

SKL Main Line Conversion for your System Means—

Increased Channel Capacity
Decreased Maintenance Costs
Top Quality Performance

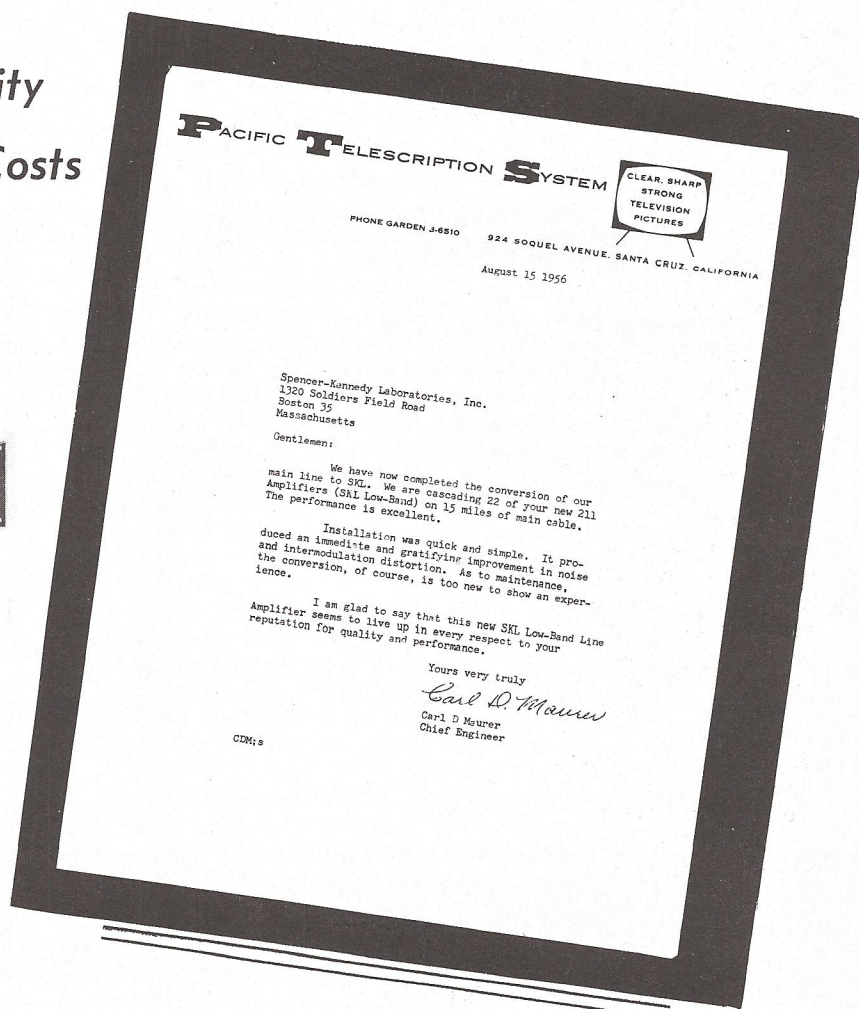


Using SKL's New Model 211 Low Band Chain Amplifier

- ✓ 5 VHF Channels
- ✓ 7 More Off-VHF Channels
- ✓ High Gain
- ✓ Full Color Fidelity
- ✓ Low Maintenance
- ✓ Dependable Service

Like Carl Maurer in Santa Cruz, more system operators are taking the performance problems out of their main lines by converting them to the new SKL Model 211 Low Band Chain Amplifier. They find that the 211 will pass low noise, distortion-free signals to their branch feeder lines, regardless of the kind of branch line equipment in use.

Trouble shooting is reduced and simplified. Since SKL's distributed amplifiers are famous for assuring "no outage" lines, an SKL main line confines distribution trouble to branch line areas easily identified.



The extremely low maintenance cost proven again and again for the SKL Model 212 Wide Band Chain Amplifier is inherent as well in the 211, which requires no tuning and continues to function even after multiple tube failure.

SKL main line conversion is economical and profitable. Through available extended term financing, equipment costs run as little as \$25 per month per mile. Lower costs of main line maintenance and the resulting easier, less time-consuming care of distribution lines will more than offset the new SKL equipment cost.

Write us today for full details. We will be glad to submit recommendations and engineering data for an SKL main line conversion for your system.

SKL SPENCER-KENNEDY LABORATORIES, INC.
1320 SOLDIERS FIELD ROAD, BOSTON 35, MASS.

A Few Facts About the Model 211 —

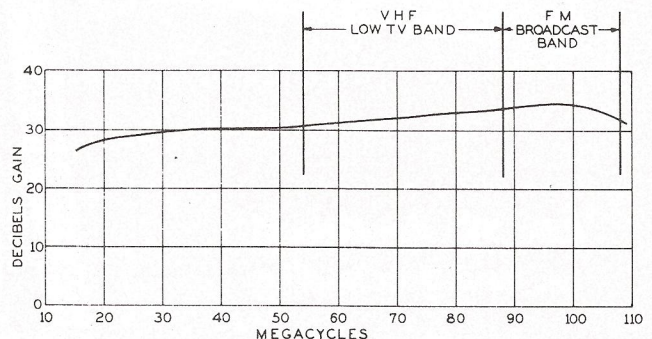
HIGH RELIABILITY: Because each of the tubes in a stage contributes equally to the gain over the entire bandwidth, tube outage results in only slight and imperceptible loss of gain in the amplifier, rather than in complete blackout of a channel. This interruption-free service is essential to successful system operation. Even when cascaded in extremely long series, the Model 211 assures delivery of the same quality signals at the farthest ends of the line as those received at the antennas.

SIMPLICITY OF OPERATION: No tuned circuits are used in the Model 211 amplifier. This feature protects against loss of picture resolution due to frequency drift and inadequate bandwidth and avoids the necessity for frequent system alignment so often required with conventional amplifiers. Each amplifier is interchangeable with any other in the line, and once in place operates dependably without further adjustment.

LOW MAINTENANCE COST: Time and expense involved in maintenance is reduced to a new minimum in a distribution system using the Model 211 line amplifier and other SKL equipment. Since the Model 211 does not use tuned circuits and since no alignment of the amplifier is required in the system, maintenance time is limited to occasional replacement of tubes. Furthermore, because tube outages do not cause amplifier failure, such replacement is done on an orderly, routine schedule, rather than on an emergency trouble-shooting basis, as is the case with other types of amplifiers. No critical adjustments and time-consuming sweep tests are needed for the Model 211. For simplicity in setting and maintaining system signal levels, both a

manual gain control and a plug for connection to the SKL pilot carrier automatic level control are provided. The shape of the amplifier's gain curve is similar to the shape of the loss curve of the cable, so that it largely offsets the requirement for further line equalization and assures the greatest economy of signal distribution. Monitor jacks built into the amplifier allow direct input and output measurements without any interruption of service in the line. The entire SKL system is engineered to make the greatest possible use of passive networks requiring no maintenance at all. Where tubes are involved, as in the Model 211, the unique reliability and minimum service requirement inherent in the equipment design have proved again and again that SKL systems perform with continuous dependability at the lowest cost.

TYPICAL FREQUENCY RESPONSE CHARACTERISTICS
MODEL 211 CHAIN AMPLIFIER



SPECIFICATIONS FOR MODEL 211 CHAIN AMPLIFIER

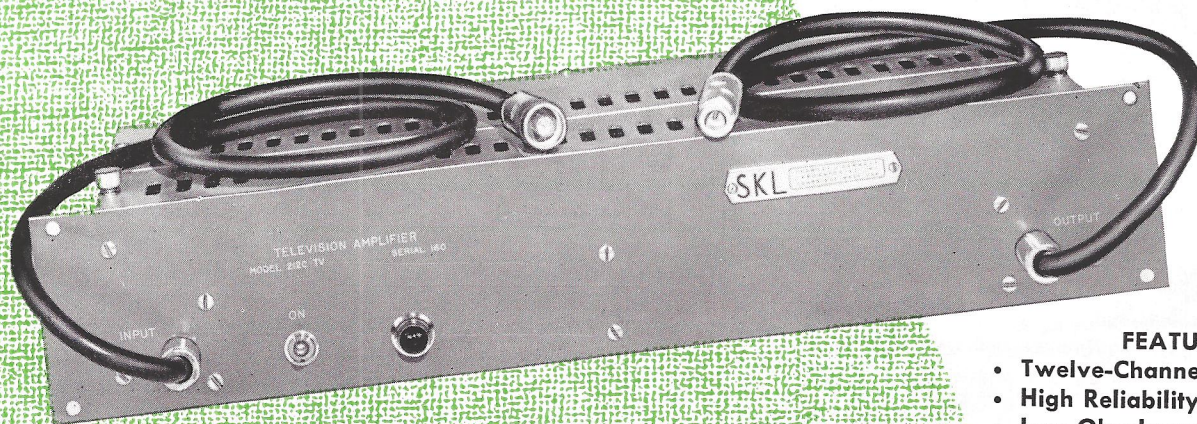
1. **BANDWIDTH:** 15 - 100 mc.
2. **VOLTAGE GAIN, NOMINAL:** 33 db at 88 mc.
3. **VARIATION IN GAIN WITH SUPPLY VOLTAGE:** Gain decreases approximately 2 db when supply voltage is reduced to 105 volts.
4. **FREQUENCY RESPONSE:** See figure.
5. **MAXIMUM OUTPUT VOLTAGE:** 4.2 volts peak.
6. **INTERMODULATION DISTORTION:** An 80% amplitude modulated signal, within the pass band of the amplifier, large enough to produce 1.0 volt amplifier output, will produce less than 0.5% amplitude modulation of another signal of equal or smaller amplitude.
7. **NOISE FIGURE:** 54 mc - 8.3 db
88 mc - 8.8 db
8. **IMPEDANCES:** Unbalanced - input and output 75 ohms.
9. **CONNECTORS:** Input - Type "N" plug, panel mounted.
Output - Type "N" jack, panel mounted.
Monitors - Type "N" jacks, panel mounted.
10. **MONITOR JACKS:** Input and output monitor jacks 26 db down from line.
11. **EXTERNAL-MANUAL SWITCH:** Located on back of unit for selecting amplifier gain control, (internal manual control, or external automatic control).
12. **MANUAL GAIN CONTROL:** Located at back of amplifier. Capable of varying gain over approximately 16 db range.
13. **EXTERNAL GAIN CONNECTOR:** Located at back of unit. Two-pin Jones plug.
14. **TUBE COMPLEMENT:** Twelve 6AK5 (or the long-life equivalent type 5654*).
15. **POWER SUPPLY:** 117 volts, 50-60 cycles, 49 watts. Power transformer primary taped for either, 107, 117, or 127 volts.
16. **FUSING:** Primary - .8 amp.
B+ - .25 amp.
17. **DIMENSIONS:** 3 1/2" wide, 19" long,
7 5/16" deep, back of front panel.
18. **FINISH:** Gray baked enamel.
19. **WEIGHT:** 16 pounds; shipping weight 19 pounds.

* In television distribution systems where the utmost in reliability, long life and uniformity is desired, use of the 5654 tubes is recommended.

SKL SPENCER-KENNEDY LABORATORIES, INC.
1320 SOLDIERS FIELD ROAD, BOSTON 35, MASS.

SKL

New Model 212-C Chain Amplifier for Television Distribution Systems



FEATURES

- **Twelve-Channel Amplification**
- **High Reliability**
- **Low Obsolescence**
- **Simplicity of Operation**
- **Low Maintenance Cost**
- **No Radiation Problems**

• **TWELVE-CHANNEL AMPLIFICATION:** The new SKL Model 212-C TV Chain Amplifier was designed to provide community, apartment house, hotel, and similar master antenna system owners with a really reliable amplifier for distributing up to twelve television channels. Yet any television system using the Model 212-C is surprisingly low in initial cost and maintenance expense.

The SKL Model 212-C will amplify all twelve VHF television channels simultaneously with high fidelity. Based on a new electronic design technique, the chain amplifier has a flat frequency response characteristic from 54 to 216 megacycles with a nominal gain of 21 db. The Model 212-C, because of its great band width, may be used in either wide-band (channels 2-13) or low-band (channels 2-6) systems.

• **HIGH RELIABILITY:** High reliability is inherent in any system using the Model 212-C TV Chain Amplifier. Each of the six tubes in a stage amplifies the entire television band. Since the output is the sum of the signals of six tubes, a tube failure will only cause a slight loss of gain in the affected amplifier, not a complete loss of picture as in conventional amplifiers.

Since reliability is so important, SKL uses only components of the highest quality in the construction of the Model 212-C. For example, in the completely new power supply, premium-quality electrolytic condensers are used to insure long, trouble-free operation of the unit. The Model 212-C is a self-contained amplifier including power supply, input and output transformers, and line filters. The amplifier is carefully tested to close tolerance limits to assure interchangeability in the field.

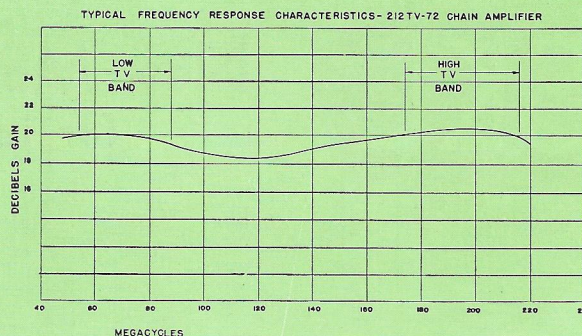
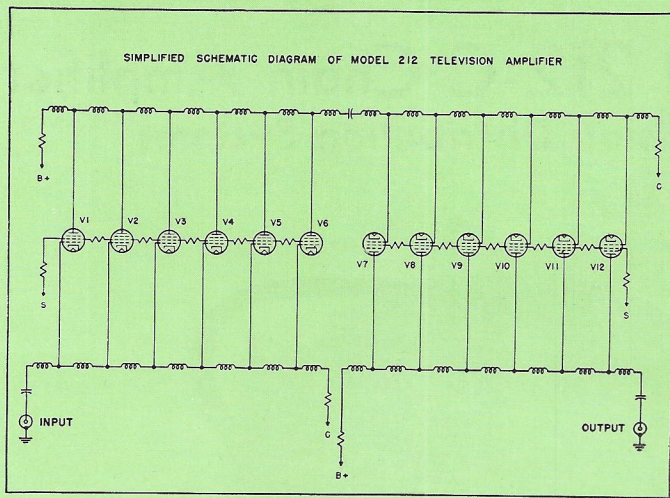
• **LOW OBSOLESCENCE:** Designed specifically for television distribution systems, whether large or small, the Model 212-C ensures a system of long life and low obsolescence. With the rapid increase in television stations, television distribution systems find the ease and surprisingly low cost with which new channels can be added to an SKL system a major advantage. Its broad band amplification assures reception of all present and future television channels, as well as color programs, without the costly and time consuming requirements of installing additional amplifiers, power supplies, etc. when new channels are added.

• **SIMPLICITY OF OPERATION:** The SKL Model 212-C TV Chain Amplifier is simple to install and operate in any type of master antenna system. Because of its great band width, no tuned circuits are used in the system. Use of untuned circuits eliminates the most serious faults of conventional distribution system amplifiers — loss of picture resolution because of inadequate band width and frequency drift. These faults cause poor picture quality which must be corrected by frequent alignment and adjustment of the entire system. This is a major cause of maintenance expense in most systems.

• **LOW MAINTENANCE COST:** Since an SKL system is broad-band, that is, having no tuned circuits, operating maintenance costs are materially reduced. Once the Model 212-C TV Chain Amplifier with its built-in power supply is installed in a system, no further alignment is required in the field. For simplicity in setting and maintaining system signal levels, both a manual gain control with a range of 5.5 db and a plug for connection to the SKL Broad-Band Automatic Level Control¹ are pro-

¹ (See Bulletin ALC 442 — Broad-Band Automatic Level Control).

SKL



vided. The slight rise in gain toward the high frequency end of the pass-band provides some compensation for the higher cable losses and lower sensitivity of receivers at the higher frequencies.

• **NO RADIATION PROBLEMS:** Television distribution systems with no radiation problems may be constructed with the SKL Model 212-C TV Chain Amplifier. Relatively low internal voltage levels as well as careful shielding and power supply filtering prevent radiation from the amplifier. RF filtering of the power line is built-in to eliminate the most serious cause of radiation. With the Model 212-C leakage radiation is imperceptible when a sensitive receiver is connected between the power cord and case. As a result, no expensive line filter or shielded enclosure is needed with the Model 212-C TV Chain Amplifier. Experience has shown that elimination of radiation with other types of equipment is a difficult and expensive operation not required with the SKL Model 212-C TV Chain Amplifier.

SUMMARY: The outstanding performance of the Model 212-C TV Chain Amplifier makes it ideally suited for

television antenna systems whether in cities, towns, or in hotels, apartment houses, motels, salesrooms, etc. Its high reliability and quality components permit it to be left unattended over long periods of time. Twelve-channel amplification, untuned circuit, and high fidelity reproduction makes the Model 212-C TV an amplifier that will provide years of reliable, trouble-free, low obsolescence service. Simple to operate and easy to maintain, television distribution systems equipped with the SKL Model 212-C TV Chain Amplifier are the most economical systems available today.

PRINCIPLE OF OPERATION: Each of the two stages of the Model 212-C TV Chain Amplifier consists of a series of six 6AK5 tubes with grids connected at intervals along an artificial delay-line and with plates connected at corresponding time intervals along another delay-line. Waves entering the input travel down the grid delay-line, formed by inductances and input capacitances of the tubes, exciting successive grids until finally absorbed by the grid terminating resistor. As the first plate begins to draw current a forward voltage wave is initiated in the plate line which travels toward the output. It is augmented at each successive plate at the proper time by the plate current from each tube until it reaches the output where it is absorbed by the external load. The backward component voltages are predominantly out of phase and are absorbed by the plate delay-line terminating resistor.

SPECIFICATIONS MODEL 212C-TV CHAIN AMPLIFIER

1. **BANDWIDTH:** 54 to 216 MC
2. **VOLTAGE GAIN:** 20 DB or greater, measured at 60 MC, 117 volt supply
3. **VARIATION OF GAIN WITH SUPPLY VOLTAGE:** Gain decreases less than 1.5 DB when supply is reduced to 105 volts
4. **FREQUENCY RESPONSE:** The gain departs less than 1.6 DB from its 60 MC value at any frequency between 54 and 88 MC and between 174 and 216 MC
5. **MAXIMUM OUTPUT VOLTAGE:** (Model 212-C TV-72): 3 volts peak
6. **INTERMODULATION DISTORTION:** (Model 212-C TV-72): With two 0.5 volt RMS sinusoidal output signals in the pass band the amplitude of the sum — or difference — frequency component is less than 20 millivolts RMS
7. **HARMONIC DISTORTION:** (Model 212-C TV-72): 4% second harmonic at 1 volt RMS output in the pass band. Higher harmonics less than 0.1%
8. **IMPEDANCES** (Unbalanced): Input and output: 72 ohms* or 52 ohms
9. **TUBE COMPLEMENT:** Twelve 6AK5 (or the long-life equivalent, type 5654**)
10. **POWER SUPPLY:** 117 volts, 50-60 cycles, 55 watts
11. **DIMENSIONS:** 3½" wide, 19" long
7½" deep, back of front panel
12. **FINISH:** Gray baked enamel
13. **WEIGHT:** 16 pounds, shipping weight 19 pounds

*For a 300 ohm balanced connection, —SKL— Model 414 Matching Transformers may be used with a 72 ohm amplifier.

**For use in community television distribution systems where the utmost in reliability, long life, and uniformity is required, Model 212C-TV-72L with 5654 tubes is recommended.

Model
*212C TV-72
**212C TV-72L
212C TV-52

Input and Output Impedances
72
72
52

Tubes
6AK5
5654
6AK5

MODEL 211 CHAIN AMPLIFIER



- Amplifies low VHF band, FM band and six sub-VHF channels
 - Requires no tuning or alignment
 - Continues to function after tube failure
 - Perfect color transmission without adjustment
 - Maximum desirable gain
 - Built-in gain control
 - Built-in line equalization
 - High reliability
 - Low maintenance cost

DESCRIPTION: The Model 211 low-band chain amplifier was developed for community and apartment antenna systems with a present or potential need for five VHF channels, the FM band, and additional sub-VHF channels for closed circuit or other use. Its advanced design and premium components combine to provide an amplifier of unique reliability and quality. Yet its low initial and operating costs make it fully economical, even in very small systems. This versatile amplifier is engineered against obsolescence. It passes color with full clarity and fidelity and has a built-in bandwidth capacity for a wide variety of off-the-air and closed circuit channels.

HIGH RELIABILITY: Because each of the tubes in a stage contributes equally to the gain over the entire bandwidth, tube outage results in only slight and imperceptible loss of gain in the amplifier, rather than in complete blackout of a channel. This interruption-free service is essential to successful system operation. Even when cascaded in extremely long series, the Model 211 assures delivery of the same quality signals at the farthest ends of the line as those received at the antennas.

SIMPLICITY OF OPERATION: No tuned circuits are used in the Model 211 amplifier. This feature protects against loss of picture resolution due to frequency

drift and inadequate bandwidth and avoids the necessity for frequent system alignment so often required with conventional amplifiers. Each amplifier is interchangeable with any other in the line, and once in place operates dependably without further adjustment.

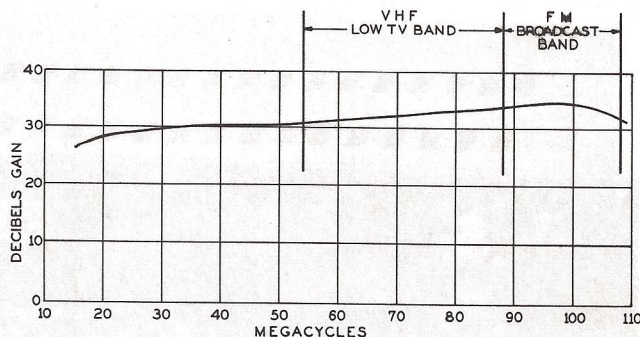
LOW MAINTENANCE COST: Time and expense involved in maintenance is reduced to a new minimum in a distribution system using the Model 211 line amplifier and other SKL equipment. Since the Model 211 does not use tuned circuits and since no alignment of the amplifier is required in the system, maintenance time is limited to occasional replacement of tubes. Furthermore, because tube outages do not cause amplifier failure, such replacement is done on an orderly, routine schedule, rather than on an emergency trouble-shooting basis, as is the case with other types of amplifiers. No critical adjustments and time-consuming sweep tests are needed for the Model 211. For simplicity in setting and maintaining system signal levels, both a manual gain control and a plug for connection to the SKL pilot carrier automatic level control are provided. The shape of the amplifier's gain curve is similar to the shape of the loss curve of the cable, so that it largely offsets the requirement for further line equalization and assures the greatest economy of signal distribution. Monitor jacks built into the amplifier allow direct input and output measurements without any

interruption of service in the line. The entire SKL system is engineered to make the greatest possible use of passive networks requiring no maintenance at all. Where tubes are involved, as in the Model 211, the unique reliability and minimum service requirement inherent in the equipment design have proved again and again that SKL systems perform with continuous dependability at the lowest cost.

RADIATION-FREE: Use of the Model 211 permits construction of television distribution systems with no radiation problems. Radiation from the amplifier is eliminated through low internal voltage levels, careful shielding and power supply filtering. RF filtering of the power line is built in to prevent the most serious cause of radiation. Even when a sensitive receiver is connected between the power cord and case, radiation leakage from the Model 211 is imperceptible. As a result, no expensive line filter or shielded enclosure is needed for the amplifier.

NON-OBSOLESCENCE: Because response of the Model 211 extends to 15 mc, six channels below Channel 2 are available for closed circuit use or general system channel expansion. This characteristic not only safeguards against system obsolescence due to availability of new signals, but makes provision for various opportunities in closed circuit operations,

TYPICAL FREQUENCY RESPONSE CHARACTERISTICS MODEL 211 CHAIN AMPLIFIER



whether in locally generated schedules, special pay-as-you-see programming or tie-in with important teaching developments in the community's educational system. FM broadcast material may also be readily put on the system. Color or black and white information is transmitted with equal high quality and with absolutely no system adjustment or alignment required. The wide flexibility and versatility of the SKL system, both now and in the future, is geared to meet new demands and new opportunities as they arise. Its broad capacity and low initial and maintenance costs make it the soundest, most economical TV distribution equipment investment available anywhere.

SPECIFICATIONS FOR MODEL 211 CHAIN AMPLIFIER

1. **BANDWIDTH:** 15 - 100 mc.
2. **VOLTAGE GAIN, NOMINAL:** 33 db at 88 mc.
3. **VARIATION IN GAIN WITH SUPPLY VOLTAGE:**
Gain decreases approximately 2 db when supply voltage is reduced to 105 volts.
4. **FREQUENCY RESPONSE:** See figure.
5. **MAXIMUM OUTPUT VOLTAGE:** 4.2 volts peak.
6. **INTERMODULATION DISTORTION:** An 80% amplitude modulated signal, within the pass band of the amplifier, large enough to produce 1.0 volt amplifier output, will produce less than 0.5% amplitude modulation of another signal of equal or smaller amplitude.
7. **NOISE FIGURE:** 54 mc - 8.3 db
88 mc - 8.8 db
8. **IMPEDANCES:** Unbalanced - input and output 75 ohms.
9. **CONNECTORS:** Input - Type "N" plug, panel mounted.
Output - Type "N" jack, panel mounted.
Monitors - Type "N" jacks, panel mounted.
10. **MONITOR JACKS:** Input and output monitor jacks 26 db down from line.
11. **EXTERNAL-MANUAL SWITCH:** Located on back of unit for selecting amplifier gain control, (internal manual control, or external automatic control).
12. **MANUAL GAIN CONTROL:** Located at back of amplifier. Capable of varying gain over approximately 16 db range.
13. **EXTERNAL GAIN CONNECTOR:** Located at back of unit. Two-pin Jones plug.
14. **TUBE COMPLEMENT:** Twelve 6AK5 (or the long-life equivalent type 5654*).
15. **POWER SUPPLY:** 117 volts, 50-60 cycles, 49 watts. Power transformer primary taped for either, 107, 117, or 127 volts.
16. **FUSING:** Primary - .8 amp.
B+ - .25 amp.
17. **DIMENSIONS:** 3 1/2" wide, 19" long, 7 5/16" deep, back of front panel.
18. **FINISH:** Gray baked enamel.
19. **WEIGHT:** 16 pounds; shipping weight 19 pounds.

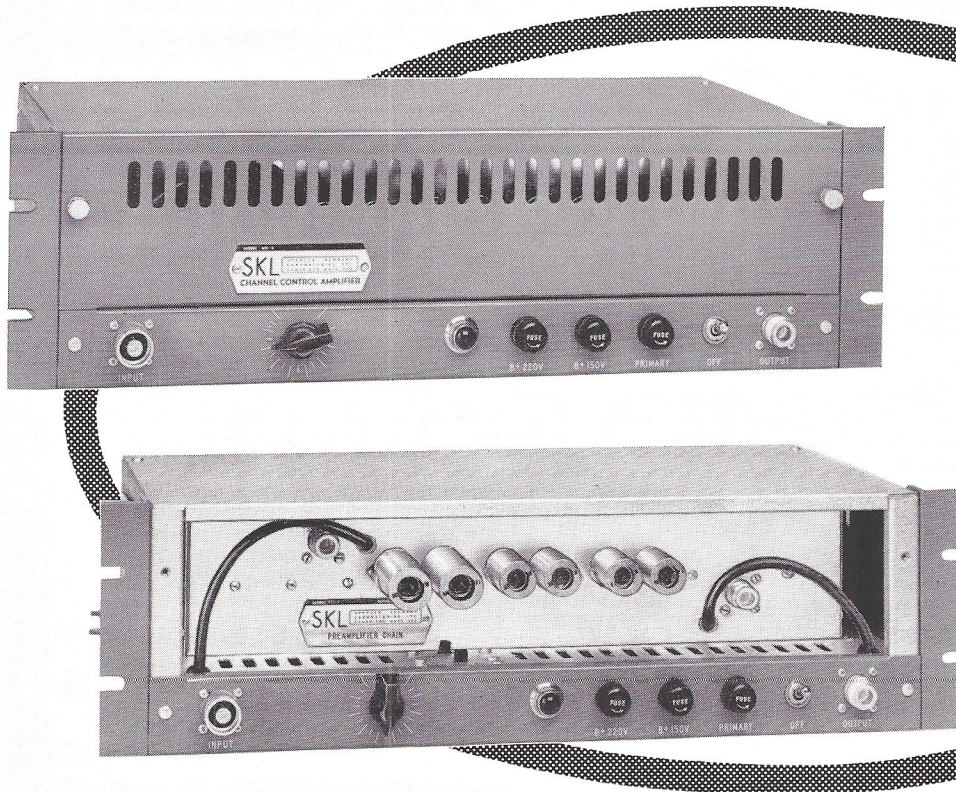
* In television distribution systems where the utmost in reliability, long life and uniformity is desired, use of the 5654 tubes is recommended.



Series 400 Television Channel Chain Amplifiers

(Model 450 Channel Chain Preamplifier, Model 451 Channel Control Amplifier)

SPENCER - KENNEDY LABORATORIES, INC.
1320 SOLDIERS FIELD ROAD, BOSTON 35, MASSACHUSETTS



FEATURES:

- New Band-Pass Chain Circuit:
 - Dead-tube-proof
 - Alignment permanent
- Controls Fading Signals
- Exploits Fringe Signals
- Functionally Designed:
 - For installation
 - For maintenance

The Series 400 Television Channel Chain Amplifiers amplify and control the level of television signals received directly from antennas. The function of the Model 450 Channel Chain Preamplifier is to amplify the signals received directly from the antenna. The Model 451 Channel Control Amplifier follows the Model 450 Preamplifier, and not only provides and controls additional gain, but also controls the gain of the preamplifiers which precede it, even though they be separated by a considerable distance.

NEW PRINCIPLE:

The Model 450 Channel Chain Preamplifier and Model 451 Channel Control Amplifier are the first commercially available equipment to incorporate a new band-pass amplifier circuit especially developed by SKL engineers for use at the antenna site of television distribution systems.

MAXIMUM DEPENDABILITY:

All of the desirable features of the chain amplifier circuit, pioneered and proven by SKL over many years, are incorporated. This special circuit has permitted the design of an amplifier which is much less dependent on tube characteristics than conventional types. In addition, like all other SKL Chain Amplifiers, these Channel Chain Amplifiers continue to operate with negligible loss of picture quality if a tube becomes weak or dies. In fact, any one of the amplifier tubes may be completely removed from its socket with little change in picture quality. Only with the SKL chain type of amplifier therefore can maintenance be placed on a routine rather than a crisis basis.

MAXIMUM FIDELITY:

The new cascode band-pass chain input stage of these amplifiers is the reason for the excellent performance on weak signals. Good

impedance match at the input prevents picture smear and ghosts being introduced through mismatch. Both the input and output impedances of these amplifiers are a good match to 75 ohms, so that interconnections may be made without special precaution, and without picture deterioration.

Each unit has a full six-megacycle bandwidth for its specific channel. Each unit, therefore, is especially well suited for the amplification of color signals without modifications.

Another important amplifier characteristic is that there is little change in response curve when the gain is changed, either manually or through the action of the automatic level control.

The Model 451 Channel Control Amplifier incorporates for the first time a signal level detector which responds to the entire television signal, not just to the picture carrier alone. In this way, it prevents the wide swings of the sound carrier which has caused so much trouble in conventional systems provided with automatic level control equipment.

MAXIMUM RECEPTION:

The low noise figure of these amplifiers makes possible the clear reception of weak television signals, yet the excellent control characteristic allows operation without trouble when the signal becomes very high during freak atmospheric conditions.

Since these amplifiers contain their own power supplies, they may be located close together or separated by a considerable distance, as required. This flexibility, combined with the exceptional dependability and stability provided by the new circuit, makes feasible arrangements which otherwise would carry an excessive maintenance risk. For example, where the antenna location is inaccessible or the antenna tower high, each preamplifier can nevertheless be prudently placed at its own antenna, without sacrificing effective level control or jeopardizing system continuity. Such an arrange-

SKL

ment is the most effective possible for the reception of weak, distant, and severely fading signals.

The incorporation of part of the total required gain in the Pre-amplifier and part in the Control Amplifier is also best when channel conversion is needed, since the output level from an SKL Channel Chain Preamplifier, when controlled by an SKL Channel Control Amplifier, is within the range for best performance of a converter.

The design provides very thorough electrical shielding, preventing leakage from the amplifiers getting back into the antenna, with the reduction of picture quality and instability which such feedback causes.

MAXIMUM CONVENIENCE:

Very careful attention to the way this equipment will be used has resulted in a design which is convenient whether the amplifier is mounted in a rack, on a wall, on a bench, or in a cabinet at the top of a tower. In each case, the tubes are readily accessible for test or replacement without delay. It is even possible, because of the chain amplifier circuit, to test and replace tubes without interrupting the signal. Monitor jacks, for measuring or monitoring the input and output signals, are also readily accessible regardless of mounting. Special air passages provide adequate amplifier ventilation and cool operation whether rack or bench mounted. Each amplifier contains its own power supply, which proves to be very convenient in planning an antenna site layout and when routine maintenance is being performed.

The input and output jacks may be readily changed from the front of the equipment to the rear, to fit the installation plan. If the units are mounted in a rack, with all wiring at the rear, a very professional appearance results. With this arrangement, the input and output monitor jacks, the tubes, and all controls are still conveniently available from the front. Regardless of mounting method, the case of these amplifiers protects the tubes and other fragile components from accidental damage and from accumulation of dust on critical circuit elements.

Both amplifiers are provided with manually adjustable controls on the front panel to permit the convenient setting of gain when used without automatic control. The control in the Model 451 is also readily accessible for setting the level of the output when automatic level control is being used.

The Model 450 Channel Chain Preamplifier

The Model 450 Channel Chain Preamplifier incorporates the new cascode band-pass chain input stage followed by stages of the new band-pass chain amplifier. Two type 6BZ7 and four premium-quality type 5654 tubes are used in those amplifiers which operate on the low VHF channels. Two additional type 5654 tubes are

used in those amplifiers which operate on the high VHF channels. In both cases the maximum output voltage is 200 millivolts into 75 ohms.

An unusual feature of the Model 450 is the high-low switch. In the "high" position, outputs as great as 200 millivolts may be used. When being used with the Model 451 Channel Control Amplifier, the "low" switch position is used to provide the greater control necessary for weak and fluctuating signals.

The Model 451 Channel Control Amplifier

The Model 451 Channel Control Amplifier may be used either as a self-controlled low noise preamplifier, or as an automatic-level-control amplifier. In the latter case, the Model 451 will not only control its own gain, but also the gain of one or more Model 450 Channel Chain Preamplifiers.

The Model 451 Channel Control Amplifier employs the same circuit as the Model 450 Preamplifier plus components to provide the control function.

The control circuit includes a driver stage of band-pass amplification to provide stable operation and flat control. This additional stage also uses the channel chain principle to maintain the dependability and stability inherent in this type of amplification. Smooth, reliable automatic-level-control action has been achieved by advanced circuit development and careful testing.

The Model 451 Channel Control Amplifier will ordinarily be used alone when the antenna output is within the range of 2,000 to 20,000 microvolts, and will keep the output constant for variations of input signal of 20 decibels.

The Model 451 operates at full gain, with all of the desirable features of the Model 450, when the input level decreases still further. (This ability to act as an excellent preamplifier for weak signals, with automatic protection against overload when signal becomes strong as during freak atmospheric conditions, can be utilized to advantage in special situations, such as when the antenna is so far away from the control point that one or more additional amplifiers must be employed.)

For stable control of signals which fluctuate over a wide range, at least one Model 450 Channel Chain Preamplifier controlled by a Model 451 Channel Control Amplifier must be used. The preamplifiers may be placed at points remote from the control amplifier, and be automatically controlled in gain by means of a single control line from the Model 451 Channel Control Amplifier. Up to 60 db (30 to 3,000 microvolts) of automatic level control action may be obtained when two Model 450 Preamplifiers and one Model 451 Control Amplifier are used.

An ALC-MANUAL switch is provided for selecting either automatic or manual operation; when set on MANUAL, both amplifiers may be manually controlled for routine gain checking.

The tube complement consists of two type 6BZ7, six type 5654, and two type 6AL5.

SPECIFICATIONS

1. Gain

Channels 2 through 6: Model 450, 35 decibels
Model 451, 35 decibels
Channels 7 through 13: Model 450, 45 decibels
Model 451, 25 decibels

2. Noise Figure, Either Unit:

Channels 2 through 6: 6 decibels average
Channels 7 through 13: 9 decibels average

3. Maximum Output Voltage: 0.20 volts RMS PS

4. Bandwidth: 6 megacycles

5. Impedance: 75 ohms input and output (Reflection coefficient less than .15 at any frequency within channel)

6. Control Range:

Model 451 Alone; 2 db change in output for 20 db change in input
Model 451 Controlling One Model 450: 1 db change in output for 40 db change in input
Model 451 Controlling Two Model 451's: 1 db change in output for 60 db change in input

7. Response Characteristic: Flat within ± 1 db over 6 mc bandwidth

8. Selectivity:

At 6 mc away from channel edge, it is —
For channels 2 through 6:

Model 450, down 35 decibels
Model 451, down 35 decibels

For channels 7 through 13:

Model 450, down 32 decibels
Model 451, down 22 decibels

9. Connectors: 75-ohm Type N (the required plugs are supplied)

10. Power Required: 105-125 volts, 50-60 cycles, 45 watts

11. Weight: 16 pounds

12. Shipping Weight: 22 pounds

13. Dimensions: 19" x 5 1/4" x 9 3/4"

14. Mounting: Rack, Wall, Bench, or Cabinet

15. Panel Finish: Grey Baked Enamel

SKL

SPENCER - KENNEDY
LABORATORIES INC
BOSTON 35 MASS USA

Telephone: ALgonquin 4-5400

SKL

SKL Model 446 Channel Converter

A Component of the -SKL- Wide-Band Distribution System for Television

SPENCER-KENNEDY LABORATORIES, INC.

186 MASSACHUSETTS AVENUE, CAMBRIDGE 39, MASSACHUSETTS



FEATURES:

Electrically Designed:

- For Fidelity
- For Dependability
- For Conservation of Gain

Functionally Designed:

- For Installation
- For Maintenance

The SKL Model 446 Channel Converter is used in television master antenna systems to convert the composite television signal from one VHF channel to another.

MAXIMUM FIDELITY:

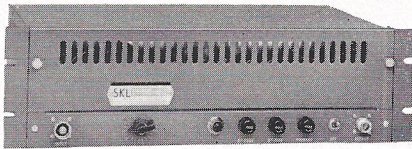
Principle of Operation: The SKL Model 446 Channel Converter uses one half of a type 6U8 tube as mixer, and the other half as separate oscillator. The oscillator utilizes a newly-developed circuit which is exceptionally stable and insensitive to the variations of the characteristics of the oscillator tube. The oscillator operates at the frequency required for the desired conversion; the mixer input is not the end product of a cascade of frequency multipliers.

Impedances are Matched: Its input and output circuits are of the double-tuned band-pass type. Both the input and the output are carefully matched to 75 ohms, so that the converter may be added to a matched system without producing harmful reflections.

Frequency Response: The frequency response of SKL Model 446 is substantially flat over its 6 mc bandwidth. This response shape is only slightly affected by tube changes, and no realigning of the coupling networks is necessary after replacing tubes.

Free From Harmful Spurious Outputs: When used with the SKL Series 400 Television Channel Chain Amplifiers, or with any other apparatus which provides equivalent selectivity and signal level, the SKL Model 446 Channel Converter has no spurious outputs which degrade the quality of the television picture. This very desirable situation results, in large part, from the fact that the oscillator operates directly at the required frequency.

SKL



Model
446—P1

MAXIMUM DEPENDABILITY:

Clean Design: By careful attention to details, it has been possible to design a circuit which performs all desired functions through the use of a 6U8 tube and an 0A2 regulator tube. The circuit components are high-quality, conservatively rated units, which may be expected to require no maintenance.

Stable Frequency: The use of temperature compensation, careful mechanical construction, and regulated supply voltages limits the oscillator-frequency drift due to temperature or line voltage to a very small amount, well within the range of the fine tuning of conventional television receivers.

Regulated Supply: The plate and screen voltages for both mixer and oscillator are regulated by a type 0A2 tube, and for this reason, operation is unaffected by supply voltage variations from 105 volts to 125 volts.

MAXIMUM CONVENIENCE:

No Insertion Loss: The nominal gain of an SKL Model 446 Channel Converter is unity; no more amplifiers are required than would be needed if channel conversion were not used. This characteristic, in addition to saving initial cost, facilitates system planning and simplifies maintenance.

Well Shielded: The design provides very thorough electrical shielding, preventing any leakage fields which might in any way cause interference or impair picture quality. No additional cabinet or power line filter needs to be used.

Mechanically Suitable: The basic converter units, one or two as required, are mounted in a power supply assembly which is like that used for the "Series 400" Television

Channel Chain Amplifiers. The converter assembly appearance is then harmonious with the amplifiers.

It retains the feature of being very convenient to install and maintain, whether mounting is desired in a rack, on a wall, on a bench, or in a cabinet. The input and output jacks may be readily changed from the front of the equipment to the rear, to fit the installation plan. If the units are mounted in a rack, with all wiring at the rear, a very professional appearance results. With this arrangement, the input and output monitor jacks, the tubes, and the on-off switch are still conveniently accessible from the front. Regardless of mounting method, the case of these converters protects the tubes and other fragile components from accidental damage and from accumulation of dust on critical circuit elements.

Special air passages provide adequate ventilation and cool operation when this unit is placed with others in a relay rack, or is operated on a bench.

The built-in power supply will be found to be very convenient in planning and maintenance.

DESCRIPTION OF THE ASSEMBLIES:

When converting from any low VHF channel (2 through 6) to any high VHF channel (7 through 13), or when converting from any high VHF channel to any low VHF channel, only one converter unit will ordinarily be required, and one Model 446 P-1 Channel Converter will perform this one conversion, while one Model 446 P-2 Channel Converter, in effect a dual unit, will perform the conversion for two signals.

Some conversions cannot be made in a single step without undesirable spurious responses, and two-step conversions are necessary in these cases. When such conversions are necessary, the Model 446 P-2 will handle this two-step conversion.

Before placing a firm order, a list of the available incoming channels and the available system channels should be supplied to SKL in order that the SKL engineering department may assist you in selecting the conversions which best suit the application.

SPECIFICATIONS

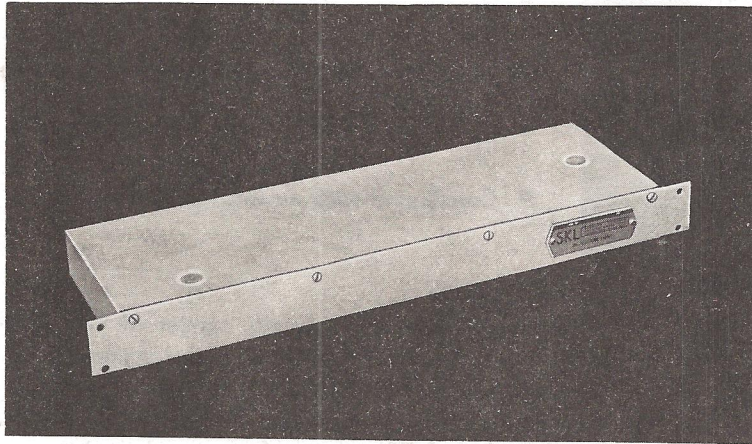
1. **GAIN:** 0 decibels (+1, —2 decibels) for a single converter. (When two units are used in a double conversion, 0 decibels (+2, —4 decibels)).
2. **BANDWIDTH:** 6 megacycles.
3. **RESPONSE CHARACTERISTIC:** Flat within 0.5 decibels over 6 megacycles bandwidth.
4. **FREQUENCY STABILITY:** Total frequency change due to supply voltage variation from 105 volts to 125 volts, and temperature change of 70°F will not exceed 40 kilocycles.
5. **SPURIOUS RESPONSES:** There are no spurious responses within the pass-band of the output channel or within a guard band of 3.0 megacycles on either side of the output channel which are stronger than —40 decibels referred to 1 millivolt. Any spurious signals outside this region will be of such strength as to cause no interference when followed by an SKL Model 451 Channel Control Amplifier or an equivalent band-pass device.
6. **IMPEDANCE:** 75 ohms, input and output (Reflection coefficient at input and output less than 0.15).
7. **CONNECTORS:** 75-ohm Type N (the required plugs are supplied).
8. **MONITORING:** Type N monitor jacks are provided at both input and output and give monitoring signals approximately 26 decibels below the respective signal levels.
9. **POWER REQUIRED:**
Model 446 P-1: 20 watts, 105 to 125 volts, 50-60 cycles.
Model 446 P-2: 25 watts, 105 to 125 volts, 50-60 cycles.
10. **WEIGHT:**
Model 446 P-1: 14 pounds.
Model 446 P-2: 16 pounds.
11. **SHIPPING WEIGHT:**
Model 446 P-1: 20 pounds.
Model 446 P-2: 22 pounds.
12. **DIMENSIONS:** 19" x 5¼" x 9¾".
13. **MOUNTING:** Rack, Wall, Bench or Cabinet.
14. **PANEL FINISH:** Gray Baked Enamel.

SKL

SPENCER - KENNEDY
LABORATORIES INC
CAMBRIDGE MASS USA

Telephone: UNiversity 4-0400

SERIES 400 TRAPS & FILTERS *



SERIES 492 HYBRID TRAPS

These new hybrid circuit traps embody a new concept in filter design, with the result that unusually sharp filters are now available at an unusually low price. Very sharp attenuation of both Television sound and picture carriers are possible with the Series 492 Hybrid Filters. Good adjacent channel operation is economically and technically feasible when you use the SKL Hybrid Filters.

DESCRIPTION: The Series 492 Rejection Traps are designed to suppress either the sound carrier of the television channel below or the picture carrier of the television channel above. This suppression is necessary where the interfering adjacent carrier is too high in signal strength to be handled by the selectivity of a channel amplifier alone.

The filter is of a new type employing a hybrid circuit principle not hitherto used in this type of application. The advantage of the filter configuration is its sharp attenuation characteristic, low insertion loss, and high degree of stability.

The traps are pretuned at the laboratories and mounted in a light-weight brush aluminum can, secured to a standard 19" rack panel.

FEATURES:

- **High rejection rate:** Over 45 db rejection of unwanted carrier now possible.
- **Both picture and sound traps available:** Rack-mounted picture and sound traps can be supplied in a convenient package easy to install.

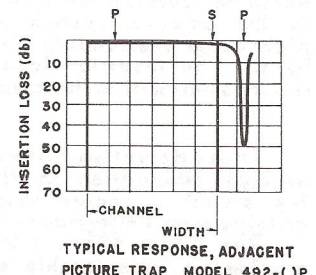
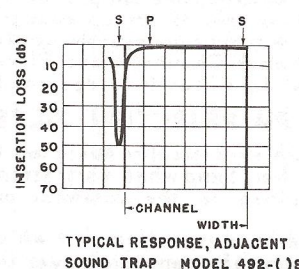
* Patent Pending

SPECIFICATIONS:

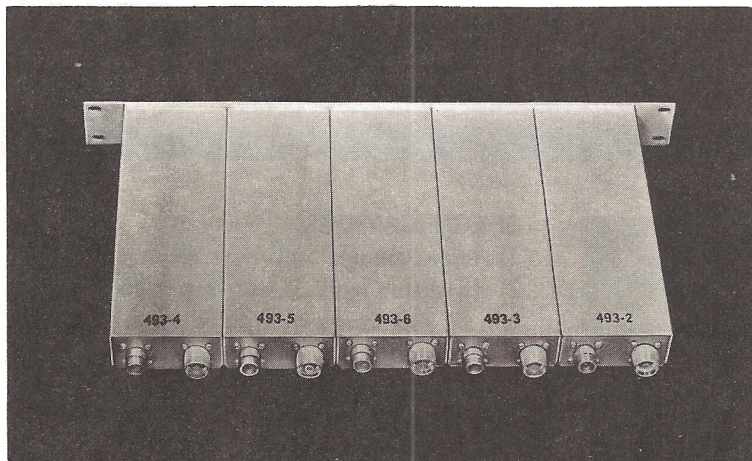
- 1) **Impedance:** 75 ohms unbalanced.
- 2) **Insertion loss:** Less than 1 db on channel up to and including the channel carrier adjacent to the ones suppressed.
- 3) **Rejection of unwanted carrier:** 45 db nominal.
- 4) **Connectors:** 75 ohm Type "N" 1 male, 1 female.
- 5) **Mounted:** Rack 1 3/4" x 19".
- 6) **Filter dimensions:** 1 23/32" by 6 1/2".
- 7) **Finish:** SKL gray baked enamel panel, natural rubbed aluminum case.

- **Stable with temperature:** SKL traps are very stable over the extreme range of temperature experienced by CATV Systems.
- **Carefully matched impedance:** Accurate impedance match insures peak performance without smear or distortion.
- **Low insertion loss:** Less than 1 db insertion loss in desired channel.
- **A new patented circuit:** These traps and filters are the result of a new concept in filter design.
- **Adjacent channel operation:** Because filters are sharp and stable, good adjacent channel operation now technically and economically possible.
- **Low Price:** Because of economic design, filters can be made at an unusually low price. No other filter available today can compare in performance or price.

TYPICAL RESPONSE CURVES



SERIES 493 -- SOUND ATTENUATORS



FEATURES:

- Attenuation adjustable over a range of 6 db.
- Very low insertion loss
- Makes adjacent channel operation possible.
- Low Cost.
- Convenient rack mounting.

SERIES 493 -- SOUND ATTENUATORS

DESCRIPTION: These new SKL filters are designed to attenuate only the sound carrier of VHF television channels when it is too high relative to the picture carrier. The maximum attenuation available is 6 db. If less than 6 db is required, the filter may easily be detuned by means of a screw driver adjustment, up in frequency thereby reducing the attenuation of the sound carrier. This ability to adjust the attenuation of the filter by predictable amounts is a unique feature of the SKL Series 493 Sound Attenuators. It is particularly valuable in a community system where an adjacent channel operation is necessary.

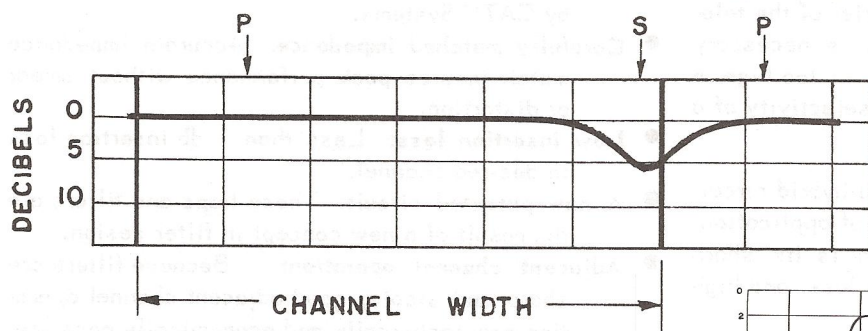
The filters are pretuned at the laboratories to the frequency of the sound carrier of the particular TV channel. They are mounted in a rectangular brushed aluminum case and mounted on a 1 3/4" x 19" rack panel. Each panel has sufficient mounting holes to accommodate five attenuators, is made of aluminum, and finished in SKL gray baked enamel. The number following the model number indicates the channel whose sound carrier is attenuated.

Models 493-2 through 493-13 sound attenuators.

SPECIFICATIONS:

1. **Attenuated frequency:** Sound carrier of VHF television channel indicated in model number.
2. **Impedance:** 75 ohm unbalanced.
3. **Maximum attenuation of sound carrier:** 6 db \pm 1 db.
4. **Insertion loss 0.75 mc away from sound carrier:** Less than 1 db.
5. **Connectors:** Type N 75 ohm -- 1 male, 1 female.
6. **Dimensions:** Five filters may be mounted on a 1 3/4" x 19" rack panel.
7. **Finish:** Filters, brushed aluminum case; rack panel, SKL gray baked enamel.

THE MODEL 400-49 RACK MOUNTING PANEL IS SUPPLIED AS A SEPARATE UNIT AND PRICE.



TYPICAL RESPONSE

MODEL 493
SOUND ATTENUATORS

SERIES 441 CHANNEL-PASS FILTERS

Models 441-2 through 441-13

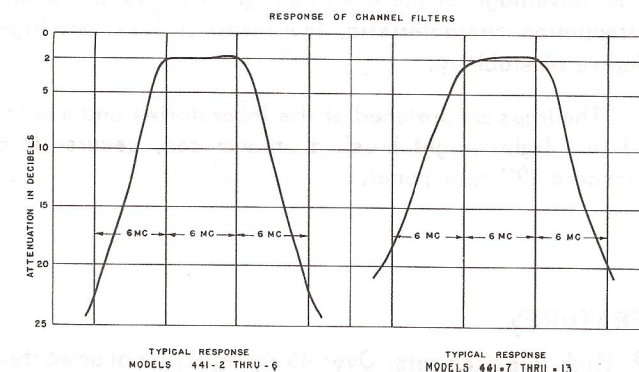
These twelve units, each designed to pass a particular channel, are highly efficient in attenuating signals which fall outside the desired channel but are picked up by the antenna system and which, if strong enough, might cause overloading of the distribution system amplifiers. The insertion loss of each Channel-Pass Filter is very small within the channel for which it is designed.

FM REJECTION FILTERS -- Models 435, 436, 437

These Rejection Filters are specifically designed to provide attenuation in the f-m band when very strong f-m signals, located very close to the antenna, are causing poor performance.

The Model 435 is a broad-band rejection unit which provides a considerable amount of attenuation over the whole f-m band. It can be adjusted to provide maximum attenuation at any frequency in the higher portion of the f-m band.

The Models 436 and 437 are intended for use when



TYPICAL RESPONSE
MODELS 441-2 THRU -6

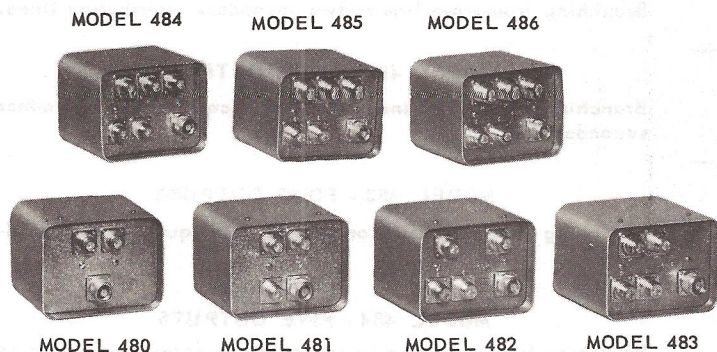
TYPICAL RESPONSE
MODELS 441-7 THRU -13

the frequency of maximum attenuation must be below 98 megacycles, the Model 436 being adjustable down to 91 mc and the Model 437 adjustable right down to the edge of channel 6.

It is possible to cascade these filters and adjust them so as to provide any desired amount of attenuation at any parts of the f-m band without adding objectionable loss in any of the VHF television bands.

Other rejection filters can be provided for special situations which may arise.

SERIES 400 MULTIVIDER LINE SPLITTERS



- IMPEDANCE MATCHED
No Picture Smears or Ghosts
- PASSIVE NETWORKS
No Tubes or Maintenance
- HIGH ISOLATION
No Inter-Line Disturbance
- WIDE-BAND RESPONSE
No Restricting Obsolescence
- FLEXIBLE DESIGN
No Mounting or Application Problems

DESCRIPTION: The Series 400 Multividers employ the distributed-constant directional coupler principle first developed by SKL and offer important new improvements in line splitting devices. In the past, line splitters have had the serious disadvantage of poor impedance match, causing troublesome ghosts and smears in the pictures. Another limitation has been an inadequate number of available output combinations to meet the varied requirements of distribution system construction.

These two major problems are solved by the Multividers. Their 75-ohm input and output provide matched impedance in all directions for both of the VHF television bands and assure for the first time clear and ghost-free pictures. Further, Multividers are available in a broad line of seven models incorporating different combinations of outputs to fit both usual and special line-splitting situations.

EFFICIENCY: In the circuit used in the Multividers, the signal is divided by means of passive networks. With no tubes used, these low-loss line splitters require no maintenance and contribute further to the proven dependability and low operating cost of the SKL television distribution system. The Multivider circuit not only provides a number of outputs at desired levels, but also inherently sets up high isolation between outputs, so that a disturbance in one line will not affect the rest of the system.

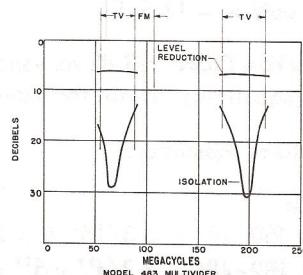
CAPACITY: Because of their excellent frequency response across the low and high VHF bands, Multividers assure wide-band capacity through all line splitting

points and will not require replacement as more off-the-air or closed circuit channels are added to the system. Here again, they contribute to the extremely important factors of low obsolescence which are inherent in all SKL systems.

Another unique feature of the Multividers is their ability to combine signals over the VHF frequencies with the same characteristics of high isolation, impedance matching and minimum loss as when they are used as dividers.

FLEXIBILITY: There is always the right Multivider model available to assure the most economical system layout, without costly waiting for specially designed equipment to solve particular situations. Installation of the units is quick and convenient. Made with weather-proof aluminum housings and equipped with Type N constant impedance connectors, Multividers can be mounted on the outside of the amplified cabinet, on a pole, cross-arm, wall or at any convenient place on the messenger wire.

TYPICAL FREQUENCY RESPONSE CHARACTERISTICS
SERIES 480 MULTIVIDERS



TYPICAL APPLICATIONS BY MODEL SERIES 400 MULTIVIDERS

Model No.	Connector Arrangement	Schematic	Taps at			
			3 db	6 db	9 db	12 db
480			2	0	0	0
481			1	2	0	0
482			1	1	2	0
483			0	4	0	0
484			1	1	1	2
485			1	0	4	0
486			0	3	2	0

MODEL 480 - TWO OUTPUTS

Branching one line either for distribution or for a secondary main line. Also at the extreme end of a secondary line when customer drop lines are long.

MODEL 481 - THREE OUTPUTS

Branching from main line to two secondary distribution lines.

MODEL 482 - FOUR OUTPUTS

Branching from main line to a major secondary and two minor secondaries.

MODEL 483 - FOUR OUTPUTS

Branching from amplifier or line to four equal level secondaries.

MODEL 484 - FIVE OUTPUTS

Branching from main line in sparsely populated areas such as edge of town on antenna run.

MODEL 485 - FIVE OUTPUTS

Branching from main line to four secondary lines of equal level.

MODEL 486 - FIVE OUTPUTS

Branching for distribution in densely populated areas where varying output levels are desired to conform to amplifier spacing.

SPECIFICATIONS SERIES 400 MULTIVIDERS

- IMPEDANCES:** All terminals - 75 ohms.
- CONNECTORS:**
 - Input - 75-ohm Type N panel plug.
 - Output - 75-ohm Type N panel jack.
- BAND WIDTH:** Excellent performance over both the low and high VHF television bands.
- NOMINAL CHANGE IN LEVEL:**
 - To #1 output - 3.2 db.
 - To #2 output - 6.4 db.
 - To #3 output - 9.6 db.
 - To #4 output - 13.5 db.
- NOMINAL ISOLATION:** 13 db at band edges, greater at frequencies within the band.
- FINISH:** Natural Aluminum.
- DIMENSIONS:**
 - Models 480, 481 - 3 3/16" x 3 3/8" x 4 1/2".
 - Models 482-486 - 3 3/4" x 5" x 4 1/2".

MODEL 400-40 MOUNTING BRACKET

The Series 400 Multividers mount readily to the SKL Model 420B and 443 Amplifier Cabinets, using the screws supplied. When a Multivider is to be mounted to a pole, crossarm or wall, the Model 400-40 Mounting Bracket should be used. By the addition of the two plates from a standard span clamp, the Model 400-40 Mounting Bracket also permits mounting of the Multivider to the messenger wire.

SPECIFICATIONS MODEL 400-40 MOUNTING BRACKET

(Fits Models 428A and 432A Directional Couplers and Series 400 Multividers.)

- OVERALL DIMENSIONS:** 7 1/2" x 2".
- MOUNTING HOLES:** 6 3/4" between centers; for 5/16" screw.
- FINISH:** Natural aluminum.

SKL**SPENCER - KENNEDY
LABORATORIES, INC.****TELEVISION DISTRIBUTION EQUIPMENT****SERIES 400 CHROMATAP
LINE TAPS AND TOOLS**

For RG 11/U and RG 59/U Cables

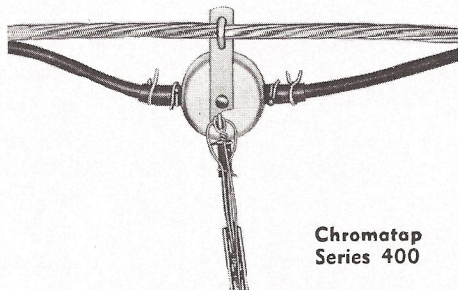
NON-RESISTIVE, NON-CAPACITIVE

COLOR-PERFECT

IMPEDANCE MATCHED ALL WAYS

LOW INSERTION LOSS

HIGH RECEIVER ISOLATION

**Chromatap
Series 400**

WIDE-BAND

NO RADIATION

WATERPROOF

MESSENGER WIRE MOUNTING

QUICKLY INSTALLED

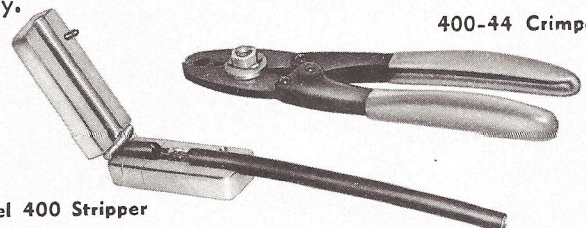
DESCRIPTION: SKL's new Series 400 Chromataps are the only line tapping units on the market that match impedance along the transmission line as well as to the television receiver. This unique feature permits the passing of both black and white and color pictures with unequalled clarity and fidelity.

The Chromatap is a directional coupler and unlike capacitive taps, provides high receiver isolation of more than 30 db over the entire VHF band, regardless of the tap loss to the receiver. Its impedance match and inherently high isolation prevent ghosts and smear in the picture and effectively prevent receiver oscillation from radiating back into the system.

Because of the Chromatap's flat frequency response, no channel is discriminated against. The extremely low insertion loss along the line is constant at all frequencies, making it unnecessary to adjust individual channel levels to the receiver. The unit's wide-band characteristic makes it equally effective on systems carrying few or many channels.

DESIGN FEATURES: Chromataps are available in two models having 10 db and 16 db of side line loss. They are passive networks which do not require maintenance and do not introduce distortion. They employ a new method of connecting to the outer braid of the coaxial cable which results in a moisture-proof, radiation-proof

attachment. Installation requires no soldering, no connectors, no taping, no drilling and no dependence on pressure contacts which oxidize and cause fluctuating signals. Chromataps mount easily on the messenger wire, with coaxial cable connections made simply and quickly.

**400-44 Crimper****Model 400 Stripper**

INSTALLATION TOOLS: The Model 400-44 Crimper is a combination tool for crimping the terminal lugs and cable braid sleeves, tightening the J-bolt nut which secures the Chromatap to the messenger and setting the pressure clamps on the connection seals.

The Model 400-50 Stripper for RG 59/U and Model 400-51 for RG 11/U Cable are uniquely efficient and easy to use. The cable is prepared for use with the Chromatap merely by placing the cable end in the stripper, closing the tool, turning it two or three times and pulling the cable out. This simple operation cuts the outer jacket, shield braid and polyethylene dielectric all to their correct respective lengths and strips them from the cable.

**SPECIFICATIONS
SERIES 400 CHROMATAPS**

Voltage drop to side line:
Insertion loss along line:
Attenuation for undesired signals:
Characteristic impedance:

Model 462
10 db
Less than 1.0 db
Greater than 30 db
75 ohms

Model 463
16 db
Less than 0.6 db
Greater than 30 db
75 ohms

PRODUCT DATA

Effective June 1, 1956

SPENCER - KENNEDY LABORATORIES, INC.
1320 SOLDIERS FIELD RD., BOSTON, MASS., U.S.A.

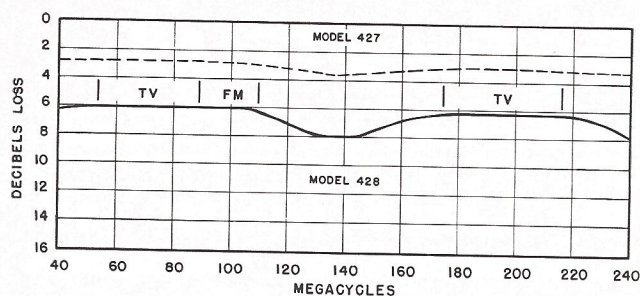


Fig. 1. Typical frequency response characteristics — Models 427 and 428A Directional Couplers

a nominal insertion loss of 6.5 decibels (see Figure 1) and isolates or reduces unwanted signals caused by the television receivers by approximately 23 decibels at the edges of the VHF television band and substantially more at mid-band frequencies (see Figure 2). It is contained in a small aluminum box with a removable cover; a terminal board behind this permits easy connection of house line drops and a main transmission line, a resistive pad to adjust the output level to the proper value, terminate an unused output in its proper impedance, and rapidly disconnect a house drop if necessary. The coaxial cable access holes in the bottom of the case are so arranged that each cable runs directly to its proper terminal. A connection diagram with space for designating the user of each house drop line is attached to the inside of the cover of the box. Easy and convenient to install and service, the Model 428A is inexpensive, has high reliability and long life because it uses no vacuum tubes.

MODEL 432A DIRECTIONAL COUPLER

Where a distribution system must feed a main line as well as four receivers, from a single input, the Model 432A Directional Coupler should be used. The Model 432A is composed of a combination of the Models 427 and Model 428A Directional Couplers, and provides one output having a level 6 decibels higher than the other four. The insertion loss between the input and the high level output is 3.2 decibels, while the loss to the remaining low level outputs is 9.5 decibels.

The Model 432A has the same isolation specifications (see Figure 2), and is mounted in an aluminum box identical with the Model 428A Directional Coupler. Like the Model 428A the Model 432A Directional Coupler provides great flexibility of use, and the highest reliability, making it indispensable to all types of distribution systems.

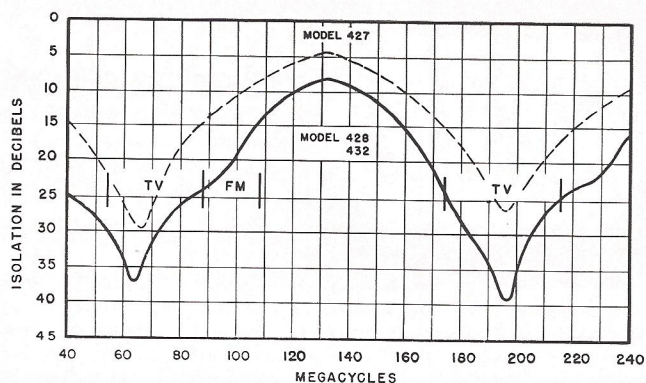


Fig. 2. Attenuation between outputs — Models 427 and 428A Directional Couplers

TECHNICAL DESCRIPTION: Basically the directional coupler consists of a number of quarter-wavelength or three-quarter-wavelength transmission-line-type step-down transformers whose inputs are connected in parallel and whose outputs are connected to the individual loads (see Figure 3). Directional-coupler action results from the connection of a resistor, R , from one output terminal to each of the others. A spurious signal fed into one output terminal passes simultaneously through one resistor and through two quarter-wave lines before reaching a second output terminal. Due to the 180 degree phase shift in the cables, current entering the second output terminal through the resistor exactly cancels the current through the cables. The three coaxial cables preceding the directional coupler serve to step down the impedance in small steps and thereby broaden the bandwidth of satisfactory operation.

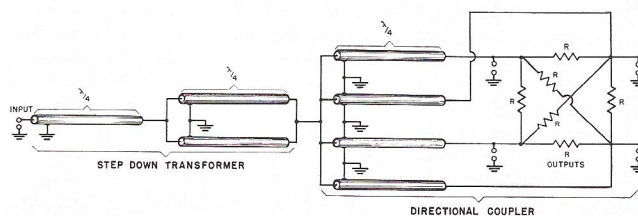


Fig. 3. Schematic of Model 428A Directional Coupler

SPECIFICATIONS

MODEL 427 AND 427A TWO-OUTPUT DIRECTIONAL COUPLERS

1. **OUTPUTS:** Two identical
2. **IMPEDANCES:** 75 ohms unbalanced
3. **BANDWIDTH:** Excellent characteristics 54 to 88 mc and 174 to 216 mc. Useful 88 to 108 mc.
4. **NOMINAL INSERTION LOSS:** 3.2 db
5. **NOMINAL ISOLATION:** 14 db minimum (11 db at 108 mc)
6. **TERMINALS:** Cable stripped for connectorless splicing
7. **CABLE LENGTH:** Approximately 40 inches overall.
8. **WEIGHT:** 4 oz.

MODEL 428A FOUR-OUTPUT DIRECTIONAL COUPLER

1. **OUTPUTS:** Four identical
2. **IMPEDANCES:** 75 ohms unbalanced
3. **BANDWIDTH:** Excellent characteristics 54 to 88 mc and 174 to 216 mc. Useful 88 to 108 mc

4. **NOMINAL INSERTION LOSS:** 6.5 db
5. **NOMINAL ISOLATION:** 23 db minimum (13 db at 108 mc)
6. **TERMINALS:** Small turret type; ground clamps for shield
7. **DIMENSIONS:** $7\frac{1}{2}$ " high, $5\frac{3}{8}$ " wide, $4\frac{3}{16}$ " deep.
8. **WEIGHT:** 3 pounds
9. **ENCLOSURE:** Weatherproof
10. **FINISH:** Gray enamel

MODEL 432A FIVE-OUTPUT DIRECTIONAL COUPLER

1. **OUTPUTS:** One high level; four low level
2. **NOMINAL INSERTION LOSS:** High level output: 3 db
Low level outputs: 9.5 db
3. **NOMINAL ISOLATION:** Between low level outputs: 23 db minimum (13 db at 108 mc). Between high level output and any low level output: 19 db minimum (12 db at 108 mc)
4. All other specifications are the same as for Model 428A

Specifications and prices subject to change without notice

SKL

SPENCER-KENNEDY
LABORATORIES INC
BOSTON 35 MASS USA

Telephone: ALgonquin 4-5400



Series 400 Directional Couplers*

Components of the -SKL- Wide-Band Distribution System for Television

SPENCER-KENNEDY LABORATORIES, INC.

1320 SOLDIERS FIELD ROAD, BOSTON 35, MASSACHUSETTS

DESCRIPTION: Whenever a number of television receivers are connected to the same source of signal, such as a transmission line or antenna, some means must be used to isolate one receiver from the other to prevent local oscillator interference and to minimize "ghosts" caused by the poor input impedance characteristic of typical receivers. The requirements placed on an isolating device, particularly at television frequencies, are that it should match the impedances of both the input and output lines, and that it should introduce as small a loss in the transmitting direction and as large a loss in the path between receivers as possible. Up to the present time the most widely used isolating devices have been resistive networks and transformers. These devices have been fairly unsatisfactory in television distribution systems because in the former case the loss of signal has been large, and in the latter case there is too little isolation, and often poor impedance match with the result that reflections occur causing ghosts or smear in a television picture.

The -SKL- Series 400 Directional Couplers very nearly fulfill the requirements for an ideal isolating device. Derived from microwave theory, they are the first practical directional couplers ever used for television distribution systems. They provide small forward loss and relatively high isolation between outputs.

The Model 427 is a single piece of special two-conductor coaxial cable, and provides two outputs from one input. It is small and light enough to be supported by its leads at any point without the need of additional bracing.

The Models 428A and Model 432A are contained in weather-proof aluminum cabinets with mounting brackets suitable for fixing them to a house, telephone pole, crossarm, etc. The front of the cabinet is removable revealing a terminal panel to which the incoming and outgoing transmission and



Models 428A and 432A Directional Couplers

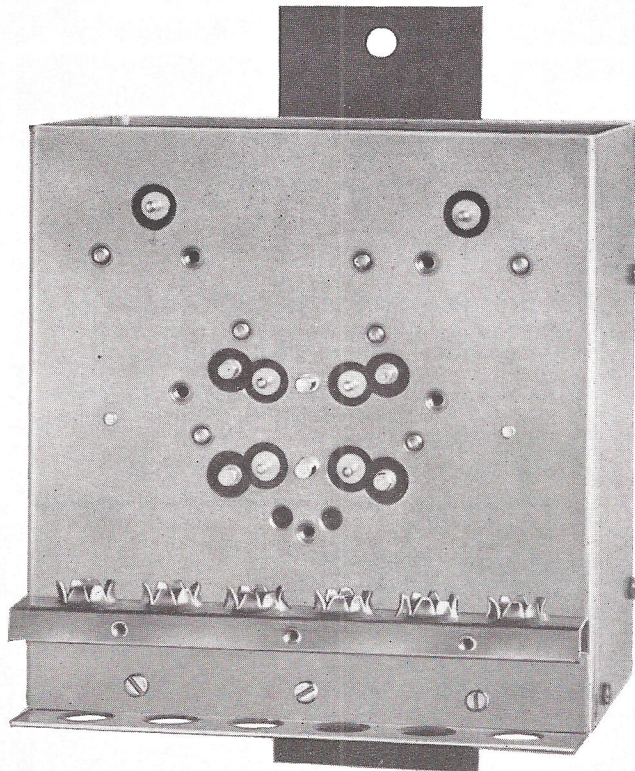
drop lines to houses connect. The terminals have been so arranged that resistive loss pads, if needed, may be easily and quickly installed, so that the signal level supplied to each receiver may be reduced if necessary. The aluminum cabinets have been weatherproofed and have an outside coat of high quality gray enamel to provide a finished appearance. The Model 428A and Model 432A Directional Couplers are specifically designed to have extremely low leakage fields.

MODEL 427 AND 427A DIRECTIONAL COUPLERS

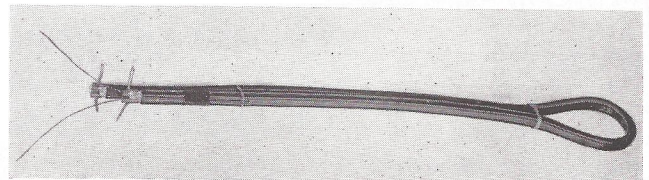
The Series 427 Directional Couplers provide one 75-ohm input and two 75-ohm outputs. The directional coupler action results in the very small forward or nominal insertion loss of 3.2db, (see Figure 1) and provides an attenuation of reflections and local oscillator interferences originating at a receiver of at least 14 decibels. (see Figure 2) Extreme simplicity in design — it consists of only a piece of special cable and one resistor — makes it simple to install and service. The Model 427 requires no power, cannot fail once it is properly installed, and will last as long as the coaxial cable. Up to 4 Model 427 Directional Couplers may be housed in the Model 433 Junction Box for outdoor use. (See Accessory Bulletin ACC400.) The Model 427A is a Model 427 Directional Coupler with an additional shielding braid and with end shield caps. It is recommended for all applications except when the coupler is installed in an electrically tight enclosure.

MODEL 428A DIRECTIONAL COUPLER

Designed to feed four 75-ohm coaxial lines from a single 75-ohm coaxial line, the Model 428A Directional Coupler has

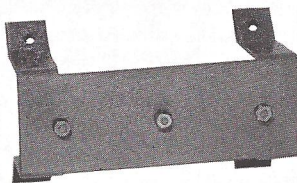


Wiring Panel in Model 432A Directional Coupler



Model 427 Two-Output Directional Coupler

*Patent Pending



400-11 Mounting Bracket

lasting gray backed enamel gives the cabinets a trim appearance. Openings on the bottom and louvers, on the hinged door provide adequate ventilation for a Model 212-TV Chain Amplifier to an ambient temperature of 110° F, and protect the interior from any kind of driving rain or snow. Brass screening covering all openings serves to protect the equipment from birds and insects. Three holes have been drilled through the rear of the cabinet for convenient mounting to a flat surface, and four holes in the bottom for mounting to the top surface of a shelf, cross brace, etc.

The Type 400-11 Mounting Bracket is available for mounting the cabinets directly on a telephone pole with sufficient hand space to satisfy utility regulations and allow the easy passage of a lineman.

Two drilled and tapped L brackets have been welded to the sides of the cabinet interior to which the Model 212-TV Amplifier may be secured by four thumb screws for easy and rapid amplifier servicing or change if necessary. Space is provided for the mounting of the **-SKL-** Model 434 Service-Entrance Circuit Breaker and Outlet which fulfills power company requirements and protects the Model 212-TV Amplifier against lightning, surges, etc. In addition, mounting holes have been drilled for the Model 429A T Network and Series 400 Equalizers. Knockouts have been punched in the bottom left and right sides of the cabinet for coaxial and power cables. A convenient ground lug and access hole for #4 wire is located adjacent to the left side holes for case and cable grounding.

ACCESSORIES:

TYPE 400-11 MOUNTING BRACKET

The Type 400-11 Mounting Bracket is constructed of welded steel with three machine screws welded to the flat part of the bracket. These screws are spaced to fit the mounting holes of the Model 420 Amplifier Cabinet. The four fingers on the outside of the bracket have been angled so as to fit telephone or power poles having diameters between 7 and 14 inches. The bracket is used to space the amplifier cabinet away from the pole so that the lineman may readily climb past the cabinet on the opposite side of the pole. (The hand space is at least 2 $\frac{1}{4}$ inches on a 10-inch diameter pole.)

MODEL 434 CIRCUIT BREAKER AND OUTLET

The **-SKL-** Model 434 Service-Entrance Circuit Breaker and Outle is recommended for use in the Model 420 Amplifier Cabinet to protect the amplifier and power line from surges and overloads as required by most power companies. It also provides two a-c receptacles, one to supply power to the Model 212TV Chain Amplifier, and the other to be used for soldering iron, meter, or other device needing power when the cabinet is to be serviced.

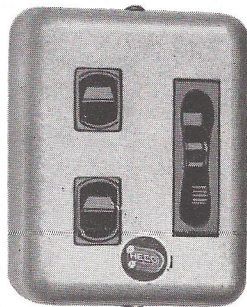
The breaker mechanism has a rating of 115 volts, 60 cycles at 4 amperes and is designed to trip at 125% of rated load after 6 seconds, but instantaneously on high surges. It is operated by a switch protruding from the front cover.

The Model 434 is finished in gray hammertone and is Underwriters' approved.

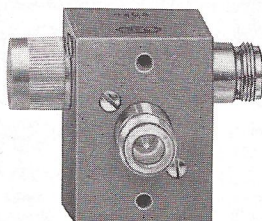
MODEL 429 MONITOR T NETWORK

Designed to provide a means of monitoring the output of the Model 212TV-72 Amplifier or trasmission line, with a television set or meter or to provide a single house connection at an isolated place, the Model 429 Monitor T Network consists of a resistive T pad mounted in an aluminum box with three Type N 72-ohm receptacles. The line loss of the Model 429 is 0.5 decibels, whereas at the monitor connection the loss is 26 decibels, thereby providing sufficient isolation so as not to disturb the transmission line when making measurements or feeding an outlet.

The Network is easily mounted in the Model 420 Amplifier Cabinet, in which holes have been drilled, by two machine screws; it is finished in gray enamel.



434 Circuit Breaker



429 AT Network

SPECIFICATIONS FOR MODEL 420 SINGLE AMPLIFIER CABINET

Dimensions: 20 $\frac{1}{4}$ inches long, 15 $\frac{3}{4}$ inches high, 6 $\frac{1}{2}$ inches deep overall.

Net Weight: 27 pounds *Shipping Weight:* 29 $\frac{1}{2}$ pounds

SPECIFICATIONS FOR MODEL 443 DOUBLE AMPLIFIER CABINET

Dimensions: 22 $\frac{5}{8}$ inches long, 20 inches high, 12 $\frac{5}{16}$ inches deep overall.

Net Weight: 41 pounds *Shipping Weight:* 44 pounds

SPECIFICATIONS FOR TYPE 400-11 MOUNTING BRACKET

Dimensions: 10 $\frac{3}{4}$ inches long, 5 inches deep, 6 $\frac{3}{4}$ inches wide overall.

Net Weight: 3 $\frac{3}{4}$ pounds *Shipping Weight:* 5 pounds

Specifications and prices are subject to change without notice

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SPENCER - KENNEDY
LABORATORIES INC.
BOSTON 35 MASS USA

Telephone: ALgonquin 4-5400

REPRESENTED BY

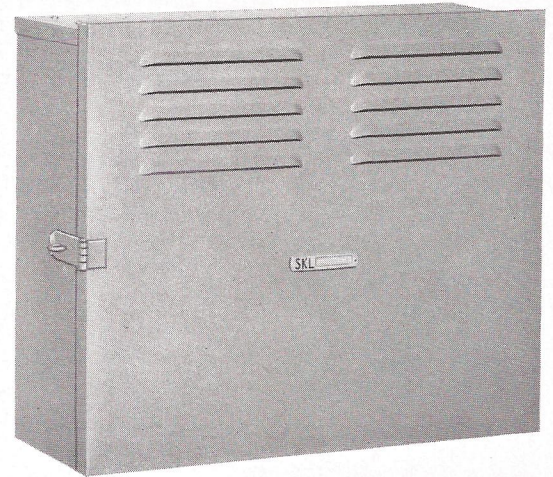
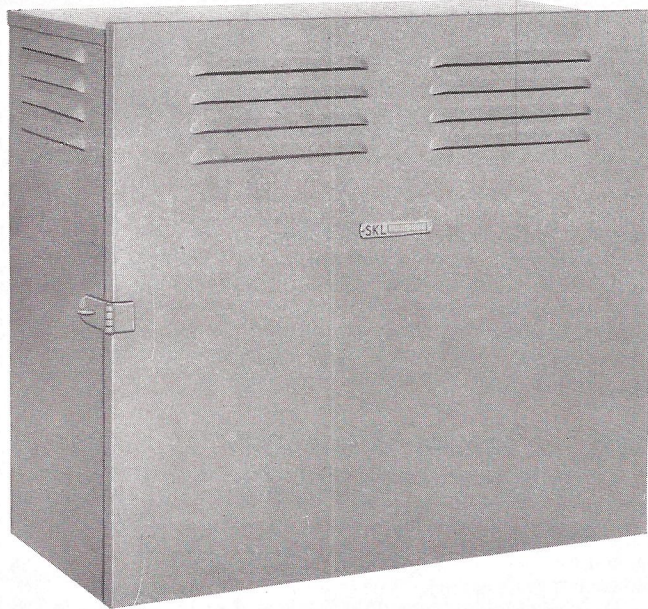


Series 400 Amplifier Cabinets

A Component of the -SKL- Wide-Band Distribution System for Television

SPENCER-KENNEDY LABORATORIES, INC.

1320 SOLDIERS FIELD ROAD, BOSTON 35, MASSACHUSETTS



FEATURES

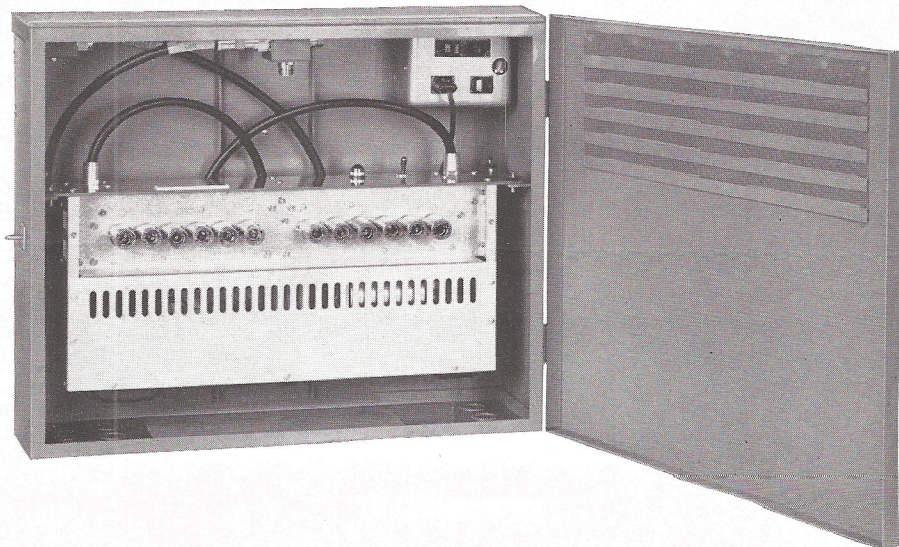
- All steel construction
- Adequate ventilation
- Protects against driving rain and snow
- Can be mounted on telephone pole, cross arm, or other flat surface
- Provision made for circuit breaker and monitor network
- Knockouts provided for coaxial cable and power wiring
- Screening provided for protection against birds and insects

DESCRIPTION: The -SKL- Model 420 Amplifier has been designed to house a single -SKL- Model 212-TV Chain Amplifier and associated equipment when mounted outdoors on a telephone pole or other structure.

The -SKL- Model 443 Amplifier is designed to house an automatic level control station, which consists of two -SKL- Model 212-TV Chain Amplifiers and an -SKL- Model 442 Automatic Level Control, when mounted outdoors.

The -SKL- Series 400 Amplifier Cabinets are constructed of welded sheet steel. A hinged, ventilated door on the front provides ready access. The door will rotate through an arc of 180 degrees. A hasp on the left side is provided for locking the cabinet with a padlock. The rear of the case is reinforced with steel members so that it is strong enough to support a man's weight.

The Series 400 Cabinets have been rust and weatherproofed by an undercoating of zinc chromate. A finish coat of long-



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REVISED: September 1, 1956

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TEL. ALgonQUIN 4-5400 CABLE ADDRESS: SPENKENLAB, BOSTON

PRICE LIST FOR SKL TELEVISION DISTRIBUTION EQUIPMENT

<u>Model No.</u>		<u>Contractors' Net Price</u>
<u>AMPLIFIERS</u>		
Model 211	Chain Amplifier. Low Band, amplifies Channels 2 through 6 simultaneously	\$ 272.00
Model 212C TV-72	Chain Amplifier. Wide-Band, amplifies Channels 2 through 13 simultaneously	259.00
Model 212C TV-72L	Chain Amplifier. Same as Model 212C TV-72 but has long life tubes	272.00
Model 450-2 to Model 450-13	Channel Chain Preamplifiers (Last number indicates channel)	348.00
Model 451-2 to Model 451-13	Channel Control Amplifiers (Last number indicates channel)	379.00
<u>CONVERTER</u>		
Model 446	Single Channel VHF Converter (low band to high band, or high band to low band) including Power Supply	\$ 345.00
	Double Converter, handles two channels (or low band to low band, or high band to high band) including Power Supply	490.00
<u>AUTOMATIC LEVEL CONTROL EQUIPMENT</u>		
Model 442C	Automatic Level Control	\$ 215.00
Model AM-800-	Pilot Carrier Generator (number after dash to indicate frequency) including Power Supply	345.00
Model 449	Pilot Carrier Control (number after dash to indicate frequency) including Power Supply	379.00
Model 400-37	Special Bracket and Hardware for ALC Station	1.10
Model 491	Pilot Filter (number after dash to indicate frequency)	45.00

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MULTIVIDERS - DIRECTIONAL COUPLERSFor Line Splitting and Distribution Outlets

Model 480	Two outputs 2 Taps at 3 db	\$ 16.00
Model 481	Three outputs 1 Tap at 3 db, 2 Taps at 6 db	19.00
Model 482	Four outputs 1 Tap at 3 db, 1 Tap at 6 db, 2 Taps at 9 db	23.50
Model 483	Four outputs 4 Taps at 6 db	23.50
Model 484	Five outputs 1 Tap at 3 db, 1 Tap at 6 db, 1 Tap at 9 db, 2 Taps at 12 db	27.00
Model 485	Five outputs 1 Tap at 3 db, 4 Taps at 9 db	27.00
Model 486	Five outputs 3 Taps at 6 db, 2 Taps at 9 db	27.00
Model 400-40	Bracket for use with 428, 432, 433 and 480	.50
Series of Multividers		
Model 427	Two-Output Directional Coupler	3.50
Model 428A	Four-Output Directional Coupler	32.00
Model 432A	Five-Output Directional Coupler	35.00

LINE EQUALIZERS

Model 470	Equalizes lines up to 92 MC, type "N" fittings	18.50
Model 431-B	Equalizes lines up to 108 MC, type "N" fittings	18.50
Model 444	Equalizes lines up to 216 MC, type "N" fittings	18.50
Model 465-60-70-188-200	Special Correcting Equalizers	25.00

FILTERS, TRAPS, ATTENUATORS

Model 441-2 to 441-13	Channel Pass Filter (last number indicates T. V. channel)	\$ 45.00
Model 492-2P to 492-13S	Rejection Trap (last number indicates Picture or Sound Carrier to be rejected)	45.00
Model 491	Pilot Filter (number after dash to indicate frequency)	45.00
Model 438-3	Attenuator Pad (Type N Fittings 72 ohm) 3 db loss	7.45
Model 438-6	Attenuator Pad (Type N Fittings 72 ohm) 6 db loss	7.45
Model 438-10	Attenuator Pad (Type N Fittings 72 ohm) 10 db loss	7.45
Model 438-20	Attenuator Pad (Type N Fittings 72 ohm) 20 db loss	7.45

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ANTENNA COMBINING NETWORKS

Model 418	Outdoor mounting; combines high and low VHF band antennas	\$ 29.00
Model 424	Indoor mounting; combines high and low VHF band antennas (miniature fittings)	16.00

SEE ALSO MULTIVIDERS - DIRECTIONAL COUPLERS

TRANSFORMERS

Model 414	72 ohm unbalanced to 300 ohm balanced transformers with Type N fitting	\$ 11.00
Model 414-B	Same as above (Weatherproof type)	12.50
Model 466	72 ohm unbalanced (miniature fitting) to 300 ohm balanced transformer with 400-2A Connector	3.50

CABINETS AND ACCESSORIES

Model 420B	Single Amplifier Cabinet, weatherproof, for single Model 211 or 212C TV Chain Amplifier	\$ 38.00
Model 443	Double Amplifier Cabinet, weatherproof for two Model 211 or 212C TV Chain Amplifiers (Cabinets do not include equalizers, monitor network, and circuit breaker. See Equalizers and acc.)	59.00
Model 400-11	Cabinet Mounting Bracket. For mounting Models 420 and 443 Amplifier Cabinets on telephone pole	6.50
Model 429B	T Network - Monitor Network, single outlet	8.90
Model 434	Circuit Breaker. For protection of equipment when mounted in Amplifier Cabinet	9.50
Model 400-20	Shield Braid. For making junctions. 50 ft. spool	3.50
Model 400-37	Special bracket and hardware for ALC station	1.10
Model 433A	Junction Box	6.25
Model 400-40	Bracket for use with 428, 432, 433 and 480 Series of Multividers	.50

RESISTIVE TERMINATIONS

Model 400-1	72 ohm resistive termination, miniature fittings	1.50
Model 400-6	72 ohm resistive termination, type N fittings	4.80

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COAXIAL FITTINGS

72 OHM, TYPE N

Model 200-1A	Panel Receptacle, threaded holes	\$	1.95
Model 400-25A	Panel Plug, threaded holes		2.75
Model 400-4	Cable Plug, for RG-59/U Cable		3.00
Model 400-5	Cable Jack, for RG-59/U Cable		3.50
Model 400-7	Cable Plug, for RG-11/U Cable		1.75
Model 200-7	Cable Jack, for RG-11/U Cable		1.40
Model 400-8	Double male cable junction (plugs)		3.75
Model 400-9	Double female cable junction (jacks)		3.75
Model 200-13	Type N to UHF adaptor. Double female		7.00
Model 400-12	Center Pin for plugs 400-4 or 400-7, ten to a bag	10 for	2.50
Model 400-21	Center Pin for jacks 400-5 or 200-7, ten to a bag	10 for	3.00
Model 400-28	Adapter for Triaxial Cable (use with 200-7 and 400-7 connectors)		.75

SPIRAFIL CABLE FITTINGS

Model 400-29 (5-513)	Coupling, 3/8" Spirafil to 3/8" Spirafil	\$	2.50
Model 400-30 (21-513)	Type N Male Plug for use on 3/8" Spirafil		5.40
Model 400-31 (23-513)	Type N Female Jack for use on 3/8" Spirafil		5.40
Model 400-52 (5-514)	Coupling 1/2" Spirafil to 1/2" Spirafil		5.70
Model 400-53 (21-514)	Type "N" Male Plug for use on 1/2" Spirafil		6.00
Model 400-54 (23-514)	Type "N" Female Jack for use on 1/2" Spirafil		6.00
Model 400-33	Rotary Cutter		5.10
Model 400-34	Flaring Tool (199-507) for 3/8" and 1/2" Spirafil		5.00

MINIATURE FITTINGS

Model 400-13	Panel Receptacle		.85
Model 400-2A	Cable Plug for RG-59/U		.65
Model 400-3	Double female cable junction (for 400-2 plugs)		1.10

RESISTORS

(Specify stock number, value and tolerance)

Stock No. 439-1, 439-7 439-9 to 439-11	1/2 watt, 10%, ten to a bag	\$	1.20/bag
Stock No. 439-2 to 439-6, 439-8	1/2 watt, 5%, ten to a bag		2.00/bag

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TESTED VACUUM TUBES

Tested 6AK5 Tubes (minimum order 12 tubes)	\$ 2.25 each
Tested 5654 long life 6AK5 Tubes (minimum order 12 tubes)	3.95 each

Prices quoted f.o.b. Boston, Massachusetts, and subject to change without notice.

Unless credit has been established, shipments will be sent c.o.d.

Printed in U. S. A.

