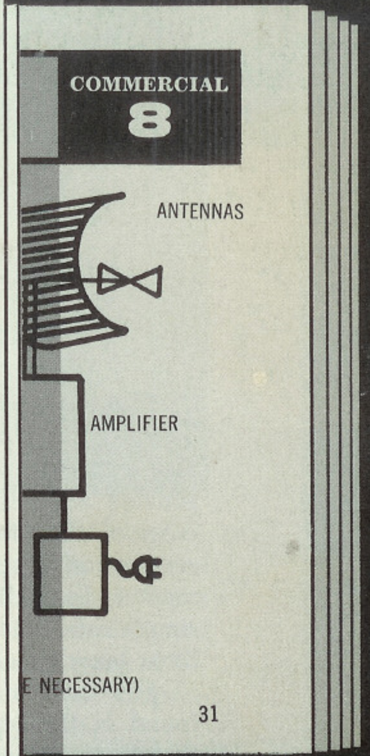
PRICE $1.00

REVISED EDITION

JERROLD

TV DISTRIBUTION SYSTEM HANDBOOK



Featuring 150 Easy to Understand TYPICAL LAYOUTS

FOR

MOTELS HOTELS HOMES

DEALER SHOWROOMS APARTMENTS

TRAILER COURTS

FOR ALL TV RECEPTION AREAS

INTRODUCTION

Many television servicemen have overlooked the lucrative field of small television systems' design and installation. Jerrold has undertaken, in this booklet, to provide a series of typical layout charts which cover most of the situations ordinarily encountered by the serviceman in selling his equipment and services to this market. In addition, brief instructions concerning the simple calculations necessary in laying out such systems have been included.

For unusual layouts, requiring arrangements not found in the typical layout charts, it is recommended that the free layout service of Jerrold be used. To take advantage of this service, ask your distributor for a signed copy of a layout questionnaire. Fill in the complete information requested, add your signature, and mail to Jerrold Electronics Corporation, 15th Street and Lehigh Avenue, Philadelphia, Pennsylvania 19132. Allow approximately two weeks from date of receipt for layout work. This service is especially valuable for large jobs or for jobs in particularly difficult areas such as locations within five miles or less of a transmitter, where the situation is made more difficult by direct pick-up of signal in the receiver's own internal wiring.

The first edition of this handbook was published in 1959 and over 35,000 copies were sold. This 2nd edition is in response to the many requests still flowing in for the original handbook and for updated information. In addition to updating the diagrams, a considerable amount of new information has been incorporated in this 2nd edition that should be tremendously helpful to the novice as well as the experienced installer.

ABOUT THE AUTHOR

Jack Beever, Technical Director of Jerrold's Distributor Sales Division, is a nationwide lecturer on TV-FM Systems theory, design and installation. He has authored many articles and published an authoritative book on TV systems. Active in the field of electronics since 1927, he has been associated with Jerrold Electronics Corporation since 1951. A specialist in field engineering, he has designed systems and developed antenna arrays for all types of TV cable systems including systems for motels, hotels, apartment houses, hospitals, institutions and homes.

This handbook reflects Jack Beever's intimate knowledge and keen understanding of this very specialized field.

TWO JERROLD RECEPTION & DISTRIBUTION CATALOGS

Your local Jerrold Distributor will be pleased to furnish you with copies of the two catalogs shown here for complete specifications and description on the Antenna Reception and Distribution Systems products specified in this handbook.

Table of Contents

	Page
Alphabetical Index	51
Description of Charts and Necessary Data	5
Use of Charts	6
Helpful Hints	7
Cures for Common System Troubles	9
System Servicing and the Decibel	11
Db Conversion Graph and Calculation Chart	14
Amplifier Specifications	15
Solid-State Preamplifier Specifications	16
Layout Charts	17 to 34
Typical Tap-Off Application	33
Coaxial Cable Loss Chart and TV Channel Data	35
Dbj Chart and Useful Formulas	36
Ultra-Tap Specifications	37
1401 Tap-Off Unit Specifications	38
PT-1461A and PT-1462A Pressure Tap Specifications	38
Paracyl and Paralog Antennas	39
Audio-trol Music Channel Specifications	40
AM/FM Tuner Specifications	41
Antenna Mixing Networks Specifications	41
Four-outlet Tap-Off, Model G-1404	42
Splitters and Directional Couplers	42
Basic TV Distribution System Theory	43

DESCRIPTION OF TYPICAL LAYOUT CHARTS

The basic requirements of a distribution system are such that two major decisions are made by the installer. One decision determines the types of antennas and, if necessary, preamplifiers to be used and the other determines the wiring of the building system itself. These two areas are generally categorized under the terms "head-end" for the antennas and preamplifiers and "distribution" for the wiring and wiring accessories.

Both decisions depend on different circumstances, and therefore almost any type of head-end can be found with any type of wiring system. This book uses a technique of split pages which allows combinations of any head-end with any wiring system so they may be viewed simultaneously. The examples listed have been carefully computed to make any combination compatible, but the installer is strongly urged to study the method of calculation described on pages 43 to 50.

DATA NECESSARY BEFORE REFERENCE TO CHARTS

Before the layout charts can be intelligently used, it is necessary that signal conditions at the proposed installation site be known. Television servicemen are, of course, familiar with signal conditions in their particular area, enough so to know that television reception conditions can be entirely different at sites separated by less than one hundred feet. Therefore, some sort of signal condition survey at the proposed installation site must be made before any logical layout can be projected.

A Jerrold 704B Field Strength Meter provides very accurate measurement of antenna signals and permits precise balancing of all systems.

USE OF TYPICAL CHARTS FOR PRELIMINARY LAYOUT

When signal conditions at the proposed site have been determined:

1. Find "head end" chart which satisfies known conditions.
2. Get building prints or make rough layout drawing of building, spotting in necessary TV outlets.
3. Choose most logical way of distributing signals (wiring plan).
4. Find "distribution system" chart which fits your plan.
5. Re-draw the two charts (head end and distribution) on the building layout.
6. Recheck wire lengths determined from drawings with actual field conditions.

IMPORTANT NOTICE:

Tap-off unit color codes have been selected based on rated amplifier outputs, and the ABD-1A and 2300A are both capable of 50 dbj (300,000 microvolt) outputs. HOWEVER, THE 2300A HAS APPROXIMATELY 40 DB OF GAIN AND THE ABD-1A APPROXIMATELY 20.

Because of this, when doubt exists about sufficient signal to drive the ABD-1A, the 2300A should be used. The ABD-1A needs 28 dbj (25,000 microvolts) input for full output; the 2300A needs 10 dbj (3,100 microvolts) for the same output. If in doubt, use red (R) coded tap-off units in place of white (W) and shorten the allowable line lengths by about 30 per cent.

HELPFUL HINTS FOR SYSTEMS' INSTALLATIONS

The different head ends shown in this manual can act as a guide to the selection of the proper type of antenna. The physical erection of the antennas will, of course, be determined by the type of antennas employed, how high it is necessary to raise these antennas in order to obtain sufficient signal, and the type of building on which the antenna is being installed. Good antenna installation practice MUST be observed with emphasis on the following points:

A. ERECTING ANTENNAS

1. The mast or tower must be thoroughly grounded, preferably with No. 6 ground wire, which is run directly to a cold water pipe or driven ground rod.

   CAUTION
   NEVER ASSUME A VENT, A GAS PIPE, OR A HOT WATER PIPE TO BE A GOOD GROUND.

2. The lead-in connection at the antenna should be covered with weather-proof compound.
3. All screws on the antenna must be tight. Loose antennas or elements can be a source of intermittent trouble.

B. COAXIAL CABLE

On all installations, except simple systems for individual homes, coaxial cables are used for signal distribution. These cables may be run indoors or outdoors, in conduit or exposed, as the situation requires, but in any case, cables must be handled carefully and installed properly to prevent future maintenance problems. Properly installed, coaxial cable will give many years of trouble-free service. A brief list of "do's" and "don'ts" in cable installations follows.

DO:

Anchor cable securely on long runs to prevent strain. Use the proper fittings for anchoring cables (squeeze fittings deform the cable by "cold flow").

Follow directions carefully in inserting tap-off units in the cables.

Weather-proof such insertions thoroughly if they are exposed to weather.

DON'T:

Bend cables sharply.

Run cables over sharp edges.

Subject cables to temperature extremes. (Coaxial cables are made of semi-plastic materials and will deform under heat, destroying the characteristics of the cable.)

C. LOCATING AMPLIFIERS

The amplifier may be located in an attic, basement or other convenient place. Care should be taken, however, to see that the location chosen is fairly centralized so that the feeder lines may be of approximately equal lengths. This is not possible, of course, in all cases, but is desirable, since it reduces amplifier requirements. In a motel, for example, it is usually possible to mount the amplifier directly in the middle of the building. In a hotel, it will probably be mounted some place near the top of the building. This practice may be deviated from in certain installations due to practical considerations. In a dealer's store, for example, it will generally prove convenient to have the amplifier in an accessible location near the receivers or in the dealer service shop.

D. MOUNTING THE AMPLIFIER

The amplifier may be mounted either horizontally or vertically. Horizontally, it may simply be laid on a shelf, table, etc. If vertical mounting is preferred to save space, the amplifier may be hung on a wall with support screws by means of the slotted holes in the chassis lip. In any case, the equipment should be mounted so that it is convenient to service, but not easily accessible to unauthorized personnel.

Any piece of electronic equipment generates heat when in operation and requires some ventilation. If the amplifier is mounted in a closet or other closed-in space, care should be taken to provide adequate ventilation. If the area is normally fairly warm, it might be advisable to remove the dust cover from the amplifier to further facilitate ventilation. The amplifier and any associated equipment should be grounded to a cold water pipe.

CURES FOR COMMON TROUBLES IN OPERATING SYSTEMS

A. NO SIGNAL

1. Check fittings of amplifiers and cables.
2. Disconnect input to amplifier and measure antenna signals. If O.K., trouble is in amplifier.
3. Check tubes in amplifiers. Replace one tube at a time, reinserting original tube, if good. If anything other than tubes has failed, see service information for the particular amplifier.

B. LOSS OF ONE CHANNEL

1. This will be possible only where single channel antennas, preamplifiers or amplifiers are being used. Check the antenna and the preamplifier or mixing unit, if they are used.

C. OVERLOAD

1. This is a condition that should be watched for, since it may present itself in any amplifying system where the incoming signals vary greatly in strength. In either case, the best remedy is, of course, to keep the strength of all incoming signals below the rated maximum input of the particular amplifier and, as near as is possible, to try to keep all incoming signals at an equal strength. If an amplifier is overloaded, it will probably show up in one of two ways—either of which is easily recognizable. The first, and most common sign of overload is windshield-wiper effect. This is also known as cross-modulation and is caused by one channel being strong enough to overload the amplifier, and consequently spilling over into the other channels. This condition will only appear in broad band amplifiers where one common amplifier is handling all channels.

   CAUTION: Do not attempt to pad down the input of a channel in which cross-modulation is observed. Find a channel in the same band which is not bothered by cross-modulation and is fairly strong—this will probably be the offender. Remember that in cross-modulation the effects are noticed on the victims, rather than on the culprit. Another effect of amplifier overload will be excessive sync buzz in the sound and unstable sync in the receivers. This effect is one that may be noticed in systems using single channel amplifiers. The effect is different in that the channel being affected is probably the one that is too strong. The remedy, however, is the same. The overly strong signal must be attenuated to a proper value.

D. GHOSTS

The three most common causes of ghost images on a master antenna system, together with the proper cure for each are:

1. **Antenna pickup of reflections.**

   This can usually be overcome by proper selection, siting and orientation of antennas.

2. **Improper termination of cables.**

   Check all cables to make sure they are properly terminated with a terminating resistor. Check all terminating resistors to see that they are properly installed and make a good connection. Also check all fittings and splices to be sure they are made properly since, even with proper termination at the end, a feeder line may possibly be open somewhere in the middle.

3. **Direct pickup of signal by the receiver.**

   When a television distribution system is installed in the vicinity of a transmitter the problem of direct pickup may arise. This is caused by signal being picked up by the length of 300 ohm twin lead that connects the tap unit and the receiver. The problem results from an out of phase condition between the directly picked up signal and the signal received from the system. Since the signal in the system sees a delay of a few microseconds in the coaxial cable, the signal which is picked up directly will arrive at the tuner first. This will manifest itself in the picture as smear, a leading ghost, multiple ghost, or possibly unstable sync. If the signal from the transmitter is very strong, it may be necessary to utilize a tap unit with a 75-ohm coaxial output and run coaxial cable all the way to the receiver. If this proves necessary, the receiver itself should be checked for proper input connections. In some models an elevator transformer is provided at the tuner. If this is the case, arrange the connections on the transformer for 75-ohm match and run the coaxial cable directly to the tuner. In receivers with no 75-ohm provisions, a matching transformer such as the T-378 will be necessary at the receiver. The choice of the transformer is up to the installer. The difference is economy.

CAUTION:

DO NOT MOUNT THE MATCHING TRANSFORMER ON AN AC-DC OR TRANSFORMERLESS TYPE CHASSIS WHICH IS CONNECTED TO ONE SIDE OF THE AC LINE. DAMAGE TO THE RECEIVER, TO THE SYSTEM, OR PERSONAL INJURY MAY RESULT.

SERVICING THE SYSTEM

Qualified technicians can service Jerrold TV Distribution Equipment readily with proper test equipment. The mixing networks, tap units, splitters, pads, etc., rarely, if ever, cause any trouble. If inoperative, check for open leads, loose fittings or mechanical defects. Schematics and instruction sheets furnished with all amplifiers will facilitate servicing these units. It is suggested that alignment of wide band amplifiers, such as the ABD-1A and 2300A, should not be attempted in the field unless special wide band sweep equipment is available. If service of this type is required, it may be obtained by packing the unit securely and sending it, along with a covering letter, to Jerrold Electronics Corp., Repair Service, 15th Street and Lehigh Avenue, Philadelphia, Pa. 19132.

THE DECIBEL

You don't have to be a mathematician to handle the decibel, but you do have to start thinking with numbers of a different kind.

The most important thing to know about the decibel, db for short, is that it doesn't say "how much" or "how many" like the "10" in 10 dollars. It says "so many times." It's something like the word "twice." And, like "twice," it doesn't have any meaning in terms of quantity ("how much") unless you specify "so many times" *something*. For example, 6 db always means (in voltage) "two times" or twice as many.

The funny thing about the db is the non-linear relationship. Look at these examples.

6 db = 2x	20 db = 10x
10 db = 3.16x	30 db = 31.6x
12 db = 4x	40 db = 100x
18 db = 8x	60 db = 1000x

Notice that while 10 db is approximately 3x, 20 db = 10x, about 3 times greater than a quantity gained by doubling 10 db. But if you double 20 db to get 40 db, you get 100x, which is 10 times greater. All this comes from the way the db is derived, and because of its funny behavior, it makes all kinds of systems figuring simple. It's best that you try to follow the reasoning behind the db. We'll start with the formula—and don't let it scare you—if you've read this far, you know enough to follow this formula through. Here it is:

$$\text{db} = 20 \log_{10} \frac{E_1}{E_2}$$

Saying it in English, it goes like this: The db is equal to 20 times the common logarithm of the major (larger) voltage divided by the minor (smaller) voltage. Solving it goes like this. Suppose we have an amplifier and want to find its voltage gain in db. Then, being an amplifier, its output will be larger than its input, so the output voltage is the "major" voltage. Divide the output by the input, the formula says, so let's assign some values. Say the output voltage is 100 and the input 10, then $100 \div 10 = 10$. Now the formula is reduced to:

$$db = 20 \log_{10} 10$$

Now we have to find the common logarithm of 10. This is what causes most TV repairmen to gulp—they forgot their logarithms as soon as possible after leaving high school. But there's no mystery about the common log. The common log, or logarithm to the base 10, is only that little number that goes above and to the right of a number, the exponent, like in 10^1—but when used as the log, it is the exponent required to raise 10 to the number we have in mind.

As an example, 2 is the logarithm of 100, since 10 raised to the 2nd power (10^2) equals 100. Now, every number we know can be expressed as a power of 10, and mathematicians have spent years compiling log tables to the tenth decimal place. In our particular problem, we have to find the exponent which makes 10 equal to the base of the common logarithm, which is also 10. This one's easy—it's 10^1, so that the common log of $\frac{E_1}{E_2}$ equals 1. The formula now looks like this:

$$db = 20 \times 1, \text{ and db (gain)} = 20$$

We have found out that the amplifier's gain is 20 db. Of course, if we'd found a fractional number, like 18.5 when we divided E_1 by E_2, we'd need a log table to find the common log of 18.5. This you'll never need as long as you have this particular booklet, which has a conversion chart from the ratio expressed by $\frac{E_1}{E_2}$ directly to db.

One of the puzzling things about the db is 0 db. 0 db isn't "nothing"—it's something. It's the same as saying "there's a relationship of one to one"—in other words no gain—no loss. It works out like this, and we can use the amplifier we had before, but now we find the input is 10 volts and the output 10 volts. The formula then looks like this:

$$\begin{aligned} db &= 20 \log_{10} \frac{E_1}{E_2} \\ &= 20 \log_{10} \frac{10}{10} \\ &= 20 \log_{10} 1 \end{aligned}$$

Since 10 divided by 10 is 1.

The question now is what exponent will raise 1 to 10? This is a funny one, the logic of which has escaped mathematicians—they only know it works—Look:

$$\begin{aligned} 10^2 &= 100 \\ 10^1 &= 10 \\ 10^0 &= 1 \\ 10^{-1} &= .1 \end{aligned}$$

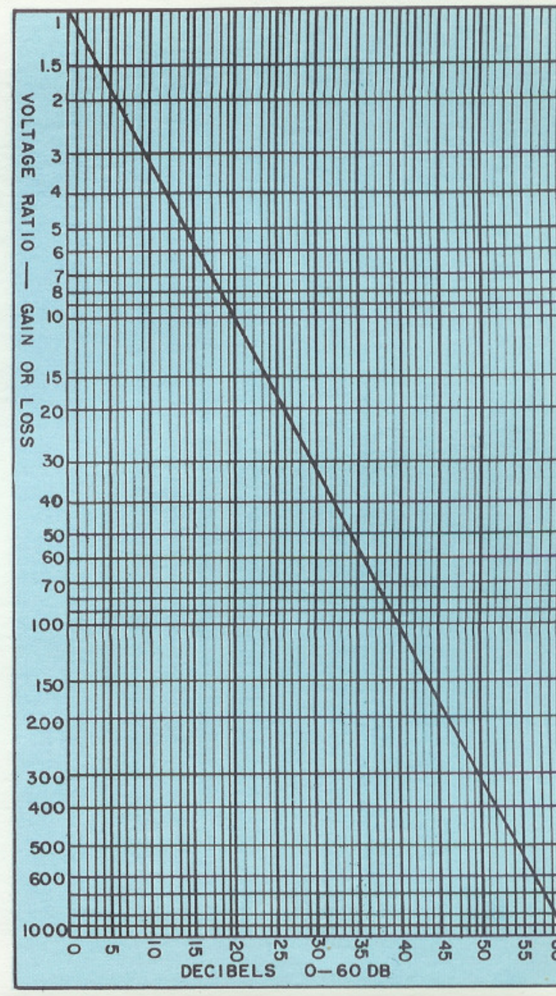
We can see the sense behind the first, second and fourth expression, but the third only makes sense because it fits *and* works. Let's put it into the formula.

$$db = 20 \times 0, \text{ and therefore the amplifier's gain is 0 db.}$$

Now this boils down to the fact that when we say 6 db, we mean that we are talking about something which is twice as great as 0 db, since 0 db is one times, and 6 db is 2 times. The question always comes—"What's 0 db?" The answer is—0 db is anything you choose to make it! In audio, committees of engineers have assigned a value to 0 db, which they agreed upon. In TV systems you can specify what you like. It can be the antenna signal, for instance, or you can choose 1,000 microvolts read across 75 ohms impedance. If you do the latter, call it dbj—because we at Jerrold have agreed upon this as a pretty good signal for a TV set.

The great advantage of using the db is that you can add and subtract numbers in db when computing a system, and the numbers stay small. Otherwise you'd have to divide or multiply at each step, and your computations would involve large, complex numbers.

DB CONVERSION



DB CALCULATIONS

3 DB = 1.4X	
6 DB = 2X	
10 DB = 3X	20 DB = 10X
30 DB = 30X	40 DB = 100X
50 DB = 300X	60 DB = 1000X

To approximate unlisted values, find values above whose sum equals the unlisted value, and multiply the corresponding ratios. Example: Find ratio equal to 52 db. 40 db + 6 db + 6 db = 52 db. Stated in ratios, (100X) x (2X) x (2X) = 400X.

SPECIFICATIONS Amplifiers

	Model 2880	Model 2300A	Model ABD-1A	Model ACL-200
Frequency Range	54 to 108 mc and 174 to 216 mc			
Minimum Gain **Lo-Band:** **Hi-Band:** **FM-Band:**	41 db 44 db 92 MC: 41 db 108 MC: 20 db approx.	39 db 40 db 98 MC: 39 db 108 MC: 23 db approx.	22 db 20 db 98 MC: 22 db 108 MC: 10 db	20 db 19 db 98 MC: 20 db 108 MC: 8 db
Impedance **Input:** **Output:**	75 ohms 75 ohms	75 ohms 75 ohms	75 ohms 75 ohms	300 ohms 75 or 300 ohms
Output Capability Per Channel for 7 Channels at ½% Cross-Modulation*	1.0 v (60 dbj**)	0.3 v (50 dbj)	0.3 v (50 dbj)	at 75 ohms: 0.15 v (44 dbj)—Lo-band 0.10 v (40 dbj)—Hi-band at 300 ohms: 0.30 v—Lo-band 0.20 v—Hi-band
Flatness of Response	1.5 db P/V	1.0 db P/V	2.5 db P/V	2.0 db P/V
Tube Complement	*(1) 6EH7 *(1) 6ES8 *(1) 6DJ8 *(2) 6EJ7 *(3) TJ880 (2) 12BY7A *frame grid types	*(2) 6DJ8 *(2) 6EJ7 *(1) 6CB6 (2) 12BY7A *frame grid types	(2) 6DJ8 (frame grid type) (2) 12BY7A	(2) 6DJ8 (frame grid type)
Power Requirements	117 VAC, 60 C.P.S. 92 Watts	117 VAC, 60 C.P.S. 63 Watts	117 VAC, 60 C.P.S. 45 Watts	117 VAC, 60 C.P.S. 18 Watts
Dimensions	17" L, 7" W, 5¼" H.	14¼" L, 7½" W, 5¼" H.	12" L, 6" W, 4½" H.	9" L, 5¾" W, 3½" H.
Shipping Weight	18 lbs.	12½ lbs.	9 lbs.	5 lbs.

*Represents capability **PER CHANNEL** for 3-ch. lo-band and 4-ch. hi-band operation. The units are capable of much higher output operation for the same number of channels; however, ½% cross-modulation is well below any objectionable signs of overload and is the best rating to use in designing systems.

**0 dbj = 1000 microvolts across 75 ohms.

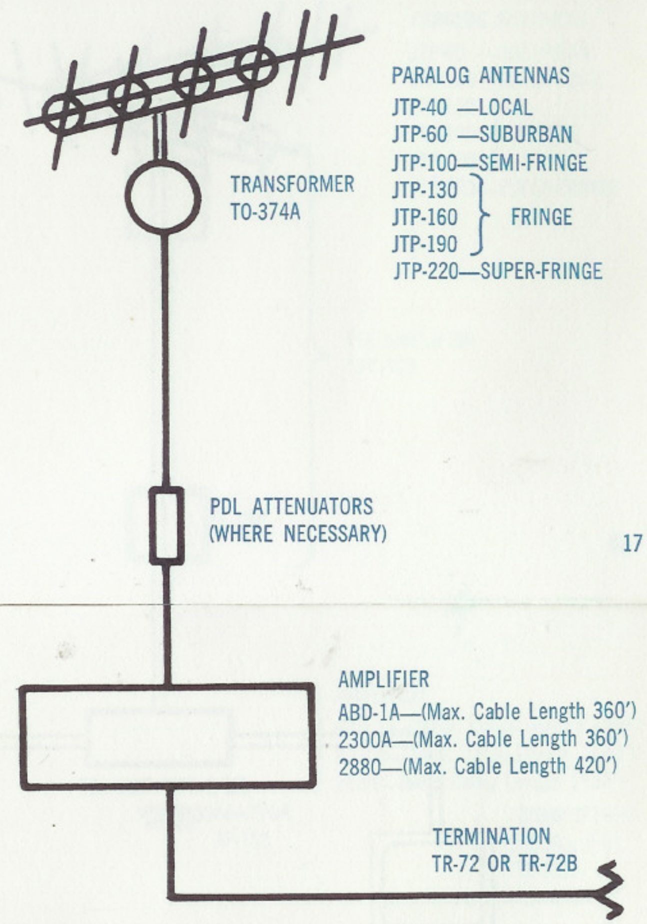
SPECIFICATIONS Solid-State Pre-amplifiers

	VHF				UHF	
MODELS	APM 102	SPM 102	SPC 103	SPC 132	ULP 104	UPM 104
Bandwidth (mc)	54-108 174-216	54-88 174-216	54-88 174-216	54-88 174-216	470-890	470-890
Gain—Lo band (db)	17.5	15.3	15.3	25	UHF	UHF
Gain—Hi band (db)	13.0	11.2	11.2	29	5.0	14.0
Gain—FM	15.0	0	0	0	NA	NA
Freq. Response (db)	1.5 P/V	1.0 P/V	1.0 P/V	1.0/ch[2]	0.5/ch[2]	0.5/ch[2]
Noise Figure (db)	4—6	4—6	4—6	4—6	12	12
Max. Input (300 Ω uv)	5,000	100,000	100,000	Lo-30 k Hi-20 k	20,000[3]	7,500[3]
Max. Output (300 Ω uv)	Lo-40 k Hi-20 k	700,000	700,000	Lo-48 dbj Hi-40 dbj (75Ω)	36,000	36,000
Input Impedance	300 Ω	300 Ω	300 Ω	300 Ω	300 Ω	300 Ω
Output Impedance	300 Ω	300 Ω	300 or 75 Ω	300 or 75 Ω	300 Ω	300 Ω
Down-lead Impedance	300 Ω	300 Ω	75 Ω	75 Ω	300 Ω	300 Ω
Power Supply	102	102	103	NA[1]	104	104
Power Consumption	3 w	3 w	3 w	5 w	3 w	4 w

NA—Not applicable
1. Post-amplifier Model 132 contains power supply.
2. Max. tilt across any channel.
3. For two channels in.

BROAD-BAND ANTENNA FOR VHF STATIONS IN SAME DIRECTION

COMMERCIAL 1



17

Amplifier: ABD-1A or 2300A			LOCATION OF TAPS ALONG FEEDER LINE:	Amplifier: 2880		
TAPS	UT-22, 33	1401		TAPS	UT-22, 33	1401
	14-W	22-R	Nearest Amplifier		22-W	30-R
	7-R	3-Y	Next Group Away		8-R	3-Y
	5-Y	1-G	Last Group		4-Y	1-G

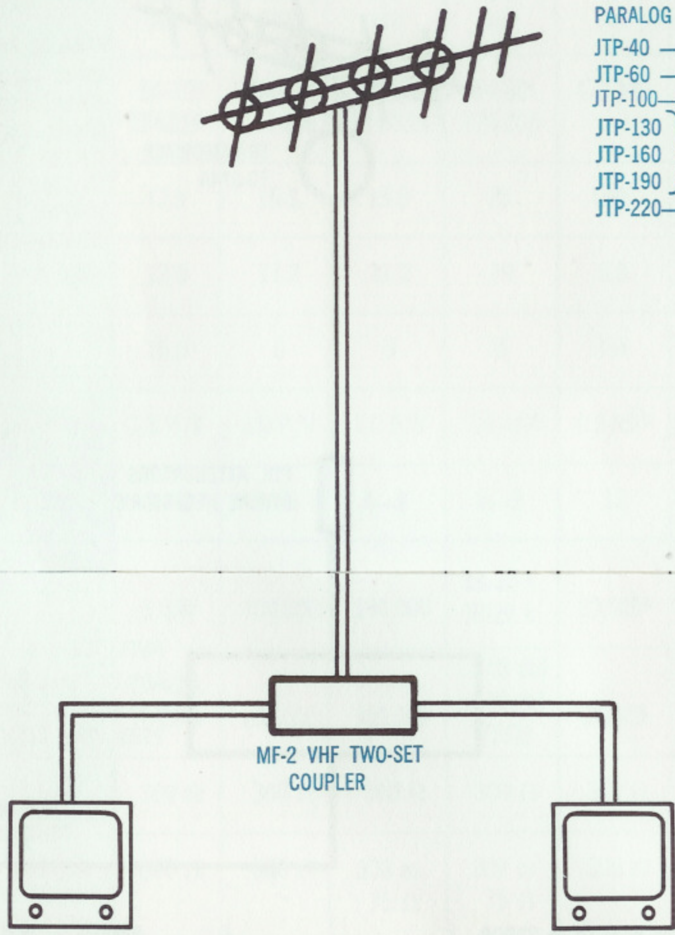
Taps Calculated on 15′ Spacing. RG-59/U Cable Used
(Refer to Typical Tap-Off Application Drawing for Tap Use—Page 33)

SINGLE FEEDER LINE, RG-59/U

COMMERCIAL A

RESIDENTIAL
1

VHF BROAD-BAND ANTENNA



PARALOG ANTENNAS
JTP-40 —LOCAL
JTP-60 —SUBURBAN
JTP-100—SEMI-FRINGE
JTP-130 }
JTP-160 } FRINGE
JTP-190 }
JTP-220—SUPER-FRINGE

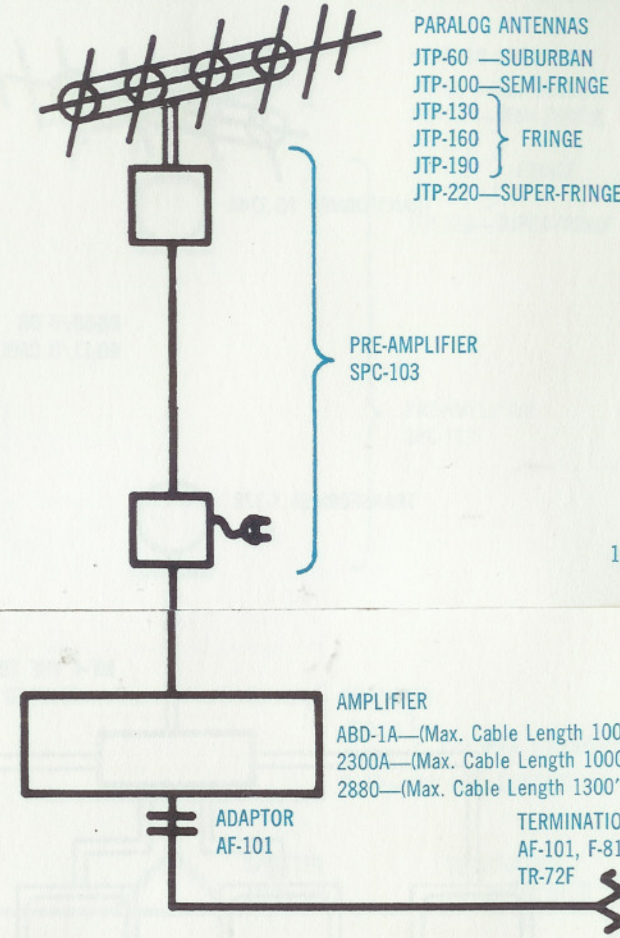
TWO SETS IN AREAS OF MEDIUM TO HIGH SIGNAL STRENGTH.
LOSS TO EACH RECEIVER FROM 4 TO 7 DB PLUS LINE LOSSES.
USE WITH HEAD ENDS 1, 2, 3, 5.

RESIDENTIAL
A

TWO-SET PASSIVE SYSTEM

PRE-AMPLIFIED VHF BROAD-BAND FOR STATIONS IN SAME DIRECTION

COMMERCIAL
2



PARALOG ANTENNAS
JTP-60 —SUBURBAN
JTP-100—SEMI-FRINGE
JTP-130 }
JTP-160 } FRINGE
JTP-190 }
JTP-220—SUPER-FRINGE

PRE-AMPLIFIER
SPC-103

AMPLIFIER
ABD-1A—(Max. Cable Length 1000′)
2300A—(Max. Cable Length 1000′)
2880—(Max. Cable Length 1300′)

ADAPTOR
AF-101

TERMINATION
AF-101, F-81
TR-72F

Amplifier: ABD-1A or 2300A	LOCATION OF TAPS ALONG FEEDER LINE:	Amplifier: 2880
TAP PT-1461A		TAP PT-1461A
27-W	Nearest Amplifier	40-W
8-R	Next Group Away	8-R
3-Y	Next Group Away	3-Y
2-G	Last Group	1-G

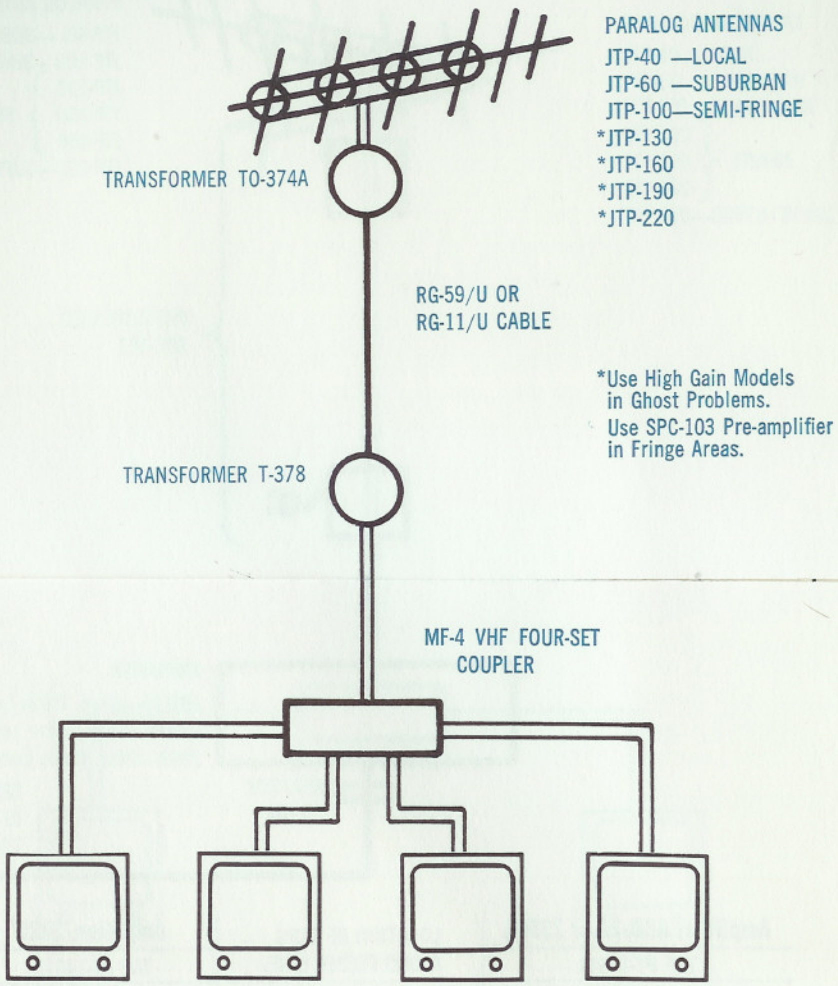
Taps Calculated on 25′ Spacing. RG-11/U Cable Used
(Refer to Typical Tap-Off Application Drawing for Tap Use—Page 33)

SINGLE FEEDER LINE, RG-11/U

COMMERCIAL
B

RESIDENTIAL 2

VHF BROAD-BAND ANTENNA WITH COAXIAL LEAD-IN (BEST FOR COLOR)



THREE OR FOUR SETS IN HIGH MEDIUM TO STRONG SIGNAL AREAS.
UP TO 10 DB LOSS TO EACH RECEIVER, PLUS LINE LOSSES.

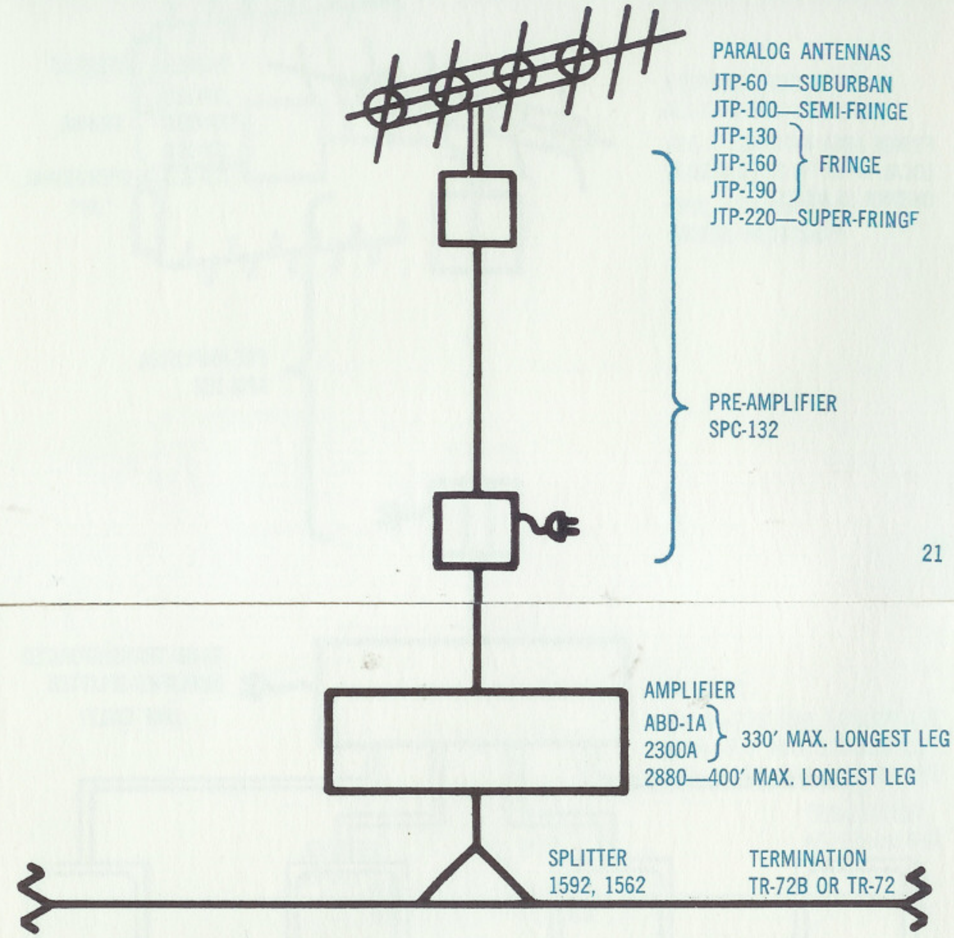
USE WITH HEAD ENDS 1, 2, 3, 5.

RESIDENTIAL B

FOUR-SET PASSIVE SYSTEM

COMMERCIAL 3

HIGH-GAIN PRE-AMPLIFIED VHF BROAD-BAND FOR STATIONS IN SAME DIRECTION



Amplifier: ABD-1A or 2300A			LOCATION OF TAPS	Amplifier: 2880		
TAPS	UT-22, 33	1401	ALONG FEEDER LINE:	TAPS	UT-22, 33	1401
	9-W	17-R	Nearest Amplifier		17-W	25-R
	7-R	3-Y	Next Group Away		8-R	3-Y
	5-Y	1-G	Last Group		4-Y	1-G

Taps Calculated on 15′ Spacing. RG-59/U Cable Used
(Refer to Typical Tap-Off Application Drawing for Tap Use—Page 33)

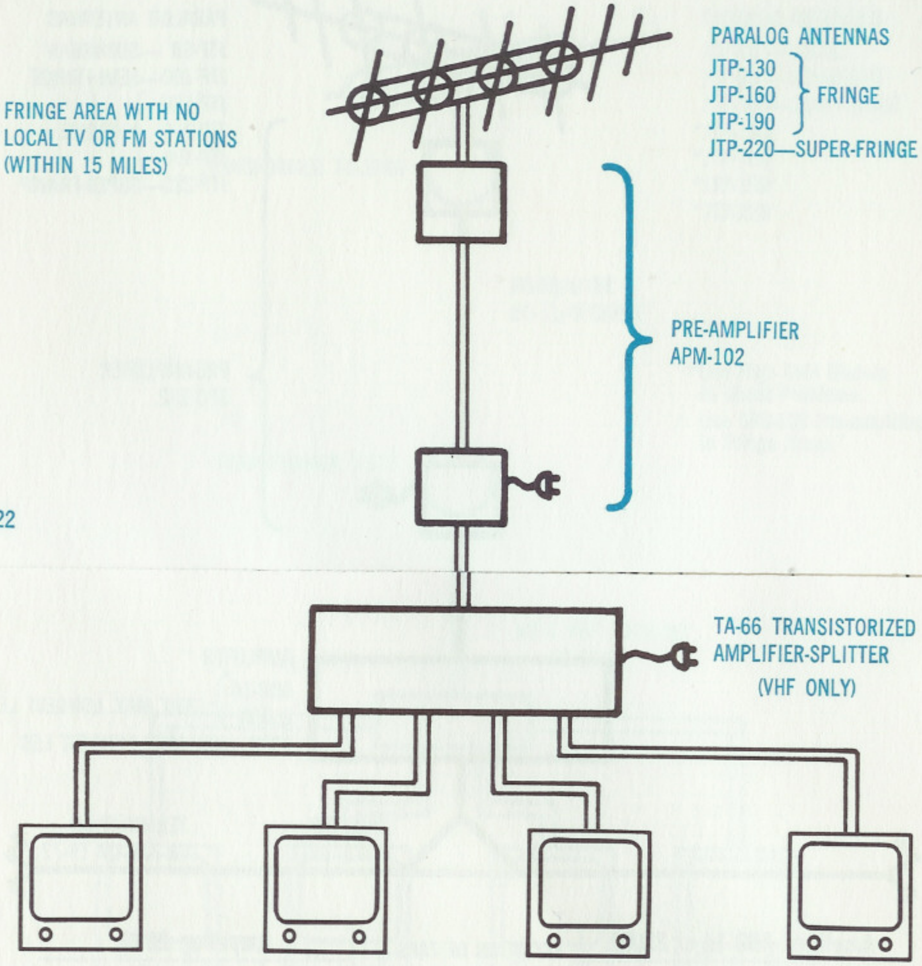
COMMERCIAL C

TWO-WAY SPLIT RG-59/U

RESIDENTIAL
3

FRINGE AREA PRE-AMPLIFIED VHF BROAD-BAND ARRAY

FRINGE AREA WITH NO LOCAL TV OR FM STATIONS (WITHIN 15 MILES)



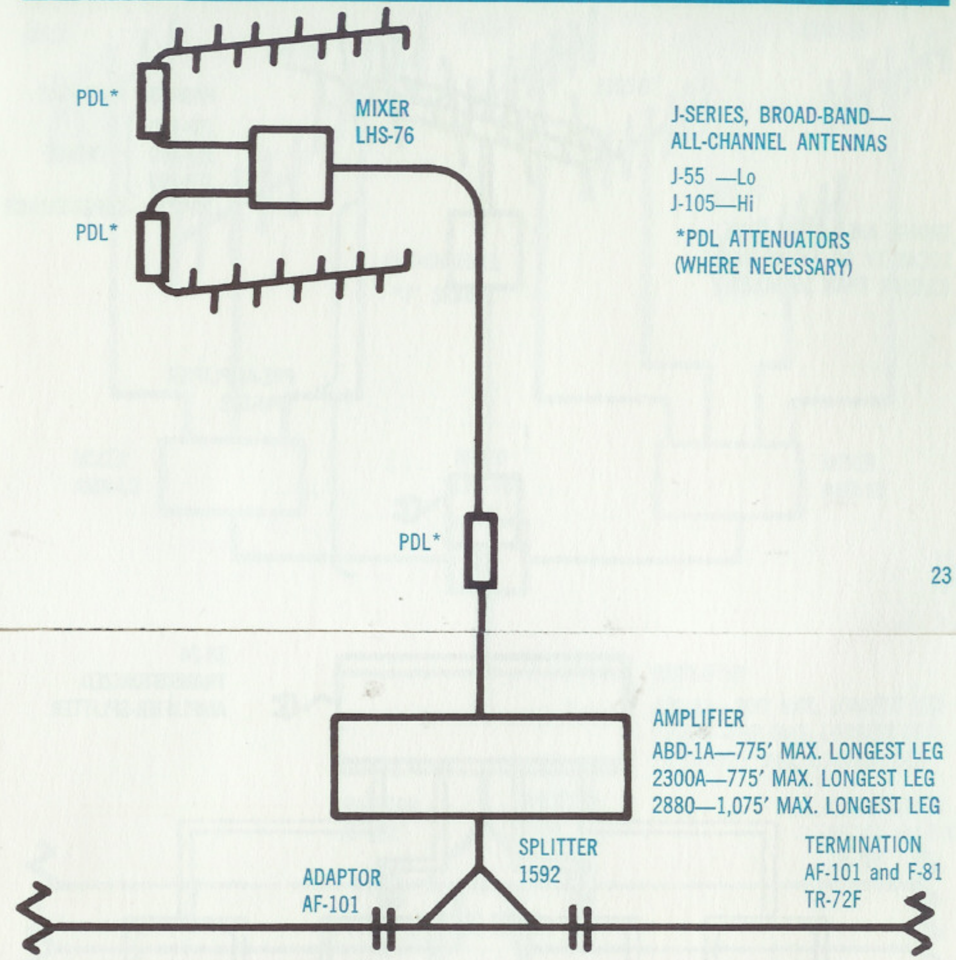
1, 2, 3, OR 4 SETS IN AREAS WITH LOCAL AND FRINGE SIGNALS.
GAIN APPROXIMATELY 6 DB TO EACH RECEIVER.
USE WITH HEAD ENDS 1, 2, 3, 4 AND 5 ONLY.

RESIDENTIAL
C

FOUR-SET AMPLIFIED SYSTEM

RUGGEDIZED VHF BROAD-BAND ANTENNAS, ALL-CHANNEL, ALL-COAXIAL CABLE

COMMERCIAL
4



Amplifier: ABD-1A or 2300A	LOCATION OF TAPS ALONG FEEDER LINE:	**Amplifier: 2880**
TAP PT-1461A		TAP PT-1461A
18-W	Nearest Amplifier	31-W
8-R	Next Group Away	8-R
3-Y	Next Group Away	3-Y
2-G	Last Group	1-G

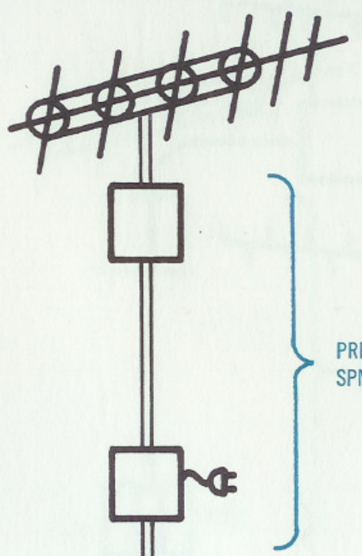
Taps Calculated on 25′ Spacing. RG-11/U Cable Used
(Refer to Typical Tap-Off Application Drawing for Tap Use—Page 33)

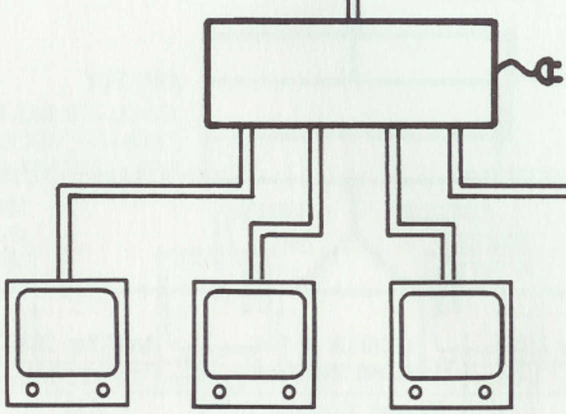
TWO-WAY SPLIT RG-11/U

COMMERCIAL
D

RESIDENTIAL **4**

PRE-AMPLIFIED VHF BROAD-BAND ARRAY FOR FRINGE AND LOCAL STATIONS





1, 2, 3 OR 4 SETS IN AREAS OF MEDIUM TO LOW SIGNAL STRENGTH.
GAIN 1 TO 2 DB TO EACH RECEIVER.

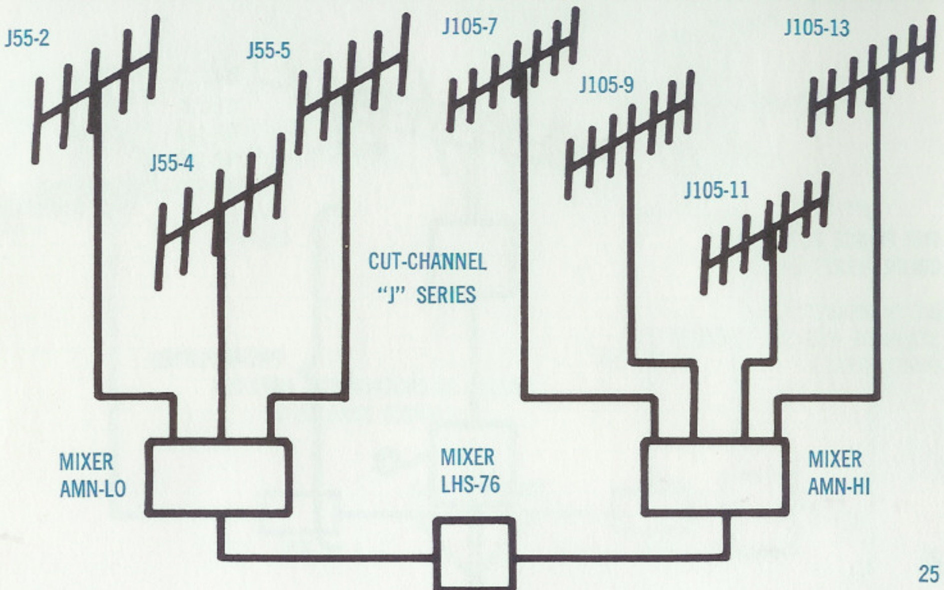
USE WITH HEAD ENDS 1, 2 AND 3 ONLY.

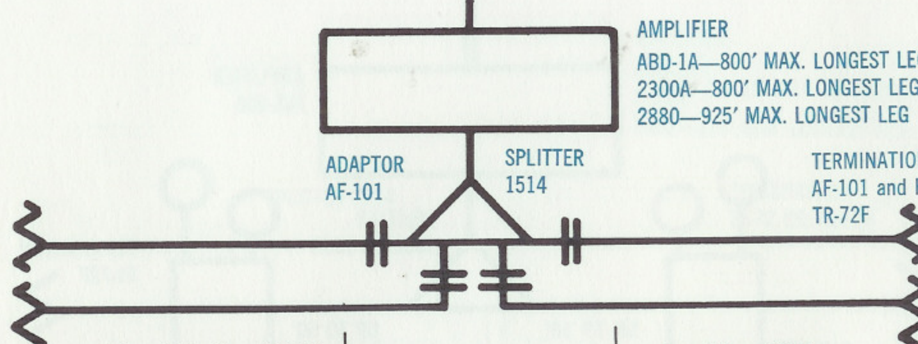
RESIDENTIAL **D**

ECONOMY FOUR-SET AMPLIFIED SYSTEM

CUT-CHANNEL, RUGGEDIZED YAGI, MULTI-CHANNEL ARRAY, 7 CHANNELS TYPICAL

COMMERCIAL **5**





Amplifier: ABD-1A or 2300A	LOCATION OF TAPS ALONG FEEDER LINE:	Amplifier: 2880
TAP PT-1461A		TAP PT-1461A
12-W	Nearest Amplifier	25-W
15-R	Next Group Away	8-R
3-Y	Next Group Away	3-Y
2-G	Last Group	1-G

Taps Calculated on 25′ Spacing. RG-11/U Cable Used
(Refer to Typical Tap-Off Application Drawing for Tap Use—Page 33)

FOUR-WAY SPLIT, RG-11/U

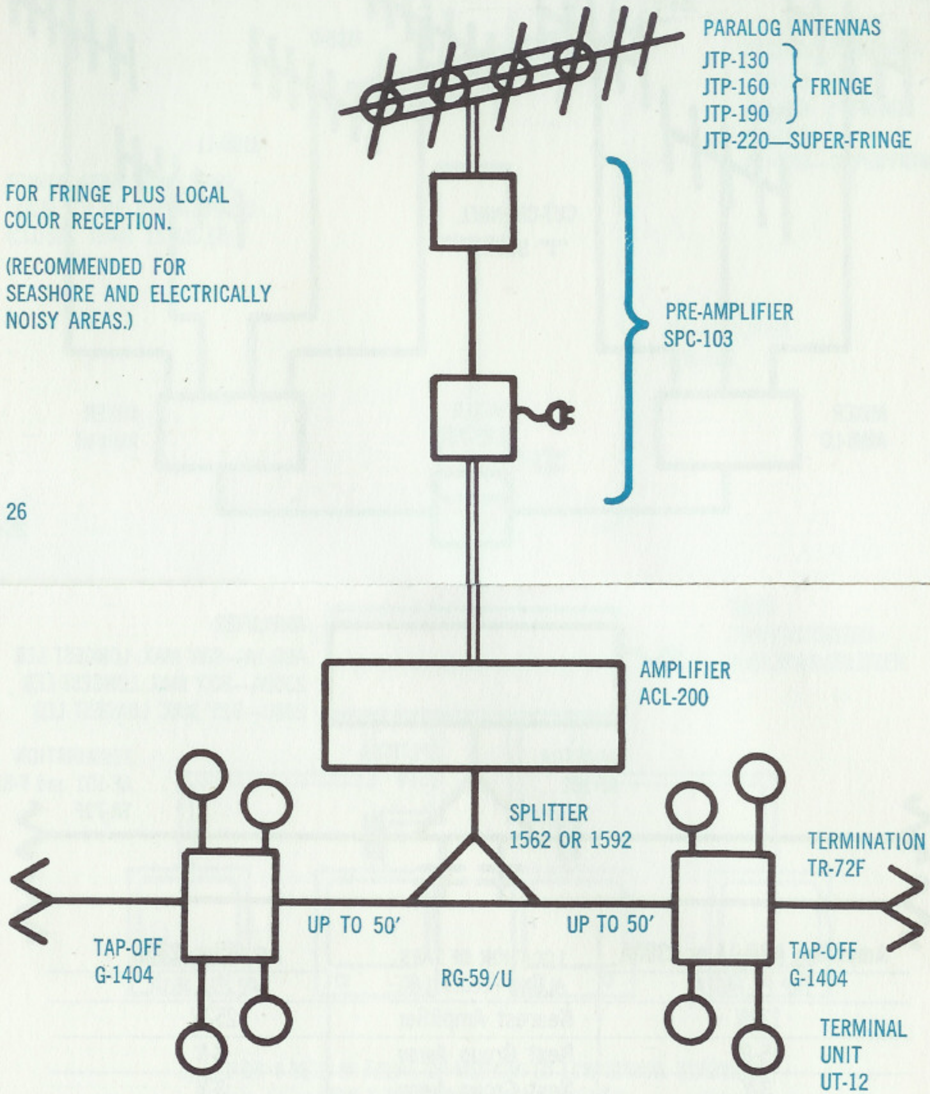
COMMERCIAL **E**

RESIDENTIAL 5

PRE-AMPLIFIED VHF BROAD-BAND ARRAY WITH COAXIAL LEAD-IN (BEST FOR COLOR)

FOR FRINGE PLUS LOCAL COLOR RECEPTION.

(RECOMMENDED FOR SEASHORE AND ELECTRICALLY NOISY AREAS.)

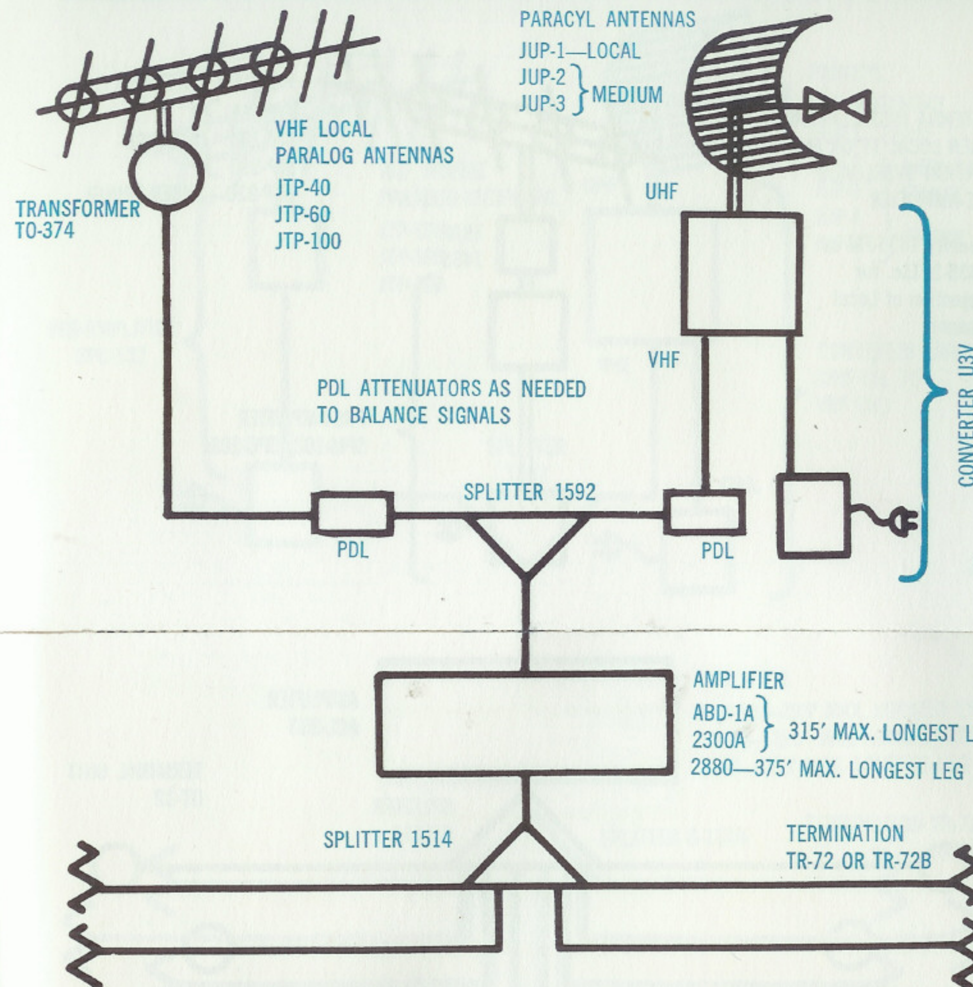


RESIDENTIAL E

DELUXE 8-OUTLET AMPLIFIED COAXIAL SYSTEM

BROAD-BAND VHF AND LOCAL UHF TO VHF CONVERSION

COMMERCIAL 6



Amplifier: ABD-1A or 2300A				Amplifier: 2880		
TAPS	UT-22, 33	1401	LOCATION OF TAPS ALONG FEEDER LINE:	TAPS	UT-22, 33	1401
	8-W	17-R	Nearest Amplifier		13-W	21-R
	8-R	3-Y	Next Group Away		8-R	3-Y
	5-Y	1-G	Last Group		4-Y	1-G

Taps Calculated on 15′ Spacing. RG-59/U Cable Used
(Refer to Typical Tap-Off Application Drawing for Tap Use—Page 33)

FOUR-WAY SPLIT, RG-59/U

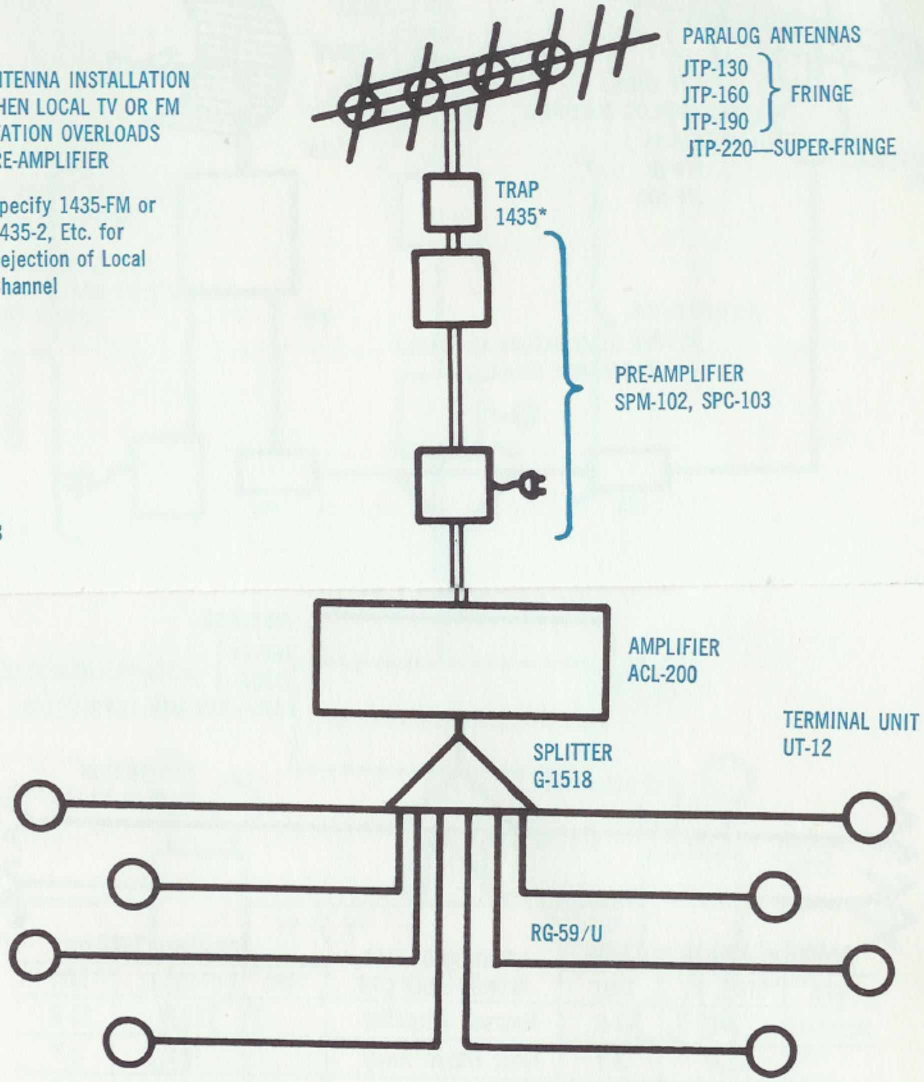
COMMERCIAL F

RESIDENTIAL
6

VHF FRINGE ARRAY WITH LOCAL STATION OVERLOAD PROBLEMS

ANTENNA INSTALLATION WHEN LOCAL TV OR FM STATION OVERLOADS PRE-AMPLIFIER

*Specify 1435-FM or 1435-2, Etc. for Rejection of Local Channel

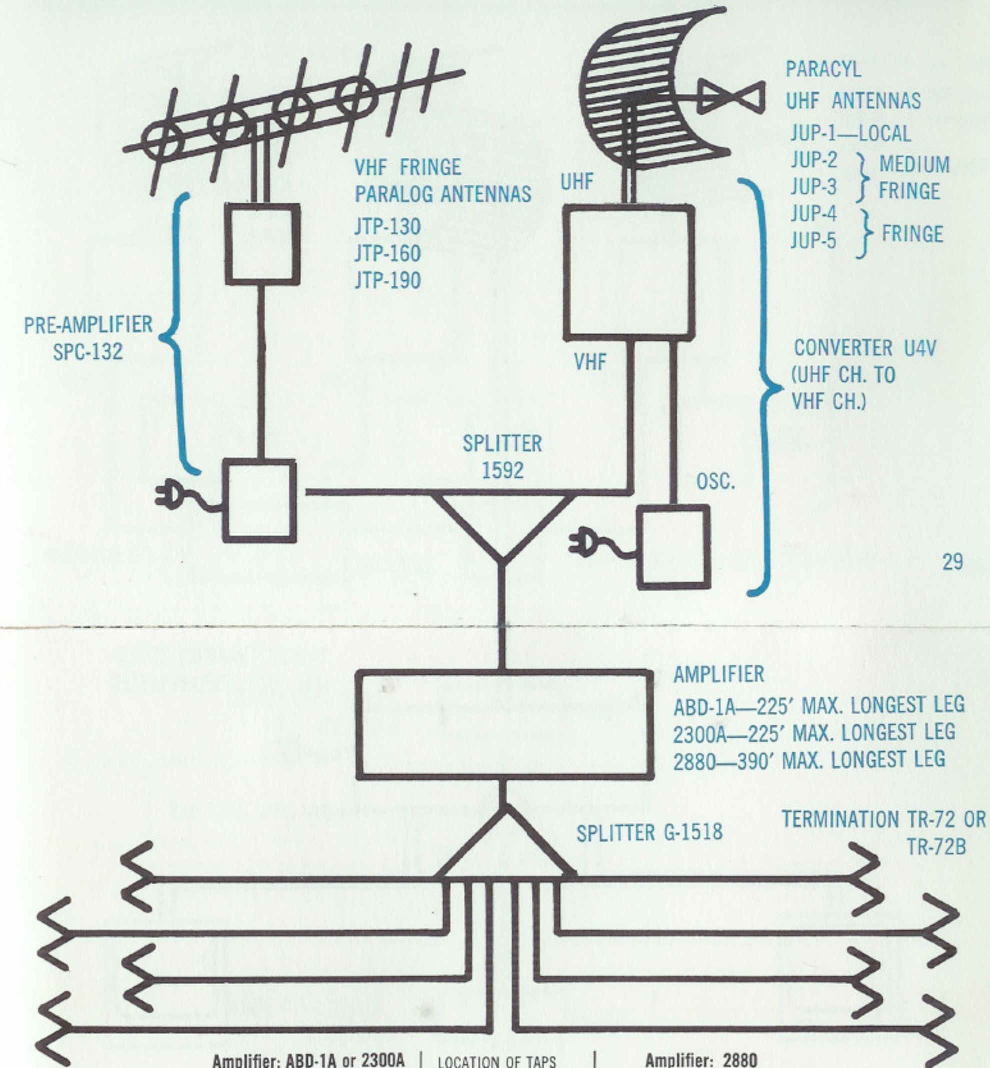


RESIDENTIAL
F

DELUXE 8-OUTLET BRANCHING COAXIAL SYSTEM

FRINGE PRE-AMPLIFIED VHF AND MEDIUM TO FRINGE UHF TO VHF CONVERSION

COMMERCIAL
7



Amplifier: ABD-1A or 2300A			LOCATION OF TAPS ALONG FEEDER LINE:	Amplifier: 2880		
TAPS	UT-22, 33	1401		TAPS	UT-22, 33	1401
	2-W	11-R	Nearest Amplifier		14-W	22-R
	8-R	3-Y	Next Group Away		7-R	3-Y
	5-Y	1-G	Last Group		5-Y	1-G

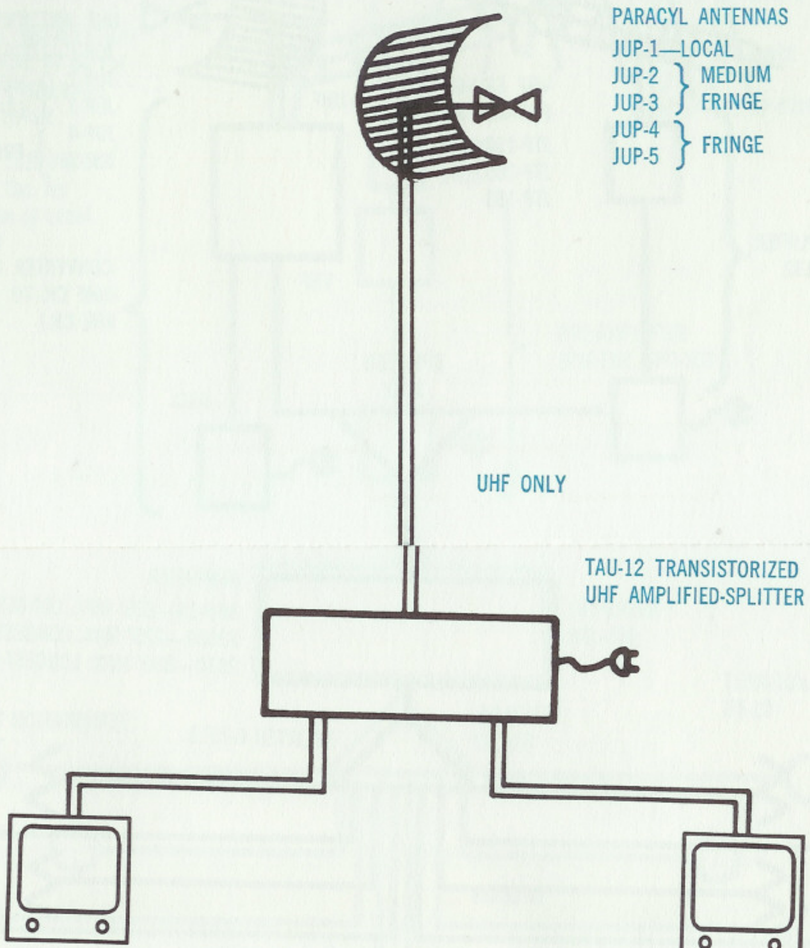
Taps Calculated on 15′ Spacing. RG-59/U Cable Used
(Refer to Typical Tap-Off Application Drawing for Tap Use—Page 33)

EIGHT-WAY SPLIT, RG-59/U

COMMERCIAL
G

RESIDENTIAL 7

UHF BROAD-BAND ARRAY



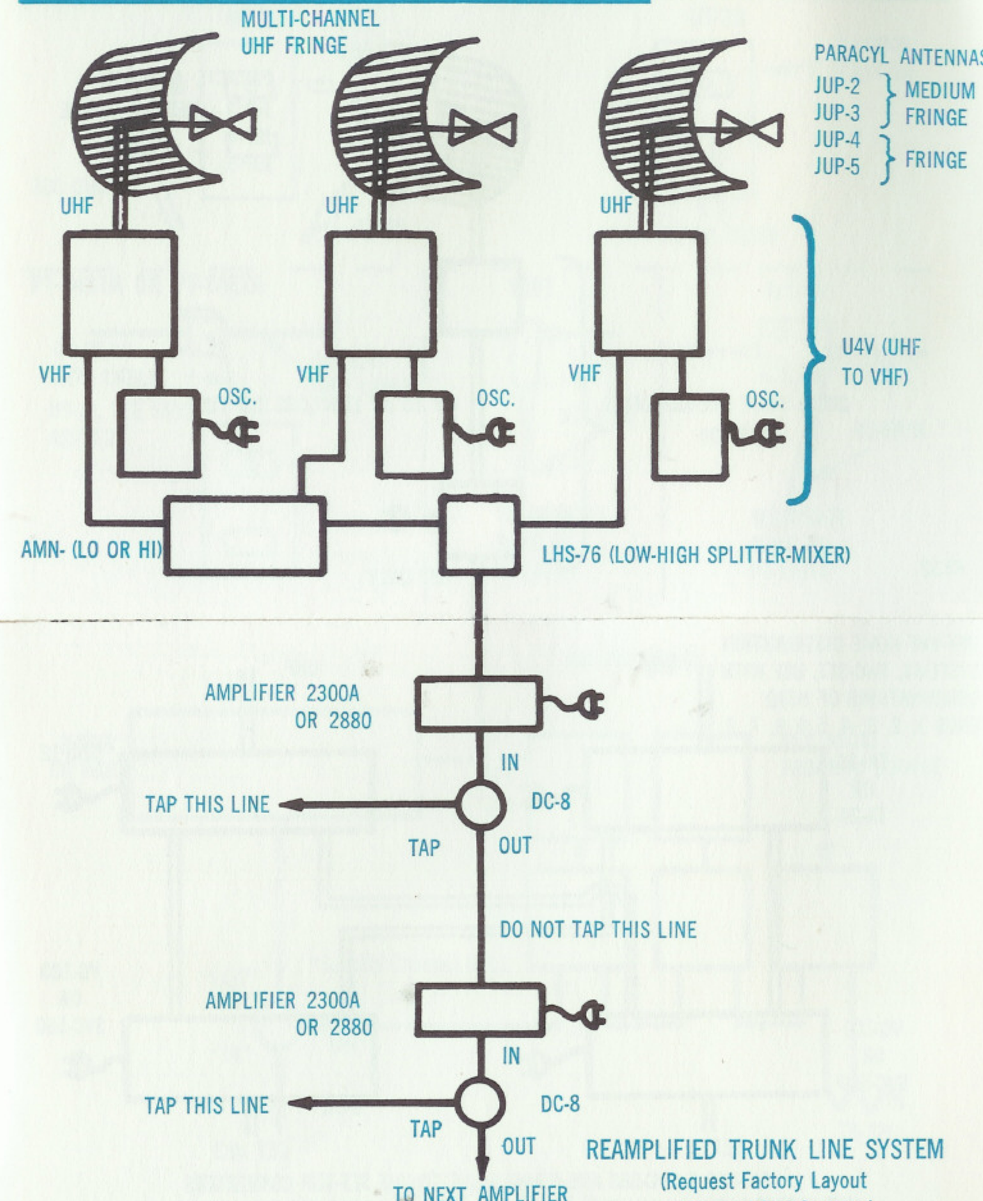
30

UHF, AMPLIFIED, TWO SETS, IN ALL SIGNAL AREAS.
USE WITH HEAD ENDS 7, 8, 9

RESIDENTIAL G

TWO-SET AMPLIFIED UHF SYSTEM

MULTI-CHANNEL UHF CONVERSION TO VHF CHANNELS



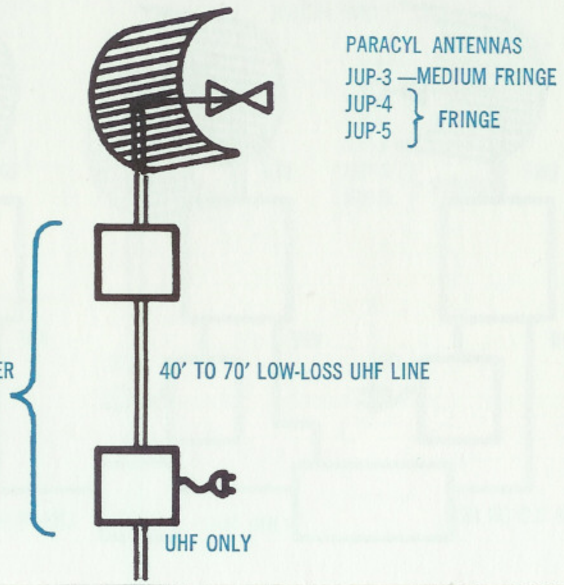
REAMPLIFIED TRUNK LINE SYSTEM
(Request Factory Layout
on Re-amplified Systems)

CASCADED AMPLIFIERS, LONG-LINE SYSTEM

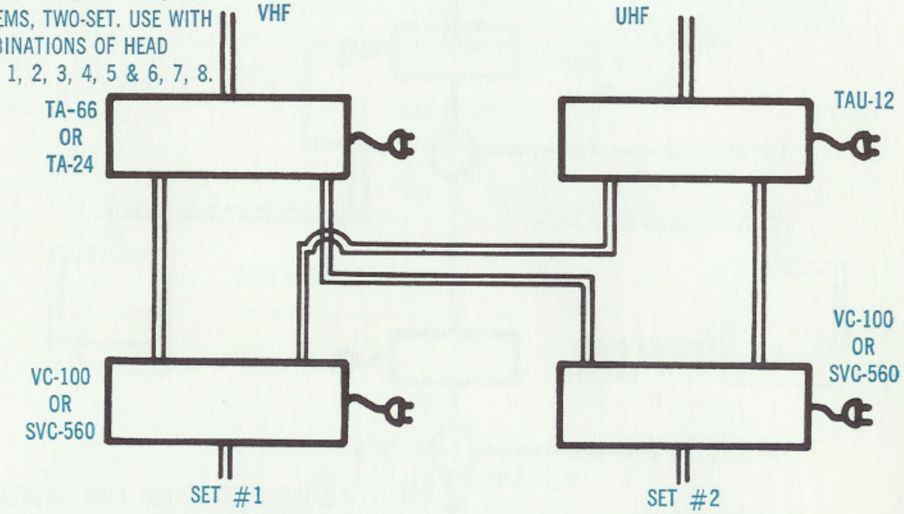
COMMERCIAL H

RESIDENTIAL 8

PRE-AMPLIFIED FRINGE UHF, RELATIVELY SHORT TO MEDIUM LEAD-IN



UHF-VHF HOME DISTRIBUTION SYSTEMS, TWO-SET. USE WITH COMBINATIONS OF HEAD ENDS 1, 2, 3, 4, 5 & 6, 7, 8.

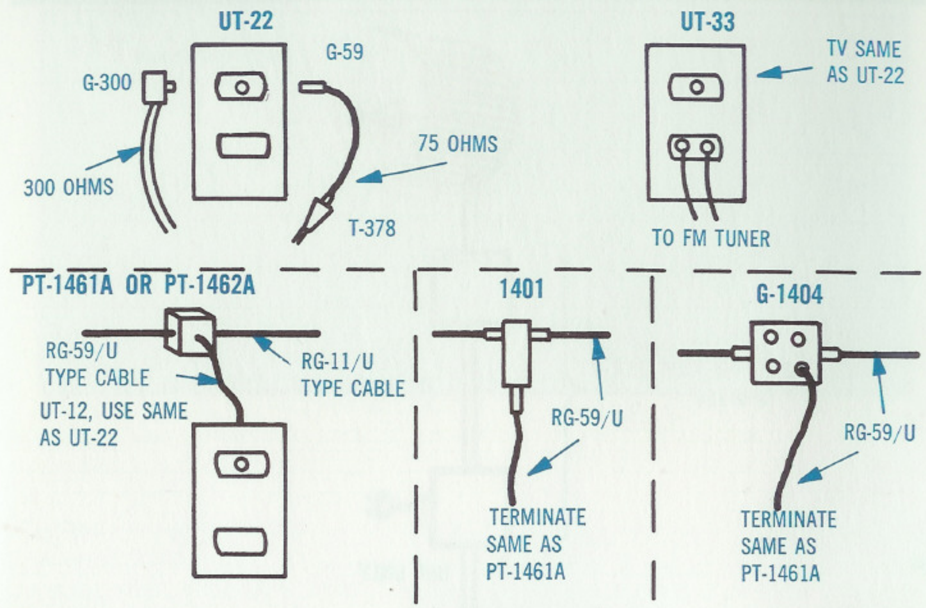


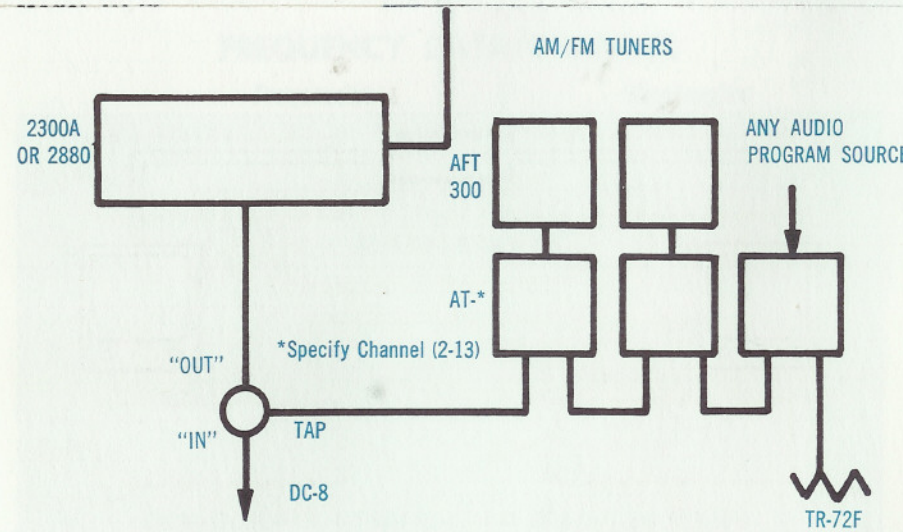
(VC-100 & SVC-560 ARE JERROLD UHF TO VHF SET-TOP CONVERTERS NOT NEEDED WITH ALL-CHANNEL RECEIVERS. NOTE: UVC-7083 FOR TRANSLATOR AREAS.)

RESIDENTIAL H

AMPLIFIED TWO-SET UHF AND VHF SYSTEM

TYPICAL TAP-OFF APPLICATION





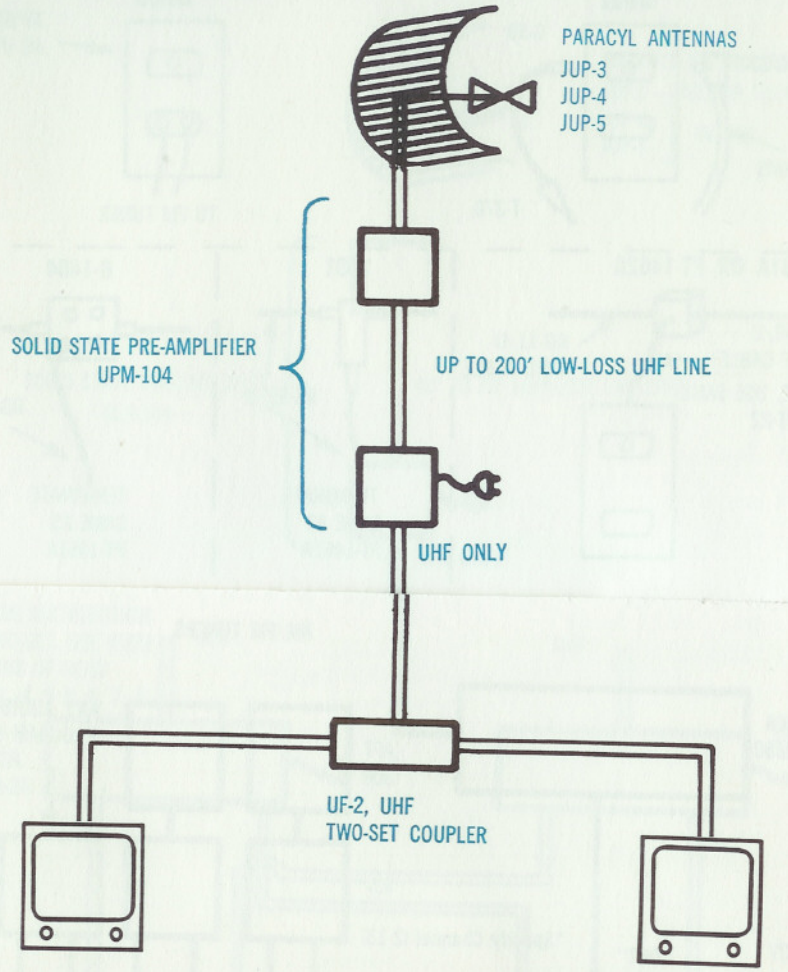
AUDIO-TROL SYSTEM

RADIO OR BACKGROUND MUSIC ON UNUSED TV CHANNELS, AUDIO-TROLS

COMMERCIAL I

RESIDENTIAL 9

PRE-AMPLIFIED FRINGE UHF, HIGH ANTENNA AND LONG LEAD-IN



UHF, PASSIVE, TWO SETS, IN HIGH OR MEDIUM SIGNAL LEVEL AREAS.
USE WITH HEAD ENDS 7, 8, 9.

RESIDENTIAL 1

TWO-SET PASSIVE UHF SYSTEM

34

COAXIAL CABLE LOSSES IN DECIBELS/100′

TYPE CABLE	CH. 2	CH. 4	CH. 6	FM	CH. 7	CH. 10	CH. 13
RG-59/U	2.8	3.2	3.6	4.0	5.3	5.6	5.9
RG-6/U	2.1	2.3	2.6	2.7	4.0	4.15	4.3
RG-11/U	1.6	1.8	2.0	2.2	2.7	2.85	3.0
RG-6/U Foam	1.69	1.87	2.09	2.12	3.16	3.33	3.5
RG-11/U Foam	1.1	1.3	1.4	1.5	1.6	1.9	2.3

FREQUENCY DATA/CHANNEL

	Frequencies			Wavelengths		
CH.	BANDWIDTH FREQ-MC	PIX-CAR MC	SND-CAR MC	AIR IN.*	COAX IN.* VEL. PROP. 0.66	COAX IN.* VEL. PROP. 0.82
2	54-60	55.25	59.75	205	135	168
3	60-66	61.25	65.25	186	123	153
4	66-72	67.25	71.75	170	112	139
5	76-82	77.25	81.75	148	97.5	121
6	82-88	83.25	87.75	138	91	112
7	174-180	175.25	179.75	66.5	44	54.5
8	180-186	181.25	185.75	64.5	42.5	53
9	186-192	187.25	191.75	62.25	41	51
10	192-198	193.25	197.75	60.5	40	49.5
11	198-204	199.25	203.75	58.5	38.5	47.5
12	204-210	205.25	209.75	57	37.5	46.5
13	210-216	211.25	215.75	55.25	36.5	45

(COLOR SUB CARRIER = PIX CARRIER + 3.58 MC APPROXIMATE)

*All wavelengths at mid-band.

DECIBELS AND DBJ CHART

REF. LEVEL 0 DBJ = 1000 UV ACROSS 75 OHMS

+		−	
60 DBJ	1,000,000 UV	2 DBJ	794 UV
50 DBJ	316,000 UV	3 DBJ	708 UV
40 DBJ	100,000 UV	6 DBJ	501 UV
30 DBJ	32,000 UV	10 DBJ	316 UV
20 DBJ	10,000 UV	12 DBJ	250 UV
18 DBJ	7,943 UV	15 DBJ	179 UV
15 DBJ	5,623 UV	18 DBJ	126 UV
12 DBJ	3,981 UV	20 DBJ	100 UV
10 DBJ	3,162 UV	30 DBJ	32 UV
6 DBJ	1,995 UV	40 DBJ	10 UV
3 DBJ	1,413 UV	50 DBJ	3 UV
2 DBJ	1,259 UV	60 DBJ	1 UV

0 DBJ ....1,000 UV

USEFUL FORMULAS

$$\text{Wavelength in Meters (Air)} = \frac{300}{\text{Freq. in MC}}$$

$$\text{Wavelength in Feet (Air)} = \frac{984}{\text{Freq. in MC}}$$

E (Volts) = I (Amps) x R (Ohms)

$$\text{Power W (Watts)} = \frac{E^2 \text{ (Volts)}}{\text{R (Ohms)}}$$

Temperature Conversion

$$F^\circ = C^\circ \times \frac{9}{5} + 32$$

Ef (Field Intensity in Microvolts per Meter) = .021 E (Field Strength Meter Reading in Microvolts Using Reference Dipole) x f (frequency in MC)

UHF Channels 14 to 83

Frequencies 470-890 MC

To Find Center Frequency of Any UHF Channel

C.F. = 473 + 6 (Channel Number—14)

SPECIFICATIONS Ultra-Tap** Components

BASIC TAP-OFF UNIT FOR TV OR FM
Model UT-22 (W, R or Y)

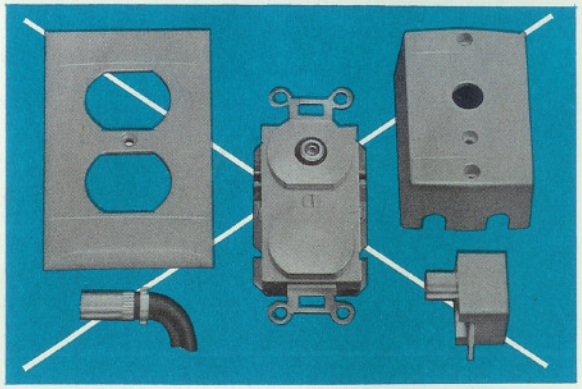
Provides a choice of three isolation and feed-thru values and is used to tap TV or FM signals from RG-59 type feeder cables. Simple crimp-on bushings and new positive-gripping clutch provide fast solder-less connections to the feeder. Model UT-22 can be flush or surface mounted. For flush-mounting the unit fits a standard 2" x 4" (or combination) wall box and new cover plates are available in a variety of types. A special housing is also available for surface mounting. Equipped with a "Gamma" receptacle, the unit accepts the new 75 or 300-ohm push-on plugs. Termination: Last unit on line must be terminated in a TR-72B.

ISOLATION AND FEED-THRU CHART
A—Isolation B—Feed-Thru
Values in db

Ch.		MODELS UT-22 AND UT-33 COLOR CODE		
		White	Red	Yellow
2	A	35	27	22.5
	B	0.2	0.4	0.2
6	A	34	25	19
	B	0.2	0.4	0.3
7	A	31	21	13
	B	0.25	0.5	0.9
13	A	30	20	11.5
	B	0.25	0.5	1.0

FLUSH COVER PLATES
Model UT-PI

Single outlet ivory cover plate.



Model UT-PS

Single outlet cover plate, brushed stainless steel.

SURFACE HOUSING
Model UT-SH

Single outlet ivory surface mounting box.

PUSH-ON "GAMMA" PLUGS
Model G-59

Male plug—For use with RG-59 type cable.

Model G-300

A 75 to 300 ohm adapter plug for connecting 300 ohm lead from receiver directly to Ultra-tap outlet.

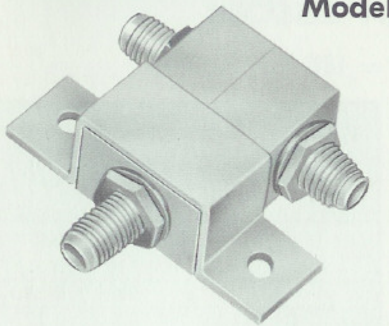
COMBINATION TAP-OFF UNIT FOR TV AND FM—Model UT-33

Available in the same isolation and feed-thru values as Model UT-22. It has additional isolation to separate TV and FM signals **for simultaneous connection of a TV receiver and an FM receiver.** The unit is flush mounted in the same manner as model UT-22. **For surface mounting a standard wire mold box is required.**

SPECIAL WALL TERMINAL UNIT—Model UT-12
(WITHOUT ISOLATION OR FEED-THRU)

A wall terminal unit providing connection to a TV or FM set from a remotely mounted isolation unit such as G-1404, 1401, or PT-1461. Similar to Model UT-22 in all other respects.

SPECIFICATIONS Receiver Isolation Network Model 1401-(*)



*Color-coded W, R, Y, G (white, red, yellow, green)

Jerrold Model 1401 is a surface-mounted, non-resistive attenuator network used with RG-59-type cables. The unit provides compensation for signal attenuation at a particular point on a feeder cable and isolation between a receiver and the distribution system.

CONTENTS OF PACKAGE: (1) 1401 unit; (3) C-52 connectors; (3) 1051 ferrules; (1) mounting bracket; (2) mounting screws; (1) instruction sheet.

ATTENUATION VALUES IN DECIBELS

Channel	White	Red	Yellow	Green	
2	34 / —	27 / —	22 / 0.06	19 / 0.12	Isolation / Feed-thru
6	28 / —	21 / 0.1	18 / 0.12	16 / 0.2	Isolation / Feed-thru
7	26 / —	17 / 0.11	14 / 0.25	11 / 0.54	Isolation / Feed-thru
13	22 / 0.05	15 / 0.15	11 / 0.5	9 / 0.9	Isolation / Feed-thru

SPECIFICATIONS Pressure Tap Receiver Isolation Units

Models PT-1461-A and PT-1462-A

Jerrold Models PT-1461-A and PT-1462-A are waterproof and corrosion-resistant pressure tap receiver isolation units designed to feed rf signals from an RG-11-type coaxial cable line via an RG-59-type cable and a transformer to a TV or FM receiver location. Model PT-1461-A is for use with single-shielded, RG-11-type cables. Model PT-1462-A is for use with RG-11-type, double-shielded cables.

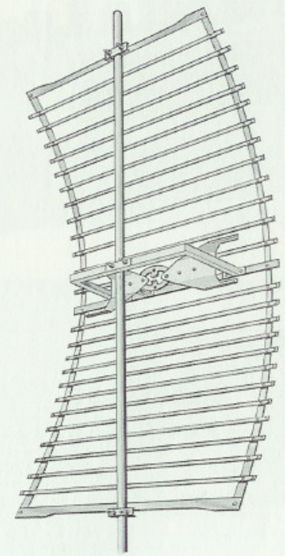
TAP-OFF DATA/CHANNEL

ISOLATION NETWORKS A = Isolation db B = Feed-through db

CH		MODELS PT-1461-A and PT-1462-A — CAPACITIVE COLOR CODE			
		WHITE	RED	YELLOW	GREEN
2	A	34	27	22	19
	B	—	—	.06	.12
6	A	28	21	18	16
	B	—	.10	.12	.20
7	A	26	17	14	11
	B	—	.11	.25	.54
13	A	22	15	11	9
	B	.05	.15	.50	.90

RESISTIVE TAPS MODEL PTR		PTR-40		PTR-35		PTR-30	
	CHAN. 2 thru CHAN. 13	A	B	A	B	A	B
		40	.05	35	0.1	30	0.2

PARACYL UHF-TV ANTENNAS



Model JUP-4

The Paracyl is an all-band UHF antenna which combines a cylindrical parabolic reflector with a unique "Extended Resonance" dipole to produce an antenna with the characteristics of the efficient parabolic reflector and a wide-band antenna with high gain. The "Extended Resonance" driver gives the Paracyl antennas the ability to operate effectively over the entire UHF television band—from the 470 mc frequency of channel 14 to the 890 mc frequency of channel 83. Five models are offered to cover every UHF-TV reception requirement, from local to super-fringe locations.

Model JUP-1—For local to suburban UHF-TV reception areas. 18" High x 24" Wide.

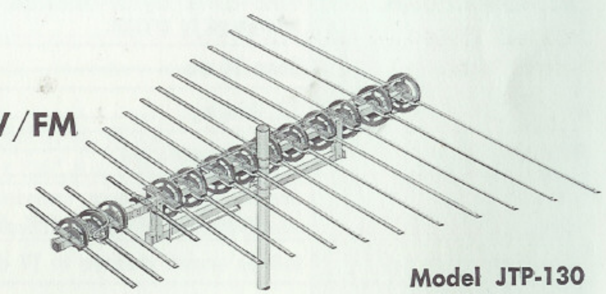
Model JUP-2—For difficult local to suburban UHF-TV reception areas. 36" High x 24" Wide.

Model JUP-3—For suburban to medium fringe UHF-TV reception areas. 48" High x 30" Wide.

Model JUP-4—For difficult suburban to fringe UHF-TV reception areas. 72" High x 36" Wide.

Model JUP-5—For fringe to super fringe UHF-TV reception areas. 94" High x 48" Wide.

PARALOG VHF-TV/FM ANTENNAS



Model JTP-130

The Paralogs are efficient TV-FM Broadband antennas which offer high gain, high front-to-back ratio and an extremely low VSWR in a single design. The combination of log periodic principles with a unique parasitic element system produces very high gain while retaining the wide bandwidth and excellent impedance match of the log periodic design. Seven models are available for TV-FM reception in any location, and three models are available for FM and FM stereo reception.

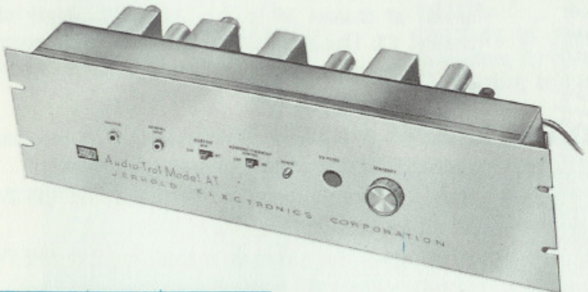
TV-FM BROADBAND MODELS

Model JTP-40—4 driven elements and 2 parasitic elements.
Model JTP-60—6 driven elements and 2 parasitic elements.
Model JTP-100—8 driven elements and 3 parasitic elements.
Model JTP-130—10 driven elements and 4 parasitic elements.
Model JTP-160—10 driven elements and 7 parasitic elements.
Model JTP-190—10 driven elements and 10 parasitic elements.
Model JTP-220—10 driven elements and 13 parasitic elements.

FM MODELS

Model FMP-8 (8 elements) Model FMP-10 (10 elements) Model FMP-16 (14 elements)

AM/FM TUNER
Model AFT-300



AUDIO-TROL
Model AT-*

SPECIFICATIONS Audio-Trol

RF Output:	Up to 55 dbj, each carrier, separately controlled, at 75 ohms, at each of two terminals.
Frequency Stability:	Video carrier crystal controlled, sound carrier AFC controlled referenced to crystal.
Spurious Signals:	Down 50 db.
Output VSWR:	1.2 Bridging.
Frequency:	Any TV channel, vhf.
Carriers:	One at video frequency, unmodulated, one at sound frequency, FM modulated, with 25 kc max. deviation.
Application:	Utilizes unused channels in TV distribution systems.
Signal for Maximum Deviation:	50 mv audio, high impedance.
Pre-emphasis Networks:	Built-in, TV standards.
Distortion:	Less than 1%, 2nd harmonic and hum.
Tube Complement:	Low channel models: (1) 6BC8, (1) 6AS6, (3) 6CB6, (1) OB2, (1) 6AU6, (1) 6AB4, (1) 6AL5. High channel models: (1) 6BC8, (1) 6AS6, (2) 6CY5, (1) OB2, (1) 6CB6, (1) 6AU6, (1) 6AB4, (1) 6AL5.
Regulation:	Gas tube voltage regulation.
Power Requirements:	45 watts at 117 volts, 60 cycles ac.
Dimensions:	Panel 19″ x 5¼″, depth behind panel—5″.
Mounting:	Standard 19″ rack.
Shipping Weight:	12½ lbs.

SPECIFICATIONS AM/FM Tuner Model AFT-300

Jerrold's new Model AFT-300 is a highly selective and sensitive, drift-free tuner for converting any AM or FM broadcast signal into an audio source for Jerrold's "AUDIO-TROL" Model AT-*.

While independent in its function, Model AFT-300 is the companion piece to Model AT-* and can be incorporated together with the Audio-Trol in a single cabinet, or can be rack-mounted separately.

FM	
Sensitivity:	3.2 microvolts IHFM (usable sensitivity 0.95 microvolts for 20 db of quieting).
Image Rejection:	45 db.
Frequency Response:	±1 db, 15-15,000 cps.
Distortion:	Unmeasurable at 30% modulation, less than 0.1% at 100% modulation.
Limiter:	Gated beam, constant output.
Antenna Impedance:	300 ohms.
AM	
Sensitivity:	80 microvolts per meter; terminal sensitivity 10 mv.
Selectivity:	10 kc bandwidth; 6 db down.
Image Rejection:	50 db.
IF Rejection:	55 db.
General	
Power Requirements:	50 w., 117 v. ac, 60 cps.
Dimensions:	19″ W x 5¼″ H x 11½″ D (excluding knobs).
Shipping Weight:	25 lbs.

SPECIFICATIONS Antenna Mixing Networks

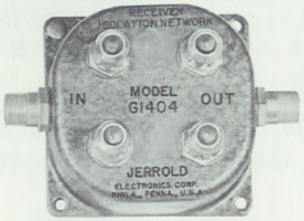
75-OHM ANTENNA MIXING NETWORKS
Models AMN-HI, AMN-LO

Model AMN-HI is a low-loss (less than 1 db) mixing network for combining up to 4 non-adjacent hi-band channels (ch. 7-13), derived from single-channel antennas or amplifiers into a single output. 75-ohm input and output impedances.

Model AMN-LO, with a maximum loss of only 0.5 db, does the same for up to 3 non-adjacent lo-band channels (ch. 2-6).

Both units are tunable, are designed for indoor mounting at the system head-end and are shipped with the necessary mounting hardware and connectors. Dimensions are 6-5/16″ x 4″ x 1½″, shipping weight is 1¼ lbs.

SPECIFICATIONS Four-Outlet Isolation Network Model G-1404*



CONTENTS OF PACKAGE
1 Unit Model G-1404
2 Mounting screws
2 Male connectors Model F-59A
4 Push-on male connectors Model G-59
1 Instruction Sheet 435-353

Jerrold Model G-1404 is a four-outlet coaxial cable tap-off unit for use in dealer's showrooms or small apartment houses. The unit comprises a network encased in a blister can housing which provides high isolation between four outputs. These outputs are Model G-61 chassis fittings which mate with Model G-59 male connectors on RG-59/U cable to permit rapid connection and disconnection of up to four cables. Line input and output terminals are Model F-61 chassis fittings which mate with Model F-59A male connectors on RG-59/U cable for permanent feed-thru continuity.

ISOLATION AND FEED-THROUGH BY CHANNEL

Isolation in db's (column A). Feed-through loss in db's (column B).

2		4		6		7		9		13	
A	B	A	B	A	B	A	B	A	B	A	B
22	.25	20	.40	18	.50	15	1.2	14	1.3	13	1.4

SPECIFICATIONS Splitters and Directional Couplers

Jerrold line splitters feature hybrid circuitry for excellent 75-ohm impedance match and isolation between outputs. Terminate unused outputs 1514 with TR-75F and G-1518 with TR-75G.

75 OHM LINE SPLITTERS

Model	1562	1592	1514	G-1518
Description	2-way	2-way	4-way	8-way
Fittings	Bushings	F Connectors	F Connectors	G Connectors
Bandwidth	54-216 mc	6-216 mc	24-216 mc	54-216 mc
Maximum Splitting Loss	3.5 db	3.5 db	6.5 db	10.0 db
Isolation Between Outputs	15-20 db	18-20 db	12 db	7-17 db
Shipped with Connectors	Not Required	F-59	F-59	G-59
Shipping Weight	6 oz.	8 oz.	7 oz.	1½ lbs.

Model DC-8

Back-matched directional coupler-splitter. Non-symmetrical splitter, 1.5 db and 9 db, matched all terminals, 75 ohms impedance. 28 db isolation between line and tap. VSWR is 1.3. Uses F-59 terminals. Shipping weight—6 oz.

BASIC TV DISTRIBUTION THEORY

The basic purpose of a TV distribution system is to transport television signals from an antenna or antennas to a multiplicity of receivers, without significant loss to the individual receiver or degradation of quality.

This statement contains the basis of many requirements. For instance, if a single antenna is to feed many receivers, then, obviously, each receiver can only get a portion of the available signal unless the signals are amplified. Amplifiers, therefore, are needed to overcome the simple losses caused by splitting the signal among so many loads.

Transmission lines which carry TV signals have loss: Therefore, amplification is needed to overcome this loss.

If the inputs of two television sets are connected to a common signal source, they will interfere with each other unless some method of isolation is used. The simplest method of isolation is to put loss between the signal source and each individual receiver. Amplification is needed to overcome this loss, also.

Essentially, then, a distribution system must consist of antennas to pick up signal, amplifiers to overcome system losses, transmission lines (coaxial cable, usually) to transport signals, splitters to branch the lines and tap-off units to provide isolation between receivers (and the lines themselves). In addition, the lines must be terminated in the characteristic impedance of the line, usually 75 ohms.

The primary tool used to describe the losses and gains in a distribution system is the decibel. This is a mathematical expression which gives a ratio in logarithmic terms. When used in voltage ratios, as is customary in TV systems, it is based on the formula

$$\text{decibel (db)} = 20 \log_{10} \frac{E_1}{E_2}$$

where E_1 is the major voltage and E_2 is the minor voltage of two voltages. A separate section describing the decibel and its use on page 11 should be studied if the use of the decibel is unclear.

The decibel is used because it very easily relates to the behavior of losses and gains in amplifiers and cables, and because it reduces computations about systems to simple addition and subtraction of small numbers. In decibels, you merely *add* gains and *subtract* losses. If numerical multipliers and divisors were used (i.e. amplifier gain, 186 times, cable losses, .5 times per hundred feet) the computations would be multiplication and division by cumbersome numbers.

Important points to bear in mind are that amplifiers do not necessarily have the same gain at all TV channels; cables have more loss the higher the frequency, hence VHF channel 13 will suffer *more* attenuation than any other VHF channel, and tap-off units will have *less* loss at the

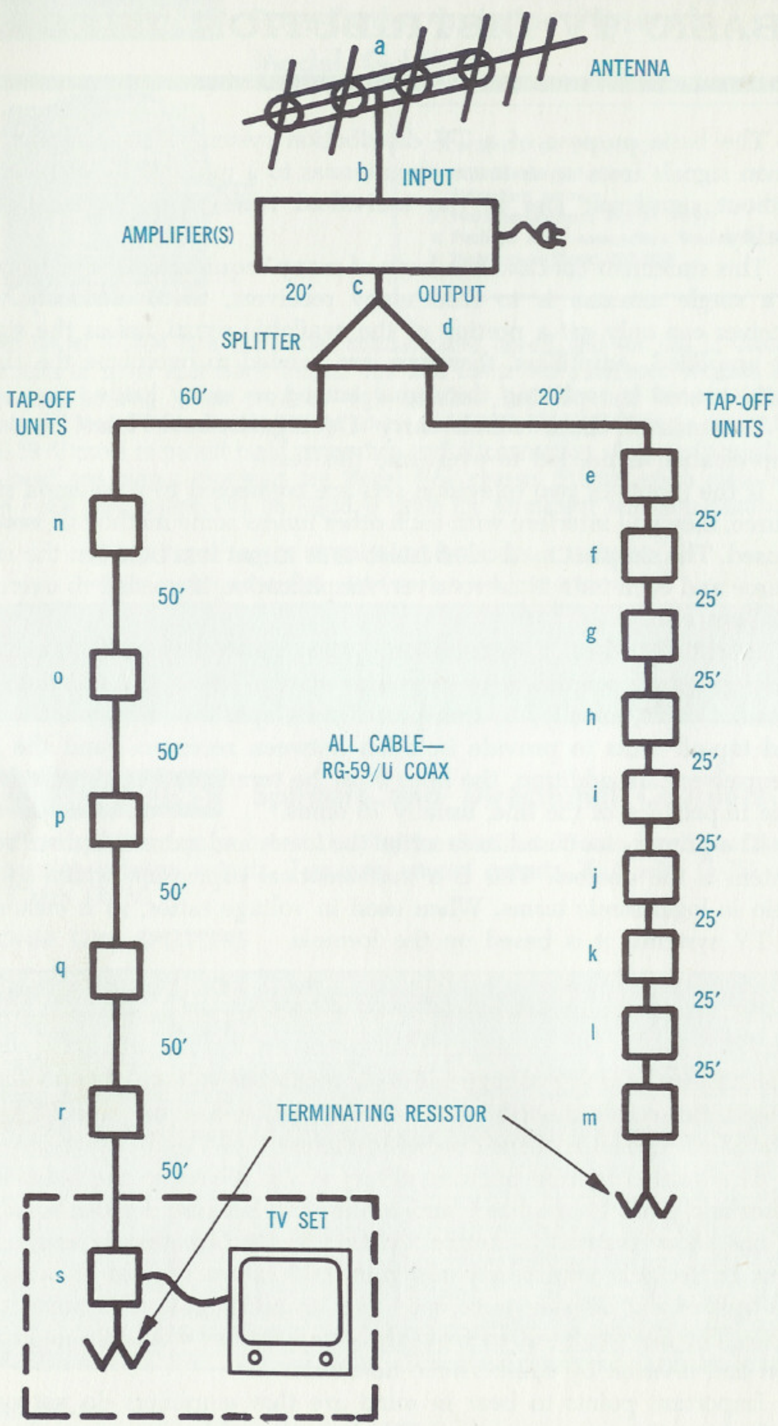


Figure 1—Block Diagram of Basic Distribution System

high VHF channels. Splitters have almost exactly equal losses at all frequencies in their rated pass-band.

Figure 1 is a simple block diagram representation of a distribution system, drawn conventionally in the schematic style. Analysis of this system will demonstrate the basic computations used in "laying out" a distribution system. To avoid tackling too many complications at once, we are going to specify some uncomplicated conditions, for example, antenna signals are assumed to be 1,000 microvolts each on channels 2, 5, 7 and 13. All are received on the single antenna with a single orientation.

On the diagram, cable lengths are specified between the various devices. This is an important parameter, and when such lengths are derived from an inspection of plans or a building they must be carefully estimated, allowing for possible difficulties in getting the cable from point to point.

We can analyze this system from the viewpoint of its basic function, feeding signals to a TV set. If we pick the point at which a TV set, "looking back" at the antenna through the system, sees the most loss-producing components, we will have chosen the most difficult job for the system to do. On Figure 1, this appears to be the set which will connect at tap-off unit "m". We can check this in the following manner.

The taps we need to check are either "s" or "m". The splitter at "d" divides the amplified antenna signal equally between each leg, and beyond this point to the antenna, losses are equal for both legs of the system. We therefore need to check only the losses between "m" and the splitter and "s" and the splitter. These losses are best tabulated in two columns. We need to know the amounts of these losses, so we must choose components and then establish their losses. Refer to the data sheet on page 37 for the Ultra-Tap, Model UT-22. You will find three models listed, "W" (white), "R" (red) and "Y" (yellow) and a chart listing isolation losses and feed-through losses in decibels. Isolation losses are those seen *between* the line and the television set, and are not seen *along* the line. Feed-through losses are those caused by insertion of the tap-off unit itself and are added to line losses. Remember that isolation losses do not accumulate, but feed-through losses do.

The reason for these different values is simple: Signals suffer loss as they travel along the cables from the amplifier, therefore they will be strong near the amplifier and weak near the ends of the system. We can therefore use high isolation values (and lower feed-through losses) near the amplifier while lower isolation losses (and higher feed-through losses) will be needed at the system ends.

Observe that the losses differ in the same unit for different channels. Isolation values are higher at the low TV channels. The reason for this becomes plain if we look at the cable loss chart on page 35. We find that losses in cable are higher at the higher channels, and therefore high channels will weaken more than low channels as the signals progress along the cable. The high channels, then, need to have less isolation between the line and set than low channels in order to feed equal signals to the receivers.

Cable is the limiting factor, and the worst losses in cable occur at channel 13. We therefore design all systems to work at channel 13, since if they work at channel 13, they will work at channel 2. The cable loss chart indicates that RG-59/U has 5.9 db loss per hundred feet at channel 13. As a safety factor, this is always considered to be 6 db.

To return to the tap-off unit, it is simple to decide that if we are considering the set at the highest loss point in the system, we are justified in choosing the tap with the lowest isolation loss at channel 13. From the tap-off loss chart, this is 11.5 db, using the yellow unit. The unit, we note, has a 1.0 db feed-through loss.

The set, therefore, starts off looking at an 11.5 db loss, and we can enter this on a piece of scratch paper under the heading "losses." We should make two columns, one titled "losses, leg 's'" and the other, "losses, leg 'm'." Place the 11.5 db figure under both columns, titled "Isolation." See below.

Losses, Leg "s"	
Isolation	11.5 db

Losses, Leg "m"	
Isolation	11.5 db

Looking back through the system, we see that leg "m" will have the feed-through losses of 8 taps (the last one does not show). Leg "s" will have the feed-through losses of 5 taps. We do not know what color code these taps will have, but we do know they will not be all yellow. We must therefore make an approximation. In practice, most of the taps will be red, a few white, and a few yellow. A good average feed-through loss is .8 db, and we can use this figure to make an approximation.

We can now add to our listings of losses as follows:

Losses, Leg "s"	
Isolation	11.5 db
Feed-through	4.0 db

Losses, Leg "m"	
Isolation	11.5 db
Feed-through	6.4 db

We derived these figures by noting that 5 taps are in leg "s", and since these add up, 5 x .8 db equals 4.0 db. In the same way, leg "m" shows 8 feed-through losses, and 8 x .8 is 6.4 db.

We need to add the cable losses to these figures. Adding up the lengths of cable we find that leg "s" has 310 feet of cable. 310 feet is 3.1 hundreds, and the loss, at 6 db per hundred feet, will be 3.1 times 6 db or 18.6 db. Leg "m" has 220 feet, 2.2 hundreds, and 2.2 times 6 db is 13.2 db. We add these figures to our listings, as below.

Losses, Leg "s"	
Isolation	11.5 db
Feed-through	4.0 db
Cable	18.6 db
Total Loss	34.1 db

Losses, Leg "m"	
Isolation	11.5 db
Feed-through	6.4 db
Cable	13.2 db
Total Loss	31.1 db

We find that leg "m", which looked the worst at first glance, is not. The greater losses are seen in leg "s", and this is the leg we must make sure works properly. If leg "s" works, leg "m" is sure to work.

We can continue the loss figures all the way back to the antenna. This will give us information about the amplification needed. Tracing backward from the beginning of leg "s" we see a splitter and more cable. The splitter is a two-way type, and can be chosen from those shown in the Jerrold catalog. Two models are listed as two-way splitters, the model 1562 and 1592. The specifications given indicate the 1562 is usable between 54 and 216 mc, which covers the VHF-TV channels. The splitting loss is 3.5 db, meaning that each output will be 3.5 db below the input. This is a very efficient device, since one-half power is a 3 db loss, and the power at the input is divided in halves. The model 1592 is identical except for bandwidth. This type is useful between 7 and 216 mc.

Mechanically, they differ in that the 1562 uses the economical but less convenient bushing fitting, while the 1592 uses the "F" series coaxial connector. We can use either of these, and since this is a small system in a competitive market, we choose the 1562.

Besides the splitter loss, we see 80 more feet of coaxial cable. We can rewrite the loss figures as given below.

Overall System Loss, Leg "s"	
Isolation Loss	11.5 db
Feed-Through Loss	4.0 db
Cable Loss, 390 Feet	23.4 db
Splitter Loss	3.5 db
Total Loss	42.4 db

We have now determined the total loss between the receiver on the last tap of leg "s" and the antenna to be 42.4 db. This loss must be overcome by an amplifier. The amplifier must be a broadband type, to handle four channels simultaneously, and it must have 42.4 db or more gain. It must also be able to handle the required output level without distortion. Before we go further, then, we must determine the output level required to drive this system. The reason this determination is important lies in the fact that we must not degrade the television signals. If an amplifier is required to handle too much signal, it will distort the signals in two basic ways, by cross modulation and compression, more often called "sync clipping." Cross-modulation is distortion of one signal by the other, and produces the symptom of "windshield wiper," black bars drifting up and down or sideways across the screen of the TV set. Sync clipping is the "clipping off" of the sync pulses of the TV carrier, which represent the highest levels of broadcast power, and therefore are first to suffer when an amplifier is called upon for more power than it can deliver. The symptoms of sync clipping are vertical or horizontal instability in the TV set—jittery pictures and/or horizontal tearing.

The only remedy for these faults is to either reduce the output or use an amplifier with greater output capability.

To determine what output is required, we must start with the requirement of the TV set.

TV sets differ in sensitivity, but any set in working condition will deliver good pictures with 1,000 microvolts (at 75 ohms) of signal. We are therefore justified in setting this level as a minimum operating standard. If we use this as a reference level, we can call it 0 db, and in order to know that we are referring to this standard, we append a "j", making it 0 dbj. 0 dbj, then, represents 1,000 uv across 75 ohms. If we assign this as a required level at the last receiver on leg "s", of Figure 2, we can quickly determine the required operating output level of the amplifier, since we know the losses on the leg, and can easily extend these figures back to the amplifier's output. The list below gives these, adding the splitter loss and the extra 20′ of cable between splitter and amplifier (c and d).

Isolation	11.5 db
Feed-Through	4.0 db
Cable Loss, 330 Feet	19.8 db
Splitter	3.5 db
	38.8 db

The loss between amplifier and last set is then 38.8 db. The level at the set must be at least 0 dbj, then the amplifier's output must be 38.8 db over 0 dbj, or 38.8 dbj.

We can now search the Jerrold catalog for an amplifier with this output capability, preferably more. We find a number of listings of broadband amplifiers, with output capability for 7 channels simultaneously in operation. For reference, we will list them below.

Amplifier Output Capability

Model No.	*(Each of 7 channels)*
2880	60 dbj (both bands)
2300A	50 dbj (both bands)
ABD-1A	50 dbj (both bands)
ACL-200	40 dbj (worst of two bands)

All four amplifiers will do the job, but the ACL-200 has only 1.2 db left for reserve. We should chose from the other three, since normal tube aging reduces overload capacity, which means the same as output capability.

The other requirement was gain, so we should find which of the remaining three have sufficient gain to raise the antenna signals to the required output, which we pegged at 38.8 dbj. To determine this figure, we can take the difference between the signal level *at the amplifier input and its output.* To get the input figure, we determine the antenna signals in dbj, subtract the down lead loss in db, which will produce the input level in dbj. We have already stated that off-the-air signals are 1,000 uv,

	System Level	Set Level
Level at amplifier output	50 dbj	
Loss in cable to splitter (20′ of RG-59/U)	—1.2 db	
Level at splitter (d)	48.8 dbj	
Loss in splitter	—3.5 db	
Level at splitter outputs	45.3 dbj	
Loss to tap-off unit "n" (60′ of RG-59/U)	—3.6 db	
Level at tap-off unit "n"	41.7 dbj	
(Use white tap, 30 db isolation)		11.7 dbj
Feed-thru of white tap	—0.25 db	
Level out of tap-off unit "n"	41.45 dbj	
Loss to tap-off unit "o" (50′ of RG-59/U)	—3.0 db	
Level at tap-off unit "o"	38.45 dbj	
(Use white tap, 30 db isolation)		8.45 dbj
Feed-thru of white tap	—0.25 db	
Level out of tap-off	38.20 dbj	
Loss to tap-off unit "p" (50′ of RG-59/)	—3.0 db	
Level at tap-off unit "p"	35.2 dbj	
(Use white tap, 30 db isolation)		5.2 dbj
Feed-thru loss	—0.25 db	
Level out	34.95 dbj	
Loss to tap-off unit "q" (50′ of RG-59/U)	3.0 db	
Level at tap-off unit "q"	31.95 dbj	
Use white tap		1.95 dbj
Feed-thru, white tap	—0.25 db	
Level out of "q"	31.7 dbj	
Loss to tap-off unit "r" (50′ of RG-59/U)	—3.0 db	
Level at "r"	28.7 dbj	
(Use red tap, isolation loss 20 db)		8.7 dbj
Feed-thru of red tap	0.5 db	
	28.3 dbj	
Et cetera to line end.		

Figure 2

JERROLD ELECTRONICS

THE NATION'S FOREMOST MANUFACTURER AND SUPPLIER OF TELEVISION DISTRIBUTION SYSTEMS

DISTRIBUTOR SALES DIVISION • PHILA., PA. 19132

A subsidiary of THE JERROLD CORPORATION

This handbook is a Jerrold Electronics Corporation Publication.

LEM, May 1964 | Printed in U.S.A. | DS-C-005.1