (DUT) receptacle. K53 (IRY34) on Analog schematic p4 connects the 601PRO Series_{XL} earth to DUT earth receptacle (which is also the 601PRO Series_{XL} front panel green jack). The power to the DUT is always off at the main menu.

Relay Sequence Description

The 601PRO software defines a number of "Relay sequences" that control the outlet power and the input signal selection. Refer to the relay sequence section. The relay numbers following "ON" or "OFF" are switched as a group. A delay of 25 milliseconds is placed between each group unless an extra "WAIT" is also included.

Example 1: This sequence is used because the reverse polarity key was pressed at a time when the outlet already has L2 open, and the mains polarity is reversed. The action is to reverse the mains polarity, and still leave L2 open. (Since the mains polarity is reversed, "L2" is controlled by K4 instead of K3.)

	Sequence: rev_outlet_on_L2_open_revpol
OFF, 52	Turn off IRY52 (K4) to keep L2 open
ON, 51,53,55	Turn on outlet IRY55 (K7+8) and IRY51 to reverse the polarity, and IRY53 to connect "L1"
Wait 50	Wait 50 milliseconds
ON, 49,50	Turn on Solid-State Relay (SSR) K1 and Mech Relay K2 (for no SSR heat sinking).

Example 2: Turning the outlet off:

	Sequence: outlet_off
ON 49	Turn on the SSR. Be certain the SSR (K1) is connected in parallel with RY50 (K2)
OFF 50	Turn off Mech relay (K2)
OFF 49	Turn off the SSR (K1). Power is not actually removed until the current passes through zero.
Wait 150	Wait 150 milliseconds for the DUT to stop and dissipate power in R1
OFF 52,53,55	Open L1 and L2 to "initialized off state"
Wait 50	Wait 50 milliseconds

Example 3: Turning the outlet on (setting normal polarity and L2 on):

	Sequence: outlet_on_normal
OFF 51	Polarity Relay to normal
ON 52,53,55	Connect the two "L2 control" relays and the DUT terminals (the unit is still unpowered)

Wait 50	Wait 50 milliseconds
ON 49, 50	Turn on both the SSR and the Mech relay

Software Note on Mains Power-Up Test

Upon power-up, and before the main menu is displayed, the 601PRO Series_{XL} measures the voltage present between the three line voltage inputs. These voltages will be referred to as: L1_Earth, L2_Earth, and L1_L2.

The L1_L2 voltage is divided by the largest line voltage present when a leakage CAL was last performed to create a scale factor that is then applied to the Mains-on-applied-part offsets.

The L1_L2 voltage is then examined to determine which voltage range to use (115 or 230). This is necessary to set the Protective Earth Continuity power transformer primary configuration relay.

If the L1_L2 voltage is between 75V to 150V, the 115 range will be used.

If the L1_L2 voltage is less than 75V or between 170V to 270V, the 230 range will be used.

Next, the L1_L2 voltage is tested to see if the mains voltage is out of range: If L1_L2 is not within 80V to 145V or 170V to 270V, the Mains_Voltage_Out_Of_Range flag is set. The operator will NOT be notified at power-up if the mains voltage is reversed.

The three voltages are then examined to determine which line (L1 or L2) to open when an OPEN L2 fault is simulated, and to determine if an Open Earth condition exists. The reason for determining which line to open for an OPEN L2 fault is to keep the line with the highest potential relative to Earth connected, thereby permitting the highest leakage to Earth to occur in the normal polarity condition. The relays that open or close the L1 and L2 lines are ahead of the relays that reverse the polarity.

A description of the algorithm for determining which lead is called L2 and to check for an Open Earth condition, follows:

```

if in the 230V range
{
if ( L1_Earth >= 170.0 ) L2_STATUS = NORMAL;
else
{
if ( L2_Earth >= 170.0 ) L2_STATUS = SWITCHED;
else
{ /* both lines to earth are < 170 -- open earth or dual phase */
if ( (L1_Earth + L2_Earth) > ( 0.95 * (L1_L2))) L2_status = NORMAL;
else
{
L2_STATUS = NORMAL;
OPEN_EARTH_ERROR = TRUE;
}
}
}
}
}
else in the 115V range
{
if ( (L1_Earth >= 80.0 ) AND ( L2_Earth < 80.0 )) L2_status = NORMAL;
else
{
if (( L2_Earth >= 80.0 ) AND ( L1_Earth < 80.0 )) L2_STATUS = SWITCHED;
else
{
L2_status = NORMAL;
if ( Mains Voltage is NOT Out Of Range ) OPEN_EARTH_ERROR = TRUE;
}
}
}
}

```

If it was determined that the L2_STATUS was SWITCHED, the 601 will open and close the 601 input L1 line instead of the L2 line when the test or operator requires that L2 be open or closed. NOTE: The “no earth” indication and actuation refers to the Earth connection to the front panel outlet (also known as functional earth and always connected to the green test jack). It is either connected to the 601 power input protective earth or not. It is never interchanged with some other signal.

At this point, the subroutine goes on to recover the leakage calibration offsets from the non-volatile memory and apply the line voltage scale factor to them, test the 500V DC source used for insulation resistance testing, test the memory backup battery voltage, and determine if the memory is full. Any errors except MAINS__VOLTAGE__REVERSED at power-up are displayed. The operator can choose to ignore them and continue by pressing the ESC button to get to the main menu.

Serial Port Hardware

IC U4 on page 1 of 6030410 generates the plus and minus voltages needed for the RS232 port, and buffers the RS232 inputs and outputs. The V+ (pin 11) and V- (pin 15) are normally 8 to 10 volts. The BCTX and BCRX signals shown on the schematic are not used (the P1 barcode port on page 2 is not populated with parts). The port signal names are relative to “Data Communication Equipment”. Since this is “Data Terminal Equipment” the direction of the signal names is reversed; i.e., the RX signal is an output from the 601PRO, and the TX signal is an input.

The RTS (Request to send -- active low input) and CTS (Clear to send – active low output) – signals control the flow of data in and out of the port. If data is presented faster than the 601's

microprocessor can accept it, the processor will set the CTS output high to signal the computer to stop sending data. Likewise, if the computer cannot accept data, it will signal the 601 pro to stop transmitting by setting the RTS input high.

Relay Identification and Switching

The Names are the software symbol names in positive logic. They refer to the relay control signal name IRY__ found on the schematics. The actual reference designation (K__) number is found on the schematic and Bill of Materials, and is printed on the circuit board. Tables 1 and 2 provide a cross reference of these signal names and the "K" relay number. In these tables, an apostrophe represents a negation (active low) of the signal.

Table 1. Analog Assembly Relay Names and Functions

Software & Signal Name	Relay RefDes	Function
IRY1	K39	Connects (LEAK-) to (V)
IRY2	K38	Connects (LEAK-) to (LL)
IRY3	K37	Connects (LEAK-) to (LA)
IRY4	K36	Connects (LEAK-) to (RL)
IRY5	K35	Connects (LEAK-) to (RA)
IRY6	K44	Connects (LEAK+) to (V)
IRY7	K43	Connects (LEAK+) to (LL)
IRY8	K42	Connects (LEAK+) to (LA)
IRY9	K41	Connects (LEAK+) to (RL)
IRY10	K40	Connects (LEAK+) to (RA)
IRY11	K19	Connects (LEAK+) to (DUTL1L2)
IRY12	K31	Connects (LEAK+) to (REDLD)
IRY13	K22	Connects (LEAK+) to (FE)
IRY14	K23	Selects (LEAK+) input
IRY15	K29	Connects (LEAK-) to (PE)
IRY16	K21	Connects (LEAK-) to (BLKLD)
IRY17	K32	PECCAL+ to VOLTS+
	K33	PECCAL- to VOLTS-
IRY18	K7	Reverses polarity of 100%
	K54	Reverses polarity of 100%
IRY19	K28	ECG terminals to LEAK-
IRY20	K30	Select LEAK- input
IRY21	K20	+ISOL to LEAK-
IRY22	K11	+ISOL or CAL to LEAK-
IRY23	K5	(L1) to (LV+)
IRY24	K4	(PE) to (LV-)
IRY25	U2,Q3,Q4	on/off of 110%
IRY26	K6	(L2) to (LV-)
IRY27	K26	(REDLD) to (VOLTS+)
IRY28	K27	(BLKLD) to (VOLTS-)
IRY29	K15	Select VOLTS+ input
	K16	Select VOLTS- input
IRY30	K3	(PE) to (LV-)

Table 1. Analog Assembly Relay Names and Functions (Cont.)

IRY31	K17	(ISRC+) to (VOLT S+)
	K18	(ISRC-) to (VOLT S-)
IRY32	K2	1A / 25A
IRY33	K45	Connects ECG signals to (RA)
	K46	Connects ECG signals to (RL)
	K47	Connects ECG signals to (LA)
	K48	Connects ECG signals to (LL)
	K49	Connects ECG signals to (V)
IRY34	K53	PE to FE
IRY35	K24	PECST+ to VOLTS+
	K25	PECST- to VOLTS+
IRY36	K51,Q12	Enable PEC CAL
	K52,Q12	Enable PEC CAL
Software & Signal Name	Relay RefDes	Function
IRY37	K8	Enable leakage CAL signal
	K9	Enable leakage CAL signal
IRY38	U14,Q8	PEC Cur On/Off
IRY39	U1,Q1,Q2	500VDC On/Off
IRY40	K1	115/230 Primary to PEC Xmfr
IRY41	K34	FE to VOLTS -
IRY42	K12	-ISOL to REDLD
IRY43	K10	-ISOL to DUTL1L2
IRY44	K14	-ISOL to PE
IRY45	K13	-ISOL to FE
IRY46	K55	Leakage comp #2
IRY47	K56	Leakage comp #1

Table 2. Power Switching Assembly Relay Names and Functions

Software & Signal Name	Relay RefDes	Function
IRY49	K1	AC Power ON (SSR)
IRY50	K2	AC Power On (parallel w. SSR)
IRY51	K5,K6	Reverse outlet polarity
IRY52	K4	Outlet HOT (L1) line ON
IRY53	K3	Outlet NEU (L2) line ON
IRY55	K7,K8	DUTL1L2 to DUT L1 & DUT L2

Table 3. Digital Assembly J3 Signals (to Measurement Assembly J2)

Net Name	Digital J3	Dig I/O	Data Bit	Function
START	1	O	0	A/D serial start pulse
CLOCK	2	O	1	A/D serial data clock
AG3'	3	O	3	Voltage Gain $\div$ 100
AG2'	4	O	2	A/D Gain $\div$ 2
VOLTS'	5	O	4	Select volts / leakage
INSL'	6	O	5	Enable leakage load
AG1	7	O	6	PGA Gain select bit 1
AG0	8	O	7	PGA Gain select bit 0
IDATA	9	I	5	A/D serial data
IEC1010F	10	O	6	IEC1010 test load
+5DFM	11	O	--	Filtered digital power
+5DFM	12	O	--	Filtered digital power
AAMIF'	13	O	7	AAMI test load
RMS'	14	O	--	RMS (vs. DC Only)
DGND	15	O	--	digital power return
DGND	16	O	--	digital power return

Table 4. Digital Assembly J2 Signals (to Analog Assembly J1)

Signal Name	D-PCB J2 - pin	Direction	Function
RYDATA'	1	Output	Serial relay data
RYCLK'	2	Output	Serial relay clock – rising edge
RYSTB'	3	Output	Serial relay strobe – level sensitive
RYEN'	4	Output	Serial relay enable – level sensitive
+5DFA	5	Output	Filtered +5 power for optoisolators
+5DFA	6	Output	Filtered +5 power for optoisolators
	7		
	8		
DGND	9	Output	Filtered power return for optoisolators
DGND	10	Output	Filtered power return for optoisolators
	11		
	12		
	13		
	14		
DAC+	15	Output	Differential D/A output signal
DAC-	16	Output	Differential D/A output signal

Table 5. Digital Assembly J1 Signals (to Power Switching Assembly J5)

Name	Digital J1- pin	Direction	Function
RY42'	1	output	Active low relay control
PSGND	2	input	Digital power supply return
RY38'	3	output	Active low relay control
PSGND	4	input	Digital power supply return
RY37'	5	output	Active low relay control
PSGND	6	input	Digital power supply return
RY36'	7	output	Active low relay control
PSGND	8	input	Digital power supply return
RY35'	9	output	Active low relay control
PSGND	10	input	Digital power supply return
RY34'	11	output	Active low relay control
PSGND	12	input	Digital power supply return
+5PS	13	input	Digital power supply
+5PS	14	input	Digital power supply
+5PS	15	input	Digital power supply
+5PS	16	input	Digital power supply

Relay Startup Arrays

Description: This is source code that shows which relay signals are changed for a particular test. It contains startup arrays for relay initialization.

```

//*****
// 601PROXL RELAY SEQUENCES
//*****

// outlet ON with normal polarity

outlet_on_normal =
    OFF - 51
    ON - 52,53,55
    WAIT - 50
    ON - 49,50

// outlet ON with reverse polarity

outlet_on_revpol =
    ON - 51,52,53,55
    WAIT - 50
    ON - 49,50

dual_lead_leakage =
    ON - 12,14,16

dual_lead_voltage =
    ON - 27,28

```

```

pec_on =
    ON - 36
    ON - 38

ecg_on =
    ON - 33

// open L2(neutral) when input mains is normal polarity

outlet_on_l2_open_normal =
    OFF - 51,53
    ON - 52,55
    WAIT - 50
    ON - 49,50

// open L2(neutral) and reverse polarity when input mains
// is normal polarity

outlet_on_l2_open_revpol =
    OFF - 53
    ON - 51,52,55
    WAIT - 50
    ON - 49,50

test1_l1_to_earth =
    OFF - 26
    ON - 23,24,29,31

test1_l2_to_earth =
    OFF - 23,24
    ON - 26,29,30,31

test1_l1_to_l2 =
    OFF - 30
    ON - 23,26,29,31

earth_cont_current =
    OFF - 27,41
    ON - 35

earth_cont_voltage =
    OFF - 35
    ON - 27,41

volt500_measurement =
    ON - 13,21

l1_l2_insulation =
    ON - 11,21

earth_leak =
    ON - 13,15

```

```

enclosure_leak =
    ON - 12,14,15

v_all =
    ON - 1,7,8,9,10,14,19,20

ll_all =
    ON - 2,6,8,9,10,14,19,20

la_all =
    ON - 3,6,7,9,10,14,19,20

rl_all =
    ON - 4,6,7,8,10,14,19,20

ra_all =
    ON - 5,6,7,8,9,14,19,20

pec_trans_115 =
    ON - 40

pec_trans_230 =
    OFF - 40

outlet_off[6] =
    ON - 49
    OFF - 50
    OFF - 49
    WAIT - 150
    OFF - 52,53,55
    WAIT - 50

// sequence used to transition outlet power when configuring from
// on state to state
outlet_transition =
    ON - 49
    OFF - 50
    OFF - 49
    WAIT - 200

signal_relays_off =
    OFF - 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24
    OFF - 25,26,27,28,29,30,31,32,33,35,36,37,38,39,41,42,43,44,45,46,47

pec_off =
    OFF - 38

equipment_current =
    ON - 29

v_lead_on =
    ON - 6,14,19

```

```

ll_lead_on =
    ON - 7,14,19

la_lead_on =
    ON - 8,14,19

rl_lead_on =
    ON - 9,14,19

ra_lead_on =
    ON - 10,14,19

ap_all_on =
    ON - 6,7,8,9,10,14,19,46

ecg_off =
    OFF - 33

IsolatedMainsSupplyOff =
    OFF - 25

IsolatedMainsSupplyOn =
    ON - 25

main_ap_leak =
    ON - 14,19,22,42,44,47

rev_pol_on = // mains AP polarity
    ON - 18

rev_pol_off = // mains AP polarity
    OFF - 18
// connects unit under test ground (FE) to protective earth
// conductor of 601pro

gnd_closed =
    OFF - 34

// disconnects unit under test ground (FE) from protective earth
// conductor of 601pro

gnd_open =
    ON - 34

ap_leads_gnd =
    ON - 6,7,8,9,10

ap_leads_open =
    OFF - 6,7,8,9,10

// L2(neutral) open when input mains is reverse polarity

```

```

rev_outlet_on_l2_open_normal =
    OFF - 51,52
    ON  - 53,55
    WAIT - 50
    ON  - 49,50

// reverse polarity and L2(neutral) open when input
// mains is reverse polarity

rev_outlet_on_l2_open_revpol =
    OFF - 52
    ON  - 51,53,55
    WAIT - 50
    ON  - 49,50

pec_selftest =
    ON  - 17,38

leak_self =
    ON  - 37

vde_patient =
    ON  - 6,7,8,9,10,14,19,22,42,43,45,46,47

vde_device =
    ON  - 6,7,8,9,10,11,12,19,22,42,45,47

volt500_off =
    OFF - 39
    WAIT - 100

volt500_on =
    ON  - 39
    WAIT - 500

pec_25_amps =
    ON  - 32

pec_01_amps =
    OFF - 32

single_lead_voltage = // Voltage RED to FE & PE = accessible voltage
    ON  - 27,41

ap_leads_open

pat_aux

outlet_disable_

```

Software Download

Software can be downloaded to the 601PRO by using the Biomed Download Utility (6040202-FW), which is a Windows 95 32-bit application. The purpose of this utility software is:

- Download a binary code file to the 601PRO Series_{XL}
- Download a language selection
- Download a serial number to assign the unit

After installing the utility:

- The user shall be able to select either COM1 or COM2 serial port. This selection shall be restored on subsequent loading of the program.
- The baud rate, parity, data and stop bits are fixed at 19200, n, 8, 1.
- The user shall be able to select the complete path and filename of the code file to download. This selection shall be restored on subsequent loading of the program.
- The user shall be able to select among the following languages for download: English, French, German and Italian. The default on loading of the program is English.

To initiate the download:

- Put the 601PRO in receive mode by powering it off and on. Within the first 3 seconds of power-up - while the unit displays "Initializing...." Press the key on the top panel labeled "Previous". At the PC, with the proper code selected as well as other options, select the Download button.
- At completion of the download a message will display on the PC and the 601 will reinitialize itself.

Scheduled Maintenance

This chapter provides current maintenance requirements.

Scheduled Maintenance Requirements

The scheduled maintenance requirements are reflected in the following table.

Interval	Description
Annually	Calibration & recertification

Instructions for Performing Scheduled Maintenance

Refer to the Test Procedures, page 14-1 when performing scheduled maintenance.

Chapter 4

Performance Verification

This chapter provides performance verification information.

Performance verification is described in 6040005-ST, Service Calibration and Test Procedure.

Chapter 5

Troubleshooting

This chapter provides troubleshooting tips.

Q: What should I do when the customer says "My unit no longer works and it smells like burnt components?"

A: **If the user is using a Variac to adjust the Mains Voltage without powering off the unit, it is likely that they exceeded one of the operating ranges 120VAC (80VAC - 145VAC) or 240VAC (170VAC- 275VAC). Switching from 120VAC to 240VAC would be considered exceeding the operating range for 120VAC since 240 is greater than 145. This is described further in**

Functional Description, page 2-1. (If you are viewing this document electronically, you may click on the link *Functional Description*.)

Q: If I want to switch from one foreign language to another, what do I need to do?

A: **Use the SYSTEM SETUP menu and select LANGUAGES. Select the desired language for the User Interface. If you are also using a keyboard in that language, use the SYSTEM SETUP menu and select EXTERNAL KEYBOARD LANGUAGE. Select the desired language. The changes will be immediate. There is no need to cycle power on the unit.**

Q: How do I download software to the 601PRO Series_{XL}?

A: **Refer to the instructions in Functional Description, page 2-1. (If you are viewing this document electronically, you may click on the link *Functional Description*.)**

Q: How do I perform printer maintenance?

A: **Perform the following steps:**

1. Accessing the Internal Printer and Paper

A. Power down the 601PRO.

B. Gently press the latch buttons on the sides of the front panel and remove the panel.

C. Using the red pull-tab on the printed circuit board (PCB), carefully pull the printer from its internal cradle, until you feel some resistance (*Figure 1*).

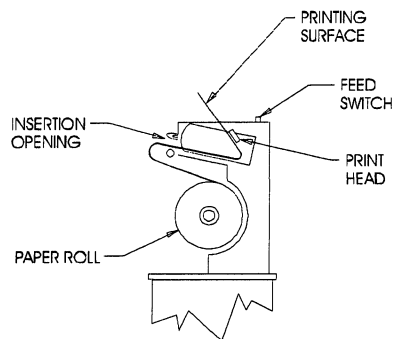


FIGURE 1

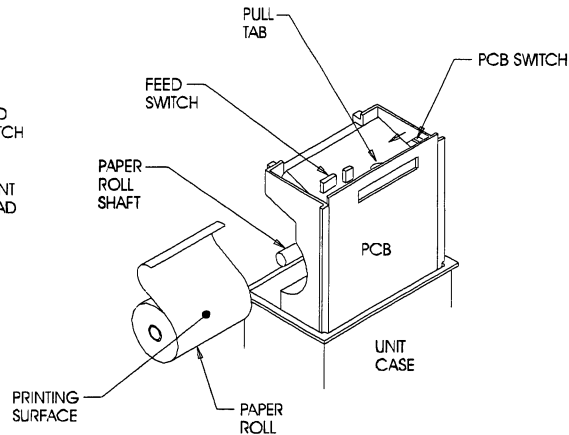


FIGURE 2

2. Replacing the Paper
 - A. Slide the old roll of paper off its shaft.
 - B. Place the new paper roll on the shaft as illustrated in *Figure 2*. Note: The outside surface of the paper roll is the printing surface.
3. Manually Advancing the Paper Feed
 - A. Gently push the paper into the paper feed opening (*Figure 1*).
 - B. Power up the unit.
 - C. Press the feed switch until the paper emerges from the print head. If the rollers do not automatically move the paper forward, apply light pressure on the paper to manually feed it into the rollers.
4. Replacing the Printer in the Case
 - A. Carefully place the printer back in the 601PRO case.
 - B. Advance enough paper so that paper appears outside the output opening on the front panel.
 - C. Make sure the printed circuit board switch is positioned toward the pull-tab (*Figure 2*).
5. Replacing the Protective Panel
 - A. Replace the front panel of the unit, ensuring that the latches engage.
 - B. Test the functionality by printing.
6. Cleaning the Printer
 - A. Clean the top panel using a dampened cloth and mild detergent.
7. No cleaning of the internal components is required.

Chapter 6

Corrective Maintenance

This chapter discusses corrective maintenance.

There are no correction maintenance procedures beyond the calibration requirements.

Chapter 7

Installation

This chapter discusses installation requirements.

The Operating Environment

The 601PRO Series_{XL} is designed to operate optimally when installed in an area where ambient temperatures remain between 10°C (50°F) and 40°C (104°F). The unit is sensitive to extreme environmental conditions. **Excessive humidity should be avoided. Condensation directly on the sensitive electronic circuits can cause the instrument to fail internal self checks.**

Unpacking and Repackaging the Instrument

If the shipping box has been damaged, inspect the instrument for visible dents and scratches as you unpack it.

If the unit is damaged, notify the carrier and your manufacturer's representative. Keep the shipping cartons and the packing material for the carrier's inspection. The manufacturer will arrange for the repair or replacement of your instrument immediately, before the shipping-related claim is settled.

If the unit is shipped to the factory for repair or replacement, it must be carefully repackaged using the original packing materials. If the original packing materials have been damaged, contact the manufacturer for replacement materials. Shipping with improper packaging materials may void your warranty. An RMA must be obtained before returning any equipment for service. Contact Bio-Tek technical service for a return material authorization (RMA) number. This number should be marked on the outside of the shipping container.

Unpacking the 601PRO

1. Carefully open the top of the box, and remove any accessories. These will include a line power cord (US, UK, Australian or European), Operator's Manual, red and black test leads, warranty card, large red clamp, and five alligator clips.
2. Lift the 601PRO Series_{XL} out of the box and remove the instrument from the plastic bag.
3. Pull the end caps off.
4. Place all shipping material back into the shipping box and save the whole set for later use if the instrument needs to be shipped again. Do not ship the instrument in anything but the stock shipping container or the instrument warranty may be voided.

After Unpacking, Verify Performance

Prior to using the instrument for the first time, verify that the instrument is operating properly and that no damage occurred during shipping by running the Final Assembly Test Procedure (6040005-TP). See Test Procedures, page 14-1

Before Repackaging the Instrument

Once the instrument is clean, reuse the original shipping box, using original packing materials. This shipping system was designed to be used no more than 5 times. If the container is damaged and/or has been used more than 5 times contact the original vendor for a new set of shipping materials.

Chapter 8

Parts List

This chapter contains a list of component parts sorted by circuit board assembly.

A complete list of the parts is described in this chapter.

Final Assembly Bills:

ISA601ProXLUS Intl Safety Analyzer/US BOM, page 8-3

ISA601ProXLUSP Intl Safety Analyzer/US/Prnt BOM, page 8-3

Accessories:

6040001 Shipping Accessories 601-88 BOM, page 8-4

Supporting BOMS

6040506 Hdw Kit Generic Final Asby BOM, page 8-4

Printed Circuit Board Assemblies:

6030401 Ac Pwr Distribution Pcb Asby BOM, page 10-6

6030408 Analog Daughter Pcb Asby BOM, page 10-8

6030410 Digital Pcb 80188 Asby BOM, page 10-10

6030529 Analog Pcb W/Daughter Pcb Asby BOM, page 10-19

6040400 Analog Measurement/Dc Pcb Asby BOM, page 10-26

6040401 Pcb Keyboard Adapter Asby BOM, page 10-30

6040403 Keyboard/Daughter Board Asby BOM, page 10-32

Note: When 6040401 is no longer available it will be replaced with 6040403 which is included in the Parts List but does not yet appear on the BOM.

Assembly Drawings:

6040500 Top Generic Asby 601-88 BOM, page 9-7
6040501 Base Generic Asby 601-88 BOM, page 9-11
6040503 Display 601-88 BOM, page 9-12

Cables

6030500 Cable Keyboard Connector Asby "Cable O" BOM, page 9-13
6030504 Cable Signal Intcon Meas Asby "Cable K" BOM, page 9-13
6030506 Cable Xfmr Cur Source Asby "Cable G" BOM, page 9-14
6030507 Cable Dc Intcon Asby "Cable E" BOM, page 9-14
6030508 Cable Ac Pwr Analog Pcb Asby "Cable I" BOM, page 9-15
6030510 Cable Ac Pwr Input Asby "Cable H" BOM, page 9-15
6030511 Cable Front Rcpt Intcon Asby "Cable A" BOM, page 9-16
6030512 Cable Ecg Asby "Cable D" BOM, page 9-16
6030513 Cable Leak/Volts Signal Asby "Cable C" BOM, page 9-17
6030514 Cable Dc Pwr Intcon Asby "Cable J" BOM, page 9-17
6030515 Cable Pwr Dist Relay Dr Asby "Cable Q" BOM, page 9-18
6030516 Cable Analog Relay Drive Asby "Cable L" BOM, page 9-18
6030517 Cable I/O Bd Interface Asby "Cable M" BOM, page 9-19
6030518 Cable Printer Asby "Cable N" BOM, page 9-19
6030519 Cable Ac Distribution Asby "Cable P" BOM, page 9-20
6030521 Cable Ground Wire Asby "Cable R" BOM, page 9-20
6030522 Cable High Volt Asaby "Cable S" BOM, page 9-21
6030523 Cable Current Sensing "Cable T" BOM, page 9-21
6030526 Cable Asby Black Wire "Cable U" BOM, page 9-22
6030527 Cable Asby Red Wire "Cable V" BOM, page 9-22
6030528 Cable Asby Green Wire "Cable W" BOM, page 9-23
6040504 Cable Display Asby BOM, page 9-23

ISA601ProXLUS Intl Safety Analyzer/US BOM

ISA601ProXLUS Intl Safety Analyzer/US rev K As of 12-10-01				
Item	Description	Rev	Qty	Remarks
15010	NUT KEPS 6-32 STEEL ZINC	A	4	
42724	RECPT US SNAP-IN 45MM	A	1	
54014	SW RCKR 2-PL 15A CKT BRKR	A	1	
6022004	PLATE BLANK PRINTER	D	1	
6022010	PRINTER PLATE BACK 601PRO	B	1	
6031005	OVRLY POWER RATING	C	1	
6032500	JIG HOLDER TOP CASE	A	0	TOOL ONLY
6032502	JIG OVERLAY ALIGNMENT	A	0	TOOL ONLY
6040000-SP	PROD SPEC 601PRO SERIES 601-88	G	0	DOCUMENT ONLY
6040001	SHIPPING ACCESSORIES 601-88	D	1	
6040005-AS	FINAL ASBY 601-88	D	0	DOCUMENT ONLY
6040005-DS	FINAL ASBY 601-88 DATA SHEET	B	0	DOCUMENT ONLY
6040005-IP	FINAL ASBY 601-88 INSP PROC	A	0	DOCUMENT ONLY
6040005-TP	FINAL ASBY 601-88 TEST PROC	D	0	DOCUMENT ONLY
6040201	SFTWR DWNLD CODE 601-88 V1.47	I	0	TOOL ONLY
6040202	SFTWR BIOMED DWNLD UTIL V1.05	B	0	TOOL ONLY
6040500	TOP GENERIC ASBY 601-88	G	1	
6040501	BASE GENERIC ASBY 601-88	C	1	
6040506	HDW KIT GENERIC FINAL ASBY	C	1	
6041001	OVRLY KEYBOARD	G	1	
6041003	DECLARATION OF CONFORMITY	A	1	
6041004	OVRLY FRONT 601-88	C	1	
6041006	OVRLY OUTLET 15 AMP	B	1	
75033	POWERCORD US WITH C19 PLUG	C	1	
7771012	TAG S/N WITH CE MARK	A	1	

ISA601ProXLUSP Intl Safety Analyzer/US/Prnt BOM

ISA601ProXLUSP Intl Safety Analyzer/US/Prnt rev K As of 12-10-01				
Item	Description	Rev	Qty	Remarks
12017	SCR PNH M3X16 STL ZINC SLTD	A	2	
42724	RECPT US SNAP-IN 45MM	A	1	
54014	SW RCKR 2-PL 15A CKT BRKR	A	1	
6031005	OVRLY POWER RATING	C	1	
6032015	PRINTER MODIFIED	A	1	
6032500	JIG HOLDER TOP CASE	A	0	TOOL ONLY
6032502	JIG OVERLAY ALIGNMENT	A	0	TOOL ONLY
6040000-SP	PROD SPEC 601PRO SERIES 601-88	G	0	DOCUMENT ONLY
6040001	SHIPPING ACCESSORIES 601-88	D	1	
6040005-AS	FINAL ASBY 601-88	D	0	DOCUMENT ONLY
6040005-DS	FINAL ASBY 601-88 DATA SHEET	B	0	DOCUMENT ONLY
6040005-IP	FINAL ASBY 601-88 INSP PROC	A	0	DOCUMENT ONLY
6040005-TP	FINAL ASBY 601-88 TEST PROC	D	0	DOCUMENT ONLY
6040201	SFTWR DWNLD CODE 601-88 V1.47	I	0	TOOL ONLY
6040202	SFTWR BIOMED DWNLD UTIL V1.05	B	0	TOOL ONLY
6040500	TOP GENERIC ASBY 601-88	G	1	
6040501	BASE GENERIC ASBY 601-88	C	1	
6040502	CABLE PRINTER ASBY	A	1	CABLE B
6040506	HDW KIT GENERIC FINAL ASBY	C	1	
6041001	OVRLY KEYBOARD	G	1	
6041003	DECLARATION OF CONFORMITY	A	1	
6041004	OVRLY FRONT 601-88	C	1	
6041006	OVRLY OUTLET 15 AMP	B	1	
75033	POWERCORD US WITH C19 PLUG	C	1	
7771012	TAG S/N WITH CE MARK	A	1	

6040001 Shipping Accessories 601-88 BOM

6040001 Shipping Accessories 601-88 rev D As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42695	CLIP ALLIGATOR RED 4MM SOCKET	D	1	
48201	ADAPTER BANANA-ALIGATOR	C	5	ACCESSORY IN JIFFY BAG
48382	PROBE/SAFETY TEST LEAD BLACK	C	1	
48383	PROBE/SAFETY TEST LEAD RED	B	1	
6033000	PACKING SET SHIPPING	B	0	
6041000	OPERATOR MANUAL 601-88 601PROS	D	1	
75034	CABLE RS232 9P M-F 6 FT	E	1	
91011	BAG JIFFY #2 8.5X12	A	0	
94075	SHIPPING DOCUMENT KIT	G	1	INSERTED BY SHIPPING
98085	BAG POLY 26X32 2 MIL	A	0	

6040506 Hdw Kit Generic Final Asby BOM

6040506 Hdw Kit Generic Final Asby rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
12169	SCR FLH M4X12 SS PHH	A	8	
15010	NUT KEPS 6-32 STEEL ZINC	A	8	
48228	LABEL, WHITE 1.5" X .75"	B	1	MARK WITH MODEL NUMBER
49354	WSHR,FINISH 4MM SS or NICPL	A	8	
49588	FLAT CABLE MNT W/OCLAMP 1 1/4"	A	1	
49950	GASKET EMI 0.4 X 0.08 PSA	A	1.41 7	
6030504	CABLE SIGNAL INTCON MEAS ASBY	C	1	CABLE K
6030511	CABLE FRONT RCPT INTCON ASBY	E	1	CABLE A
6030515	CABLE PWR DIST RELAY DR ASBY	C	1	CABLE Q
6030516	CABLE ANALOG RELAY DRIVE ASBY	C	1	CABLE L
6032005	STRIP GROUNDING	A	2	
66289	LOCTITE 454 GEL 20GRAM	A	0	A/R
7770102	LABEL "FCC COMPLIANCE"	A	1	
7770108	LABEL, CAL VOID	A	1	
7771004	STICKER CALIBRATION	B	1	
7771010	LABEL ETL UL CSA 1010.1 LISTED	C	1	

Chapter 11

Parts No Longer Used and New Parts Introduced

This chapter provides information relative to the earlier version of the 601PRO Series CE.

The following parts are not used on the 601PRO Series_{XL}. They were used on previous versions of the 601PRO.

Item	Description
04020	DSPLY LED 4 SEG BAR GREEN
04021	DISPLAY LCD 40X4 LINE
12107	SCR PNH 6-32X1/2 SS PHH
16003	WSHR LK SP 6 SS
23060	VOLTAGE INV LCD BACKLIGHT
25081	IC 74HC04 HEX INVERTER
25084	IC 74HC541 TS OCTAL BFR NONINV
25086	IC 74HC574 OCTAL D FLIP-FLOP
25094	IC L7662CPA NEG CONVERTER
25121	IC 74HC273 D FLIP FLOP WRESET
25125	IC 5801 DRIVER LATCHED
25127	IC MAX695 WATCHDOG TIMER
25137	IC 74HC540 OCTAL BUFFER
25138	IC 74HC05 HEX INV W/OPEN DRAIN
26010	TRANSISTOR PN2907 SIG PNP 40V
28044	VOLT REF 2.5 LT1009 0.2%
28071	IC MAX238 RS232 QUAD TX AND RX
28073	IC DS1315 TIME CHIP PHANTOM
28075	IC 74ACT32 QUAD INPUT OR
29008	IC 7524 8-BIT BUF D/A CON
29060	IC 82C55 CMOS PROG P INTRFC
29091	IC SER EEPROM
29092	IC 64180 UP PLCC 10MHZ
29093	IC 3.5KB CONTROLLER KEYBD
29109	TRANSIENT SUPPRESSOR 5V
29113	IC EPROM 256KX8 150NS
29114	IC RAM STATIC 512KX8
31303	RES 30.0K OHM 5% 1/4W
32133	RES 3.01K OHM 1% 1/4W

Item	Description
32163	RES 8.250K OHM 1% ¼W
32232	RES 200.00OHM 1% ¼W
32265	RES 210K OHM 1% ¼W
32266	RES 20K OHM .1% ¼W
35003	TRIMPOT 2K, 1T
37046	RESNET 10K SIP 10PIN 9RES 5%
37066	RESNET 150 OHM 5R6P
37107	RESNET 5R10P 33OHM SIP
42096	HEDR 3-P .100 GOLD
42151	JUMPER .100 .025 SQ PINS
42159	INSD 40-S .1 x .1 28GA GOLD
42312	HEDR 34PIN .1X.1
42416	CONN 5-S DIN 180 DEG PANEL MT
42579	CONN 9 PIN DSUB PCB MNT STR F
42580	CONN 9 PIN DSUB PCB MNT STR M
42722	RECPT FRAME ADAPTER 45MM-50MM
47034	BATTERY 3V LITHIUM 2/3A 1.2AH
47035	BATTERY HOLDER 2/3A PCB MNT
49056	SOCKET I.C. 40-PIN DIP
49244	CRYSTAL 32.768 KHZ
49371	SOCKET IC 24-PIN .300 DIP
49374	SOCKET IC 32-PIN DIP
49389	SOCKET 68P PLCC
49473	SOCKET IC 44P PLCC
49502	HDR 16S THRU BOARD
49503	HDR 10P .1X.1 RTANG
49505	CRYSTAL 18.432 MHZ
49525	HDR 40-P .1X.1 STRT WALLED
49551	HDR SOCKET STRIP 20POS .100
49764	SCREW JACK 4-40X.625L THREADED
49826	HDR 25S DSUB STRT W/FILTERS
54005	SW DIP 4-SW SIDE-ACT
6020203	DIGITAL BD PAL EP610 ASBY
6020205	DIGITAL BD PAL EP910 ASBY
6022013	RECEPTICAL PLATE
6030001	ACCESSORIES
6030005-AS	-FINAL ASBY
6030005-IP	-FINAL ASBY INSPECTION PROC
6030008-DS	-FINAL TEST PROCEDURE ENHNCD
6030008-TP	-FINAL TEST PROCEDURE ENHANCED
6030219	FRMWR BTI ENG ASBY +PEC V3.00
6030219-SP	-FRMWR BTI ENG ASBY +PEC V3.00
6030400	DIGITAL PCB ASBY
6030400	DIGITAL PCB ASBY

6030400-AS	-DIGITAL PCB ASBY
Item	Description
6030400-SC	-DIGITAL PCB ASBY
6030400-TP	-DIGITAL PCB ASBY
6030403	I/O INT PCB ASBY
6030403-AS	-I/O INT PCB ASBY
6030403-SC	-I/O INT PCB ASBY
6030403-TP	-I/O INT PCB ASBY
6030404	ANALOG MEASUREMENT PCB ASBY
6030404-AS	-ANALOG MEASUREMENT PCB ASBY
6030404-SC	-ANALOG MEASUREMENT PCB ASBY
6030404-TP	-ANALOG MEASUREMENT PCB ASBY
6030500	CABLE KEYBOARD CONNECTOR ASBY
6030500-AS	-CABLE KEYBOARD CONNECTOR
6030502	BASE GENERIC ASBY
6030502-AS	-BASE GENERIC ASBY
6030503	TOP GENERIC ASBY
6030503-AS	-TOP GENERIC ASBY
6030517	CABLE I/O BD INTERFACE ASBY
6030517-AS	CABLE I/O BD INTERFACE ASBY
6030518	CABLE PRINTER ASBY
6030518-AS	-CABLE PRINTER ASBY
6031000	OPERATORS MANUAL 601PRO SERIES
6031001	OVRLY KEYBOARD
6031003	OVRLY FRONT
6031006	OVRLY REAR
6031007	OVRLY OUTLET
6031009	OVRLY CAT II
6031011	DECLARATION OF CONFORMITY
6031011-AW	-DECLARATION OF CONFORMITY
6031400	DIGITAL PCB
6031403	I/O INT PCB
6031404	ANALOG MEASUREMENT PCB
6032000	CASE TOP
6032001	CASE BOTTOM
61036	ALARM PIEZP 3.3KHZ
62004	RELAY 5V 1A REED
71020	SHRINK TUBE 3/32"
71043	WIRE 28AWG 40-COND RIBBON GRAY
81026	CAP 100UF 35V ELEC
83029	CAP 22 pF 100V DISC
84054	CAP .0033UF FILM
99125	LABEL 1"X1/2" CONTINUOUS

The following parts have been introduced to the 601PRO Series_{XL}. They were not used in previous versions of the 601PRO.

Item	Description
04036	DISPLAY LCD 4X40 & LED BL
16012	WSHR LK INT 1/4 ST
22056	TRANSIENT SUPPRESSOR 24V BIOIR
28162	IC OPTOCOUPLER DUAL HCPL-263N
32207	RES 750.00 OHM 1% 1/4W
32343	RES 30.1K OHM 1% 1/4W
35012	TRIMPOT 1K, 25T
42455	JACK BANANA NON-INSULATED
44265	PANEL MOUNTING FRAME
49022	SOCKET I.C. 14-PIN DIP
49950	GASKET EMI 0.4 X 0.08 PSA
6030410	DIGITAL PCB 80188 ASBY
6031013	OVRLY REAR DIGITAL
6032017	COVER TOP
6032018	PANEL I/O
6040001	SHIPPING ACCESSORIES 601-88
6040005-AS	FINAL ASBY 601-88
6040400	ANALOG MEASUREMENT/DC PCB
6040400-AS	ANALOG MEASUREMENT/DC PCB
6040400-SC	ANALOG MEASUREMENT/DC PCB SCH
6040400-TP	ANALOG MEASUREMENT/DC PCB
6040500	TOP GENERIC ASBY 601-88
6040500-AS	TOP GENERIC ASBY 601-88
6040501	BASE GENERIC ASBY 601-88
6040501-AS	BASE GENERIC ASBY 601-88
6040502	CABLE PRINTER ASBY
6040502-AS	CABLE PRINTER ASBY
6040503	DISPLAY 601-88
6040503-AS	DISPLAY 601-88
6040504	CABLE DISPLAY ASBY
6040504-AS	CABLE DISPLAY ASBY
6041001	OVRLY KEYBOARD
6041003	DECLARATION OF CONFORMITY
6041003-AW	DECLARATION OF CONFORMITY
6041004	OVRLY FRONT 601-88
6041006	OVRLY OUTLET 15 AMP
6041400	ANALOG MEASUREMENT/DC PCB
6042000	CASE BOTTOM 601-88
71022	WIRE 24AWG TEFLON SOLID YELLOW
75034	CABLE RS232 9P M-F 6 FT
84073	CAP 1.0UF 100VDC PEF 10% 85C

Chapter 12

Service Change Notices

*This chapter provides a list of
Service Change Notices..*

"Please refer to BTResource" for current listing of Service Changes.
For those who can not access BTResource, please contact Bio-Tek Service Department.

https://btrsource.biotek.com/Biomed_Shared/Service/Biomed_Service_Main.htm

Service:	800-24-BIOTEK
Service FAX:	802-655-3399
E-Mail:	<u>mailto:bmdtac@biotek.com</u>

Chapter 13

External Keyboards

*This chapter provides information
regarding external keyboards.*

To: Holly Creeks

Copy: Bob Chutter, Chris Many, Howard Ring

From: Bill Nicolay

Filename: External Kybd Eval-6.doc

Date: January 18, 2000

Subject: Evaluation of the external keyboard when used with the 601PRO Series XL with "AMIKEY" keyboard decoder on the 6040401 Rev A Keyboard Adapter PCB Assembly.

Revision to Kybd Eval-6 by Holly Creeks as follows:

Updated to reflect PIC 16C57C controller, which is called out on 6040403 and requires SW1 position 3 to be in the "OPEN" position. The changes to the keyboard interface are completely transparent to the end-user and both interfaces process keys as depicted in the attached tables.

This evaluation was a repetition of the test performed on the production release version of the 601PRO-XL and documented in memo filename External Kybd Eval-4.doc. A more through explanation of the keyboard operation was described in that memo. The "AMIKEY" keyboard decoder on the 6040401 Rev A Keyboard Adapter PCB Assembly was installed in place of the keyboard decoder IC used for the previous evaluation.

Conclusion: The configuration tested performs acceptably. Several minor differences (described below) were noted, but none were serious enough to cause problems or warrant further action. Differences between the version being tested and the previous version were:

Italian:

- Single Quote (') produced a sound but no display character. As the single quote is not in the 601PRO character set, this is correct operation – the original evaluation was probably in error.
- Fn-/ (shifted and normal) produced a sound but no display character. The previous version displayed minus signs. Although the ideal would be to display the (/) character, the new behavior is preferable to what was previously occurring.

German:

- Fn-, (shifted and normal) produced no action. The previous version produced sound only. The difference is meaningless.

French:

- Fn-. (shifted and normal) produced no action. The previous displayed the decimal point. While display of the decimal point is desirable, no action is consistent with the operation of this key in all other language versions and a decimal point can be obtained by using the regular (.) key instead of the function key.

601PRO Series XL serial number 145536 (6030229 Revision 1.00 hardware) with 6040201 firmware Version 1.02 was used. The specific keyboards tested were:

Language	Article Number	Serial Number
-----	-----	-----
US English	G84-4100PAAUS/00	C 006150 K49
German	G84-4100PPADE/01	C 010848 L27
French	G84-4100PPAFR/01	C 005012 L33
Italian	G84-4100PPAIT/00	C 000198 K41

The following table contains the character that appears on the LCD display for the normal and shifted version of each key on all supported keyboards. so = keyclick sound but no action, and na = no sound & no action. Changes from the previous evaluation are highlighted.

US English 0.96				German 0.96				French 0.96				Italian 0.96			
Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	
Esc	Esc	Esc	Esc	Esc	Esc	Esc	Esc	Esc	Esc	Esc	Esc	Esc	Esc	Esc	
F1	Prev	Prev	F1	Prev	Prev	F1	Prev	Prev	F1	Prev	Prev	F1	Prev	Prev	
F2	SK1	SK1	F2	SK1	SK1	F2	SK1	SK1	F2	SK1	SK1	F2	SK1	SK1	
F3	SK2	SK2	F3	SK2	SK2	F3	SK2	SK2	F3	SK2	SK2	F3	SK2	SK2	
F4	SK3	SK3	F4	SK3	SK3	F4	SK3	SK3	F4	SK3	SK3	F4	SK3	SK3	
F5	SK4	SK4	F5	SK4	SK4	F5	SK4	SK4	F5	SK4	SK4	F5	SK4	SK4	
F6	PtHd	PtHd	F6	PtHd	PtHd	F6	PtHd	PtHd	F6	PtHd	PtHd	F6	PtHd	PtHd	
F7	PtDat	PtDat	F7	PtDat	PtDat	F7	PtDat	PtDat	F7	PtDat	PtDat	F7	PtDat	PtDat	
F8	View	View	F8	View	View	F8	View	View	F8	View	View	F8	View	View	
F9	na	na	F9	na	na	F9	na	na	F9	na	na	F9	na	na	
F10	na	na	F10	na	na	F10	na	na	F10	na	na	F10	na	na	
Num Lock	na	na	Num Lock	na	na	Num Lock	na	na	Num Lock	na	na	Num Lock	na	na	
Prt Sc/Sys	so	so	Prt Sc/Sys	so	so	Prt Sc/Sys	so	so	Prt Sc/Sys	so	so	Prt Sc/Sys	so	so	
Rq			Rq			Rq			Rq			Rq			
Scroll Lock	na	na	Scroll Lock	na	na	Scroll Lock	na	na	Scroll Lock	na	na	Scroll Lock	na	na	
Pause	na	na	Pause	na	na	Pause	na	na	Pause	na	na	Pause	na	na	
I/I	I	1	I/I	I	1	I/&	1	so	I/I	I	so	I/I	I	1	
@/2	so	2	"/2	so	2	2/e	2	E	"/2	so	E	"/2	so	2	
#/3	so	3	Mark/3	na	3	3/"	3	so	It\$/3	so	so	It\$/3	so	3	
\$/4	so	4	\$/4	so	4	4/	4	so	\$/4	so	so	\$/4	so	4	
%/5	so	5	%/5	so	5	5/()	5	(	%/5	so	(	%/5	so	5	
^/6	so	6	&/6	so	6	6/-	6	-	&/6	so	-	&/6	so	6	
&/7	so	7	//7	I	7	7/e	7	E	//7	I	E	//7	I	7	

US English 0.96				German 0.96				French 0.96				Italian 0.96			
Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	
* / 8	so	8	(/ 8	(	8	8 /		na	/ 8	(	na			8	
/ 9	(	9	) / 9	)	9	9 / c		C	) / 9	)	C			9	
/ 0	)	0	= / 0	so	0	0 / a		A	= / 0	so	A			0	
/ -	so	-	? / Beta	?	na	deg /)		)	? /	?	)			so	
+ / =	so	so	' /	so	so	+ / =		so	^ /	so	so			I	
BS	BS	BS	BS	BS	BS	BS		BS	BS	BS	BS			BS	
Home	7	7	Home	7	7	Home		7	Home	7	7			7	
Tab	na	na	Tab	na	na	Tab		na	Tab	na	na			na	
Q	Q	Q	Q	Q	Q	A		A	Q	Q	A			Q	
W	W	W	W	W	W	Z		Z	W	W	Z			W	
E	E	E	E	E	E	E		E	E	E	E			E	
R	R	R	R	R	R	R		R	R	R	R			R	
T	T	T	T	T	T	T		T	T	T	T			T	
Y	Y	Y	Z	Z	Z	Y		Y	Y	Y	Y			Y	
U	U	U	U	U	U	U		U	U	U	U			U	
I	I	I	I	I	I	I		I	I	I	I			I	
O	O	O	O	O	O	O		O	O	O	O			O	
P	P	P	P	P	P	P		P	P	P	P			P	
{ /	so	so	UE	UE	UE	.. / ^		so	e / e	E	so			E	
/]	so	so	* / +	so	so	FR / \$		na	* / +	so	so			so	
/ \	so	na	' / #	so	so	u / *		na	x / u	na	so			U	
Pg Up	9	9	Pg Up	9	9	Pg Up		9	Pg Up	9	9			9	
Caps Lock	na	na	Caps Lock	na	na	Caps Lock		na	Caps Lock	na	na			na	

US English 0.96				German 0.96				French 0.96				Italian 0.96			
Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	
A	A	A	A	A	A	Q	Q	Q	A	A	A	A	A	A	
S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	
F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	
G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	
H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	
K	K	K	K	K	K	K	K	K	K	K	K	K	K	K	
L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
/	.	.	OE	OE	OE	M	M	M	cs/o	C	O			O	
“/”	so	so	AE	AE	AE	%/u	so	U	o/a	O	A			A	
Enter	Enter	Enter	Enter	Enter	Enter	Enter	Enter	Enter	Enter	Enter	Enter	Enter	Enter	Enter	
Pg Dn	3	3	Pg Dn	3	3	Pg Dn	3	3	Pg Dn	3	3	Pg Dn	3	3	
Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	
Z	Z	Z	Y	Y	Y	W	W	W	Z	Z	Z	Z	Z	Z	
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
M	M	M	M	M	M	?/	?	so	M	M	M	M	M	M	
</	so	so	/	.	so	/	.	.	/	.	.	/	.	so	
>/	so	.	/	.	.	//	/	.	/	.	.	/	.	.	
?//	?	/	/	so	-	ss/l	na	l	/-	so	-	/-	so	-	
Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	Shift	

US English 0.96				German 0.96				French 0.96				Italian 0.96			
Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	601 Norm
Up	8	8	Up	8	8	Up	8	8	Up	8	8	Up	8	8	8
End	1	1	End	1	1	End	1	1	End	1	1	End	1	1	1
Ctrl	na	na	Ctrl	na	na	Ctrl	na	na	Ctrl	na	na	Ctrl	na	na	na
Fn	See Fn keys		Fn	See Fn keys		Fn	See Fn keys		Fn	See Fn keys		Fn	See Fn keys		
Alt	na	na	Alt	na	na	Alt	na	na	Alt	na	na	Alt	na	na	na
~f	so	so	>/<	na	na	>/<	na	na	>/<	na	na	>/<	na	na	na
Space	Space	Space	Space	Space	Space	Space	Space	Space	Space	Space	Space	Space	Space	Space	Space
Alt Gr	na	na	Alt Gr	na	na	Alt Gr	na	na	Alt Gr	na	na	Alt Gr	na	na	na
Ins	0	0	Ins	0	0	Ins	0	0	Ins	0	0	Ins	0	0	0
Del	na	na	Del	na	na	Del	na	na	Del	na	na	Del	na	na	na
Left	4	4	Left	4	4	Left	4	4	Left	4	4	Left	4	4	4
Down	2	2	Down	2	2	Down	2	2	Down	2	2	Down	2	2	2
Right	6	6	Right	6	6	Right	6	6	Right	6	6	Right	6	6	6
Fn - F11	na	na	Fn - F11	na	na	Fn - F11	na	na	Fn - F11	na	na	Fn - F11	na	na	na
Fn - F12	PtCal	PtCal	Fn - F11	PtCal	PtCal	Fn - F11	PtCal	PtCal	Fn - F12	PtCal	PtCal	Fn - F12	PtCal	PtCal	PtCal
Fn - 0	0	0	Fn - 0	0	0	Fn - 0	0	0	Fn - 0	0	0	Fn - 0	0	0	0
Fn - 1	1	1	Fn - 1	1	1	Fn - 1	1	1	Fn - 1	1	1	Fn - 1	1	1	1
Fn - 2	2	2	Fn - 2	2	2	Fn - 2	2	2	Fn - 2	2	2	Fn - 2	2	2	2
Fn - 3	3	3	Fn - 3	3	3	Fn - 3	3	3	Fn - 3	3	3	Fn - 3	3	3	3
Fn - 4	4	4	Fn - 4	4	4	Fn - 4	4	4	Fn - 4	4	4	Fn - 4	4	4	4
Fn - 5	5	5	Fn - 5	5	5	Fn - 5	5	5	Fn - 5	5	5	Fn - 5	5	5	5
Fn - 6	6	6	Fn - 6	6	6	Fn - 6	6	6	Fn - 6	6	6	Fn - 6	6	6	6

US English 0.96			German 0.96			French 0.96			Italian 0.96		
Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm	Key label	601 Shift	601 Norm
Fn - 7	7	7	Fn - 7	7	7	Fn - 7	7	7	Fn - 7	7	7
Fn - 8	8	8	Fn - 8	8	8	Fn - 8	8	8	Fn - 8	8	8
Fn - 9	9	9	Fn - 9	9	9	Fn - 9	9	9	Fn - 9	9	9
Fn - .	na	na	Fn - ,	na	na	Fn - .	na	na	Fn - .	na	na
Fn - -	-	-	Fn - -	-	-	Fn - -	-	-	Fn - -	-	-
Fn - +	so	so	Fn - +	so	so	Fn - +	so	so	Fn - +	so	so
Fn - /	/	/	Fn - divide	-	-	Fn - /	/	/	Fn - /	so	so
Fn - *	so	so	Fn - *	so	so	Fn - *	so	so	Fn - *	so	so
			Fn - ^	na	so	Fn - 2	na	na	Fn - \	so	so
Fn - Enter	Enter	Enter	Fn - Enter	Enter	Enter	Fn - Enter	Enter	Enter	Fn - Enter	Enter	Enter
Fn - Ctrl	na	na	Fn - Ctrl	na	na	Fn - Ctrl	na	na	Fn - Ctrl	na	na

The Cherry 4100 is a compact keyboard that does not contain a separate numeric keypad. Keys not on the Cherry 4100 for which the code is known to be active are: Num Center 5

Additional observations:

The keyboard LEDs blink upon power-up (as they should).

~~The Caps Lock LED properly indicates the action of the Caps Lock function in all versions.~~

The Num Lock and Scroll Lock LEDs remain unlit.

The following two lines may be printed as a label for the keyboard function keys:

Esc/ Stop	Previous	^^^ SK1	^^^ SK2	^^^ SK3	^^^ SK4	Print Header	Print Data	View Settings
--------------	----------	------------	------------	------------	------------	-----------------	---------------	------------------

Calibration Instructions

This chapter discusses performing adjustments, alignments, and calibration.

When pressed, the F12 key on the external keyboard will generate the following calibration information:

Calibration Values
 Cal Line Volt: 117.4
 VDE Dev Leak: 0.884
 VDE Pat Leak: 1.058
 MAP Cal Norm Rev
 1.058 1.046
 1.058 1.046
 1.071 1.046
 1.083 1.058
 1.096 1.071
 PEC Scale: 1.008
 PEC 1Amp CAL: 0.037
 PEC 25Amp CAL: 0.038
 500 Volt Actual:484.34
 Powerup Line Volt:1117.7

The 5 rows of MAP Cal values correspond to leads RA, RL, LA, LL, V.

Refer to the test procedure(s) referenced when performing adjustments, alignments and calibration.

Test Procedures

This section contains the Service procedures used in testing the 601PRO Series_{XL} and its variations. These documents are subject to change.

PART NUMBER	DESCRIPTION
6040005-TP	Final Assembly Test Procedure
6040005-DS	Final Assembly Test Data Sheet
6040005-ST	Service Calibration and Test Procedure
6040005-SD	601PRO Series XL SVCE Data Sheet
Certificate of Calibration	

CONFIDENTIAL

Bio-Tek Instruments, Inc.

Model: 601PRO Series XL

Procedure: 6040005-TP

Title: Final Assembly Test Procedure

<u>Rev</u>	<u>Description of changes</u>	<u>ECO</u>	<u>Date</u>
A	Release To Production	32913	11/11/99
B	Add External Keyboard Test Par. 6.3	33149	02/09/00
C	Add Note to Select 601PROXL Para 1.4.1	35341	08/14/01
D	Chg Para 1.2, 6.3 in Support of Daughter Board Asby with PIC Controller	35533	10/30/01

Equipment Required

(X) Requires listing on the Certificate of Calibration specified on the Data Sheet.

- (X) 6030602 (Multi-Test Box)
- (X) 5020105 or Equivalent (Current Test Station)
- () 6032505 - Jig, Outlet Adapter, European
- () 6032506 - Jig, Outlet Adapter United Kingdom
- () 6032507 - Jig, Outlet Adapter, Australian
- () Variac 100 - 250 VAC RMS, 5 amps, single phase, grounded
- (X) DMM with Null Function Fluke Model 8842A or equivalent
- (X) DMM with 10A Current Capability Fluke Model 45 or equivalent
- (X) Calibrator, Fluke model 5100 B or equivalent.
- () Burn-In Oven (set at 110 °F)
- () Parallel Printer with cable
- () Windows 95 PC (or equivalent) with Biomed Download Utility (E6040202-FW) installed
- () E6040202-MP (Contains specification-checksum and version number for firmware)
- () Serial Cable (75034) or equivalent
- (X) Hypot Tester, Associated Research, Model 4045AI or equivalent
- () Receptacle Tester, Ideal Industries, model 61-035 or equivalent
- () 4 M Ohm +/- 1% resistor (No calibration necessary)
- () 48355 Keyboard (or IBM compatible keyboard with large 5 pin DIN connector)

NOTE: Tests marked (NS) are not required for units being tested after return for service, but may be done at the discretion of the service technician.

When an entry on the data sheet (6040005-DS) is required, a note such as: **(DS – Check to indicate completion)**, **(DS – Record PASS or FAIL)**, or **(DS – Record Value)** is present in this procedure.

NOTE: Tests may be selected through the Main Menu and "soft keys" or where applicable, with the front panel shortcut keys. To access the tests through the Main Menu, select TESTS/AUTOMODES, then select MANUAL, and use the "soft keys" until you come to the desired test. The "soft key" labeled MORE will toggle through all of the available tests. Select the test by pressing the associated "soft key". Whenever the "calibrator" is called for, another signal source monitored by the DMM may be used. If using the calibrator, the 50 ohm divider must be placed in the override mode for all tests. Some tests make measurements to the front receptacle bracket mounting screw. If the revision of the unit does not have such a part, the rear panel 601 Earth jack may be used instead.

1.0 SOFTWARE DOWNLOAD & LANGUAGE SELECTION

- 1.1 **(NS) Install S/N label per final assembly DWG. (see Routing for DWG. #). (DS – Record Value)**

- 1.2 **Dip Switch settings:** On the digital board configure SW1 per the following: **(DS – Check to indicate completion)**

Up = Open, Down = Closed

Switch #1 always DOWN (UP selects digital board test station code)

Switch #2 always DOWN

Switch #3 UP for PIC daughter assembly - 6040403; DOWN for Amikey daughter assembly - 6040401

Switch #4 UP for internal printer installed, DOWN for no internal printer

- 1.3 **(NS) Load Paper:** Thread Printer paper into Internal Printer (See Final Assembly DWG for directions). Place SW2 in Printer to the left hand position. **(DS – Check to indicate completion)**

- 1.4 **(NS) Firmware Download, Language Selection, & Serial Number Entry:**

- 1.4.1 Connect a computer to the RS232 serial port on the UUT with the serial cable. At the computer, open the Biomed Download program, select 601PROXL and gain access to the firmware and language code revisions specified by the BOM.

NOTE: If the Biomed Download Utility does not display a field for the serial number you must close down the utility and run the Windows Registry Editor. Do this by:

- 1) Select the Window's Start button and choose the Run menu option and type in **regedit**. Select the key: **HKEY_CURRENT_USER\Software\Bio-Tek Instruments\BioMedDownload\601PRO**
- 2) Edit the field Serial Number and set its value to 1.
- 3) Exit

Invoke the Biomed Download Utility again and confirm that you are now prompted for a serial number.

- 1.4.2 Connect the UUT line cord to a wall outlet (115VAC) or Variac set to approximately 115VAC.
- 1.4.3 Turn the UUT power ON. If the UUT displays the message "Ready for Software download..." proceed with the next step (1.4.4). If the unit displays "Initializing..." press the key on the UUT labeled "Previous" while the display reads "Initializing..." (within three seconds of power-up). The display should then read "Ready for Software download...".
- 1.4.4 **Power Supply Voltage Adjustment:** Connect a DVM positive lead to J1 pin 2 or 3 (one of the red wires) on the 6030401 power switching board and negative lead to TP3 on the digital board. If necessary, adjust the trimpot on the power supply (mounted to the rear of the base) until the DVM reads 5.0VDC $\pm$ 0.1VDC. **(DS – Record Value)** Lock the trimpot.
- 1.4.5 On the computer:

Select English as the language for the UUT.

Select the code to be downloaded either by typing in the path and filename or using the Browse button to select it.

Enter the UUT serial number (up to 15 characters long).

Initiate downloading by pressing the Download button on the PC. The UUT display should indicate "Download in progress...". The download will require three to five minutes and a message indicating the download is complete will be displayed on the PC. The serial cable can be removed.

- 1.5 Turn the UUT power OFF. Power it on again and confirm the software version is correct (it is displayed briefly after the initialization sequence takes place). Turn the UUT power OFF. **(DS – Record PASS or FAIL)**
- 1.6 If an error occurred during the download a message will be displayed on the PC. If this occurs check the following:

- Check both ends of serial cable and verify they are securely connected.
- Confirm that you are using the correct serial cable.
- Confirm the file name and location of file being downloaded.
- If you power off the UUT or close the Download Utility you need to restart both the UUT and the Download Utility and begin again.

2.0 BURN-IN

(NS) Place unit in Burn-in Oven. Plug the UUT into the power strip located in the oven that is plugged into a Variac. Make sure the Variac is adjusted to **230 ± 3 VRMS**. Turn the UUT power ON. Use the menus and "soft keys" or the shortcut key to select the **Mains Voltage** test. The screen should display the following:

L1-Earth	226 to 234 volts
L2-Earth	0 to 2 volts
L1-L2	226 to 234 volts

The burn-in period is **2 hours at 110 °F**. When the burn-in period is complete, remove UUT from the oven and continue with testing. (**DS – Check to indicate completion**)

3.0 SET-UP

- 3.1 Connect a parallel printer to the UUT .
- 3.2 Plug the UUT power cord into a Variac set to 115 VAC RMS ± 0.5 VAC.
- 3.3 Plug the external keyboard to the UUT.

4.0 POWER-UP

- 4.1 Turn the UUT power ON. Following startup screens with the firmware version, and a short delay; the UUT should display the MAIN MENU screen. (**DS – Record PASS or FAIL**)

5.0 UUT SYSTEM CONFIGURATION

NOTE: The nonvolatile parameters listed below are required to perform the test. If this is a new instrument these parameters will have automatically been set as part of the firmware download. If this instrument has been returned for service (with or without a new firmware download), go to the appropriate menu and change the settings to reflect the specified Default Parameters:

Default Parameters	Access via:
Class: I	Main Menu->CLASS/TYPE
Type: BF	Main Menu->CLASS/TYPE
Leads: 5 (all type BF)	View Present Settings Key on top panel
Test Standards Enabled: IEC 601-1, VDE 751.1, IEC 1010, AAMI	Main Menu->UTILITIES->ENABLE STANDARDS
Test Standard Selected: IEC 601-1	Main Menu->SYSTEM SETUP->TEST STANDARD
Select the printer type: Internal Printer if installed or select External Ascii Only if not installed	Main Menu->SYSTEM SETUP->PRINTER OUTPUT
Beeper Setting: On	Main Menu->SYSTEM SETUP->BEEPER

6.0 PRINTER TESTS

6.1 Internal Printer Test

If the unit has an internal printer, press the **print header** key and confirm that the internal printer starts printing. When it stops printing the printouts should look like the one shown below.

NOTE: The 601PRO # “nnnnnnnnn” should correspond to the serial number on the S/N label installed on the rear of the UUT. **(DS – Record PASS or FAIL)**

BIO-TEK INSTRUMENTS INC.

Date

Time

CONTROL#: _____

PROCEDURE ID#: _____

LOCATION: _____

DEVICE TYPE: _____

MANUFACTURER: _____

SERIAL #: _____

TECHNICIAN: _____

601PRO # nnnnnnnnn

STANDARD: xxxx

CLASS xx, TYPE xx

ECG LEADS: x

(Lead assignments noted)

6.2 External Printer Test

At the Main Menu select SYSTEM SETUP->Printer Output and select the appropriate External Printer. Return to the Main Menu and press the **print header** key and confirm that the external printer starts printing. When it stops printing the printout should look like the one shown below.

NOTE: The 601PRO # “nnnnnnnnn” should correspond to the serial number on the S/N label installed on the rear of the UUT. **(DS – Record PASS or FAIL)**

BIO-TEK INSTRUMENTS INC.

Date

Time

CONTROL#: _____

PROCEDURE ID#: _____

LOCATION: _____

DEVICE TYPE: _____

MANUFACTURER: _____

SERIAL #: _____

TECHNICIAN: _____

601PRO # nnnnnnnnn

STANDARD: xxxx

CLASS xx, TYPE xx

ECG LEADS: x

(Lead assignments noted)

6.3 External Keyboard Test

From the main menu, press F2 key on external keyboard twice.

The display will show a prompt to enter a control number.

If prompt does not appear, verify correct external keyboard hardware installed per BOM and dip switch #3 setting Par 1.2

Press keys at random and note that the UUT displays the last character typed on the external keyboard. **(DS – Record PASS or FAIL)**

If it is a character that the 601 is not programmed to recognize, a block is displayed and an error tone sounds – this is not an error in the digital board.

NOTE: The external printer, printer cable and external keyboard are no longer needed and may be removed.

7.0 FINAL ASSEMBLY TESTS

NOTE: If using the calibrator, the 50 ohm divider must be placed in the override mode for all tests.

7.1 **System Check:** Verify all leads are detached from the instrument. From the UTILITIES menu select SYSTEM TEST. When test is complete the display should read **PASS**. **(DS – Record Checksum & PASS or FAIL)** Return to the Main Menu via the key labeled "Previous".

7.2 **Mains Voltage Test:** Select the **Mains Voltage** test and verify the readings. **(DS – Record Values)**

- 7.3 **Dual Lead Voltage Test:** Select the **Dual Lead Voltage** test by selecting the "soft key" from the Voltage Test. Apply the following voltages from the calibrator between the red and black jacks on the UUT, and verify that the measurements are correct. **(DS – Record Values)**

1.0VDC

1.0VAC @ 1KHz

- 7.4 **Dual Lead Leakage Test:** Access this test from the Main Menu->TESTS/AUTOMODES->MANUAL and press the "MORE" key to select the **Dual Lead Leakage** test. Apply the following voltages from the calibrator between the red and black jacks on the UUT, and verify that the measurements are correct. **(DS – Record Values)**

500mVAC @ 1KHz

1.0VDC

- 7.5 **Earth Leakage Test:** Select the **Earth Leakage** test. Apply the following voltage from the calibrator between the Green jack and rear panel 601 Earth jack, and verify that the measurements are correct. **(DS – Record Value)**

1.0VDC

- 7.6 **Enclosure Leakage Test:** Select the **Enclosure Leakage** test. Apply the following voltage from the calibrator between the Red jack and rear panel 601 Earth jack, and verify that the measurements are correct.. **(DS – Record Value)**

1.0VDC

- 7.7 **Patient Auxiliary Current Test:** Select the **Patient Auxiliary Current** test and each of the lead configurations shown below. Apply the following voltages from the calibrator between the V2 jack on the UUT front panel and the selected jack, and verify that the measurements are correct.. **(DS – Record Values)**

<u>Selected Jack</u>	<u>Lead Configuration</u>	<u>Input Signal</u>
RA	RA-ALL	1.0VDC
RL	RL-ALL	1.0VDC
LA	LA-ALL	1.0VDC
LL	LL-ALL	1.0VDC
LL	V1-V6-ALL	1.0VDC

- 7.8 **Outlet Control Test:** Plug a **receptacle tester** into the unit's front receptacle (use an **outlet adapter if necessary**). Select the **Mains Voltage** test then the Dual Lead "soft key". Use the DUT "soft key" to move between normal and reverse polarity and the **L2** and **EARTH** "soft keys" to verify that the polarity, L2 (Neutral line) and earth ground functions operate correctly (compare the display indications to the receptacle tester lights). Remove the receptacle tester. **(DS – Record PASS or FAIL)**
- 7.9 **Equipment Current Setup:** Press the *esc* key to return to the Main Menu (disconnects the outlet). Connect the **Current Calibration Station (Load)** to the test station outlet. Select one **5A load** on the current test station. Connect the DMM to the Current Test Station's current output jacks, and setup the DMM to read approximately 5Amperes AC.
- 7.10 **Equipment Current Calibration & Test:** Select the **Current Consumption** test. The display on the UUT should be within **±0.1 amps** of the value displayed on the DMM. If the reading is not within spec, re-adjust RT1 on the Analog board. Lock the trimpot. Press the DUT "soft key" to toggle between Normal and Reverse polarity along with the **L2** "soft key", to verify the following measurements: **(DS – Record PASS or FAIL)**

NORM POL, EARTH, NO L2	(0.0 AMPS)
REV POL, EARTH, NO L2	(0.0 AMPS)
REV POL, EARTH, L2	(±0.1 AMPS of load reading)

Press *esc* Key. Disconnect the Current Calibration Load.

- 7.11 Turn the UUT Power OFF.
Set the Variac voltage to **230.0 VAC RMS +/-0.5 VAC**.
Turn the UUT Power ON.
- 7.12 **System Check:** Verify all leads are detached from the instrument. From the UTILITIES menu select SYSTEM TEST. When test is complete the display should read **PASS**. **(DS – Record PASS or FAIL)**
- 7.12.1 **Software Version Number:** Verify software version number displayed corresponds to what is specified in the latest revision of 6040201-mp. **(DS - Record version number & PASS or FAIL.)**
- 7.12.2 **Software Checksum:** Verify checksum displayed corresponds to what is specified in the latest revision of 6040201-mp. **(DS - Record checksum & PASS or FAIL.)**

7.13 **Mains Voltage Test:** Select the **Mains Voltage** test and verify the readings. **(DS – Record Values)**

7.14 **Insulation Resistance L1-L2 to Case Test:** Select the **Insulation Resistance** test (and select Mains L1, L2 - Case if necessary). Connect a power cord from the Multi-Test Box to the UUT front receptacle. Switch the L1/L2 switch on the Multi-Test Box **ON**. Connect a test lead between the Multi-Test Box jacks as indicated. Activate the Insulation Resistance test by pressing the **START TEST** "soft key". Verify the measurements. **(DS – Record Values)**

Connect test lead

L1/L2 to GND
L1/L2 to B1
L1/L2 to B2
L1/L2 to B3
No Lead

7.15 **Insulation Resistance ALL to Case Test:** Select the **Insulation Resistance ALL to Case** test by using the **AP INSUL** "soft key". Switch the **L1/L2 switch** on the Multi-Test Box **OFF**. Connect a test lead between the RA jack on the UUT front panel and the respective test jack on the Multi-Test Box. Activate the Insulation Resistance test by pressing the **START TEST** "soft key". Verify the measurements. **(DS – Record Values)**

Connect test lead

RA to GND
No Lead

Displayed Reading

0.0 MΩ
OVER

7.16 Detach all leads from UUT and remove power cord from the front receptacle.

7.17 At the Main Menu select **SYSTEM SETUP->TEST STANDARD** and then select the **VDE 751.1** test standard.

7.18 **Leakage Offset Calibration:** Select the **VDE Equivalent Patient Leakage** test. Press the **CALIBRATE** "soft key" then the **CAL** "soft key". Relays will click for several seconds while the display says "Calibration in Progress...". No Failure should occur. **(DS – Record PASS or FAIL)**

7.19 **VDE Equivalent Patient Leakage Zero Test:** Press the **START TEST** "soft key" to activate the **VDE Equivalent Patient Leakage** test. Verify the display reads 0μA or 1 μA. **(DS – Record Values)**

7.20 **VDE Equivalent Device Leakage Zero Test:** Select the **Equivalent Device Leakage** test and press the **START TEST** "soft key" to activate the test. Verify the display reads 0 μA or 1 μA. **(DS – Record Values)**

- 7.21 Use the DMM to measure the resistance of the 4MΩ resistor. Confirm that the resistance value is within the range specified below: (**Record Reading On Data Sheet**)

<u>Nominal</u>	<u>Acceptable</u>
4MΩ	3.96MΩ to 4.04MΩ

- 7.22 **VDE Equivalent Device Leakage Test** Connect the 4MΩ test resistor between the **Outlet L1 or Outlet L2** and the **Green** Jack on the front panel. Press the **START TEST** "soft key" to activate the test. Verify that the 601PRO reads within the limits on the data sheet. (**DS – Record Values**)
- 7.23 **VDE Equivalent Patient Leakage Test:** Select the **Equivalent Patient Leakage** test. Connect the 4MΩ test resistor between the **V1** Jack and the **Green** Jack on the front panel. Press the **START TEST** "soft key" to activate the test. Verify that the UUT reads within the limits on the data sheet. (**DS – Record Values**)
- 7.24 At the Main Menu select **SYSTEM SETUP->TEST STANDARD** and then select **IEC 601-1** test standard.
- 7.25 **Mains on Applied Part – Leakage Test:** . Connect the 4MΩ test resistor between the **RL** Jack and the **Green** Jack on the front panel. Select the **Mains On Applied Part** test. The lead configuration should be **ALL** to **EARTH**. Press the **START TEST** "soft key" to activate the test. Verify that the UUT reads within the limits on the data sheet. (**DS – Record Value**)
- 7.26 **Mains on Applied Part – Zero Test:** Disconnect all leads from the front panel jacks. If necessary, select a lead configuration of **ALL-EARTH** . Press the **START TEST** "soft key" to activate the test. Verify the UUT reads 0μA or 1μA for both Normal and Reverse. (**DS – Record Value**)
- 7.27 **1A Earth Resistance Calibration:** Select the **Earth Resistance** test. Connect the Red lead between the **Red jack** on the UUT and the **A1 jack** on the Multi-Test Box. Connect the black lead between the **Green jack** on UUT and the **A2 jack** on the Multi-Test Box. Press the **CAL** "soft key" and verify that the UUT returns from the lead calibration sequence with no errors. (**DS – Record PASS or FAIL**)
- 7.28 **25A Earth Resistance Calibration & Test:** Select the **25 A** current level by pressing the **1A/25A** "soft key". Press the **CAL** "soft key" and verify that the UUT returns from the lead calibration sequence with no errors. Verify the following resistance measurements on the Multi-Test Box by pressing the **START TEST** "soft key" to activate the test. (**DS – Record PASS or FAIL and Values**)

Note: Cleanliness of the leads and jacks can affect the test.

<u>Black & Red Lead Connections</u>	<u>Displayed Current</u>	<u>Ohms</u>
A2 and A1	23.0 to 25.0A	0.000 to 0.002 Ω
A2 and A4	23.0 to 25.0A	(Per Data Sheet Limits)

- 7.29 **1A Earth Resistance Test:** Select the **1A** current level by pressing the **1A** "soft key". Verify the following resistance measurements on the Multi-Test box by pressing the **START TEST** "soft key" to activate the test. **(DS – Record Values)**

<u>Black & Red Lead Connections</u>	<u>Displayed Current</u>	<u>Ohms</u>
A2 and A4	0.5 to 1.5 A	(Per Data Sheet Limits)
A2 and A5	0.5 to 1.5 A	(Per Data Sheet Limits)

- 7.30 At the Main Menu select SYSTEM SETUP->TEST STANDARD and then select **AAMI** test standard.

- 7.31 Select the **Enclosure Leakage** test. Apply the following voltage from the calibrator between the Red and rear panel 601 Earth jack, and verify that the measurements are correct. **(DS – Record Values)**

500mVAC @ 1KHz

1.0VDC

- 7.32 At the Main Menu select SYSTEM SETUP->TEST STANDARD and then select **IEC 1010** test standard.

- 7.33 Select the **Accessible Voltage/Leakage** test and the Leakage "soft key". Apply the following currents from the calibrator between the Red and rear panel 601 Earth jack, and verify that the measurements are correct. **(DS – Record Values)**

500 μ A @ 1KHz

1000 μ ADC

- 7.34 At the Main Menu select SYSTEM SETUP->TEST STANDARD and then select **IEC 601-1** test standard.

- 7.35 If the language on the BOM is something other than English: At the Main Menu select SYSTEM SETUP and use the MORE "soft key" to select LANGUAGE. At the prompt for selecting the keyboard language choose English followed by the Enter key. At the prompt for display/print language choose the language

indicated on the BOM and press Enter. Return to the Main Menu and confirm a difference in the language.

- 7.36 Turn the UUT **Power OFF**. Remove power cord from back.

8.0 GROUNDING TEST

Set DMM to measure ohms. **Null the DMM test leads.** Measure the resistance from the ground pin of the power input connector (on the rear of the instrument) to the following locations:

1. Front receptacle bracket mounting screw . **(DS – Record Value)**
2. Top assembly side mounting screw. **(DS – Record Value)**

The resistance at these points should be **1.0 Ω MAXIMUM.**

9.0 HYPOT TEST

NOTE: THIS TEST MUST BE PERFORMED BY A CERTIFIED TECHNICIAN.

CAUTION: THE HYPOT TESTER PRODUCES POTENTIALLY DANGEROUS VOLTAGES!

Obtain the Hypot tester and place it in a clear working area. Remove the UUT power cord (if attached) and turn the **power switch on**. With the Hypot tester off, select DC test voltage and set the output adjust to MIN. Connect the UUT to the Hypot tester via a power cord. Turn on the Hypot tester and adjust the output slowly to **1700 VDC**, wait **1 second** and return the output adjustment to MIN. No breakdown or leakage should occur. If the Hypot tester trips or registers leakage, the UUT under test fails and needs to be repaired. Switch the unit's power switch OFF. **(DS – Record PASS or FAIL)**

10.0 CASE ASSEMBLY & LABELING

Install rear labels and case screws per final assembly drawing. (see Routing for Drawing Number). **(DS – Check to confirm)**

END OF TEST PROCEDURE

CONFIDENTIAL

Bio-Tek Instruments, Inc.

Certificate # (WO/UNIT) : _____

Model: 601PRO Series XL

Serial # _____

Procedure: 6040005-DS

Title: Final Assembly Test Data Sheet

<u>Rev</u>	<u>Description of changes</u>	<u>ECO</u>	<u>Date</u>
A	Release to Production	32913	11/11/99
B	Add Par. 6.3 External Keyboard test	33149	02/09/00

For Page 1 & 2 use,

"Certificate of Calibration" Form: QA70 . 02FORM4 (For Manufacturing)

OR

Form: SF8 (For Service)

NOTE: Technician to complete form and mark "Uncertainty of Measurement" as 4 : 1

INSTRUCTIONS:

1. This data sheet is to be used with the referenced documents for production calibration or post-service calibration of the specified product.
2. The steps in the data table are numbered to correspond with the paragraphs in the referenced test procedure.
3. Record results in Table and/or check P (pass) or F (fail) as appropriate.

Reference Procedure: 6040005-TP

Step	Item	Requirement	Value	P	F
1.1	Install SN label	(Not for Service Tests)	N/A		
1.2	Dip Switch Settings	Setup (Check P if done)	N/A		
1.3	Load Paper	Setup (Not for Service Tests)	N/A		
1.4.4	Set 5 Volt power	4.9 - 5.1 VDC			
1.5	Download FW	Pass/Fail	N/A		
2.0	Burn-in	Burn-in (Not for Service Tests)	N/A		
4.1	Power-up	Correct Function (Pass/Fail)	N/A		
6.1	Internal Printer test	Printout per procedure (Pass/Fail)	N/A		
6.2	External Printer test	Printout per procedure (Pass/Fail)	N/A		
6.3	External Keyboard test	(Pass/Fail)	N/A		
7.1	System Check	(Pass/Fail)	N/A		
7.2	Mains Voltage	L1 to Earth 114.0 - 116.0 VAC			
		L2 to Earth 0.0 - 2.0 VAC			
		L1 to L2 114.0 - 116.0 VAC			
7.3	Dual Lead Voltage	1.0VDC.990 -1.01 VDC			
		1.0VAC @ 1 kHz .96-.99 VAC			
7.4	Dual Lead Leakage	0.5VAC @ 1 kHz 338.5 - 389.5 μ A			
		1.0VDC 993-1,007 μ A			
7.5	Earth Leakage	993-1,007 μ A			
7.6	Enclosure Leakage	993-1,007 μ A			
7.7	Patient Auxiliary Current	RA-ALL 993-1,007 μ A			
		RL-ALL 993-1,007 μ A			
		LA-ALL 993-1,007 μ A			
		LL-ALL 993-1,007 μ A			
		LL-V1-V6 ALL 993-1,007 μ A			
7.8	Outlet Control	(Pass/Fail)	N/A		
7.10	Load current cal.	Adjusted $\pm$ 0.1A (Pass/Fail)	N/A		
		No L2, 0.0A (Pass/Fail)	N/A		
		Rev Pol, No L2, 0.0A (Pass/Fail)	N/A		
		Rev Pol, $\pm$ 0.1A (Pass/Fail)	N/A		
7.12	System Check	(Pass/Fail)	N/A		
7.12.1	Version Number	(Pass/Fail)			
7.12.2	Checksum	(Pass/Fail)			
7.13	Mains Voltage	L1 to Earth 228.0-232.0 VAC			
		L2 to Earth 0.0-2.0 VAC			
		L1 to L2 228.0- 232.0 VAC			

7.14	Insulation	L1/L2-GND	0.0 MΩ			
	Resistance	L1/L2 - B1	0.8-1.2 MΩ			
	L1-L2 to Case	L1/L2 - B2	48.0-52.0 MΩ			
		L1/L2 - B3	238-262 MΩ			
		No lead	“OVER”			

Certificate # (WO/UNIT) : _____

Step	Item	Requirement	Value	P	F
7.15	Insulation Resistance	RA to GND 0.0 MΩ			
	ALL to Case	No lead "OVER"			
7.18	Leakage Cal	(Pass/Fail)	N/A		
7.19	Equivalent Pat. Zero	0 μA or 1 μA			
7.20	Equivalent Device Zero	0 μA or 1 μA			
7.21	Test Resistance	4MΩ TEST RES. 3.96-4.04 MΩ			
7.22	Equivalent Device Leak	4MΩ 62μA-70μA			
7.23	Equivalent Patient Leak	4MΩ 62μA-70μA			
7.25	Mains On AP Leakage	4MΩ FWD 62μA-70μA			
	ALL to EARTH	4MΩ REV 62μA-70μA			
7.26	Mains On AP Zero	ALL to E FWD 0μA or 1μA			
		ALL to E REV 0μA or 1μA			
7.27	Earth Res. 1A Cal	CAL (Pass/Fail)	N/A		
7.28	Earth Res. 25A Cal & Test	CAL (Pass/Fail)	N/A		
		(A2 to A1) 23.00A-25.00A			
		(A2 to A1) 0.000-0.002 Ω			
		(A2 to A4) 23.00A-25.00A			
		(A2 to A4) 0.095-0.105 Ω			
7.29	Earth Resistance 1A Test	(A2 to A4) 0.500 – 1.500 A			
		(A2 to A4) 0.095- 0.105 Ω			
		(A2 to A5) 0.500 – 1.500 A			
		(A2 to A5) 0.980-1.020 Ω			
7.31	AAMI Enclosure Leakage	0.5VAC@1KHz 338-390 μA			
		1.0VDC 993-1,007 μA			
7.33	IEC 1010 Accessible Leakage	500μA@1KHz 266-305 μA			
		1000μADC 993-1007 μA			
8.0	Grounding -- Front	0.00 - 1.00 Ω			
	Grounding -- Top	0.00 - 1.00 Ω			
9.0	Hypot Test	(Pass/Fail)	N/A		
		(Not for Service Tests)			
10.0	Assemble & Label	(Check Pass to confirm)	N/A		

Certificate # (WO/UNIT) : _____

Calibration Technician _____

Date _____

QC DATA:

Reference Procedure: * 6040005-IP * Note: 6040005-IP Not For Service Use

* **1.0** Data Sheet Has The Correct Lot/Unit Number And Complete. Pass____ Fail____

* **2.0** The Model Number And Labels Correct Per Work Order Information. Pass____ Fail____

* **3.0** Verify the Unit Is Clean And Free From Cosmetic Defects. Pass____ Fail____

I HEREBY CERTIFY THAT I HAVE REVIEWED ALL ACCEPTANCE DATA, THAT THE PRODUCT MEETS PERFORMANCE SPECIFICATIONS AND IS ACCEPTABLE FOR RELEASE.

Name or Inspector No.

Title

Date

Note: Copy of the Certificate of Calibration is to be included with each product.

CONFIDENTIAL

Bio-Tek Instruments, Inc.

Model: 601PRO Series XL

Procedure: 6040005-ST

Title: Service Calibration and Test Procedure

<u>Rev</u>	<u>Description of changes</u>	<u>ECO</u>	<u>Date</u>
A	Release To Production	33518	04/26/00

Equipment Required

(X) Requires listing on the Certificate of Calibration specified on the Data Sheet.

- (X) 6030602 (Multi-Test Box)
- (X) 5020105 or Equivalent (Current Test Station)
- () 6032505 - Jig, Outlet Adapter, European
- () 6032506 - Jig, Outlet Adapter United Kingdom
- () 6032507 - Jig, Outlet Adapter, Australian
- () Variac 100 - 250 VAC RMS, 5 amps, single phase, grounded
- (X) DMM with Null Function Fluke Model 8842A or equivalent
- (X) DMM with 10A Current Capability Fluke Model 45 or equivalent
- (X) Calibrator, Fluke model 5100 B or equivalent.
- () Parallel Printer with cable
- () Windows 95 PC (or equivalent) with OTIS for WINDOWS (4060202-FW) installed
- () E6040202-MP (Contains specification-checksum and version number for firmware)
- () Serial Cable (75034) or equivalent
- () Receptacle Tester, Ideal Industries, model 61-035 or equivalent
- () 4 M Ohm +/- 1% resistor (No calibration necessary)

When an entry on the data sheet (6040005-SD) is required, a note such as: **(DS – Check to indicate completion)**, **(DS – Record PASS or FAIL)**, or **(DS – Record Value)** is present in this procedure.

NOTE: Tests may be selected through the Main Menu and "soft keys" or where applicable, with the front panel shortcut keys. To access the tests through the Main Menu, select TESTS/AUTOMODES, then select MANUAL, and use the "soft keys" until you come to the desired test. The "soft key" labeled MORE will toggle through all of the available tests. Select the test by pressing the associated "soft key". Whenever the "calibrator" is called for, another signal source monitored by the DMM may be used. If using the calibrator, the 50 ohm divider must be placed in the override mode for all tests. Some tests make measurements to the front receptacle bracket mounting screw. If the revision of the unit does not have such a part, the rear panel 601 Earth jack may be used instead.

1.0 SET-UP

- 1.1 Connect a parallel printer to the UUT .
- 1.2 Plug the UUT power cord into a Variac set to 115 VAC RMS $\pm$ 0.5 VAC.
- 1.3 **Load Paper:** If Internal Printer option is installed, thread Printer paper into Internal Printer (See Final Assembly DWG for directions). SW2 in Printer must be in to the left hand position. **(DS – Check to indicate completion)**

2.0 POWER-UP

- 2.1 Turn the UUT power ON. Following startup screens with the firmware version, and a short delay; the UUT should display the MAIN MENU screen. **(DS – Record PASS or FAIL)**

3.0 UUT SYSTEM CONFIGURATION

NOTE: The nonvolatile parameters listed below are required to perform the test. If this is a new instrument these parameters will have automatically been set as part of the firmware download. If this instrument has been returned for service (with or without a new firmware download), go to the appropriate menu and change the settings to reflect the specified Default Parameters:

Default Parameters	Access via:
Class: I	Main Menu->CLASS/TYPE
Type: BF	Main Menu->CLASS/TYPE
Leads: 5 (all type BF)	View Present Settings Key on top panel
Test Standards Enabled: IEC 601-1, VDE 751.1, IEC 1010, AAMI	Main Menu->UTILITIES->ENABLE STANDARDS
Test Standard Selected: IEC 601-1	Main Menu->SYSTEM SETUP->TEST STANDARD
Select the printer type: Internal Printer if installed or select	Main Menu->SYSTEM SETUP->PRINTER OUTPUT

External Ascii Only if not installed	
Beeper Setting: On	Main Menu->SYSTEM SETUP->BEEPER

4.0 PRINTER TESTS

4.1 Internal Printer Test

If the unit has an internal printer, press the **print header** key and confirm that the internal printer starts printing. When it stops printing the printouts should look like the one shown below.

NOTE: The 601PRO # “nnnnnnnnnn” should correspond to the serial number on the S/N label installed on the rear of the UUT. **(DS – Record PASS or FAIL)**

BIO-TEK INSTRUMENTS INC.

Date _____ Time _____

CONTROL#: _____

PROCEDURE ID#: _____

LOCATION: _____

DEVICE TYPE: _____

MANUFACTURER: _____

SERIAL #: _____

TECHNICIAN: _____

601PRO # nnnnnnnnnn

STANDARD: xxxx

CLASS xx, TYPE xx

ECG LEADS: x

(Lead assignments noted)

4.2 External Printer Test

At the Main Menu select SYSTEM SETUP->Printer Output and select the appropriate External Printer. Return to the Main Menu and press the **print header** key and confirm that the external printer starts printing. When it stops printing the printout should look like the one shown below.

NOTE: The 601PRO # “nnnnnnnnn” should correspond to the serial number on the S/N label installed on the rear of the UUT. **(DS – Record PASS or FAIL)**

BIO-TEK INSTRUMENTS INC.
Date _____ Time _____
CONTROL#: _____
PROCEDURE ID#: _____
LOCATION: _____
DEVICE TYPE: _____
MANUFACTURER: _____
SERIAL #: _____
TECHNICIAN: _____
601PRO # nnnnnnnnn
STANDARD: xxxx
CLASS xx, TYPE xx
ECG LEADS: x
(Lead assignments noted)

NOTE: The printer and printer cable are no longer needed and may be removed.

5.0 FINAL ASSEMBLY TESTS

NOTE: If using the calibrator, the 50 ohm divider must be placed in the override mode for all tests.

5.1 System Check: Verify all leads are detached from the instrument. From the UTILITIES menu select SYSTEM TEST. When test is complete the display should read **PASS**. **(DS – Record Checksum & PASS or FAIL)** Return to the Main Menu via the key labeled "Previous".

5.2 Mains Voltage Test: Select the **Mains Voltage** test and verify the readings. **(DS – Record Values)**

5.3 Dual Lead Voltage Test: Select the **Dual Lead Voltage** test by selecting the "soft key" from the Voltage Test. Apply the following voltages from the calibrator between the red and black jacks on the UUT, and verify that the measurements are correct. **(DS – Record Values)**

1.0VDC

1.0VAC @ 1KHz

- 5.4 **Dual Lead Leakage Test:** Access this test from the Main Menu->TESTS/AUTOMODES->MANUAL and press the "MORE" key to select the **Dual Lead Leakage** test. Apply the following voltages from the calibrator between the red and black jacks on the UUT, and verify that the measurements are correct. **(DS – Record Values)**

500mVAC @ 1KHz

1.0VDC

- 5.5 **Earth Leakage Test:** Select the **Earth Leakage** test. Apply the following voltage from the calibrator between the Green jack and rear panel 601 Earth jack, and verify that the measurements are correct. **(DS – Record Value)**

1.0VDC

- 5.6 **Enclosure Leakage Test:** Select the **Enclosure Leakage** test. Apply the following voltage from the calibrator between the Red jack and rear panel 601 Earth jack, and verify that the measurements are correct.. **(DS – Record Value)**

1.0VDC

- 5.7 **Patient Auxiliary Current Test:** Select the **Patient Auxiliary Current** test and each of the lead configurations shown below. Apply the following voltages from the calibrator between the V2 jack on the UUT front panel and the selected jack, and verify that the measurements are correct.. **(DS – Record Values)**

<u>Selected Jack</u>	<u>Lead Configuration</u>	<u>Input Signal</u>
RA	RA-ALL	1.0VDC
RL	RL-ALL	1.0VDC
LA	LA-ALL	1.0VDC
LL	LL-ALL	1.0VDC
LL	V1-V6-ALL	1.0VDC

- 5.8 **Outlet Control Test:** Plug a **receptacle tester** into the unit's front receptacle (use an **outlet adapter if necessary**). Select the **Mains Voltage** test then the Dual Lead "soft key". Use the DUT "soft key" to move between normal and reverse polarity and the **L2** and **EARTH** "soft keys" to verify that the polarity, L2 (Neutral line) and earth ground functions operate correctly (compare the display indications to the receptacle tester lights). The DUT "soft key" needs to be selected again to get back to normal polarity. Remove the receptacle tester. **(DS – Record PASS or FAIL)**

- 5.9 **Equipment Current Setup:** Press the *esc* key to return to the Main Menu (disconnects the outlet). Connect the **Current Calibration Station (Load)** to the test station outlet. Select one **5A load** on the current test station. Connect the DMM to the Current Test Station's current output jacks, and setup the DMM using the mVAC scale to read approximately 5Amperes AC.

5.10 **Equipment Current Calibration & Test:**

- 5.10.1 Select the **Current Consumption** test. The display on the UUT should be within **±0.1 amps** of the value displayed on the DMM. If the reading is not within spec, re-adjust RT1 on the Analog board. Lock the trimpot.

- 5.10.2 Press the DUT "soft key" to toggle between Normal and Reverse polarity along with the **L2** "soft key, to verify the following measurements: **(DS – Record PASS or FAIL)**

NORM POL, EARTH, NO L2	(0.0 AMPS)
REV POL, EARTH, NO L2	(0.0 AMPS)
REV POL, EARTH, L2	(±0.1 AMPS of load reading)

Press *esc* Key. Disconnect the Current Calibration Load.

- 5.11 Turn the UUT Power OFF.
Set the Variac voltage to **230.0 VAC RMS +/-0.5 VAC**.
Turn the UUT Power ON.
- 5.12 **System Check:** Verify all leads are detached from the instrument. From the UTILITIES menu select SYSTEM TEST. When test is complete the display should read **PASS**. **(DS – Record PASS or FAIL)**
- 5.12.1 **Software Version Number:** Verify software version number displayed corresponds to what is specified in the latest revision of 6040201-mp. **(DS - Record version number & PASS or FAIL.)**
- 5.12.2 **Software Checksum:** Verify checksum displayed corresponds to what is specified in the latest revision of 6040201-mp. **(DS - Record checksum & PASS or FAIL.)**
- 5.13 **Mains Voltage Test:** Select the **Mains Voltage** test and verify the readings. **(DS – Record Values)**

- 5.14 **Insulation Resistance L1-L2 to Case Test:** Select the **Insulation Resistance** test (and select Mains L1, L2 - Case if necessary). Connect a power cord from the Multi-Test Box to the UUT front receptacle. Switch the L1/L2 switch on the Multi-Test Box **ON**. Connect a test lead between the Multi-Test Box jacks as indicated. Activate the Insulation Resistance test by pressing the **START TEST** "soft key". Verify the measurements. (**DS – Record Values**)

Connect test lead

L1/L2 to GND
L1/L2 to B1
L1/L2 to B2
L1/L2 to B3
No Lead

- 5.15 **Insulation Resistance ALL to Case Test:** Select the **Insulation Resistance ALL to Case** test by using the **AP INSUL** "soft key". Switch the **L1/L2 switch** on the Multi-Test Box **OFF**. Connect a test lead between the RA jack on the UUT front panel and the respective test jack on the Multi-Test Box. Activate the Insulation Resistance test by pressing the **START TEST** "soft key". Verify the measurements. (**DS – Record Values**)

Connect test lead

Displayed Reading

RA to GND	0.0 MΩ
No Lead	OVER

- 5.16 Detach all leads from UUT and remove power cord from the front receptacle.
- 5.17 At the Main Menu select **SYSTEM SETUP->TEST STANDARD** and then select the **VDE 751.1** test standard.
- 5.18 **Leakage Offset Calibration:** Select the **VDE Equivalent Patient Leakage** test. Press the **CALIBRATE** "soft key" then the **CAL** "soft key". Relays will click for several seconds while the display says "Calibration in Progress...". No Failure should occur. (**DS – Record PASS or FAIL**)
- 5.19 **VDE Equivalent Patient Leakage Zero Test:** Press the **START TEST** "soft key" to activate the VDE Equivalent Patient Leakage test. Verify the display reads 0 μA or 1 μA. (**DS – Record Values**)
- 5.20 **VDE Equivalent Device Leakage Zero Test:** Select the **Equivalent Device Leakage** test and press the **START TEST** "soft key" to activate the test. Verify the display reads 0 μA or 1 μA. (**DS – Record Values**)
- 5.21 Use the DMM to measure the resistance of the 4MΩ resistor. Confirm that the resistance value is within the range specified below: (**Record Reading On Data Sheet**)

Nominal

Acceptable

4MΩ

3.96MΩ to 4.04MΩ

- 5.22 **VDE Equivalent Device Leakage Test** Connect the 4MΩ test resistor between the **Outlet L1 or Outlet L2** and the **Green** Jack on the front panel. Press the **START TEST** "soft key" to activate the test. Verify that the 601PRO reads within the limits on the data sheet. **(DS – Record Values)**
- 5.23 **VDE Equivalent Patient Leakage Test:** Select the **Equivalent Patient Leakage** test. Connect the 4MΩ test resistor between the **V1** Jack and the **Green** Jack on the front panel. Press the **START TEST** "soft key" to activate the test. Verify that the UUT reads within the limits on the data sheet. **(DS – Record Values)**
- 5.24 At the Main Menu select **SYSTEM SETUP->TEST STANDARD** and then select **IEC 601-1** test standard.
- 5.25 **Mains on Applied Part – Leakage Test:** . Connect the 4MΩ test resistor between the **RL** Jack and the **Green** Jack on the front panel. Select the **Mains On Applied Part** test. The lead configuration should be **ALL to EARTH**. Press the **START TEST** "soft key" to activate the test. Verify that the UUT reads within the limits on the data sheet. **(DS – Record Value)**
- 5.26 **Mains on Applied Part – Zero Test:** Disconnect all leads from the front panel jacks. If necessary, select a lead configuration of **ALL-EARTH** . Press the **START TEST** "soft key" to activate the test. Verify the UUT reads 0μA or 1μA for both Normal and Reverse. **(DS – Record Value)**
- 5.27 **1A Earth Resistance Calibration:** Select the **Earth Resistance** test. Connect the Red lead between the **Red jack** on the UUT and the **A1 jack** on the Multi-Test Box. Connect the black lead between the **Green jack** on UUT and the **A2 jack** on the Multi-Test Box. Press the **CAL** "soft key" and verify that the UUT returns from the lead calibration sequence with no errors. **(DS – Record PASS or FAIL)**

- 5.28 **25A Earth Resistance Calibration & Test:** Select the **25 A** current level by pressing the **1A/25A** "soft key". Press the **CAL** "soft key" and verify that the UUT returns from the lead calibration sequence with no errors. Verify the following resistance measurements on the Multi-Test Box by pressing the **START TEST** "soft key" to activate the test. **(DS – Record PASS or FAIL and Values)**

Note: Cleanliness of the leads and jacks can affect the test.

<u>Black & Red Lead Connections</u>	<u>Displayed Current</u>	<u>Ohms</u>
A2 and A1	23.0 to 25.0A	0.000 to 0.002 Ω
A2 and A4	23.0 to 25.0A	(Per Data Sheet Limits)

- 5.29 **1A Earth Resistance Test:** Select the **1A** current level by pressing the **1A** "soft key". Verify the following resistance measurements on the Multi-Test box by pressing the **START TEST** "soft key" to activate the test. **(DS – Record Values)**

<u>Black & Red Lead Connections</u>	<u>Displayed Current</u>	<u>Ohms</u>
A2 and A4	0.5 to 1.5 A	(Per Data Sheet Limits)
A2 and A5	0.5 to 1.5 A	(Per Data Sheet Limits)
Remove Test Leads		

- 5.30 At the Main Menu select **SYSTEM SETUP->TEST STANDARD** and then select **AAMI** test standard.

- 5.31 Select the **Enclosure Leakage** test. Apply the following voltage from the calibrator between the Red Jack and rear panel 601 Earth jack, and verify that the measurements are correct. **(DS – Record Values)**

500mVAC @ 1KHz

1.0VDC

- 5.32 At the Main Menu select **SYSTEM SETUP->TEST STANDARD** and then select **IEC 1010** test standard.

- 5.33 Select the **Accessible Voltage/Leakage** test and the Leakage "soft key". Apply the following currents from the calibrator between the Red Jack and rear panel 601 Earth jack, and verify that the measurements are correct. **(DS – Record Values)**

500 μ A @ 1KHz

1000 μ ADC

- 5.34 At the Main Menu select SYSTEM SETUP->TEST STANDARD and then select **IEC 601-1** test standard.
- 5.35 If the language on the BOM is something other than English: At the Main Menu select SYSTEM SETUP and use the MORE "soft key" to select LANGUAGE. At the prompt for selecting the keyboard language choose English followed by the Enter key. At the prompt for display/print language choose the language indicated on the BOM and press Enter. Return to the Main Menu and confirm a difference in the language.
- 5.36 Turn the UUT **Power OFF**. Remove power cord from back.

6.0 GROUNDING TEST

Set DMM to measure ohms. **Null the DMM test leads.** Measure the resistance from the ground pin of the power input connector (on the rear of the instrument) to the following locations:

- 1. Front receptacle bracket mounting screw. **(DS – Record Value)**
- 2. Top assembly side mounting screw. **(DS – Record Value)**

The resistance at these points should be **1.0 Ω MAXIMUM**.

7.0 COMPUTER CONTROL

- 7.1 Reconnect power cord to the back of the 601PRO, plug in and turn unit on. Connect a "straight through" serial cable between the computer's COM port and the serial connection on the 601PRO. Check 601's setup menu to set COM parameters to 2400 N,8,1.
- 7.2 On the computer, select OTIS for WINDOWS. At the main screen, select FILE - OPEN PROCEDURE, then select \OFW\PROCEDURES\SAMPLES\601s-1b.MDB.
- 7.3 Check that the program is set for 2400 baud N,8,1 operation too. Connect a device to the 601's front panel receptacle, and make a connection from the red jack to the chassis of the device you are testing.
- 7.4 On OTIS, select the RUN button, and run the test. Pass and fail criterion is not necessary, this test is to assure the unit's ability to function properly under computer control.

- 7.5 If the 601Pro operates properly under computer control and reports data back to OTIS, Check the proper spot on the data sheet.

END OF TEST PROCEDURE

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Bio-Tek Instruments, Inc.

Model: 601PRO Series XL

Procedure: 6040005-SD

Title: 601PRO Series XL SVCE Data Sheet

Page 3 of 5

Rev	Description of Changes	ECO	Date
A	Release to Production	33518	04/26/00

REFERENCE: 6040005-ST

INSTRUCTIONS

1. This data sheet is to be used with the referenced documents for service of the 601PRO Series XL.
2. The items in the section below labeled data are numbered to correspond with the referenced procedure.
3. Record the product serial number, date, and your signature in the space provided.
4. Record results in Table.
5. **Requires use of "CERTIFICATE of CALIBRATION" Form SF8 as Page 1 & 2.**

Serial Number	Technician	Certificate #	Date

UUT DATA

STEP	ITEM	REQUIREMENT	AS RECEIVED	CAL DATA
2.1	Unit Displays MAIN MENU at Power-Up	Pass/Fail	Pass _____ Fail _____	Pass _____ Fail _____
4.1	Internal Printer Test	Pass/Fail/NA	N/A	Pass _____ Fail _____ N/A _____
4.2	External Printer Test	Pass/Fail	N/A	Pass _____ Fail _____
5.1	System Check	Checksum Pass/Fail	Checksum: _____ Pass _____ Fail _____	Checksum: _____ Pass _____ Fail _____
5.2	Mains Voltage Test	L1-Earth: 114.0-116.0 VAC L2-Earth: 0.0-2.0 VAC L1-L2: 114.0-116.0 VAC	_____ _____ _____	_____ _____ _____
5.3	Dual-Lead Voltage Test I	1.0 VDC: 0.990-1.01 VDC 1.0 VAC@1 kHz: .96-.99 VAC	_____ _____	_____ _____
5.4	Dual-Lead Leakage Test II	0.5 VAC@1 kHz: 338-390 μ A 1.0 VDC: 993-1007 μ A	_____ _____	_____ _____
5.5	Earth Leakage Test	993-1007 μ A	_____	_____

STEP	ITEM	REQUIREMENT	AS RECEIVED	CAL DATA
5.6	Enclosure Leakage	993-1007 μ A	_____	_____
5.7	Patient Auxiliary Current	RA-ALL: 993-1007 μ A RL-ALL: 993-1007 μ A LA-ALL: 993-1007 μ A LL-ALL: 993-1007 μ A LL-V1-V6 ALL 993-1007 μ A	_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
5.8	Outlet Control	Pass/Fail	Pass _____ Fail _____	Pass _____ Fail _____
5.10.1	Load Current Calibration	± 0.1 A of DMM: Pass/Fail (Zero Analog RT1 to adjust)	Pass _____ Fail _____ (do not zero)	Pass _____ Fail _____
5.10.2	Load Current Test	No L2, 0.0 A: Pass/Fail Rev Pol, No L2, 0.0A: Pass/Fail Rev Pol, ± 0.1 A: Pass/Fail	Pass _____ Fail _____	Pass _____ Fail _____
5.12	System Check	Pass/Fail	Pass _____ Fail _____	Pass _____ Fail _____
5.12.1	Software Version #	Verify latest revision, record version #.	Pass _____ Fail _____ Ver: _____	Pass _____ Fail _____ Ver: _____
5.12.2	Checksum	Pass/Fail	Pass _____ Fail _____	Pass _____ Fail _____
5.13	Mains Voltage	L1-Earth: 228.0-232.0 VAC L2-Earth: 0.0-2.0 VAC L1-L2: 228.0-232.0 VAC	_____ _____ _____	_____ _____ _____
5.14	Insulation Resistance L1-L2 to Case	L1/L1-GND: 0.0 M Ω L1/L2-B1: 0.8-1.2 M Ω L1/L2-B2: 48.0-52.0 M Ω L1/L2-B3: 238-262 M Ω No Lead: "OVER"	_____ _____ _____ _____ _____	_____ _____ _____ _____ _____
5.15	Insulation Resistance ALL to Case	RA-GND: 0.0 M Ω No Lead: "OVER"	_____ _____	_____ _____
5.18	Leakage Cal	Pass/Fail	Pass _____ Fail _____	Pass _____ Fail _____
5.19	Equiv. Patient Zero:	0 μ A or 1 μ A	_____	_____
5.20	Equiv. Device Zero	0 μ A or 1 μ A	_____	_____
5.21	Test Resistance	3.96-4.04 M Ω	_____	_____
5.22	Equiv. Device Lkg.	62-70 μ A	_____	_____
5.23	Equiv. Patient Lkg.	62-70 μ A	_____	_____
5.25	Mains On AP Lkg. ALL-EARTH	FWD: 62-70 μ A REV: 62-70 μ A	_____ _____	_____ _____
5.26	Mains On AP Zero	ALL-E FWD: 0-1 μ A ALL-E REV: 0-1 μ A	_____ _____	_____ _____
5.27	1A Earth Resistance	Pass/Fail	Pass: _____	Pass: _____

	Cal.		Fail:	Fail:
--	------	--	-------	-------

6040005-SD REVA SVCE DATA SHEET CERTIFICATE # _____

PAGE 5 OF 5

STEP	ITEM	REQUIREMENT	AS RECEIVED	CAL DATA
5.28	25A Earth Resistance Cal & Test	Cal: Pass/Fail Test: A2-A1: 23.00-25.00 A 0.000-0.002 Ω A2-A4: 23.00-25.00 A 0.095-0.105 Ω	Pass _____ Fail: _____ _____ _____ _____	Pass: _____ Fail: _____ _____ _____ _____
5.29	1A Earth Resistance Test	A2-A4: 0.500-1.500 A 0.095-0.105 Ω A2-A5: 0.500-1.500 A 0.980-1.020 Ω	_____ _____ _____ _____	_____ _____ _____ _____
5.31	AAMI Enclosure Lkg.	0.5VAC@1kHz: 338-390 μ A 1.0 VDC: 993-1007 μ A	_____ _____	_____ _____
5.33	IEC 1010 Accessible Leakage	500 $\square$ A@1kHz: 266-305 μ A 1000 $\square$ ADC: 993-1007 μ A	_____ _____	_____ _____
6.0	Grounding - Front Grounding - Top	0.00-1.00 Ω 0.00-1.00 Ω	_____ _____	_____ _____
7.5	Operation under Computer Control	Sends and receives data	Pass _____ Fail _____	Pass _____ Fail _____

Assembly Drawings

*This chapter contains diagrams
for each section of the
601PRO Series_{XL}, to assist with identification of parts placement.*

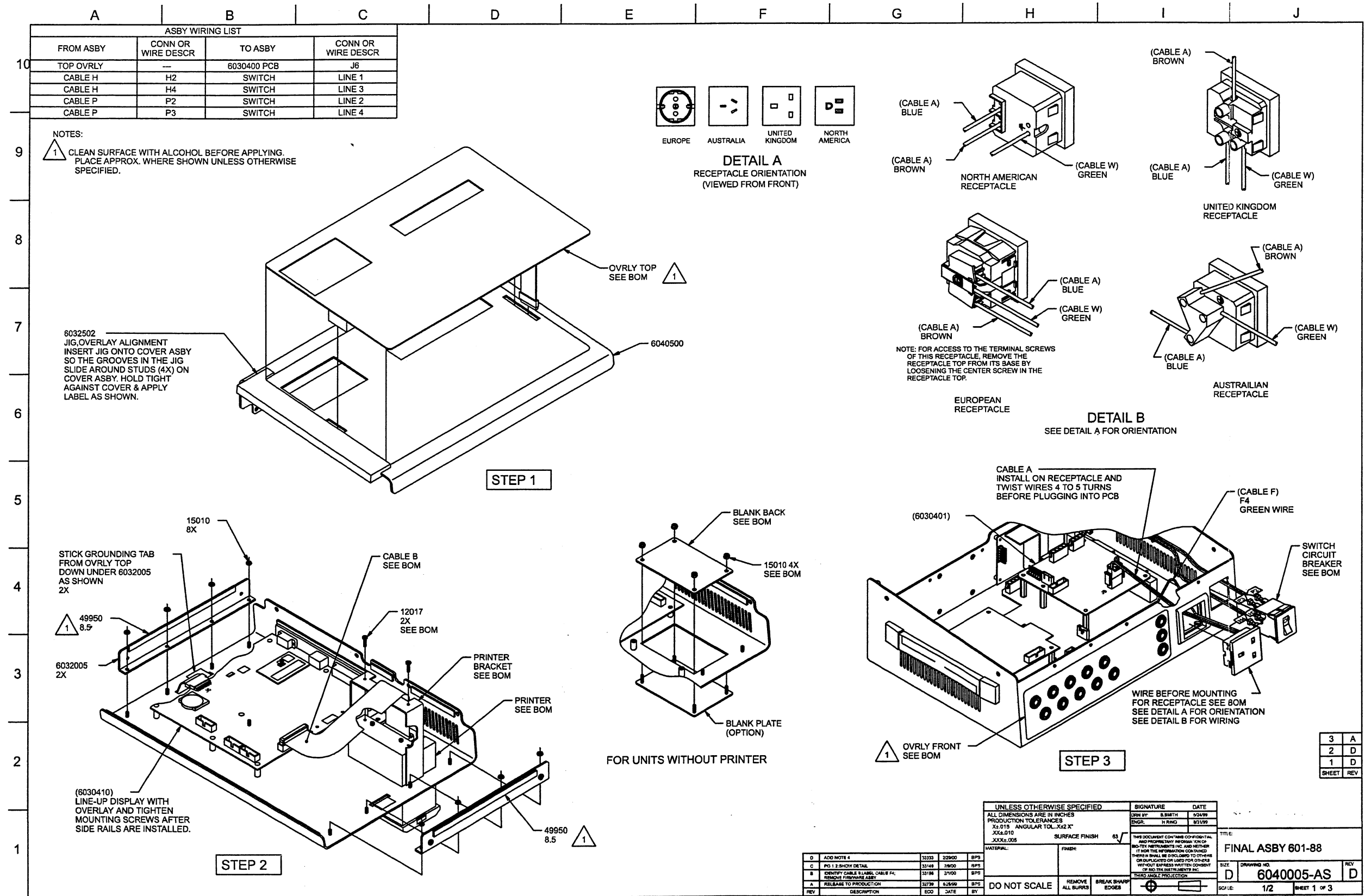
Assembly Drawings

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- 6040500-AS Top Generic Asby 601-88 (Page 1 of 1), page 9-6
- 6040501-AS Base Generic Asby 601-88 (Page 1 of 3), page 9-8
- 6040503-AS Display 601-88 (Page 1 of 1), page 9-12

Cables

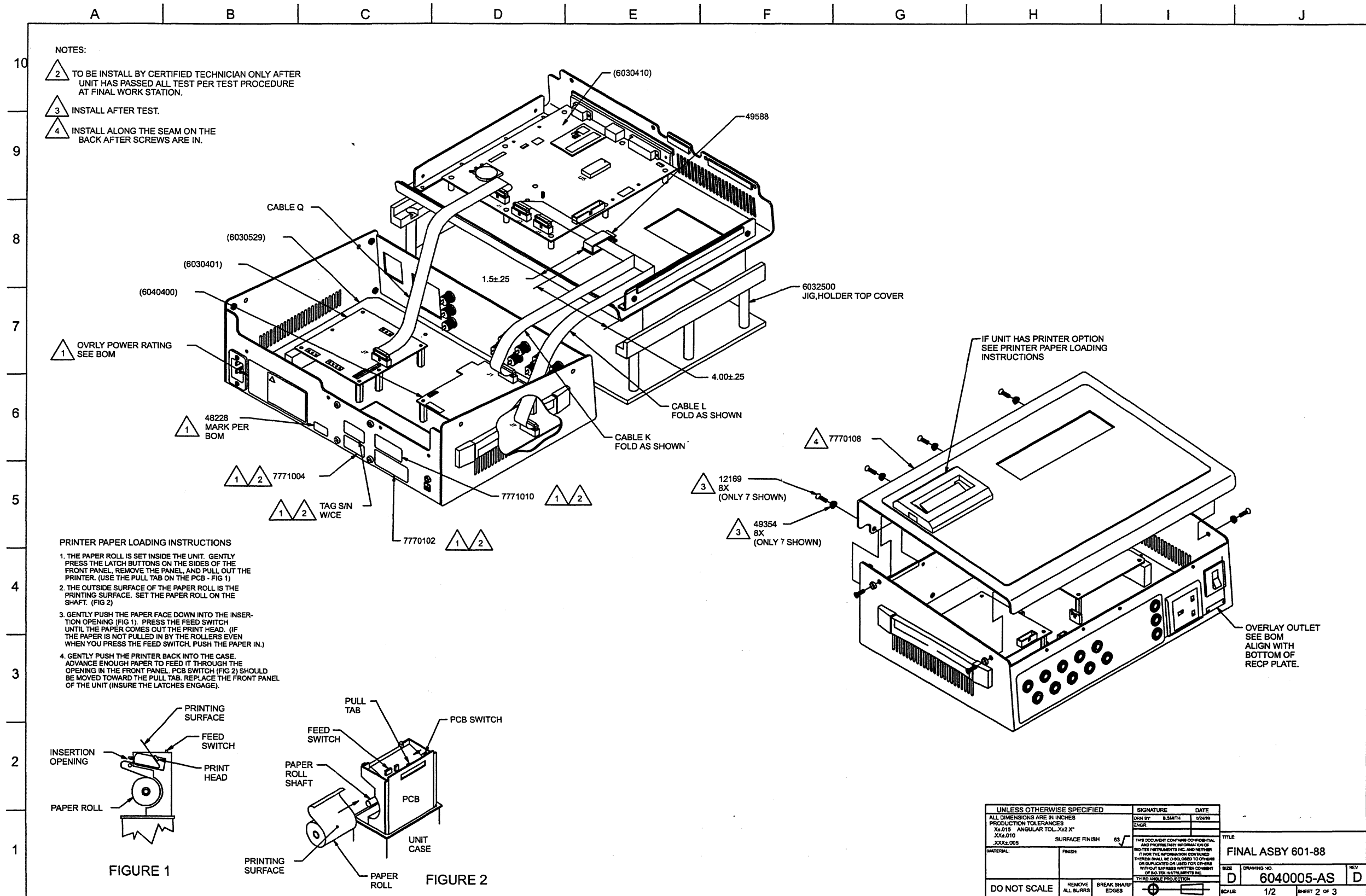
- 6030500-AS Cable Keyboard Connector Asby “Cable O” (Page 1 of 1), page 9-13
- 6030504-AS Cable Signal Intcon Meas Asby “Cable K” (Page 1 of 1), page 9-13
- 6030506-AS Cable Xfmr Cur Source Asby “Cable G” (Page 1 of 1), page 9-14
- 6030507-AS Cable Dc Intcon Asby “Cable E” (Page 1 of 1), page 9-14
- 6030508-AS Cable Ac Pwr Analog Pcb Asby “Cable I” (Page 1 of 1), page 9-15
- 6030510-AS Cable Ac Pwr Input Asby “Cable H” (Page 1 of 1), page 9-15
- 6030511-AS Cable Front Rcpt Intcon Asby “Cable A” (Page 1 of 1), page 9-16
- 6030512-AS Cable Ecg Asby “Cable D” (Page 1 of 1), page 9-16
- 6030513-AS Cable Leak/Volts Signal Asby “Cable C” (Page 1 of 1), page 9-17
- 6030514-AS Cable Dc Pwr Intcon Asby “Cable J” (Page 1 of 1), page 9-17
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- 6030516-AS Cable Analog Relay Drive Asby “Cable L” (Page 1 of 1), page 9-18
- 6030517-AS Cable I/O Bd Interface Asby “Cable M” (Page 1 of 1), page 9-19
- 6030518-AS Cable Printer Asby “Cable N” (Page 1 of 1), page 9-19

- 6030519-AS Cable Ac Distribution Asby “Cable P” (Page 1 of 1), page 9-20
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- 6030526-AS Cable Asby Black Wire “Cable U” (Page 1 of 1), page 9-22
- 6030527-AS Cable Asby Red Wire “Cable V” (Page 1 of 1), page 9-22
- 6030528-AS Cable Asby Green Wire “Cable W” (Page 1 of 1), page 9-23
- 6040504-AS Cable Display Asby (Page 1 of 1), page 9-23

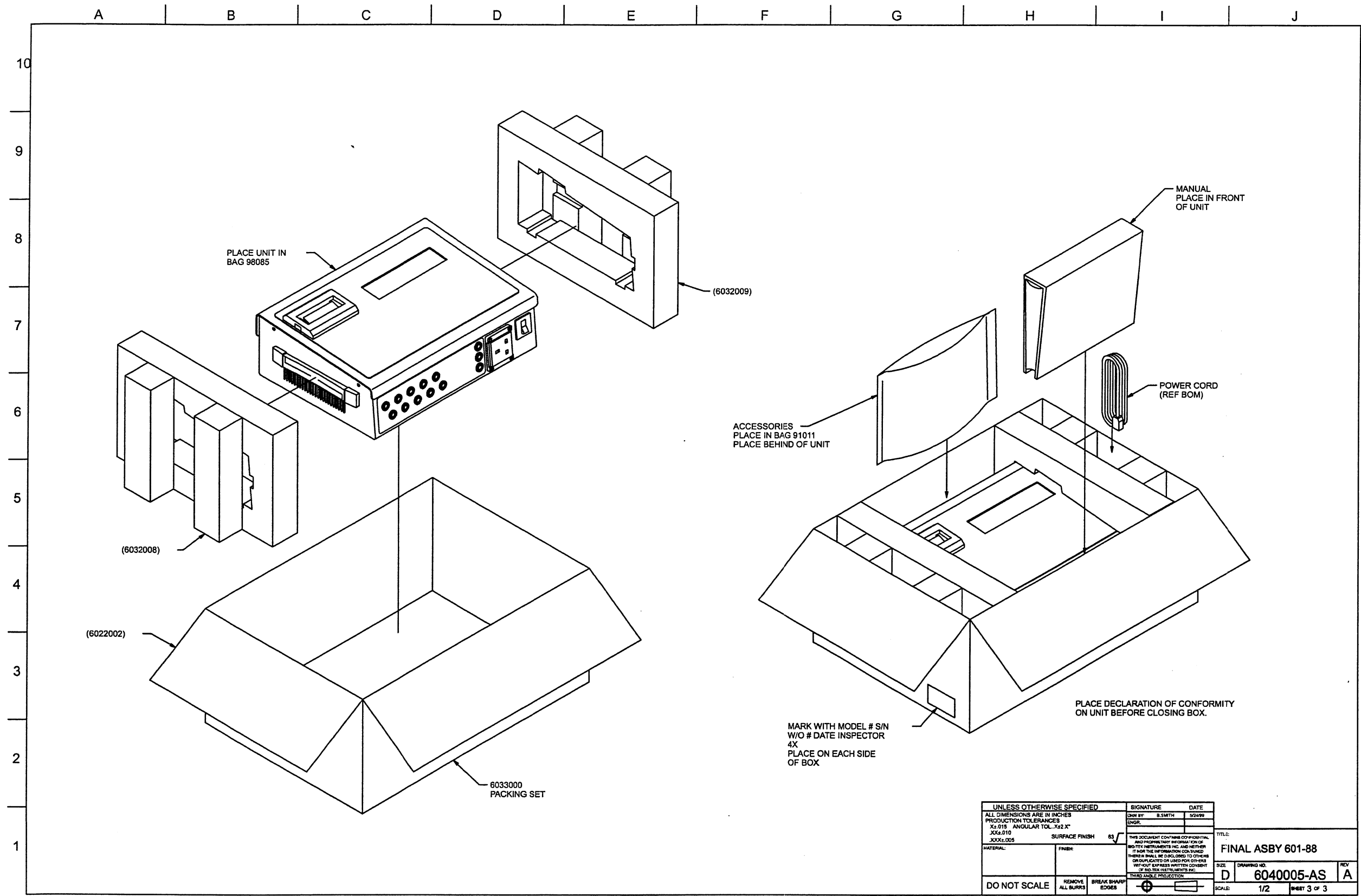


6040005-AS Final Asby 601-88 (Page 1 of 3)

Front: 6040005-AS Final Asby 601-88 (Page 1 of 3)
Back: 6040005-AS Final Asby 601-88 (Page 2 of 3)

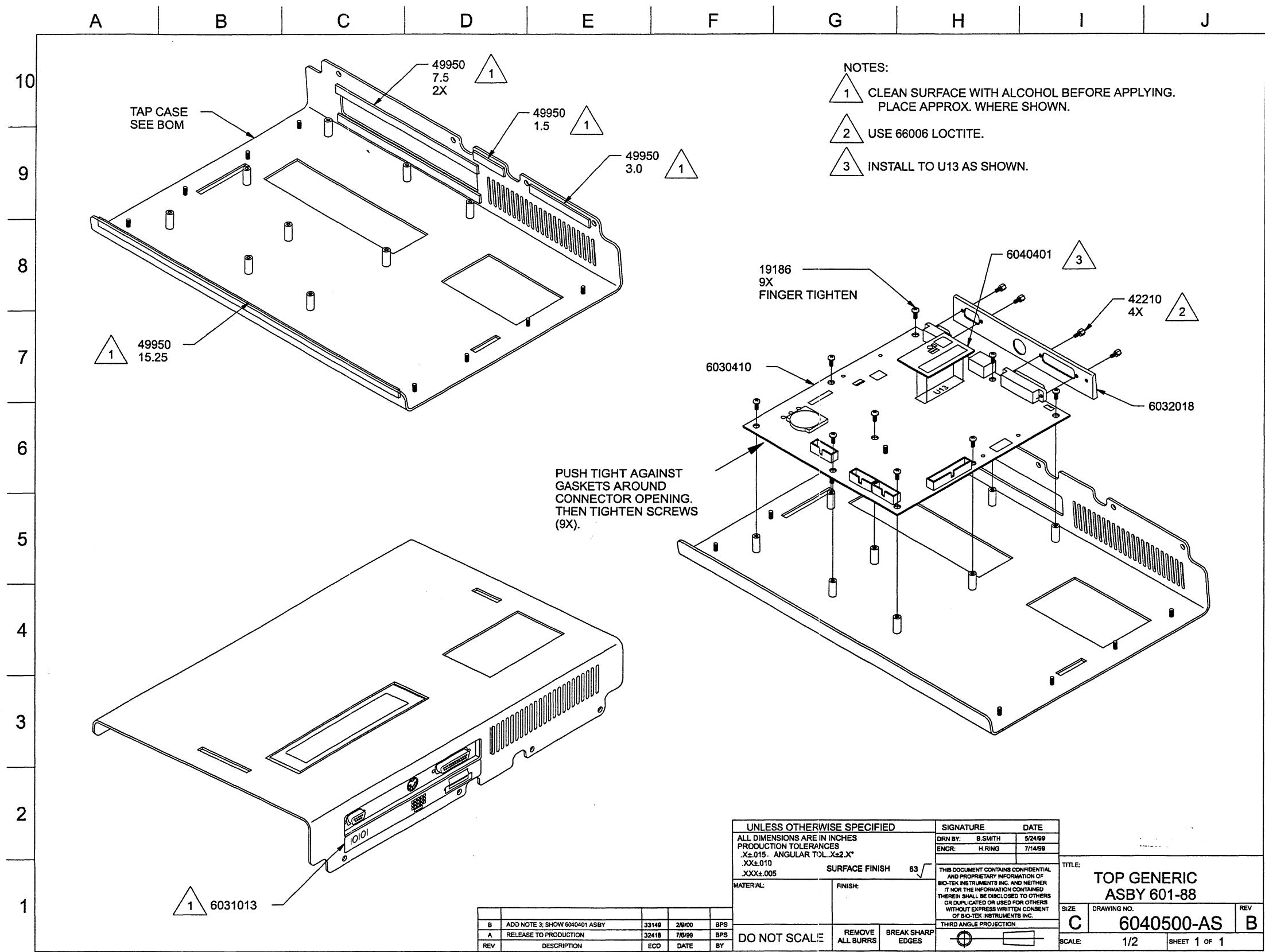


UNLESS OTHERWISE SPECIFIED		SIGNATURE	DATE
ALL DIMENSIONS ARE IN INCHES		DRN BY: S. SMITH	5/24/99
PRODUCTION TOLERANCES		ENGR:	
XX.015 ANGULAR TOL. .012 X"			
XX.010			
XXXX.005			
SURFACE FINISH			
FINISH			
DO NOT SCALE			
REMOVE ALL BURRS			
BREAK SHARP EDGES			
THIRD ANGLE PROJECTION			
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TITLE		FINAL ASBY 601-88	
SIZE	D	DRAWING NO.	6040005-AS
SCALE	1/2	SHEET	2 OF 3



6040005-AS Final Asby 601-88 (Page 3 of 3)

Front: 6040005-AS Final Asby 601-88 (Page 3 of 3)
 Back: 6040500-AS Top Generic Asby 601-88 (Page 1 of 1)

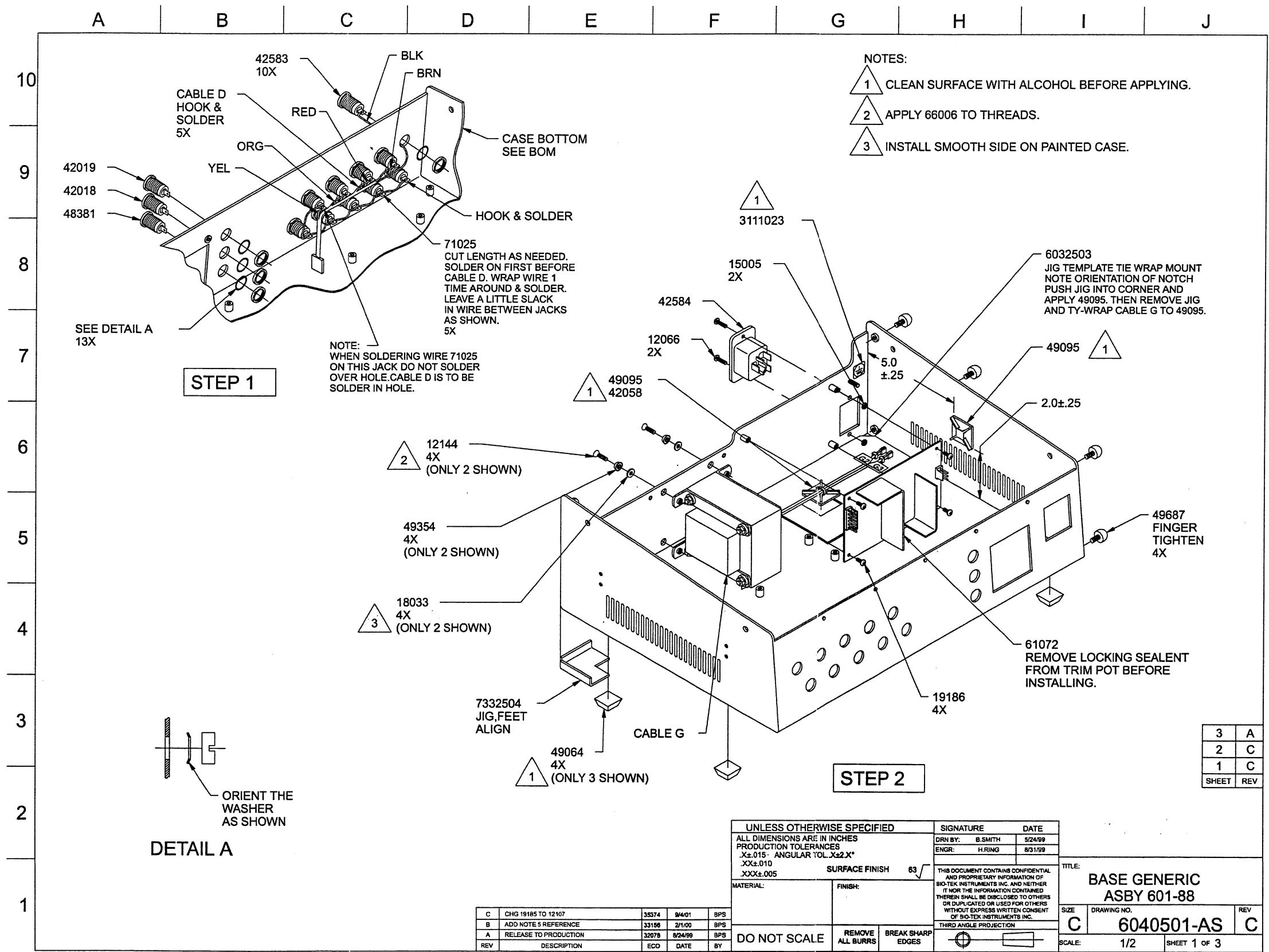


6040500-AS Top Generic Asby 601-88 (Page 1 of 1)

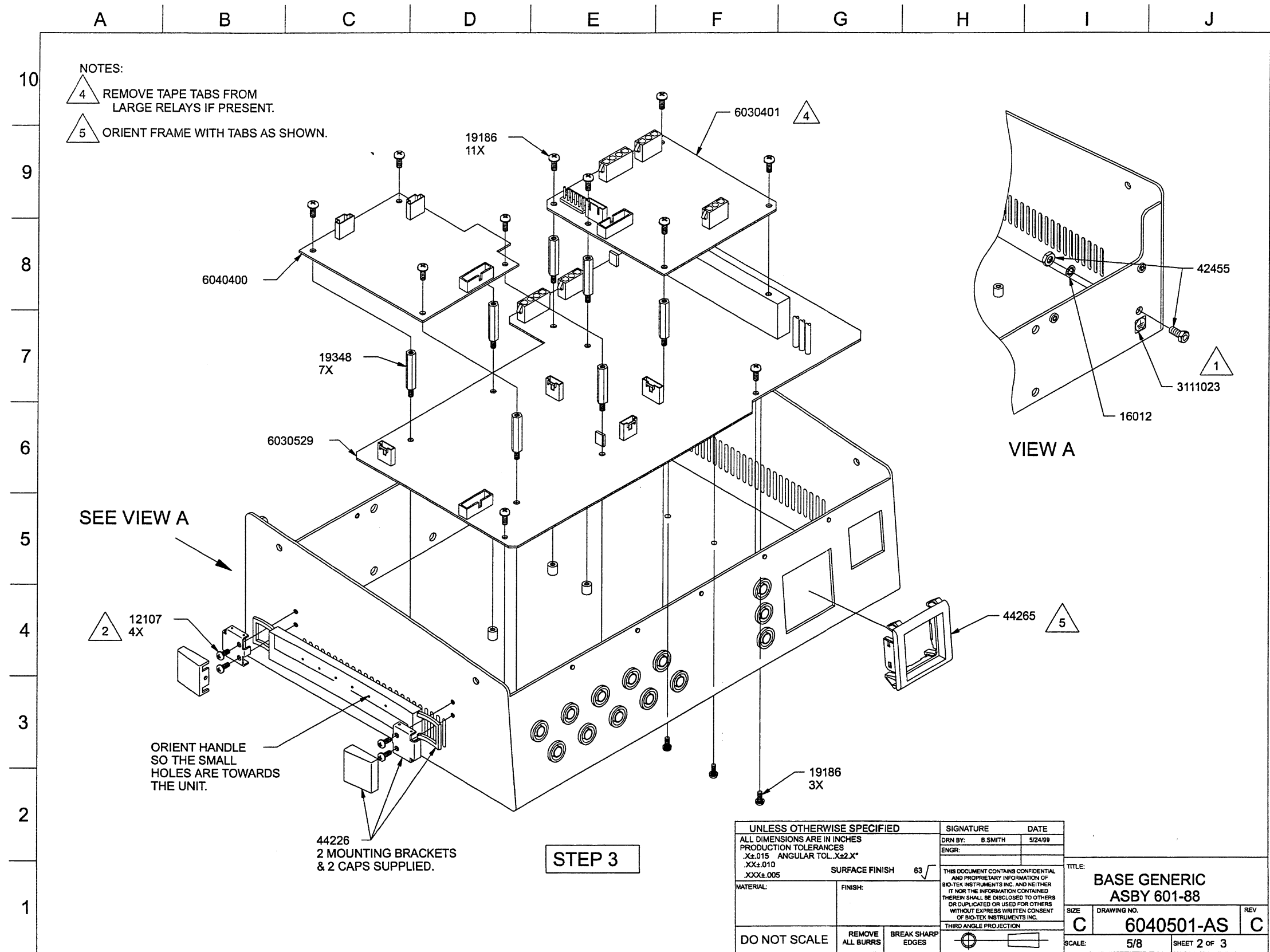
6040500 Top Generic Asby 601-88 BOM

6040500-AS Top Generic Asby 601-88 rev G As of 12-10-01				
Item	Description	Rev	Qty	Remarks
19186	SEMS 6-32X1/4 ST PHIL ITOOTH	A	9	
42210	SCREWLOCK FM/25P SUB D	A	2	
49950	GASKET EMI 0.4 X 0.08 PSA	A	2.89 6	
6030410	DIGITAL PCB 80188 ASBY	F	1	
6031013	OVRLY REAR DIGITAL	B	1	
6032017	COVER TOP	D	1	
6032018	PANEL I/O	B	1	
6040403	KEYBOARD/DAUGHTER BOARD ASBY	A	1	
6040500-AS	TOP GENERIC ASBY 601-88	B	0	DOCUMENT ONLY
6040503	DISPLAY 601-88	A	1	

Note: When 6040401 is no longer available it will be replaced with 6040403.

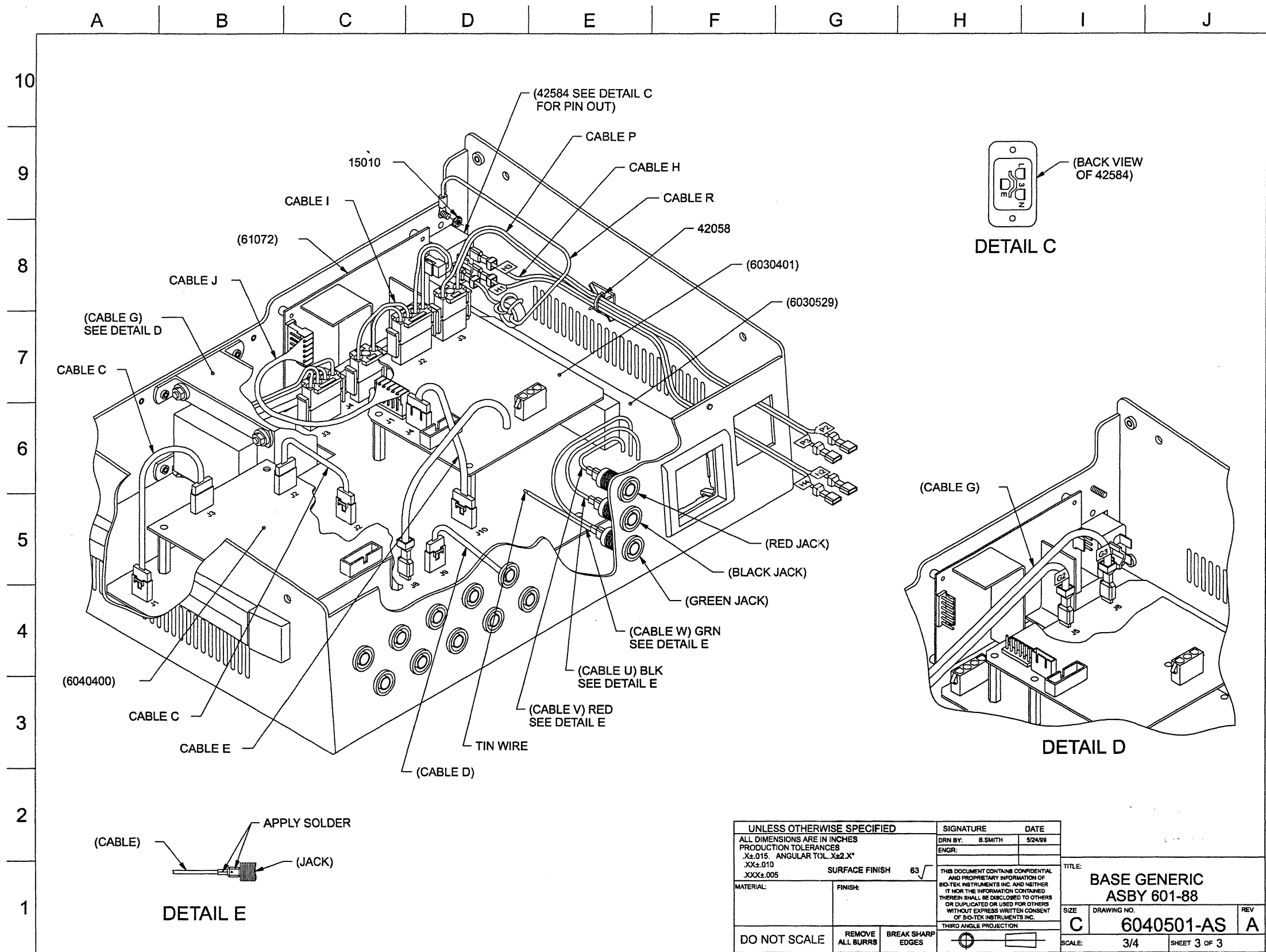


6040501-AS Base Generic Asby 601-88 (Page 1 of 3)



6040501-AS Base Generic Asby 601-88 (Page 2 of 3)

Front: 6040501-AS Base Generic Asby 601-88 (Page 2 of 3)
 Back: 6040501-AS Base Generic Asby 601-88 (Page 3 of 3)

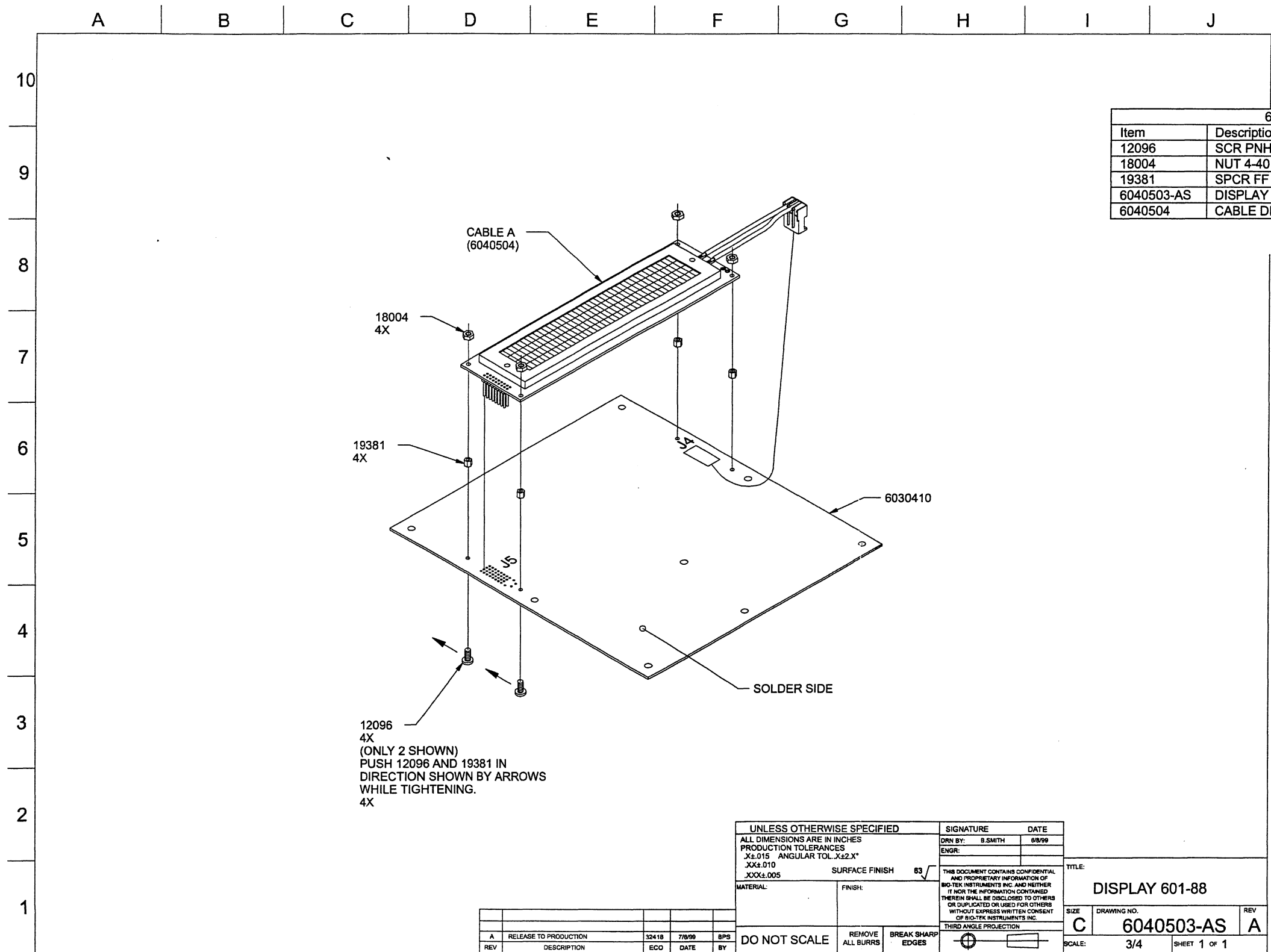


6040501-AS Base Generic Asby 601-88 (Page 3 of 3)

6040501 Base Generic Asby 601-88 BOM

6040501-AS Base Generic Asby 601-88 rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
12066	SCR PNH 4-40X3/8 SS PHH	A	2	
12107	SCR PNH 6-32X1/2 SS PHH	A	4	
12144	SCR FLH 8-32X1/2 SS PHH	A	4	
15005	NUT KEPS 4-40 STEEL ZINC	A	2	
15010	NUT KEPS 6-32 STEEL ZINC	A	1	
16012	WSHR LK INT 1/4 ST	A	1	
18033	WSHR FNDR 6 SS	B	4	
19186	SEMS 6-32X1/4 ST PHIL ITOOTH	A	18	
19348	SPCR MF 6-32X1.25 1/4 HEX AL	A	7	
3111023	LABEL,GROUNDING SYMBOL	A	2	
42018	SOCKET SAFETY LAB BLACK	B	1	
42019	SOCKET SAFETY LAB RED	B	1	
42058	TIE WRAP 3"	A	2	
42455	JACK BANANA NON-INSULATED	A	1	
42583	SOCKET SAFETY LAB GRAY	B	10	
42584	CONN PWR INLET C20 .25 TERM	B	1	
44226	HANDLE BLACK FLEXABLE	A	1	
44265	PANEL MOUNTING FRAME	A	1	
48381	JACK BANANA SAFTY .25 TAB GRN	B	1	
49064	FOOT RUBBER 9/16" SQ BLACK	B	4	
49095	MOUNT CABLE TIE ADHESIVE	B	2	
49354	WSHR,FINISH 4MM SS or NICPL	A	4	
49687	FOOT RUBBER WITH 8-32 STUD	A	4	
6030401	AC PWR DISTRIBUTION PCB ASBY	H	1	
6030506	CABLE XFMR CUR SOURCE ASBY	D	1	CABLE G
6030507	CABLE DC INTCON ASBY	C	1	CABLE E
6030508	CABLE AC PWR ANALOG PCB ASBY	B	1	CABLE I
6030510	CABLE AC PWR INPUT ASBY	C	1	CABLE H
6030512	CABLE ECG ASBY	C	1	CABLE D
6030513	CABLE LEAK/VOLTS SIGNAL ASBY	C	2	CABLE C
6030514	CABLE DC PWR INTCON ASBY	B	1	CABLE J
6030519	CABLE AC DISTRIBUTION ASBY	C	1	CABLE P
6030521	CABLE GROUND WIRE ASBY	D	1	CABLE R
6030529	ANALOG PCB W/DAUGHTER PCB ASBY	D	1	
6032503	JIG TEMPLATE TIE WRAP MOUNT	A	0	TOOL ONLY
6040400	ANALOG MEASUREMENT/DC PCB ASBY	D	1	
6040501-AS	BASE GENERIC ASBY 601-88	C	0	DOCUMENT ONLY
6042000	CASE BOTTOM 601-88	D	1	
61072	PWR SPLY +5V +/-12V 40W UL544	D	1	
66006	LOCTITE 242 BLUE	A	0	A/R
71025	WIRE 24AWG BUS SOLID TND	A	1	12"
7332504	JIG FEET ALIGN	A	0	TOOL ONLY

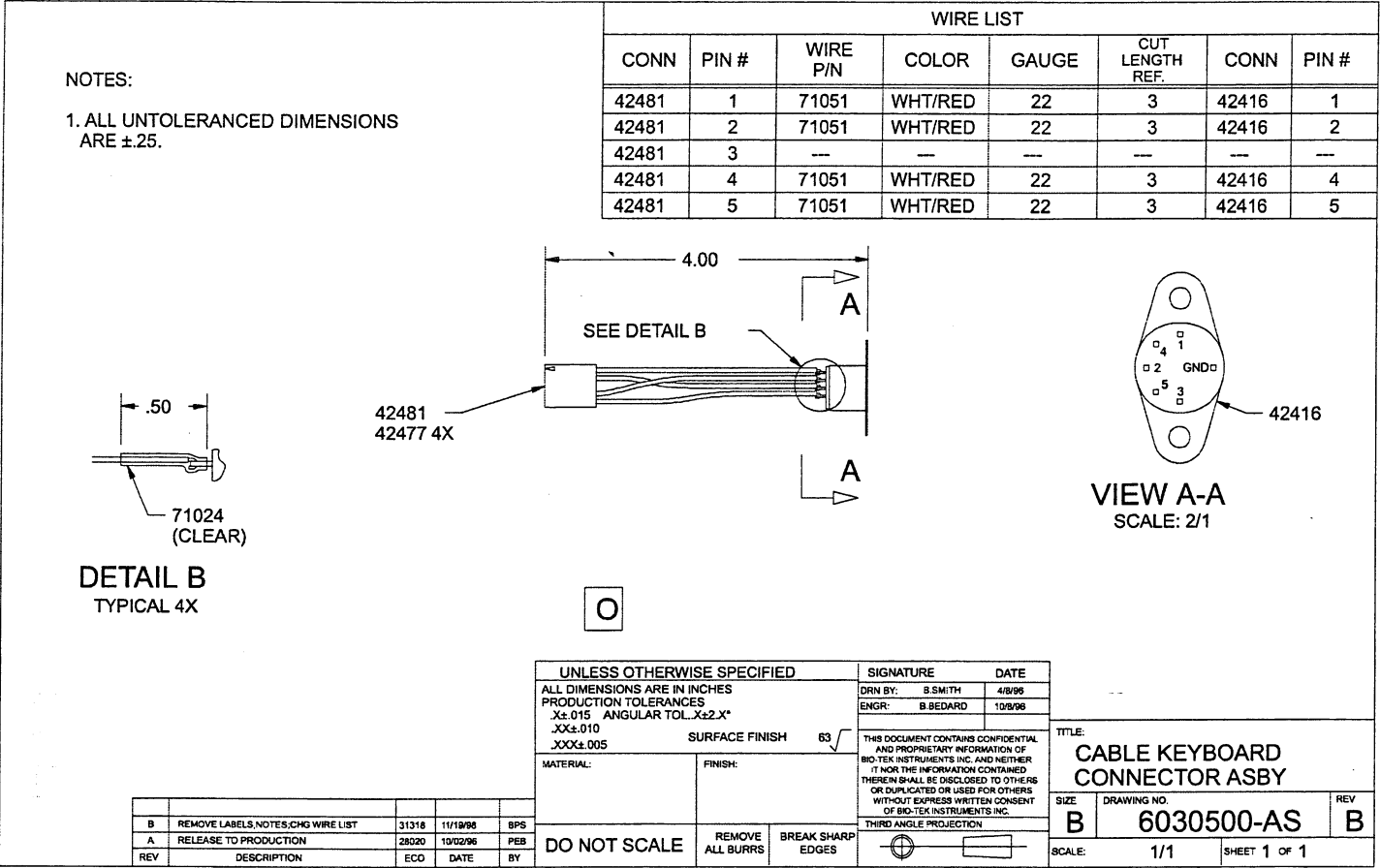
Front:
6040501 Base Generic Asby 601-88 BOM
Back:
6040503-AS Display 601-88 (Page 1 of 1)
6040503 Display 601-88 BOM



6040503-AS Display 601-88 rev A As of 12-10-01				
Item	Description	Rev	Qty	Remarks
12096	SCR PNH 4-40X1/2 SS PHH	B	4	
18004	NUT 4-40 NYLON NAT	B	4	
19381	SPCR FF 4-40X.25 1/4 HEX NY	B	4	
6040503-AS	DISPLAY 601-88	A	0	DOCUMENT ONLY
6040504	CABLE DISPLAY ASBY	A	1	CABLE A

6040503-AS Display 601-88 (Page 1 of 1)

6040503 Display 601-88 BOM



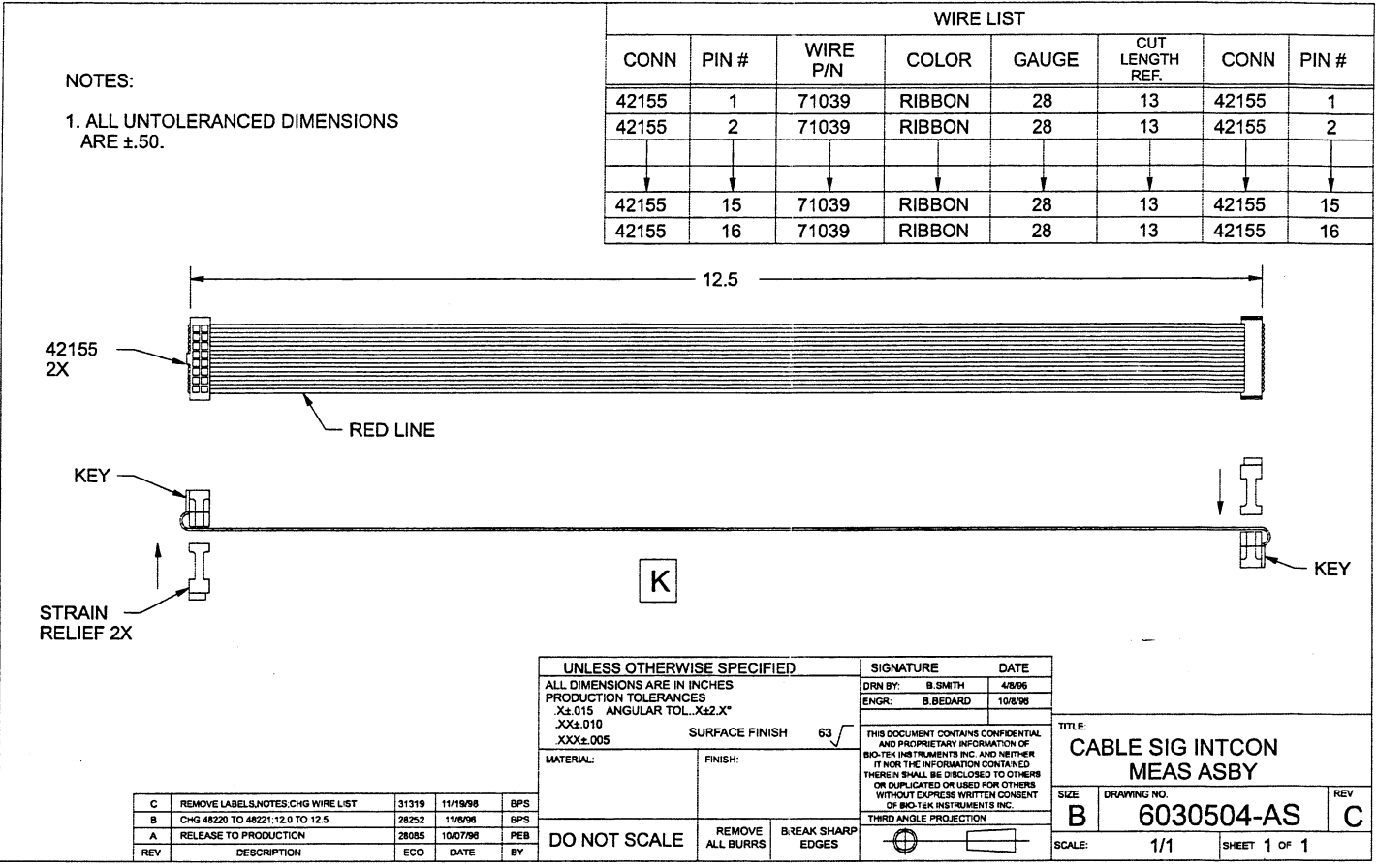
6030500-AS Cable Keyboard Connector Asby “Cable O” (Page 1 of 1)

6030500 Cable Keyboard Connector Asby “Cable O” BOM

6030504-AS Cable Signal Intcon Meas Asby “Cable K” (Page 1 of 1)

6030504 Cable Signal Intcon Meas Asby “Cable K” BOM

6040500-AS Cable Keyboard Connector Asby rev B As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42416	CONN 5-S DIN 180 DEG PANEL MT	B	1	USED ON CABLE O
42477	TERM CRIMP FEMALE 22-26AWG	B	4	USED ON CABLE O
42481	CONN 5P POL/LAT .1 UNLOAD RCT	A	1	USED ON CABLE O
6030500-AS	-CABLE KEYBOARD CONNECTOR ASBY	B	0	DOCUMENT ONLY
71024	SHRINK TUBE 1/8"	B	0.17	.5"(4X), USED ON CABLE O
71051	WIRE 22AWG MIL-W-16878 WHT/RED	A	1	3"(4X), USED ON CABLE O



6030504-AS Cable Signal Intcon Meas Asby rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42155	INSD 16-S .1 x .1 28GA GOLD	B	2	USED ON CABLE K
6030504-AS	-CABLE SIGNAL INTCON MEAS ASBY	C	0	DOCUMENT ONLY
71039	WIRE 28AWG 16-COND RIBBON GRAY	A	1.1	13", USED ON CABLE K

Front:

6030500-AS Cable Keyboard Connector Asby “Cable O” (Page 1 of 1)

6030500 Cable Keyboard Connector Asby “Cable O” BOM

6030504-AS Cable Signal Intcon Meas Asby “Cable K” (Page 1 of 1)

6030504 Cable Signal Intcon Meas Asby “Cable K” BOM

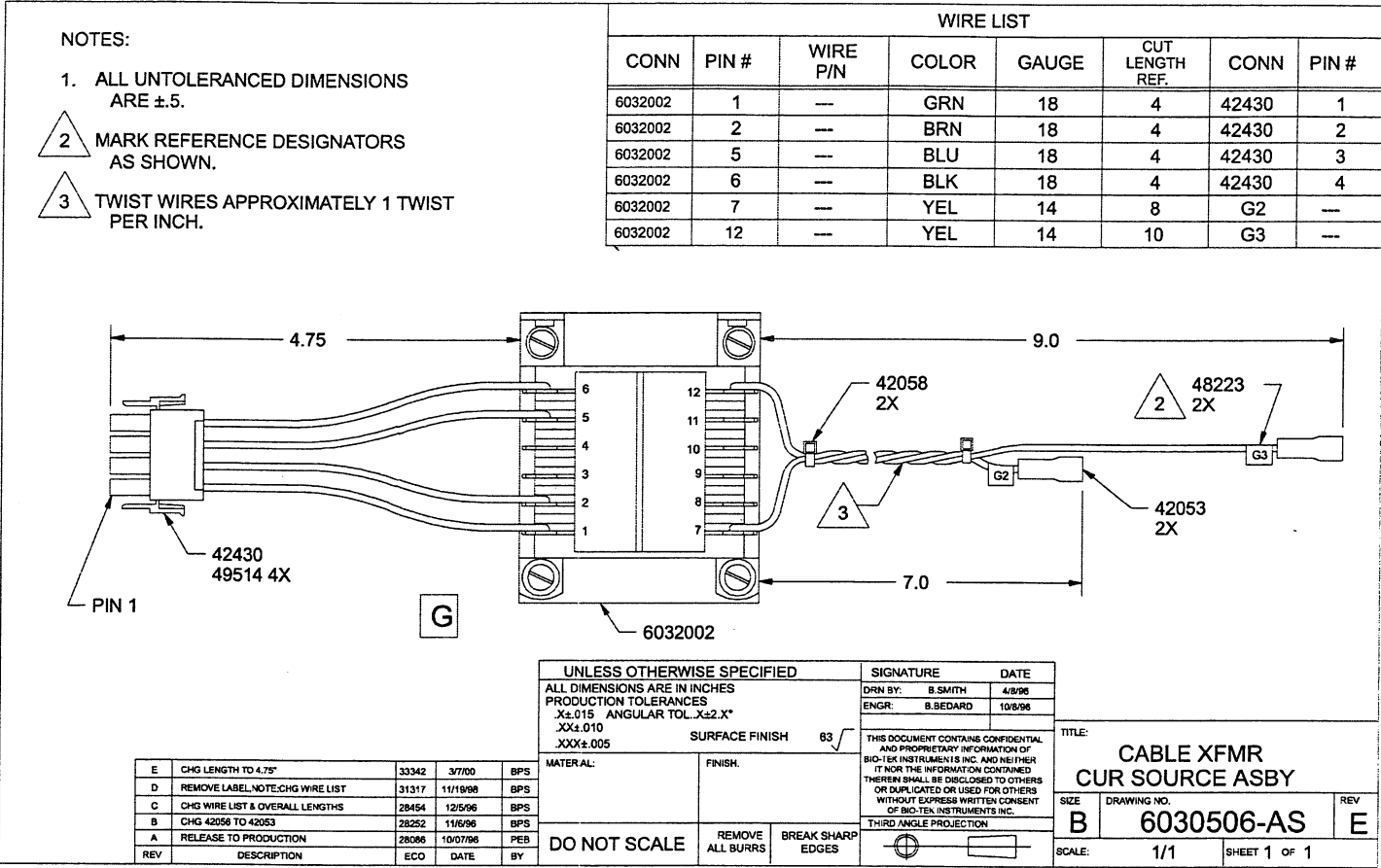
Back:

6030506-AS Cable Xfmr Cur Source Asby “Cable G” (Page 1 of 1)

6030506 Cable Xfmr Cur Source Asby “Cable G” BOM

6030507-AS Cable Dc Intcon Asby “Cable E” (Page 1 of 1)

6030507 Cable Dc Intcon Asby “Cable E” BOM



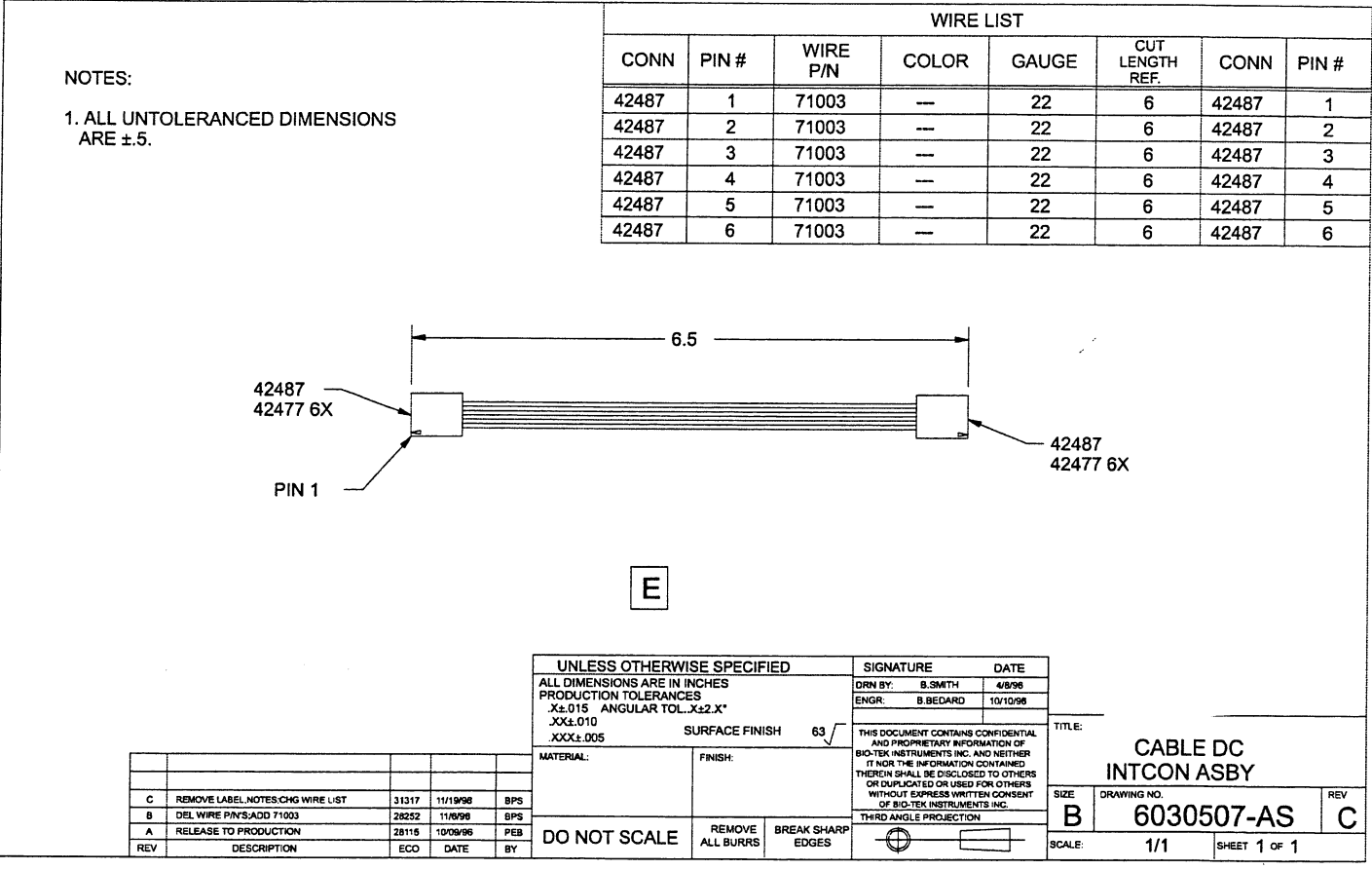
6030506-AS Cable Xfmr Cur Source Asby “Cable G” (Page 1 of 1)

6030506 Cable Xfmr Cur Source Asby “Cable G” BOM

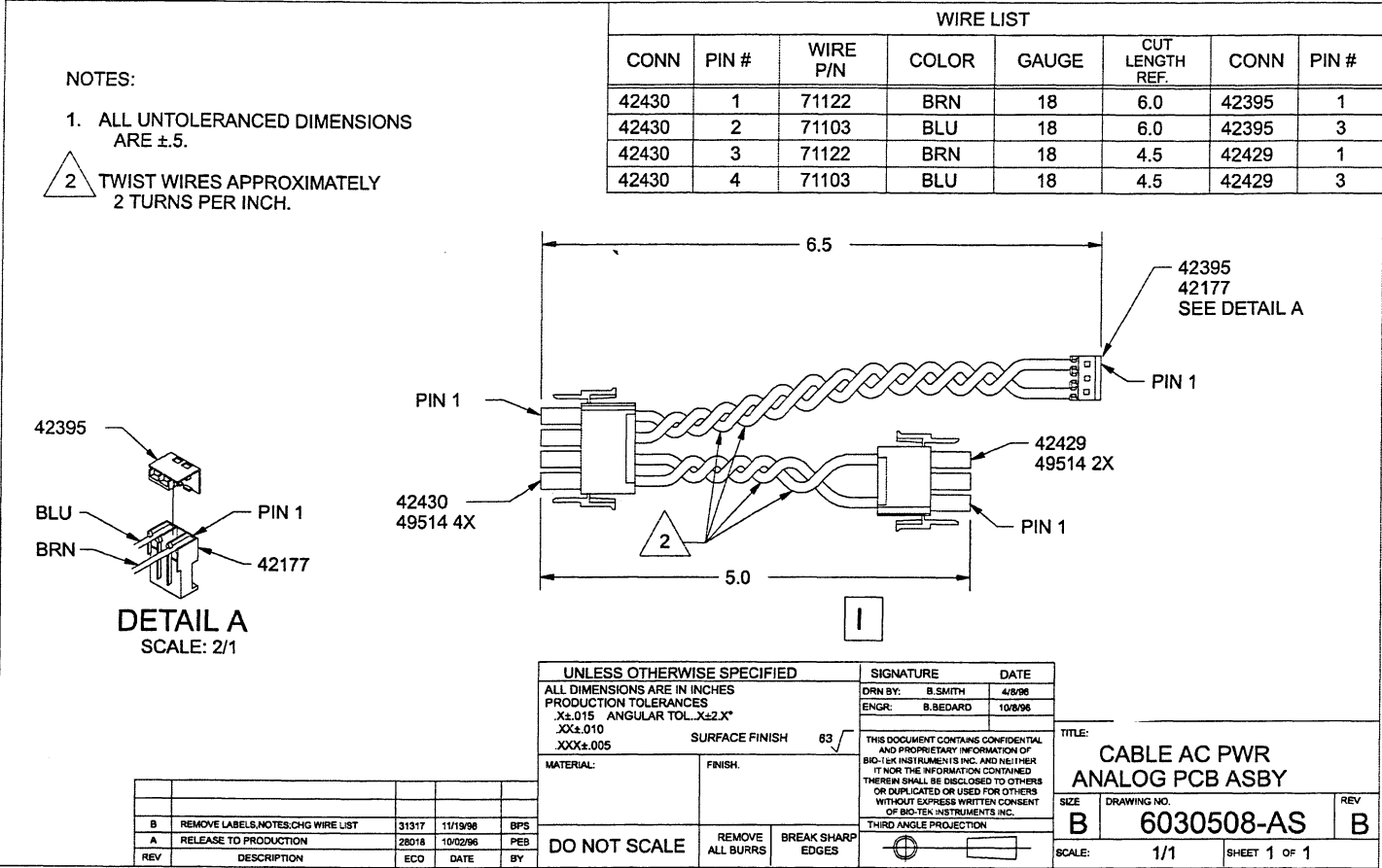
6030507-AS Cable Dc Intcon Asby “Cable E” (Page 1 of 1)

6030507 Cable Dc Intcon Asby “Cable E” BOM

6030506-AS Cable Xfmr Cur Source Asby rev D As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42053	TERM FTAB .25 16-14 INS	D	2	USED ON CABLE G
42058	TIE WRAP 3"	A	2	USED ON CABLE G
42430	CONN 4POS MATE-N-LOK	A	2	USED ON CABLE G
48223	LABEL, CABLE .50 X .35 X .75	B	2	USED ON CABLE G
49514	PIN MATE-N-LOK 20-14-AWG	B	4	USED ON CABLE G
6030506-AS	-CABLE XFMR CUR SOURCE ASBY	E	0	DOCUMENT ONLY
6032002	TRANSFORMER CURRENT SOURCE	B	1	USED ON CABLE G



6030507-AS Cable Dc Intcon Asby rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42477	TERM CRIMP FEMALE 22-26AWG	B	12	USED ON CABLE E
42487	CONN 6P POL/LAT .1 UNLD RCT	B	2	USED ON CABLE E
6030507-AS	-CABLE DC INTCON ASBY	C	0	DOCUMENT ONLY
71003	WIRE 22AWG 10-COND RIBBON	B	0.5	6" USED ON CABLE E



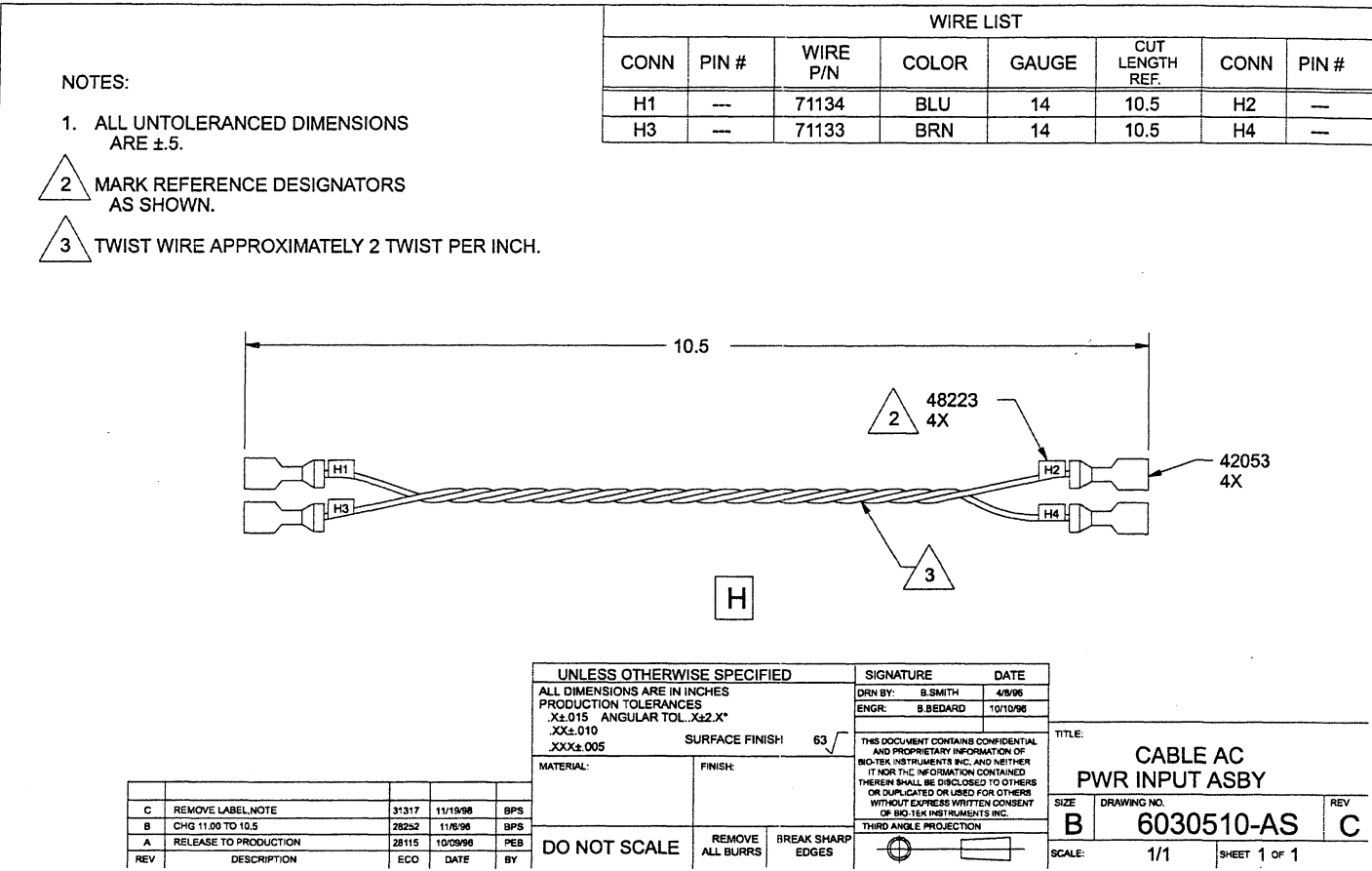
6030508-AS Cable Ac Pwr Analog Pcb Asby “Cable I” (Page 1 of 1)

6030508 Cable Ac Pwr Analog Pcb Asby “Cable I” BOM

6030510-AS Cable Ac Pwr Input Asby “Cable H” (Page 1 of 1)

6030510 Cable Ac Pwr Input Asby “Cable H” BOM

6030508-AS Cable Ac Pwr Analog Pcb Asby rev B As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42177	INDS 3-S .156 18GA	A	1	USED ON CABLE I
42395	STRAINRELIEF-INDS 3-S .156	A	1	USED ON CABLE I
42429	CONN 3POS MATE-N-LOK	A	1	USED ON CABLE I
42430	CONN 4POS MATE-N-LOK	A	1	USED ON CABLE I
49514	PIN MATE-N-LOK 20-14-AWG	B	6	USED ON CABLE I
6030508-AS	-CABLE AC PWR ANALOG PCB ASBY	B	0	DOCUMENT ONLY
71103	WIRE 18AWG UL1007 LIGHT BLUE	D	0.9	4.5".6", USED ON CABLE I
71122	WIRE 18AWG UL1007 BROWN	A	0.9	4.5".6", USED ON CABLE I



Front:

6030508-AS Cable Ac Pwr Analog Pcb Asby “Cable I” (Page 1 of 1)

6030508 Cable Ac Pwr Analog Pcb Asby “Cable I” BOM

6030510-AS Cable Ac Pwr Input Asby “Cable H” (Page 1 of 1)

6030510 Cable Ac Pwr Input Asby “Cable H” BOM

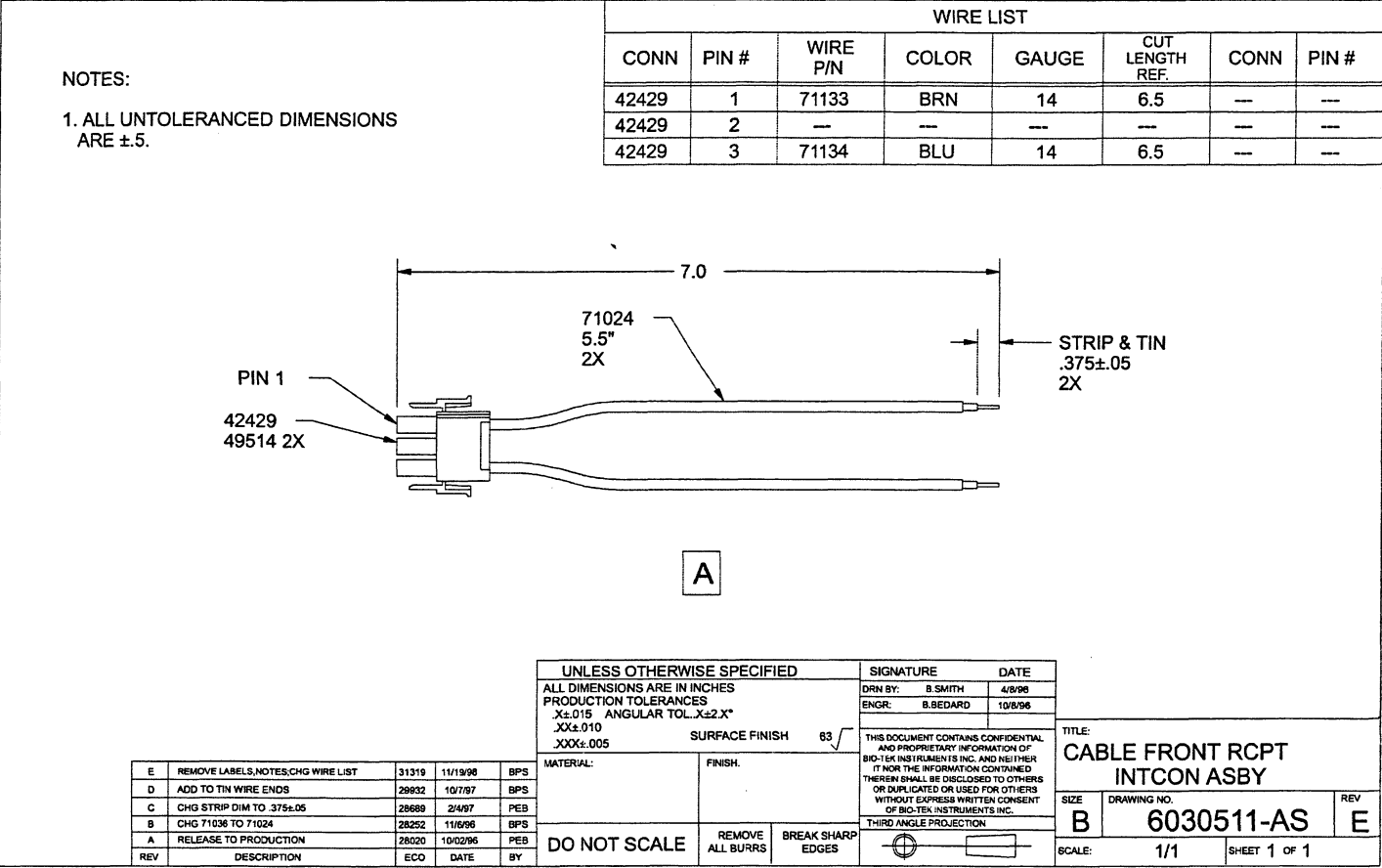
Back:

6030511-AS Cable Front Rept Intcon Asby “Cable A” (Page 1 of 1)

6030511 Cable Front Rept Intcon Asby “Cable A” BOM

6030512-AS Cable Ecg Asby “Cable D” (Page 1 of 1)

6030512 Cable Ecg Asby “Cable D” BOM



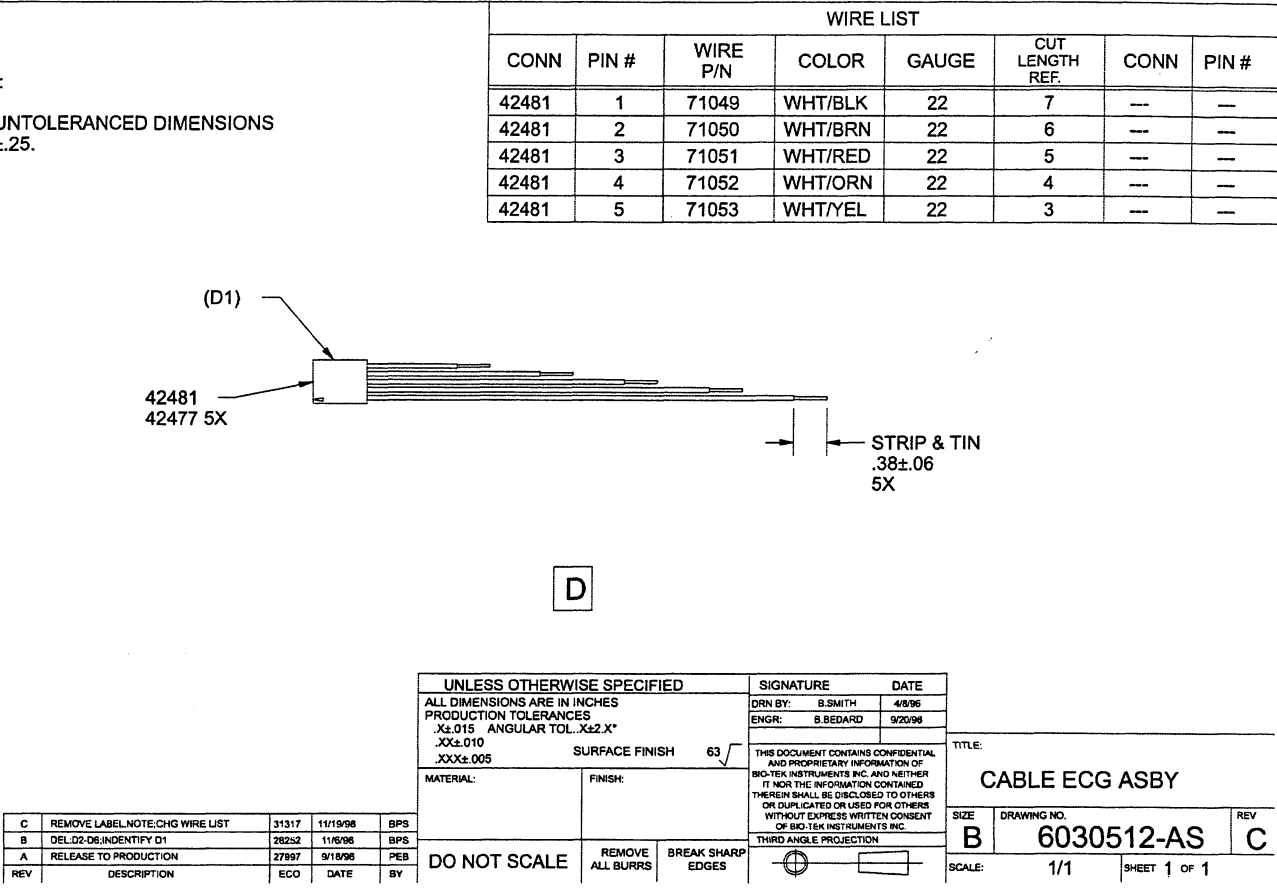
6030511-AS Cable Front Rcpt Intcon Asby “Cable A” (Page 1 of 1)

6030511 Cable Front Rcpt Intcon Asby “Cable A” BOM

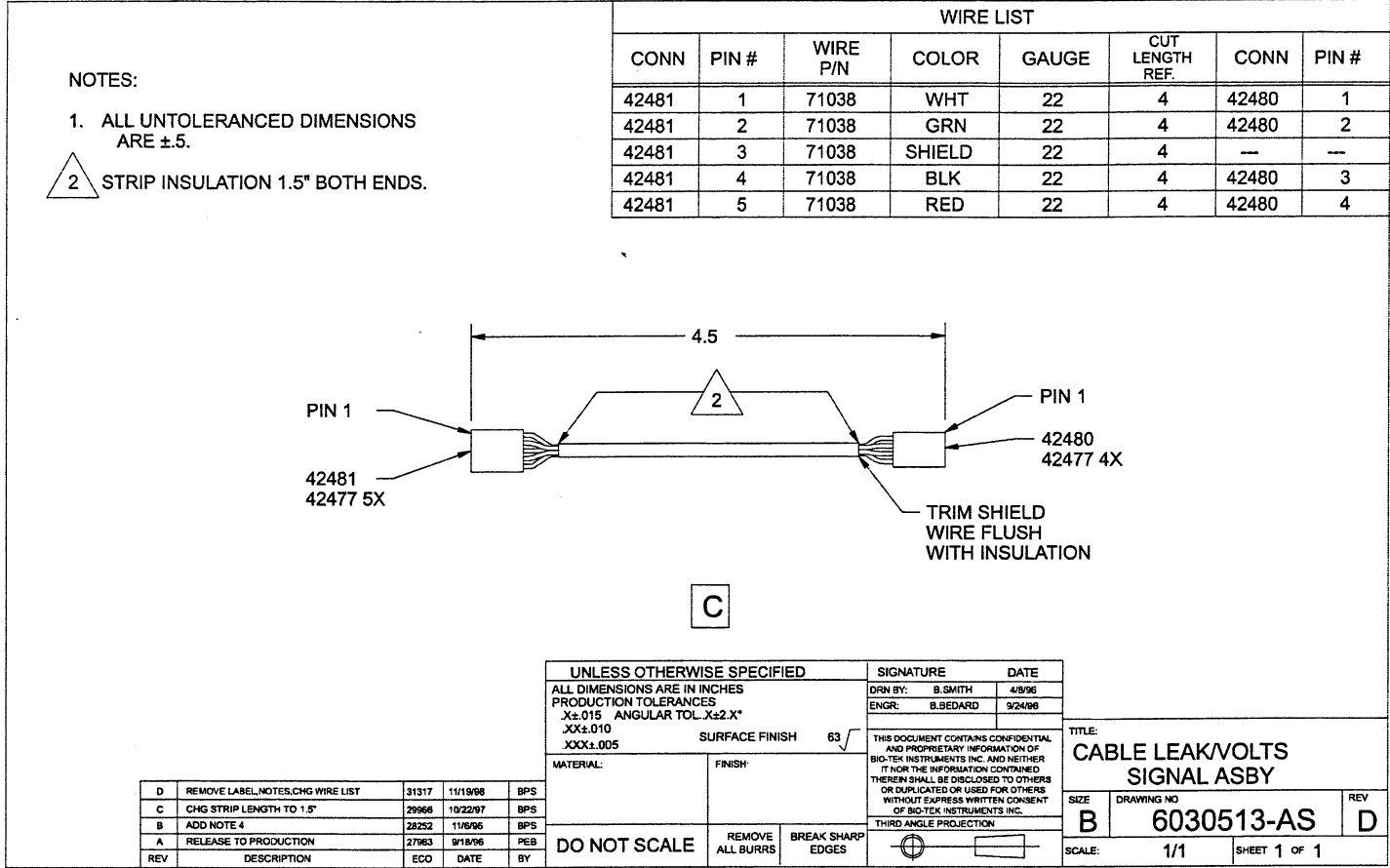
6030512-AS Cable Ecg Asby “Cable D” (Page 1 of 1)

6030512 Cable Ecg Asby “Cable D” BOM

6030511-AS Cable Front Rcpt Intcon Asby rev E As of 12-10-01					
Item	Description	Rev	Qty	Remarks	
42429	CONN 3POS MATE-N-LOK	A	1	USED ON CABLE A	
49514	PIN MATE-N-LOK 20-14-AWG	B	2	USED ON CABLE A	
6030511-AS	-CABLE FRONT RCPT INTCON ASBY	E	0	DOCUMENT ONLY	
71024	SHRINK TUBE 1/8"	B	1	5.5"(2X) USED ON CABLE A	
71133	WIRE 14AWG MIL-W-16878 BROWN	A	0.6	6.5", USED ON CABLE A	
71134	WIRE 14AWG MIL-W-16878 LT BLUE	A	0.6	6.5", USED ON CABLE A	



6030512-AS Cable Ecg Asby rev C As of 12-10-01					
Item	Description	Rev	Qty	Remarks	
42477	TERM CRIMP FEMALE 22-26AWG	B	5	USED ON CABLE D	
42481	CONN 5P POL/LAT .1 UNLOAD RCT	A	1	USED ON CABLE D	
6030512-AS	-CABLE ECG ASBY	C	0	DOCUMENT ONLY	
71049	WIRE 22AWG MIL-W-16878 WHT/BLK	A	0.58	7", USED ON CABLE D	
71050	WIRE 22AWG MIL-W-16878 WHT/BRN	A	0.5	6", USED ON CABLE D	
71051	WIRE 22AWG MIL-W-16878 WHT/RED	A	0.42	5", USED ON CABLE D	
71052	WIRE 22AWG MIL-W-16878 WHT/ORN	A	0.34	4", USED ON CABLE D	
71053	WIRE 22AWG MIL-W-16878 WHT/YEL	A	0.25	3", USED ON CABLE D	



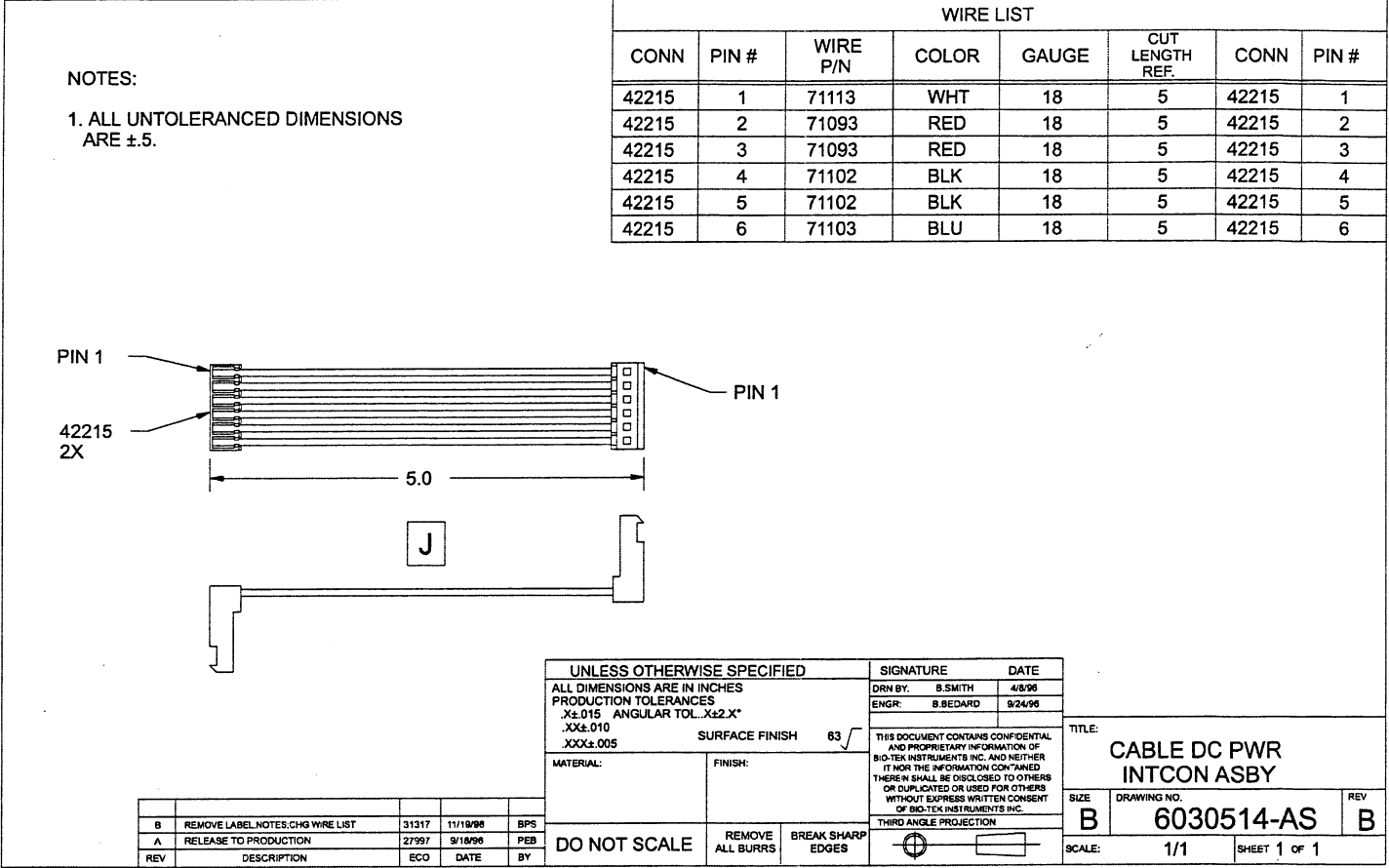
6030513-AS Cable Leak/Volts Signal Asby “Cable C” (Page 1 of 1)

6030513 Cable Leak/Volts Signal Asby “Cable C” BOM

6030514-AS Cable Dc Pwr Intcon Asby “Cable J” (Page 1 of 1)

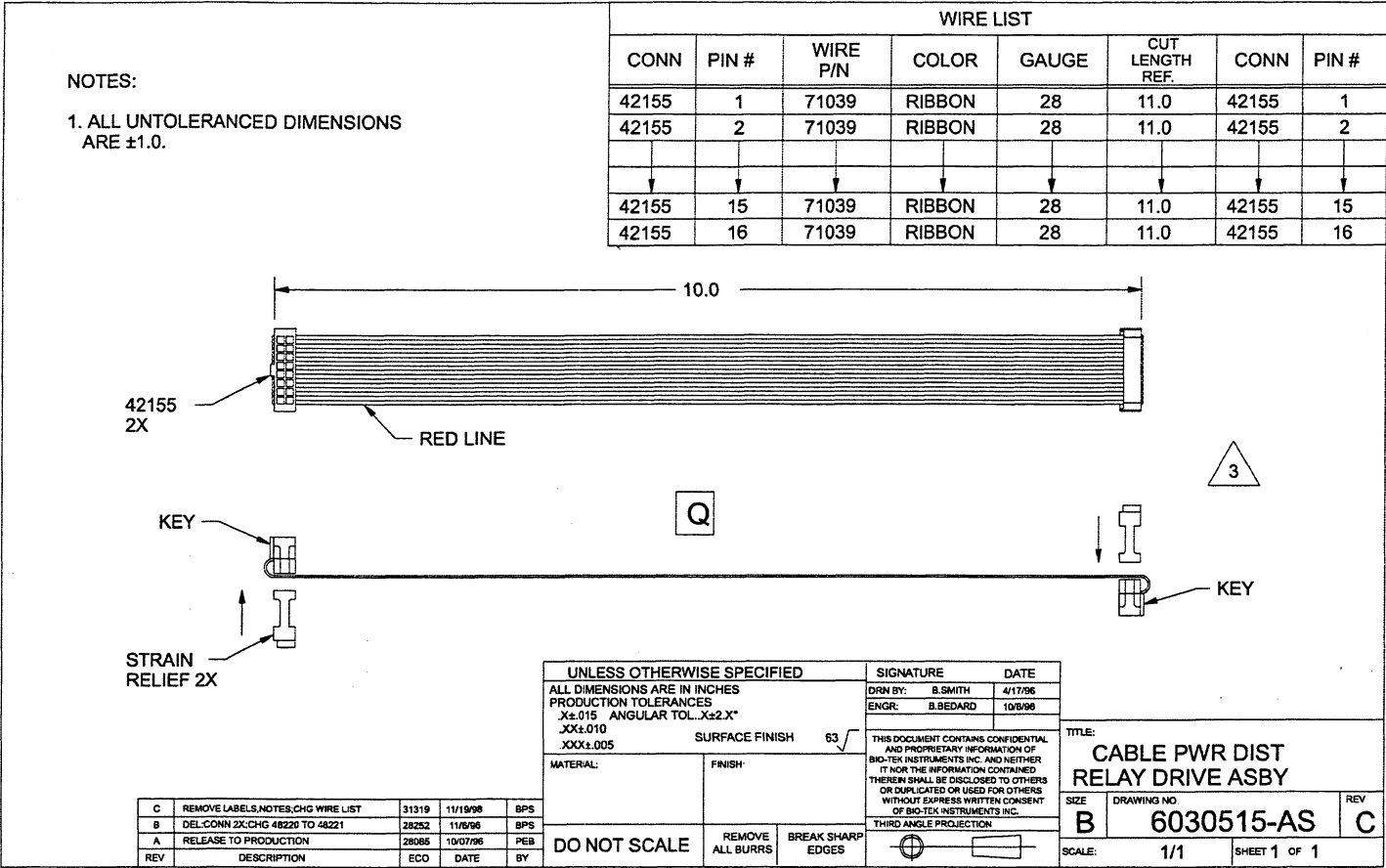
6030514 Cable Dc Pwr Intcon Asby “Cable J” BOM

6030513-AS Cable Leak/Volts Signal Asby rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42477	TERM CRIMP FEMALE 22-26AWG	B	9	USED ON CABLE C
42480	CONN 4P POL/LAT .1 UNLOAD RCT	A	1	USED ON CABLE C
42481	CONN 5P POL/LAT .1 UNLOAD RCT	A	1	USED ON CABLE C
6030513-AS	-CABLE LEAK/VOLTS SIGNAL ASBY	D	0	DOCUMENT ONLY
71038	WIRE 22AWG 4COND TWPR SHLD DR	A	0.34	4", USED ON CABLE C



6030514-AS Cable Dc Pwr Intcon Asby rev B As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42215	CONN 6-P .156 CTR 18GA ID	A	2	USED ON CABLE J
6030514-AS	-CABLE DC PWR INTCON ASBY	B	0	DOCUMENT ONLY
71093	WIRE 18AWG UL1007 RED	B	0.84	2 @ 5", USED ON CABLE J
71102	WIRE 18AWG UL1007 BLACK	A	0.84	2 @ 5", USED ON CABLE J
71103	WIRE 18AWG UL1007 LIGHT BLUE	D	0.42	5", USED ON CABLE J
71113	WIRE 18AWG UL1007 WHITE	B	0.42	5", USED ON CABLE J

Front:
6030513-AS Cable Leak/Volts Signal Asby “Cable C” (Page 1 of 1)
6030513 Cable Leak/Volts Signal Asby “Cable C” BOM
6030514-AS Cable Dc Pwr Intcon Asby “Cable J” (Page 1 of 1)
6030514 Cable Dc Pwr Intcon Asby “Cable J” BOM
Back:
6030515-AS Cable Pwr Dist Relay Dr Asby “Cable Q” (Page 1 of 1)
6030515 Cable Pwr Dist Relay Dr Asby “Cable Q” BOM
6030516-AS Cable Analog Relay Drive Asby “Cable L” (Page 1 of 1)
6030516 Cable Analog Relay Drive Asby “Cable L” BOM



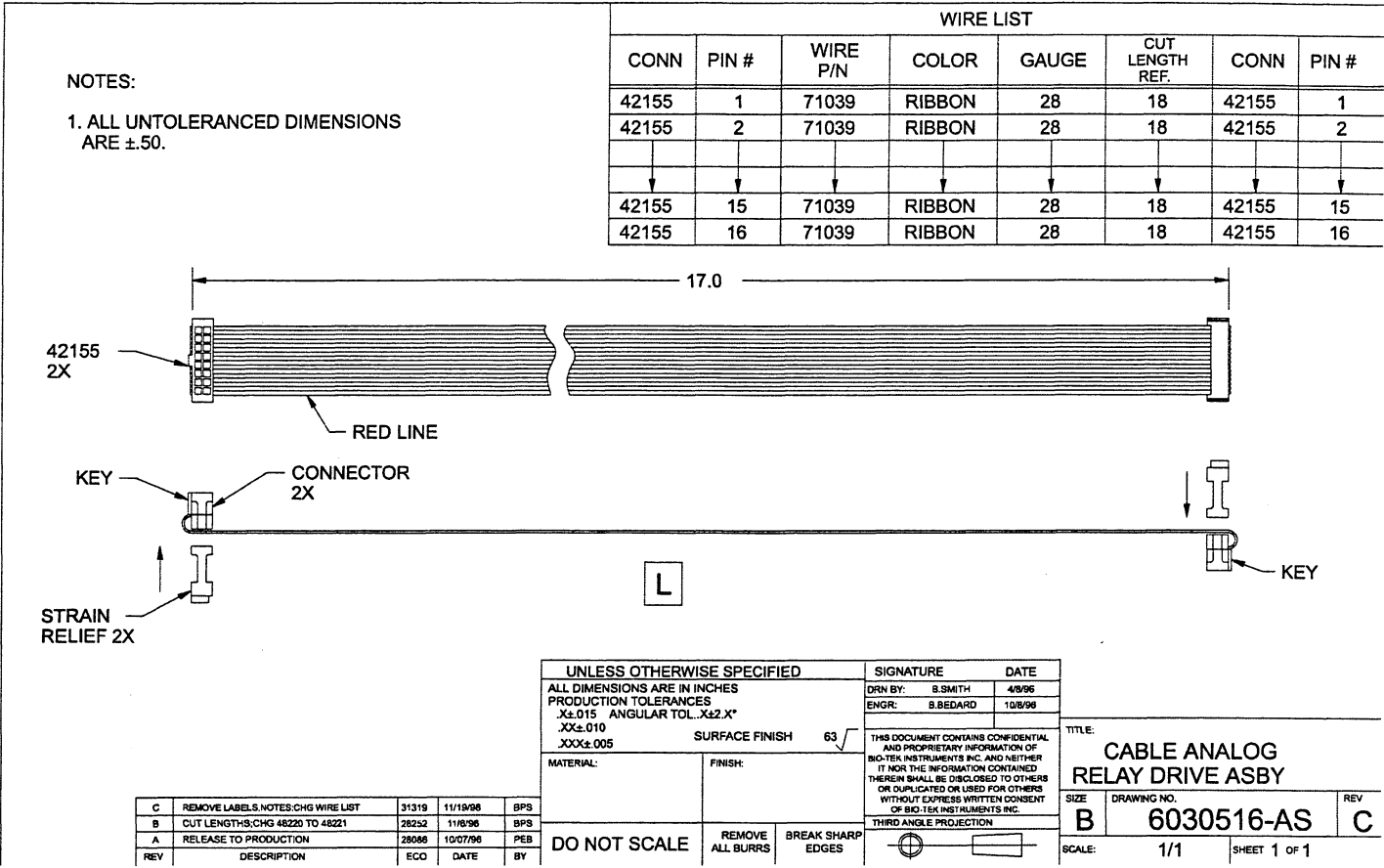
6030515-AS Cable Pwr Dist Relay Dr Asby “Cable Q” (Page 1 of 1)

6030515 Cable Pwr Dist Relay Dr Asby “Cable Q” BOM

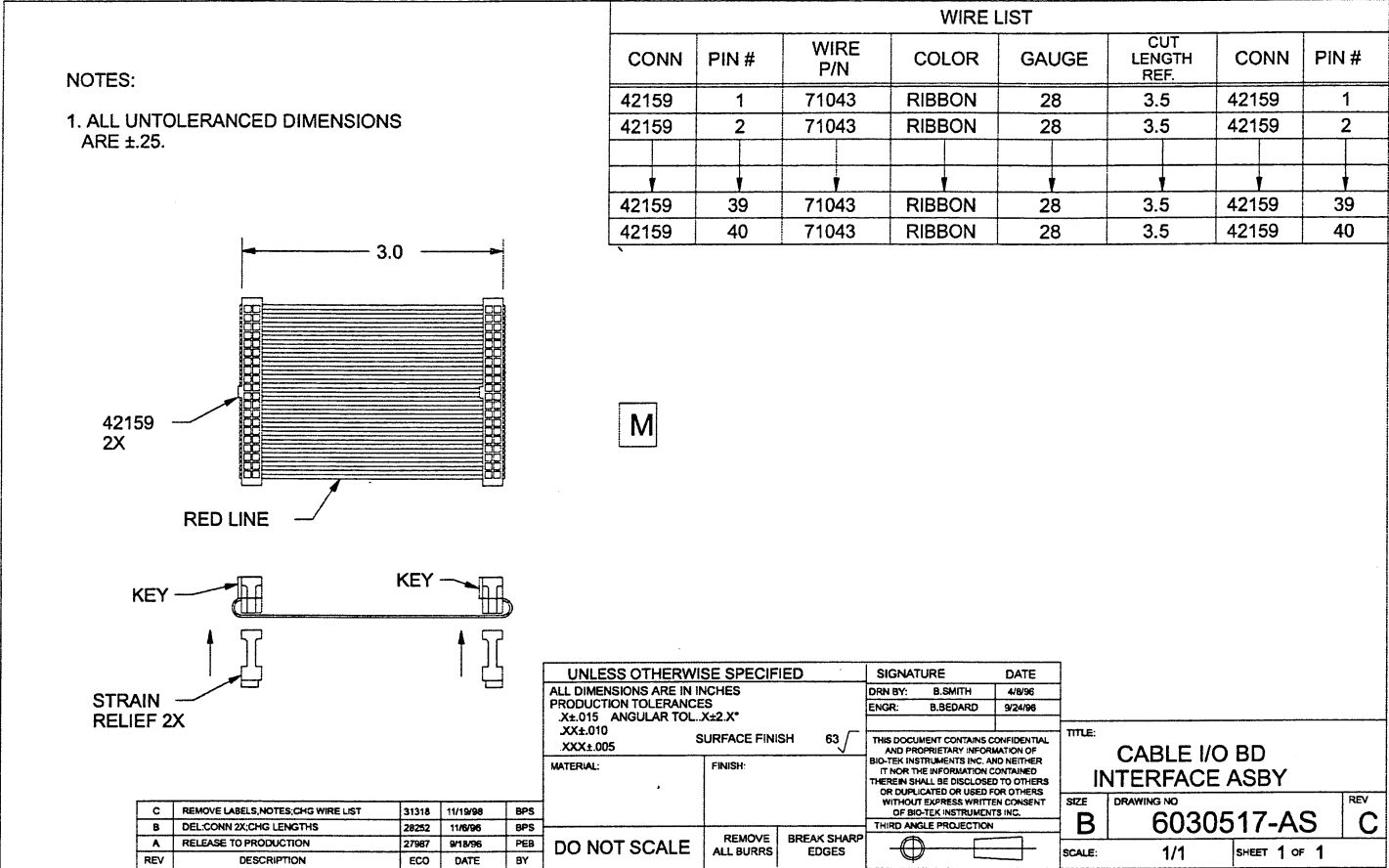
6030516-AS Cable Analog Relay Drive Asby “Cable L” (Page 1 of 1)

6030516 Cable Analog Relay Drive Asby “Cable L” BOM

6030515-AS Cable Pwr Dist Relay Dr Asby rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42155	INSD 16-S .1 x .1 28GA GOLD	B	2	USED ON CABLE Q
6030515-AS	-CABLE PWR DIST RELAY DR ASBY	C	0	DOCUMENT ONLY
71039	WIRE 28AWG 16-COND RIBBON GRAY	A	0.92	11", USED ON CABLE Q



6030516-AS Cable Analog Relay Drive Asby rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42155	INSD 16-S .1 x .1 28GA GOLD	B	2	USED ON CABLE L
6030516-AS	-CABLE ANALOG RELAY DRIVE ASBY	C	0	DOCUMENT ONLY
71039	WIRE 28AWG 16-COND RIBBON GRAY	A	1.5	18" USED ON CABLE L



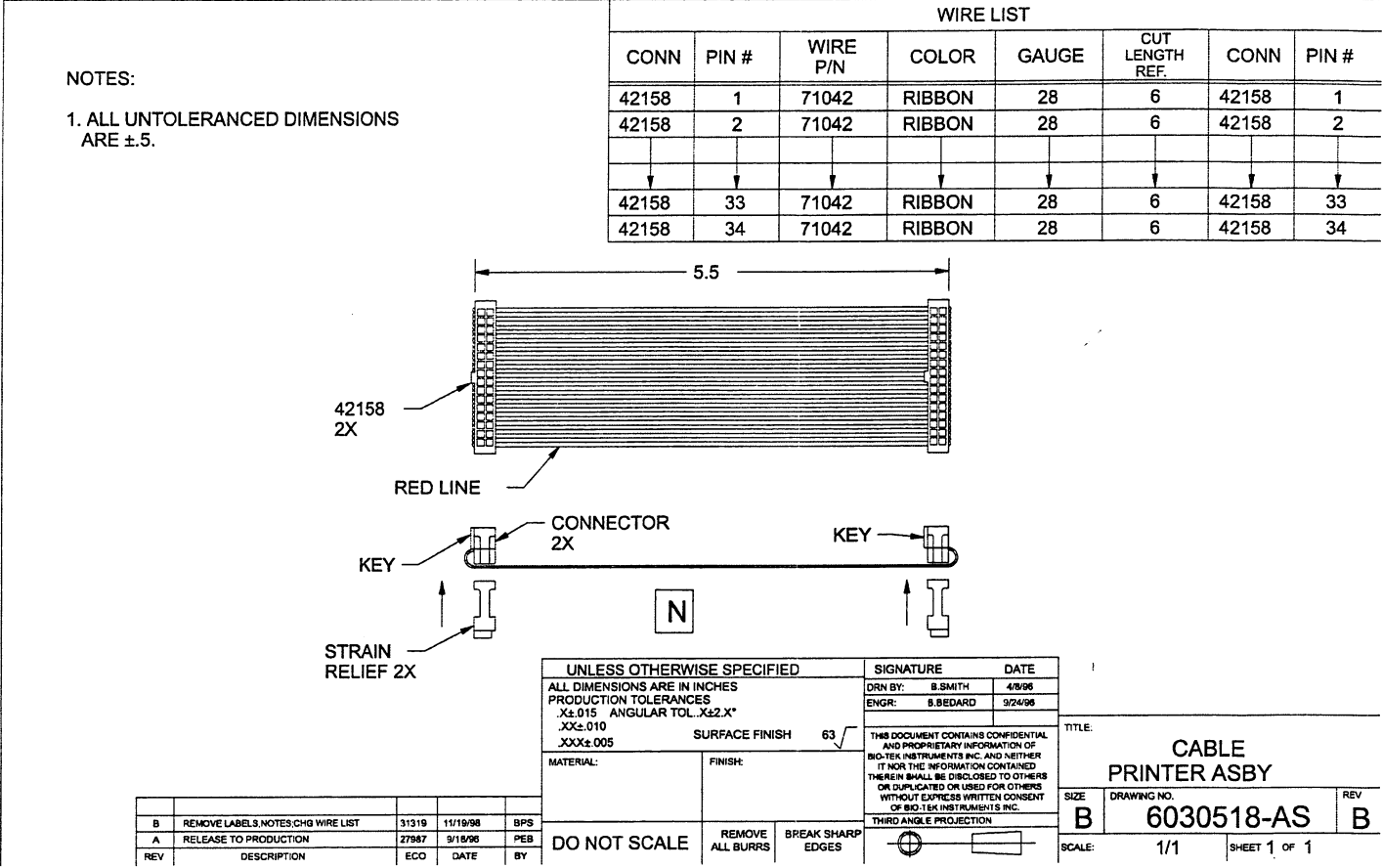
6030517-AS Cable I/O Bd Interface Asby “Cable M” (Page 1 of 1)

6030517 Cable I/O Bd Interface Asby “Cable M” BOM

6030518-AS Cable Printer Asby “Cable N” (Page 1 of 1)

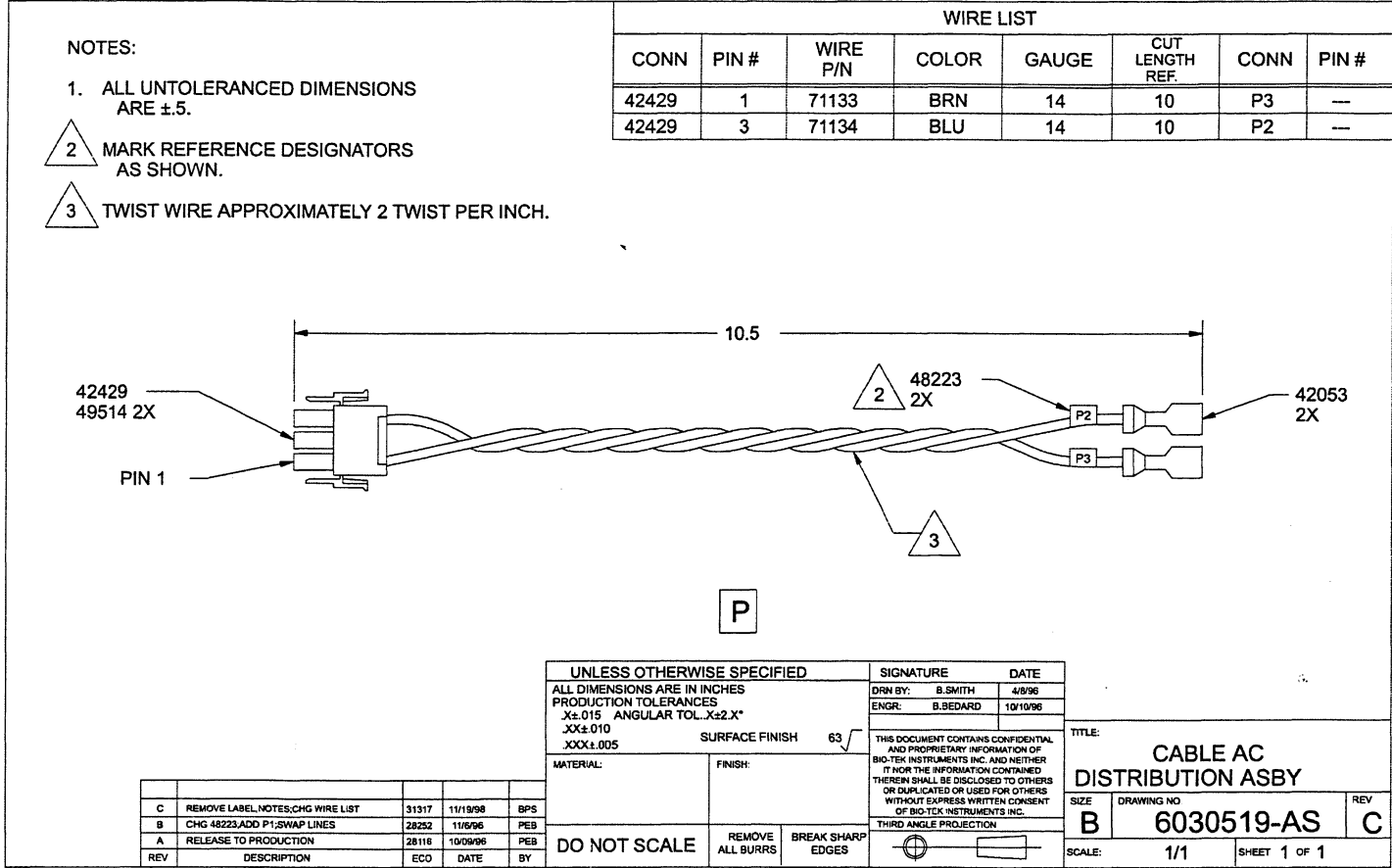
6030518 Cable Printer Asby “Cable N” BOM

6030517-AS Cable I/O Bd Interface Asby rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42159	INSD 40-S .1 x .1 28GA GOLD	B	2	USED ON CABLE M
6030517-AS	CABLE I/O BD INTERFACE ASBY	C	0	DOCUMENT ONLY
71043	WIRE 28AWG 40-COND RIBBON GRAY	A	0.3	3.5" USED ON CABLE M



6030518-AS Cable Printer Asby rev B As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42158	INSD 34-S .1 x .1 28GA GOLD	C	2	USED ON CABLE N
6030518-AS	-CABLE PRINTER ASBY	B	0	DOCUMENT ONLY
71042	WIRE 28AWG 34-COND RIBBON GRAY	A	0.5	6", USED ON CABLE N

Front:
6030517-AS Cable I/O Bd Interface Asby “Cable M” (Page 1 of 1)
6030517 Cable I/O Bd Interface Asby “Cable M” BOM
6030518-AS Cable Printer Asby “Cable N” (Page 1 of 1)
6030518 Cable Printer Asby “Cable N” BOM
Back:
6030519-AS Cable Ac Distribution Asby “Cable P” (Page 1 of 1)
6030519 Cable Ac Distribution Asby “Cable P” BOM
6030521-AS Cable Ground Wire Asby “Cable R” (Page 1 of 1)
6030521 Cable Ground Wire Asby “Cable R” BOM



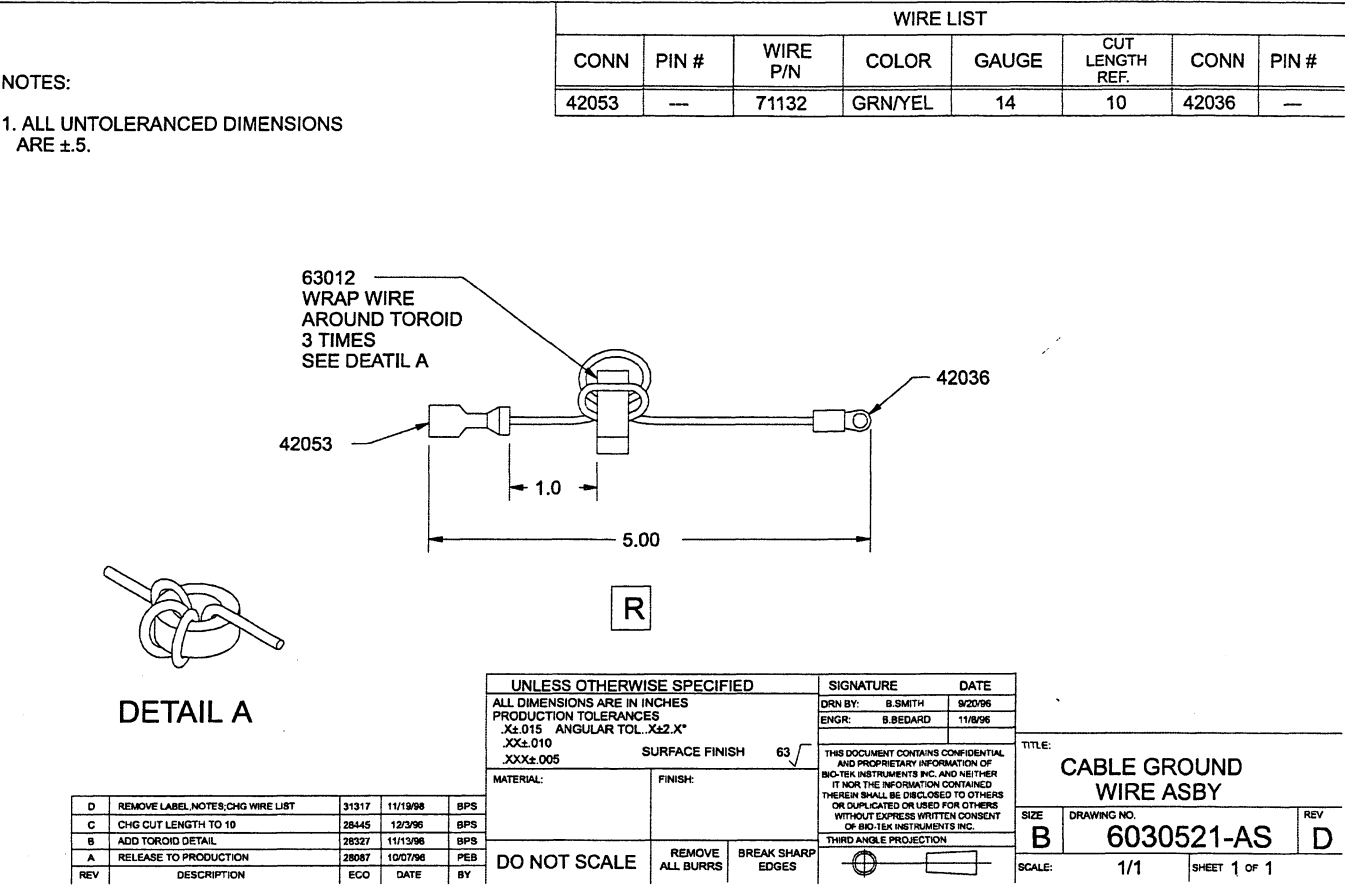
6030519-AS Cable Ac Distribution Asby “Cable P” (Page 1 of 1)

6030519 Cable Ac Distribution Asby “Cable P” BOM

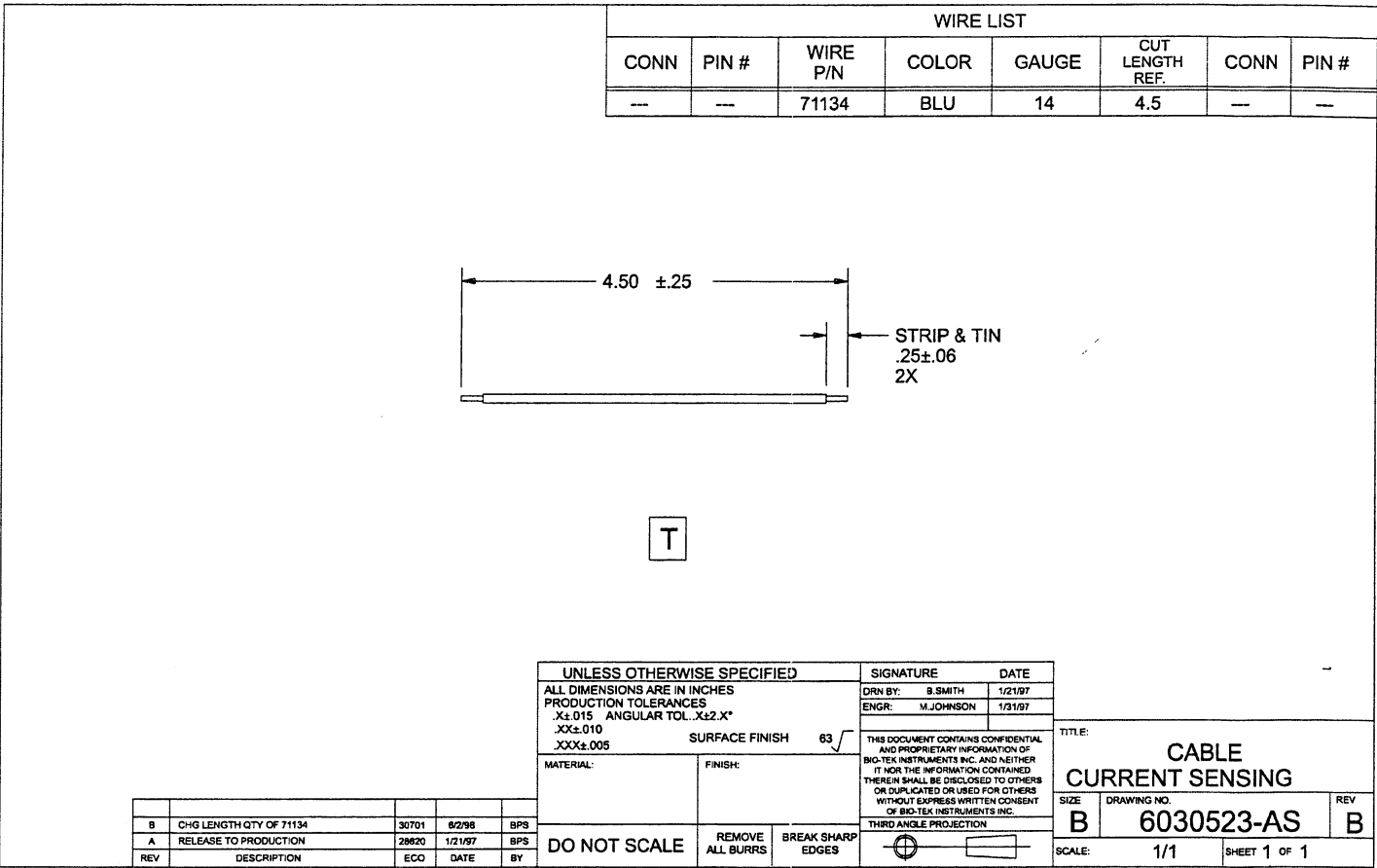
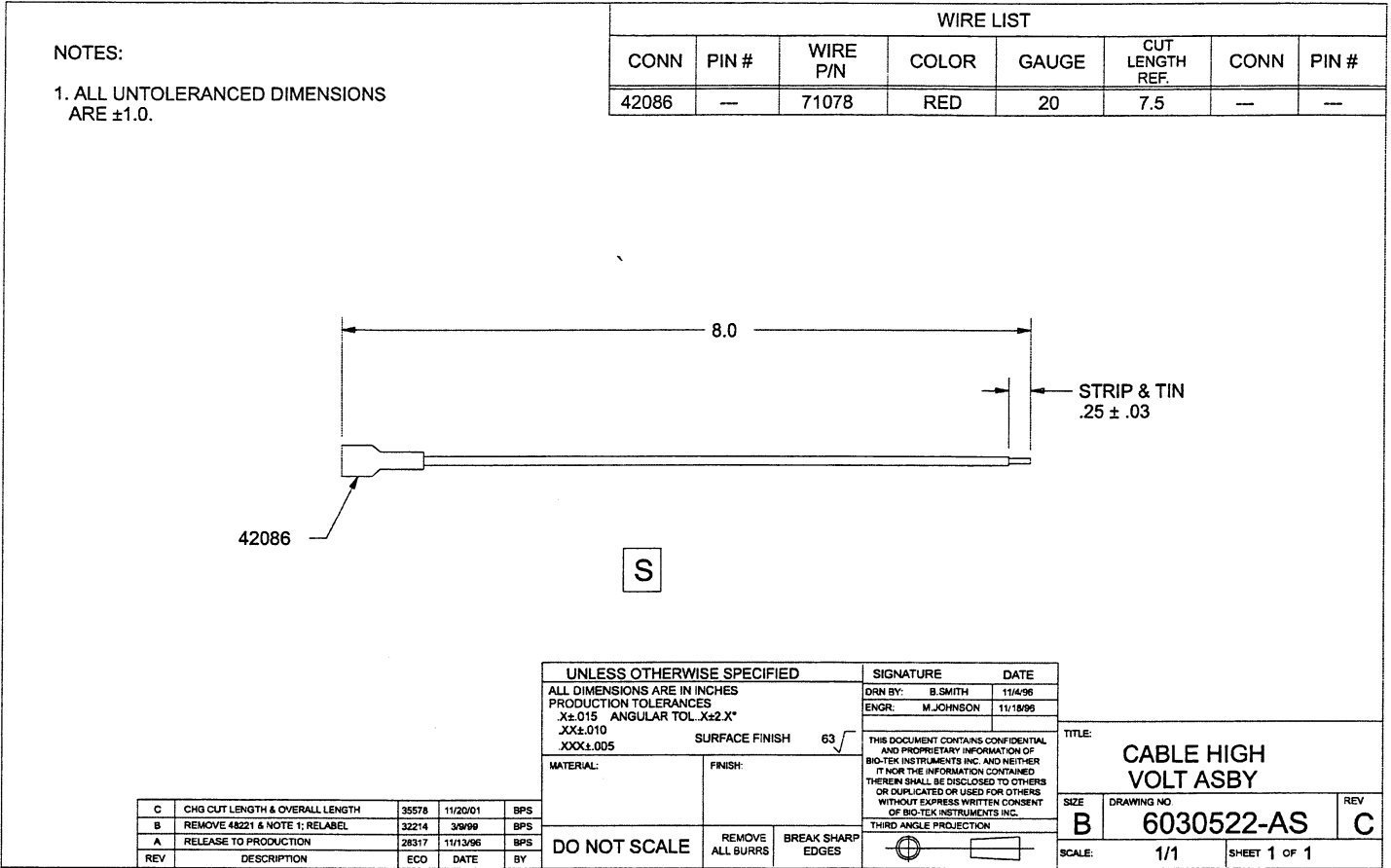
6030521-AS Cable Ground Wire Asby “Cable R” (Page 1 of 1)

6030521 Cable Ground Wire Asby “Cable R” BOM

6030519-AS Cable Ac Distribution Asby rev C As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42053	TERM FTAB .25 16-14 INS	D	2	USED ON CABLE P
42429	CONN 3POS MATE-N-LOK	A	1	USED ON CABLE P
48223	LABEL, CABLE .50 X .35 X .75	B	2	USED ON CABLE P
49514	PIN MATE-N-LOK 20-14-AWG	B	2	USED ON CABLE P
6030519-AS	-CABLE AC DISTRIBUTION ASBY	C	0	DOCUMENT ONLY
71133	WIRE 14AWG MIL-W-16878 BROWN	A	0.84	10", USED ON CABLE P
71134	WIRE 14AWG MIL-W-16878 LT BLUE	A	0.84	10", USED ON CABLE P



6030521-AS Cable Ground Wire Asby rev D As of 12-10-01				
Item	Description	Rev	Qty	Remarks
42036	TERM RING #6 16-14 GA INS	E	1	USED ON CABLE R
42053	TERM FTAB .25 16-14 INS	D	1	USED ON CABLE R
6030521-AS	-CABLE GROUND WIRE ASBY	D	0	DOCUMENT ONLY
63012	INDUCTOR TOROID	B	1	USED ON CABLE R
71132	WIRE 14AWG UL1015 GRN/YEL	A	0.83	10", USED ON CABLE R



6030522-AS Cable High Volt Asaby “Cable S” (Page 1 of 1)

6030522 Cable High Volt Asaby “Cable S” BOM

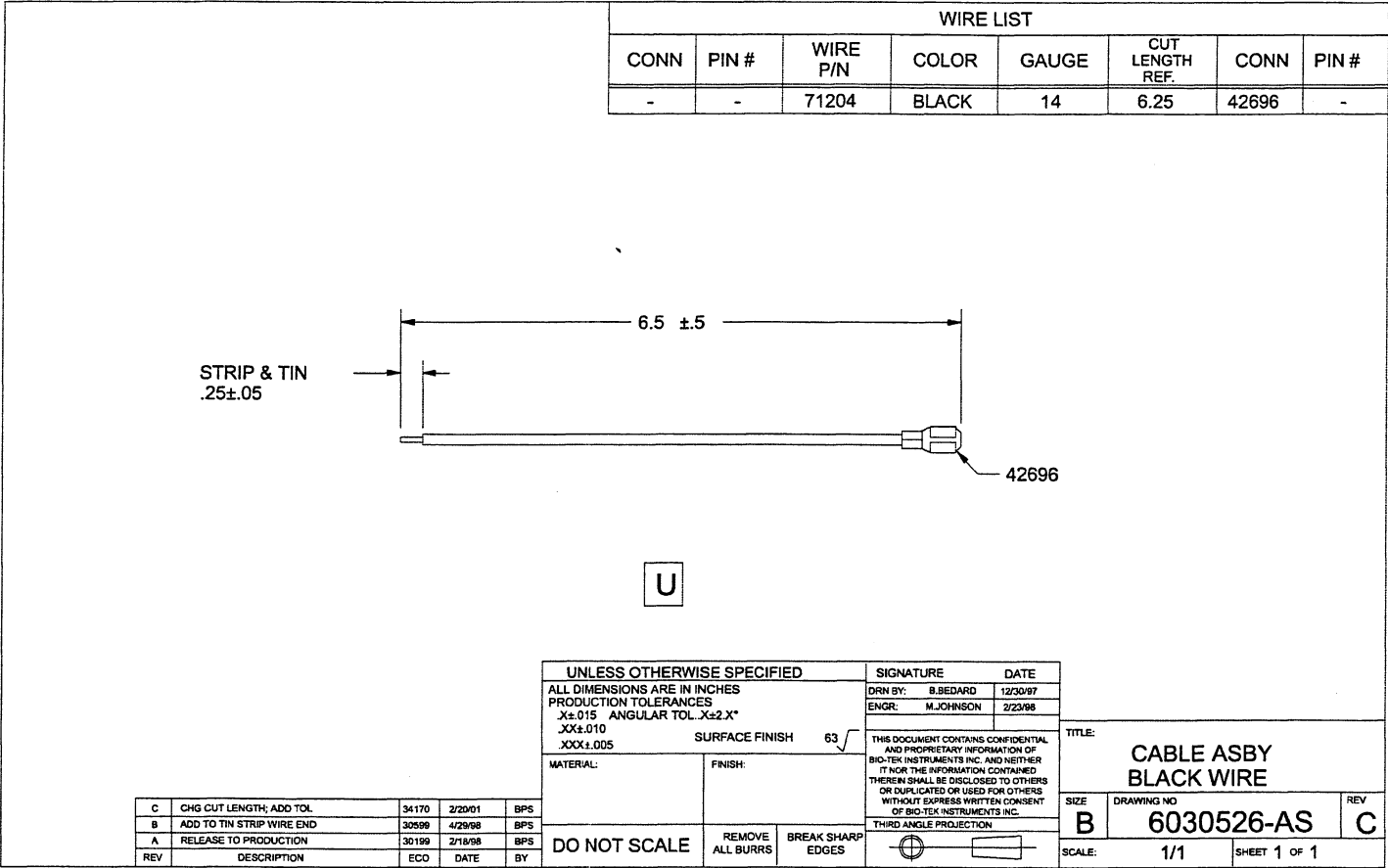
6030523-AS Cable Current Sensing “Cable T” (Page 1 of 1)

6030523 Cable Current Sensing “Cable T” BOM

6030522-AS Cable High Volt Asaby rev C As of 12-10-01					
Item	Description	Rev	Qty	Remarks	
42086	TERM FTAB .25 22-18 INS TL1	C	1	USED ON CABLE S	
6030522-AS	-CABLE HIGH VOLT ASBY	C	0	DOCUMENT ONLY	
71078	WIRE 20AWG UL3239 RED	C	0.625	7.5", USED ON CABLE S	

6030523-AS Cable Current Sensing rev B As of 12-10-01					
Item	Description	Rev	Qty	Remarks	
6030523-AS	-CABLE CURRENT SENSING	B	0	DOCUMENT ONLY	
71134	WIRE 14AWG MIL-W-16878 LT BLUE	A	0.38	4.5", USED ON CABLE T	

Front:
6030522-AS Cable High Volt Asaby “Cable S” (Page 1 of 1)
6030522 Cable High Volt Asaby “Cable S” BOM
6030523-AS Cable Current Sensing “Cable T” (Page 1 of 1)
6030523 Cable Current Sensing “Cable T” BOM
Back:
6030526-AS Cable Asby Black Wire “Cable U” (Page 1 of 1)
6030526 Cable Asby Black Wire “Cable U” BOM
6030527-AS Cable Asby Red Wire “Cable V” (Page 1 of 1)
6030527 Cable Asby Red Wire “Cable V” BOM



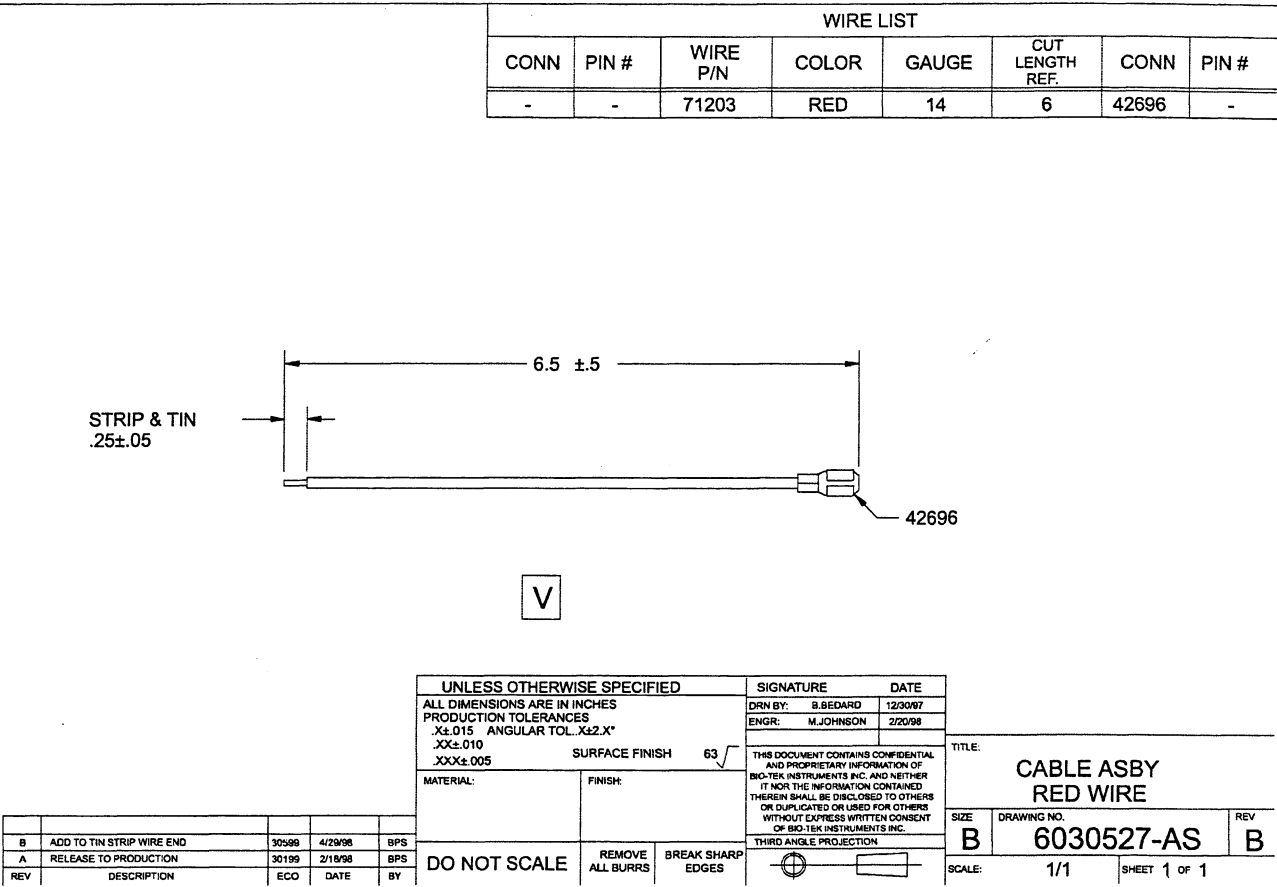
6030526-AS Cable Asby Black Wire “Cable U” (Page 1 of 1)

6030526 Cable Asby Black Wire “Cable U” BOM

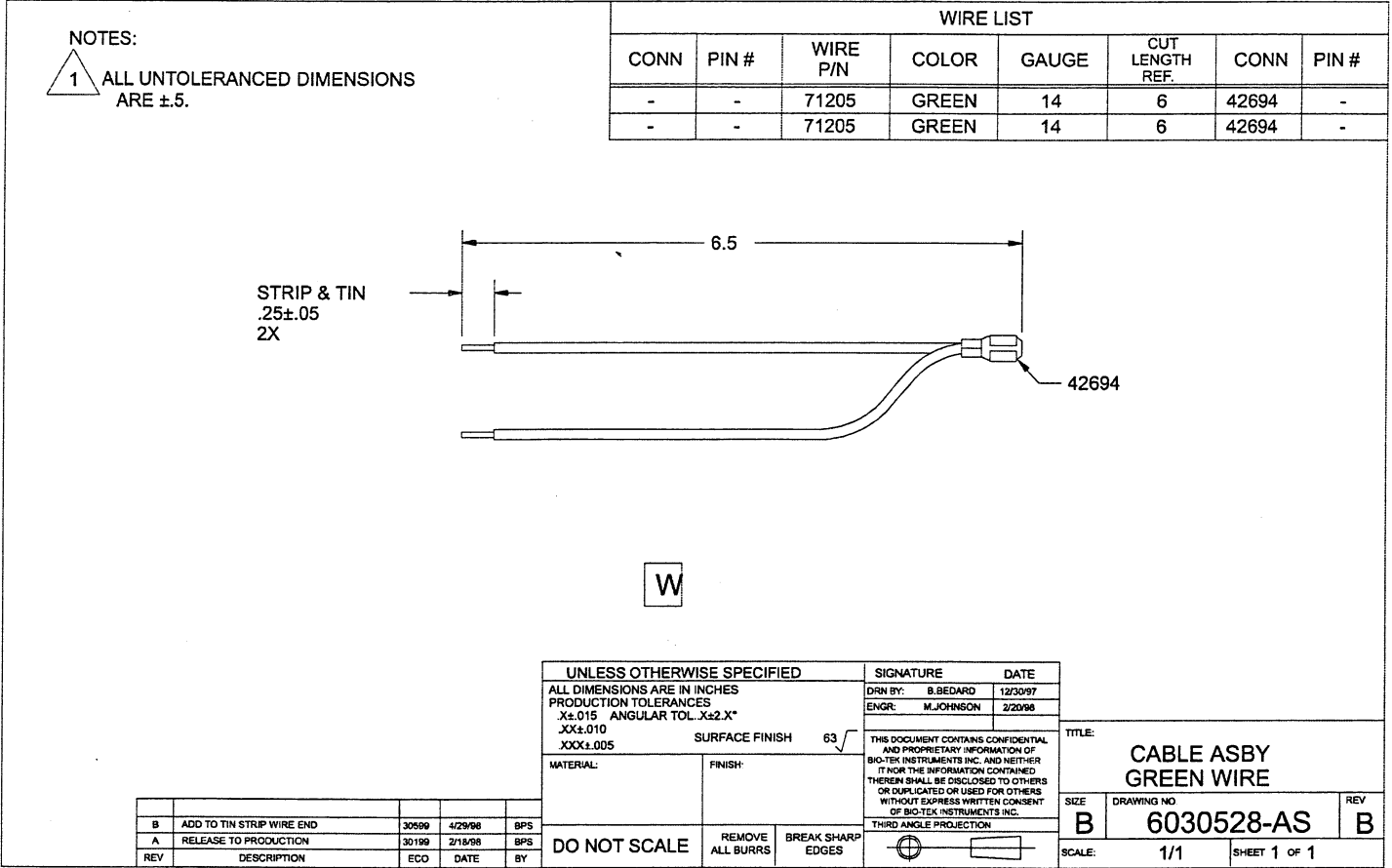
6030527-AS Cable Asby Red Wire “Cable V” (Page 1 of 1)

6030527 Cable Asby Red Wire “Cable V” BOM

6030526-AS Cable Asby Black Wire rev A As of 12-10-01					
Item	Description	Rev	Qty	Remarks	
42696	TERM FTAB.187 16-14AWG UNINSUL	A	1	USED ON CABLE U	
6030526-AS	-CABLE ASBY BLACK WIRE	C	0	DOCUMENT ONLY	
71204	WIRE 14AWG MIL-W-16878 BLACK	A	0.5	6" USED ON CABLE U	



6030527-AS Cable Asby Red Wire rev A As of 12-10-01					
Item	Description	Rev	Qty	Remarks	
42696	TERM FTAB.187 16-14AWG UNINSUL	A	1	USED ON CABLE V	
6030527-AS	-CABLE ASBY RED WIRE	B	0	DOCUMENT ONLY	
71203	WIRE 14AWG MIL-W-16878 RED	A	0.5	6" USED ON CABLE V	

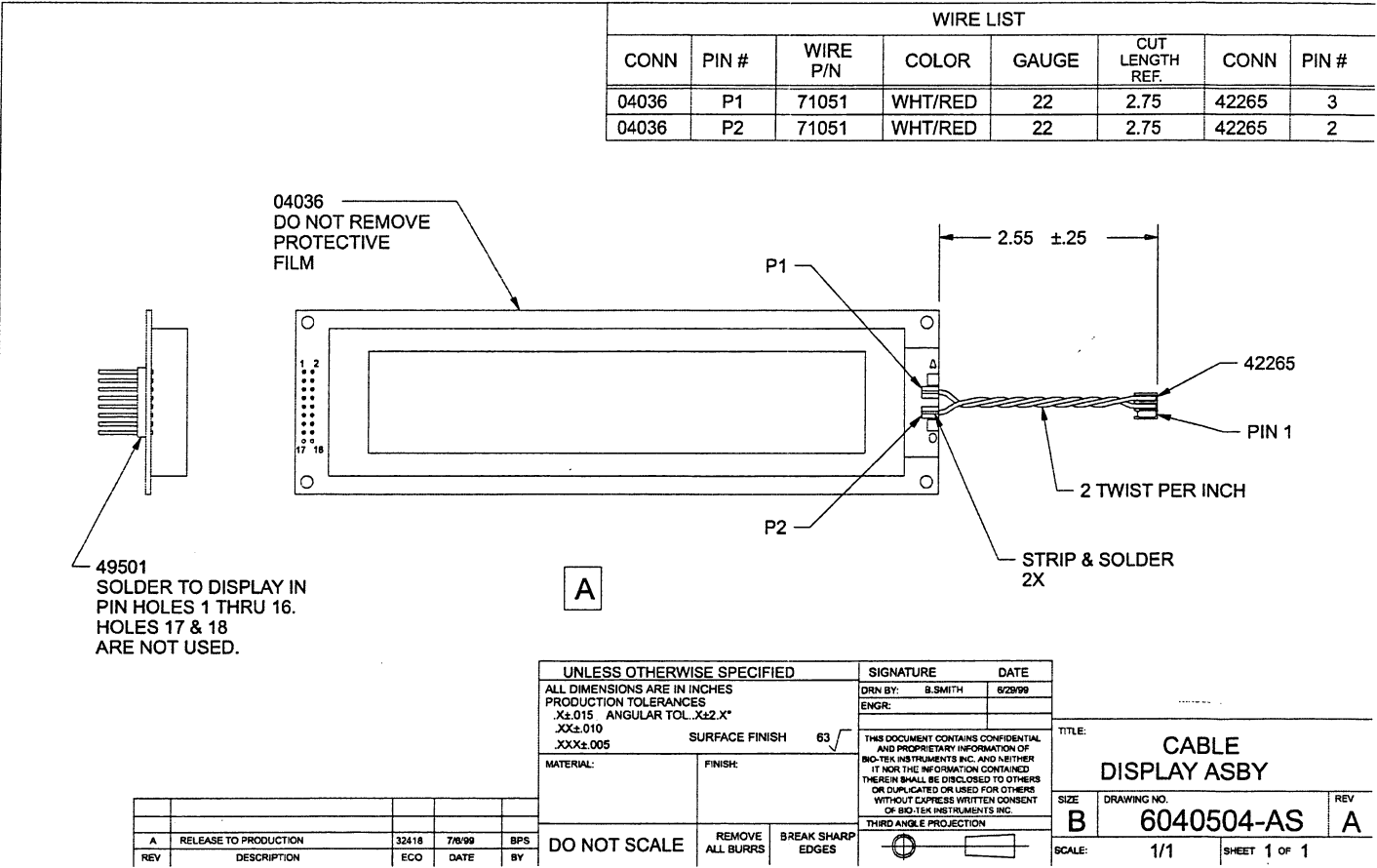


6030528-AS Cable Asby Green Wire “Cable W” (Page 1 of 1)

6030528 Cable Asby Green Wire “Cable W” BOM

6040504-AS Cable Display Asby (Page 1 of 1)

6040504 Cable Display Asby BOM



Front:
6030528-AS Cable Asby Green Wire “Cable W” (Page 1 of 1)
6030528 Cable Asby Green Wire “Cable W” BOM
6040504-AS Cable Display Asby (Page 1 of 1)
6040504 Cable Display Asby BOM
Back:
Blank

Chapter 10

Schematic Drawings

*This chapter contains diagrams
for each section of the
601PRO Series_{XL}, to assist with identification of parts placement.*

Road Map to Schematics and Revisions

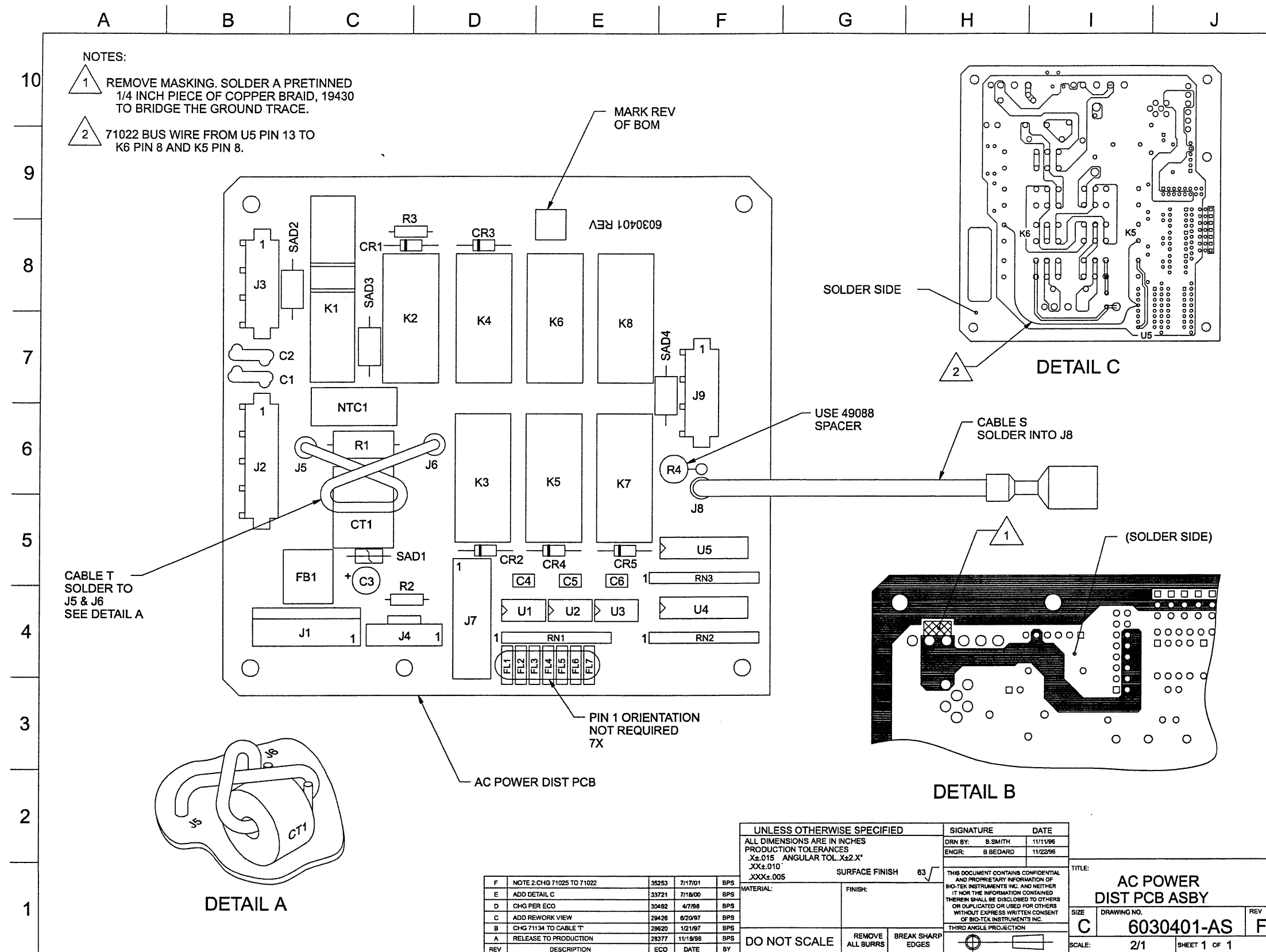
- **Digital PCB Assembly, 6030410-SC, p. 1:** Microprocessor (U1), Address Latches (U11 & U12), I/O decoding (U8), RS232 Driver (U4), clock chip (U3).
- **Digital PCB Assembly, 6030410-SC, p. 2:** External Keyboard Connector and RS232 port connector, Printer latches/connectors, (The external connectors contain a separate ground plane and various EMI and ESC filters).
- **Digital PCB Assembly, 6030410-SC, p. 3:**, External Keyboard controller (U13) and buffers U9), data bus buffer (U14), D/A and differential driver (U15 & U16), 2.5 voltage reference for D/A (U19), voltage inverter U17.
- **Digital PCB Assembly, 6030410-SC, p. 4:** EPROM (U5) with jumpers for size selection, Static RAM(U6), two flash memory ICs (U7 & U18), and a collection of bypass caps.
- **Digital PCB Assembly, 6030410-SC, p. 5:** Output latches and a 3 port I/O controller (U21) that controls the front panel keypad, measurement assembly gain, A/D control, load selection (AAMI, IEC1010, or IEC601); printer status input signals, dipswitch inputs, driver (U24) for sound generator BP1, connection for the display LED back-light (J4), LCD contrast control (RT1).
- **Digital PCB Assembly, 6030410-SC, p. 6:** Parallel latch (U28, U29) to control the power switching relays, and a parallel latch (U26, U27) to control the analog assembly relays (serially controlled) as well as other digital assembly functions. Power for the digital assembly arrives on J1 and is filtered BNX3 and related components.
- **Measurement PCB Assembly, 6040400-SC, p. 1:** Opto-isolators used to float the front end (U2..U7, U13). Signals isolated are for gain control and A/D control; DC low pass filter selection, AAMI and IEC1010 load selectors; 12VDC to +/- 15VDC isolated supply for measurement circuitry (U12); 5VDC isolated supply (from +15VDC).
- **Measurement PCB Assembly, 6040400-SC, p. 2:** Leakage loads (approximately 1KHz cutoff frequency) with switching for IEC601, IEC1010, and AAMI. Low pass filter that can be switched into the leakage channel for DC Only measurements. Voltage measurement resistor network (divides voltage down to a usable range for the instrumentation amp.) Voltage or leakage current channel selection (K3, K5).
- **Measurement PCB Assembly, 6040400-SC, p. 3:** Instrumentation amp, with gain selection (Gains of 1, 10, and 100 are used) (U8), RMS to DC converter (U10), and A/D (with serial output) (U1). K1 selects gains of 0.9804 or 0.5929: it is primarily used for large leakage signals. U11 is used as a ripple filter and A/D input buffer. U9 is needed to buffer the input to RMS converter because the converter's input impedance is low.
- **AC Power Switching PCB Assembly, 6030401-SC, p. 1:** Power switching relays, which control the DUT outlet, including on/off, open neutral, reverse mains; surge suppression, current measuring current transformer, opto coupling drivers and noise suppression used with the power relays, and power supply noise isolation filter.
- **Analog PCB Assembly, 6030529-AS, Rev.C:** Includes mains on applied part hardware leakage compensation circuit and protective earth test improvements to allow testing of instruments containing up to 500mH inductance in the ground connection.
- **Analog PCB Assembly, 6030529-SC, p. 1:** serial to small relay drivers, relay control isolation, with noise suppression, differential amp for ECG driving, main power supply input connector, with noise filtering networks ("PC style supply with auto input voltage ranging circuitry).
- **Analog PCB Assembly, 6030529-SC, p. 2:** DUT current measuring pre-amp. 110% of mains supply with isolated power switch, 115/230 VAC selecting relay for controlling the primary of the protective earth continuity transformer. Signal relay switching and scaling for misc. measurements (Mains voltage, DUT current, Protective earth cal, Protective earth current measurement signal.)
- **Analog PCB Assembly, 6030529-SC, p. 3:** Switching for Applied part leads, ECG signals; an isolated 12 VDC to 500VDC supply for insulation resistance testing; switching to apply 500VDC or 110% of mains to various places, like the applied parts, or DUT mains leads; Front panel red and black, and green jacks are switched here for various measurement.
- **Analog PCB Assembly, 6030529-SC, p. 4:** Protective Earth power supply (1 or 24 amp) with cal circuit; 12vdc to 12vdc isolated power supply for floating control of Protective earth current (PEC); Instrumentation amp for measuring PEC; drivers for on/off and 1/24 Amp control of PEC; Isolated 12 VDC to 12 VDC supply for driving PEC FETs.
- **Analog PCB Assembly, 6030529-SC, p. 5:** Protective Earth power supply, control circuitry; RMS converter for PEC control feedback loop.
- **Analog PCB Assembly, 6030529-SC, p. 5:** Protective Earth power supply, control circuitry; RMS converter for PEC control feedback loop.
- **Keyboard Adaptor PCB, 6040401-SC:** 601 Keyboard Interface to PC/AT Type Keyboard; "Daughter PCB" with keyboard interface IC and oscillator. Replaces keyboard controller and oscillator on 6030410 Digital PCB Assembly.
- **Analog Daughter PCB, 6030408-SC:** Comparators for VSCYCLE with pullup for "posclamp" and "negclamp."

Schematic Assembly Drawings

- 6030401-AS Ac Pwr Distribution Pcb Asby (Page 1 of 1), page 10-5
- 6030408-AS Analog Daughter Pcb Asby (Page 1 of 1), page 10-8
- 6030410-AS Digital Pcb 80188 Asby (Page 1 of 1), page 10-9
- 6030529-AS Analog Pcb W/Daughter Pcb Asby (Page 1 of 2), page 10-17
- 6040400-AS Analog Measurement/Dc Pcb Asby (Page 1 of 1), page 10-25
- 6040401-AS Pcb Keyboard Adapter Asby (Page 1 of 1), page 10-30
- 6040403-AS Keyboard/Daughter Board Asby (Page 1 of 1), page 10-32

Schematics

- 6030401-SC Ac Pwr Distribution Pcb Asby (Page 1 of 1), page 10-7
- 6030408-SC Analog Daughter Pcb Asby (Page 1 of 1), page 10-8
- 6030410-SC Digital Pcb 80188 Asby (Page 1 of 6), page 10-11
- 6030529-SC Analog Pcb W/Daughter Pcb Asby (Page 1 of 5), page 10-20
- 6040400-SC Analog Measurement/Dc Pcb Asby (Page 1 of 3), page 10-27
- 6040401-SC Pcb Keyboard Adapter Asby (Page 1 of 1), page 10-31
- 6040403-SC Keyboard/Daughter Board Asby (Page 1 of 1), page 10-33

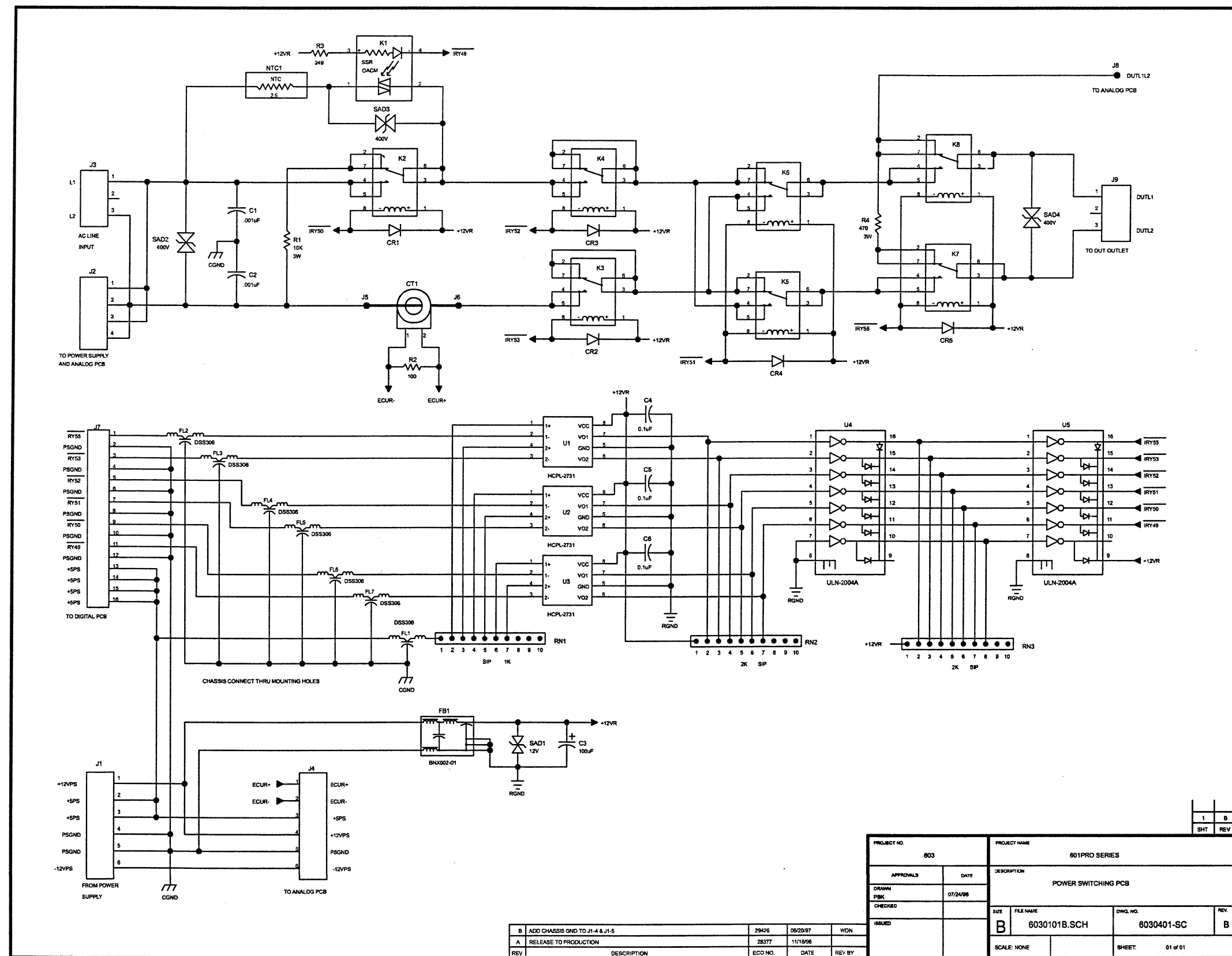


6030401-AS Ac Pwr Distribution Pcb Asby (Page 1 of 1)

Front: 6030401-AS Ac Pwr Distribution Pcb Asby (Page 1 of 1)
 Back: 6030401 Ac Pwr Distribution Pcb Asby BOM

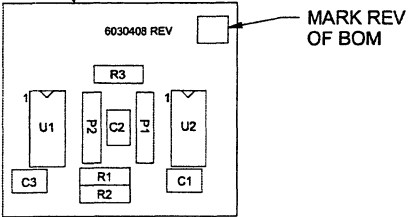
6030401 Ac Pwr Distribution Pcb Asby BOM

6030401-AS Ac Pwr Distribution Pcb Asby rev H As of 12-10-01				
Item	Description	Rev	Qty	Remarks
19430	SOLDER BRAID .220W	A	0	A/R
21004	DIODE 1N4148 SIGNAL	B	5	CR1-5
28014	TRANS ARRAY 2004	B	2	U4,5
28126	IC HCPL2731 DUAL OPTOCOUPLER	A	3	U1-3
29108	TRANSIENT SUPPRESSOR 12V	E	1	SAD1
29112	TRANS ZORB 1.5KE400A 400V	C	3	SAD2-4
32100	RES 100.00 OHM 1% 1/4W	B	1	R2
32111	RES 249.0 OHM 1% 1/4W	B	1	R3
33080	RES 10K OHM 1% 3W	E	1	R1
37108	RESNET 2K 9R10P	A	2	RN2,3
37109	RESNET 1K 9R10P	A	1	RN1
38083	RES 470 OHMS 1% 3W	A	1	R4
42214	HEDR 6-P .156 CTR TIN	B	1	J1
42581	HEDR 16PIN .1X.1 4 WALL	B	1	J7
46083	INRUSH CURRENT LIMITER 2.5 OHM	A	1	NTC1
49088	SPCR COMPONENT 1/16 TEFLON	A	1	
49510	HDR 4POS MATE-N-LOK	A	1	J2
49515	HDR 3POS MATE-N-LOK	A	2	J3,9
49524	HDR 6-P .100 PCB MOUNT GOLD	A	1	J4
6030401-AS	-AC PWR DISTRIBUTION PCB ASBY	F	0	DOCUMENT ONLY
6030401-SC	-AC PWR DISTRIBUTION PCB ASBY	B	0	DOCUMENT ONLY
6030401-TP	-AC PWR DISTRIBUTION PCB ASBY	C	0	DOCUMENT ONLY
6030522	CABLE HIGH VOLT ASABY	C	1	[CABLE S]
6030523	CABLE CURRENT SENSING	B	1	
6031401	AC POWER DISTRIBUTION PCB	A	1	
62024	RELAY 5A SOLID STATE	C	1	K1
62027	FILTER EMI SUPPR .5-1GHZ	A	1	FB1
62037	FILTER EMI 2200PF 100VDC	A	7	FL1-7
62039	RELAY SPDT 16A	B	7	K2-8
63010	CURRENT SENSOR 50/60HZ CS60	A	1	[CT1]
71022	WIRE 24AWG TEFLON SOLID YELLOW	B	0.6	[]
81007	CAP 100 uF 16V ELEC	E	1	C3
83050	CAP .001UF DISK 300VAC LINE	A	2	C1,2
85024	CAP .1UF 50V CER	B	3	C4-6

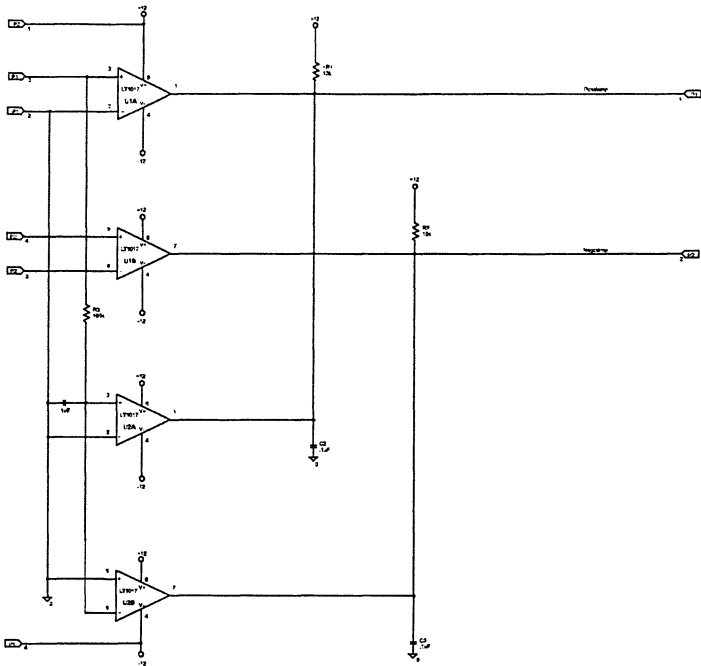


Front:
6030401-SC Ac Pwr Distribution Pcb Asby (Page 1 of 1)
Back:
6030408-AS Analog Daughter Pcb Asby (Page 1 of 1)
6030408 Analog Daughter Pcb Asby BOM
6030408-SC Analog Daughter Pcb Asby (Page 1 of 1)

NOTES:
1. ALL COMPONENTS INSTALLED ON COMPONENT SIDE.



UNLESS OTHERWISE SPECIFIED					SIGNATURE		DATE	
ALL DIMENSIONS ARE IN INCHES PRODUCTION TOLERANCES .X±.015 ANGULAR TOL .X±2 X° .XX±.010 .XXX±.005 SURFACE FINISH 63					DRN BY: B SMITH		11/24/97	
MATERIAL:					ENGR:		TITLE: ANALOG DAUGHTER PCB ASBY	
FINISH:					THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION OF BIO-TEK INSTRUMENTS INC. AND NEITHER IT NOR THE INFORMATION CONTAINED THEREIN SHALL BE DISCLOSED TO OTHERS OR DUPLICATED OR USED FOR OTHERS WITHOUT EXPRESS WRITTEN CONSENT OF BIO-TEK INSTRUMENTS INC.			
THIRD ANGLE PROJECTION								
DO NOT SCALE					REMOVE ALL BURRS	BREAK SHARP EDGES	SIZE B	
DESCRIPTION					ECO		DRAWING NO. 6030408-AS	
REV					DATE		REV A	
RELEASE TO PRODUCTION					30114 12/12/97		SCALE: 2/1	
BY					SPS		SHEET 1 of 1	



BIO-TEK Instruments, Inc. Highland Industrial Park Winchester, VT 05440-0908 802-886-4040		Title Analog Daughter PCB	
Drawn by: PBK		Number 6030408-SC	Revision A
Date: 8/22/97			
Page Size: A		Filename: 6030408.sch	Page 1 of 1

6030408-AS Analog Daughter Pcb Asby (Page 1 of 1)

6030408 Analog Daughter Pcb Asby BOM

6030408-SC Analog Daughter Pcb Asby (Page 1 of 1)

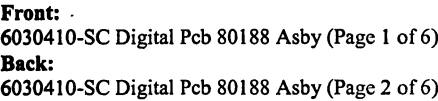
Note: 6040403-AS and SC will replace the 6030408 respectfully. See

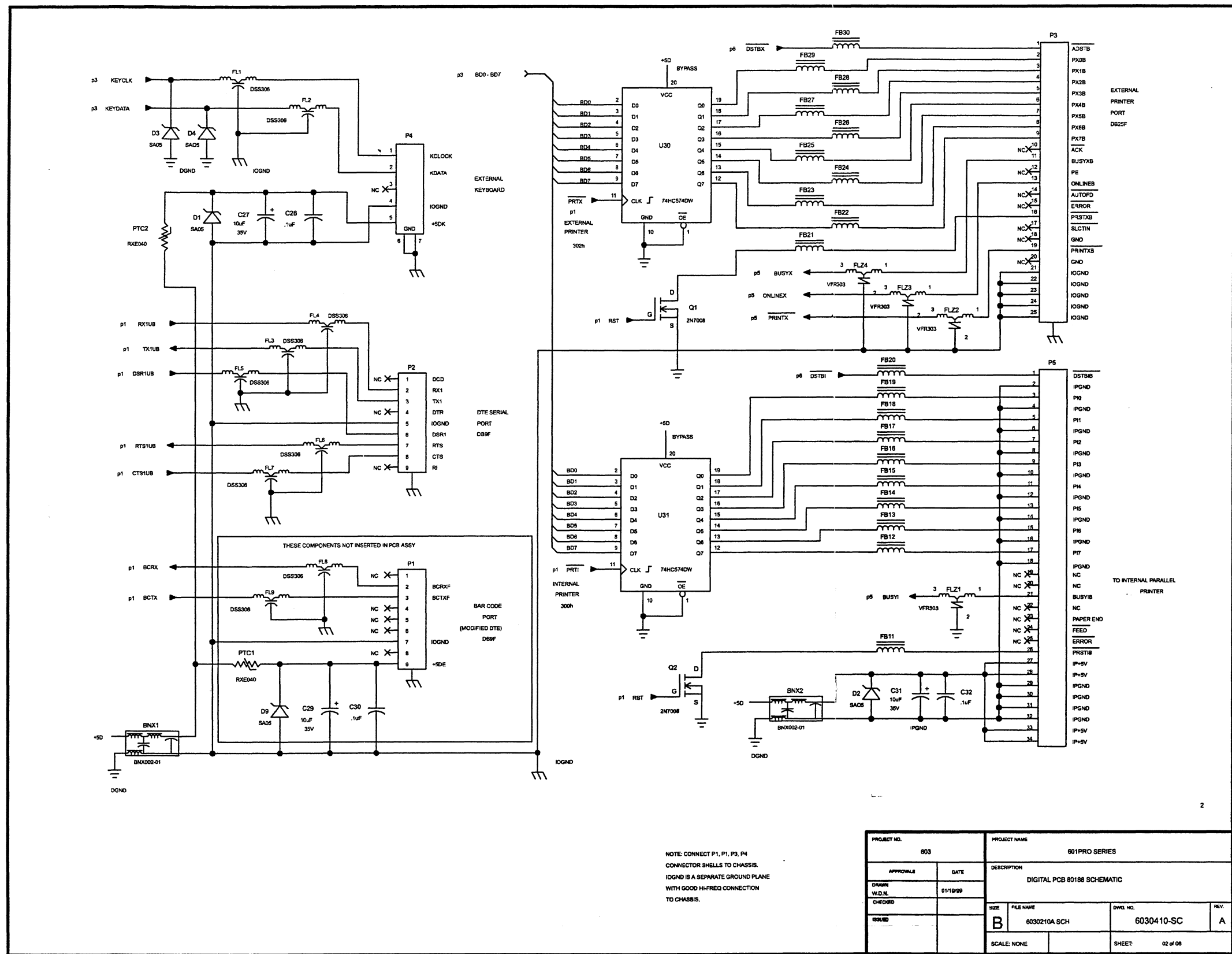
6030408-AS Analog Daughter Pcb Asby rev A As of 12-10-01				
Item	Description	Rev	Qty	Remarks
25108	IC LT1017CN8 COMPARATOR	A	2	U1,2
32030	RES 100.0K OHM 1% 1/4W	C	1	R3
32042	RES 10.00K OHM 1% 1/4W	B	2	R1,2
42689	SPCR PCB 4PIN .6 BD-BD .1LEADS	A	2	P1,2
6030408-AS	-ANALOG DAUGHTER PCB ASBY	A	0	DOCUMENT ONLY
6030408-SC	-ANALOG DAUGHTER PCB SCHEMATIC	A	0	DOCUMENT ONLY
6031408	ANALOG DAUGHTER PCB	A	1	
85024	CAP .1UF 50V CER	B	3	C1-3

6030410 Digital Pcb 80188 Asby BOM

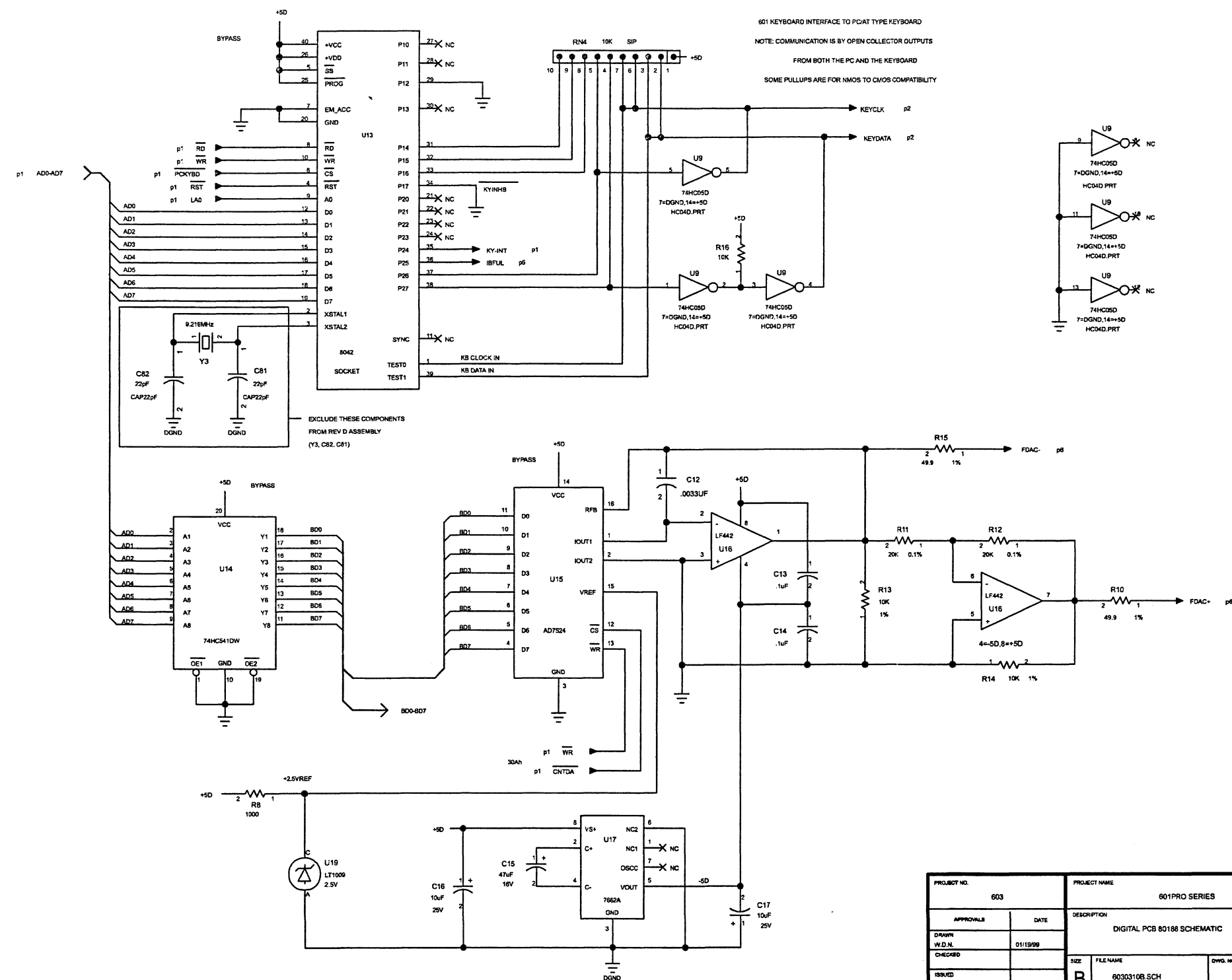
6030410-AS Digital Pcb 80188 Asby rev F As of 12-10-01 (Page 1 of 2)				
Item	Description	Rev	Qty	Remarks
19963	SCR SELF TAPPING 2X3/16	A	2	
21004	DIODE 1N4148 SIGNAL	B	1	D8
23012	OP-AMP DUAL LF442CN	C	1	U16
23015	IC 7524 MULTIPLYING DAC SO	B	1	U15
25094	IC L7662CPA NEG CONVERTER	B	1	U17
25136	IC DS1233-10 ECONO RESET	A	1	U2
25140	IC 74HC574 SOP20	A	4	U20,22,30,31
25145	IC 74AC138 SOP16	A	1	U8
25146	IC 74HC541 SOP20	A	1	U14
25151	IC 74AC573 SOP20	A	2	U11,12
25158	IC 74HC540 OCTAL INV BFR DW20	A	2	U27,29
25159	IC 74HC05 HEX INV OPEN D14	A	2	U9,10
25161	IC 74HC273 OCTAL D FF&CLR DW20	A	3	U26,28,23
25162	IC DS1307 SERIAL RTC&64X8 DIP8	A	1	U3
25163	IC 80C188EB UP 20MHZ PLCC84 70	B	1	U1
26024	IC 2003A TRANS ARRAY SM	A	1	U24
27013	TRANSISTOR 2N7008RLRA N-CH	F	2	Q1,Q2
28044	VOLT REF 2.5 LT1009 0.2%	B	1	U19
28158	IC MAX208 RS232 4T/4R ESDDS024	A	1	U4
29109	TRANSIENT SUPPRESSOR 5V	C	7	D1-7
29140	IC 128KX8 STATIC RAM TSOP 8X20	C	1	U6
29155	IC 82C55A2 PLCC-44 24-BIT I/O	A	1	U21
29156	IC ROM-FLASH 512KX8 AT29C040	A	2	U7,18
32042	RES 10.00K OHM 1% 1/4W	B	3	R13,14,16
32047	RES 1.000K OHM 1% 1/4W	B	1	R8
32163	RES 8.250K OHM 1% 1/4W	D	1	R9
32181	RES 49.90 OHM 1% 1/4W	B	2	R10,15
32266	RES 20K OHM .1% 1/4W	D	2	R11,12
35003	TRIMPOT 2K, 1T	A	1	"RT1"
37046	RESNET 10K SIP 10PIN 9RES 5%	A	4	RN2,3,4,5
38020	RES 2 OHM 2W .5%	C	1	R7
38088	RES 30 OHM 5% 1/8W 1206	B	3	R5,6,17
38107	RES 2.00K OHM 1/8W 1% 1206 SMD	A	3	R20-22
42211	HEDR 3-P .100 CTR LOK GOLD	B	1	J4
42312	HEDR 34PIN .1X.1	A	1	P5
42581	HEDR 16PIN .1X.1 4 WALL	B	3	J1,2,3
42715	CONN 5-DIN RA PCB & SHIELD	A	1	P4
42717	CONN DB25F RA PCB SHELL&INSERT	A	1	P3
42718	CONN DB9F RA PCB SHELL&INSERT	A	1	P2
46096	FUSE PTC 0.4A/0.8A 60V	A	1	PTC2
47049	BATTERY 3V LITHIUM COIN	A	1	[]
47050	BATTERY HOLDER 3V LITH COIN	A	1	B1
49014	TERM PCB	B	3	TP1-3
49056	SOCKET I.C. 40-PIN DIP	B	1	U13 SOCKET
49374	SOCKET IC 32-PIN DIP	A	1	U5 SOCKET
49478	SOCKET 84-PIN PLCC	B	1	U1 SOCKET
49502	HDR 16S THRU BOARD	A	1	[J5]
49503	HDR 10P .1X.1 RTANG	B	1	J6
49741	CRYSTAL 32.768KHZ	A	1	Y2
49743	CRYSTAL CLOCK OSC 32 MHZ	B	1	Y1
54005	SW DIP 4-SW SIDE-ACT	A	1	SW1

6030410-AS Digital Pcb 80188 Asby rev F As of 12-10-01 (Page 2 of 2)				
Item	Description	Rev	Qty	Remarks
6030229	FRMWR BOOT TEST DWNLD V1.02	B	1	U5
6030410-AS	-DIGITAL PCB 80188 ASBY	D	0	DOCUMENT ONLY
6030410-SC	-DIGITAL PCB 80188 SCHEMATIC	B	0	DOCUMENT ONLY
6030410-TP	DIGITAL PCB 80188 TEST PROC	B	0	DOCUMENT ONLY
6031410	DIGITAL PCB 80188	B	1	
61036	ALARM PIEZP 3.3KHZ	B	1	
62027	FILTER EMI SUPPR .5-1GHZ	A	3	BNX1,2,3
62037	FILTER EMI 2200PF 100VDC	A	32	FL1-7,10-35
62064	FILTER EMI SM BEAD 1206	B	30	FB1-30
62065	FILTER EMI & 50V VARISTOR	B	4	FLZ1-4
81026	CAP 100UF 35V ELEC	B	1	C26
84040	CAP 10 UF 25V TANT SIZE 7343	A	10	C1-3,16,17,24,27,29,31,33
84054	CAP .0033UF FILM	A	1	C12
84066	CAP 1UF TANT 35V SIZE 3528	B	7	C4-7,18,19,84
84072	CAP 47UF 16V TANT SM 7343	A	1	C15
85024	CAP .1UF 50V CER	B	36	C8-11,13,14,20-23,25,28,32,38-59,83





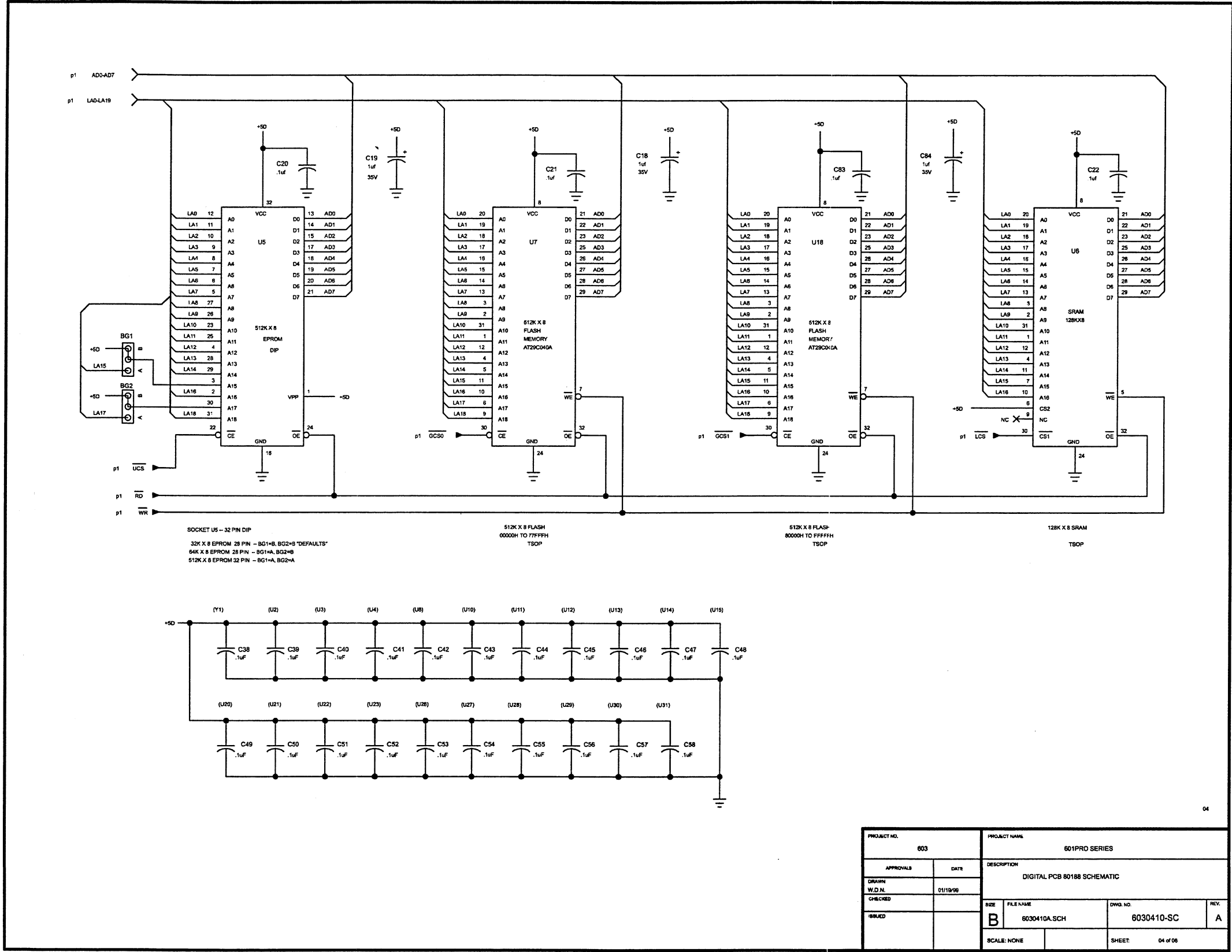
6030410-SC Digital Pcb 80188 Asby (Page 2 of 6)



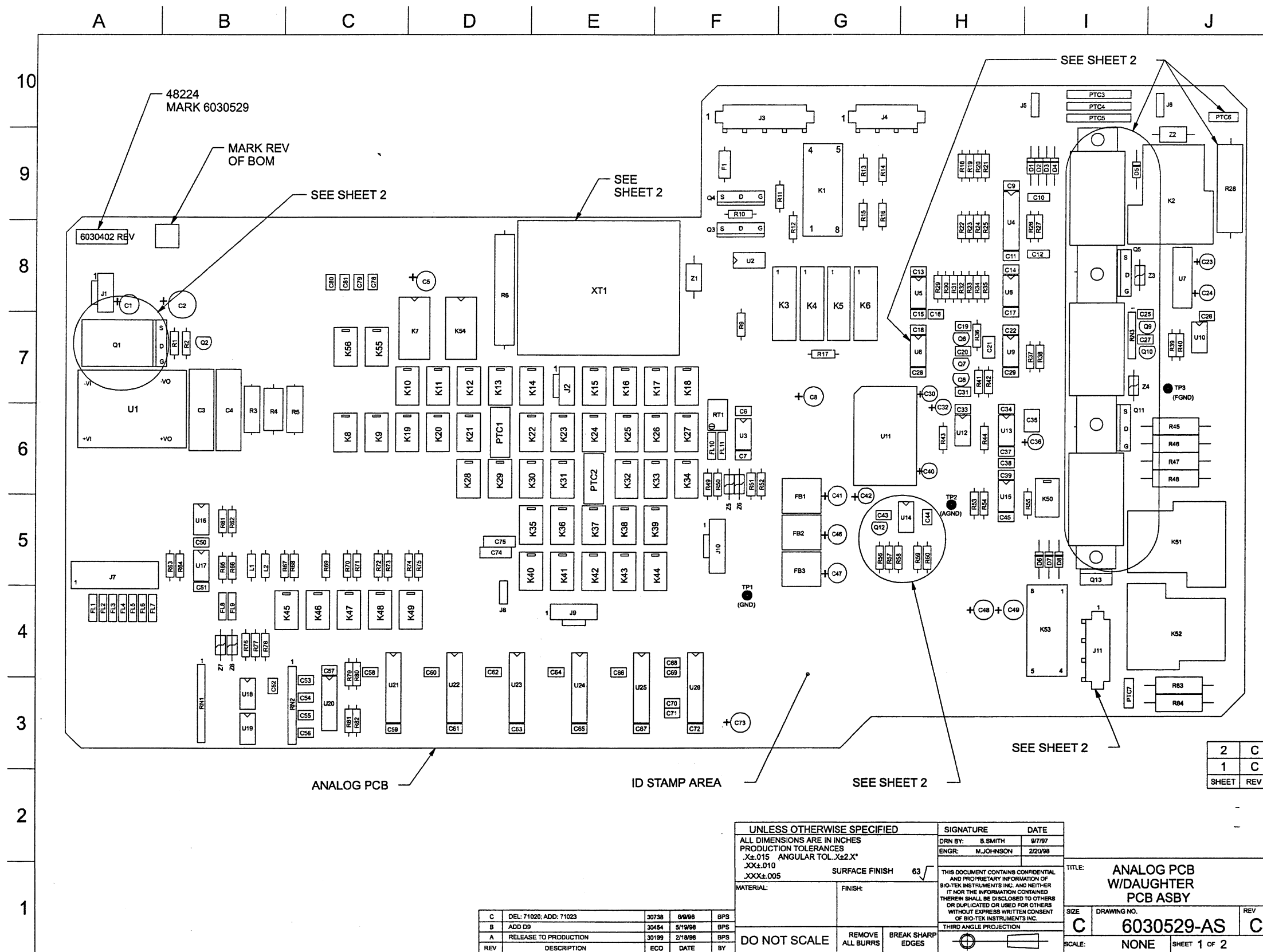
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APPROVALS		DESCRIPTION	
DRAWN W.D.N.		DIGITAL PCB 80188 SCHEMATIC	
CHECKED		DATE 01/19/99	
ISSUED		SIZE B	FILE NAME 6030310B.SCH
		DWG. NO. 6030410-SC	REV. B
		SCALE: NONE	SHEET 03 of 06

6030410-SC Digital Pcb 80188 Asby (Page 3 of 6)

Front: 6030410-SC Digital Pcb 80188 Asby (Page 3 of 6)
Back: 6030410-SC Digital Pcb 80188 Asby (Page 4 of 6)

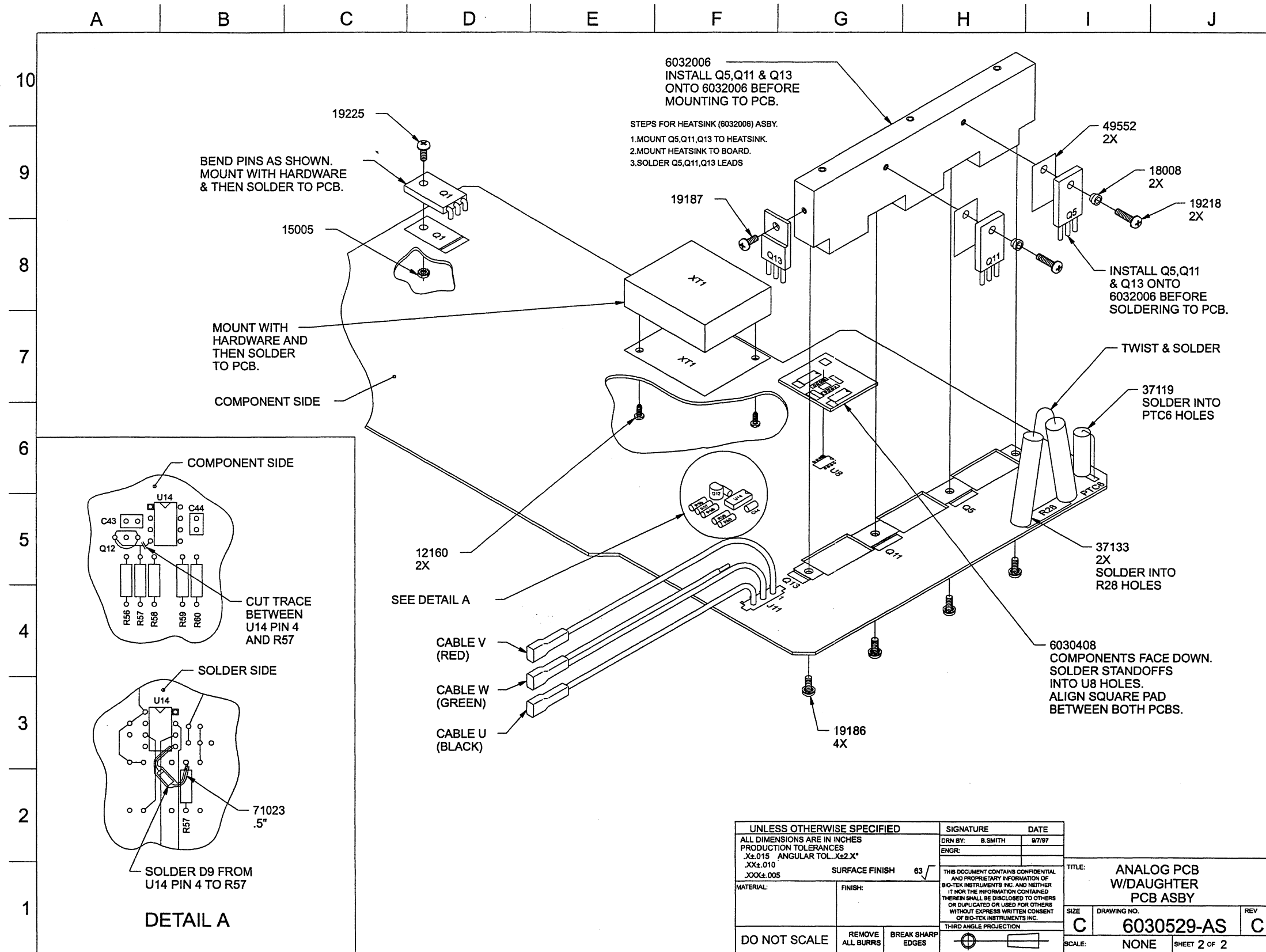


6030410-SC Digital Pcb 80188 Asbv (Page 4 of 6)



6030529-AS Analog Pcb W/Daughter Pcb Asby (Page 1 of 2)

Front:
 6030529-AS Analog Pcb W/Daughter Pcb Asby (Page 1 of 2)
Back:
 6030529-AS Analog Pcb W/Daughter Pcb Asby (Page 2 of 2)



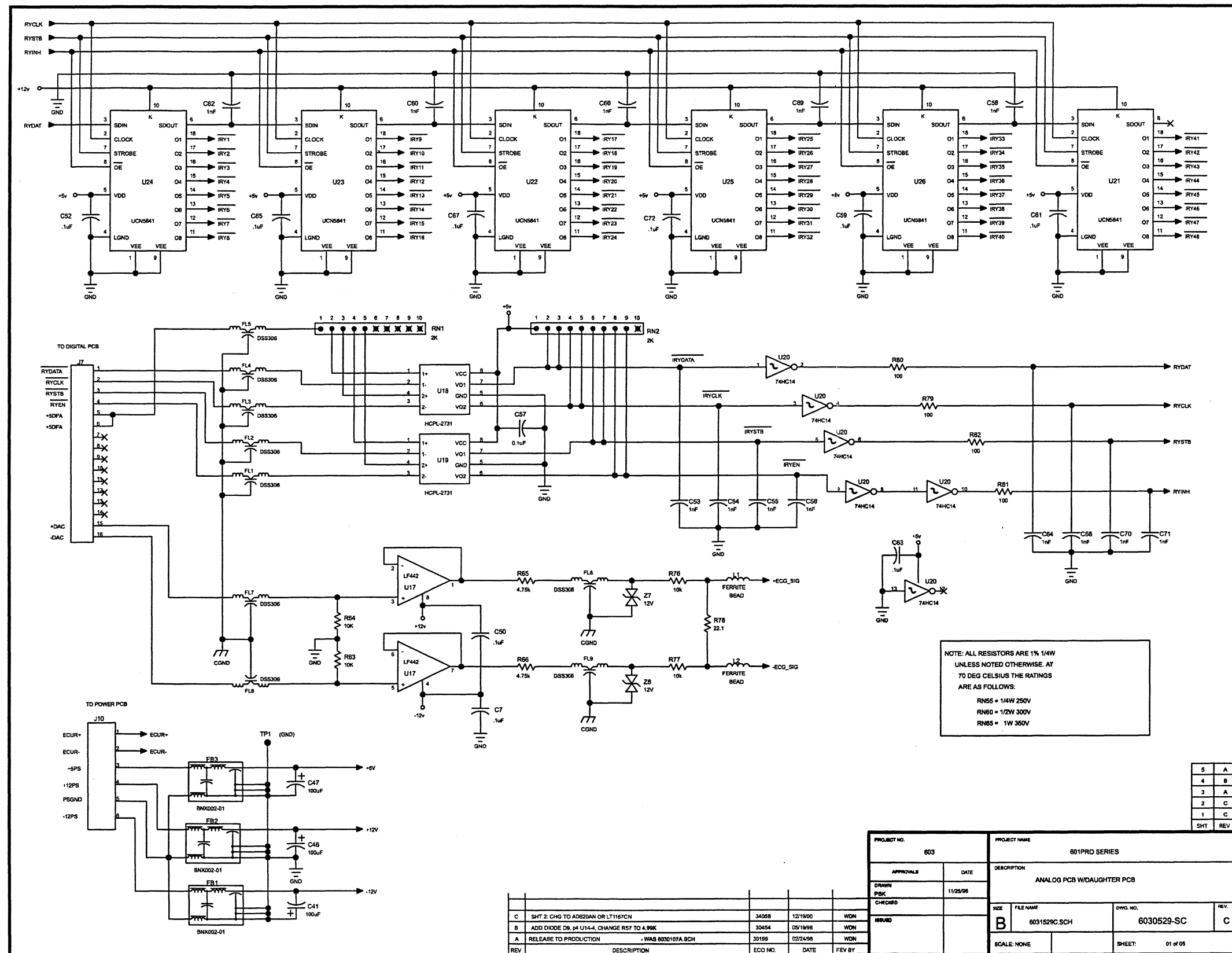
6030529-AS Analog Pcb W/Daughter Pcb Asby (Page 2 of 2)

6030529 Analog Pcb W/Daughter Pcb Asby BOM

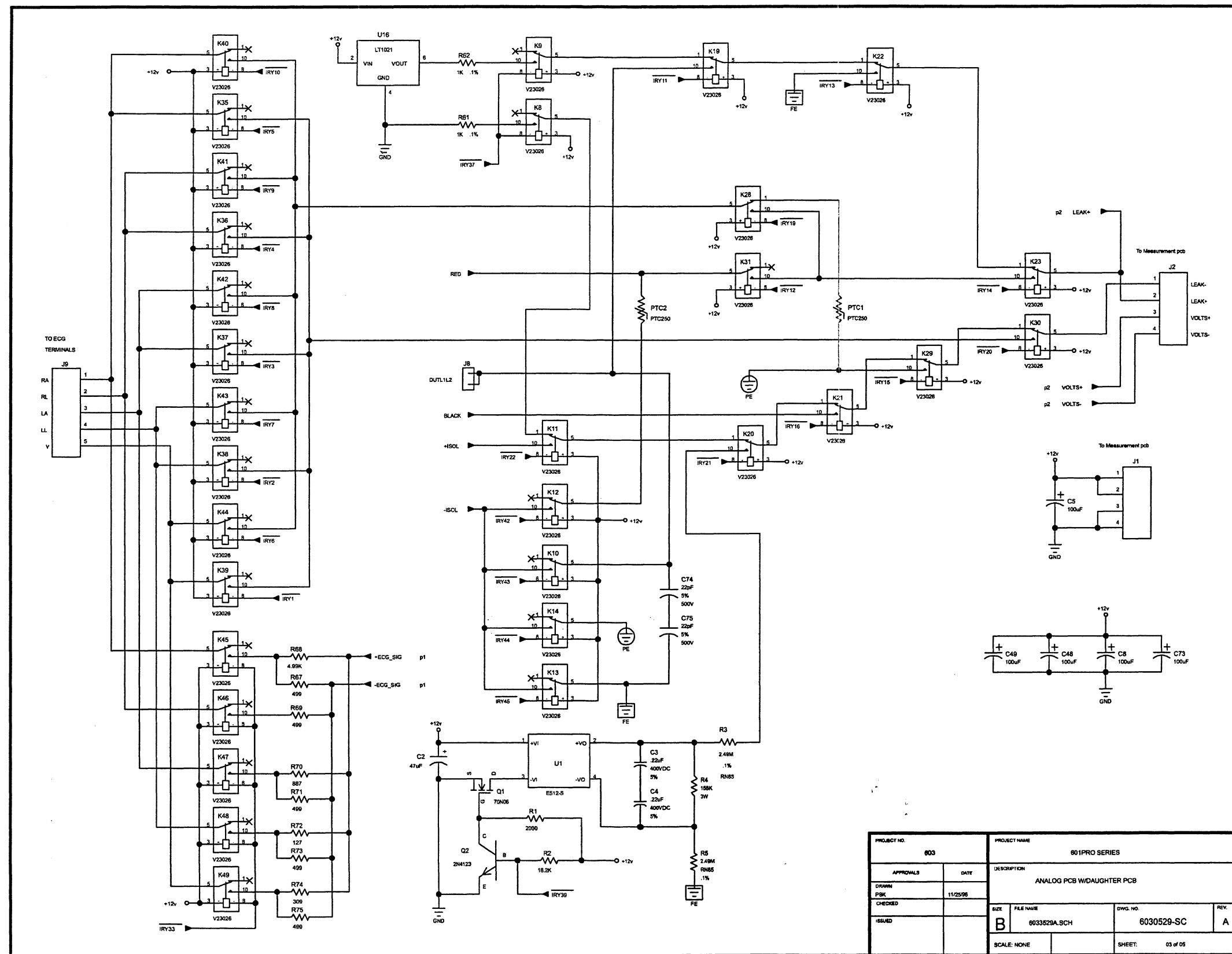
6030529-AS Analog Pcb W/Daughter Pcb Asby rev D As of 12-10-01 (Page 1 of 2)				
Item	Description	Rev	Qty	Remarks
12160	SCR PNH 4-40X3/8 SS TYPE F PHH	A	2	[]
15005	NUT KEPS 4-40 STEEL ZINC	A	1	[]
18008	WSHR SHLDR 4 .04TK NY	B	2	[]
19186	SEMS 6-32X1/4 ST PHIL ITOOTH	A	4	[]
19187	SEMS 4-40X1/4 ST PHIL ITOOTH	A	1	[]
19218	SEMS 4-40X1/2 ST PHIL ITOOTH	A	2	[]
19225	SEMS 4-40X3/8" ST PHIL ITOOTH	A	1	[]
21004	DIODE 1N4148 SIGNAL	B	9	D1-D8, [D9]
23012	OP-AMP DUAL LF442CN	C	1	U17
23064	IC AD736 RMS-DC CONV	A	1	U13
23071	OP AMP LT1014 QUAD	C	1	U4
23098	IC AD620B INSTRUMENTATION AMP	A	1	U15
23120	IC PRECISION OP AMP AD620AN	A	1	U3
25100	IC 74HC14N HEX INV SCHMITT	D	1	U20
25108	IC LT1017CN8 COMPARATOR	A	2	U5,6
25109	IC LT1013CN8 LOWOFFSET OPAMP	B	1	U9
26002	TRANSISTOR 2N4123 SIG NPN	A	1	Q2
27013	TRANSISTOR 2N7008RLRA N-CH	F	6	Q6-10,12
27016	MOSFET N-CH 70AMP	C	3	[Q1,5,11]
27017	FET PWR N-CH 800V ISOWATT218	A	2	Q3,4
28072	IC PVI1050 ISOLATOR MICRO ELEC	A	1	U2
28118	IC 5841 8BIT SERIAL IN LATCH	A	6	U21-26
28126	IC HCPL2731 DUAL OPTOCOUPLER	A	4	U10,14,18,19
28147	IC LT1021 VOLT REF 5V .05%	A	2	U12,16
29108	TRANSIENT SUPPRESSOR 12V	E	6	Z3-8
29112	TRANS ZORB 1.5KE400A 400V	C	1	Z1
29147	TRANSZORB 30V BI DIRECTIONAL	A	1	Z2
32030	RES 100.0K OHM 1% 1/4W	C	2	R30,32
32034	RES 249.0K OHM 1% 1/4W	D	4	R20,21,25,26
32039	RES 1.00M OHM 1% 1/4W	B	2	R24,27
32041	RES 1.000 OHM 1% 1/4W	B	1	R35
32042	RES 10.00K OHM 1% 1/4W	B	9	R49,50,58-60,63,64,76,77
32044	RES 20.00K OHM 1% 1/4W	B	6	R18,19,22,23,29,41
32047	RES 1.000K OHM 1% 1/4W	B	1	R9
32052	RES 2.00M OHM 1% 1/4W	B	1	R10
32088	RES 18.20K OHM 1% 1/4W	C	1	R2
32100	RES 100.00 OHM 1% 1/4W	B	7	R31,33,43,79-82
32112	RES 2.00K OHM 1% 1/4W	B	5	R1,36,39,40,56
32134	RES 4.75K OHM 1% 1/4W	B	2	R65,66
32181	RES 49.90 OHM 1% 1/4W	B	2	R51,52
32195	RES 22.10 OHM 1% 1/4W	B	1	R78
32199	RES 499.00 OHM 1% 1/4W	B	6	R34,67,69,71,73,75
32222	RES 4.99K OHM 1% 1/4W	B	2	R68, [R57]
32259	RES 309 OHM 1% 1/4W	B	1	R74
32260	RES 887 OHM 1% 1/4W	B	1	R70
32261	RES 127 OMH 1% 1/4W	B	1	R72
32276	RES 499K OHM .1% 1/4W	D	4	R11,13,14,42
33080	RES 10K OHM 1% 3W	E	1	R7
35006	TRIMPOT 5K, 25T	A	1	RT1

6030529-AS Analog Pcb W/Daughter Pcb Asby rev D As of 12-10-01 (Page 2 of 2)				
Item	Description	Rev	Qty	Remarks
37002	RESNET 10K OHM 5R 6P SIP	B	1	RN3
37067	RES 249K .1% 1/4W	D	3	R12,15,16
37068	RES 1K .1% 1/4W	D	2	R61,62
37108	RESNET 2K 9R10P	A	2	RN1,2,
37112	RES 2.49M .1% 1W	B	2	R3,5
37119	RES 2 OHM 5W .5%	B	1	PTC6
37126	RES 1.0 OHM .1% 2W	A	2	R83,84
37129	RES 3.16K .1% 1/4W	A	1	R55
37132	THERMISTOR PTC 39MA 265VDC	B	3	F1,PTC1,PTC2
37133	RES 5 OHM 10W 1%	B	2	[R28]
38015	RES .01 OHM 2W .5%	E	4	R45-48
38018	RES 158K 3W 1%	B	2	R4,8
38019	RES 2.15K .1% 50PPM	C	2	R53,54
38053	RES 49.9K .1% 1/4W	C	1	R17
38084	RES 12.0K .1% 1/4W	C	3	R37,38,44
38096	RES 43K OHM 5% 5W WW 300V	B	1	R6
42063	HEDR .25 MTAB	A	3	J5,6,8
42319	HEDR 4-P .100 PCB MOUNT GOLD	A	2	J1,2
42324	HEDR 5-P .100 PCB MOUNT GOLD	A	1	J9
42581	HEDR 16PIN .1X.1 4 WALL	B	1	J7
46087	FUSE RESETTABLE 8 AMP HOLD	A	3	PTC3-5
46088	FUSE RESETTABLE 0.9A	A	1	PTC7
48224	LABEL PCB .80" X .25"	B	1	
49014	TERM PCB	B	3	TP1-3
49510	HDR 4POS MATE-N-LOK	A	1	J3
49515	HDR 3POS MATE-N-LOK	A	1	J4
49524	HDR 6-P .100 PCB MOUNT GOLD	A	1	J10
49552	PAD THERMAL TO-218	A	2	[]
56014	THERMOSTAT 60 DEGREES C TO220	A	1	[Q13]
6030408	ANALOG DAUGHTER PCB ASBY	A	1	[U8]
6030526	CABLE ASBY BLACK WIRE	A	1	CABLE U
6030527	CABLE ASBY RED WIRE	A	1	CABLE V
6030528	CABLE ASBY GREEN WIRE	A	1	CABLE W
6030529-AS	-ANALOG PCB W/DAUGHTER PCB	C	0	DOCUMENT ONLY
6030529-SC	-ANALOG PCB W/DAUGHTER PCB	C	0	DOCUMENT ONLY
6030529-TP	-ANALOG PCB W/DAUGHTER PCB TP	B	0	DOCUMENT ONLY
6031407	ANALOG PCB ENHANCED	A	1	
6032006	HEATSINK 601 ANALOG PCB	B	1	[]
6032016	XFRMR MAINS ON AP CUSTOM	C	1	[XT1]
62014	RELAY 30A SPDT 20 MOHM ON RES	F	3	K2,51,52
62025	RELAY SPST MINI REED HI VOLT	B	4	K3-6
62026	RELAY DPDT 12V NON-LATCH 2A	D	2	K7,54
62027	FILTER EMI SUPPR .5-1GHZ	A	3	FB1-3
62037	FILTER EMI 2200PF 100VDC	A	11	FL1-11
62038	RELAY DPDT 5A	A	1	K1
62039	RELAY SPDT 16A	B	1	K53
62040	FILTER EMI BEAD LEADED	A	2	L1,2
62046	CONV DC-DC 12VDC IN 500 OUT	A	1	U1
62048	RELAY SPDT SMALL SIG 12V COIL	A	45	K8-50,55,56
62050	CONV DC-DC +12DC IN +/-12 OUT	B	1	U11
62055	CONV DC-DC 12V TO 12V 62MA	A	1	U7
71023	SHRINK TUBE 1/16"	B	0.05	[OVER D9]
81007	CAP 100 uF 16V ELEC	E	9	C1,5,8,41,46-49,73
82003	CAP 10 uF 25V TANT	C	7	C23,24,30,32,36,40,42
82013	CAP 47UF 10% 20V TANT RADIAL	E	1	C2
83067	CAP 22PF 500V 5% NPO CERAMIC	C	2	C74,75

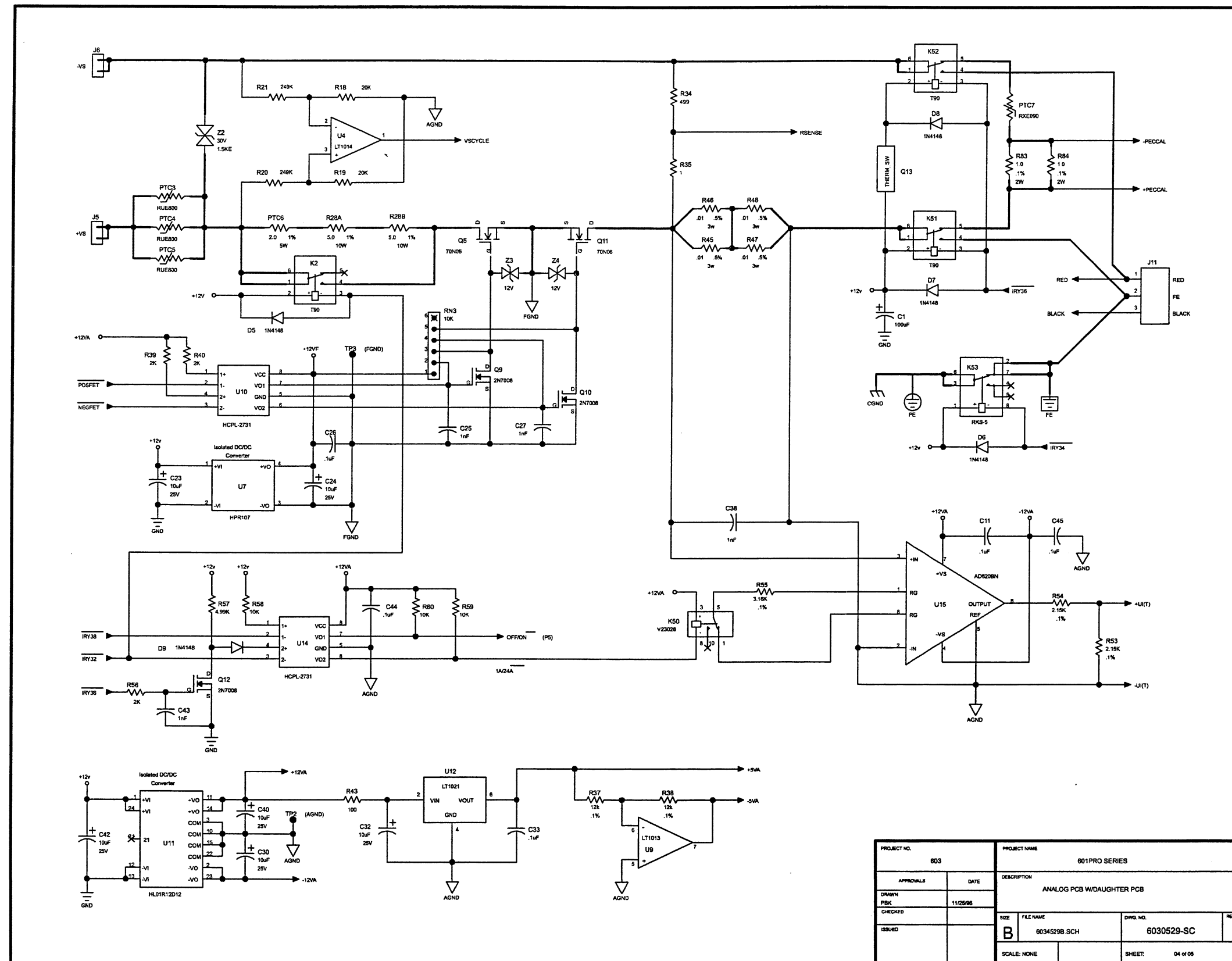
Front: 6030529 Analog Pcb W/Daughter Pcb Asby BOM
Back: 6030529-SC Analog Pcb W/Daughter Pcb Asby (Page 1 of 5)



6030529-SC Analog Pcb W/Daughter Pcb Asby (Page 1 of 5)

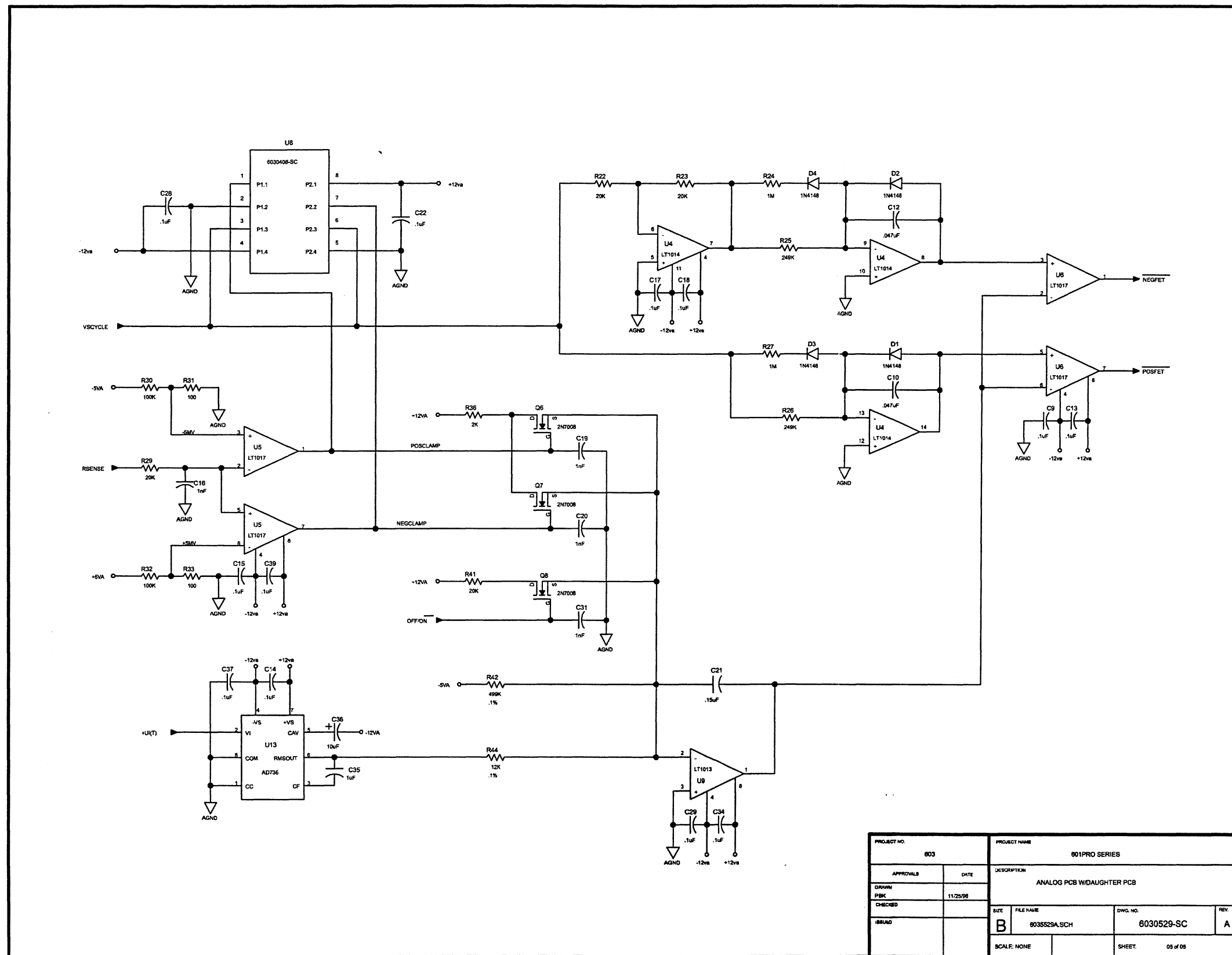


PROJECT NO. 803		PROJECT NAME 601PRO SERIES	
APPROVALS	DATE	DESCRIPTION ANALOG PCB W/DAUGHTER PCB	
DRAWN PSK	11/25/96	SIZE B	FILE NAME 6030529A.SCH
CHECKED		DWG. NO. 6030529-SC	REV. A
ISSUED		SCALE: NONE	SHEET: 03 of 05

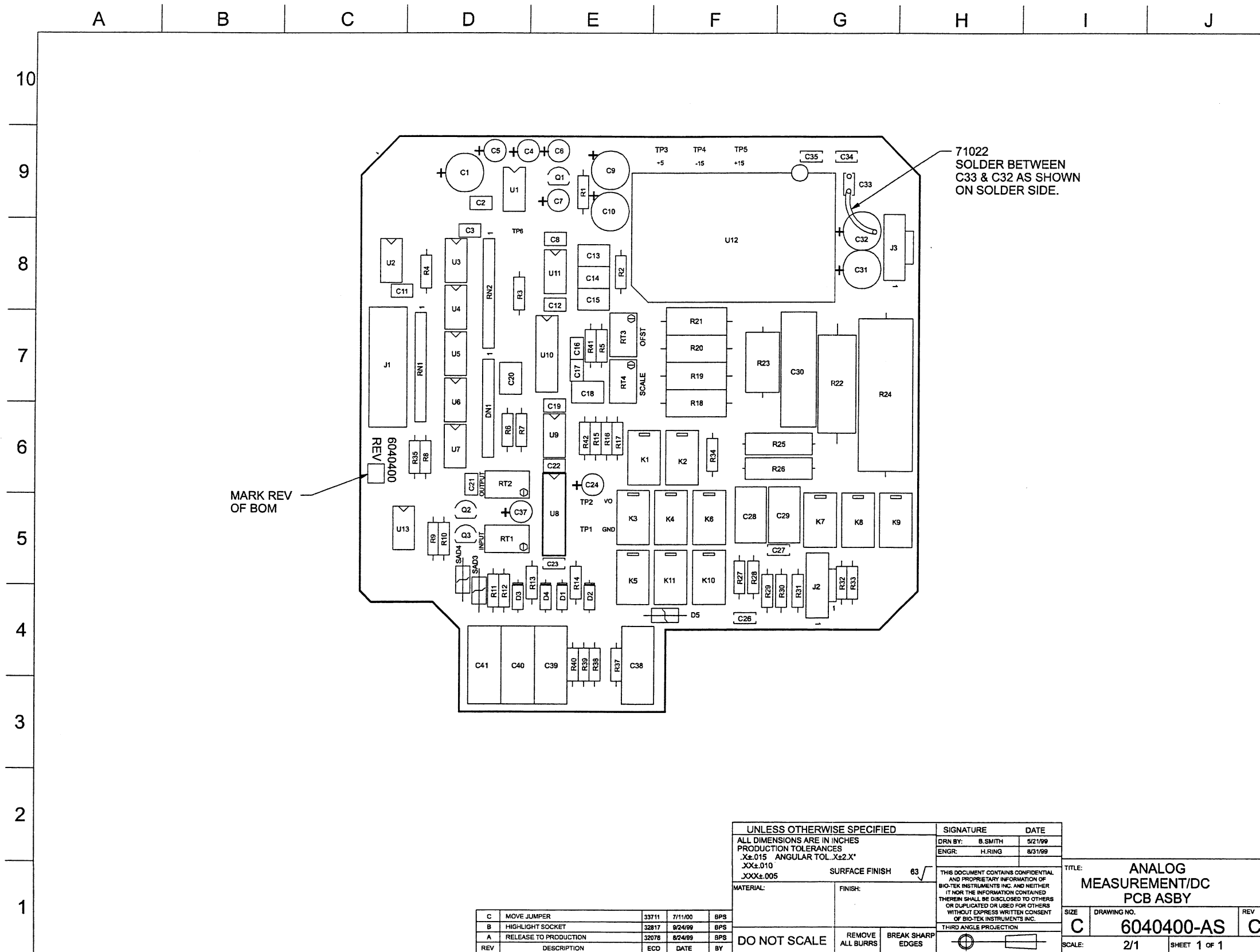


6030529-SC Analog Pcb W/Daughter Pcb Asby (Page 4 of 5)

Front:
6030529-SC Analog Pcb W/Daughter Pcb Asby (Page 4 of 5)
Back:
6030529-SC Analog Pcb W/Daughter Pcb Asby (Page 5 of 5)



6030529-SC Analog Pcb W/Daughter Pcb Asby (Page 5 of 5)



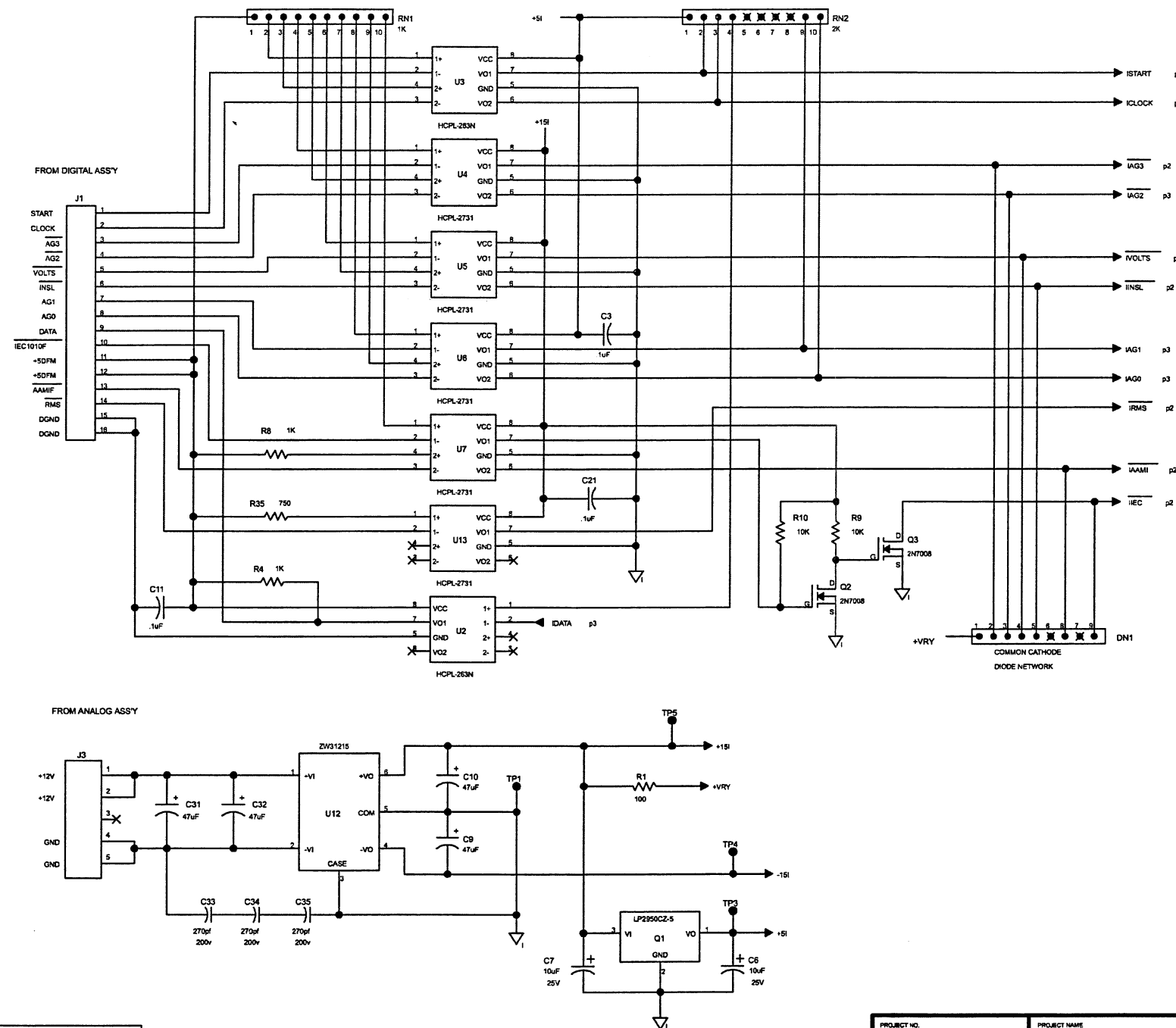
6040400-AS Analog Measurement/Dc Pcb Asby (Page 1 of 1)

Front: 6040400-AS Analog Measurement/Dc Pcb Asby (Page 1 of 1)
Back: 6040400 Analog Measurement/Dc Pcb Asby BOM

6040400 Analog Measurement/Dc Pcb Asby BOM

6040400-AS Analog Measurement/Dc Pcb Asby rev D As of 12-10-01 (Page 1 of 2)				
Item	Description	Rev	Qty	Remarks
21012	DIODE 200V 1MA	D	4	D1-4
22046	DIODE SIP 9P COMMON CATHODE	A	1	DN1
22056	TRANSIENT SUPPRESSOR 24V BIOIR	A	1	D5
23104	IC OP AMP OP285GP	A	1	U9
25113	IC AD637JQ RMS-TO-DC CONV	B	1	U10
25126	IC MAX170 12BIT A/D CONV	C	1	U1
26025	TRANS ZORB SA7.5CA B1-DIR	B	2	SAD3,4
27013	TRANSISTOR 2N7008RLRA N-CH	F	2	Q2,3
28050	VOLT REG +5V LOW-DROP-OUT	C	1	Q1
28126	IC HCPL2731 DUAL OPTOCOUPLER	A	5	U4-7,13
28129	IC OP AMP DUAL OP270GP	B	1	U11
28162	IC OPTOCOUPLER DUAL HCPL-263N	A	2	U2,3
32030	RES 100.0K OHM 1% 1/4W	C	2	R5,6
32039	RES 1.00M OHM 1% 1/4W	B	1	R41
32042	RES 10.00K OHM 1% 1/4W	B	2	R9,10
32047	RES 1.000K OHM 1% 1/4W	B	2	R4,8
32057	RES 75.00K OHM 1% 1/4W	B	2	R2,3
32100	RES 100.00 OHM 1% 1/4W	B	4	R1,7,34,42
32111	RES 249.0 OHM 1% 1/4W	B	2	R13,14
32112	RES 2.00K OHM 1% 1/4W	B	2	R11,12
32207	RES 750.00 OHM 1% 1/4W	C	1	R35
32276	RES 499K OHM .1% 1/4W	D	2	R32,33
32343	RES 30.1K OHM 1% 1/4W	A	4	R37-40
33080	RES 10K OHM 1% 3W	E	4	R18-21
35008	TRIMPOT 10K, 25T	A	1	"RT2"
35011	TRIMPOT 50K, 25T	A	2	"RT1","RT3"
35012	TRIMPOT 1K, 25T	A	1	"RT4"
37031	RES 100K OHM .1% 1W	B	2	R25,26
37051	RES 1.5K .1% 1/4 WATT 50PPM	D	1	R16
37067	RES 249K .1% 1/4W	D	4	R28-31
37068	RES 1K .1% 1/4W	D	1	R15
37093	RES 8.16K OHM .1% 1/4W 5PPM	B	1	R27
37108	RESNET 2K 9R10P	A	1	RN2
37109	RESNET 1K 9R10P	A	1	RN1
37115	RES 1K .25% 5WPK NI 100V 50PPM	B	1	R23
37116	RES1.5K.25% 26WPK NI 200V50PPM	D	1	R22
37117	RES 1K.25% 70WPK NI 375V 50PPM	C	1	R24
38053	RES 49.9K .1% 1/4W	C	1	R17
42324	HEDR 5-P .100 PCB MOUNT GOLD	A	2	J2,3
42581	HEDR 16PIN .1X.1 4 WALL	B	1	J1
49014	TERM PCB	B	6	TP1-6
49022	SOCKET I.C. 14-PIN DIP	B	1	SU8

6040400-AS Analog Measurement/Dc Pcb Asby rev D As of 12-10-01 (Page 2 of 2)				
Item	Description	Rev	Qty	Remarks
6040204	IC INST AMP PGA202BG TESTED	A	1	[U8]
6040400-AS	ANALOG MEASUREMENT/DC PCB ASBY	C	0	DOCUMENT ONLY
6040400-SC	ANALOG MEASUREMENT/DC PCB SCH	B	0	DOCUMENT ONLY
6040400-TP	ANALOG MEASUREMENT/DC PCB ASBY	C	0	DOCUMENT ONLY
6041400	ANALOG MEASUREMENT/DC PCB	A	1	
62048	RELAY SPDT SMALL SIG 12V COIL	A	11	K1-11
62053	CONV DC-DC +12 TO +/- 15V	A	1	[U12]
71022	WIRE 24AWG TEFLON SOLID YELLOW	B	0.1	[]
82003	CAP 10 uF 25V TANT	C	6	C4-7,24,37
82013	CAP 47UF 10% 20V TANT RADIAL	E	5	C1,9,10,31,32
83012	CAP 10 pF 1000V DISC	A	1	C23
83051	CAP 270PF 5% 200V NPO CER	A	5	C26,27,33-35
84048	CAP 1UF 63V POLY FILM	B	2	C18,20
84060	CAP .015UF 5% 250VAC PP FILM	A	1	C29
84061	CAP .22UF 5% 200VAC PP FILM	A	1	C30
84062	CAP .022UF 5% 250VAC PP FILM	A	1	C28
84068	CAP .47UF 63V FILM 10%	A	3	C13-15
84073	CAP 1.0UF 100VDC PEF 10% 85C	A	4	C38-41
85024	CAP .1UF 50V CER	B	10	C2,3,8,11,12,16,17,19 ,21,22



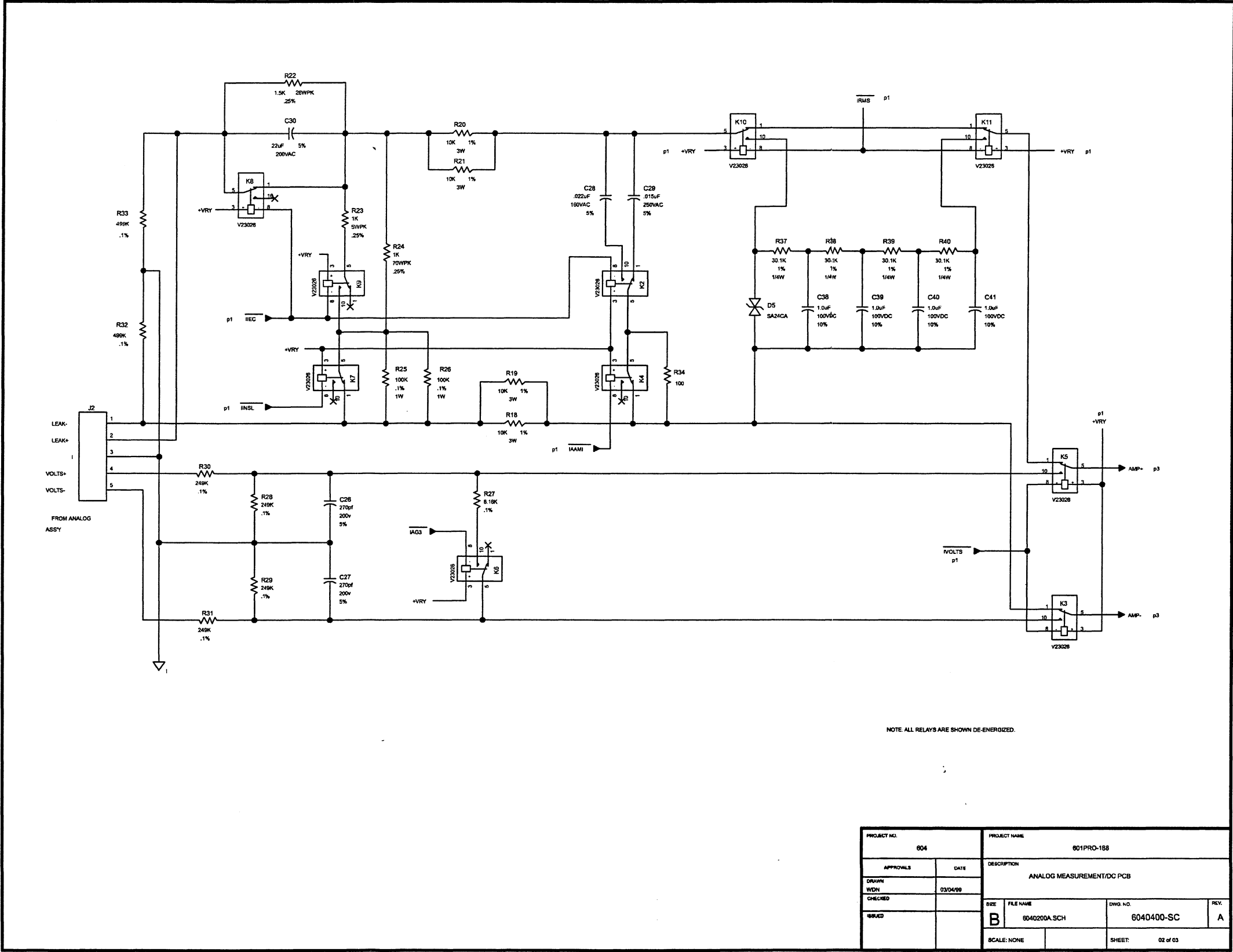
NOTE: ALL RESISTORS ARE 1% 1/4W
UNLESS NOTED OTHERWISE. AT
70 DEG CELSIUS THE RATINGS
ARE AS FOLLOWS:
RN55 = 1/4W 250V
RN60 = 1/2W 300V
RN65 = 1W 350V

REV	DESCRIPTION	ECO NO.	DATE	REV BY
B	SHFT 3: ADD 6040204 FOR U18	33720	07/18/00	WCH
A	RELEASE TO PRODUCTION	32078	08/24/99	WCH

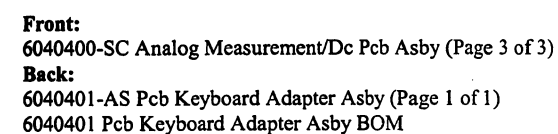
PROJECT NO. 604		PROJECT NAME 601PRO-188	
APPROVALS		DATE	
DRAWN PDK		11/30/96	
CHECKED			
ISSUED			
SIZE B	FILE NAME 60401006 SCH	DWG. NO. 6040400-SC	REV. B
SCALE: NONE		SHEET: 01 of 03	

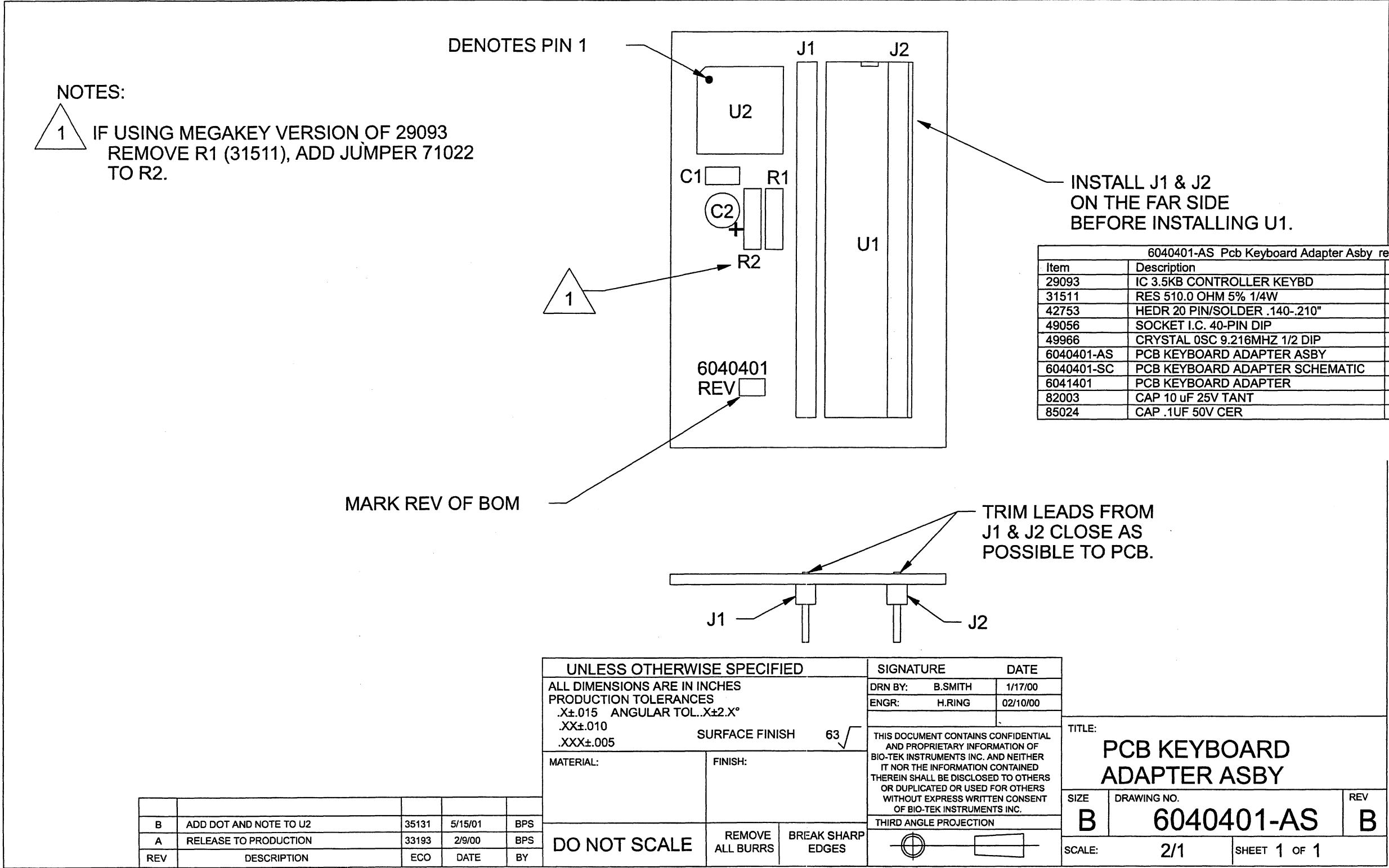
6040400-SC Analog Measurement/Dc Pcb Asby (Page 1 of 3)

Front: 6040400-SC Analog Measurement/Dc Pcb Asby (Page 1 of 3)
Back: 6040400-SC Analog Measurement/Dc Pcb Asby (Page 2 of 3)



6040400-SC Analog Measurement/Dc Pcb Asby (Page 2 of 3)

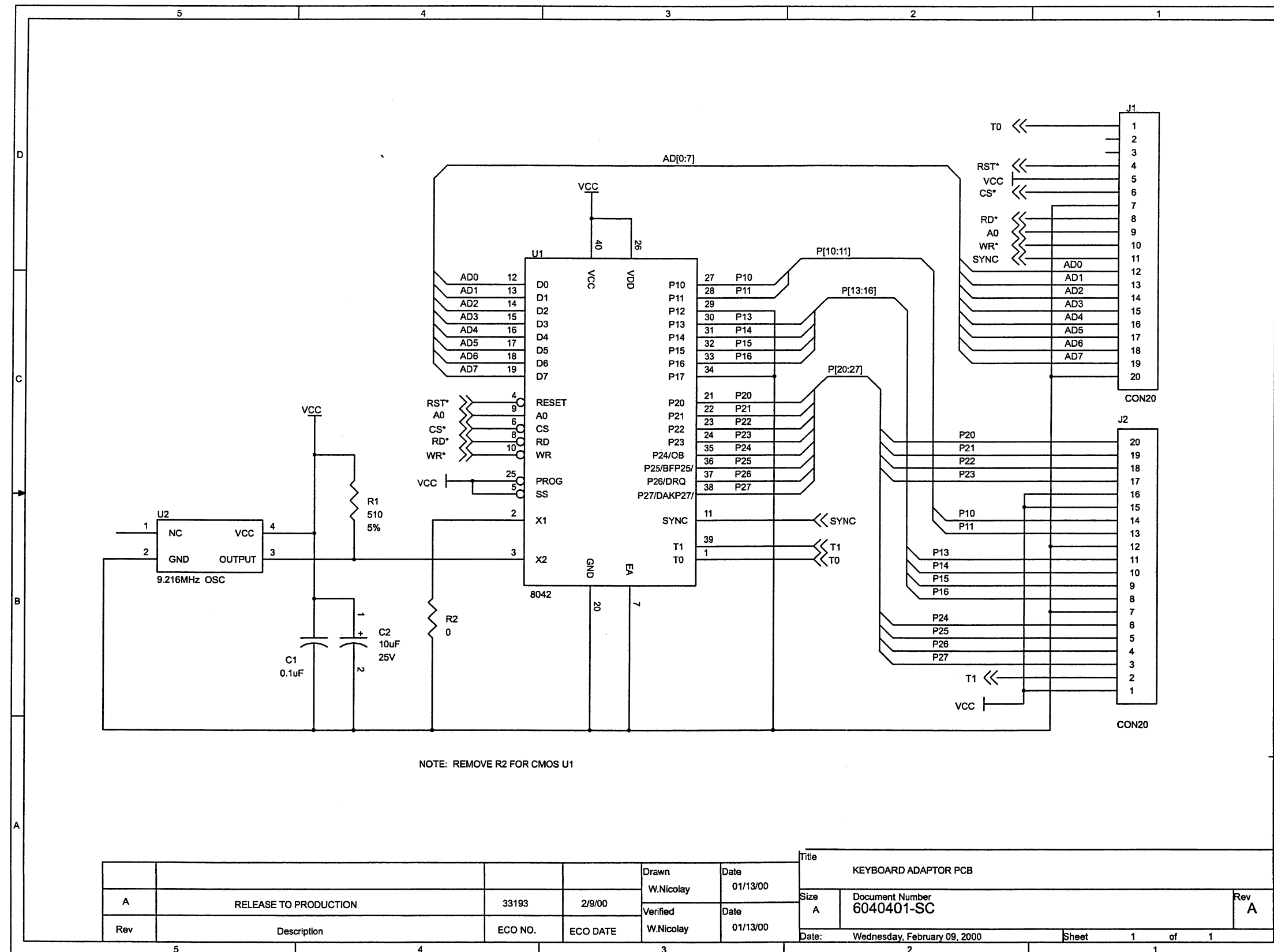




6040401-AS Pcb Keyboard Adapter Asby (Page 1 of 1)

6040401 Pcb Keyboard Adapter Asby BOM

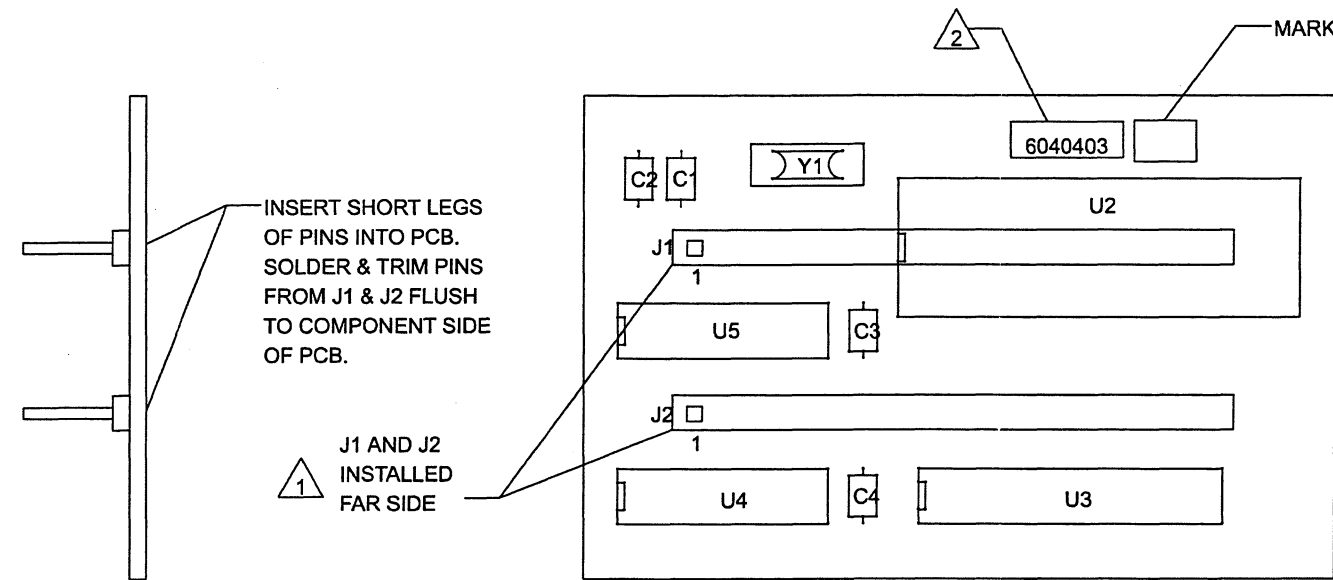
Note: When 6040401 is no longer available it will be replaced with 6040403 which is provided but not yet appear on the BOM.



6040401-SC Pcb Keyboard Adapter Asby (Page 1 of 1)

Front:
6040401-SC Pcb Keyboard Adapter Asby (Page 1 of 1)
Back:
6040403-AS Keyboard/Daughter Board Asby (Page 1 of 1)
6040403 Keyboard/Daughter Board Asby BOM

- NOTES:
- 1 DO THIS STEP FIRST.
 - 2 ADD LABEL MARKED WITH P/N 6040403.

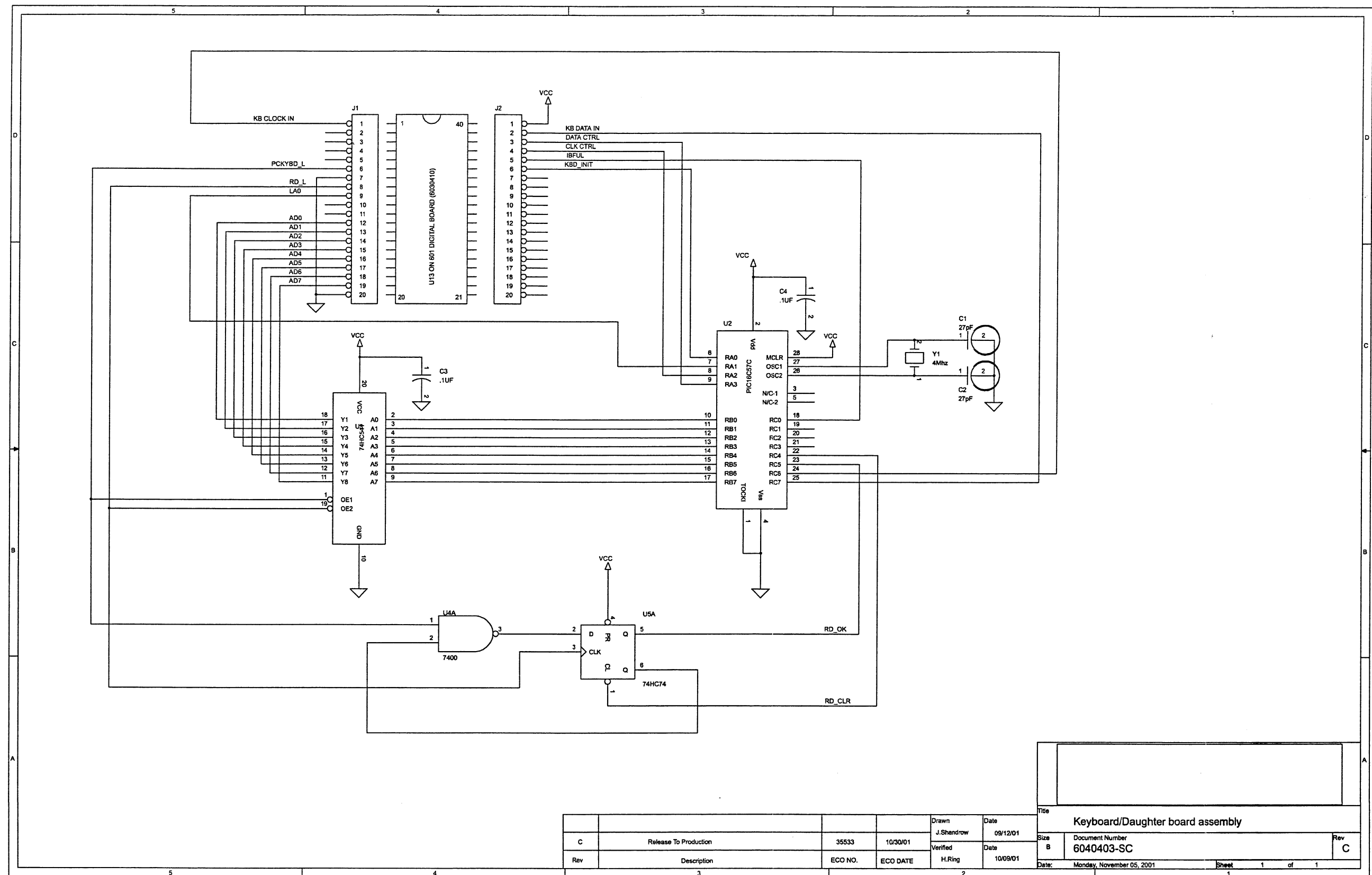


6040403-AS Keyboard/Daughter Board Asby rev A As of 12-10-01				
Item	Description	Rev	Qty	Remarks
25080	IC 74HC00 NAND 2-IN QUAD	B	1	U4
25084	IC 74HC541 TS OCTAL BFR NONINV	E	1	U3
25116	IC 74HC74 DUAL D-FLIP FLOP	B	1	U5
28178	CRYSTAL 4MHZ	A	1	Y1
42753	HEDR 20 PIN/SOLDER .140-.210"	A	2	J1,J2
48224	LABEL PCB .80" X .25"	B	1	
49149	SOCKET IC 28-PIN DIP	B	1	FOR U2
6040204	IC INST AMP PGA202BG TESTED	A	1	U2
6040206	SFTWR MICRO CONT AT KBD V1.00	A	1	
6040403-AS	KEYBOARD/DAUGHTER BOARD ASBY	A	0	DOCUMENT ONLY
6040403-SC	KEYBOARD/DAUGHTER BOARD SCHEM	C	0	DOCUMENT ONLY
6041403	KEYBOARD/DAUGHTER BOARD	C	1	
81037	CAP 27PF 100V RADIAL	C	2	C1,C2
85024	CAP .1UF 50V CER	B	2	C3,C4

					UNLESS OTHERWISE SPECIFIED			APPROVALS		DATE	
					ALL DIMENSIONS ARE IN INCHES			DRAWN	B.SMITH	9/20/01	
					PRODUCTION TOLERANCES			APPROV.			
					.XX%±.015 ANGULAR TOL. 1/16±2% 1/4			-		-	
					.XX%±.010 SURFACE FINISH 63						
					.0001%±.005						
					MATERIAL						
					-			THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION OF BIO-TEK INSTRUMENTS INC. AND NEITHER IT NOR THE INFORMATION CONTAINED HEREIN SHALL BE DISCLOSED TO OTHERS OR DUPLICATED OR USED FOR OTHERS WITHOUT EXPRESS WRITTEN CONSENT OF BIO-TEK INSTRUMENTS INC.		TITLE: KEYBOARD/DAUGHTER BOARD ASBY	
					FINISH						
					-						
								SIZE		DWG. NO.	
								B		6040403-AS	
								SCALE:		2/1	
										SHEET 1 OF 1	

6040403-AS Keyboard/Daughter Board Asby (Page 1 of 1)

6040403 Keyboard/Daughter Board Asby BOM



6040403-SC Keyboard/Daughter Board Asby (Page 1 of 1)

Front: 6040403-SC Keyboard/Daughter Board Asby (Page 1 of 1)
Back: Blank

601PRO^{XL}