Film-Tech

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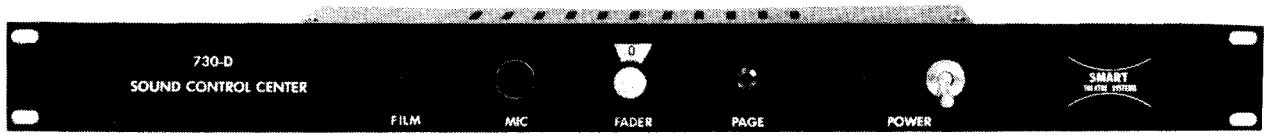
INSTALLATION AND OPERATION MANUAL

730-D DRIVE-IN SOUND CONTROL CENTER

SMART
THEATRE SYSTEMS

SMART THEATRE SYSTEMS
P.O. BOX 80361, ATLANTA, GEORGIA 30341 404/422-1082

730-D DRIVE-IN SOUND CONTROL CENTER



MADE IN U.S.A.

A UNIQUE UNIVERSAL SOUND CONTROL CENTER COMPLETE WITH DUAL PREAMPS, AUDIO LIMITER, PAGING MIC, AND MUSIC FADE.

FEATURES

Two Projector Preamps
Solid State Logic
Exciter or Electronic Changeover
Built in Paging Mic
Effective Audio Limiter
Intermission Music Fade
Automation Capability
State-of-the-Art Design
Quality Engineered
Sound Shaping Controls

The Smart 730-D Drive In Sound Control Center contains many of the features of the popular indoor SXL 730 Sound Control Center. In addition, features valuable to Drive-in theatre operators are included. The 730-D is a unique product that incorporates all the important sound functions required for a professional theatre presentation.

The 730-D Drive-In Sound Control Center contains an exclusive "Variable Ratio Shelving Limiter" section that has positive control over loud soundtrack passages and transient peak material to protect transmitters from overload and distortion in wireless drive-in sound systems, and also can be effective in decreasing the dynamic range of soundtracks for use in standard drive-in field speaker systems. This advantage keeps the soundtrack sound level from dropping below the ambient noise level of audience created noise. Low sound passages won't get lost in drive-in theatre traffic noises, slamming car doors, talking neighbors and children's noises. The variable ratio limiter can be adjusted so that soft sounds are raised in level while loud sounds are limited.

The 730-D can also be a valuable component in designing indoor multi-cinema complexes. Because the effective built-in limiter can "pull down" loud soundtrack passages, the unit can be an aid in reducing acoustic "bleed through" between adjacent auditoriums.

A built-in electret microphone on the front panel along with a silent push switch allows field paging over film or intermission music. The high quality microphone has its own adjustable internal preamp. No coil cords, external switching or compatibility problems, and broken mic cases from being dropped on the floor.

Two built-in preamplifiers contain pass filters to minimize film splice and low frequency noise. Silent changeover is accomplished by solid state switch and logic circuits that can be manually actuated or controlled by automation equipment. The limiter is a true peak limiter with an impressive 50:1 compression ratio during heavy drive from the solar cell preamp, or as little as 2:1 ratio by use of the internal threshold control. The master front panel fader has a maximum 10 db range to accommodate different recording film levels. A separate internal output control adjusts output drive when only a small amount of limiting is required. Fast attack and release minimize "pumping," even when maximum bass boost is employed. Bass and treble controls allow shaping of the playback for the most pleasing sound quality. Either exciter lamp changeover or electronic changeover may be selected. A 50 millisecond changeover delay causes a soft changeover with no pops or clicks.

The self-contained music cross fade circuit produces a professional effect as the show transitions from intermission music-to-film and vice versa. The unique Smart 730-D Drive-In Sound Control Center contains more features and is more cost effective than any comparative product in the theatre market.

SMART
THEATRE SYSTEMS

SMART THEATRE SYSTEMS

3870 N. Peachtree Rd., Suite E, P.O. Box 80361, Atlanta, GA. 30341, (404) 452-1820

730-D

PERFORMANCE SPECIFICATIONS

Frequency Response	
Music Input:	40 to 12,500 ± 1 dB
Solar Cell Input:	80 to 8,000 ± 1 dB
Signal to Noise Ratio:	Greater Than 68 dB
Gain Preamps:	20 dB
Gain Music Input:	4.5 dB
Projector Input Sensitivity:	10 MilliVolt Audio for Full Output
Music Input:	.5V RMS for Full Output
Maximum Output:	3.7V RMS into 100 Ohms or Higher
Fader Control Range:	± 5 dB (10 dB Total) when Limiter is adjusted for 2:1 ratio
Total Harmonic Distortion:	.25% at Full Output
Limiter Compression Ratio:	50:1 at Maximum Input Drive and Preamp Gain with Ratio, Decreasing to 2:1 at Lower Drive and Preamp Settings
Microphone Gain Range:	Adjustable 20 dB Range
Bass Control Range:	+ 9 dB Boost and −12 dB cut at 125 Hz
Treble Control:	Flat to 15 dB cut at 8 kHz. Turnover 1 kHz
Size:	1¾" X 6" X 19" Rack Mount
Weight:	4.5 Lbs.
Color:	Theatre Black

ENGINEERS SPECIFICATIONS

Theatre Sound Control Center shall be a self-contained package for drive-in theatres, containing two solar cell preamps, all electronic switching, bass and treble sound shaping controls, built-in field paging microphone and audio limiter. Built-in limiter shall be capable of a 50:1 compression ratio at heavy drive levels and contain a "soft knee" characteristic with fast attack and release time constants. An output control shall adjust for headroom and prohibit limiter overdrive at various limiter settings. A built-in electric microphone filament feeds a separate microphone preamplifier with its own level control. The unit shall combine left and right channels from a stereo player for intermission music without undue loading and be capable of music fade in and out upon command from a remote switch or automation. Remote L.E.D.'s and tally lights must indicate projector in use. Electronic or exciter lamp changeover selectable from internal switch shall be provided. The unit shall be universal in meeting needs of existing booths or new installations. The Sound Control Center is the Smart Model 730-D.

SMART THEATRE SYSTEMS

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ABOUT THE CIRCUITRY.....

Input signals from each projector's solar cells arrive at the solar cell preamp inputs and are terminated in 680 Ohms by the input resistors. This loading reduces high frequency losses caused by cable capacitance. An input capacitor blocks exciter lamp D.C. bias and also acts as the first element of an active high pass filter that allows sounds above 65 Hz to pass into the preamp. The full filter has an 18 dB per octave slope rate. Each projector solar cell preamp is selected by a solid state alternate latch circuit that activates the electronic switches. A delay circuit on each switch quickly fades in each projector so that there are no pops or clicks during changeover. The on-to-off transition period of each switch is approximately 50 milliseconds. The selected projector signal then passes through a bass and high frequency control to the limiter. Intermission music from an external tape player or phono enters through a level control to the music preamp. At this point, 6 dB of additional gain is available. The music fade circuit allows the music to pass, when activated. This "activation" is controlled by a command from a remote switch. The front panel "film" L.E.D. changes from red (music mode) to green (film mode) to indicate the system status. The built-in electret microphone feeds a microphone preamp and is actuated by the front panel "page" button.

Paging, intermission music and both projector's film sound are fed to the limiter and then to the output line amplifier. The output impedance of the line amplifier is very low and will feed almost any amplifier or transmitter without difficulty. A build out resistor protects the amplifier, and can sustain a direct short to ground if "muting" is desired.

The limiter incorporated into the 730-D is a true limiter with "variable ratio shelving". The internal control sets the knee for limiting . However, the knee is a soft turn with a plateau at the top. The limiter reacts differently to hard drive from the preamps than from low drive. Therefore, front end adjustments of the 730-D interact with the limiter knee adjustment to provide a wide range of compression ratios for the desired results. A line output level control is also associated with the limiter. As more limiting is dialed in, or more input drive is developed from the preamps, the sound becomes subjectively much louder. The dynamic range of the original material can be completely lost with heavy limiting. At this point the line amplifier runs out of "head room" and will distort. The output control must be reduced as the limiting threshold control or preamp trim controls are increased. Conversely, if only a small amount of limiting is required, the output control can be increased to raise the output drive to a point below which the line amplifier again runs out of head room. The fader control on the front panel has a restricted 10 dB range when moderate limiting is employed, and a 18 dB range when no limiting is used. Set up adjustments must be made with the fader in the maximum position, then reduced to mid position setting for normal operation. This gives the operator a ±5 dB adjustment to accomodate for various prints that will be exhibited. Loud soundtrack passages will be "leveled" by the limiter, while soft passages can be raised slightly. When "light" limiting or no limiting is preset into the unit, the fader has a wide range of level adjustment.

OPERATION

MASTER FADER

Has limited control over sound level sent to the field speakers or wireless transmitter. Allows minor changes of volume to accommodate low or high recording levels on film soundtrack. Most of the Fader action is handled automatically by the built in audio limiter circuit.

MUSIC-FILM LIGHT

This light emitting diode registers the status of the sound system. When the indicator is green, sound from the film soundtrack is passing through the unit. When the light is red, the intermission music source is on the system.

POWER LIGHT

Indicates that AC power is present from the line source. This lamp also shows that the internal power supply is operating. The power switch adjacent to this lamp turns the 730-D ON and OFF.

INTERMISSION MUSIC

If a tape music machine has been wired into your sound system, sound switching (fade-in or fade-out) is either manually actuated by a remote switch, or controlled by automation equipment. The music machine must be "rolling" before the music fade circuit is triggered to avoid "scoop" as the machine comes up to speed.

LIMITER

An audio peak limiter is contained in the 730-D. It has a quick attack and release time constant, and is internally adjusted upon installation by the sound engineer. Here are a few definitions that may help you as you read this manual.

Compressor:	An amplifier, whose gain decreases as its input increases.
Limiter:	A compressor, whose output level remains constant regardless of the input level.
Threshold:	The level above which the compressor or limiter begins functioning.

INSTALLATION

Before you can install the 730-D you must determine your wiring requirements. Use the handy reference below then go to the appropriate section in this manual for instructions.

Single Projector	OR	Dual Projector
Electronic Changeover (both exciter lamps on all the time)	OR	Exciter Lamp Changeover (both projectors audio on all the time)
Manual Changeover	OR	Automation Changeover
Continuous Command	OR	Momentary Changeover Command
Intermission Music Machine	OR	No Music

Do not ground any terminal on the rear barrier strip unless the procedure calls for grounding. Some terminals have voltage to feed the external lamps.

Make sure the equipment rack is properly ventilated. Usually the 730-D is positioned at eye level for easy access to the FADER control. Because it is usually above other equipment, the rising heat from other components in the rack can shorten the life of the unit unless adequate ventilation is provided.

The three prong AC plug will ground the chassis to reduce the hazard of electrical shock to personnel.

Two conductor cables from the solar cell(s) must be shielded. Even though there is RF suppression built into the inputs to reduce unwanted radio signals from strong local transmitters, shielding will minimize pickup from SCR dimmers, AC line garbage and transient power surges from relays, motors, etc., that may find its way into the sound system. Ground the shield of the cable that is connected to the solar cell terminals at the 730-D only. Do not ground the other end of the shield at the projector.

PROTECTION

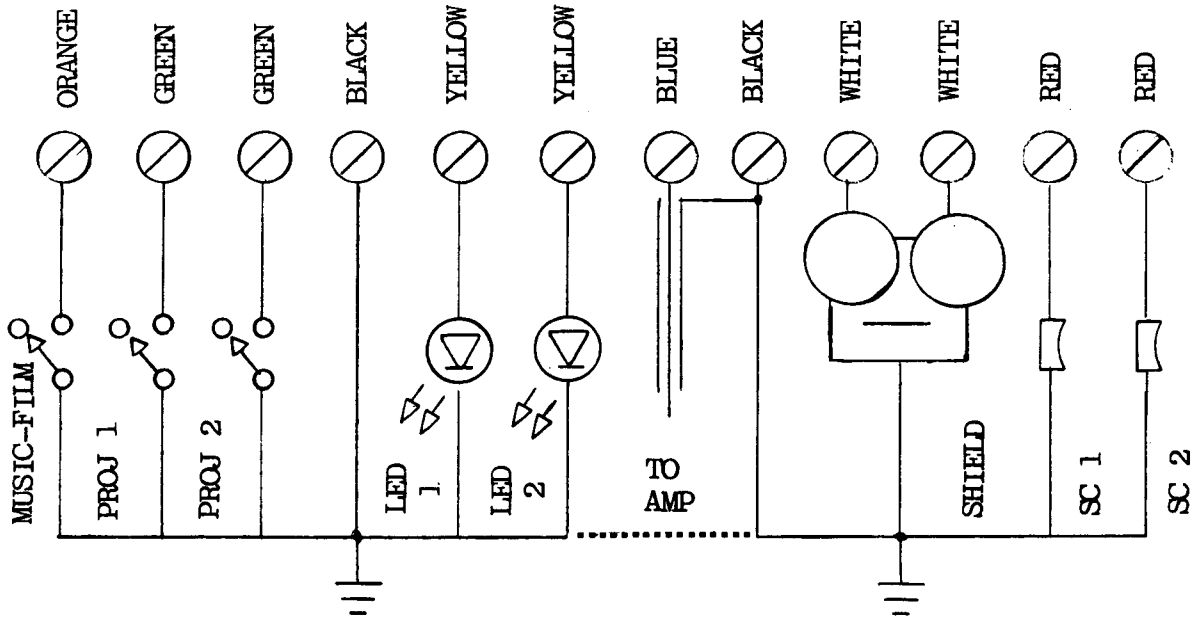
The 730-D uses one main fuse mounted on the rear of the chassis for protection. The fuse can be quickly replaced in the event of a failure. The power indicating L.E.D. on the front panel is directly across power supply and will extinguish in the event of a blown fuse. The voltage regulator on the printed circuit card is self-protecting. This device is an integrated circuit that senses unusual current draw, and automatically shuts down until the problem has been corrected. Replace a blown fuse with a 1/2 Amp 3AG type only.

ON-OFF POWER SWITCH

Enables the operator to turn unit On and Off separately from other components. The usual method of activating the entire sound system is with a common master AC switch or system AC circuit breaker. In this case, the 730-D power switch is always left in the ON position.

NOTE: Leave enough slack on the wires connected to the 730-D so that the chassis may be pulled partially out of the rack while still connected. This will allow the top chassis cover to be removed to gain access to the internal set up controls.

REAR BARRIER STRIP WIRING



CONNECT LED AND COMMAND RETURNS TO THIS GROUND

CONNECT AUDIO SHIELDS AND RETURNS TO THIS GROUND

SOUND MUTING

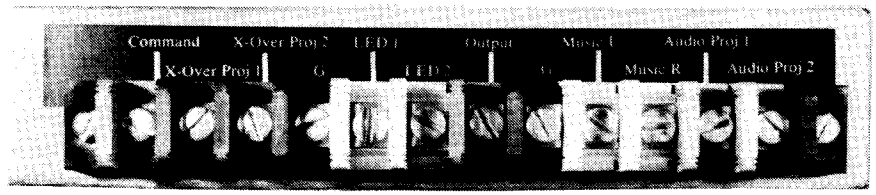
Some automation systems mute projector audio during xenon strikes to keep the radiated RF signal from the ignitor from getting into low level audio circuits. Because the 730-D has RF suppression circuits, we suggest you make a test in the booth before wiring a muting line. Muting may be unnecessary! However, if you can hear the ignitor in the audio, muting can be accomplished by shorting the output of the 730-D to ground. An internal build-out network will allow a dead short without harm to the Sound Control Center. This is the simplest method and only requires one wire, plus shield to the automation equipment.

PROJECTOR INPUTS

The two projector inputs are separate self-contained preamplifiers that are either electronically switched alternately by the logic circuit or mixed so that the output of each preamplifier is combined into the next circuit. A D.C. "blocking" capacitor isolates each preamplifier from the solar cells. This capacitor is necessary in order to block D.C. light bias from the exciter lamp and allow only the analog audio to pass into the preamp. Some solar cells "prefer" to be terminated into a like impedance. A 680 Ohm, 5% resistor provides termination for each solar cell. Solar cells must be terminated in order to offset cable capacitance. Without termination there would be increasing high frequency roll off with increasing wire length. Separate level trim controls are used for each preamplifier so that the audio level is the same between projectors during changeover. The trim pots are initially set to their 9 o'clock position during set up, then trimmed during the final level adjustment phase of installation. Extra gain can be obtained by turning the trim pots clockwise.

MUSIC INPUT

Music input combines both signals from a stereo player. Direct connection to a single input often deteriorates the response of the source player and increases distortion. The 730-D has a combining network that allows the two outputs from the stereo player to be combined for a complete monaural presentation on the theatre sound system. A monaural player may be connected to either of the music inputs with the shield to ground. Make sure the player you are using is isolated from the AC line. If it does not have a power transformer do not use it with the 730-D.



ELECTRONIC CHANGEOVER

An electronic switch selects projector ONE or projector TWO audio upon command from the logic circuit. If projector ONE is ON, projector TWO is OFF and vice versa. This positive action takes place when the internal miniswitch on the printed circuit card has been moved to the "EL" position. When a two projector booth has both exciter lamps on at the same time the electronic changeover mode should be used. Refer to "momentary" or "continuous" command in another section.

EXCITER CHANGEOVER

Some dual projector systems rely on switching of the exciter lamps in order to effect a changeover. In this arrangement, both solar cells are active and the respective exciter lamps are switched alternately. The internal changeover option switch in the 730-D should be placed in the "EX" position. Using a test film, projector audio trim controls should be set so that solar cell output is the same for each projector. The installing engineer may still wish to use the external L.E.D. indicators and changeover logic functions used for an electronic changeover in order to have "following" indicators. Of course, the exciter lamps are making the actual changeover and the logic is just switching L.E.D. indicators in this mode.

CONTINUOUS SINGLE WIRE COMMAND

When the internal mini-switch is placed in the "C" option position, a single wire (to ground) will execute a changeover between two projectors. Connect a single wire to projector TWO changeover terminal and run the wire to the remote changeover switch or automation equipment. When this wire is held low (grounded) projector TWO will be actuated. When the single wire is high (ungrounded) projector ONE is On. This mode is also useful for single projector systems where muting is desired. When the single wire is high (ungrounded) the projector is ON. Grounding the lead switches audio to the unused preamp. Short the unused solar cell input to ground to avoid noise. When using the continuous single wire command option, changeover ONE terminal is not used.

MOMENTARY CHANGEOVER

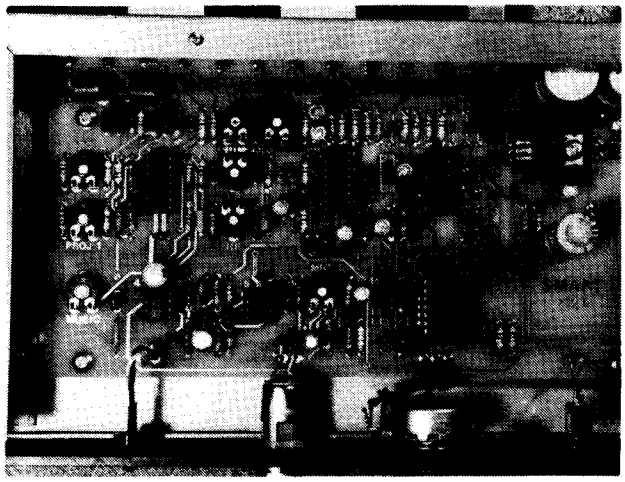
Two terminals on the rear barrier strip are used to alternate audio from the internal preamps. They are labeled "X-Over 1" and "X-Over 2". Any momentary contact to ground of either of these terminals will force the logic and electronic switch into the desired mode. An SPST momentary switch on each terminal is all that is necessary to alternate between two projectors. A pair of dry contacts on the changeover box in a manual system will suffice. If the unit is used with automation equipment, check that the relay making the projector changeover has no voltage on its contacts. You are looking for a point that will ground the changeover lead for each projector. Although a momentary contact is all that is required to initiate an alternate changeover, a continuous ground on each changeover lead is also suitable. Grounding both leads at the same time is a non-permissable state for the logic circuit. Place the internal mini-switch in the "A" option position for this method of projector selection. Connect a single conductor wire to projector ONE changeover terminal on the rear barrier strip, and a single wire to projector TWO changeover terminal. A single wire is also required as a common ground for remote actuation of the changeover circuit. You may wish to use a two conductor shielded cable for this function, with the shield acting as common to both changeover switches.

CHANGEOVER L.E.D. INDICATORS

Terminals are provided on the rear barrier strip for remote indicating L.E.D. changeover lights. Any standard L.E.D. may be employed. They are not furnished with the 730-D. Power to light each L.E.D. orginates from the Sound Control Center and no external power supply is required. Connect a single conductor wire to the "X-Over L.E.D. 1" terminal of the barrier strip. Connect another wire to the "X-Over L.E.D. 2" terminal. A third wire is used as common to both remote L.E.D.'s. This wire can be connected to any convenient ground point in the system. As the logic switches the audio changeover between projectors, it also causes the remote L.E.D.'s to alternate in order to alert the operator as to which projector has active audio. The positive lead (anode) of each L.E.D. (long pin) is connected to the terminal, and the negative lead (cathode) is permanently grounded.

SINGLE PROJECTOR (PLATTER)

When AC power is applied to the 730-D Sound Control Center (power switch or panel breaker), the solid state logic always causes the changeover to select projector ONE input first. For this reason connect the solar cell leads to the projector ONE audio input on the rear barrier strip. Ground projector TWO audio input with a short piece of wire. Set projector ONE trim control to the approximate 9 o'clock position. Set the internal changeover option switch to "EL" (Electronic Position). Ground projector ONE changeover terminal with a short piece of wire to the nearest ground terminal. This will prevent the system from ever going over to the other projector input. Do not ground projector TWO changeover terminal. The solid state logic circuit will not permit the selection of two states of operation at the same time. The "A" or "C" option on the internal logic switch may be left in either position since the grounding of projector ONE changeover forces the logic into a permanent mode. The music-film function and audio adjustments are covered in another section of this manual.



All controls and switches are easily accessible with chassis cover removed. Each is individually labeled for easy identification. Clockwise rotation of pots increases desired function, and vice versa.

DUAL PROJECTOR (AUTOMATION OR MANUAL)

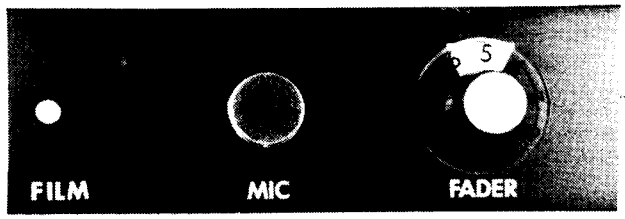
The solid state logic will always select projector ONE first when the 730-D is energized. Identify which projector is number ONE and run the two conductor shielded solar cell leads to projector ONE audio input. Ground the shield at the input terminals only. Follow the same procedure for the second projector and connect to the projector TWO audio input. Set the internal projector's trim control to the approximate 9 o'clock position. This completes the soundtrack input wiring.

OUTPUT CAPABILITY

The Sound Control Center is capable of driving several amplifiers simultaneously. Its low impedance output can be used to supply signal to the main amplifier, emergency amplifier, and booth monitor amplifier without undue loading. Also, long lines are possible to allow the 730-D to be distant from each amplifier. There is plenty of "headroom" to allow loud passages to be reproduced without distortion. Balanced or unbalanced loads may be "bridged" across the output without signal deterioration. Connect a single conductor shielded wire to the output terminal on the barrier strip and ground the shield to the nearest ground terminal.

MASTER FADER

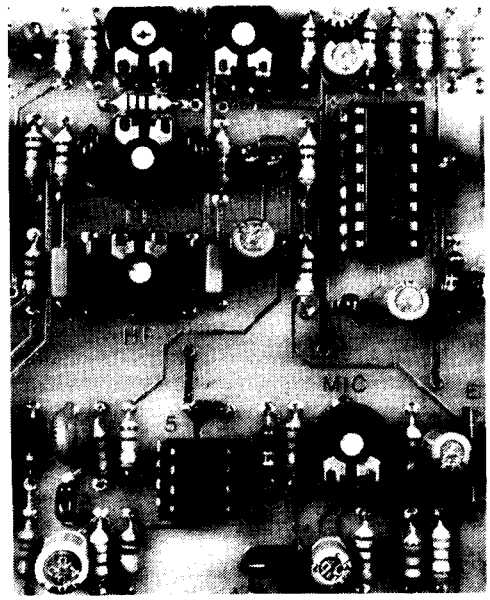
This front panel control is unusual in that the range that the operator has is dependent on the internal settings that have been made by the installing engineer. If the input drive and limiter adjustments are set for heavy limiting of soundtrack material, the range of the master fader is only ±1 dB for the full extremes of the control. If moderate limiting is employed, then the range is ±5 dB on the front panel. We suggest this approach so that the operator can adjust small soundtrack differences. If no limiting is employed (threshold fully CCW and input trim at a low setting) the 730-D acts much like a standard booth preamplifier. The range of the master fader is 18 dB across its range. With this in mind, the installer can adapt the unit to any special environment and achieve the desired results.



Master Fader should be set to mid-position before adjusting internal controls. This will give the operator some control range after system is fully balanced.

MUSIC-FILM LIGHT

The Music-Film light tells the operator the status of the input sources. The built-in cross fade circuit is actuated by grounding the "command" terminal on the rear of the 730-D. This grounding may be controlled by automation equipment or a manual switch action by the operator. A single SPST switch is all that is necessary. As long as the "command" terminal is held low (grounded), the music circuit will be present and the panel light will glow RED. When the lead is high (ungrounded), the selected projector input will pass and the panel light will glow GREEN.



BASS CONTROL affects only frequencies below 125 Hz. Full boost or cut positions do not cause dialogue midrange frequencies to sound either "thin" or "tubby". HF control can cut only. High frequencies can be tapered but not boosted. A permanent 8 kHz low pass filter rolls off extreme high end of audio spectrum. Intermission music is not affected by these controls.

TREBLE CONTROL

When the treble control is in the minimum position (fully clockwise) the ACADEMY CURVE is approximated. A 3 dB per octave roll-off occurs starting at 1 kHz and is down 20 dB at 9 kHz. This "standard" curve often sounds too dull to the average listener. Playback of the soundtrack lacks "sparkle". The installer may wish to brighten the auditorium sound for the most pleasant balance. Turning the treble control to the flat position (fully counterclockwise) is a good starting point. Select a suitable setting that gives the best sound and minimizes film scratches on badly worn prints. A permanent 8 kHz low pass filter gently rolls off the high end and is not affected by treble control settings.

BASS CONTROL

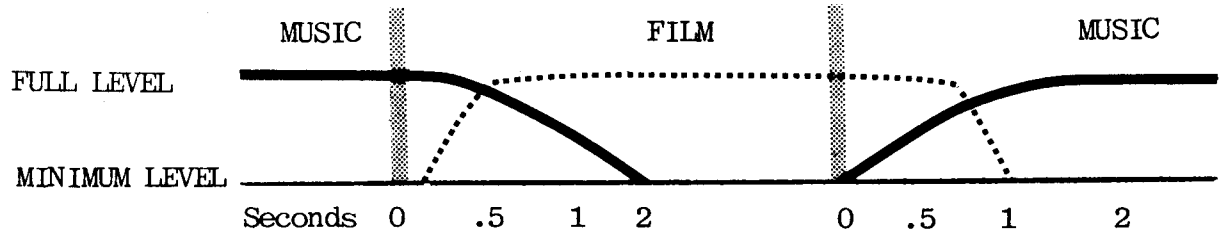
This important control can add fullness to the soundtrack. The bass boost is centered at 125 Hz and will not muddy the mid-range dialogue region of the spectrum, even in the extreme boost position. The permanent 50 Hz high pass filter minimizes splice thumps when bass boost is used. The normal setting for the bass is in the mid-position of the control. A clockwise turn increases bass. Bass signal can be reduced by turning the pot counterclockwise. Bass and treble controls do not affect the music channel.

MUSIC LEVEL

This control sets the film-to-music balance in the system. Setting the proper film level was discussed elsewhere in this manual. Since the Master Fader (operator control) affects both the film and music volume, it is important that the internal music control be set after all other control settings have been determined. If the player used as a music source has its own volume control, set it for a reasonable undistorted level to provide the best signal-to-noise ratio before setting the internal control in the 730-Of course, you must actuate the "command" terminal on the barrier terminal strip before the music will fade in. We recommend that the music be set at a lower level than the film playback level for the most pleasing transition. The Master Fader does not affect the preset music level. Also, audio shaping controls do not affect the music input.

MUSIC-FILM CROSS FADE CIRCUIT

Provides a professional transition between pre-show music and beginning of film; also fast fade-out of film and slow simultaneous fade-in of intermission music. The aural effect is similar to two records cross-faded on a radio station. This approach is unique to the 730-D. The music source (tape player, phono, etc.) must be operating at the time the cross-fade circuit is activated. When the "commmand" terminal has been grounded, music will fade-in. Film sources will fade-out.



MUSIC-FILM CROSS FADE ACTION

MICROPHONE LEVEL ADJUSTMENT

The microphone level is adjusted with the internal "mic" control for a normal paging level. Turning the control clockwise increases the level. Theatre personnel using the paging facility should speak in a normal voice about four to six inches from the panel microphone. When the paging button is held in, the microphone circuit is active. Releasing the button turns the microphone Off. Adjust the "mic" control until the sound is clean and at a comfortable level. Remember that the paging circuit goes through the limiter and a point will be reached where no further level increase is observed. High microphone levels will cause overdrive to the limiter, and increase the background noise from the booth machinery. TURN DOWN THE BOOTH MONITOR before paging to avoid acoustic feedback.

LIMITER SET UP PROCEDURE

An oscilliscope is required to monitor the 730-D output while adjustments are being made. It is also necessary to monitor program material while setting controls. Here is the recommended procedure after the unit has been installed in the system.

1. Turn field amplifier or transmitter OFF and monitor output of 730-D with monitor amplifier-speaker and scope.

2. Open Fader to MAXIMUM. Set projector trim pots, limiter, threshold pot and output pot to MINIMUM settings. (Fully counterclockwise)

3. Run a reel of film on one projector. (Feature, previews, short subject, etc.). Adjust BASS and HF control for the most pleasing sound shaping.

4. Remove film and place a test loop on projector. (SMPTE 1 kHz tone or Dolby tone loop). Set projector trim pot at approximately the 9 o'clock position. Measure the level output on scope screen. Actuate the changeover and move the loop to the other projector. Set the second projector trim control to a level that produces the same amplitude on the scope as the first projector. Each projector trim pot has a 10 dB range to accomodate low solar cell levels in theatres that run reduced voltage on exciter lamps.

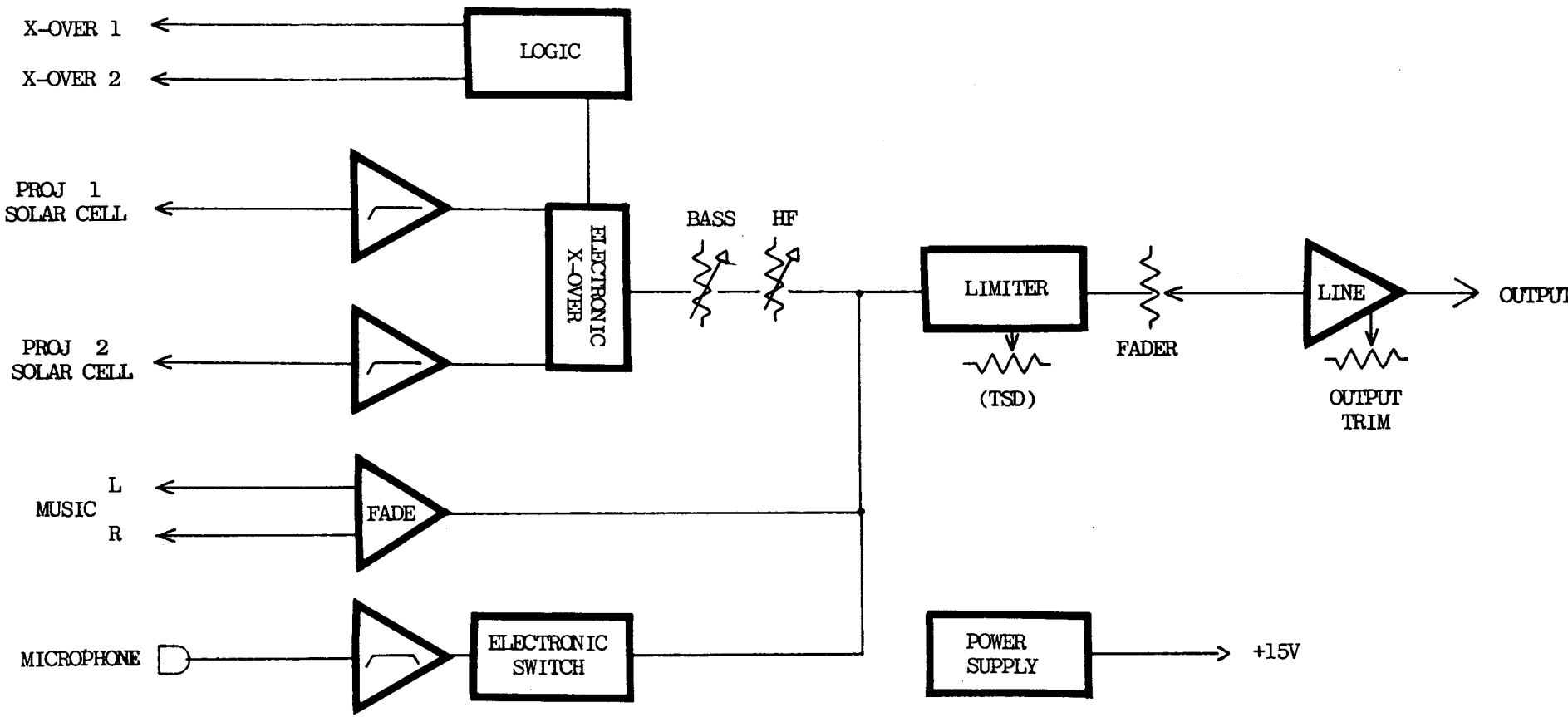
5. While the test loop is still running on either projector slowly increase limiter THRESHOLD control clockwise until no amplitude change is noticed on the scope screen. This setting is right at the limiting knee. Replace the test loop with a trailer. (Previews are always recorded near the 100% modulation level).

6. While listening to the monitor and watching the scope program waveform, increase OUTPUT pot level (clockwise) until you are just below the output line amplifier clipping point. Squaring of peaks on the scope and an occasional "snapping" sound on the audio monitor indicate clipping of the program material. Reduce the output control (CCW) until these symptoms disappear.

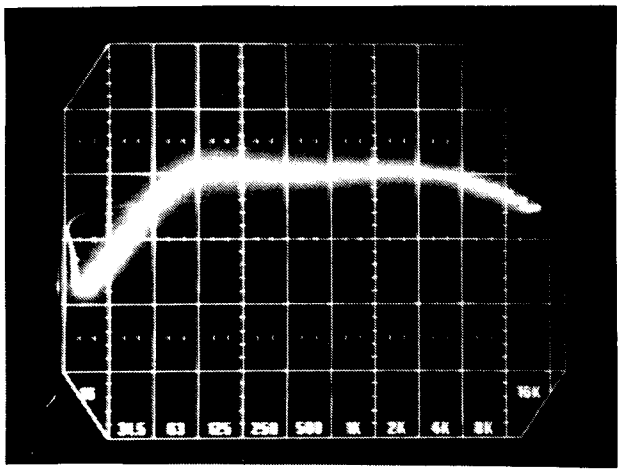
7. Start tape player, activate the music COMMAND of the 730-D and adjust the music input with the internal pot for the desired level. Keep in mind that the music source is also passing through the limiter, and a point will be reached in the music pot adjustment where no further level increase will occur.

8. Turn down monitor amplifier and press the PAGE button on the front panel. Talk into paging microphone at a distance of 6 inches from the mic. Set internal microphone (MIC) level to the same level as the music and film on the scope screen. Be sure to avoid line amplifier clipping.

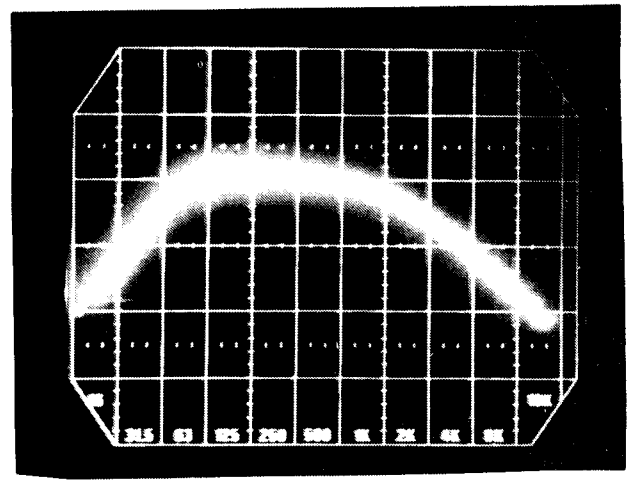
9. Set the Master Fader to mid-position (5) on the front panel. Remove test equipment and turn on the field amplifier transmitter. Adjust this equipment for proper operating level.



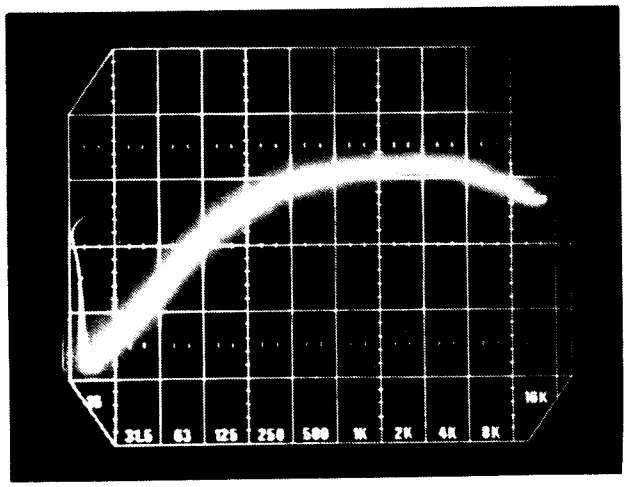
BLOCK DIAGRAM OF 730-D CIRCUITRY



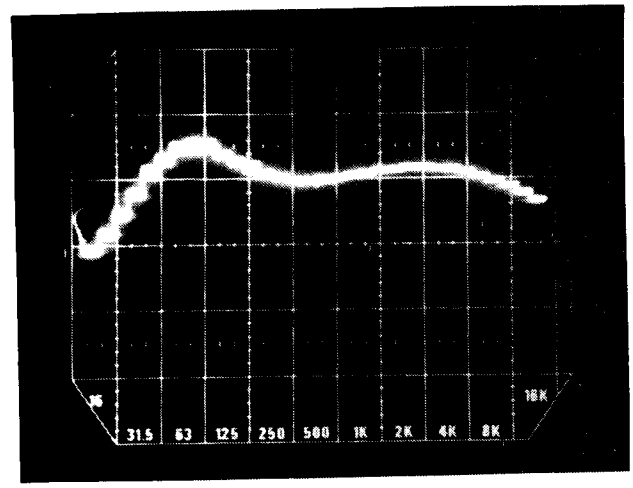
Real time 1/3 octave analysis shows film inputs with bass and HF controls in the flat position. Notice 18 dB per octave high pass filter which cuts frequencies below 50 Hz. This minimizes splice "thumps" and mechanical rumble.



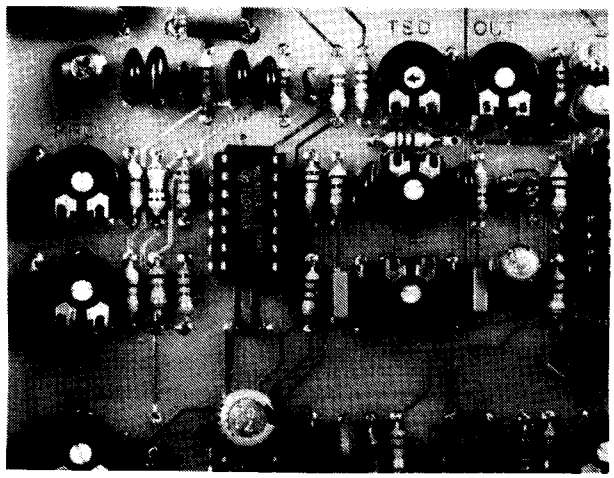
Bass control in the flat position and HF control in the full cut position. This curve is similar to standard academy roll off playback curve. Often sounds too "dull" to average listener.



HF control in flat position and bass control at minimum. Useful in highly reverberant acoustic environments such as prisons, gymnasiums, etc. Helps increase intelligibility of dialogue.



Bass control in full boost position and HF control flat. Helps add bottom end to bass deficient systems. Also, "sweetens' sound. Low limiter setting is employed to keep from limiting bass energy.

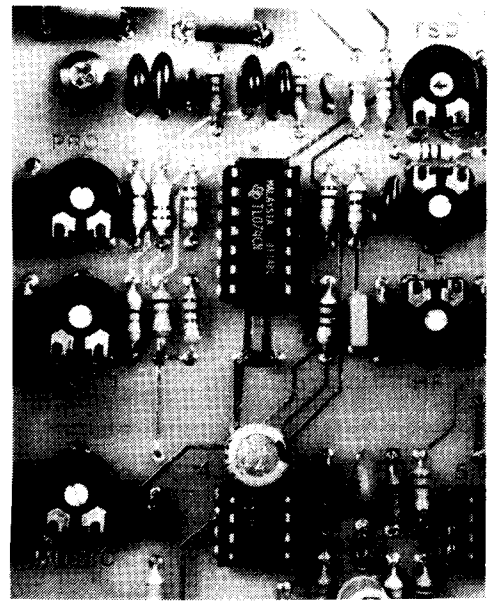


LIMITER THRESHOLD (TSD) and line amplifier control (OUT) are at the top of the PC card. A clockwise rotation increases limiter action and increases output. These two circuits are associated and must be adjusted for compatibility.

SOLAR CELL INPUTS

The 730-D is a monaural (single channel) device. In the event the unit is driven from a stereo solar cell, (for future use) both the left-right cells should be combined and connected to each input. The neutral wire (black) is ground.

Input controls are on the left side of the card. Projector One and Two solar cell trim control (PROJ 1, PROJ 2) have extra gain if needed. Music control sets intermission music level from an external player.



FINAL LEVEL ADJUSTMENTS

To set the intermission music level, activate the music circuit by grounding the "command" terminal on the barrier strip through the remote switch. Start the music player and adjust the music control on the P.C. card for the desired level. Do not move the Master Fader control on the front panel from its position while making adjustments on the music function. The Master Fader controls only the film level. Proper balance between the film and music sources is set inside the unit with their respective controls.

SERVICE

Every component of the 730-D is field replaceable with commonly available parts, including the various integrated circuits. The unit has been carefully designed to work with ±10% tolerance capacitors and resistors, even though we manufacture the unit with closer tolerance components. IC sockets are used to facilitate easy removal and replacement on any integrated circuit, should this ever become necessary.

Each unit is "burned in" for 48 hours at the factory before Q. C. testing and packaging. A failure of one or more functions of the 730-D will lead to a service call from the owner. Always check the obvious causes of the symptoms first.

1. Is the unit receiving AC power? (Power L.E.D. ON)

2. Is a fuse blown? (The 730-D has only one fuse, replace with 1/2 Amp 3AG type only)

3. Are all external switches (manual or automation) in their proper position?

4. Is the equipment preceding or following the unit operating properly?

5. Are internal switches in proper position? Switches halfway between positions will cause strange symptoms.

When all symptoms point to an internal problem your only choice is to substitute the unit and find the problem in the shop or repair it in the booth.

A quick check at the +15 volt power bus will indicate the proper operating voltages to the active components. Place your meter negative lead on the chassis at any convenient point, and switch your meter to the plus 30 volt D.C. range. Carefully place the plus probe of your meter on the input pin (Pin 1) of the positive voltage regulator (7815 mounted on heat sink). You should read between 18 and 24 volts from the diode bridge. If not, you have a diode failure or transformer failure. Now move the plus lead of your meter to the output pin of the positive regulator. You should read very close to 15 volts D.C. If you cannot obtain the above mentioned readings, check for a shorted filter capacitor or defective I.C. BE CAREFUL NOT TO SHORT PINS ON THE REGULATORS WHEN MAKING TESTS. A MOMENTARY SHORT WILL DESTROY THEM.

All L.E.D. indicators are buffered and current limited. A failure or short of an L.E.D will not cause a loss of voltage through the circuits.

When you are satisfied that voltages are correct, go to the section of the circuitry that appears to be giving trouble. The most practical way to trouble shoot audio circuits is through signal tracing. Put an audio signal into the input and follow it until the signal is not longer present. This method will allow you to locate a defective component.

We have gone to the extra expense of using integrated circuit sockets so that a defective chip can be quickly replaced without unsoldering and resoldering. Because the integrated circuits contain thousands of active components sealed within their casing, they cannot be fixed. The whole package must be replaced with a suitable replacement. Here are some tips on trouble shooting audio circuits.

1. Make sure command circuit is activated into the mode you are testing.

2. Very hot I.C.'s are generally shorted internally.

3. An open resistor may lead you to believe that an I.C. is defective. Use a substitute device to see if fault is in the I.C., or elsewhere.

4. Shorted input capacitors will bias the I.C. to an OFF mode.

5. I.C.'s can be vibrated out of sockets during shipment. Be sure they are firmly seated in their sockets.

If replacement of an integrated circuit is necessary, there are substitutes that will work until you can get an exact replacement. A 1458 can substitute for a TL072 or 5532. A TL084 will substitute for a TL074, or a 4016B will substitute for a 4016A. However, the performance specifications will degrade. This suggested replacement list is only for emergency use.

In the installation section of this manual shielded audio cable is called for in wiring the 730-D. We recommend foil type shielded cable, rather than braided types. Foil shield provides 100% shielding, whereas the best braided shield can only provide 93% shield ability because of the tiny holes between overlapping conductors. Cheaper braided cable is even less than 93% shielding because of loose weave, but even the cheapest foil shield is still 100% effective.

It is very rare to have to replace an entire P.C. card. Suspect active components first, then capacitors, and finally resistors, in that order.

SMART THEATRE SYSTEMS maintains a factory service department and can provide quick handling of replacement parts, or telephone advice in the event of a problem.

Refer to the schematic diagram at the end of this manual for component values and circuit wiring.

730-D PARTS LIST

RESISTORS

47 Ohm	R69
100 Ohm	R54
680 Ohm	R1, R67
910 N	R32
1K	R7, R58, R68
1.6K	R27, R28
3.3K	R24
3.6K	R63, R62, R57
6.8K	R47
8.2K	R20
10K	R6, R9, R12, R15, R18, R19, R35, R38, R43, R50, R51, R55, R69
12K	R23
18K	R4, R61
22K	R28, R39, R40
33K	R42
36K	R56
56K	R30, R31
91K	R2, R66
100K	R4, R8, R10, R11, R13 R14, R26, R44, R46
150K	R48
180K	R3, R60

POTS

100 Ohm	R34
5K	R22
10K	R21
100K	R5, R17, R41, R49, R53

CAPACITORS

330 PF	C31
.01 MFD	C9, C10, C16, C17
.02 MFD	C1, C2, C7, C8, C28
.1 MFD	C5, C11, C39
.33 MFD	C34
.47 MFD	C36
.68 MFD	C32, C37
1 MFD	C4, C27, C29, C35
1.5 MFD	C6, C18, C24, C38
10 MFD	C3, C12, C13, C21
22 MFD/16	C30
100 MFD/10	C22
470 MFD/35	C19
1000 MFD/35	C20

INTEGRATED CIRCUITS

U1	TL074
U2	MC3340P
U3	TL072
U4	4016A
U5	NE570
U6	7815 REGULATOR

DIODES

IN914	D1, D2, D3, D4
IN4001	D5, D6

POWER TRANSFORMER 150706
FUSE 1/2 AMP 3AG Type