Voice Channel

Tube Channel Strip with Digital Connectivity

SERVICE MANUAL

APPLIED RESEARCH AND TECHNOLOGY

IMPORTANT SAFETY INSTRUCTIONS – READ FIRST

This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure. Voltage that may be sufficient to constitute a risk of shock.

This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Please read manual.

Read instructions:
Retain these safety and operating instructions for future reference. Heed all warnings printed here and on the equipment. Follow the operating instructions printed in this user guide.

Do not open:
Aside from one vacuum tube, there are no user serviceable parts inside. Refer any service work to qualified technical personnel only.

Power sources:
Only connect the unit to mains power of the type marked on the rear panel. The power source must provide a good ground connection.

Power cord:
Use the power cord with sealed mains plug appropriate for your local mains supply as provided with the equipment. If the provided plug does not fit into your outlet consult your service agent. Route the power cord so that it is not likely to be walked on, stretched or pinched by items placed upon or against.

Grounding:
Do not defeat the grounding and polarization means of the power cord plug. Do not remove or tamper with the ground connection on the power cord.

Ventilation:
Do not obstruct the ventilation slots or position the unit where the air required for ventilation is impeded. If the unit is to be operated in a rack, case or other furniture, ensure that it is constructed to allow adequate ventilation.

Moisture:
To reduce the risk of fire or electrical shock do not expose the unit to rain, moisture or use in damp or wet conditions. Do not place a container of liquid on it, which may spill into any openings.

Heat:
Do not locate the unit in a place close to excessive heat or direct sunlight, as this could be a fire hazard. Locate the unit away from any equipment, which produces heat such as: power supplies, power amplifiers and heaters.

Environment:
Protect from excessive dirt, dust, heat, and vibration when operating and storing. Avoid tobacco ash, drink spillage and smoke, especially that associated with smoke machines.

Handling:
To prevent damage to the controls and cosmetics avoid rough handling and excessive vibration. Protect the controls from damage during transit. Use adequate padding if you need to ship the unit. To avoid injury to yourself or damage to the equipment take care when lifting, moving or carrying the unit.

Servicing:
Switch off the equipment and unplug the power cord immediately if it is exposed to moisture, spilled liquid, objects fallen into opening, or the power cord or plug becomes damaged during a lightning storm or if smoke odor or noise is noted. Refer servicing to qualified technical personnel only.

Installation:
Install the unit in accordance with the instructions printed in the user guide.

Voice Channel

Tube Channel Strip with Digital Connectivity

LIST OF FIGURES

INTRODUCTION

The ART Voice Channel is the answer to your recording and computer audio interface needs. Our second-generation discrete Class-A microphone preamp provides clean quiet gain while maintaining incredible transparency. A powerful dynamics processor subtly controls transients and noise of the most demanding sources. The ART Voice Channel's semi-parametric EQ offers wide tune-ability and can be patched before OR after the dynamics processor. Separate insertion jacks allow you to use your favorite external signal processing gear immediately after the Mic preamp and before the EQ and dynamics processor. Another patch point exists just before the A/D converters. Choose between a wide range of outputs including balanced analog output, 44.1 KHz to 192 KHz AES/EBU, S/PDIF, ADAT and USB. Both analog and digital meters provide a detailed indication of audio levels.

INSTALLATION

The ART Voice Channel may be used in a wide variety of applications and environments. In a rack-mountable, all-steel enclosure, the unit is designed for continuous professional use. Mounting location is not critical, however for greater performance reliability we recommend that you not place the unit on top of power amps, or other sources of heat and/or strong magnetic fields. The tube circuitry needs about a minute to "warm up" and stabilize from a cold power up.

AC Power Hookup

The ART Voice Channel has an internal power supply. Only connect the unit to mains power of the type marked on the rear panel. The power source must provide a good ground connection, and the ground pin on the mains plug should never be defeated.

Analog Audio Connections

Audio connections to and from the Voice Channel are:

Front panel balanced combo input:	[XLR]	Pin 2 = Hot (+), Pin 3 = Cold (-), Pin 1 = Ground
	[1/4-inch]	Tip = Hot (+), Sleeve = Ground
Rear panel balanced combo input:	[XLR]	Pin 2 = Hot (+), Pin 3 = Cold (-), Pin 1 = Ground
	[1/4-inch]	Tip = Hot (+), Ring = Cold (-), Sleeve = Ground
Rear panel balanced 1/4" output:		Tip = Hot (+), Ring = Cold (-), Sleeve = Ground
Rear panel 1/4" insert input:		Tip = Hot (+), Sleeve = Ground
Mic Preamp Output:		Tip = Hot (+), Sleeve = Ground
A/D Main & A/D CH2 Inserts:		Tip = Input, Ring = Output, Sleeve = Ground

USB OPERATION

Connect your analog jacks and power up the unit first. Next, set the front panel controls for proper operation as per the previous sections. Then connect the USB cable to the appropriate input on your computer and lastly to the USB connector on the Voice Channel.

Once the USB connection is made and your computer is on, the unit will automatically connect and try to set your computer “Default Audio Device” to be “USB Audio CODEC”. Usually the computer will do this automatically whenever a USB device is first connected, but it is sometimes necessary to make the selection manually. The same settings may need to be made in your particular audio application as well (Check your application instructions). These settings should be made while the Voice Channel and computer are connected and powered on.

FRONT PANEL CONTROLS and JACKS

Mic Preamp Controls

The Voice Channel input consists of a discrete Class-A differential preamp. The circuit is optimized for low impedance microphones as well as line level signals. Up to 60dB of gain is available from this stage. The output can be inverted using the INVERT switch.

The impedance of the front and rear XLR inputs is continuously variable for fine-tuning the preamp to a wide variety of mics. Phantom power is available on the XLR inputs as well.

A selectable low-cut filter removes rumble, wind noise, and pops, thereby increasing clarity.

Instrument Input

The ¼-inch T/S jack on the front panel provides a high impedance unbalanced input, and when used, automatically switches off the mic pre-amp. (The rear combo jack's ¼-inch T/R/S balanced input is lower impedance and is part of the mic pre-amp. The rear jack is not intended to be used with high impedance microphones or instruments.) NOTE: When using the INSTRUMENT INPUT, the PAD switch is disabled and does NOT affect the gain.

Gain Control

This control adjusts both the mic pre-amp gain as well as the instrument input gain. The gain marked applies to the mic pre-amp without the PAD switch depressed. The instrument input gain markings are on the right side of the slash (/). Refer to the APPLICATIONS section to learn how to optimize the gain control for low noise operation.

Impedance Control

This knob sets the load impedance at the front and rear panel XLR inputs of the Voice Channel. Use the IMPEDANCE CONTROL to subtly tune the sound of your microphone. Various microphones will change their sound at differing load impedances. The correct setting is subjective. Adjust this control to personal taste.

Pad Switch

This switch reduces the mic pre-amp gain by up to 20dB to prevent clipping when high level mic, or line level signals are applied to the balanced XLR or ¼-inch T/R/S inputs. This switch does NOT affect the ¼-inch T/S front panel INSTRUMENT INPUT.

Phantom Power

The switch safely applies +48Volt phantom power to the XLR inputs. Use phantom power only when the microphone that you are using requires it. Doing so will extend the life of the Voice Channel as well as reducing the possibility of shock hazard.

Invert Switch

This switch selects the output phase of the Voice Channel. There is a 180 degree phase shift through the Voice Channel™ when lit.

Low Cut Switch

This switch inserts a 100Hz 6dB/Oct. Low-Cut filter into the signal path. The filter is designed to remove rumble, pops, and wind noise, yet still sound natural.

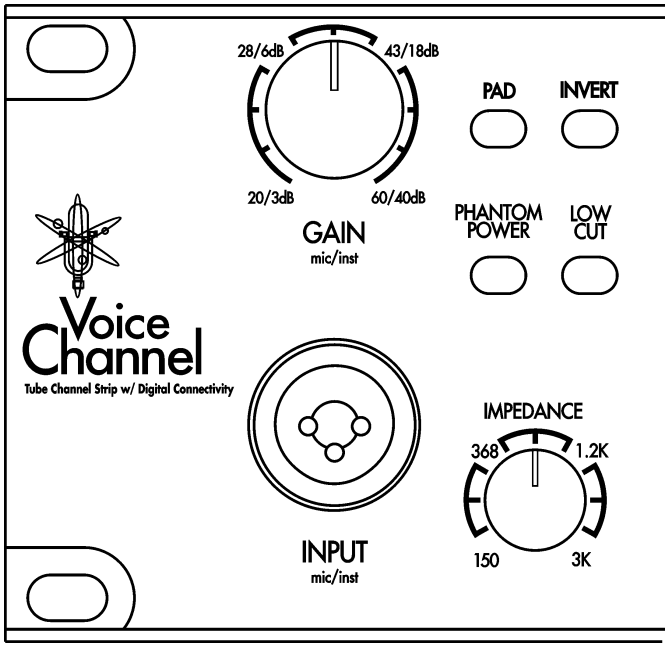

FIGURE 1 – Preamp section

Tube Voltage Switch

The vacuum tube preamp section can be adjusted to run at two different plate voltages. Refer to Figure 2 for the location of the switch.

Choose the “NORMAL” setting for adding warmth to the input signal. This setting has an increased amount of tube saturation at higher signal levels.

Choose the “HIGH” setting to increase overall gain, headroom, and bandwidth.

NOTE: The change between tube voltage modes is gradual, taking 10 to 20 seconds to be fully activated.

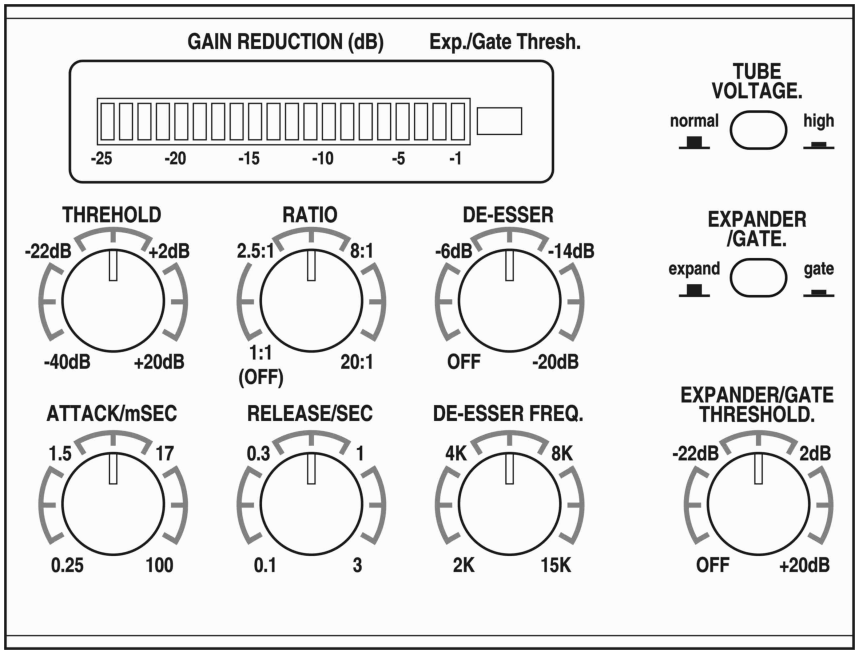

FIGURE 2 – Dynamics Section

Dynamic Processor Controls

The ART Voice Channel dynamics section consists of an above threshold Compressor/Limiter with De-esser plus a selectable Expander/Gate. The attack and release controls allow a wide range of adjustment while the complex detector assures fast response without distortion. The De-esser is frequency tunable.

Threshold Control

This control sets the level, above which the Compressor/Limiter in the Voice Channel starts to act on the input signal. As the control is turned clockwise, more input signal is required to begin reducing gain. The compression action can be seen in the Gain Reduction LED meter.

Ratio Control

The RATIO control sets the amount of gain reduction that takes place based on how far the input signal is over the threshold level (set by the THRESHOLD control). **When the control is fully counterclockwise, the Compressor/Limiter is OFF.**

A good starting point for vocals is 2.5:1.

To have the unit act as a limiter, set the RATIO control to 20:1.

De-esser Control

The DE-ESSER control sets how much more the gain is reduced at high frequencies when using the Compressor/Limiter. The most common application is reducing sibilance when compressing vocals. When fully counterclockwise, the De-esser function is OFF. As the control is turned clockwise, high frequency material is compressed more than mid and low frequency material.

De-esser Freq. Control

This control selects which high frequencies the DE-ESSER acts upon. Turned fully counterclockwise, the DE–ESSER acts on the upper mid-range. When set fully clockwise, only the highest frequencies are reduced more during de-essing compression. Center the DE-ESSER FREQ. control as a starting point for vocal work.

Attack Control

The ATTACK control sets the time it takes the Compressor/Limiter to respond to increases in signal level (by reducing gain). You can use this control to shape the “front end” of the dynamics envelope.

One example is to listen to a snare hit and adjust the attack control. A short attack makes the snare sound “thin”. As the attacks go longer (and the knob is turned clockwise) you should hear more of the thump in the compressed snare. The downside is that this creates an overshoot, (a large transient), the length of which is the time set by the ATTACK control.

Overshoots less than 1 msec are very hard to hear even when they are clipped. If the attack is set too fast, the gain may be reduced too much and thereby create a “pumping” sound[1]. One way to eliminate this is to use the LOW CUT filter to remove plosive sounds in vocals that can make the detector overreact.

[1] “Pumping” in a Compressor/Limiter sounds like the signal is muted when it shouldn’t be.

Release Control

The RELEASE control sets the time the Compressor/Limiter takes to increase the gain after the input level drops.

Longer settings maintain the dynamics of the input signal, while shorter settings reduce the dynamics. Shorter settings will also increase the apparent reverberation, and at extreme gain reduction settings, lead to "breathing" artifacts[2]

Gain Reduction LED Meter

The GAIN REDUCTION meter displays the Compressor/Limiter's attenuation action. The meter covers a very large range while offering high resolution.

The large yellow LED at the right-hand end of the meter indicates Expander or Gate action. The brightness of the LED indicates the amount of gain reduction for the Expander function. Since the Gate is either ON or OFF, there is no brightness variation.

Expander/Gate Switch

This switch allows the selection of the Expander or the Gate functions. Both are useful in reducing unwanted background noise in the audio signal.

In the "OUT" position the Expander function is selected. Use this mode to gradually reduce background noise and maintain some of the input dynamics. This is useful for instruments with gradually decaying amplitude envelopes.

Depress this switch to select the Gate mode. This mode quickly cuts off the noise as the input signal drops.

Expander/Gate Threshold Control

The Expander/Gate action begins below the level indicated by the EXPANDER/GATE THRESHOLD control. The EXPANDER/GATE THRESH. LED in the GAIN REDUCTION display will light when the Expander or Gate attenuates the input signal.

The Expander/Gate Threshold detector has built-in hysteresis, which causes the unit to trigger "ON" at a higher level than the level required to trigger back to the "OFF" state.

The Expander slope is about 1:1.5. This is subtle enough to maintain the decay envelope of the source material and still lower the noise as the input signal drops. The EXPANDER/GATE THRESH. LED will light dimly for the first 5dB of gain reduction, and then glow brightly as the attenuation increases above this level.

The Gate function has an intelligent detector with a fast "attack" and "release", coupled with a program dependant "hold". The hold time is longer for sustained passages and shorter for transients. As the input drops below the threshold and the input signal is muted, the EXPANDER/GATE THRESH. LED lights brightly.

You can turn off the Expander/Gate function by setting the THRESHOLD control fully counterclockwise to "OFF".

[2] "Breathing" is the sound of the Compressor/Limiter turning up the gain so quickly you can hear breathing noises between words during vocal processing.

Semi-Parametric EQ

The ART Voice Channel offers a four-band semi-parametric equalizer. The EQ can be bypassed as well as positioned before or after the dynamics processing section. Each band has ± 15dB of control range.

The High and Low EQ bands are shelving type with a switch selectable turnover point.

The two Mid bands can be continuously tuned over a five octave range.

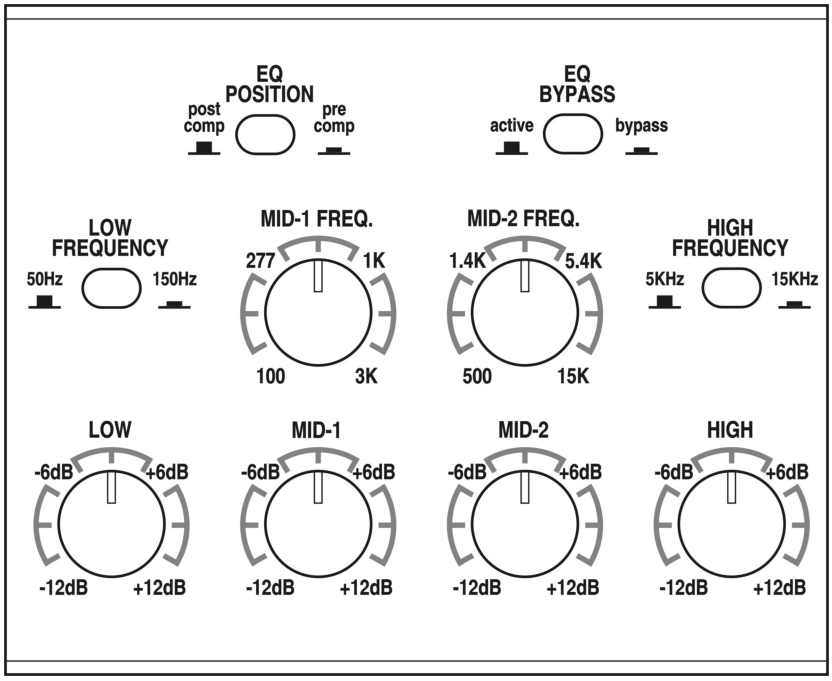

FIGURE 3 – Equalizer Section

EQ Position Switch

The EQ POSITION switch allows you to connect the EQ before or after the dynamics processing block. This is useful in cases where the input signal needs a great deal of EQ before the Compressor/Limiter processes it. One example of using the EQ in the “PRE” position is using the LOW EQ control as a tunable low frequency cut, supplementing the LOW CUT filter switch.

Refer to Figure 4 for the block diagram of the Tube Channel. Note that the Mic preamp insert jack function is located before the EQ position switch.

EQ Bypass Switch

This switch allows you to instantly set the EQ completely flat without loosing the current EQ settings.

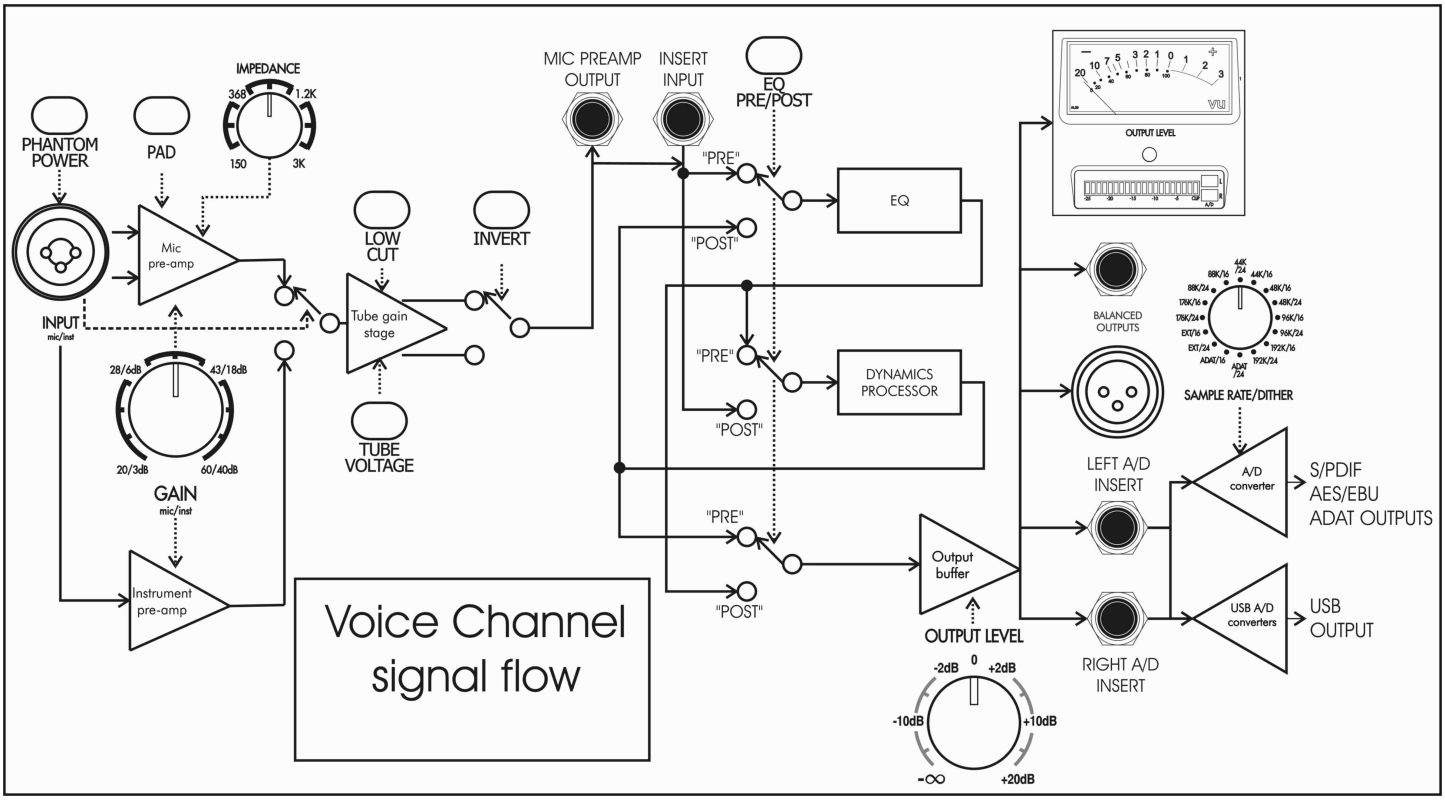

FIGURE 4 – Signal Flow Block Diagram

Output Level Control

The OUTPUT LEVEL control provides gain or attenuation to adjust for a variety of system operating levels. This control affects the levels sent to the A/D converter and to the balanced analog OUTPUT jacks.

Output Level Meters

The ART Voice Channel provides both analog and digital output meters. The meters monitor the signal level just after the output control. This signal is sent to both the analog and digital outputs.

"0" VU on the analog VU meter corresponds to +4dBu on the balanced outputs, and about –20dB on the LED bargraph meter.

The LED bargraph meter indicates peak levels as well as average levels. Average levels are indicated by a continuous string of LEDs being lit. Peak levels are indicated by a single LED and are held for about 2 seconds. The last LED in the meter is marked "Clip", and it indicates that the output level is set too high.

The A/D Clip indicator LEDs act independent of the OUTPUT LEVEL meter. This provides an accurate indication of A/D converter clipping. This is useful when using the A/D insertion jacks, since the level at the converters will not be indicated on the main meters when these inputs are used.

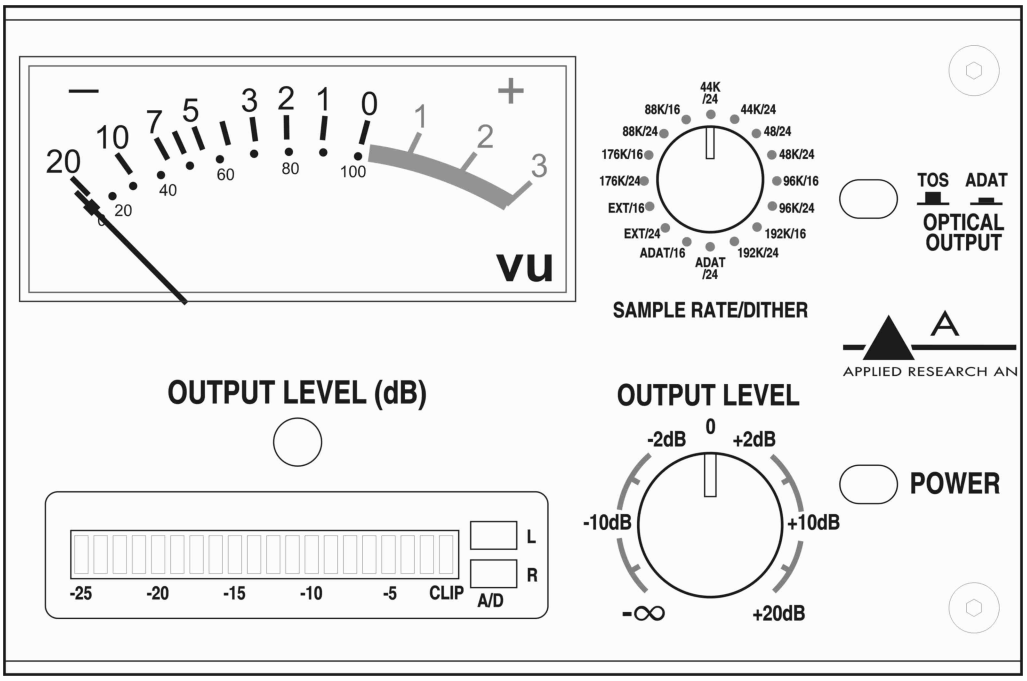

FIGURE 5 – Output Section

Sample Rate/Dither Control

The SAMPLE RATE/DITHER knob selects the sample rate for the AES/EBU, S/PDIF, and optical outputs. It also selects the dither applied. Set the switch appropriately to match up with 16 or 24 bit encoding.

NOTE: This control does NOT affect the USB output.

Optical Output Switch

The OPTICAL OUTPUT switch sets the signal format of the rear panel OPTICAL OUTPUT connector. In ADAT mode channels 1 and 2 are the “left” and “right” A/D outputs of the Voice Channel respectively. NOTE: If the A/D insertion jacks are not being used, both channels 1 and 2 carry the same signal. If the ADAT INPUT is also being used, channels 3 thru 8 are passed through along with channels 1 and 2 of the ART Voice Channel.

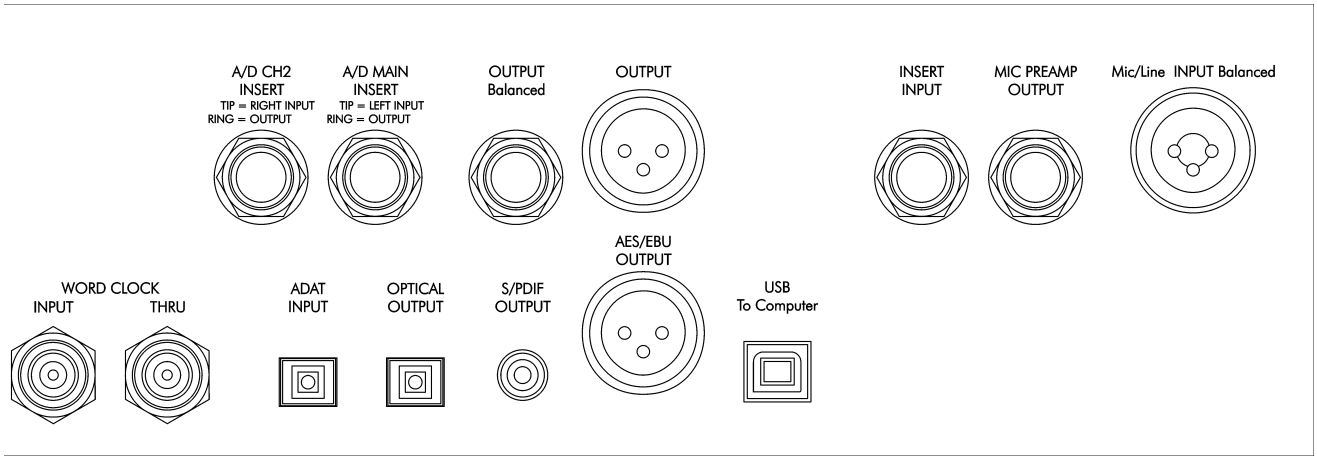

FIGURE 6 – Rear Panel

REAR PANEL CONNECTIONS

Mic/Line Input

This “combo” jack provides balanced inputs to the microphone preamplifier. The XLR connection is in parallel with the front input jack XLR. The input impedance of both XLR connections is variable by the front panel Impedance knob.

The rear ¼-inch input of the combo jack overrides the front panel XLR input when used. This input’s impedance is NOT affected by the front panel Impedance control and is fixed at 20K Ohms.

The Front panel Instrument input overrides the rear jack when it is used.

Mic Preamp Output

This ¼-inch T/S unbalanced jack provides a direct signal from the microphone preamplifier, ahead of the EQ and dynamics processors. This output can be used in conjunction with the INSERT INPUT jack to insert external signal processors between the main preamp section and the EQ and dynamics processing of the Voice Channel.

Insert Input

This ¼-inch T/S unbalanced jack is an input to the EQ and dynamics processing sections. This input can be used in conjunction with the MIC PREAMP OUTPUT jack to insert external signal processors between the main preamp section and the EQ and dynamics processing of the Voice Channel™.

Balanced Output

The analog output of the Voice Channel is available on both a ¼-inch TRS balanced jack and an XLR jack. This output is active balanced, and will adjust to balanced or unbalanced termination without gain change. The LED and analog meter monitor the level present at this output. “0” VU on the analog meter corresponds with +4dBu (about 1.2 Volts RMS).

A/D Main Insert and A/D CH2 Insert

Signal processing can be added between the analog output of the Voice Channel and the “left” and “right” channels of the A/D converter by using the A/D MAIN INSERT and the A/D CH2 INSERT respectively. Use a ¼-inch T/R/S (stereo) cable. The Ring is the output of the preamp and the Tip is the input to the A/D converter.

In order to use just the A/D converter and not the Voice Channel preamp, simply plug a standard ¼-inch T/S phone cable into either A/D insertion jack.

Wordclock Input and Thru Jacks

The WORDCLOCK INPUT is used to externally sync the Voice Channel to a master clock source. The BNC WORDCLOCK INPUT jack is connected directly to the BNC WORDCLOCK THRU jack, providing the ability to loop through the Voice Channel and connect other devices to the wordclock sync source, saving the use of a BNC T–adapter.

The input is high impedance thus leaving the wordclock connection ***unterminated***. (A 75 Ohm BNC terminator should be used on the WORDCLOCK THRU jack if the WORDCLOCK INPUT jack is used only by itself.)

Select the EXT/16 or EXT/24 sample rate setting on the front panel to utilize External Wordclock mode.

Refer to FIGURE 7 for wordclock termination examples.

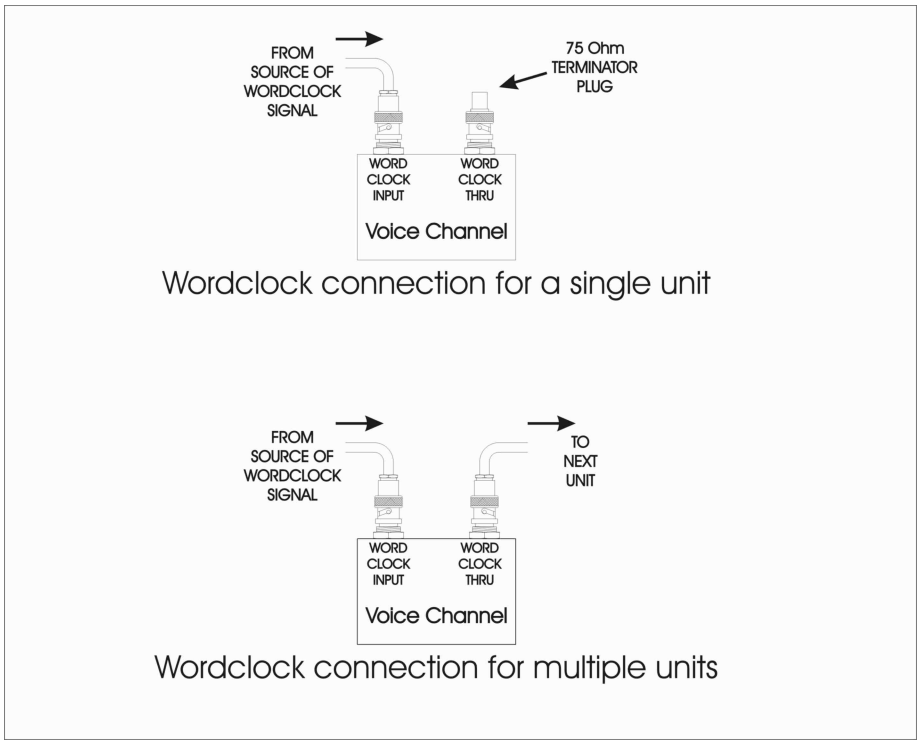

FIGURE 7 – Wordclock Termination

ADAT Input Jack

The optical ADAT input allows the Voice Channel A/D converter to synchronize to systems using ADAT optical connections. The Voice Channel inserts its output in channels 1 and 2 of the ADAT stream while passing through channels 3 thru 8. Select ADAT/16 or ADAT/24 with the Sample Rate control on the front panel to enable this mode.

Optical Output Jack

The OPTICAL OUTPUT jack works in conjunction with the front panel OPTICAL OUTPUT switch, to output either an ADAT formatted signal or a TOS formatted signal. The front panel SAMPLE RATE/DITHER control sets the sample rate, dither, and sync source for this output.

S/PDIF Output Jack

This connector provides S/PDIF formatted digital outputs from the “left” and “right” A/D converters. The front panel SAMPLE RATE/DITHER control sets the sample rate, dither, and sync source for this output.

AES/EBU Output Jack

This connector provides AES/EBU signal level digital outputs from the “left” and “right” A/D converters. The front panel SAMPLE RATE/DITHER control sets the sample rate, dither, and sync source for this output.

USB Jack

The USB jack provides the output of the Voice Channel to a direct computer USB connection. The Voice Channel will be recognized as a standard audio device on the PC or Mac. The sample rate and bit depth of this interface is set by the computer and is independent of the front panel settings. The audio data formats are limited to 32 KHz, 44.1 KHz, 48 KHz, 16 or 24 bit encoding.

APPLICATIONS

Bypassing Components Of The Voice Channel

To bypass the vacuum tube microphone preamp: Use the preamp INSERT INPUT jack.

To bypass the Compressor/Limiter: Set the RATIO control fully counterclockwise to 1:1.

To bypass the Expander/Gate: Set the EXPANDER/GATE THRESHOLD control fully counterclockwise to OFF.

To bypass the EQ: Use the EQ bypass switch.

Optimizing The Preamp For Lowest Noise

The preamp of the ART Voice Channel can be optimized for low noise by combining use of the PAD and Input GAIN control for mic and line level signals. NOTE: The PAD control has no effect on the INSTRUMENT INPUT (Front panel 1/4" input of the INPUT combo jack).

First, bypass the Compressor/Limiter, Expander/Gate and EQ. Next center the OUTPUT LEVEL control to "0" dB of gain. The OUTPUT LEVEL LED meter can now be used to correctly indicate the clip level of the input stage.

Second, start with the PAD in the "OUT" position and the GAIN control centered. Refer to the OUTPUT LEVEL LED meter's peak-hold function. Make sure that this meter never indicates clipping (the red LED is held on after a transient). The peak-hold indicator can be in the "yellow" range or in the –5dB range of levels.

If the signal level is too high, depress the PAD switch.

Third, adjust the GAIN control to keep the peak levels in the –5dB range of the OUTPUT LEVEL LED meter.

Utilizing Pre/Post Compression EQ

The Equalizer section of the Voice Channel can be applied either before OR after the Compressor/Limiter. This function is useful in getting the best performance out of the unit.

Setting the Equalizer to "PRE COMP" is useful when the input signal contains too much low or high frequency information. Compressors in general work best when the audio is equalized first. (This can also serve to better control signal overshoots to the A/D converters as well.)

One example is a vocal where the performer/microphone combination produces a "popping" sound, and when compressed, the Compressor/Limiter "pumps". Sometimes the use of the LOW CUT filter in the preamp section does not cut enough of this out, or cuts too much of the lower midrange out of the signal to be useful. Here, the EQ can surgically remove this information and better optimize the overall sound.

SERVICE PARTS

ART Part #	Value	Description	Footprint	Qty	Location
IC PARTS SECTION					
100-1134-101	LM339AN	QUAD COMPARATOR	DIP14	5	U106, U107, U108, U109, U110
100-1271-101	TL074	Op-Amp, Quad, 14-pin DIP	DIP14	5	U102, U103, U104, U201, U206
100-1403-101	74HC595	8-bit Shift Reg. w/Output Latch	DIP16	4	U205, U207, U301, U302
100-1397-101	74HC7046	HIGH SPEED PLL w/LOCK DETECTOR	DIP16	1	U310
165-1387-102	MC68HRC908JK1P(20)	8-Bit Microcontroller	DIP-20	1	U200
100-1359-101	NE5532	Op-Amp, Dual, 8-pin DIP	DIP8	7	U5, U6, U100, U203, U204, U306, U309
100-1406-101	OPA-2134	Op-Amp, Dual, 8-pin DIP	DIP8	1	U7
100-1104-101	TL072	Op-Amp, Dual, 8-pin DIP	DIP8	1	U202
100-1333-103	THAT2181B	VCA, Low-Noise, Low-THD	PAD-8	1	U105
REGULATOR/TRANSISTOR PARTS SECTION					
100-1091-103	TIP112	NPN Transistor, Darlington - Small Signal	TO220-VERT	1	Q1
100-1089-101	uA7805	Voltage Regulator - 7800 Family	TO220-VREG	1	U4
100-1089-106	uA7812	Voltage Regulator - 7800 Family	TO220-VREG	1	U3
100-1042-102	uA7815	Voltage Regulator - 7800 Family	TO220-VREG	1	U2
100-1042-101	uA7915	Voltage Regulator - 7900 Family	TO220-VREG	1	U1
100-1181-101	2N4401	NPN Transistor - Single	TO92-EBC	14	Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q100, Q104, Q300, Q301, Q308
100-1145-101	2N4403	PNP Transistor - Single	TO92-EBC	10	Q18, Q19, Q20, Q21, Q22, Q101, Q102, Q103, Q200, Q201
POT AND TRIMMER PARTS SECTION					
165-1164-101	CTS ABS. ENCODER	CTS ABSOLUTE ENCODER	CTS ABS. ENCODER	1	SW204 sample rate
100-1010-101	25K	POT-TRIMMER	TRIMHORZ	1	VR109 THD trim
100-1025-118	100K DUAL "C" TAPER	Pot, Dual Element	POT-9MM-DUAL	2	VR205 Mid-2 Freq, VR206 Mid-1 Freq
165-1027-105	5K DUAL/ 5%"C" TAPER	Pot, Dual Element	POT-16DUAL-H	1	VR2 Gain
165-1025-121	100K "A" TAPER	POT - Single Control / Trimmer	POT-9MM-SGL	1	VR103 Attack
100-1025-101	100K "B" TAPER	POT-TRIMMER	POT-9MM-SGL	1	VR102 Ratio

ART Part #	Value	Description	Footprint	Qty	Location
100-1025-103	10K "B" TAPER	POT-TRIMMER	POT-9MM-SGL	8	VR100 Expand/gate, VR105 Threshold, VR106 Output, VR108 De-Esser, VR200 Mid-2, VR202 High, VR203 Low, VR204 Mid-1
165-1025-115	5K "A" TAPER"	POT - Single Control / Trimmer	POT-9MM-SGL	1	VR1 Impedance
164-1025-122	5K "C" TAPER	POT - Single Control / Trimmer	POT-9MM-SGL	2	VR104 Release, VR107 De-Esser Freq
CONNECTOR/JACK PARTS SECTION					
100-5082-102	GP1FA550RZ	Fiber optic reciever	GP1FA550TZ	1	U317
100-5082-103	GP1FA550TZ	Fiber optic transmitter	GP1FA550TZ	1	U316
100-5291-101	XLR-PHONE COMBO	NEUTRIK XLR/PHONE COMBO JACK	XLR COMBO-HORZ	2	JK3 MIC/LINE INPUT, JK4 INPUT MIC/INST
100-5270-102	XLR-M-H	Switchcraft PD3MRML2 Male XLR right angle rear mount	XLR-M-H	2	JK201 OUTPUT, JK302 AES/EBU OUTPUT
100-5035-101	jack 1/4" washer gnd.	REFERENCE CLIFF CL14422	J-CLIF-GND	5	JK1 INSERT IN, JK2 MIC PRE OUTPUT, JK200 OUTPUT BALANCED, JK303 A/D CH2 INSERT, JK304 A/D MAIN INSERT
100-5225-102	J-CLIFF-GND	Jack, Cliff Stereo, with Grounding Clip	J-CLIF-GND	5	JK1, JK2, JK200, JK303, JK304
100-5262-101	TAB-FASTON		TAB.250	11	P1- P7, P201-P204
100-5080-101	BNC CONNECTOR	BNC-RAP2001 REFERENCE SWITCHCRAFT	BNC RT WITH WASHER AND NUT	2	JK300, JK301 WORDCLOCK
100-5081-101	RCA-041 SW JACK	90 degree switched RCA jack	RCA SW	1	JK305 S/PDIF
169-1001-101	USB CONNECTOR	Power Dynamics USB-FB1RPX1	JK306	1	JK306 USB
INDICATOR PARTS SECTION					
LEDREPAIRKIT	LED Back light			1	M1
100-2005-107	VU METER W/tbox	NISSEI TN73 W/O BEZEL		1	M1
SWITCH PARTS SECTION					
100-5022-104	SW-4PDT	Switch, 4PDT, PCB Mount	SW-4PDT-FH-LIT2	2	SW101 EQ POSITION, SW202 LOW FREQ
100-5022-102	SW-DPDT-FH	Switch, DPDT, PCB mount	SW-DPDT-FH-LIT2	9	SW1, SW2, SW3, SW4, SW6, SW100, SW200, SW201, SW222 All other switches
165-2001-101	E-SWITCH P277-EE-1-C-X-C	E-SWITCH POWER SWITCH #P227-EE-2-C-X-C	SW-DPST-PWR	1	SW5 PWR SWT
MISC. PARTS					
100-1200-101	12AX7A		TUBE-9PIN	1	V1
MECHANICAL PARTS SECTION					
100-1511-101	TRANSFORMER, TOROID	20V-0-20V @.7A + 9V@.4A 120/240V PRIMARY		1	TR100 (MAY REQUIRE FEMALE CONNNECTORS)

ART Part #	Value	Description	Footprint	Qty	Location
100-5052-107	.75" KNOB /BLACK	TAIWAN KNOB 42006-2G-D (TKE)		2	VR2 GAIN, VR106 OUTPUT
100-5052-108	0.5" KNOB /BLACK	TAIWAN KNOB 42006-4G-D (TKE)		14	VR1, VR100, VR102, VR103, VR104, VR105, VR107, VR108, VR200, VR202, VR203, VR204, VR205, VR206, SW204
164-2004-101	LIT SWITCH CAP			12	SW1, SW2, SW3, SW4, SW5, SW6, SW100, SW101, SW200, SW201, SW202, SW222

FULL BILL OF MATERIALS

ART Part #	Value	Description	Footprint	Qty	Location
AXIAL PARTS SECTION					
100-1002-190	0 Ohm jumper	Resistor, Carbon Film, 5%	AXIAL0.4	1	R339
100-1002-176	1.5K	Resistor, Carbon Film, 5%	AXIAL0.4	4	R242, R243, R244, R245
100-1002-191	10 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	4	R29, R31, R32, R33
100-1002-103	100 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	21	R69, R73, R163, R166, R254, R255, R256, R300, R308, R334, R180, R260-C269
100-1002-134	100K	Resistor, Carbon Film, 5%	AXIAL0.4	16	R43, R44, R45, R46, R49, R50, R71, R100, R104, R108, R110, R115, R118, R133, R275, R305
100-1002-117	10K	Resistor, Carbon Film, 5%	AXIAL0.4	44	R3-R17, R34, R36, R63, R70, R105, R106, R116, R117, R129, R132, R179, R200-R209, R231, R232, R233, R234, R235, R276, R277, R324
100-1001-401	10.0k Ohms	Resistor, Carbon Film, 1%	AXIAL0.4	2	R130, R131
100-1002-184	10M	Resistor, Carbon Film, 5%	AXIAL0.4	1	R147
100-1002-192	150 Ohms	Resistor, Carbon Film	AXIAL0.4	12	R68, R127, R146, R155, R164, R169, R172, R175, R176, R177, R309, R314
100-1002-119	15K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R320
100-1002-221	120K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R143
100-1002-177	160K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R173
100-1002-106	1K	Resistor, Carbon Film, 5%	AXIAL0.4	10	R66, R120, R121, R122, R215, R222, R223, R224, R225,R270
100-1002-144	1M	Resistor, Carbon Film	AXIAL0.4	16	R55, R56, R57, R135, R140, R153, R154, R226, R227, R228, R229, R230, R310, R311, R312, R325
100-1002-216	33 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	1	R30
100-1001-339	2.49K	Resistor, Carbon Film	AXIAL0.4	2	R51, R52
100-1002-109	2.4K	Resistor, Carbon Film, 5%	AXIAL0.4	4	R62, R344, R345, R346
100-1002-182	200K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R109
100-1002-122	20K	Resistor, Carbon Film, 5%	AXIAL0.4	7	R40-R42, R170, R174, R217, R304
100-1001-435	22.6K	Resistor, Carbon Film, 5%	AXIAL0.4	2	R53, R54

ART Part #	Value	Description	Footprint	Qty	Location
100-1002-123	22K	Resistor, Carbon Film, 5%	AXIAL0.4	2	R240, R241
	24 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	1	R67
100-1002-124	24K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R113
100-1002-104	200 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	2	R18, R211
100-1002-181	240 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	1	R144
100-1002197	270 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	2	R326, R329
100-1002-138	240K	Resistor, Carbon Film, 5%	AXIAL0.4	2	R60, R72
100-1002-153	2K	Resistor, Carbon Film, 5%	AXIAL0.4	23	R1, R27, R28, R35, R37, R38, R112, R123, R125, R126, R162, R165, R168, R210, R212, R213, R214, R216, R246, R247, R271, R313, R342
	27 Ohms, 1/2 W		AXIAL0.5	1	R273
100-1002-199	2.7K	Resistor, Carbon Film, 5%	AXIAL0.4	4	R236, R237, R238, R239
100-1002-112	3.9K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R272
100-1002-159	300K	Resistor, Carbon Film, 5%	AXIAL0.4	4	R156, R157, R158
100-1002-169	330 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	19	R11, R114, R119, R124, R128, R136, R137, R141, R142, R148, R181, R182, R183, R259, R306, R327, R330, R332
100-1002-127	33K	Resistor, Carbon Film, 5%	AXIAL0.4	3	R134, R145, R160
100-1002-128	39K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R151
100-1002-110	3K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R315
100-1002-102	4.7 ohm	Resistor, Carbon Film, 5%	AXIAL0.4	1	R274
100-1002-113	4.7K	Resistor, Carbon Film, 5%	AXIAL0.4	3	R2, R103, R317
100-1001-368	4.99K	Resistor, Carbon Film, 5%	AXIAL0.4	8	R58, R59, R61, R171, R218, R219, R220, R221
100-1002-179	47 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	2	R257, R258
100-1002-141	470K	Resistor, Carbon Film, 5%	AXIAL0.4	4	R139, R150, R159, R161
100-1002-130	47K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R252
100-1002-114	5.1K	Resistor, Carbon Film, 5%	AXIAL0.4	8	R102, R183, R301, R319, R322, R323, R328, R333
100-1002-185	5.1M	Resistor, Carbon Film, 5%	AXIAL0.4	2	R64, R65

ART Part #	Value	Description	Footprint	Qty	Location
100-1002-187	510 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	18	R19, R20, R21, R22, R23, R24, R25, R26, R124, R302, R303, R309, R314, R316, R321 R340, R341, R343
100-1002-154	51K	Resistor, Carbon Film, 5%	AXIAL0.4	2	R152, R331
100-1002-115	6.8K	Resistor, Carbon Film, 5%	AXIAL0.4	2	R47, R48
100-1002-218	620 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	1	R337
100-1002-116	7.5K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R101
100-1002-213	75 Ohms	Resistor, Carbon Film, 5%	AXIAL0.4	3	R178, R180, R338
100-1001-485	75K	Resistor, Carbon Film, 5%	AXIAL0.4	1	R149
	OPTIONAL PART	**DO NOT STUFF**		2	R335, R336
100-1005-117	470pF	Resistor, Carbon Film, 5%	CAP-AXIAL	1	C217
100-1005-111	.001uF	Resistor, Carbon Film, 5%	CAP-AXIAL	1	C216
100-1001-401	10.0k Ohms	Resistor, Carbon Film, 1%	AXIAL0.4	4	R248-251
SMT RESISTORS					
	1K Ohms		0603	2	R347, R348
	200 Ohms		0603	2	R349, R350
RADIAL PARTS SECTION					
100-1035-103	.01uF	Capacitor, Film / Ceramic	RADIAL0.1	1	C47
100-1038-101	100pF	Capacitor, Film / Ceramic	RADIAL0.1	13	C28, C43, C107, C202, C203, C204, C205, C326, C327, C331, C332, C342, C343
100-1036-104	10pF monobloc	Capacitor	RADIAL0.1	3	C215, C220, C226
100-1036-102	150pF	Capacitor, Film / Ceramic	RADIAL0.1	1	C28, C34
100-1036-109	20pF monobloc	Capacitor, Film / Ceramic	RADIAL0.1	3	C118, C348, C349
100-1036-101	330pF	Capacitor, Film / Ceramic	RADIAL0.1	6	C35, C38, C39, C40, C52, C325
100-1036-103	33pF	Capacitor, Film / Ceramic	RADIAL0.1	5	C42, C44, C46, C306, C307
100-1036-120	47pF	Capacitor, Film / Ceramic	RADIAL0.1	1	C300
	OPTIONAL PART	**DO NOT STUFF**	RADIAL0.1	4	C334, C335
100-1037T116	.001uF	Capacitor, Film / Ceramic	RADIAL0.2		
100-1037T103	.0033uF	Capacitor, Film / Ceramic	RADIAL0.2	3	C113, C117, C224
100-1037T102	.0047uF	Capacitor, Film / Ceramic	RADIAL0.2	1	C218
100-1037T106	.015uF	Capacitor, Film / Ceramic	RADIAL0.2	1	C225
100-1037T107	.022uF	Capacitor, Film / Ceramic	RADIAL0.2	3	C209, C323, C324

ART Part #	Value	Description	Footprint	Qty	Location
100-1037T111	.1uF	Capacitor, Film / Ceramic	RADIAL0.2	22	C41, C103, C104, C105, C106, C206, R223, C308, C310, C311, C312, C313, C315, C316, C317, C318, C319, C320, C321, C322, R336, R337
100-1009T109	.22uF	Capacitor, Film / Ceramic	RADIAL0.2	2	C207, C208
ELECTROLYTIC CAPACITOR PARTS SECTION					
100-1162-115	.15uF	Capacitor, Electrolytic (polarized)	LYTIC.1	3	C37,C328, C329
100-1008-101	.47uF 50V	Capacitor, Electrolytic (polarized)	LYTIC.1	4	C110, C111, C221, C222
100-1008-102	1uF/50V	Capacitor, Electrolytic (polarized)	LYTIC.1	9	C109, C114, C219, C228, C302, C338, C339, C340, C341
100-1162T114	220uF/6.3V	Capacitor, Electrolytic (polarized)	LYTIC.1	9	C29, C30, C31, C32, C33, C200, C201, C346, C347
100-1162T117	22uF/35V	Capacitor, Electrolytic (polarized)	LYTIC.1	33	C4, C5, C6, C7, C8, C9, C10, C11, C36, C49, C50, C51, C100, C101, C102, C115, C116, C210, C211, C212, C213, C214, C227, C230, C309, C333, C344, C345, C350
	4.7uF	Capacitor, Electrolytic (polarized)	LYTIC.1	1	C47
100-1162-109	47uF	Capacitor, Electrolytic (polarized)	LYTIC.1	1	C301
100-1162-124	100uF/100V	Capacitor, Electrolytic (polarized)	LYTIC.2	9	C12, C13, C14, C15, C16, C17, C18, C19, C20
100-1162-125	100uF/200V	Capacitor, Electrolytic (polarized)	LYTIC.2	3	C21, C22, C23
100-1162-107	2200uF/16V	Capacitor, Electrolytic (polarized)	LYTIC.2	3	C24, C25, C48
100-1162-112	2200uF/35V	Capacitor, Electrolytic (polarized)	LYTIC.2	3	C1, C2, C3
100-1162-110	470uF/25V	Capacitor, Electrolytic (polarized)	LYTIC.2	3	C26, C27, C229
	OPTIONAL PARTS	**DO NOT STUFF**			C334, C335
DIODE PARTS SECTION					
100-1029T101	1N4148	Diode - Signal or Power Rectifier	DIODE0.4	26	D13, D14, D18, D19, D100, D101, D102, D103, D104, D105, D106, D107, D108, D109, D110, D111, D112, D115, D118, D200, D202, D203, D205, D300, D301, D304
100-1030-102	1N5235B	Diode, Zener, <= 1w	DIODE0.4	1	D114
100-1030-101	1N5231B	Diode, Zener, <= 1w	DIODE0.4	3	D116,D119, D121

ART Part #	Value	Description	Footprint	Qty	Location
100-1030-107	1N5240B	Diode, Zener, <= 1w	DIODE0.4	1	D113
100-1030-101	1N5261B	Diode, Zener, <= 1w	DIODE0.4	1	D15
100-1030-108	1N5818	1N5818 shottkey diode	DIODE0.4	3	D120, D201, D204
100-1098-101	1N4003	Diode - Signal or Power Rectifier	DIODE0.4LG	15	D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D16, D17, D22, D23, D24
IC PARTS SECTION					
100-1134-101	LM339AN	QUAD COMPARATOR	DIP14	5	U106, U107, U108, U109, U110
100-1271-101	TL074	Op-Amp, Quad, 14-pin DIP	DIP14	5	U102, U103, U104, U201, U206
100-1403-101	74HC595	8-bit Shift Reg. w/Output Latch	DIP16	4	U205, U207, U301, U302
100-1397-101	74HC7046	HIGH SPEED PLL w/LOCK DETECTOR	DIP16	1	U310
165-1387-102	MC68HRC908JK1P(20)	8-Bit Microcontroller	DIP-20	1	U200
100-1359-101	NE5532	Op-Amp, Dual, 8-pin DIP	DIP8	7	U5, U6, U100, U203, U204, U306, U309
100-1406-101	OPA-2134	Op-Amp, Dual, 8-pin DIP	DIP8	1	U7
100-1104-101	TL072	Op-Amp, Dual, 8-pin DIP	DIP8	1	U202
100-1333-103	THAT2181B	VCA, Low-Noise, Low-THD	PAD-8	1	U105
SMT PARTS SECTION					
100-1348-101	LM3046M	Transistor Array, 3-NPN + 1-Diff Pair NPN	SO-14	1	U101
100-1116-103	74HC00	Quad 2-IN Nand Gate	SO-14	1	U300
100-1398-101	74HC74	Flip-Flop, Dual D-Type w/Preset & Clear	SO-14	1	U305
100-1399-101	74HC161	Synchronous 4-Bit Binary Counter	SO-16	2	U303, U304
100-1404-101	74HC4053	Analog Switch, 3PDT - 3 Control Lines	SO-16	2	U307, U308
100-1401-101	AL-1401A	ALESIS OPTICAL OUTPUT GENERATOR	SOL-20	1	U315
100-1402-101	AL-1402	ALESIS OPTICAL INPUT RECIEVER	SOL-24	1	U313
100-1410-101	PCM-1804	24 bit, 192KHz A/D converter	SSOP-28	1	U314
100-1409-101	DIT-4192	192KHz Digital audio transmitter	TSSOP-28	1	U318
165-2001-101	***XF5756-ER9***	XFMRS - 192KHz AES/EBU TRANSFORMER	XF5756-ER9	1	TR300
	PCM2902	USB INTERFACE I.C.		1	U311

REGULATOR/TRANSISTOR PARTS SECTION					
ART Part #	**Value**	**Description**	**Footprint**	**Qty**	**Location**
100-1091-103	TIP112	NPN Transistor, Darlington - Small Signal	TO220-VERT	1	Q1
100-1134-105	LM317T(3)	3-TERMINAL ADJUSTABLE REGULATOR AND 3-AMP ADJUSTABLE REGULATOR	TO220-VREG	1	U8
100-1089-101	uA7805	Voltage Regulator - 7800 Family	TO220-VREG	1	U4
100-1089-106	uA7812	Voltage Regulator - 7800 Family	TO220-VREG	1	U3
100-1042-102	uA7815	Voltage Regulator - 7800 Family	TO220-VREG	1	U2
100-1042-101	uA7915	Voltage Regulator - 7900 Family	TO220-VREG	1	U1
100-1181-101	2N4401	NPN Transistor - Single	TO92-EBC	14	Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q100, Q104, Q300, Q301, Q308
100-1145-101	2N4403	PNP Transistor - Single	TO92-EBC	10	Q18, Q19, Q20, Q21, Q22, Q101, Q102, Q103, Q200, Q201
100-1144-103	2SA1316	PNP - high gain,low noise/80V	TO92-ECB	2	Q16, Q17
100-1098T103	BF423	PNP Transistor - Single	TO92-ECB	4	Q12, Q13, Q14, Q15
POT AND TRIMMER PARTS SECTION					
100-1164-101	CTS ABS. ENCODER	CTS ABSOLUTE ENCODER	CTS ABS. ENCODER	1	SW204
100-1010-101	25K	POT-TRIMMER	TRIMHORZ	1	VR109
100-1025-105	100K DUAL "C" TAPER	Pot, Dual Element	POT-9MM-DUAL	2	VR205, VR206
100-1025-120	5K DUAL/ 5%"C" TAPER	Pot, Dual Element	POT-16DUAL-H	1	VR2
100-1025-121	100K "A" TAPER	POT - Single Control / Trimmer	POT-9MM-SGL	1	VR103
100-1025-101	100K "B" TAPER	POT-TRIMMER	POT-9MM-SGL	1	VR102
100-1025-103	10K "B" TAPER	POT-TRIMMER	POT-9MM-SGL	8	VR100, VR105, VR106, VR108, VR200, VR202, VR203, VR204
165-1025-115	5K "A" TAPER"	POT - Single Control / Trimmer	POT-9MM-SGL	1	VR1
164-1025-122	5K "C" TAPER	POT - Single Control / Trimmer	POT-9MM-SGL	2	VR104, VR107
CONNECTOR/JACK PARTS SECTION					
100-5082-102	GP1FA550RZ	Fiber optic reciever	GP1FA550TZ	1	U317
100-5082-103	GP1FA550TZ	Fiber optic transmitter	GP1FA550TZ	1	U316
100-5291-101	XLR-PHONE COMBO	NEUTRIK XLR/PHONE COMBO JACK	XLR COMBO-HORZ	2	JK3, JK4
100-5270-102	XLR-M-H	Switchcraft PD3MRML2 Male XLR right angle rear mount	XLR-M-H	2	JK201, JK302

ART Part #	Value	Description	Footprint	Qty	Location
100-5035-101	jack 1/4" washer gnd.	REFERENCE CLIFF CL14422	J-CLIF-GND	5	JK1, JK2, JK200, JK303, JK304
100-5225-102	J-CLIFF-GND	Jack, Cliff Stereo, with Grounding Clip	J-CLIF-GND	5	JK1, JK2, JK200, JK303, JK304
100-5262-101	TAB-FASTON		TAB.250	11	P1- P7, P201-P204
100-5080-101	BNC CONNECTOR	BNC-RAP2001 REFERENCE SWITCHCRAFT	BNC RT WITH WASHER AND NUT	2	JK300, JK301
100-5081-101	RCA-041 SW JACK	90 degree switched RCA jack	RCA SW	1	JK305
100-1138-310	FLEX-10	10 WIDE FLEX STRIP, ONE END DEPICTED	SIP-10	10	JP1, JP200, JP300, JP700, JP702, JP800, JP802, JP900, JP902, JP906
100-1138-305	FLEX-5	FLEX STRIP- FIVE WIDE	SIP-5	6	JP310, JP704, JP804, JP806, JP904, JP908
169-1001-101	USB CONNECTOR	Power Dynamics USB-FB1RPX1	JK306	1	JK306
INDICATOR PARTS SECTION					
100-1136-103	***Red***	***Kingbright- WP1043ID***	***Kingbright-WP1043ID***	***2***	LED300, LED301
	RED BARGRAPH	***MV57164 RED BARGRAPH***		2	U111, U112
	GREEN BARGRAPH	***MV54164 GREEN BARGRAPH***		1	U113
	RED,YELLOW, GREEN	***MV5A164 RED, YELLOW, GREEN BARGRAPH***		1	U114
100-1136-104	Yellow	***Kingbright- WP1043YD***	LED-L383	1	LED103
100-1132-102	Blue	LED - Single, T1, T1 3/4, T1 plus SMD 1205 SIZE, W/LENS - KINGBRIGHT APTD3216PBC (BLUE)	LED-T1	2	LED2, LED222
100-1031-119	Orange	LED - Single, T1, T1 3/4, T1 plus SMD 1205 SIZE, W/LENS - KINGBRIGHT APTD3216PBC (BLUE)	LED-T1	9	LED1, LED3, LED4, LED6, LED100, LED101, LED200, LED201, LED202
100-1031-122	Red	LED - Single, T1, T1 3/4, T1 plus SMD 1205 SIZE, W/LENS - KINGBRIGHT APTD3216PBC (BLUE)	LED-T1	1	LED5
100-2005-107	VU METER W/box	NISSEI TN73 W/O BEZEL		1	M1
SWITCH PARTS SECTION					
100-5022-104	SW-4PDT	Switch, 4PDT, PCB Mount	SW-4PDT-FH-LIT2	2	SW101, SW202
100-5022-102	SW-DPDT-FH	Switch, DPDT, PCB mount	SW-DPDT-FH-LIT2	9	SW1, SW2, SW3, SW4, SW6, SW100, SW200, SW201, SW222
165-2001-101	E-SWITCH P277-EE-1-C-X-C	E-SWITCH POWER SWITCH #P227-EE-2-C-X-C	SW-DPST-PWR	1	SW5

MISC. PARTS					
ART Part #	**Value**	**Description**	**Footprint**	**Qty**	**Location**
100-1158T101	100uH	Inductor, Iron Core	CHOKE0.2	1	L401
100-1200-101	12AX7A		TUBE-9PIN	1	V1
100-1222-246	10.848MHz	Crystal - Series or Par. Mode	XTAL-HC18	1	X300
100-1222-246	12.000MHz	Crystal - Series or Par. Mode	XTAL-HC18	1	X301
100-1228-103	RELAY-DPDT, 12V	HS212-12	RELAY-DPDT-DIP	2	RL1, RL300
100-5068-101	TUBE SOCKET	Tube, Dual Triode (9-pin mini)	TUBE-9PIN	1	V1
100-5204-106	HEATSINK #100-5204-106	Heatsink, Add-On to TO-220	HTSK-5204-106	5	HS1, HS2, HS3, HS4, HS5
MECHANICAL PARTS SECTION					
165-3001-103	PCB BOARD			1	
100-5216-104	.250" x .203" "L" bracket	Keystone #543-621	BRKT-90^-FRT	4	Gain display, Output display
100-1511-101	TRANSFORMER, TOROID	20V-0-20V @.7A + 9V@.4A 120/240V PRIMARY		1	TR100 (MAY REQUIRE FEMALE CONNNECTORS)
100-5027-122	6/32-3/8 ROLOX			9	POWER INLET, GND LUG,COVER, PCB-PCB STANDOFF
	STANDOFF, PCB-PCB, 1.2", THREADED FOR 4-40 SCREWS			2	
	Tube Shield/Spring/Collar			1	V1
	4-4-40x 1/8" screws			10	V1, Gain Display, Output display
	2-.350"#4 threaded standoffs			2	V1
	4-40 X 1/4" Pan head black, phillips			12	PCB to PCB standoffs, "L" brackets
100-5030-106	NUT 6-32 HEX NYLOK			3	POWER INLET, GND LUG
	#4BX3/8 PH PN HD ST BLK SCREW			16	CHASSIS TO FRONT, JK3,JK201,JK302,U316,U317 (OPTICAL JACKS), LED PCB MOUNTING
100-5032-131	SCREW 4-40X1/4 FLAT HEAD UNDER CUT	PCB TO STANDOFF		2	SCREWS FOR JK4
100-5033-113	1/4 JACK PLASTIC NUT	REAR PANEL		6	JK1,JK2,JK100,JK200,JK303,JK304

ART Part #	Value	Description	Footprint	Qty	Location
100-5052-107	.75" KNOB /BLACK	TAIWAN KNOB 42006-2G-D (TKE)		2	VR2, VR106
100-5052-108	0.5" KNOB /BLACK	TAIWAN KNOB 42006-4G-D (TKE)		14	VR1, VR100, VR102, VR103, VR104, VR105, VR107, VR108, VR200, VR202, VR203, VR204, VR205, VR206, SW204
159-2009-200	POWER INLET IEC w/FUSE W/ VOLTAGE SELECT	REAR PANEL		1	PL100
165-2001-200	FRONT PANEL			1	
165-2002-200	CHASSIS			1	
165-2003-200	COVER			1	
165-2004-200	Window	2.600 X .650		1	Atten. Window
165-2005-200	Window	2.600 X .650		1	Level Window
215-8002-100	HARNESS .187 TO GND LUG			1	HARNESS .187 TO GND LUG, 6"
255-8002-101	HARNESS PRIMARY AC			1	
165-2002-101	LIT SWITCH CAP			12	SW1, SW2, SW3, SW4, SW5, SW6, SW100, SW101, SW200, SW201, SW202, SW222
	#8 1 1/2" SCREW	FOR TRANSFORMER		1	TR100
	#8 WASHER	FOR TRANSFORMER		1	TR100
	#8 NYLOK NUT	FOR TRANSFORMER		1	TR100
	.125" ADHESIVE BASE STANDOFF	PCB TO CHASSIS		2	
PACKAGING PARTS					
500-5011-100	PKG BAG			1	15.75(OPEN)x26.500".002
165-	PKG BOX			1	MTL UNIT BOX
100-6003-101	SERIAL LABEL			2	
-	END CAPS			2	PKG MTL ENS CAP
000-100-120	WARRANTY CARD			1	
000-100-121	WARRANTY ENVELOPE			1	
165-5004-101	MANUAL			1	PKG MANUAL
MFG 9169-101	BAG			1	PKG BAG 6"X6" X .002 FOR MANUAL PACKAGE
100-1057-109	110V IEC POWER CORD			1	

20-0-20 VAC

9 VAC

POWER SWITCH

Wire between fuse and transformer primary common.

Power switch LED

TUBE VOLTAGE

LOW CUT

PAD

GAIN

PHASE

INSERT OUT

INSERT IN

IMPEDANCE

Rear Mic/line Input

Front Mic/Instrument Input

Comp & Gate

Comp & gate v104.schdoc

EQ & host

EQ & host v104.schdoc

Digital output

Digital output v104.schdoc

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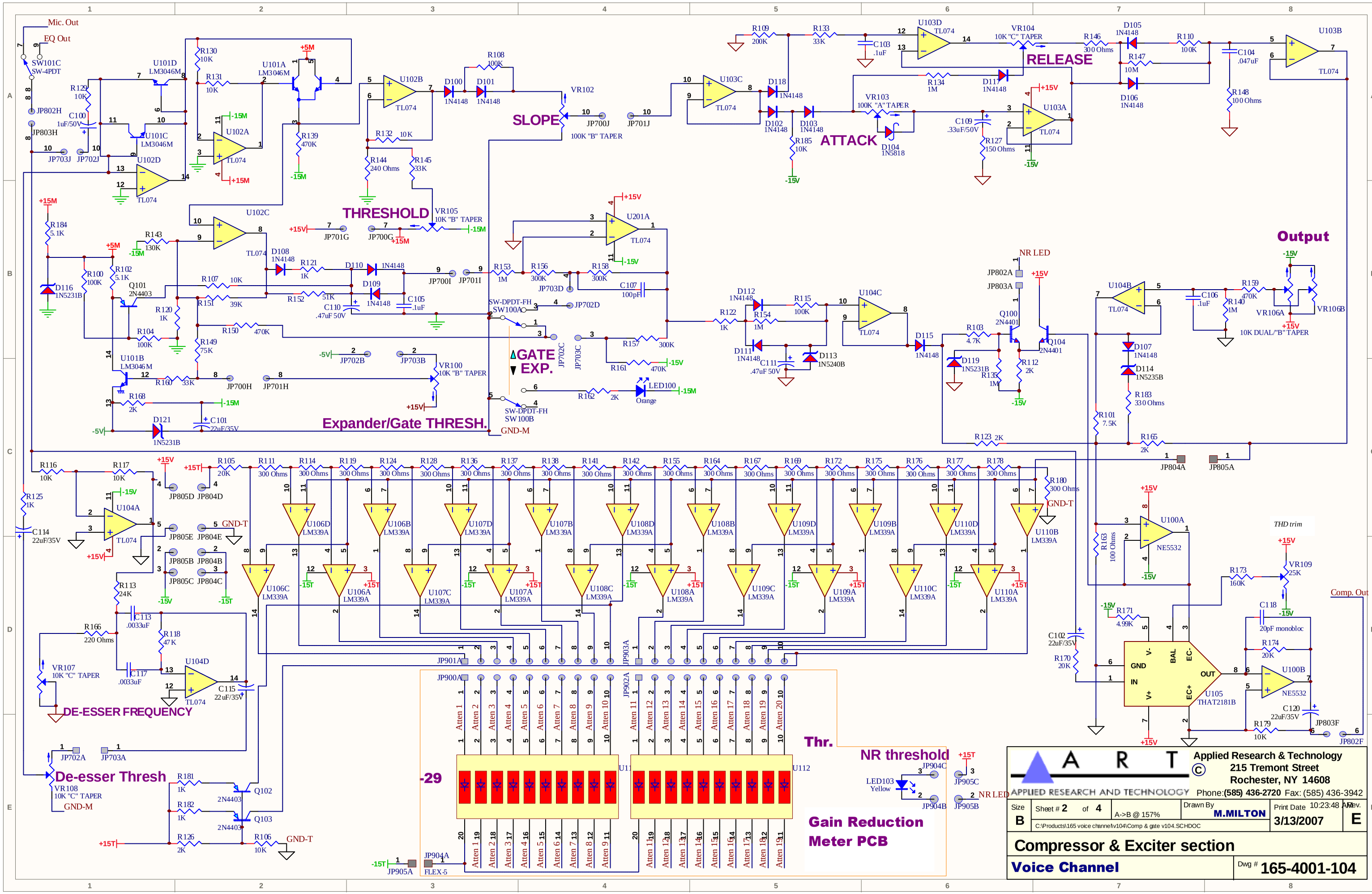
165- Voice Channel Power & Preamp

Voice Channel

Dwg # 165-4001-104


Mic. Out
EQ Out
SW101C SW-4PDT
JP802H
JP803H
JP703J
JP702J
U101D LM3046M
U101C LM3046M
U102D TL074
R129 10K
C100 1uF/50V
R130 10K
R131 10K
U101A LM3046M
U102A TL074
R139 470K
+5M
-15M
+15M
U102B TL074
D100 1N4148
D101 1N4148
R108 100K
VR102
SLOPE
100K "B" TAPER
JP700J
JP701J
R132 10K
R144 240 Ohms
R145 33K
U102C TL074
THRESHOLD
VR105 10K "B" TAPER
JP701G
JP700G
U103C TL074
R109 200K
R133 33K
C103 .1uF
U103D TL074
VR104 10K "C" TAPER
RELEASE
R146 300 Ohms
D105 1N4148
R147 10M
D106 1N4148
R110 100K
C104 .047uF
R148 100 Ohms
U103B TL074
D118 1N4148
D102 1N4148
D103 1N4148
R185 10K
ATTACK
VR103 100K "A" TAPER
D104 1N5818
R134 1M
D117 1N4148
C109 .33uF/50V
R127 150 Ohms
U103A TL074
+15V
-15V
R184 5.1K
D116 1N5231B
R100 100K
R102 5.1K
Q101 2N4403
R104 100K
R120 1K
R143 130K
R107 10K
R151 39K
R152 51K
R150 470K
R149 75K
D108 1N4148
R121 1K
D110 1N4148
D109 1N4148
C110 .47uF 50V
C105 .1uF
JP700I
JP701I
R153 1M
R156 300K
R158 300K
JP703D
C107 100pF
U201A TL074
SW-DPDT-FH SW100A
JP702D
JP703C
R157 300K
R161 470K
R162 2K
LED100 Orange
SW-DPDT-FH SW100B
GND-M
GATE EXP.
Expander/Gate THRESH.
U101B LM3046M
R160 33K
R163 2K
C101 22uF/35V
D121 1N5231B
JP702B
JP703B
JP700H
JP701H
VR100 10K "B" TAPER
D112 1N4148
R122 1K
R154 1M
R115 100K
D111 1N4148
C111 .47uF 50V
D113 1N5240B
U104C TL074
D115 1N4148
NR LED
JP802A
JP803A
Q100 2N4401
Q104 2N4401
R103 4.7K
D119 1N5231B
R135 1M
R112 2K
R123 2K
U104B TL074
C106 .1uF
R159 470K
R140 1M
VR106A
VR106B
10K DUAL/"B" TAPER
Output
D107 1N4148
D114 1N5235B
R183 330 Ohms
R101 7.5K
R165 2K
JP804A
JP805A
R116 10K
R117 10K
R125 1K
C114 22uF/35V
U104A TL074
JP805D
JP804D
JP805E
JP804E
JP805B
JP804B
JP805C
JP804C
GND-T
R113 24K
C113 .0033uF
C117 .0033uF
R118 47K
R166 220 Ohms
VR107 10K "C" TAPER
U104D TL074
C115 22uF/35V
DE-ESSER FREQUENCY
JP702A
JP703A
De-esser Thresh
VR108 10K "C" TAPER
R181 1K
R182 1K
R126 2K
Q102 2N4403
Q103 2N4403
R106 10K
R105 20K
R111 300 Ohms
R114 300 Ohms
R119 300 Ohms
R124 300 Ohms
R128 300 Ohms
R136 300 Ohms
R137 300 Ohms
R138 300 Ohms
R141 300 Ohms
R142 300 Ohms
R155 300 Ohms
R164 300 Ohms
R167 300 Ohms
R169 300 Ohms
R172 300 Ohms
R175 300 Ohms
R176 300 Ohms
R177 300 Ohms
R178 300 Ohms
R180 300 Ohms
U106D LM339A
U106B LM339A
U107D LM339A
U107B LM339A
U108D LM339A
U108B LM339A
U109D LM339A
U109B LM339A
U110D LM339A
U106C LM339A
U106A LM339A
U107C LM339A
U107A LM339A
U108C LM339A
U108A LM339A
U109C LM339A
U109A LM339A
U110C LM339A
U110A LM339A
U110B LM339A
JP901A
JP903A
JP900A
JP902A
Atten 1
Atten 2
Atten 3
Atten 4
Atten 5
Atten 6
Atten 7
Atten 8
Atten 9
Atten 10
Atten 11
Atten 12
Atten 13
Atten 14
Atten 15
Atten 16
Atten 17
Atten 18
Atten 19
Atten 20
U111
U112
Thr.
-29
JP904A
FLEX-5
JP905A
NR threshold
JP904C
LED103 Yellow
JP904B
JP905C
JP905B
NR LED
Gain Reduction Meter PCB
U100A NE5532
R163 100 Ohms
THD trim
VR109 25K
R173 160K
C118 20pF monobloc
R174 20K
U100B NE5532
C120 22uF/35V
R179 10K
JP803F
JP802F
Comp. Out
R171 4.99K
C102 22uF/35V
R170 20K
U105 THAT2181B
GND
IN
BAL
OUT
V-
V+
EC-
EC+
29
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Rev. E
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Compressor & Exciter section
Voice Channel
Dwg # 165-4001-104

EQ Section

EQ BYPASS
Bypass
Active

HIGH
15 KHz
5 KHz

Hi-SHIFT

Lo-SHIFT
150 Hz
50 Hz

LOW

Lo-MID

Hi-MID

Hi-MID FREQ.

Lo-MID FREQ.

Sample Rate encoder

Opto Switch & LED

Balanced Output

Level meter

Comp. Out
Mic. Out
SW101B
SW-4PDT
JP802J
JP803J
EQ_BYP
C212 22uF/35V
R232 10K
SW200A
LED200 Orange
GND-T
JP802G
SW200B
JP803G
R246 2K
-15T
EQ Out
Comp. Out
SW101A SW-4PDT
SW101D SW-4PDT
R247 2K
LED101 Orange
JP802I
C232 22uF/35V
JP803I
R200 10K
R201 10K
R202 10K
R203 10K
R204 10K
R205 10K
R248 30K
R249 30K
R250 30K
R251 30K
R257 47 Ohms
R258 47 Ohms
C215 10pF monobloc
C220 10pF monobloc
U203A NE5532
U203B NE5532
C200 220uF/6.3V
C201 220uF/6.3V
JP200F
JP201F
JP200E
JP201E
JP200C
JP201C
R-OUT+
R-OUT-
GND-R
C205 100pF
C204 100pF
JK200
J-CLIFF-GND
chassis
JK201 XLR-M-H
Left Dig. Level
U204A NE5532
R278 10K
C209 .022uF
JP705A
JP704A
VR206B 100K DUAL "C" TAPER
VR206A 100K DUAL "C" TAPER
U202B TL072
JP705B
JP704B
JP705E
JP704E
C225 .015uF
C219 1uF/50V
R238 2.7K
R239 2.7K
R237 2.7K
JP705C
JP704C
VR205A 100K DUAL "C" TAPER
VR205B 100K DUAL "C" TAPER
R236 2.7K
C224 .0033uF
C206 .1uF
U201B TL074
C218 .0047uF
JP705D
JP704D
U201D TL074
U206A TL074
U206C TL074
U206D TL074
U206B TL074
U201C TL074
U202A TL072
U204B NE5532
R218 4.99K
R219 4.99K
R220 4.99K
R221 4.99K
R230 1M
R231 10K
R253 100
R254 100
R255 100
R256 100
R229 1M
VR200 10K "B" TAPER
VR204 10K "B" TAPER
C202 100pF
C203 100pF
C213 22uF/35V
C211 22uF/35V
C210 22uF/35V
R240 22K
R241 22K
C231 22uF/35V
R242 1.5K
R243 1.5K
R226 1M
VR202 10K "B" TAPER
SW201B SW-DPDT-FH
JP703I JP702I JP702H JP703H
C217 470pF
C216 .001uF
SW201A SW-DPDT-FH
LED201 Orange
R216 2K
GND-M
R252 47K
R271 2K
R227 1M
R228 1M
SW202C SW202D SW-4PDT
JP703F JP702F JP702E JP703E JP702G JP703G
SW202A SW-4PDT
LED202 Orange
C214 22uF/35V
C221 .47uF/50V
C207 .22uF
C208 .22uF
C222 .47uF/50V
R244 1.5K
VR203 10K "B" TAPER
R245 1.5K
C230 22uF/35V
R217 20K
R233 10K
R234 10K
R235 10K
R277 10K
D201 1N5818
R211 200 Ohms
R275 100K
C223 .1uF
R259 330 Ohms
D202 1N4148
D203 1N4148
D204 1N5818
PEAK-A/D
+ filament
R273 27 Ohms/ 1/2W
P203 SK3
P204 SK4
P-chassis201
P-chassis202
mb1
mb2
R279 150 Ohms
R280 150 Ohms
D206 BAV23S
D207 BAV23S
LED203 Orange
LED204 Orange
LED205 White
R281 300 Ohms
M1 VU
METER-VU-LIT
L1
L2
R274 10 Ohms
U205 74HC595
U207 74HC595
RCK GI SER SRCLR SRCK VCC GND QA QB QC QD QE QF QG QH
R260 100 Ohms
R261 100 Ohms
R262 100 Ohms
R263 100 Ohms
R264 100 Ohms
R265 100 Ohms
R266 100 Ohms
R267 100 Ohms
R268 100 Ohms
R269 100 Ohms
JP907A
JP906A
JP909E JP908E
JP909D JP908D
Q200 2N4403
Q201 2N4403
R213 2K
R214 2K
C229 470uF/25V
reset'
(To Digital page)
U113
U114
-25
Clip
C226 10pF monobloc
R206 10K
R207 10K
C227 22 uF/35V
1N4148
D205
RST
R209 10K
U200
IRQ OSC1 OSC2/PTA6 PTD7* PTD6* PTD5 PTD4 PTD3* PTD2* VDD VSS RST PTB7 PTB6 PTB5 PTB4 PTB3 PTB2 PTB1 PTB0
display latch
display clock
display data
PLL Hi
Encoder B
Encoder A
PEAK-A/D
USB-spdif
serial latch
PLL_locked
serial data
serial clock
RSTN
CS'
R225 1K
CTS ABS. ENCODER SW204
R210 1K
R222 2K
R272 3.9K
R223 1K
JP806C JP807C
SW222A
SW-DPDT-FH
R212 2K
JP806B JP807B
R224 1K
LED222 Blue
R270 1K
JP806D JP807D
JP807A JP806A JP807E JP806E
R215 1K
R208 10K
C228 1uF/50V
U204B NE5532
R276 10K
P201 SK1
P202 SK2
+5V
+15V
-15V
-15I
GND

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EQ and Output sections

Voice Channel

Dwg # 165-4001-104

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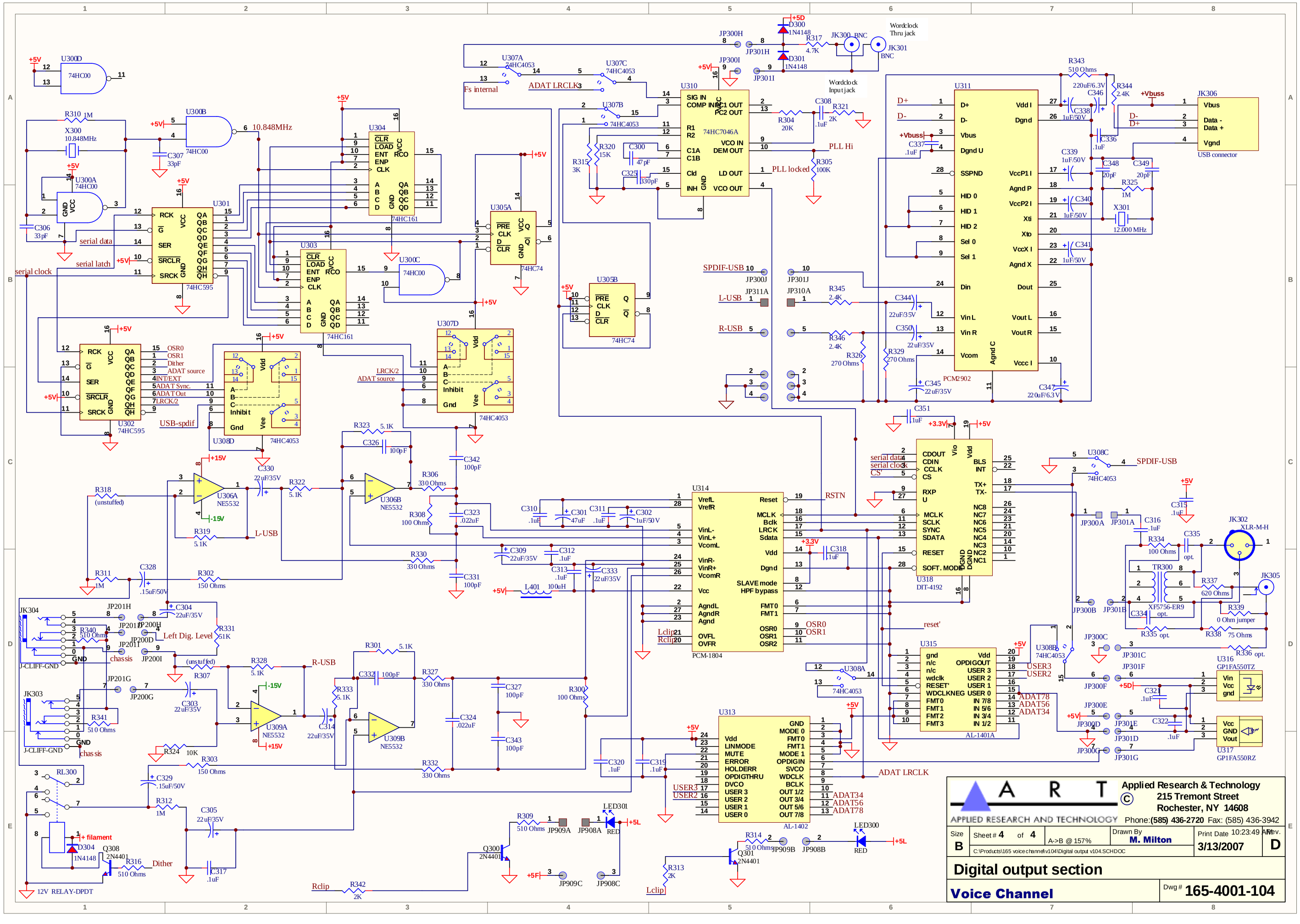

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A->B @ 157%	Drawn By M. Milton
C:\Products\165 voice channel\v104\Digital output v104.SCHDOC	Print Date 10:23:49 AM 3/13/2007
Rev. D	

Digital output section

Voice Channel

Dwg # 165-4001-104

WARRANTY INFORMATION

Limited Warranty (USA only)

Applied Research and Technology will provide warranty and service for this unit in accordance with the following warrants:

Applied Research and Technology, (A R T) warrants to the original purchaser that this product and the components thereof will be free from defects in workmanship and materials for a period of **three** years from the date of purchase. Applied Research and Technology will, without charge, repair or replace, at its option, defective product or component parts upon prepaid delivery to the factory service department or authorized service center, accompanied by proof of purchase date in the form of a valid sales receipt.

Online Registration

Please go to www.artproaudio.com. Select “*Support*”, then "*Product Registration*” input your information here.

Exclusions

This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. This warranty is void if the serial number is altered, defaced, or removed.

A R T reserves the right to make changes in design or make additions to or improvements upon this product without any obligation to install the same on products previously manufactured.

A R T shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitations of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific rights and you may have other rights, which vary from state to state.

For units purchased outside the United States, an authorized distributor of Applied Research and Technology will provide service.

SERVICE

The following information is provided in the unlikely event that your unit requires service.

1. Be sure that the unit is the cause of the problem. Check to make sure the unit has power, all cables are connected correctly, and the cables themselves are in working condition. You may want to consult with your dealer for assistance in troubleshooting or testing your particular configuration.
2. If you believe that the ART unit is at fault, go to www.artproaudio.com. Select "*Support*", then "*Return Authorization Request*" to request a return authorization number.
3. If you are returning the unit for service, pack the unit in its original carton or a reasonable substitute. The original packaging may not be suitable as a shipping carton, so consider putting the packaged unit in another box for shipping. Print the RA number clearly on the outside of the shipping box. Print your return shipping address on the outside of the box.
4. Include, with your unit, a note with the RA number and your contact information, including a return shipping address (we cannot ship to a P.O. box) and a daytime phone number, and a description of the problem, preferably attached to the top of the unit. Also include a copy of your purchase receipt.

Please fill in the following information for your reference:

Date of purchase: _____

Purchased from: _____

Serial Number: _____

SPECIFICATIONS

Input Impedance

Mic ..... 150 to 3.4K Ohms, variable
Line ..... 20K Ohms
Instrument ..... 2.5M Ohms
Preamp Insert ..... 7.5K Ohms
A/D Inserts ..... 10K Ohms

Output Impedance

Balanced Outputs ..... 200 Ohms balanced
Preamp Output ..... 100 Ohms
A/D Inserts ..... 510 Ohms

Frequency Response

Analog In to Analog Out ..... 12 Hz to 100 KHz +0, -1 dB
Analog In to Digital Out ..... 12 Hz to 20 KHz +0, -1 dB @ 44.1 KHz sample rate
..... 16 Hz to 42 KHz +0, -1 dB @ 96 KHz sample rate

THD

1 KHz ..... ≤ .015% typical
20 to 20 KHz ..... ≤ .033% typical

Equivalent Input Noise

Mic/Line ..... -130 dBu, Input shorted, Max gain, “A” weighted
Instrument ..... -105 dBu, Input shorted, Max gain, “A” weighted

Maximum Input Level

Mic/Line ..... +18 dBu balanced with PAD
Instrument ..... +15 dBu

Maximum Gain

Mic ..... 70 dB (XLR to balanced output)
Instrument ..... 40 dB (1/4-inch to balanced output)

Maximum Output level

Balanced ..... +20 dBu
Unbalanced ..... +20 dBu
Output Level At Meter 0 VU ..... +4 dBu

Preamp

Microphone Gain ..... 0 dB to +60 dB
Instrument Gain ..... +3 dB to +40 dB
Low Cut Filter ..... 100 Hz, 1-pole, 6 dB/Octave

EQ

Boost/Cut ..... ±12 dB on each band
Low Freq. Tuning ..... 50/150 Hz Selectable
MID 1 Freq. Tuning ..... 100 Hz to 3 KHz continuously variable
MID 2 Freq. Tuning ..... 500 Hz to 15 KHz continuously variable
High Freq. Tuning ..... 5K/15 KHz Selectable

Compressor/Limiter

Attack Time ..... 250 uSec. to 100 mSec.
Release Time ..... 100 mSec to 3 Sec.
De-esser Tuning ..... 2.5 KHz to 15 KHz continuously variable
Compression Ratio ..... 1:1 to 20:1
Expander Slope 1:1.5

Digital section

Wordclock Range ..... 30 KHz to 204 KHz
Sample Rates ..... 44.1 KHz, 48 KHz, 88.2 KHz, 96 KHz, 176 KHz, 192 KHz
A/D Dynamic Range ..... 106 dB “A” weighted
USB A/D Dynamic Range ..... 94 dB “A” weighted

Dimensions (HWD) ..... 3.50-inch x 19.0-inch x 9.17-inch, 88.9mm x 483mm x 233mm

Weight ..... 10.5 lbs., 4.76kg

Power Requirements ..... USA – 105 to 125 VAC/ 60 Hz Export units configured for country of destination.

USB Minimum System Requirements ..... USB Class compliant plug-and-play Mac and PC interface

Note: 0 dBu = 0.775 VRMS, 0 dBV = 1 VRMS

ART maintains a policy of constant product improvement. ART reserves the right to make changes in design, or make additions to, or improvements upon, this product without any obligation to install same on products previously manufactured. Therefore, specifications are subject to change without notice.

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