SUGGESTED ARCHITECTURAL SPECIFICATIONS

TELEVISION MASTER ANTENNA SYSTEM

I GENERAL.....

A The TV System Contractor shall be a division of, or the authorized distributor for, a television manufacturer maintaining a local staff of specialists for engineering assistance, installation and maintenance of television and radio signal distribution systems, and associated equipment.

B The system shall be complete, ready for connection to, and use of, a television receiver at each outlet location. All required material and labor shall be supplied by the TV System Contractor except those items specifically stated as the work of others.

C Warranty shall be one year full coverage maintenance, including all material and labor required to provide consistent peak performance of the system. Post-warranty maintenance shall be available on contract or call basis.

D All technical labor, for installation and maintenance, shall be performed by skilled electronic system specialists in the permanent employ of the equipment manufacturer.

(Include where conduit is involved)

Conduit, junction and pull boxes, outlet boxes, service entry weather head, and all conduit fittings or accessories required shall be supplied and installed under the separate sub-contract for electrical work.

(Include where union jurisdiction requires all cable to be installed in conduit by electrical wiremen)

Labor only, for pulling cable in conduit, shall be included in the separate sub-contract for electrical work. Cable, and a drawing showing the proper routing for cable, shall be supplied by the TV System Contractor.

(Include for frame or other construction which would permit cable to be roughed in without conduit and where union jurisdiction requires all cable to be installed by electrical wiremen)

Labor only, to install cable roughed in firred walls, ceilings or floors, shall be included in the separate sub-contract for electrical work. Cable, and drawing showing the proper routing for cable, shall be provided by the TV System Contractor.

II FUNCTION.....

A The system shall provide the reception of Color and Monochrome (black and white) TV transmissions, consistent with local conditions. Service shall be provided from channels ___, ___, ___, ___, ___, ___, and ___.

B Outlets, located as shown on the drawings, shall provide minimum signal levels of 2 millivolts per channel, color signal, at each outlet, measured across 75 ohms impedance.

C The system, as designed and equipped, shall be expandable for subsequent addition of: Up to seven non-adjacent TV channels; FM and/or AM radio signals. If and when any of these services shall be desired, it shall be possible to provide them without adding new distribution wiring, by utilizing the same coaxial cable specified herein for TV system signal distribution. Providing for the possibility of such additional services shall not at present add to the cost of the herein specified TV system.

(Include for building of four stories height or more)

Upper floor outlets shall have minimum signal levels progressively in excess of 2 millivolts as the height increases, to overcome the increased possibility of direct unwanted signal pick up.

(Include when UHF channels are included in the service)

The signals of UHF channel(s) —— & ——, shall be converted by system equipment, to unused non-adjacent VHF channel(s) —— & ——.

III EQUIPMENT.....

A All basic equipment shall be that of a single reputable manufacturer with an accepted reputation for engineering achievements and development of quality electronic products. All equipment shall be designed for continuous operation.

MINIMUM REQUIREMENTS SHALL BE AS FOLLOWS:

1. ANTENNAS and associated hardware: VHF antennas shall be individual channelized yagis of not less than 5 elements each or the equivalent in gain and directivity. *All equipment installed outside the building shall be of rust resistant and corrosion resistant materials, and of such physical construction as to withstand severe weather conditions.

   VHF yagi antenna—RCA 931942 through 931953.

   *(Include at * above if UHF channels are involved)*

   UHF antenna(s) shall be corner reflector(s) or the equivalent in gain and directivity.

   UHF corner reflector antenna—RCA 956306.

2. AMPLIFIER—*Note to Architect and Engineer:* It is advisable to consult with your RCA Systems Representative concerning the amplifier selection which would be appropriate to handle a specific building. Factors involved in the selection are signal reception conditions, number and maximum length of risers required and number of outlets. References to the number of outlets which may be energized by each of the amplifiers described below are approximations only. The factors stated above might substantially affect the amplifier requirements.

Amplifier RCA Type 5BB

(a) Type 5BB Amplifier (for up to 40 outlets). A *Broadband* amplifier

shall be supplied which will assure continued operation of either high or low band channels in event of an amplifying tube failure.

The amplifier shall provide: 37 db gain for each high band channel 7 through 13, 28 db gain for each low band channel, 2 through 6; up to 0.2 volt output RMS COLOR signal per channel; combined or separate inputs of 75 ohms impedance for high and low band channels, combined all channel output of 75 ohms impedance; low noise pentode input circuitry and high gain pentode output circuitry separated for each band of channels. Frequency response shall be within 0.5 db across the full band width of each channel. The amplifier shall be complete within itself including power supply and ventilating cover. It shall be capable of handling up to seven non-adjacent channels. *Not over six* tubes shall be employed.

Amplifier RCA Type HG

(b) HG Amplifier for up to 300 outlets. A *channelized* amplifier shall be supplied to assure continued operation of all except one channel in the event of any tube failure and to supply sufficient output voltage.

The amplifier shall be capable of producing: 54 db gain for each high band channel, 7 through 13; 50 db gain for each low band channel, 2 through 6; 2.0 volts output RMS COLOR signal per channel.

The amplifier shall include; automatic gain control, built-in for each individual channel, without requiring additional tubes, to maintain relatively constant output voltages, despite changes in antenna signals and to compensate for tube aging; a complete enclosure heavy duty cabinet, with hinged removable door, sufficient venting and a locking hasp, separate and individually additive plug-in channel amplifier strips with modern low noise cascode circuitry throughout, using three tubes for each low band channel and four tubes for each high band channel.

Amplifier inputs shall be for individual channels and of 75 ohms impedance. Outputs shall be combined through a passive tunable mixer which provides an output test point and a combined output of 75 ohms impedance. Frequency response shall be within 0.5 db across the full band width of each channel. Test points shall be provided for DC filament and AGC bias voltages to aid and simplify maintenance.

A constant voltage transformer regulated power supply shall be included to compensate for and protect against power line fluctuations and shall be capable of handling up to seven channels in continuous operation.

RCA High Power Post Amplifier

(c) High Power Post Amplifier—combined with a type HG Amplifier as specified in (b) above (for up to 1000 outlets). A High Power output amplifier of channelized design shall be located and coupled with the

Master high gain amplifier to increase available power up to 6 volts RMS COLOR signal per channel.

The power amplifier shall be designed for mounting in the same cabinet housing with the high gain amplifier; be complete within itself including power supply. Provide coverage for up to seven channels; have a frequency response of 0.5 db across the full band width of each channel; have separate inputs for each channel and a combined all-channel output all of 75 ohm impedance. Minimum gain shall be 12 db per channel. One tube per channel shall be employed.

UHF Converter RCA Types CUL/CUH

(Include when UHF channel is involved)

UHF converter. A UHF to VHF converter designed specifically for fixed channel system use shall be supplied. It shall have: No more than an 8 db noise figure; no less than 20 db gain across equal impedances; 0.1 volt output capability; 1:1 picture sound ratio; compensation against drift. The converter shall be complete within itself including power supply and vented cover.

AM/FM Amplifier RCA Type 939389

(Include where AM/FM signal is desired at each TV outlet)

AM/FM Amplifier. AM/FM amplifier designed to be incorporated in a TV distribution system for the purpose of adding AM & FM antenna signal distribution. This will make it possible to operate a TV, FM or AM receiver from each outlet. It shall be: Versatile enough to be able to be used with the TV amplifiers utilizing the existing coaxial distribution system; capable of separate AM, FM & TV inputs with combined output of all signals; and capable of a 19 db gain over FM range.

IV ACCESSORIES . . . . . .

All distribution accessories shall be of passive design, requiring no electric power for operation and utilizing no tubes or other components requiring parts replacement, or maintenance due to normal usage. All accessories shall be 75 ohm impedance devices to properly match the coaxial cable used.

Line Splitters, 4 Way, RCA 939343; 2 Way, RCA 939342

A *Line splitters* shall have a flat frequency response across the full band width of any channel and shall produce: not more than 7 db loss across any high band channel or 6 db loss across any low band channel, for the 4 way splitters; not more than 3.5 db loss across any channel, for 2 way splitters.

Tap-offs, RCA 939338

B *Tap-offs* shall be capacitive type, providing not less than 15 db isolation between any outlet and the connecting riser. Tap-offs shall produce not more than 1.2 VSWR, and shall have sufficient resistive termination to eliminate standing wave introduction when outlets are not connected to TV receivers.

(Include in AM/FM-TV System only)

Tap-off shall be capable of handling AM/FM receiver antenna as well, similar to RCA 939340.

Face Plates RCA 939337—Plastic, Brown
Face Plates RCA 939336—Plastic, Ivory
Face Plates RCA 939180-55—Metal, Stainless Steel

C *Outlet receptacles* shall be threaded screw type coaxial connectors to facilitate sure contact and simple connection and disconnection. Face plates shall be *(plastic or metal)* with *(ivory, brown or stainless steel)* finish.

Connectors RCA 932079
Matching Transformers 75/300 ohm RCA 939161

D *Coaxial receiver connecting cables,* 6 feet in length, equipped with plugs to match the outlet receptacles and receiver matching transformers to match the 300 ohm input impedance of TV receivers, shall be supplied for each outlet. Transformers not needed with RCA receivers.

Coaxial Cable, Sweep Tested—RG59U Gray—RCA 939122
Coaxial Cable, Sweep Tested—RG11U Black—RCA 939121

E *Cable*—All cable shall be coaxial types, RG59U for secondary distribution and RG11U, if required, for primary transmission. Cable shall all be sweep-tested before use, to assure against defects at VHF television frequencies, including excessive losses.

For any additional information or specifications to meet unusual or special situations, or to include services in addition to television signals, please write—RCA Service Company, Multiple System Sales, Camden 8, New Jersey, or contact your nearest RCA Service Company Branch. (See front section for branch locations.)

ADDITIONAL INFORMATION CONCERNING TELEVISION COAXIAL DISTRIBUTION SYSTEMS

A. Amplifier Television Coaxial Distribution System:

1. General—

An amplifier master television antenna system consists of basic elements which are combined to supply television signals to any number of receivers with the assurance that each receiver will perform as well or better than it would if it were connected to its own outdoor antenna. Starting with the "off the air" signal, the system consists of receiving antennas (usually one for each channel to be received) and a coaxial cable feed from each antenna to an amplifier. The amplifier increases the signal strength of the channel received to a high level and sends those signals over coaxial cables to the individual receivers. Special frequency separators, interference filters, attenuators and accessories are used to improve the picture quality.

2. Individual Building Type System—

The building type system is confined to a single building or structure. The system can distribute signals to buildings varying in size from a small four-family apartment building to a multi-storied apartment building. A set of antennas is installed on the roof as close to the center of the distribution system as possible. The feed cables from each of the antennas are then fed into the master amplifiers located in the building. The amplifier may utilize strip amplifiers for each channel, or a broadband amplifier that will amplify all channels. The output of the broadband amplifiers or the combined outputs of the strip amplifiers are single line and the line is split using a branching amplifier or splitter. The distribution lines are run to the various parts of the building. Tap-offs for the individual receivers are made from the distribution lines.

B. Unamplified Television Coaxial Distribution System:

1. General—

Unamplified master antenna systems can be used although they are seldom satisfactory for feeding more than four television receivers from one antenna, since they divide the available signal among all the receivers. Low signal levels at each receiver prevents the use of adequate isolation devices and creates the problem of interference between the several receivers in the system. These problems are minimized in a properly designed and installed amplified master television antenna system (Master-Tenna by RCA).

C. System Planning:

1. General—

Planning a coaxial distribution system may be performed in three phases, i.e., the facility at the antenna, the facility at master amplifiers, and the

receiver or distribution area. The facility at the antenna site includes the antenna, preamplifiers (if required) and the cables to the master amplifier location. The facility at the master amplifier includes amplifiers (as needed to boost signal level), frequency separators, interference filters, attenuators and accessories used to improve picture quality. The receiver or distribution area includes all cables to form main risers, tap-off devices for receiver isolation, and outlets to each receiver location.

2. Antenna Siting—

(a) The major factors to consider in selecting an antenna site are:

1. The availability of strong, noise-free signals that are free of severe fading.
2. The availability of AC power.
3. Obtaining a minimum distance between the antenna site and the area where receivers are located.

(b) A field strength meter should be used to check the strength of the signals and to observe the degree of fading. A good quality receiver should be used in conjunction with a high gain antenna (such as a yagi) to observe the quality of the signal as pertains to noise level, "ghosting," adjacent channel, and co-channel interference. Special traps and specially designed antennas may be necessary, if co-channel and/or adjacent channel interference is present.

(c) A "rule of thumb" of 300 microvolts across 300 ohms measured at the output of a high gain antenna (before preamplification) may be used to determine if there is sufficient signal at antenna site to warrant its use in a coaxial distribution system. The figure will be modified depending upon the size of the distribution system, noise level at the antenna site, degree of fading, etc., and should not be considered the absolute criteria for useable signal strength.

(d) The antennas most commonly used are of the single channel, 5 to 10 element yagi type. The yagi antenna provides a high gain with reasonably good side and rear lobe attenuation, thereby reducing adjacent channel and co-channel interference. Stacked yagi-type antennas, etc., are used only when strong interference or low signal levels require their use.

3. Master Amplifier—

(a) The master amplifier receives the signals from the antennas (or preamplifiers) and amplifies the signal. The master amplifier consists of a separate amplifier strip for each channel received with the output of the strips mixed together to form a common output on a single cable which then contains the amplified signals of all channels. In some instances, such as in the case of a small hotel type system, a broadband type of amplifier can be used satisfactorily. The application of broadband amplifiers is limited however, because of the difficulty in applying automatic gain control (AGC) on an individual

channel basis. The master amplifiers should be equipped with AGC to minimize the effect caused by signal fading.

4. Distribution System—

(a) The distribution system may be defined as that part of a coaxial distribution system involving the signal distribution to the various receivers.

(b) Passive isolation devices (splitters) use resistive networks or matching transformers and provide a 3.5 to 12 db insertion loss (and isolation) between risers as well as dividing the input signals (output of amplifier) equally to all risers of distribution system.

(c) The receiver isolation network is a passive network, that provides isolation between the riser cable and the individual receiver. In addition to providing isolation, the network attenuates the relatively high RF voltage present on the riser cable to prevent over-loading the receiver. The capacitive type has the advantage of offsetting the effect of coaxial cable attenuation as frequency rises since the reactance of the series capacitor is lower (less attenuation) on the high-channels whereas cable loss is higher on the high-channels. Conversely, the reactance of the capacitor is higher (more attenuation) on the low-channels, thus tending to maintain a system balance. The insertion loss, referred to the distribution cable, is lower in the case of capacitor networks, than in the case of resistance networks (for equal values of isolation).

(d) A receiver matching transformer is a desirable accessory item which matches the unbalanced 70 ohm cable to the 300 ohm balanced input of the receiver. RCA Victor hotel receivers have provision for accepting 70 ohm unbalanced feed directly to the tuner in which case a receiver matching transformer should not be used.

(e) A minimum signal level of 1000 microvolts (measured at the outlet) should be provided at each receiver on the coaxial distribution system. In strong signal areas, a stronger signal level (3000 to 10,000 microvolts) should be present to minimize the effect of direct signal pickup.

5. Coaxial Cable—

(a) The industry accepted nominal impedance for coaxial cable used in coaxial distribution systems is 70 ohms. RG59U is most frequently used for riser cable and receiver drop. There are many other types of 70 ohm coaxial cable available and economic considerations will determine the types of coaxial cable to be used in a coaxial distribution system.

(b) All coaxial cable with a vinyl outer jacket (except sporafel, foamflex, styroflex, etc.) should use a non-contaminating vinyl outer jacket. Before installing, all cable should be preswept to insure that suck-outs are not present on any channels being distributed.

6. Conduit Systems—

Conduit may be provided for distribution cables within new buildings. The size of the conduit will depend on the design of the system, but it should not be smaller than ¾" I. D.

Recommended Conduit Size							
Number of Cables	1	2	3	4	5	6	7
RG59U	¾"	¾"	1"	1½"	1½"	1½"	1½"
RG11U	¾"	1"	1½"	1½"	1½"	2"	2"

7. Level Calculations—

After selecting the antenna site, determining distribution cable routings, and deciding receiver locations, a level diagram should be prepared. It can be used to determine amplifier requirements and attenuation required in the receiver isolation network.

Should any further assistance be desired, contact the nearest RCA Service Company branch (see page in front section for branch locations), or write RCA Service Company, Multiple System Sales, Camden 8, N. J.

standing wave introduction when outlets are not connected to TV receivers.