

SECTION 6 — MANUFACTURERS LIST

CODE	MANUFACTURER	LOCATION
AD	Analog Devices	Norwood, MA
AV	AVX/Stantel Corp.	Myrtle Beach, SC
BE	Belden	Richmond, IN
CA	Catalyst Semiconductor	Santa Clara, CA
CE	Centralab Electronics Div.	Milwaukee, WI
CK	C&K Components	Newton, MA
CS	Crystal Semiconductor	Austin, TX
CT	CTS	Elkhart, IN
DL	Dale	Tempe, AZ
EC	E-Switch	Minneapolis, MN
EM	Ecam Technology	Scottsdale, AZ
GI	General Instruments/Quality Technologies	Sunnyvale, CA
HP	Hewlett Packard Opto-electronics Div.	Santa Clara, CA
IL	Illinois Capacitor	Lincolnwood, IL
LF	Littlefuse	Des Plaines, IL
LG	Logitek (Circuit Cards)	Houston, TX
LO	Lite-On Inc. Semiconductor Div.	Milpitas, CA
MM	Maxim	Sunnyvale, CA
MO	Motorola Semiconductor Products	Phoenix, AZ
MP	Mepcopal	San Diego, CA
NC	NIC Components Corp.	North Amityville, NY
NI	Nichicon	Schaumburg, IL
NT	Neutrik	Lakewood, NJ
PR	Mill-Max Mfg. (Preci-dip)	Oyster Bay, NY
PN	Panduit Corp.	Tinsley Park, IL
SI	Signal Transformer	Inwood, NY
SR	Schurter Inc.	Petaluma, CA
SS	Schott Corp.	Minneapolis, MN
SY	Stanley	Battle Creek, MI
TI	Texas Instruments, Inc.	Dallas, TX

SYMBOL	DESCRIPTION	LOGITEK PART NUMBER
C24,25 12061A471JATMA	470pf/100V ceramic SMD	AV-
C26 NMC1206Z5U104M50T	1 uf/50V Z5U SMD(1206)	NC-
Diodes		
D1,2	5.4V zener	GI-1N4734A
Integrated Circuits		
IC1,2	Quiet op amp	SG-NE5532N
IC2,3	Balanced line receiver	AD-SSM2143P
IC5	-5VDC regulator/100 mA	MO-MC79L05ACP
IC6	+5VDC regulator/100 mA	MO-MC78L05ACP
IC7	ADC 16-bit stereo	AD-AD1877JR
4 pcs. 1003	8-pin dip socket	EM-100-083-10-
Connectors		
J1,2	Phone jack switch PC	SW-RN-114BCP
J3	10-pin dual row socket	PN-050-010-455
Ferrites		
FR1-3	Ferrite bead	MU-BLM32A07PB
Resistors		
R1,2	21k, .1%	DL-RNC55H2102BS
R3-7	4220, 1%	
R8,9	50K multiturn trimpot	MP-CT9X503
R10,11	21K, .1%	DL-RNC55H2102BS
R12	4220, 1%	
R13-14	300	
1 pc.	ADC Input circuit card	LG-264A

SYMBOL	DESCRIPTION	LOGITEK PART NUMBER
	(order by brightness number on display card)	
D129	Yellow LED bar 2mm x 5mm	LO-LTL-433Y
D130	Orange LED bar 2mm x 5mm	HP-HLMP-S401
D131,132	Red LED bar 2mm x 5mm	LO-LTL-433HR
D133-168	Orange LED bar 3.2,, x 5.6mm	HP-HLMP-T400
D169-191	Yellow LED bar 2.4mm x 5mm	LO-LTL-23251AL
D192	Red 3-digit 7-segment display	HP-5082-7433
Integrated Circuits		
IC1-6	64 LED driver	MM-MAX7219CWG
IC7	+5VDC regulator 1.5A	MO-MC7805CT
Connectors		
P1	10-pin dual row header	PN-051-010-153
P2	3-pin header	PN-MFSS100-3A
P3	6-pin right angle header	PN-MFAS100-6
J1	10-pin dual row socket	PN-050-010-455
J2	3-pin socket	PN-CE100F28-3A
J6	6-pin socket	PN-CE100F28-6A
Resistors		
R1-6	5100	
Switches		
S9-11	pushbutton	EC-TL2301
6 pcs.	cap black 5mm x 11mm	EC-5FBlack
8 pcs.	64-pin SIP press-in socket	PR-304-13-164-41-
770	32-pin SIP header strip	EM-127-1-3210-
4 pcs.	14-pin DIP socket	EM-100-143-10-
5002	Display circuit card	LG-260A
1 pc.	Display driver circuit card	LG-261A
1003		
1 pc.		
1 pc.		
5-6 ADC Input Card		
Capacitors		
C1-4	75pf/1000V ceramic	CE-DD-750
C5,6	4.7uf/25V tantalum	AV-
TAP475K025CCS		
C7,8	2200pf/50V ceramic SMD	NC-
NMC1206NPO222K50TR		
C9-12	1uf/35V tantalum	AV-
TAP105K035HSB		
C13,14	4.7uf/25V tantalum	AV-
TAP475K025CCS		
C15	.1 uf/50V ceramic SMD	NC-
NMC1206Z5U104M50T		
C16,17	470pf/100V ceramic SMD	AV-
12061A471JATMA		
C18	.1 uf/50V ceramic SMD	NC-
NMC1206Z5U104M50T		
C19	.01uf/	AV-
12065E103MATMA		
C20,21	1uf/35V tantalum	AV-
TAP105K035HSB		
C22	.01uf/	AV-
12065E103MATMA		
C23	1 uf/50V ceramic SMD	NC-
NMC1206Z5U104M50T		

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>LOGITEK PART NUMBER</u>
D1,2 GI-1N4734A	5.4V zener	
Integrated Circuits		
IC1	AES/EBU receiver without uP port	CS-CS8412-CS
IC2	+5VDC regulator/100 mA	MO-MC78L05ACP
IC3	+5VDC regulator/1.5A	MO-MC7805CT
IC4	Watchdog timer/uP reset	MM-MAX1232CPA
IC5	EEPROM 8K x 8 150 ns	CA-CAT28C64BN-
15		
IC6 2101KP40	DSP 16 bit 2K/1K	AD-ADSP-
IC7 1 pc.	3 to 8 decoder SMD 8-pin dip socket	MO-MC74HC138D EM-100-083-10-
1003		
1 pc.	32-pin PLCC socket	EM-150-032-11-02
1 pc.	68-pin PLCC socket	EM-150-068-11-02
Connectors		
J1	3-pin large socket	PN-CE156F20-3A
J3	3-pin socket (2 pcs.)	PN-CE100F28-3A
J5-7	10-pin dual row socket	PN-050-010-455
J1	Female XLR	NT-NC3FK-H
P2	Male XLR	NT-NC3MK-H
P3	6-pin header	PN-MFSS100-6A
P4	3-pin large header locking	PN-MFLS156-3A
P5-7	10-pin dual row header	PN-051-010-153
Crystal		
Y1	12.288 Mhz crystal	CT-MP122
Resistors		
R1	2200	
R2	110	
R3	75	
R4	1000	
R5,6	100K	
R7,8	100K 2% 5 position bussed	CT-770-61-R104
R9,10	20K 8 position isolated SMD	CT-767163203G
R11,12	10K	
Switches		
S(1-8)	Dip switch block	CT-194-8MST
S(12,13)	Dip switch block	CT-194-2MST
Transformers		
T1	AES/EBU	SS-67129600
1 pc.	VU-Trax Dual Control circuit card	LG-265
5-5 Display Assembly		
Capacitors		
C1,2 NMC1206Z5U104M50T	.1 uf/50V Z5U SMT(1206)	NC-
C3 TAP107K020CCS	100uf/20V tantalum	AV-
Diodes		
D1-62	Tricolor LED bar 2mm x 5mm (order by brightness number on display card)	SY-VBRG5641X
D63	Yellow LED bar 2mm x 5mm	LO-LTL-433Y
D64	Orange LED bar 2mm x 5mm	HP-HLMP-S401
D65,66	Red LED bar 2mm x 5mm	LO-LTL-433HR
D67-128	Tricolor LED bar 2mm x 5mm	SY-VBRG5641X

IC2	AES/EBU receiver with uP port	CS-CS8411-CS
IC3	+5VDC regulator/100 mA	MO-MC78L05ACP
IC4	+5VDC regulator/1.5A	MO-MC7805CT
IC5	Watchdog timer/uP reset	MM-MAX1232CPA
IC6	EEPROM 32Kx8 200ns	CA-CAT28C256BN-
20		
IC7	DSP 16 bit 2K/1K	AD-ADSP-
2101KP40		
IC8,9	3 to 8 decoder	MO-SN74HCT138N
1 pc.	8-pin dip socket	EM-100-083-10-
1003		
2 pcs.	16-pin dip socket	EM-100-163-10-
1003		
1 pc.	20-pin dip socket	EM-100-203-10-
1003		
1 pc.	32-pin PLCC socket	EM-150-032-11-02
1 pc.	68-pin PLCC socket	EM-150-068-11-02

Connectors

J1	3-pin large socket	PN-CE156F20-3A
J2,3	3-pin socket	PN-CE100F28-3A
J4	10-pin dual row socket	PN-050-010-455
J6	Female XLR	NT-NC3FK-H
P1	3-pin large header	PN-MFSS156-3A
P2,3	3-pin header	PN-MFSS100-3A
P4	10-pin dual row header	PN-051-010-153
P7	Male XLR	NT-NC3MK-H

Crystal

Y1	10,000,000 hz crystal	CT-MP101-10-30PH
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Resistors

R1	2200	
R2	110	
R3	75	
R4,5	100K 2% 5 position bussed	CT-770-61-R104
R6	1000	
R7	10K	
R8	100K 2% 5 position bussed	CT-770-61-R104
R9	10K	

Switches

S(1-8)	Dip switch block	CT-194-8MST
S(12,13)	Dip switch block	CT-194-2MST

Transformers

T1	AES/EBU	SS-67129600
1 pc.	VU-Trax Digital Control circuit card	LG-252C

5-3 Analog Input Control Card

5-4 Dual Input Control Card

C1	.047uf/1000V ceramic	CE-CW-20C473K
C2-4	10uf/25V tantalum	AV-
TAP106K025HSB		
C5-10	.1 uf/50V SMD	NC-
NMC1206Z5U104M50T		
C11	25pf/1000V ceramic	CE-DD-250
C12	15pf/1000V ceramic	CE-DD-150

Diodes

SECTION 5 — REPLACEMENT PARTS LIST

All replacement parts are stocked in depth at the Logitek factory. Most are also available through local electronic parts distributors. For your convenience in purchasing replacement parts locally, we include the following parts list.

All Logitek part numbers consist of a two-letter manufacturer code followed by that manufacturer's standard part number for the item. A list of manufacturers, arranged alphabetically by manufacturer code, follows this parts list in Section 7.

All resistors are 1/4 watt, +/- 5% tolerance unless otherwise noted.

SYMBOL	DESCRIPTION	LOGITEK PART NUM-
5-1 Power Supply		
Capacitors		
C1	6800 uf/25V electrolytic	IL-688LBA025M2CD
C2	.1uf/50V ceramic disc	NC-.100MF50ME2
C3,4	100uf/25V electrolytic	MI-UFS1E101MPJ
Integrated Circuits		
IC1 1 pc. 1003	Charge pump 8-pin dip socket	TI-LT1054CN EM-100-083-10-
Rectifiers		
RT1	6A pc mount/240V	GI-GBPC-602
Fuses		
F1	1/2 amp slow blow 20mm	LF-218.500
Connectors		
P1	3-pin large header - locking	PN-MLSS156-3A
J1	3-pin large socket	PN-CE156F20-3A
J2	Power entry module/fuse holder	SR-6200.4115
Switches		
S1 121MS02QE	Slide DPDT	CK-L202-
Transformers		
T1	8V, 3A international rating	SI-IF-24-16
1 pc.	Super-VU Supply circuit card	LG-253B
1 pc.	Power card (North America)	BE-17251
5-2 Digital Input Control Card		
Capacitors		
C1-3 TAP106K025HSB	10uf/25V tantalum	AV-
C4-8	.1uf/50V ceramic	CE-UK50-104
C9	.047uf/1000V ceramic	CE-CW-20C473K
C10	25pf/1000V ceramic	CE-DD-250
C11	15pf/1000V ceramic	CE-DD-150
C12	.1uf/50V ceramic	CE-UK50-104
Diodes		
D1,2 GI-1N4734A	5.4V zener	
Integrated Circuits		
IC1	8 bit transceiver	TI-SN74HCT541N

flag. These are input to the DSP via a read to address zero.

Connector P5 attaches to the DSP's other serial port and allows analog data to be sent to the DSP via an external ADC card. The connector also provides power and the master processor clock for use by the ADC card.

If the digital receiver IC1 can lock onto an input signal then the DSP will display that signal whether it contains errors or not. If no signal is connected to J1 or the data rate is out of the receiver's capture range, then the DSP will display the data from P5. This happens even if nothing is connected to the analog inputs or the ADC card is absent.

4-9 Display Assembly LG-260 & LG-261

The VU-Trax display assembly consists of two circuit boards hooked together via two part pin and socket connectors. The display card (LG260) hold the LEDs and the pushbutton switches. The driver card (LG261) contains the driver chips and control board interface connectors. This assembly is hot pluggable and is reloaded with all operating parameters at least once a second.

Filtered power is connected to the driver card via J1. +5VDC regulator IC7 is bolted to the meter enclosure to increase heat dissipation and connects to the driver card via J2. C1,C2 and C3 stabilize the 5 volt supply.

Each display driver IC controls 64 LEDs by scanning them in an eight by eight matrix. Segment lines are current controlled and connect to the LED anodes. Digit lines connect to the LED cathodes. Scanning is accomplished by taking each digit line low one at a time and sourcing current from the segment lines for whichever of the 8 LEDs in a digit group need to be lit. The driver chips can also selectively decode BCD data into 7-segment numeric display signals. Maximum LED brightness is set by the external resistors. The drivers further control brightness by pulse-width modulating the LED on times with a value supplied by the DSP.

The display drivers accept synchronous serial data (clock, data, load) in 16 bit strings composed of an address byte and a data byte. The driver ICs are arranged in two chip groups. The data out of one chip is hooked to the data in of the second chip such that 4 bytes can be loaded, two to each chip, with one load pulse.

IC1 and IC5 drive the upper bargraph (left channel). IC2 and IC6 drive the lower bargraph (right channel). IC3 and IC4 drive the scale LEDs, 7-segment display and indicator LEDs.

The two circuit cards can be easily separated by prying them apart with a large screwdriver. Try to work all the pins apart a little bit at a time so that all the pins will disconnect at once. Bending the interconnect pins will make reassembly harder.

Avoid removing the metal LED alignment plate if at all possible. There is very little space around the scale backlight LEDs and, if any get bent, it can take some time to reassemble the alignment plate. If a LED needs replacing, the alignment plate should be pushed down toward the circuit card until the end of the LED can be grabbed with a pliers and removed. A small spot of solder attaches each bargraph LED to its socket. This should be removed before pulling out the LED. Remember to consult the component diagram for the correct orientation before installing a new LED.

4-10 ADC Input Card LG-264

The audio from the left input 1/4" phone connector J2 is connected to a RF lowpass filter formed by R10, R11, C3 and C4. The resistors also form a -9 dB pad with the input impedance of the balanced receiver IC4. IC4 provides an additional -6 dB pad between its input and output. These pads allow +20 dBu input signals to be handled by the +/- 5 volt supply rails. The output of IC4 is unity gain inverted by op-amp IC2b and fed back to the reference input of IC4. This enables IC4 to present an identical resistive load on its two input pins. Input gain is adjusted via trimpot R9 which is the feedback resistor around gain stage IC1b.

***** **IMPORTANT** *****

Only replace IC2 with an op-amp which is slower than the SSM2143 such as the TL072 used here. A faster op-amp like the NE5532 will cause the output of IC4 to oscillate.

Signal from IC1b is fed through antialias filter R14 C8 and DC isolated by C11 before connecting to the left input of the sigma delta analog to digital convertor IC7. The right channel connects to the convertor via similar circuitry.

The 12.288 MHz master clock input to the ADC is generated by a crystal oscillator located on the DSP control card. Combined left and right audio data is sent synchronously (data, clock, frame sync) to the DSP in 64-bit strings via connector P3. The reset signal from the DSP control card is also connected to the ADC. The DSP activates the reset once a day which causes the ADC to perform a self calibration routine for about half a second. If the meter has undergone a substantial temperature change, it may generate noise up to -70 dBFS until it undergoes a calibration cycle

The three supply voltages from P3 are EMI isolated by ferrite beads FR1,FR2 and FR3 before connecting to the other circuitry. IC5 and IC6 supply low noise regulated +/- 5 VDC to the analog portions of the circuit. The digital part of the data convertor gets its +5 VDC from the DSP control card.

every 150 mSec. This pin is normally pulsed low every 5 mSec by the left bargraph load signal.

The DSP (IC7) is clocked by a 10 MHz crystal oscillator consisting of Y1,C10,C11 and an internal driver. IC7, pin43 is a buffered output of the oscillator.

The first thing the DSP (IC7) does after reset is copy its startup program from EEPROM IC6 to internal RAM memory. That program executes once and then loads the main program from EEPROM which executes continuously. Note that the 8 bit data bus is connected to the middle byte of the DSP's 24 bit data port.

Address decoder IC8 is used to reset the watchdog timer (IC5), connect the rear panel programming switches (S1-S8) to the data bus via buffer IC1 and read/write the data receiver (IC2) control/status registers.

Front panel pushbuttons S9,10,11 are connected directly to the low byte of the DSP data port.

Serial data is sent synchronously (data, clock, load) to the display driver chips via the display connector J4 in 32 bit strings. Data is placed on the top bit of the DSP data port and clocked into the display drivers via a write to address decoder IC9. Other writes to IC9 will load the 32 bit data string into the left bargraph, right bargraph or scale/indicator driver groups via J4. A write to the left bargraph will also be decoded by IC8 and used to reset the watchdog timer.

Two channel audio data is fed synchronously (data, clock, frame sync) from data receiver IC2 to DSP (IC7) serial port 1.

Encoded audio data enters the meter via XLR connector J6 and is directly connected to the output connector P7. Note that no buffering is applied to the loop through output.

The input data signal is connected to pulse transformer T1 via DC blocking capacitor C8. The output of T1 is loaded by R1,R2,R3 and connected to data receiver IC2. C9 and R6 form a loop filter used by IC2 to recover the embedded clock from the coded input signal. IC2 separates the audio data, channel data and clock from the input data. The audio is sent to the DSP in 64 bit strings via a serial port. Channel status data is stored in internal RAM and retrieved by the DSP via an 8 bit parallel port. The parallel port is also used by the DSP to load control information into the data receiver.

4-7 Analog Input Control Card

4-8 Dual Input Control Card LG-265

Power from input connector P4 is connected to voltage regulators IC2 and IC3 as well as display board connector P6. IC2 is a +5VDC regulator that feeds power to the analog front end of data receiver IC1. The voltage is filtered by C2, C6 and clamped against over voltage and voltage reversal by D1. IC3

is a +5VDC regulator that feeds the digital portion of IC1 and all other circuits on the control board. The output voltage is filtered by C3 and clamped by D2. Distributed power filtering is supplied by C4,7,8,9 & 10.

On power up, the DSP is kept in reset by IC4 until the power has stabilized, ensuring a good power on reset. IC4 also contains a watchdog timer that will reset the DSP if its ST pin is not taken low at least once every 150 mSec. This pin is normally pulsed low every 5 mSec by the left bargraph load signal.

The DSP (IC6) is clocked by a 12.288 MHz crystal oscillator consisting of Y1,C11,C12 and an internal driver. IC6, pin43 is a buffered output of the oscillator.

The first thing the DSP (IC6) does after reset is copy its startup program from EEPROM IC5 to internal RAM memory. That program executes once and then loads the main program from EEPROM which executes continuously. Note that the 8 bit data bus is connected to the middle byte of the DSP's 24 bit data port.

The rear panel programming DIP switches S1-S8 are also connected to the DSP's middle data byte via isolation resistors R10 and control that portion of the data bus when neither the DSP nor the EEPROM output is active. The DSP inputs the switch positions via a read to address zero.

Front panel pushbuttons S11,12,13 are connected to the high byte of the DSP 24-bit data port via connector P3 and isolation resistors R9.

Serial data is sent synchronously (data, clock, load) to the display driver chips via the display connector P6 in 32 bit strings. Data is placed on the top bit (bit 23) of the DSP data port and clocked into the display drivers via a write to address decoder IC7. Other writes to IC7 will load the 32 bit data string into the left bargraph, right bargraph or scale/indicator driver groups via P6. A write to the left bargraph will also reset the watchdog timer.

Two channel audio data is fed synchronously (data, clock, frame sync) from digital data receiver IC1 to DSP (IC6) serial port 1.

Encoded audio data enters the meter via XLR connector J1 and is directly connected to the output connector P2. Note that no buffering is applied to the loop through output.

The input data signal is connected to pulse transformer T1 via DC blocking capacitor C5. The output of T1 is loaded by R1,R2, R3 and connected to data receiver IC1. C1 and R4 form a loop filter used by IC1 to recover the embedded clock from the coded input signal. IC1 separates the audio data, channel data and clock from the input data. The audio is sent to the DSP in 64 bit strings via a serial port. Three other signals from IC1 are read once per stereo sample and are connected to the DSP's parallel data port via isolation resistors R9. These are the channel status bit, start of subcode data block flag and receiver error

SECTION 4 — MAINTENANCE

4-1 General Information

The VU-Trax is designed to need a minimum of maintenance for long trouble-free operation. Should repair be necessary, the technician should first read the information in the manual concerning the circuits in question and should follow proper procedures for testing and replacing semiconductors. Logitek engineers are readily available at the factory to provide technical assistance both during and after the warranty period.

***** **WARNING** *****

The inside of the VU-Trax contains no controls or user serviceable parts. The cover should only be removed by competent technical personnel capable of servicing this type of equipment. Hazardous voltages exist on the underside of some circuit cards.

4-2 Fuse

The primary winding of the power transformer is fused with a 1/2 amp slow-blow 20mm fuse housed in a fuse holder in a slide-out drawer under the power cord on the rear panel of the unit. It should only be replaced with fuses of the same type and current rating. The power cord must be unplugged from the rear panel to gain access to the fuse holder.

***** **WARNING** *****

Do *NOT* replace the fuse without first disconnecting the meter's power cord from the wall socket, as dangerous voltages are present which may cause electrical shock. Always use fuses of the same value and type as specified in this manual. Do *NOT* use fuses of a higher value than those specified, as shock hazard and fire hazard may result.

A blown fuse is most often, although not always, a symptom of another failure. Related circuitry should always be carefully examined after any fuse failure, especially if a replacement fuse also blows.

4-3 Handling of CMOS Integrated Circuits

All logic components in the VU-Trax meter are CMOS type integrated circuits. Even though all circuits have built in static discharge protection, special care must be taken in the handling of these devices, particularly in dry environments.

***** **IMPORTANT** *****

Do *NOT* remove or handle CMOS integrated circuits except in a grounded environment which is free of the risk of static electricity. Store such circuits on conductive foam or in anti-static controllers. Do *NOT* store on styrofoam or other plastic sheets. Improper handling may damage these devices.

4-4 Access to Circuit Cards

Access to the circuitry of the rackmount and half-rack meters is accomplished by removing the six screws that attach the top cover. The inside of the desktop unit is accessed by removing the four screws along the edges of the bottom panel and pulling apart the two halves of the plastic case.

4-5 Power Supply LG-253

Each VU-Trax contains a ground isolated and filtered step-down power supply to create the necessary operating voltages. This supply is located on a PCB on the right side of the meter enclosure.

Mains AC from the power entry module J2 is fed through fuse F1, located in a drawer under the power cord in J2, to J1 on supply card LG-253. J1 feeds voltage selection switch S1 which connects the dual primaries of transformer T1 in series for 230VAC operation or parallel for 115VAC operation. The dual secondaries of T1 are wired in parallel and loaded with a full-wave bridge rectifier RT1. The DC output of RT1 is filtered by capacitors C1 and C2 and fed to the red and green output pads. The voltage should be between 8 to 10 VDC with less than .5 volt of ripple.

Analog input models will also have a charge pump consisting of IC1 and C3 that feeds filter C4 and the black output pads. The voltage should be -8 to -10 VDC with less than .1 volt of ripple.

Jumpers soldered to the output pads feed power to one or two meter control cards.

***** **WARNING** *****

Dangerous voltages are present on the bottom of the power supply card. Always disconnect the AC power cord when servicing this circuit board.

4-6 Digital Input Control Card LG-252

Power from input connector J1 is connected to voltage regulators IC3 and IC4 as well as display board connector J4. IC3 is a +5VDC regulator that feeds power to the analog front end of data receiver IC2. The voltage is filtered by C1, C7 and clamped against over voltage and voltage reversal by D1. IC4 is a +5VDC regulator that feeds the digital portion of IC2 and all other circuits on the control board. The output voltage is filtered by C2 and clamped by D2. Distributed power filtering is supplied by C3,4,5,6,12.

On power up, the DSP is kept in reset by IC5 until the power has stabilized, ensuring a good power on reset. IC5 also contains a watchdog timer that will reset the DSP if its ST pin is not taken low at least once

dicates the current location of the right channel in the stereo sound field. The overall width and location of the stereo image is shown by a second pair of red and green segments that hold the furthest left and right readings for about three seconds.

If a mono signal is being displayed, then the red and green segments will be at the same location resulting in a dot that looks orange. If the mono signal is off center (such as left channel only), the resulting orange dot will be off to one side of the display.

3-7 ZOOM — High Resolution Mode

Zoom is a high resolution mode that zooms in on a +/- 6 dB range around the reference point. The range is evenly divided across the scale with a resolution of .2 dB per segment. The image display zooms in to a +/- 9 degree range around 0 degrees. The zoom mode has its own backlighted scale with the user selected zero reference point highlighted on the numeric display at its center. VU, Loud and I-S modes may all be zoomed. Zoom is activated by pressing the ZOOM button at the bottom center of the meter front panel.

3-8 Auxiliary Data Display

VU-Trax models with serial digital inputs provide information about the input data format via indicator lights along the bottom of the meter front panel.

MODE describes the relation of the two main audio channels in the data stream and is recovered from embedded channel status data. The professional format refers to these channels as A and B. In the consumer format, mode has a different meaning and is not displayed on this meter.

Mode Data Display

Label	Meaning
2CH	2 channel — A & B are not related
Ster	Stereo — A is left channel
Mon	Mono — B is not used
P/S	Primary/Secondary — A is primary
-none-	no indication

EMPHASIS indicates pre-emphasis has been applied to the audio and is recovered from the embedded channel status data. The circle is lit only when emphasis is detected.

CONSUMER indicates whether the data stream is in the professional or consumer format and is recovered from the embedded channel status data. The circle is lit only when consumer format is detected.

SAMPLE RATE is the actual data sample frequency measured by the meter in one second intervals. This function is active even when the received data is invalid.

Sample Rate Data Display

Label	Meaning
32.0	32,000 Hz, +/- .1%
44.0	44,056 Hz, +/- .1%
44.1	44,100 Hz, +/- .1%
47.9	47,952 Hz, +/- .1%
48.0	48,000 Hz, +/- .1%
-none-	no data or non standard rate

3-9 Changing Display Brightness

The overall illumination level of the meter can be set to one of eight levels. To change the brightness level, press and hold down the SHIFT (HOLD) button while repeatedly pressing the BRIGHTNESS (ZOOM) button until the desired illumination level is achieved.

3-10 LED Test

A lamp test mode has been inserted into the brightness change cycle right after the highest setting. In this mode all LED segments should be dimly lit. The bargraphs should be orange, indicating that both the red and green segments are operating.

3-11 Controlling Display Clutter

The bargraph reference markers, zoom scale and auxiliary data displays form three groups that can be individually turned on and off to reduce the visual business of the meter display.

To cycle through the groups, press and hold down the SHIFT (HOLD) button while repeatedly pressing the SHOW DATA (MODE) button until the desired combination of groups appears.

The Main display functions can also be deactivated. The VU bars may be turned off with the MODE button, the peak hold dot may be turned off with the HOLD button and the PPM dot can be turned off via the rear panel programming switches.

3-12 Resetting the Program

The VU-Trax contains software that executes on a programmable DSP chip. If the processor memory becomes corrupted, the meter will probably fail to operate. In most cases, an independent watchdog circuit will notice that the meter is working incorrectly and restart the system.

The processor can be reset manually by turning the power off and then back on again.

***** **NOTICE** *****

Once a day the display will freeze for a second while the meter goes through a reset and the analog to digital converter recalibrates itself.

SECTION 3 — OPERATING INSTRUCTIONS

3-1 Bargraph Description

The VU-Trax display contains two multi-LED bargraph displays mounted one above the other. The top bar shows either left channel (L) or image/phase(I) information. The bottom bar shows either right channel (R) or mono sum (S) information. The bars are marked at either end to indicate their function. The bars start with a small square green LED on the left hand end that lights when the average input is above -90 dBFS (decibels below full scale). The next 60 segments are tri-color LEDs that can be green, red or orange depending on their function and cover the range from -60 dBFS to -.6 dBFS.

The top four LEDs of each bar are single color and cover the range of 0 dBFS to +3 dBFS. Signals above full scale cannot be directly measured, so the VU-Trax uses interpolation techniques to estimate values above 0 dBFS. If any of the "+" LEDs light, it means that the signal is being clipped and immediate action should be taken. These clipping indicators have extra long hold times to accentuate their presence.

The zero reference point of the meter is indicated by a dim orange marker in the bargraph. The reference mark can be varied between -10 and -20 dBFS via switches on the back panel. An optional peak marker can be set from +8 to +12 dB above the zero reference and is used as a reference indicator for the PPM display.

3-2 VU Display

VU is indicated by a solid green bar. VU represents the perceived loudness of the input signal. The motion of the bars conforms to the industry standard 30 mSec per 20 dB rise and fall times. Note that the speed of the bar will appear faster near the top of the meter display because each segment there represents fewer dBs than at the bottom of the meter. The VU display can be turned off by pressing the MODE button at the bottom left corner of the front panel repeatedly until the VU bars disappear.

3-3 PPM Display

Peak program meter (PPM) information is shown by a single red segment. PPM represents the highest point of the input signal. The display has a zero rise time and an industry standard 2.8 Sec per 24 dB fall time. The dot will appear to fall faster near the top of the meter range because each segment there represents fewer dBs than at the bottom of the meter. Also, the dot will disappear instantly if the input level falls below -90 dBFS. The PPM display is always active unless it is turned off by the programming switches on the back panel.

3-4 Peak Hold Display

The peak hold display is a single red segment that maintains the highest PPM reading for a user selectable amount of time. If the holding period expires before the PPM dot equals or exceeds the peak hold dot, then the peak hold dot will be set equal to the current PPM position.

Two holding modes are available. Release (Rel) mode holds the peak reading for either 2 or 5 seconds depending on the position of the rear panel program switches. Maximum (Max) mode holds the highest peak reading until it is manually reset by turning the peak hold off and then on again.

Peak hold can be cycled through Off, Rel and Max modes by repeatedly pressing the HOLD button at the lower right corner of the meter front panel.

3-5 LOUD — Loudness Filter

The VU display can be compensated to match the frequency response of the human ear by enabling the loudness filter. This will cause the VU bars to more closely represent the actual loudness perceived by the listener and allow better level matching between different kinds of program material.

The loudness filter is calibrated for a listening level of 58 dB SPL. The filter will be less accurate for listening levels above and below this point.

To activate the filter, press the MODE button in the lower left corner of the meter front panel until the "Loud" indicator is lit.

Users of the digital input meters should note that filtering is a function of sample rate. The meter has a separate filter for each of the five sample rates listed on the front panel. If a non listed sample rate is used the loudness filter will be deactivated.

3-6 I-S — Image/Sum Display

The image and sum displays are activated by pressing the MODE button in the lower left corner of the meter front panel until the "I-S" indicator is lit.

In this mode, the lower bargraph displays the mono sum of the left and right input channels. The display operates identically to the left and right bargraphs except that the loudness filter is not available.

The upper bargraph shows the stereo image and relative phase information. Three orange markers are located at 90 degrees left, 0 degrees center and 90 degrees right. The scale covers 180 degrees which is the largest relative phase difference two signal can have. The scale for the image meter is printed in white and is not backlit.

The red dot indicates the current location of the left channel in the stereo sound field and the green dot in-

SECTION 2 — PREPARATION FOR USE

2-1 Initial Inspection

Check the shipping carton carefully for external damage. If the carton shows evidence of abuse, ask the carrier's agent to be present when the unit is unpacked. Carefully unpack the unit to avoid damaging the equipment through the use of careless procedures. Inspect all equipment for damages immediately after unpacking. Bent and broken parts, dents and scratches should be noted. If damage is found, refer to paragraph 2-2 for recommended claim procedures. Keep all packing material for possible future use.

2-2 Claims

If the unit has been damaged, notify the carrier immediately. File a claim with the carrier and advise Logitek of such action to arrange for repair or replacement without waiting for a claim to be settled with the carrier.

2-3 Repacking for Shipment

If the unit must be returned to Logitek, attach a letter to it showing the owner's name and address. A description of necessary service should be included in the letter. The original shipping carton and packaging materials should be used for reshipment if possible. Use FRAGILE labels on each surface. Return the unit freight prepaid. Be sure to insure the unit for its full value. The unit will be repaired promptly and returned freight prepaid.

2-4 Installation

Rackmount Enclosure

The VU-Trax rackmount models are designed to be mounted in a standard 19" equipment rack by using the four mounting holes in the corners of the front panel. Plastic washers should be used to keep the mounting screw from marring the front panel finish.

Bridge Enclosure

The VU-Trax meter bridge enclosure is designed to sit on any flat surface. Note that the enclosure is taller than it is deep so it can easily fall over if pushed.

While flow through ventilation is not necessary, the units should not be mounted directly above equipment which produces significant heat, such as equipment using vacuum tubes. The unit should never be operated if the ambient temperature is above 55 degrees C (131 degrees F).

2-5 Connecting Mains Power

Connect the meter to the power mains with the enclosed power cord. The unit is factory set for 115VAC operation but 230VAC operation can be selected via

a slide switch located next to the power transformer inside the unit. To gain access to the voltage select switch, remove the enclosure top cover. The switch is located adjacent to the large power transformer.

2-8 Connecting Analog Input Models

The VU-Trax accepts balanced or unbalanced inputs via rear panel DB-25 connectors. The connectors are wired as follows:

Balanced Connection

Pin 1	Meter 1+	Pin 14	Meter 1-
Pin 2	Meter 2+	Pin 15	Meter 2-
Pin 3	Ground	Pin 16	Ground
Pin 4	Meter 3+	Pin 17	Meter 3-
Pin 5	Meter 4+	Pin 18	Meter 4-
Pin 6	Ground	Pin 19	Ground
Pin 7	Meter 5+	Pin 20	Meter 5-
Pin 8	Meter 6+	Pin 21	Meter 6-
Pin 9	Ground	Pin 22	Ground
Pin 10	Meter 7+	Pin 23	Meter 7-
Pin 11	Meter 8+	Pin 24	Meter 8-
Pin 12	Ground	Pin 25	Ground
Pin 13	Ground		

Unbalanced Connection

Pin 1	Meter 1+	Pin 14	Jumper to Gnd
Pin 2	Meter 2+	Pin 15	Jumper to Gnd
Pin 3	Ground	Pin 16	Ground
Pin 4	Meter 3+	Pin 17	Jumper to Gnd
Pin 5	Meter 4+	Pin 18	Jumper to Gnd
Pin 6	Ground	Pin 19	Ground
Pin 7	Meter 5+	Pin 20	Jumper to Gnd
Pin 8	Meter 6+	Pin 21	Jumper to Gnd
Pin 9	Ground	Pin 22	Ground
Pin 10	Meter 7+	Pin 23	Jumper to Gnd
Pin 11	Meter 8+	Pin 24	Jumper to Gnd
Pin 12	Ground	Pin 25	Ground
Pin 13	Ground		

The VU-Trax shield pins have their own ground path to the chassis at the connector and do not share any ground paths with the internal circuitry. This allows cable shields to be connected at both ends without causing hum problems.

The zero reference level for each input can be set anywhere between -10 dBu and +20 dBu by adjusting the multiturn gain control located on the rear of the enclosure. A small flat blade screwdriver is needed to adjust the gain.

SECTION 1— GENERAL INFORMATION

1-1 General Description

The Logitek VU-Trax is a bargraph type audio meter featuring two tri-color LED bargraphs separated by a backlighted scale. Three function buttons and several auxiliary data indicators are also included on the front panel. The meters accept either analog audio or serial digital inputs and are available in three mounting configurations — all with internal power supplies.

1-2 Electrical Specifications

Bargraphs per meter: Two
Indicators per bargraph: 66
Normal Range: -80db, -60 to +3 dB
(positive dBs are interpolated)

Zoom Range: -80dB, ref level +/- 6 dB

Reference Point: -10,-12,-14,-16,-18 or -20 dB

Peak Markers: +8,+10 or +12 dB above ref pt

Response Time:

VU Mode 300 mS/20dB attack & release
PPM Mode 0 mS attack, 2.8S/24dB release
Peak Hold 0 mS attack, 3 or 7 Second hold
Max Hold 0 mS attack, pushbutton release
Image/Phase 3 Sec hold on max image

Frequency Response:

Normal +/- .1 dB 20 Hz - 20 KHz
Loudness Filter 58 dB SPL auditory curve
-40 dB 20 Hz, 0 dB 1250 Hz, -50 dB 20 KHz

Brightness control: 8 levels

Analog Input:

Sensitivity -10 to +20 dBu for full scale
rear panel adjustable
Overload Level +24 dBu
Impedance 40 Kohm balanced
Connector 3-pin XLR

Digital Input:

Formats AES/EBU or S/PDIF
Impedance 110 Ohm (XLR)
75 Ohm (coax adapter)
Pass-through 2200 Ohm (XLR)
Termination transformer balanced

AC Line Input Voltage:

50-60 Hz 105-129 VAC or
(switch settable) 220-240 VAC

Power Requirement:

UV1-(all), UDT-(all) 10 Watts
UV2-(all) 20 Watts

Dimensions:

1RU enclosure	19" W x 7" D x 1 ³ / ₄ " H
Half Rack enclosure	16 ¹ / ₂ " deep
Desk top enclosure	8 ¹ / ₄ " W x 9" D x 2 ¹ / ₄ " H

1-3 Standards

The VU-Trax meters are designed to conform to the ballistic standards described in IEEE document G.2.1.2/13, IEC document 268 and EBU document 3205-E. This ensures that the bargraph motion will closely track other standard mechanical and electronic meters.

The one exception to these standards is the PPM attack time. The VU-Trax uses a true peak measurement scheme that always displays the highest peak of the input signal. The PPM standard specifies a short averaging period for peak signals that keeps sounds with durations too short to be heard well from being displayed, no matter how loud they are. The delay also allows mechanical meters to keep up with fast changing inputs. Under most circumstances there is no noticeable difference between true peak and PPM peak readings. However, if you do need the VU-Trax to conform to the PPM peak standard then please contact the Logitek factory for further information.

1-4 Instrument Identification

The VU-Trax is identified by a model number and a three or four digit serial number. The model number and serial number appear on a label on the back of the unit near the power cord. All correspondence to your Logitek dealer or to the Logitek factory should refer to the model number and serial number.

1-5 Where to Find Help

Logitek customer service personnel are available to help with any questions, comments or problems you might have with the VU-Trax meter, both during and after the warranty period. Our hours of operation are 8AM to 5PM central time. We may be contacted in one of the following ways.

By Phone: 800-231-5870 (USA & Canada)
or 713-782-4592

By Fax: 713-782-7597

By Mail: Logitek Electronic Systems, Inc
3320 Bering Drive
Houston, Texas 77057

VU-Trax LED Meter OPERATION & SERVICE MANUAL TABLE OF CONTENTS

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Logitek Software License Agreement

The VU-Trax unit you have purchased contains embedded software. The software is owned by Logitek Electronic Systems, Inc. and is protected by United States copyright laws and international treaty provisions.

Logitek grants to you the right to use one copy of the embedded software in each VU-Trax meter you purchase. You may not rent or lease the software. You may not reverse engineer, decompile, disassemble, or create derivative works from the software. You may not create copies of the software.

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