OPERATING AND MAINTENANCE INSTRUCTION MANUAL

“TVU”

ON-SCREEN AUDIO LEVEL DISPLAY

—— USER'S RECORD ——
Model "TVU" - Serial No. _____
Date Purchased _____
Warranty Card Mailed — ☐

OPERATING AND MAINTENANCE INSTRUCTION MANUAL

"TVU"

ON-SCREEN AUDIO LEVEL DISPLAY

October, 1995

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INTRODUCTION

"TVU" PRODUCT DESCRIPTION

General

Inovonics' "TVU" displays stereo audio level metering on the screen of a television video monitor. It is connected in-line with the monitor video signal and inserts into the picute a boxed, annotated stereo bargraph image which may be positioned anywhere on the screen.

The "TVU" is transparent to program video, and in the BYPASS (Power Off) mode, is switched out of the video signal path entirely. A STEREO/MONO switch removes the unused bargraph when only a single-channel display is required.

Balanced audio line inputs accept normal studio program levels, and a separate pair of single-ended "phono" jacks interface with "semi-pro" equipment.

The "TVU" is contained in a small box chassis which may be attached to the side of the video monitor, or simply set in the bottom of an equipment cabinet. If access to the front-panel controls is desired, an optional panel allows conventional rack-mounting of the unit.

Display Options

The "TVU" may be switched between traditional "VU" response characteristics (with program Peak Flasher) and the UK/EBU-standard PPM (Peak Programme Meter) display. Both displays conform to applicable standards and have complete and proper scale designations.

Optional Custom Displays

Bargraph scale graphics and the "lookup table" for level data are held in integrated circuit Read-Only Memory (ROM). This makes custom displays possible; for instance, compressed or expanded measurement ranges and scale designations. Questions regarding this option may be directed to the factory.

"TVU" TECHNICAL SPECIFICATIONS, VIDEO

Signal Standards:
Compatible with either NTSC (USA) or PAL (Europe) standards without modification.

Video Input:
Bridging or 75-ohm terminating; accepts 1-volt peak-to-peak composite video with negative sync.

Video Output:
75-ohm source, delivers 1 volt p-p into 75-ohm-terminated load.

Video Bandwidth:
±0.5dB, 10Hz-10MHz; linear phase response over picture bandwidth.

"TVU" TECHNICAL SPECIFICATIONS, AUDIO

Frequency Response
±0.25dB, 20Hz-20kHz

Balanced Program Line Inputs:
Active-balanced, bridging; accommodate nominal "0VU" input levels between 0dBu and +15dBu.

Unbalanced "Semi-Pro" Inputs
Single-ended, bridging; accommodate input levels between –15dBu and 0dBu..

Input Range Adjustment:
VU CALIBRATE (Input Gain) controls accommodate line level ranges noted above. PPM CAL controls offset PPM "zero" reference from zero-VU by –5dB to –13dB.

VU Display:
Quasi-log-dB scale, +3VU to –20VU; measurement resolution approximately 0.15dB-per-step at 0VU reference level. 300ms VU integration per ANSI C16.5:1954.

PPM Display:
Linear dB scale, +6dB to –22dB; approximately 0.3dB-per-step measurement resolution. 10ms PPM integration per BS4297:1968.

Peak Flasher (VU" Mode Only)**:**
Active in VU mode only. 10ms peak integration with trip level adjustable between 0VU and +15VU.

Power Requirements:
105–130VAC (230V available), 50/60Hz; 10 watts.

Size and Weight:
8½"W x 1½"H x 6½"D; 3 lbs (shipping).

Optional Rack-Mount Panel:
19"W x 1¾"H (1U); accommodates one or two (side-by-side) "TVU" units.

Section II

INSTALLATION

UNPACKING AND INSPECTION

Immediately upon receipt of the equipment, inspect carefully for any shipping damage. If damage is suspected, notify the carrier at once, then contact Inovonics.

It is recommended that the original shipping carton and packing materials be saved for future reshipment. In the event of return for Warranty repair, shipping damage sustained as a result of improper packing for return *may invalidate the Warranty!*

IT IS VERY IMPORTANT that the Warranty Registration Card found at the front of this Manual be completed and returned. Not only does this assure coverage of the equipment under terms of the Warranty, and provide some means of trace in the case of lost or stolen gear, but the user will automatically receive specific SERVICE OR MODIFICATION INSTRUCTIONS should they be issued by Inovonics.

MOUNTING

Chassis Mounting

Inovonics' "TVU" is packaged in a small chassis which may be mounted out-of-the-way to any flat surface, such as the outside coverof a TV monitor or the inside wall of an equipment rack. Four 4-40 screws may be removed to separate the chassis cover from the chassis base. The base has four, #6 screw clearance holes on 4" x 7" centers to facilitate mounting.

Rack Mounting

The optional accessory panel permits traditional rack-mounting of the "TVU," requiring only 1¾ inches (1U) of vertical rack space for either a single "TVU," or two "TVU" units side-by-side, in a standard 19-inch equipment rack.

Heat Dissipation

Consuming no more power than a bedside clock radio, heat generated by the "TVU" is insignificant. The unit is specified for operation within an ambient temperature range between freezing and 120°F/ 50°C. Because adjacent, less efficient equipment may radiate substantial heat, be sure that any equipment rack or other confined space has sufficient ventilation to keep the temperature below the stated maximum.

AC (MAINS) POWER

As Delivered Unless specifically ordered for export shipment, the "TVU" is equipped with a power transformer for operation from 115V, 50/60Hz AC mains. The rear-panel designation next to the fuseholder will confirm both the mains voltage selected and the value of the fuse supplied. It is factory practice to cross-out the *inappropriate* mains voltage designation with an indelible black marking pen.

> **BE SURE** that the "TVU" mains voltage rating and fuse value are appropriate for the mains supply before plugging the unit into the wall outlet.

Power Cord The power cord supplied with the "TVU" is fitted with a North-American-standard male plug. The individual cord conductors are color-coded in accordance with USA standards:

BLACK = AC "HOT" WHITE = AC NEUTRAL GREEN = GROUND

RADIO FREQUENCY INTERFERENCE (R F I)

Location Although we have anticipated that the "TVU" may be operated close to high-power transmitters, you should exercise care in locating the unit away from *abnormally* high RF fields.

Ground Loops In some installations a mains frequency or RF ground loop may be formed between the input or output cable shield grounds and the AC power cord ground. Use of a "ground-lifting" AC adapter should remedy the situation.

VIDEO INPUT AND OUTPUT CONNECTIONS

Video Input The "TVU" has a high impedance, "bridging" video input characteristic. A 75-ohm input terminator is provided, however, and is normally strapped-in by shorting the designated terminals on the rear-panel barrier strip. ***PLEASE NOTE*** that this termination bridges the input connector *only when the "TVU" is switched into the circuit.* In the BYPASS (Power Off) mode, the input source is terminated directly by the video monitor.

Video Output The output of the "TVU" has a 75-ohm source impedance and requires a 75-ohm terminating load. The video monitor connected to the output of the "TVU" must have its input termination switched on. If two or more monitors are connected to the "TVU" output, only one should provide a terminating load; the others should be set for a "bridging" input characteristic.

AUDIO INPUT CONNECTIONS

Balanced Inputs

The "TVU" has electronically-balanced (transformerless) LEFT and RIGHT channel BALANCED-BRIDGING LINE INPUTS which are brought out to a screw-terminal barrier strip on the rear panel and include chassis ground connections for cable shields.

A balanced program audio feed to the "TVU" will use both the HI and the LO terminals, plus the associated GND (ground) terminal for each of the two stereo channels. Since these are "bridging" (high impedance) inputs, they provide no termination for equipment which feeds the "TVU". Please feel at liberty to connect 600-ohm resistors across the input terminals should you feel this really necessary. Most professional equipment nowadays features low output impedances and high input impedances. The concept of 600-ohm "line-matching" dates from the age of transformer coupling and is rooted in the mystique of telephone engineering. More often than not, audio line impedance matching is ignored by today's enlightened teleproduction wizards (you) and leading-edge equipment manufacturers (us).

Unbalanced Inputs

The phono-jack UNBALANCED LINE INPUTS accept single-ended audio from semi-pro and consumer-grade gear at the reduced line levels typical with such equipment. When using the phono-jack inputs, be sure that nothing is connected to the BALANCED-BRIDGING LINE INPUT barrier strip terminals.

MONAURAL OPERATION

When the "TVU" is used to display the level of a single channel of program audio, the unit may be switched to MONO to remove the right channel bargraph display. Of course, this requires that the single channel of audio be connected to the left channel input.

Section III

SETUP AND OPERATION

NORMAL SETUP PROCEDURE

"TVU" adjustments are made with a small, flat-blade screwdriver through the front-panel adjustment access holes. The following procedure assumes 1) that the "TVU" has been connected in-line with the video monitor observing proper termination conditions as described in the Installation section; 2) that left and right program audio is peroperly connected, also as previously described.

1. With "TVU" switched to the STEREO mode and power turned on, position the level display image to the desired area of the screen with the V (vertical) and H (horizontal) POSITION controls.
2. Feed a 1kHz sinewave test tone from both the left and right channels of the audio control console at the normal, "zero reference" program level. This corresponds to 0VU, or 100% on the console meters.
3. With the "TVU" switched to the VU mode, adjust the VU CALIBRATE L and R (INPUT LEVEL) controls for an on-screen bargraph indication of 0VU.
4. Switch the "TVU" to PPM and adjust the PPM CAL. L and R (GAIN OFFSET) controls for a bargraph indication of –6dB, or other desired "Peak Crest Factor" offset. (See next subheading.)
5. Observing the PPM readout, which should now indicate –6dB, increase the console test tone level for a PPM bargraph display of 0dB. (This will peg the console meters.)
6. Return the "TVU" to VU measurement. The bargraph will register full-scale ("pegged") since the test signal is now 6dB above 0VU.
7. Adjust the FLASHER LEVEL SET control slowly counterclockwise until the Peak Flssher just trips, as evidenced by a flashing display background. At this point the "TVU" Peak Flasher is set to indicate program peaks which reach 6dB above 0VU. This may be reset for another value by repeating Steps 5-7 with a different offset factor. When the FLASHER LEVEL SET control is turned fully clockwise, the Peak Flasher is disabled.
8. Remove the test signal. The "TVU" is now calibrated for use in either the VU or PPM display modes.

OPERATING CONSIDERATIONS:
PEAK vs. AVERAGE METERING

Today's wideband program audio equipment, multiple, close-in microphone pickup techniques and contemporary tastes in pop music present program audio transmission and recording systems with far wider dynamics than in the past. This requires accurate and sophisticated level measurement and signal-handling methods.

Most US production and broadcasting facilities are familiar with the "VU" level measurement standard which has been traditional in this cojntry since the 1030s. Being an average-responding device with a relatively long (300 millisecond) integration time, the VU meter does not give as accurate a presentation of today's program dynamics as it did for program material prevalent back in the '30s. Nevertheless, VU ballistics do give a meaningful display of the "syllabic" nature of a speech signal, and of the "beat" of most musical accompaniment.

The European Peak Programme Meter (PPM) represents a measurement standard which yields a more accurate indication of program dynamic range. Either a peak-responding meter or and LED-type readout, or a peak indicator used in conjunction with a VU meter, has seen increasing use in US studios.

The "TVU" may be used in either its VU (with Peak Flasher) or its PPM mode to best display today's wide program dynamics. The level offset between zero-VU and either the Peak Flasher "trip" level or PPM "reference" is somewhat ambiguous. This value depends on signal headroom margin throughtout the total audio chain, and on established operating procedures. The 6dB figure called out in the setup is an often-used starting value, though many users have standardized on other offsets ranging from 6dB to 12dB.

The audio (or video) eigineer concerned with the quality of his sound should consult some of the in-depth articles concerning signal headroom, distortion mechanisms, audio processing systems, etc. which appear in trade publications and in the Journals of various technical societies.

Section IV

CALIBRATION

The Inovonics "TVU" makes the most efficient use of both analog and digital integrated circuitry to reduce overall circuit complexity. Aside from the front-panel user controls, there are only three additional calibration pots which rarely, if ever, require attention.

Black Level Adjust

"TVU" video characteristics are fixed, anticipating a normal 1-volt p-p program video signal. Bargraph image "white" is preset at about 90% of program video peak white, and the "black" bvackground of the level display image is about 10% above program video black. This restricted signal amplitude of the level display area assures that the generated image will fall inside program video levels and will neither dominate the monitor visually nor confuse sync separation circuitry.

Though the peak-to-peak "TVU" image level is fixed, an adjustment is provided to center the display signal within the program level range.

The PGM BLACK control, R55, is on the Analog board beneath the Digital circuit assembly. R55 is accessed with a small screwdriver through a hole in the "TVU" cover, reaching through a clearance hole in the Digital board. Adjustment of this control is made either by observing the "TVU" output signal with an oscilloscope, or while watching the video monitor. The only caution is to keep display "black" out of the program sync area, and to keep display "white" below the "blooming" point of the monitor. Once set for a particular program signal, R55 need never be reset. As shipped, R55 is factory-centered within the standard 1V p-p program signal.

Master "Dot" Clock

"TVU" digital circuitry is clocked by a gated, astable R/C oscillator. The clock frequency is approximately 8MHz and is not arithmetically related to the video line rate, H.

Clock frequency is set by R1 on the upper, Digital circuit assembly. This adjustment is not at all critical, and is made while observing the video monitor. Though R1 does affect the width of the level display image, proper calibration of this pot should not be compromised for a desired image width.

With R1 fully clockwise, the level display will be at its widest and thin white vertical lines *may* be observed in the bargraph image area. As R1 is slowly turned counterclockwise, the display width will begin to decrease. As R1 is turned further counterclockwise, a point will be reached where faint white vertical lines will definitely be seen to divide the boxed display. The proper setting of R1 is just clockwise of the

setting where these lines appear, or where the display width increases about 10% from the critical “white line” point.

A/D Limit Adjustment

The analog-to-digital converter (A/D) generates an 8-bit code for each of the 93 quantized steps of program level measurement. R9 on the Digital board sets the code for the top-most (highest level) step.

With the “TVU” operating in the PPM mode, apply a 1kHz sinewave oscillator signal to both the left- and right-channel inputs at a level at least 10dB above a full-scale indication. Adjust R9 clockwise until the bargraph extends beyond the top of the scale and into the L and R channel-ID portion of the scale annotation. Back R9 carefully counterclockwise until the bar is *just* contained at the top-most scale marking.

Final accuracy of this setting may be confirmed by checking scale linearity in the VU mode between 0VU and +3VU, advancing the test signal in 1dB increments. The bargraph display should follow the oscillator precisely, without visible “compression” at the top of the scale.

Section V

CIRCUIT DESCRIPTIONS

This section details the circuitry of the Inovonics "TVU". Circuit descriptions refer to the three pages of Schematic Diagrams contained in the Appendix, Section VI, Pages #, # and #.

ANALOG CIRCUIT ASSEMBLY

Video Path

Referring to the first page of the Analog board schematic, program video enters the "TVU" via J3. In the BYPASS position of S2, the VIDEO IN and VIDEO OUT are tied directly together. In the PWR. ON position of S2, input video is normally terminated by R52 and is fed to both a sync separator and to the level display keyer and buffer amplifier.

Sync Separator

Q3 is a linear, inverting video amplifier which drives the sync separator, Q4. Q4 is operated with a bias condition which strips the amplified, positive-going composite sync from program video. Q5, preceded by a simple R/C integrator, delivers vertical, field-rate sync pulses to the digital circuitry. Q6 differentiates composite sync to recover horizontal, line-rate sync pulses.

DC Restoration

Input video is coupled through C18 to DC-restorer Q2. The base of Q2 may be set with R55 to equalize program and level display black levels (see Page #). CMOS anbalog switch sections A1 (1-2 and 3-4) form a SPDT switch to select either program video or level display information. The "wiper" of this SPDT switch feeds IC6, a video buffer amplifier IC with 6dB gain and a 75-ohm "buildout" output resistance. When terminated by the monitor, net circuit gain is unity.

Audio Input

Circuitry pertaining to the left program audio channel will be described. The quick-witted reader should be able to transpose this information for the right program with a minimum of difficulty.

Referring to the second page of the Analog board schematic, the primary left program audio input is balanced and buffered by IC1B. The secondary, unbalanced input is fed single-ended to IC1B through R1, establishing a higher gain for "semi-pro" equipment line levels.

Rectification and Integration

IC2B inverts the output of IC2D, CR1 and CR2 thus comprising a full-wave rectifier for left-channel program audio. C6 integrates the rectified audio, and S1A selects the integration characteristic (as well as display ballistic response) for VU and PPM display modes.

Peak Flasher In the VU dkisplay mode, CR8 and CR9 route left- and right-channel program peaks to a common integrator, R44 and C14. Peaks are given 10ms integration and compared with an adjustable FLASHER LEVEL SET voltage from R45. When toggled, the output of comparator IC3B sets flip-flop IC4B. IC4A and IC4B are also gated by vertical sync pulses to turn the display image area completely white on alernate video fields. This gives a flashing warning that program peaks have exceeded the Peak Flasher trip value.

A/D Multiplexing C13 and IC3A form a sample-and-hold circuit for rectified VU- or PPM-derived values. A2(3-4 and 8-9) selects between the left and the right channel values at a picture field rate, or 30 samples, each channel, per second. A2(1-2 and 10-11), switched on by vertical sync pulses, establish the sample period, roughly, as that of the vertical interval. Q1, driven by the A/D converter, discharges C13 completely just before each sample is taken.

CR7 cancels the DC level offset and termperature drivt characteristics of the program audio rectifier diodes. The output of the sample-and-hold stage, IC3A, feeds the A/D converter on the Digital board. This feed consists of alternate samples of left- and right-channel program levels, each held for one conversion period.

Power Supplies The first page of the Analog board schematic also shows the "TVU" power supply and chassis-mounted components. 3-terminal adjustable voltage regulator Ics provide the ±15-volt and the +5-volt supplies. V (vertical) and H (horizontal) POSITION controls are physically located on the Analog board, though associated circuitry is on the Digital circuit assembly.

DIGITAL CIRCUIT ASSEMBLY

Conversion Left- and right-channel program levels are converted from their analog values to 8-bit digital codes by A/D converter IC19. Conversion alternates between left and right at a video field rate, yielding 30 digitized samples-per-channel per second. 8-bit latches IC17 and IC18 hold the samples between updates and during alternate fields.

Display Positioning Video sync pulses trigger the two one-shot multivibrators IC21B (vertical) and IC 21A (horizontal). Timing is set by the two POSITION controls and respective timing capacitors, C4 and C5. The vertical and horizontal one-shot delays correspond to the offsets betwen the top of the picture and the top of the level display area, and the left side of the picture and the left side of the level display area, respectively. IC21A sets flop-flop IC20A, and IC21B sets IC4A. At the coindidence of these

delays, AND gate IC9B enables the master "dot" clock, IC1A, which initiates the level display sequence.

Display This outline of display sequence logic covers the basic display

Sequence

"window"; its height and width with respect to the television picture.

Horizontal sync pulses are counted-down by IC6. When the 97 steps of level and annotation display are complete, IC7B resets IC4 to end the sequence for that video field. Within each field, gated clock pulses at the display "dot" rate of approxmiately 8mhz are divided by IC2A, IC2B and IC3A into the 8-dot "characters" which are fundamental to the display annotation and bargraph graphics. The inserted level display image is seven characters wide, except in the MONO mode which has an abbreviated 5-character width. Characters are counted-down by IC5 which resets IC20 after each video line of 7-character level display.

Display Window Routine

Within the display window, the 97 lines of display and the seven, 8-dot characters of each line comprise a matrix which forms the level display image. IC12 is a programmable read-only memory (PROM) which holds two such matrices. Each matrix has two functions A *static* function holds scale markings and designations for the VU and the PPM display modes. What would be considered the *dynamic* part of the PROM matrix is a pari of "lookup" tables for display level address informatin.l VU and PPM tables are compared with digitized program levels from the A/D converter to create the dynamic bargraph element of the "TVU" display.

As the lines of the display are progressively scanned, IC5 and IC6 address the PROM matrix to transfer-out 8-bit character blocks of data. IC8, IC9 and IC10 provide further decoding for the particular character addresses corresponding to the level readout bar segments. When, for example, the left-channel bar segment address is decoded, IC17 passes digitized left-channel level data to IC15 and IC16, comprising an 8-bit digital comparator. This comparator is also presented with PROM level addresses to dictate which individual lines of the bargraph will appear as black or white.

IC13 is a serial shift register. It receives 8-bit characters of scale annotation data from the PROM and is clocked at the master "dot" clock rate to create the display scale graphics video signal. Shift register action is overridden by the digital comparator for the left- and right-channel bar addresses. The output of IC13 is the actual video signal which is inserted into the display window.

Section VI

APPENDIX

The following section of this Manual contains Parts Lists for the Inovonics “TVU”, Schematic Diagrams of the electronic circuitry, and an explanation of Inovonics’ Warranty Policy.

PARTS LIST

EXPLANATION OF PARTS LISTINGS

This section contains listings of component parts used in the Inovonics "TVU." These are listed either *en-masse,* or by schematic component reference designation, and may, or may not, specify a particular manufacturer. When no manufacturer is called-out, the term "open mfgr." advises that any manufacturer's product is acceptable.

If a particular component is not listed at all, this means that we do not consider it a typical replacement item. Should you need to order an unlisted part, call, write or FAX the factory with a brief description and we'll do our best to figure out what you need and get it on its way to you.

CAPACITOR SPECIFICATIONS

Unless specifically noted by component reference designation, **capacitors** are specified as follows:

a) **Under 100pF** are "dipped mica" type, DM-15 (or CM-05 military series) size designation; "P" value is picofarads, ±5%, 200VDC; (open mfgr.).

b) **100pF to 0.47μF** are of the metalized mylar or polyester variety; whole number "P" values are picofarads, decimal values are microfarads, ±5%, 50VDC or better. The style used in the 708 is the "minibox" package with lead spacing of 0.2 inch. **Preferred mfgr.:** Wima MKS-2 or FKC-2 series. **Alternates:** CSF-Thompson IRD series or Roederstein KT-1808 or KT-1817 series.

c) **1.0μF and above** are radial-lead electrolytics, value per schematic, 25VDC; (open mfgr.).

ANALOG CIRCUIT ASSEMBLY

A1,2	Integrated Cct.; (open mfgr.) CMOS 4066B
C22,23,33-36	Capacitor, Monolithic Ceramic, 0.1μF, 50VDC; (open mfgr.)
C31	Capacitor, Electrolytic, axial leads, 1000μF, 35VDC; (open mfgr.)
C32	Capacitor, Electrolytic, axial leads, 100μF, 35VDC; (open mfgr.)
CR1,2,4,5,7-13	Diode, Silicon Signal; (open mfgr.) 1N4151 or equiv.
CR3,6	Diode, Schottky; (open mfgr.) 1N5711
CR14-17	Diode, Silicon Rectifier; (open mfgr.) 1N4005

IC1,3	Integrated Cct.; (open mfgr.) LF353N
IC2	Integrated Cct.; Raytheon RC4136BCN
IC4	Integrated Cct.; (open mfgr.) CMOS 4013B
IC5	Integrated Cct.; (open mfgr.) 74LS14
IC6	Integrated Cct.; Harris CA3100E
IC7	Integrated Cct.; (open mfgr.) LM317LZ
IC8	Integrated Cct.; (open mfgr.) LM337LZ
IC9	Integrated Cct.; (open mfgr.) LM317T
J1,2	Connector, PC-mounting phono jack; Mouser 16PJ097
J3,4	Connector, BNC chassis-mounting male; Amphenol 31-221
J5	Connector, PC-mounting barrier strip; Magnum A204208-NL-R-50
J7	Connector, 5-position male; Molex 26-48-1054 or 26-48-1244
Q1-4,6	Transistor, NPN; (open Mfgr.) 2N3904
Q5	Transistor, PNP; (open mfgr.) 2N3906
R6,10,26,30	Resistor, single-turn variable, 100K; CTS X201R104B
R45,79,80	Resistor, single-turn variable, 25K; CTS X201R253B
R55	Resistor, single-turn trimming, 1K; Tokos GF06U1 102K
	NOTE: All fixed resistors are ¼W, 5% carbon film type; value per schematic diagram.
S1,2	Switch, alternate-action, 4 -pole, 2-position; ECG TA 4UEE/TAG/BLK

DIGITAL CIRCUIT ASSEMBLY

C3,6-13	Capacitor, Monolithic Ceramic, 0.1μF, 50VDC; (open mfgr.)
CR1-7	Diode, Silicon Signal; (open mfgr.) 1N4151 or equiv.
J601-603	Connector, BNC chassis-mounting male; Amphenol 31-221
IC1	Integrated Cct.; (open mfgr.) 74LS14
IC2,3	Integrated Cct.; (open mfgr.) 74LS74
IC4,20	Integrated Cct.; (open mfgr.) CMOS 4013B
IC5,6	Integrated Cct.; (open mfgr.) CMOS 4520B
IC7,9,11	Integrated Cct.; (open mfgr.) 74LS08
IC8	Integrated Cct.; (open mfgr.) 74LS04
IC10	Integrated Cct.; (open mfgr.) 74LS02

IC12 Integrated Cct.; (open mfgr.) 27C256
NOTE: This EPROM requires factory programming.

IC13 Integrated Cct.; (open mfgr.) 74LS165

IC14,17,18 Integrated Cct.; (open mfgr.) 74LS373

IC19 Integrated Cct.; National Semi. ADC-0804LCN

IC21 Integrated Cct.; (open mfgr.) 74LS221

R1 Resistor, single-turn trimming, 500Ω; Tokos GF06U1 501K

R9 Resistor, single-turn trimming, 5K; Tokos GF06U1 502K

S1 Switch, alternate-action, 2 -pole, 2-position; ECG TA 2UEE/TAG/BLK

CHASSIS-MOUNTED COMPONENTS

F1 Fuseholder; Littlefuse 345-611-010 with 345-601-020 Cap for ¼-inch (US) fuses, or 345-621-020 Cap for 5mm (European) fuses. Fuse is standard "fast-blow" type in value specified on rear panel with reference to mains supply.

T1 Power Transformer; Signal 241-5-36 (single-primary) for 115VAC only, or Signal DP 241-5-36 (dual-primary) for 115/230VAC operation.

- Connector, 5-position female (for power transformer); Molex 09-50-7051; requires 5ea Molex 08-50-0106 Crimp Terminals.

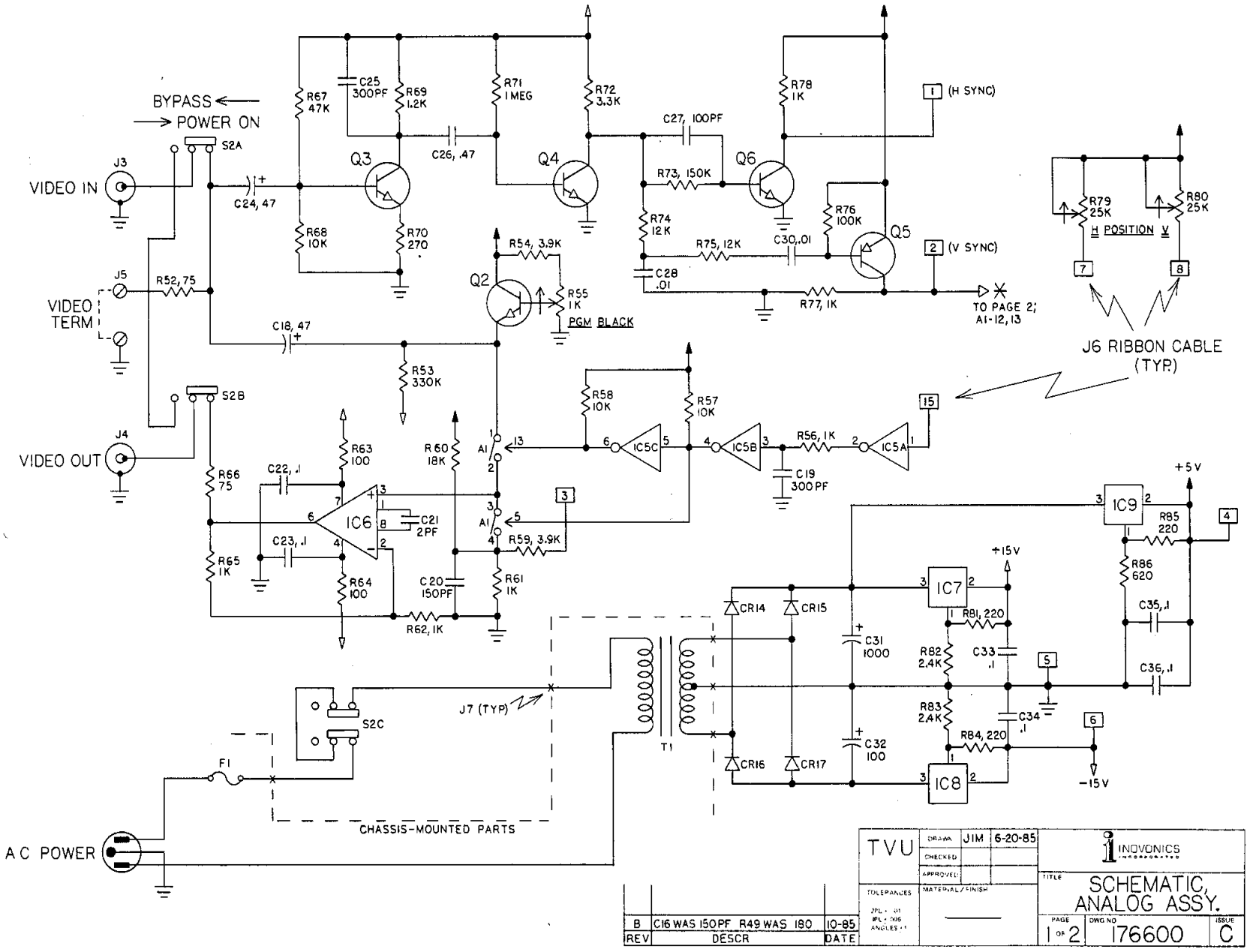
MAIL-ORDER COMPONENT SUPPLIERS

The following electronic component distributors have proven to be reputable suppliers of both large and small quantities of parts. Most semiconductors, ICs, capacitors, resistors or connectors used in the "TVU" are available from one or more of these firms. Each supplier publishes a full-line catalog, available free for the asking.

Mouser Electronics — Call (800) 346-6873

Digi-Key Corporation — Call (800) 344-4539

ACTIVE (div. of Future Electronics) — Call (800) 677-8899


BYPASS
POWER ON
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J3
VIDEO IN
J5
VIDEO TERM
J4
VIDEO OUT
S2B
S2C
F1
AC POWER
CHASSIS-MOUNTED PARTS
J7 (TYP)
T1
R67 47K
C25 300PF
R69 1.2K
R71 1 MEG
R72 3.3K
C27, 100PF
R78 1K
1 (H SYNC)
Q3
Q4
Q6
C26, .47
C24, 47
R73, 150K
R74 12K
R76 100K
Q5
R68 10K
R70 270
R54, 3.9K
Q2
R55 1K
PGM BLACK
R75, 12K
C30, .01
2 (V SYNC)
C28 .01
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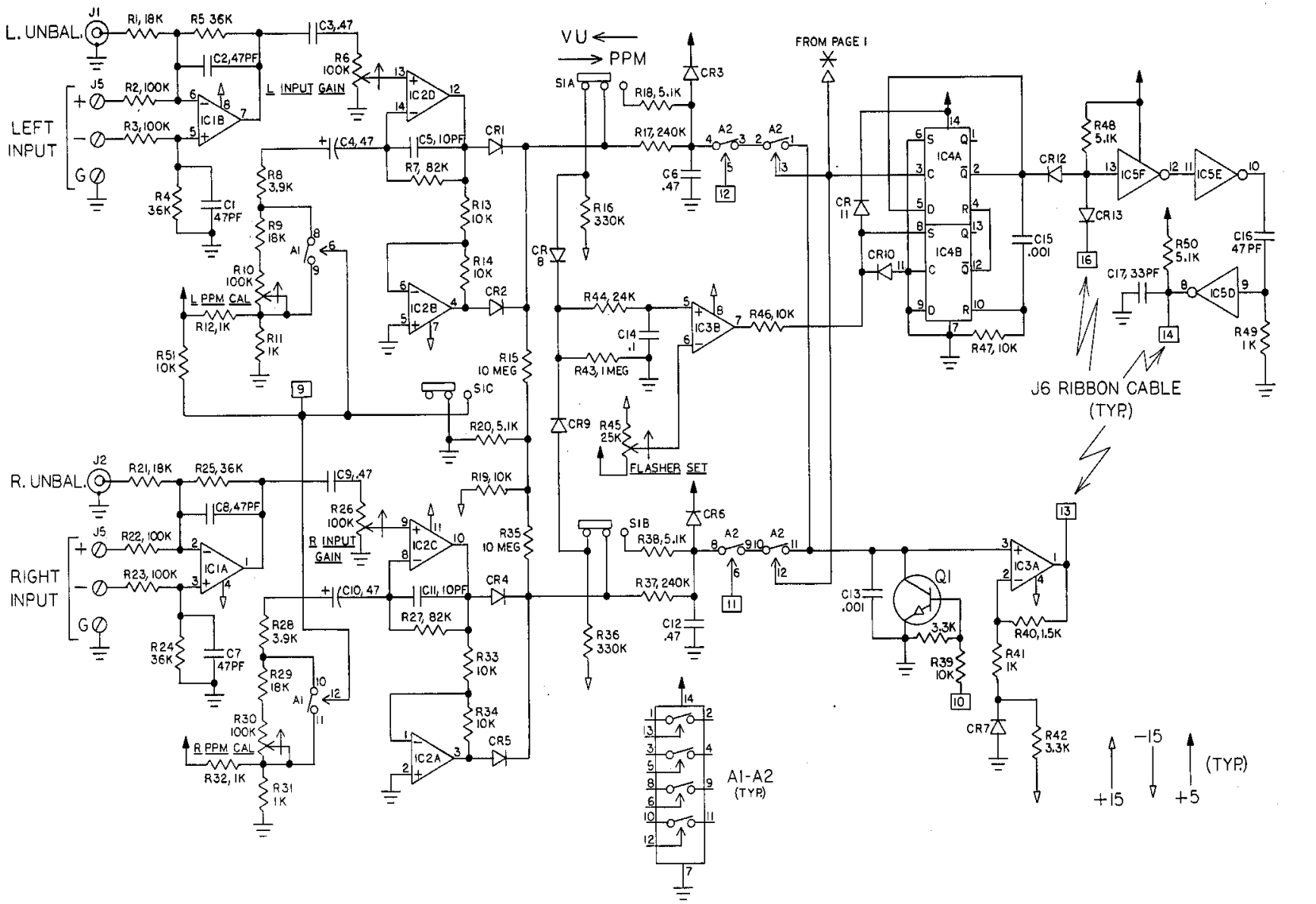
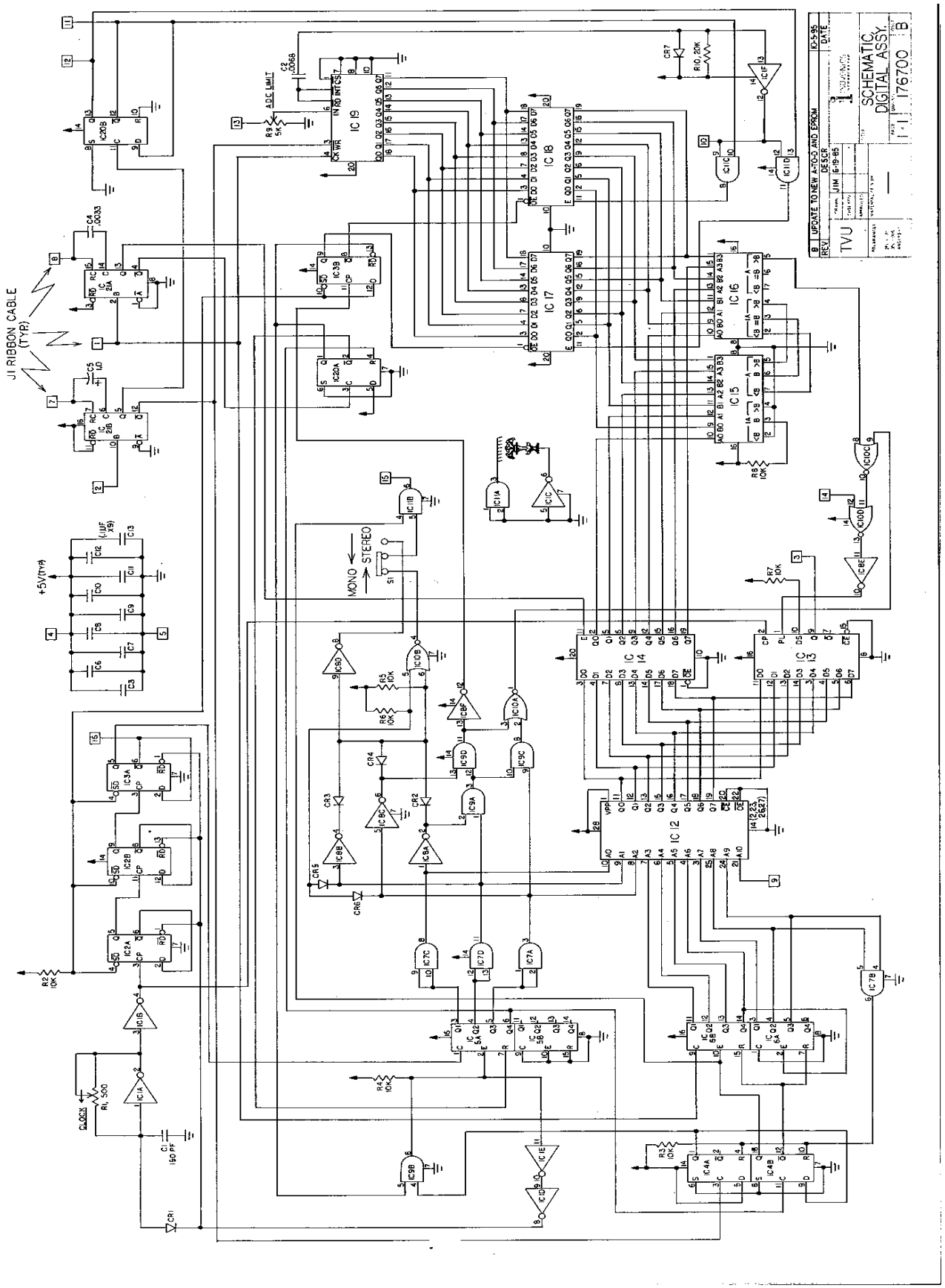
J6 RIBBON CABLE (TYP)
R52, 75
C18, 47
R53 330K
R58 10K
R57 10K
15
R56, 1K
IC5C
IC5B
IC5A
C19 300PF
R63 100
R60 18K
A1
13
C22, .1
IC6
C21 2PF
C23, .1
R64 100
R65 1K
R66 75
R59, 3.9K
3
C20 150PF
R61 1K
R62, 1K
+5V
IC9
R85 220
4
R86 620
C35, .1
C36, .1
+15V
IC7
R81, 220
R82 2.4K
C33 .1
5
R83 2.4K
C34 .1
R84, 220
6
IC8
-15V
CR14
CR15
CR16
CR17
C31 1000
C32 100
TVU
DRAWN JIM 6-20-85
CHECKED
APPROVED
MATERIAL/FINISH
TOLERANCES
INOVONICS INCORPORATED
TITLE
SCHEMATIC, ANALOG ASSY.
PAGE 1 OF 2
DWG NO 176600
ISSUE C
B C16 WAS 150PF R49 WAS 180 10-85
REV DESCR DATE


L. UNBAL.
J1
R1, 18K
R5 36K
C3,47
C2,47PF
R6 100K
L INPUT GAIN
IC2D
LEFT INPUT
J5
R2, 100K
R3, 100K
IC1B
G
R4 36K
C1 47PF
R8 3.9K
R9 18K
A1
R10 100K
L PPM CAL
R12, 1K
R11 1K
R51 10K
C4, 47
C5, 10PF
R7, 82K
CR1
R13 10K
R14 10K
IC2B
CR2
R15 10 MEG
S1C
R20, 5.1K
VU ← → PPM
S1A
R18, 5.1K
CR3
R17, 240K
C6 .47
R16 330K
CR8
R44, 24K
C14 .1
R43, 1 MEG
IC3B
R46, 10K
R45 25K
FLASHER SET
CR9
R19, 10K
FROM PAGE 1
IC4A
IC4B
CR11
CR10
C15 .001
R47, 10K
CR12
CR13
R48 5.1K
IC5F
IC5E
R50 5.1K
C17, 33PF
IC5D
C16 47PF
R49 1K
J6 RIBBON CABLE (TYP.)
R. UNBAL.
J2
R21, 18K
R25, 36K
C9, .47
C8, 47PF
R26 100K
R INPUT GAIN
IC2C
RIGHT INPUT
J5
R22, 100K
R23, 100K
IC1A
G
R24 36K
C7 47PF
R28 3.9K
R29 18K
A1
R30 100K
R PPM CAL
R32, 1K
R31 1K
C10, 47
C11, 10PF
R27, 82K
CR4
R35 10 MEG
S1B
R38, 5.1K
CR6
R37, 240K
C12 .47
R36 330K
IC2A
R33 10K
R34 10K
CR5
A1-A2 (TYP.)
Q1
C13 .001
3.3K
R39 10K
IC3A
R40, 1.5K
R41 1K
CR7
R42 3.3K
+15
-15
+5
(TYP.)
TVU
DRAWN
JIM
6-21-85
CHECKED
APPROVED
MATERIAL
INOVONICS INCORPORATED
SCHEMATIC, ANALOG ASSY.


SCHEMATIC, DIGITAL ASSY.
176700 B
TVU
B UPDATE TO NEW A-TO-D AND EPROM
REV DESCR DATE
JI RIBBON CABLE (TYP.)
+5V(typ.)
MONO
STEREO
CLOCK
A/D LIMIT
IC 19
IC 18
IC 17
IC 16
IC 15
IC 14
IC 13
IC 12