
HoweTech

MODEL 2300A PHASE CHASER

Installation/Operations Manual

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SECTION 1 INTRODUCTION

Immediately upon the arrival of your Phase Chaser, inspect the contents of the shipping carton for any damage incurred in transit. If damage is found, notify the transportation company promptly.

All equipment is careful tested and inspected at the factory. If any damage occurs in shipment, the carrier is responsible. However, only the consignee may make a claim against the carrier. Save the carton as evidence of damage for inspection by the shippers.

Occasionally, component failure subsequent to factory test and burn-in may occur during the first three months of operation. Provided that the unit is not subject to abuse, all the electrical components should last indefinitely.

The factory limited warranty covers both parts and labor for a period of three years after the date of shipping. This warranty is non-transferable.

SECTION 2 WARRANTY

Under normal use, all Howe Technologies Phase Chasers are warranted to be free from defects in parts and workmanship for a period of TWO (2) YEARS after the date of shipment. All warranties are void under any of the following conditions: (a) if the equipment is operated under environmental conditions or circumstances other than those specifically described in HoweTech literature or instructions manuals.

Upon notification within the specified warranty period, HoweTech agrees to repair or replace the equipment, at its option, or supply, for any maintained equipment, replacements for parts that are defective as to design, materials or workmanship, provided that the defective unit or parts are returned in accordance with HoweTech instructions.

At HoweTech's sole discretion, the buyer may be requested to return such defective equipment or parts to HoweTech, F.O.B. Boulder, Colorado. Parts or equipment may be returned only with HoweTech's prior authorization and must be identified by a Return Merchandise Authorization number previously issued by HoweTech. All such equipment or parts so returned must be sent freight prepaid, at the Buyer's risk; adequate packing should be supplied to prevent damage in shipping.

A detailed description of any failure or malfunction should be included with the returned merchandise to expedite repair or replacement. Repaired parts, or repaired or replaced equipment will be returned to the Buyer, F.O.B.

The above warranty does not extend to other such parts or equipment such as lamps, tubes, transistors, integrated circuits or fuses manufactured by other which are subject only to such adjustment as HoweTech may obtain from the suppliers thereof.

HoweTech shall not be liable for any subsequent or consequent damages resulting from the use, or inability to use the equipment, or for any loss, damage, or expense incurred thereby nor from any other cause. Except as set forth herein and except as to title, there are no warranties expressed or implied, nor any affirmations of fact or promises by HoweTech with reference to the equipment or its merchandisability, "fitness for application", signal coverage, infringement, or otherwise extend beyond the description on the face thereof.

This warranty is conveyed solely to the original Buyer unless prior written authorization for Transfer of Warranty has been obtained from HoweTech. Transfer of warranty will be granted under the following conditions:

1. The equipment is shipped with incoming and return freight prepaid to HoweTech, Boulder, Colorado

2. All non-warranty repairs deemed necessary by HoweTech to restore the equipment to its original operational condition are authorized and prepaid by the Buyer (excepting that, with the express written authorization by the Buyer, such

modifications to the equipment as may have been made by the original owner that are acceptable to the new Buyer may be left as is, provided that, in the option of HoweTech, such modifications will not cause damage to, or failure of, the equipment;

3.Transfer of Warranty shall provide coverage for the specified equipment solely to the new Buyer, as specified herein, for the remaining period of the original Warranty; the warranty period shall expire TWO (2) YEARS after the date of shipment to the original Buyer. Any subsequent transfer of ownership does not imply transference of an warranty, expressed or implied, without prior written authorization of HoweTech.

For more information about this warranty, contact Howe Technologies at (303) 444-4693.

SECTION 3 INSTALLATION

General

The Phase Chaser should be connected to a high quality AC source of the proper voltage. To reduce shock hazard, it is recommended that the earth ground NOT be disconnected. The earth ground connection will tend to improve the rejection so radio frequency noise, and, because all circuit grounds are isolated from chassis ground, it will not contribute to ground loop problems.

After installation it is recommended that power be kept on continuously. the high precision circuits in the unit require several minutes to stabilize after power is applied, so keeping the unit powered-up will reduce possible errors.

Avoid mounting the unit immediately adjacent to large power amplifiers, since AC fields associated with the power transformers can couple into sensitive audio circuitry and produce hum.

Wiring

For maximum rejection of radio noise, twisted pair foil shielded cable (such as Belden #8451 or equivalent) providing 100% coverage is recommended instead of wrapped-strand or braid shielded cable. using balanced lines will reduce hum and noise pickup.

The shield of the audio cable should not be used as the signal ground connection.

Audio Input connections

The audio connections are made through the 'Right" and "Left" XLR connectors located on the rear panel.

If the source is unbalanced, either signal input pin can be used; i some cases, connected the unused input lead to ground at the source end will increase rejection of RFI, 60Hz noise and other interference.

The input impedance is 20K Ohm per leg. Each channel is provided with a socket for a user-supplied input terminating resistor (see Section 4.3). In the BYPASS mode, these resistors are disconnected from the inputs to avoid double termination on the source.

Audio output connections

The output circuits are active balanced, able to drive loads of 600 Ohms or grater. Standard pin assignments for balanced lines are used 1:Gnd; 2:Hi; 3:lo.

Each output driver has a 51 Ohm series resistor to provide optimum drive capability with minimum overshoot and ringing. In general, it is preferable to operate the unit into high impedance loads (without input terminating resistors whenever possible since the voltage divider formed by the internal resistors and a low impedance load can reduce headroom.

Balanced loads

Figure ___ shows proper connection of the outputs to balanced or unbalanced loads. In a balanced configuration, he ground connections (pin 1) is optional. If the ground is used, it may have to be disconnected at one end if a ground loop problem arises. The choice of which end to connect is best determined empirically, since the optimum interference characteristic will depend on the specific installation environment.

Unbalanced loads

For unbalanced loads, the output amplifier ground (pin 1) MUST be connected to audio ground at the load and the proper output pin (depending on desired signal polarity) connected to the center (or "hot") audio terminal of the load.

Note that only one side of the balanced output is required to drive an unbalanced load, so the relative output level will be 6 dB lower that in the corresponding balances configuration. The unused output pin may be used to drive an additional unbalanced load (but the polarity of the signal will be reversed).

CAUTION: IN NO CASE SHOULD THE UNUSED OUTPUT TERMINAL BE CONNECTED TO GROUND.

SECTION 4 CIRCUIT DESCRIPTIONS

Audio input and output

A standard lo-noise instrumentation differential amplifier configuration is used at each input. Two poles of RC filtering providing 12 dB per octave rolloff (–3 dB at Khz) to reject radio frequencies. An additional LC filter (ferrite bead/capacitor) is provided at each input to shunt very high frequency signals.

An input gain selector jumper is provided for each channel to optimize performance for with normal (+0 dBm) or High (+14dBm) live signal environments.

A socket is provided at each input for a bridging termination resistor; these are disconnected from the inputs when the unit is in the bypass mode, preventing double termination.

The differential output amplifiers are NE5532 op amp. operating with dual 20 Volt power supplies; this provides full +28 dBm output drive capability. Output gain set jumpers are provided: these must be set to match the input jumpers for proper unity gain operation.

The mono output is one half the sum of the main channel outputs, and so will maintain the same relative output power level as the stereo outputs.

Polarity correction

In most stereo program material, a significant degree of correlation exists between the right and left channels. The correlation coefficient is unity for mono segments, while for stereo it is inversely related to the perceived width of the stereo image. The correlation coefficient for unrelated signals will be zero and they will be perceived as independent mono sources.

In general, the instantaneous degree of correlation will swing rapidly over a wide range, but on the average (for properly polarized signals) it will have some positive value between zero and one; a reverse polarity condition will yield a negative net correlation.

In order to accurately discriminate between real polarity errors and the short duration reversals inherent in normal material, both the magnitude and the duration of the signal polarity condition must be known.

The Polarity Detector employs an analog multiplier to compute the correlation coefficient between the input signals. The integrated output of the multiplier (mult-out) drives a comparator which in turn feeds a missing pulse detector. When mult-

out exceeds the Sensitivity Threshold, the FLIP timer is enabled; a mult-out level below the threshold resets the timer to zero.

A polarity inversion condition is assumed to exist when the average correlation coefficient remains more negative that the Sensitivity Threshold for the duration of the FLIP delay time.

At this point, the polarity of one audio channel (the right) is reversed using a transient-free soft cross-fade.

Because the exact values of the decision points are largely a matter of taste, both Sensitivity Threshold and the FLIP Decision Time can be set by the user.

The FLIP light on the front panel indicates the status of the polarity corrector: when the amber LED is on, the polarity reversal circuit is active.

In certain applications, it may be desirable to allow long duration polarity reversals. The automatic action of the FLIP circuit is controlled using the front panel rocker switch: green indicates that the circuit is enabled, red indicates that all polarity errors will be ignored.

Missing channel fill-in

The signal level at each input is monitored by high accuracy averaging full wave rectifier coupled to a comparator. A signal level below the Dropout Threshold is considered missing. Two independent timing functions are provided, Mono Fill Delay and Stereo Restore Delay.

In the event of a missing input channel condition, the Mon Fill circuit connects the remaining active channel to both outputs (Mono Mode),using a soft cross-fade. For the unit to shift modes from Stereo to Mono, one channel must be active and the other must remain continuously below the Dropout Threshold for the duration of the Mono Start period.

If the missing channel is restored and both channels remain active (above the Dropout Threshold) for the duration of the Stereo Restore period, the unit shifts to Stereo Mode.

When both inputs have been inactive for the duration of the Stereo Restore time period, the circuit shifts back to Stereo Mode.

The two time delay adjustments interact: the Stereo Restore delay is actually a fraction (between 0 and 1) of the Mono Fill delay. The Stereo Restore adjustments determines the value of this fraction, while the actual value of the time delay depends on the setting of the Mono Fill adjustment.

Time delay correction

The time delay corrector consists of a cross-correlator, used as a phase error detector, a high gain op amp coupled to some decision making circuitry, and a voltage controlled differential time delay network (see Block Diagram, Fig. 2). these elements are configured as a negative feedback servo amplifier operating in the time domain: it always tends toward an equilibrium point where the average output error detector is zero. When this condition is achieved, the inter-channel time delay error must necessarily be zero as well.

A cross correlator has two inputs and one output. For inputs of exactly the same frequency, the output will assume a steady state value proportional to the sine of the phase angle between the inputs; unrelated inputs will yield A.C. components at the sum and difference frequencies, but the average output (that is, the D.C. value) will be zero.

If the outputs are stereo audio signals, the output of the cross correlator will be proportional to the sum of the instantaneous phase differences of the rated signal components (any uncorrelated signals produce zero average output, and so do not contribute to the sum). If there is a fixed time delay between the inputs, the average cross correlator output will be non-zero: this value is used as the error signal in the servo loop.

A precision op amp serves as the error amplifier that drives the actual correlation circuitry. The output of this op amp will assume whatever value is required to assure that both its inputs remain at the same potential. This means that since the non-inverting input is connected directly to ground (i.e., to zero), the inverting input must be ground as well.

Both op-amp inputs are equal only when the output of the cross correlator is zero, which in turn is true only when there is no net time delay error between its input signals.

SECTION 5 OPERATING INSTRUCTIONS

General

The time delay correction circuitry is designed to respond to large time base errors while leaving intentional stereo phase information intact. Therefore it can be usefully employed on the most complex program material containing a liberal mixture of music, dialog, and sound effects; the Phase Chaser will apply the proper correction to each segment, resulting in mono compatibility throughout the entire program.

In accordance with good audio design principles, the Phase chaser should be connected directly after the audio source where errors are likely to occur. However, since the response of the Phase Chaser is entirely program material dependent, it can be installed anywhere in the audio chain, with ONE EXCEPTION: it should NOT be installed after a device which introduces differential frequency dependent phase shifts between the right and left channels.

Equipment such as the common stereo synthesizer uses interleaved comb filters (or the like) to cause phase shifts between the audio channels to simulate a stereo-like effect while leaving the mono sum intact. The Phase Chaser may, under some circumstances, try to compensate for these varying phase shifts; chasing such capricious phase shifts in the synthesized stereo signal may lead to mono incompatibility.

Front panel display and controls

The 21 segment LED bar display shows the relative amount of time delay correction being applied; this is precisely equal to the input time delay error. For typical program material, each LED corresponds to 15 microseconds of error.

The Online/Bypass switch controls the system operation; the green LED indicates On-line Status.

The FLIP switch controls the polarity-reversing circuit. When the circuit is enabled (switch LED green), the FLIP circuit will correct polarity errors. When the LED is res, the function is disabled and no polarity correction can occur. When the amber LED is on, polarity correction can occur. When the amber LED is on, polarity correction is in effect.

The FILL switch controls the Mono fill circuit. When the circuit is enabled (switch LED green), the FILL circuit will correct channel dropout errors. When the LED is red, the function is disabled and no fill in can occur. When the red LED is on, mono fill is in effect.

The CLIP LED (red) indicates an internal signal overload condition.

Input/output gain selection

The internal operating signal level of the Phase Chaser should be optimized for the expected signal levels. Two signal level settings are provided, one for nominal levels of +0 dBm and one for +14 dBm and higher. The unit is for +0 dBm at the factory; the other setting should be used only in installations where high signal levels are generally expected, with peaks exceeding +20 dBm. USE HI LEVEL MODE.

In order to maintain unity gain through the Phase Chaser, the input and output gain set jumpers on both channels must all be in the +0 dBm or the +14 dBm position. The input jumpers are E101 (left) and E201 (right); the output jumpers are E102 (left) and E202 (right). See Figure 1 for gain positions.

Input terminating resistor installation

A resistor socket is provided near each input bypass relay. R127 and R227 are the input terminating resistor locations for the left and right channels, respectively.

For optimum performance, low noise metal film resistors are recommended.

Polarity correction setup

Three adjustments are provided: Sensitivity; "FLIP" time delay; And Multiplier D.C. offset trim.

a. Sensitivity:

The Sensitivity adjustment (R446) controls the relative amount of inter-channel polarity error that will activate the polarity error detector. Whenever the amount of error exceeds the Sensitivity threshold, the FLIP delay timer is started.

Turning R466 clockwise increases the detector sensitivity so a smaller amount of polarity error will initiate the "FLIP" decision timer.

b. "FLIP" time delay:

Turning R481 clockwise speeds up the "FLIP" decision by decreasing the time delay between the initial detection of input and the operation of the "FLIP" circuit. This trimmer provides an adjustment range from zero delay to approximately 10 seconds.

Once the circuit has responded to a polarity inversion and flipped the right channel, the Sensitivity setting represents the degree of positive correlation (that is, proper polarity) that the inputs must attain for the circuit to switch back to the normal (non-inverted) state.

c. Multiplier D.C. offset adjust:

Unit is shipped factory calibrated; instructions are for reference only. With no audio input, adjust R449 for 0 volts D.C. at pin 8 of U407.

Missing channel fill-in setup

Three adjustments are provided: Dropout Threshold adjust; Mono Start Delay; and Stereo Delay.

a. Dropout Threshold:

One trimpot, R509, controls the Dropout Threshold for both channels. An input signal level below the threshold is considered missing. Clockwise rotation of R509 increases the allowable input dynamic range by lowering the Dropout Threshold level.

The threshold level is set at the factory for -40 dBm; this can be changed using the following procedure. Using an oscilloscope (or voltmeter), the Threshold level can be determined directly by decreasing the input level and observing the switching points of the level sensing comparators U502a and U502b (see Schematic). Connect a convenient sine wave source to each input. With the 'scope probe connected to either pin 1 or pin 7 of U502, reduce the associated input level (Left = pin 7, Right = pin 1): when the comparator output switches LO, the input is below the Dropout Threshold. Adjust R509 for desired performance.

b. Mono Start Delay

Clockwise rotation of R545 produces faster Mono Fill switching, by reducing the Mono Fill delay.

c. Stereo Restore Delay

Clockwise rotation of R527 produces faster Stereo Restore switching, by reducing the Stereo Restore delay.

Audio time delay correction calibration

All the calibrations of the decision points for the automatic time base correction circuitry are preset at the factory. The various adjustments interact and cannot be reset without special test equipment; these trimmers have been sealed to prevent

mechanical drift. Any calibration must be performed only by trained factory personnel.

Remote control functions

a. Remote Bypass and Reset:

These input functions are accessed through the Remote Input three-conductor jack on the rear panel. A momentary switch closure is required for each function: connect Tip and Sleeve for Bypass, Ring and Sleeve for Reset.

b. Remote Status outputs:

Four status outputs are available on the main circuit card, at P801; any two of these can be connected to the Status Output jack on the rear panel. Each output driver (TL-074 op amp) provides a typical drive level of 13 volts peak at 10 ma.

The outputs are (logic high: +13V / logic lo: -13V):

Mono/Stereo Output	[pin 1]
Clipping	[pin 3]
On-line/Bypass	[pin 5]
FLIP/normal	[pin 7]

Power-up status selection

The Phase Chaser is provided with an On-line/Bypass button on the front panel; the system status can be toggled between Bypass and On-line using this button.

The initial status (Bypass or On-line) of the Phase Chaser when power is first applied (or after a power failure) is set with an internal jumper, E851 (see Figure 1).

SECTION 6 MAINTENANCE AND SERVICING

The Phase Chaser requires no routine maintenance. The phase correction circuitry and calibrations are factory serviceable ONLY. All other parts of the unit may be serviced by the user.

As improved dual op-amps became available, they may be substituted in the audio signal path using the sockets provided on the main circuit card, The user must make sure that if substitutions are made, the devices selected are specified to be unity gain stable, otherwise high frequency oscillations can result. Because all the internal audio circuits are D.C. coupled, such factors as input offset voltage and drift must also be taken into account if proper operation is to be maintained. Any equipment failure caused by the use of device types other than those originally supplied will VOID the warranty unless prior written authorization has been obtained from HoweTech.

SECTION 7 SPECIFICATIONS

AUDIO INPUTS:

Two active balanced (Left, Right). Nominal input level, 0 dBm or +14 dBm, selectable; +28 dBm maximum. Balanced input impedance, 40k Ohms.

AUDIO OUTPUTS:

Three active balanced (Left, Right, Mono). Maximum output level +28 dBm. Balanced output impedance, 100 Ohms.

REMOTE CONTROL INPUT:

Independent remote bypass and remote reset (1/4" tip//ring/sleeve); each actuated by SPST switch closure.

STATUS OUTPUTS:

Mono/Stereo; Clipping status; On-line/Bypass; Polarity Reverse/Normal. 1/4" tip/ring/sleeve phone jack can be programmed for any tow of four outputs.

FREQUENCY RESPONSE:

DC to 20 Khz, flat. Input RFI rejection filter, –xxx dB at 500KHz (600 Ohm source)

THD:

.....less than 0.02%

NOISE:

.....below –80 dBm.

CHANNEL SEPARATION:

.....(to be specified in final version of owner's manual).

ENVELOPE DELAY:

.....less than 10 microseconds at zero correction

MAXIMUM DIFFERENTIAL DELAY CORRECTION:

.....150 microseconds

CORRECTION ACCURACY:

..... 2 microseconds

MINIMUM AUDIO INPUT TO ACHIEVE CORRECTION:

.....–50 dBm

FRONT PANEL LED STATUS INDICATORS:

Time delay error display:21 segment LED Bar

Polarity: Enabled/Disabled: Function active

Mono Fill: Enabled/Disabled; Function active

Overload: Clipping/Normal;

System status: On-Line/Bypass

FRONT PANEL CONTROLS:

.....On-Line/Bypass; FLIP enable; FILL enable

POWER REQUIREMENTS:

.....115 VAC, 60Hz, 25 watts

DIMENSIONS

.....19" x 1 3/4" x 15"

SECTION 8 APPLICATION NOTES

Recording and post production

Since the Phase Chaser will correct the AVERAGE time delay sensed in the program material, care should be taken to avoid using program material containing SIMULTANEOUS signals with different inherent time base errors.

This can occur, for example, with stereo program material that has been mixed down from multi-track masters. If only one of the several input sources contained a severe time delay while the rest had been properly phased, the Phase Chaser will provide an intermediate amount of correction, corresponding to the average time delay in all the tracks.

In practice this can be avoided by employing the Phase Chaser early in the mix-down process as a monitoring device on the final stereo mix. The Phase Chaser will respond to any mon-incompatible sections of the mix as it is created. Sections containing possible trouble spots can be corrected.

If a better copy of the source material causing the problem cannot be obtained, the Phase chaser can be used to correct the problem prior to the final mix-down.

In situations where remixing the source material is impossible, field tests indicate that the overall correction applied (which will be a compromise from the phase correction purist standpoint) generally results in a subjective improvement.

Tape Deck Phase Measurement

For single tome signals, The Phase Chaser behaves like an extremely accurate phase locked loop;. Any time delay error between the inputs will be corrected by the unit, and the amount of applied correction will be indicated on the front LED display. If only green LED is on, the inputs are properly aligned.

Therefore, the Phase Chaser can be used with a standard alignment tape as a quick means to adjust head azimuth on cart machines and similar tape desks.

Surround Sound Applications

The 2300A can be used to correct inter channel time delay errors which occur in Dolby™ Surround Sound phase-encoded two track program material. The unit should be connected between the program source and the Surround Sound Decoder.

Time delays cause errors in the decoding process so that material intended for the center channel (such as mon dialog) is incorrectly routed to the surround speakers. This primarily affects upper frequencies.

An example is the "spitting effect observed when vocal sibilance appears in the surround while the rest of the dialog remains up front.

SECTION 9 CALIBRATION PROCEDURE

1. Turn on power and check all supply voltages; turn off.
2. Insert all integrated circuits; apply power.
3. Set R306 for 3.4 volts across R309 (7K50).
4. Adjust DC offset of U407: R449, scope at top of R452 (20K0).
5. Adjust DC offset of sine detector (U705): R708, scope at bottom of R711 (31K6).
6. Adjust DC offset of cosine detector (U706): R733, scope at bottom of R736 (61K9).
7. Adjust R481 (FLIP delay) for 2.5v at U409, pin 5.
8. Adjust R466 (FLIP hysteresis) for 1.0v at U409, pin 3.
9. Adjust R546 (mono fill delay) for 1.5v at U503, pin 2.
10. Adjust R527 (stereo restore delay) for 1.0v at U503, pin 13.
11. Adjust R509 (dropout threshold) for 50mv at U502, pin 2.
12. Set R572 (Surround pause threshold) for 4.8v at U706, pin 2.
13. Set R755 (window, slow loop) for 1.70v at P702, pin 5.
14. Set R757 (window, fast loop) for 3.5v at P702, pin 4.
15. Apply 2kHz to 10kHz (very slow sweep) and adjust R707 to optimize sine correlator symmetry at R711, bottom end. (Note that small residual errors due to circuit imbalances should be correct by the slow loop).
16. Using scope in differential mode, connect to top of R728 and R731. Adjust R732 for optimum cosine correlator symmetry (2kHz to 10kHz, as before).
17. Verify FLIP operation at 500 Hz (approximate).
18. Verify Cosine Reset operation: use 5kHz, scope probe on P701, pin 5; this pin should go low when input is inverted.
19. Verify CLIP detection.
20. Verify FILL detection.

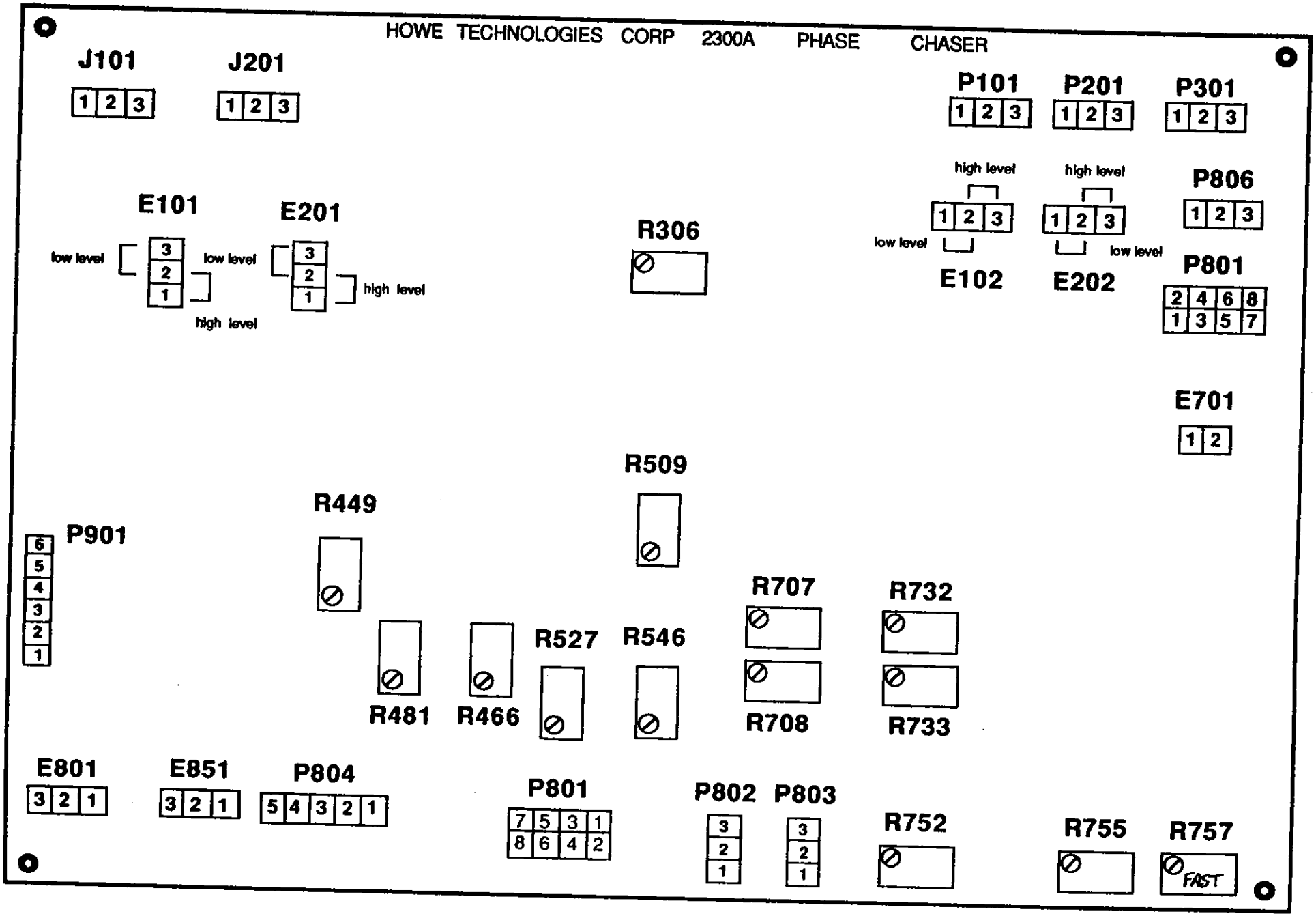


Figure 1. Main Card calibration and jumper positions diagram

2300 Phase Chaser Block Diagram

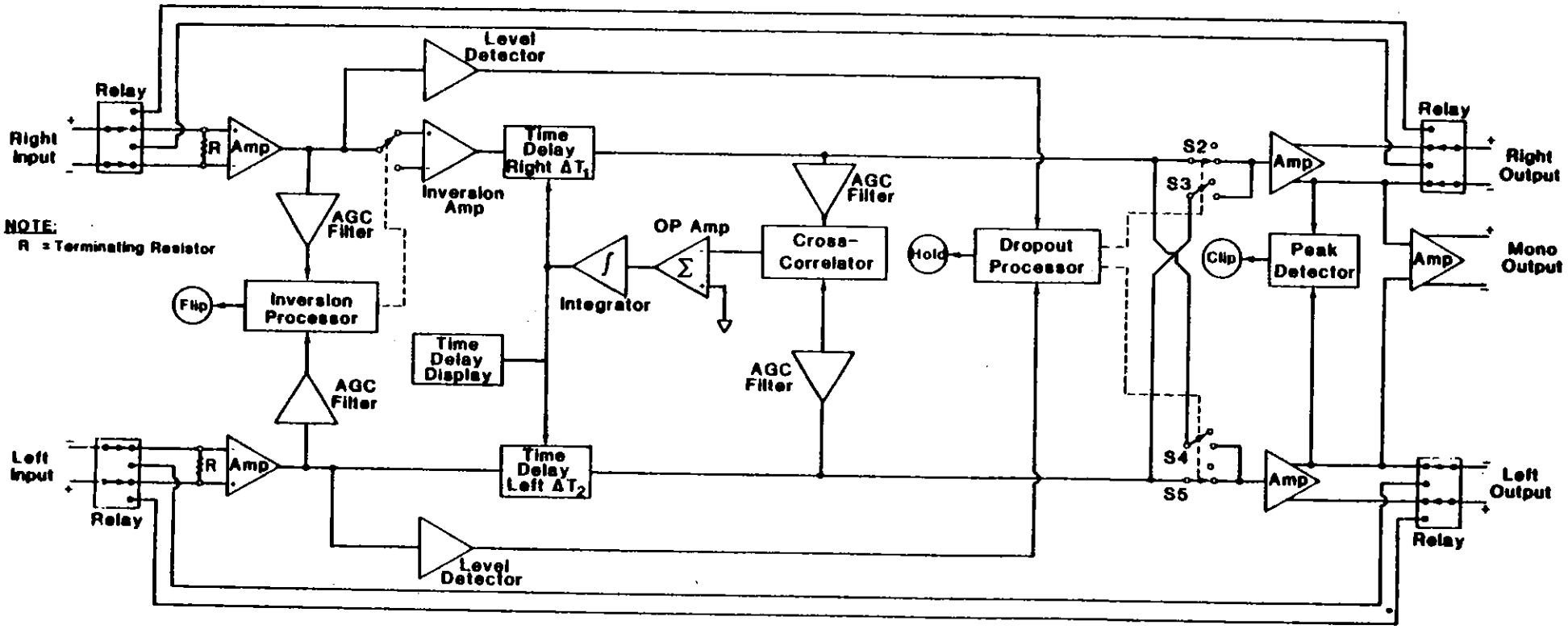


Figure 2 Block diagram of 2300 Phase Chaser.

HOWE TECHNOLOGIES

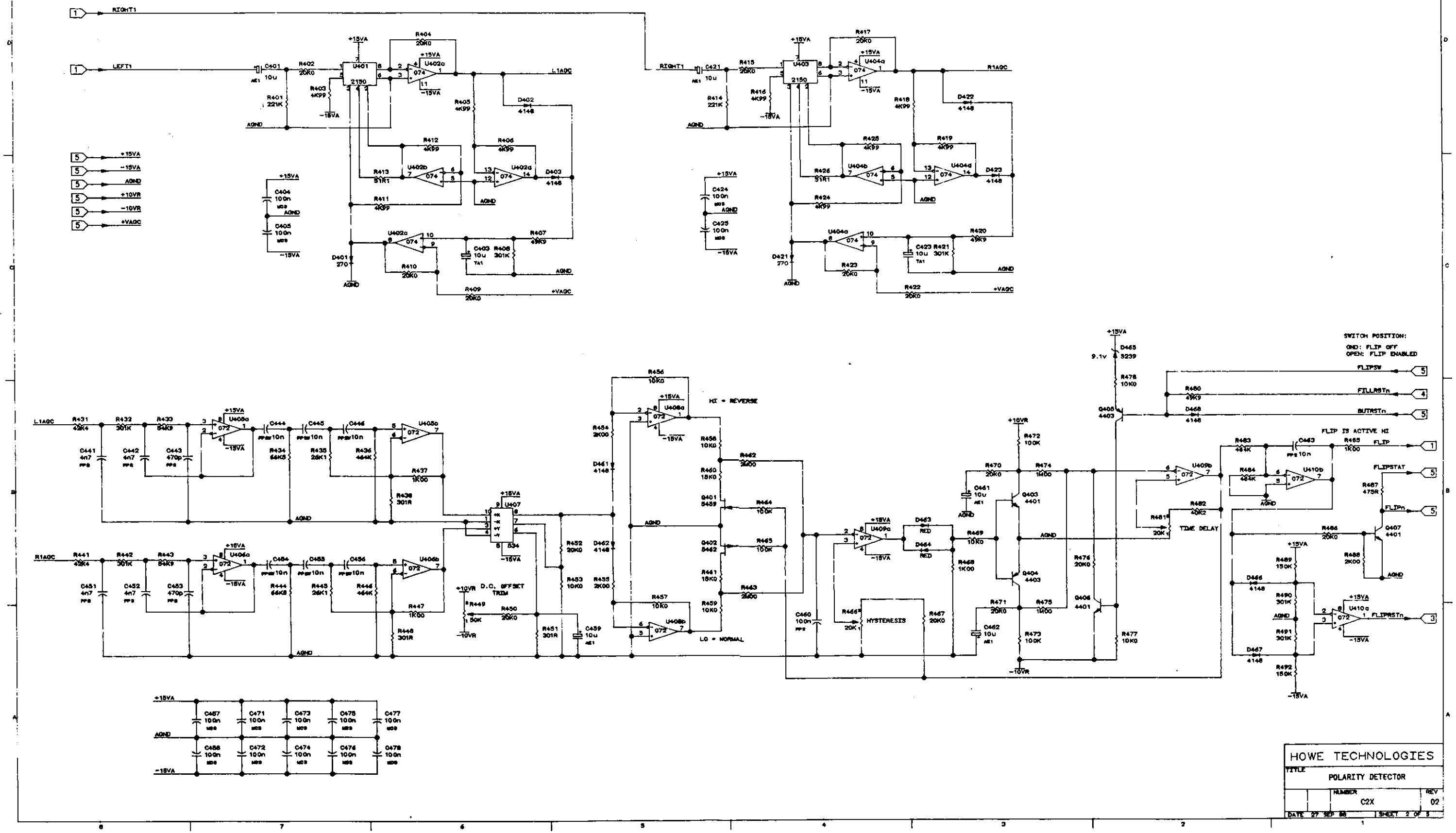
TITLE: MAIN AUDIO CHAIN

NUMBER: C1X

REV: 02

DATE: 27 SEP 88 | SHEET 1 OF 8

NOTE: ANALOG SWITCH SENSE (NC,NO) SHOWN FOR LOGIC "0" INPUT.


RIGHT1
LEFT1
+15VA
-15VA
AGND
+10VR
+VAQC
L1AQC
R1AQC
U401
U402a
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Q401
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Q406
Q407
Q408
HI = REVERSE
LO = NORMAL
D.C. OFFSET TRIM
HYSTERESIS
TIME DELAY
SWITCH POSITION:
GND: FLIP OFF
OPEN: FLIP ENABLED
FLIPSW
FILLRSTn
BUTRSTn
FLIP
FLIPSTAT
FLIPn
FLIPRSTn
FLIP IS ACTIVE HI
HOWE TECHNOLOGIES
POLARITY DETECTOR
C2X
02
DATE 27 SEP 88
SHEET 2 OF 5

NOTE: 1 ANALOG SWITCH IS MAKE-BEFORE-BREAK, DG243

2 PRECISION FILTER CAPS MATCHED TO 0.5%

NOTE: ANALOG SWITCHES SHOWN WITH LOGIC "0" INPUT.

LEFT2 (1% match)

RIGHT2 (1% match)

GAIN TRIM

+10VR OFFSET ADJUST

SURROUND THRESHOLD ADJUST

TRACK=HI HOLD= LO

RESET=LO RUN=HI

COS(PHAS)

HOWE TECHNOLOGIES

TITLE: BALANCED CROSS-CORRELATOR

NUMBER: C3X REV: 02

DATE: 27 SEP 88 SHEET 3 OF 8

HOWE TECHNOLOGIES

TITLE: DROPOUT DETECTOR & MONO FILL

NUMBER: C4X

REV: 02

DATE: 27 SEP 88

SHEET 4 OF 8

HI = STEREO
LO = MONO

HI: STEREO (DELAYED)
LO: MONO ENABLED (FAST)
ENABLEn

HI: BOTH OK
0: ONE MISSING
LO: BOTH OFF

HI: OK
LO: MISSING

HI: DIFFERENT
LO: SAME

GND: MONO OFF
OPEN: FILL ENABLED

DROPOUT THRESHOLD

HOWE TECHNOLOGIES

TITLE: FUNCTION CONTROL

NUMBER: C5X

REV: 02

DATE: 27 SEP 88 | SHEET 5 OF 6

MOUNTING HOLES: MH01 MH02 MH03 MH04 MH05 MH06

FRONT PANEL DISPLAY

D.C. POWER INPUT

WINDOW MODULE CONNECTIONS

BYPASS SWITCH

FILL SWITCH

FLIP SWITCH

* SET INPUT + OUTPUT LEVEL JUMPERS FOR HIGH LEVEL. ⇒ E101+201: 2+1 E102+202: 1+2

** INPUTS BRIDGING (HI-Z.)

SECTION 9 CALIBRATION PROCEDURE

1. Turn on power and check all supply voltages; turn off.
2. Insert all integrated circuits; apply power.
3. Set R306 for 3.4 volts across R309 (7K50).
4. Adjust DC offset of U407: R449, scope at top of R452 (20K0).
5. Adjust DC offset of sine detector (U705): R708, scope at bottom of R711 (31K6).
6. Adjust DC offset of cosine detector (U706): R733, scope at bottom of R736 (61K9).
7. Adjust R481 (FLIP delay) for 2.5v at U409, pin 5. — SET FOR 10 SEC. DELAY; 3 SEC. RETURN TO NORMAL
8. Adjust R466 (FLIP hysteresis) for 1.0v at U409, pin 3.
9. 4.00 ✓ Adjust R546 (mono fill delay) for 1.5v at U503, pin 2. — SET FOR 15 SEC. DELAY ≈ 4.0V
10. .75V Adjust R527 (stereo restore delay) for 1.0v at U503, pin 13. — SET FOR 5 SEC. DELAY (≈ 3 SEC) ≈ 1.0V − 0.75V
11. Adjust R509 (dropout threshold) for 50mv at U502, pin 2.
12. 5.05 ✓ Set R572 (Surround pause threshold) for 4.8v at U706, pin 2. — SET FOR 5.0 VOLTS OR A BIT HIGHER TO REDUCE LOCKUP
13. Set R755 (window, slow loop) for 1.70v at P702, pin 5.
14. Set R757 (window, fast loop) for 3.5v at P702, pin 4. — SET FOR 1.00V - FAST CORRECTION
15. Apply 2kHz to 10kHz (very slow sweep) and adjust R707 to optimize sine correlator symmetry at R711, bottom end. (Note that small residual errors due to circuit imbalances should be correct by the slow loop).
16. Using scope in differential mode, connect to top of R728 and R731. Adjust R732 for optimum cosine correlator symmetry (2kHz to 10kHz, as before).
17. Verify FLIP operation at 500 Hz (approximate).
18. Verify Cosine Reset operation: use 5kHz, scope probe on P701, pin 5; this pin should go low when input is inverted.
19. Verify CLIP detection.
20. Verify FILL detection.