

*KEEP*  
Issue 4.05

*JTB*

# T&R NOTES



## ***Transmission and Radio Notes***

Volume 2, No. 1

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American Telephone & Telegraph Company  
Engineering Department

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## 1. PERFORMANCE AND METHODS ENGINEERING

### 1.03 Special Services

#### 1.03.3 School-to-Home Conference Circuit

The Pacific Telephone Company has developed a new School-to-Home conference circuit which enables a teacher to use the regular telephone switching network to dial a maximum of 20 outlying student stations and then conduct classes on a full conference basis with these stations.

The teacher's equipment consists of a M-button Call Director modified to provide various switching and conferencing arrangements. These arrangements allow the teacher to talk to each student individually, group them in a regular conference circuit, or place them on an auxiliary conference circuit. The teacher may allow or disallow students to converse among themselves. A voice identification lamp is provided which enables the teacher to identify noise or voice currents on any one of the connecting lines. Other features include a cord dialer, optional use of handset, headset or speakerphone and jacks for the playback of pre-recorded tapes.

The conference bridge uses 50A control units from the 5A speakerphone. This unit provides voice switching which permits a substantial volume increase when receiving and eliminates staging. Compression amplifiers are also employed which maintain the variation of increasing speech levels. All control logic, amplifiers, volume bridges, connectors, terminate strips and power supply are mounted within a 787 PBX-Type cabinet.

The student uses a standard 500 type telephone with a headset for comfort and hands-free convenience. The Central Office lines to the students are arranged for receiving calls only. On the teacher's console, all lines except the first are arranged for origination of calls only.

This conference equipment has been manufactured in limited quantities by the Los Angeles Western Electric Distributing House. Bell Telephone Laboratories' personnel consider this equipment to be well designed. They have no plans at the present time to do any additional developmental work unless the demand for this equipment warrants it.

J.F. Mallis

### 1.05 Radio Frequency Coordination

#### 1.05.1 FCC Matters - Booklets of Interest

There has been a number of recent developments under FCC Booklets concerning radio matters which will be of interest to you. These developments are summarized in the following:

##### 1. 150 Mc/s HELLERON Channels

The October, 1966, T & R NOTES described how the FCC proposed to make two 20 kc/s channels in the 150 Mc/s band available for wireline common carriers under Booklets 16776 and 16778. Four MEC's (wireline common carriers) filed reply comments under Booklet 16778 which attacked our proposal for exclusive one-way assignments for HELLERON service by advancing arguments attempting to prove that one-way assignments were unnecessary, that 150 Mc/s channels had no transmission advantages over 40 Mc/s channels with respect to signaling services and that unfair competition would result. A response to the MEC reply comments has been forwarded (1/16/67) to the FCC in which the arguments were refuted (we think conclusively) by pointing out the distortions of fact, faulty assumptions and erroneous conclusions that were given in the reply comments.

The next step is up to the FCC and it is critical if we are to be permitted to provide BELLBOY service some day. The FCC could propose rules designating these channels for one-way signalling or two-way mobile use on an exclusive basis, or permit both services depending upon the users needs. The common carriers will have an opportunity to comment on the proposed rules. Once this procedure is completed, the FCC will be able to issue an order which finalizes the new rules. While it is difficult to estimate how long these procedures will take, our best guess is that it will take at least six months, and we hope that it will take care of BELLBOY.

### 2. 5-Year Licenses for Mobile Systems

Under Docket 16875 the FCC proposes to increase the maximum license periods in Domestic Public Land Mobile Radio Services from three to five years. We filed comments with the FCC in which we concurred with the proposal for a five-year licensing period.

### 3. Splitting 450 Mc/s Channels

The FCC proposes, under Docket 17023, to split the 450 Mc/s common carrier channel frequency assignments from the present 50 kc/s to 25 kc/s. The proposed changes in technical standards for the channels are:

	<u>Present</u>	<u>Proposed</u>
Channel Frequency Separation	50 kc/s	25 kc/s
*Frequency Deviation	+15 kc/s	+5 kc/s
Fixed and Base Station Frequency Tolerance	±0.0005%	0.00025%
Audio Low Pass Filter Attenuation (receiver)	-	**50 log <sub>10</sub> 0.70

\*Change to be effective on all channels within 6 months after effective date of Report and Order.

\*\*For each transmitter in dB greater than 1,800 C/S attenuation (I in kc/s) for frequencies between 5 and 20 kc/s. Above 20 kc/s the attenuation shall be at least 50 dB.

The above changes in technical standards, when applied, are expected to result in 6 additional two-way channel assignments. Under this proposal the new technical standards are to be made effective for all systems by November 1, 1971, and for all new systems authorized on November 1, 1967, and later. The change in frequency deviation, however, is proposed to be effective for all systems within 6 months after the Report and Order authorizing the new standards.

A.T.&T. comments were forwarded to the FCC pointing out that there will be a resulting degradation in service due to the reduction in frequency deviation which may be reduced by the use of new narrow band equipment. It was suggested that the requirement for reducing the frequency deviation on existing channels within 6 months be waived when split channel assignments are not needed, with no waiver extending beyond November 1, 1971. It was also suggested that common carrier air-ground frequencies in this band use in service be accepted until split operation is required.

### 4. Application to Reassign 35-43 Mc/s Channels to Industrial Users

A petition SH-10690 has been sent to the FCC by the Special Industrial Radio Service Association (SIRSA) requesting that the common carrier highway channels (35-43 Mc/s) be reallocated to the Special Industrial Radio Service. The four 35-43 Mc/s channels for exclusive one-way signalling system assignments would be excluded from the proposed reallocation. The SIRSA petition pointed out that extremely heavy usage is now being made of channels available to the Special Industrial Radio Service and that less usage was being made of the common carrier highway channels.

Comments opposing the SIRSA petition were filed by A.T.&T. on the basis of present usage and the possibility of utilizing the band for a new radio service ("business extension" telephone service) in the future. The New York Telephone Co., Michigan Bell Telephone Co., Ohio Bell Telephone Co., Pacific Telephone and Telegraph Co., and the Pacific Northwest Bell Telephone Co. each filed in opposition to SIRSA based on current usage of the highway channels.

## 2.09 Video Systems

### 2.09.1 CATV Systems

We are issuing E.L. 48 to update engineering information provided in IPCL 7553 and to introduce several new items. Following is a brief description of the items covered in E.L. 48:

1. Announcement of a new two-phase CATV Systems Development Program. Included is a list of development items along with expected completion dates.
2. A review of the status of manufacturers in meeting ES-19925.
3. A brief discussion of CATV transmission objectives and interface requirements.
4. Provision of a complete list of practices being prepared including expected availability dates.
5. Introduction of a new Extended Distribution Design. An illustration is included giving typical operating levels and rules for tandem operation of line extension amplifiers.
6. A brief description of an interim two-pilot transmission scheme presently under trial in one company.
7. Announcement that the Laboratories are presently studying field strength meters and head end equipment in preparation to issuing KS Specifications.
8. Announcing preparation of specifications for splitters, directional couplers and an improved pressure tap.
9. Plans for a third CATV Engineering course.

The Western Electric Company has informed us the Jervold Electronics Corporation has met Specification ES-19925 with the exception of the Line Extender and Intermediate Bridging Amplifier. We have prepared E.L. 150 which forwards cost and ordering information.

T.F. Bennett

## 2.10 Maintenance Test Equipment for All Systems

### 2.10.1 General - Milliwatt Test Line Levels

There appears to be some misunderstanding in some locations as to the required output levels of milliwatt test lines. It has been found that some offices are making allowances for switching losses when adjusting these levels.

The switch-through-switch concept for design and maintenance of trunks, which was introduced several years ago, provides that the switching loss at the incoming end should be included as part of the trunk loss. This policy states, "The overall loss of a trunk consists of all of the loss between the outgoing switch appearance of the trunk at the outgoing end and the outgoing switch at the incoming end to which the trunk is connected. The overall loss thus includes the loss of the switching path or cord circuit at the incoming end."

The level of the milliwatt test line is therefore established at the outgoing switch (connector bank, connector bank, crosspoints, jack, etc.) on which the test line appears. Where there is no test pad, this means that the level at the outgoing switch should be exactly 0 dBm. Where a test pad is involved, the level is reduced by the exact amount of the test pad which is normally 2 dB. In No. 4-type offices, however, a value of 4 dB or  $4A + 2$  dB may be used because the milliwatt test line may be arranged to switch out all or part of the A pad in the trunk under test.

The 103-305-333 sections of practices covering the measurements of milliwatt test lines specify the exact point for connection of the 22A milliwatt reference meter. This is the point where the levels discussed above apply. In other words, the REFERENCE LEVEL switch of the 22A meter is set at 0 or -2 when the set is connected as per the instructions, except that in No. 4-type offices it may be set at +1 or (A + 2) depending on the office involved.

All procedures for test maintenance and the correction appraisal observations are based upon the assumption that all milliwatt test line levels have been adjusted correctly as discussed above. Any departure from these levels will, of course, affect the accuracy of the measurements.

Normally, all milliwatt test lines should be checked for accuracy once every year and after any change which affects the milliwatt distributing system. Hence any maladjustments should be picked up on the next test. However, if it is possible that any have been adjusted incorrectly through misunderstanding of the requirements, they should be checked, and readjusted if necessary, as soon as possible.

The 103-305-333 sections are being retained to bring them up to date. A more definite statement of the requirements is being included in each section with a view to avoiding further misunderstandings.

D.T. Osgood

## 2.10.2

### ATMS

The Western Electric Company has issued a Marketing Brochure on the Acoustic Transmission Measuring System (ATMS). This brochure is being distributed with F.M. 204 dated February 15, 1967. Additional copies of the brochure can be obtained through your local Western Electric Distributing House.

D.T. Osgood

## 2.11 Mobile Radio Systems

### 2.11.1 General - Touch-Tone for Mobile Radio

Extensive tests conducted by Bell Laboratories indicate that Touch-Tone calling, properly engineered, is at least as reliable as the present MJ rotary dial operation. This has been verified during recent tests at 400 mhz on high speed runs of railroad cars. These tests were conducted as part of the Laboratories system evaluation program for the High-Speed Train telephone project.

Final plans for implementing Touch-Tone into the MJ and MK mobile systems are being studied. We now expect that specific information will be provided in a General Letter early in the second quarter of 1967.

H.G. Bart

### 2.11.2 MK Mobile Radio

On June 17, 1966, Mr. Klumstad wrote to all Chief Engineers concerning the new MK 400 mhz Radio Telephone System.

On December 3, 1966 the FCC published a Notice of Proposed Rule Making, Section 17.023, which defines the technical requirements for split channel operation. BTL specifications incorporating the proposed changes are now in the hands of interested suppliers.

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Although TD-3 and TR-3 are capable of 4,000 mile, 43 dBm0 performance, the basic components will also be used for medium-haul systems. It is planned to provide standard arrangements utilizing towers, antenna/waveguide systems, buildings, protection switching, and test procedures compatible with medium-haul transmission requirements and competitive in costs. To accomplish these objectives and to insure that the system arrangements will be optimum, frequent consultations with the Operating Companies will be needed as the development progresses.

Until this development program is completed, it is anticipated that some use will be made of outside suppliers' radio equipment for medium-haul needs. To insure adequate performance and compatibility of these equipments, we plan to issue a specification covering the desired transmission characteristics.

A.S. Day

## 4. GENERAL AND MISCELLANEOUS

### 4.02 Organization

Parker W. Austin, Transmission Engineer - Facilities, Washington and Idaho Area, Pacific Northwest Company, has joined the Transmission Section as Engineering Manager, Transmission Performance. He replaces F.J. Skinner who has moved up to Engineering Director of the Transmission Section.

H.G. Buck of the Mobile and Special Radio Systems Group can be reached on 212-393-3028. The telephone number was incorrectly listed in the December issue of T & R NOTES.

### 4.05 How Do You Say Giga?

There has been much confusion over the pronunciation of the prefix giga, meaning one billion. The new Random House Dictionary of the English Language is the only authority we've been able to find that gives a pronunciation. Even the RHD doesn't give a pronunciation when it lists the prefix only, but in listings of compound words including this prefix the pronunciation is given as *jig* or *ijig*. That is, the "g" is pronounced as a "j" and either a long or short "i" is acceptable. These pronunciations are difficult for some people because they think a hard "g" is more nearly like the Greek from which this prefix comes. We would appreciate hearing from anyone who can cite any other authority on this matter.

However you pronounce it, its abbreviation is always a capital G. Similarly, "mega" and "tera" should always be abbreviated by using the initial capital while those prefixes of kilo and lower should always use lower case abbreviations (e.g., Cts, MHz, kHz, dB, pF).

R.C. Harris

### 4.05 Hertz is in the Driver's Seat

In the May - June 1965 issue of RADIO NOTES we suggested that cycles per second (c/s) be used in preference to Hertz (Hz) in Bell System writing. Since that time the Editorial Committee of the Bell System Technical Journal has recommended the use of the International System of Units, which includes the term Hertz, for scientific and technical data (See BSTJ, July - August 1965). Also, CCIB has now recommended Hertz for use in English publications as well as French and Spanish. Furthermore, Hertz has appeared in other publications so often that it probably will no longer be confusing to the reader.

As far as Bell System Practices are concerned, we have adopted the use of Hertz throughout for all new or revised sections, provided, however, that we will continue our rule of referring to panel markings, jacks, etc. verbally. We might, therefore, "see a signal generator for 60 kHz at .05 dBm and patch into the '60 KC IN' jack." There will be a gradual period of change-over to the new terms lasting many years - we certainly don't plan to reissue any sections just to "go Hertz" - but we don't think there will be any real confusion any more than there was during an earlier period when our "condensers" became "capacitors" and "resist coils" turned into "transformers."



#### 4.85 New WWV Station in Operation

The National Bureau of Standards radio station WWV started transmitting from its new site near Ft. Collins, Colorado at 0000 GMT, December 1, 1966. The station location is about seven miles north of Ft. Collins, Colo., near State Highway No. 1. The approximate coordinates of the antennas are  $40^{\circ} 49' 49''$  N,  $105^{\circ} 02' 27''$  W. Originally it had been planned to make this move on July 1, 1966, but the move was delayed several months. The station was relocated from its previous location at Greenbush, Maryland, for a number of reasons, among the most important of which was to obtain better signal coverage over the country.

WWV transmits standard frequency and time signals on six frequencies as follows.

<u>Frequency</u>	<u>Transmitter Power</u>
2.5 Mc/s	2.5 kw
5 Mc/s	18 kw
10	18
15	18
20	2.5
25	2.5

Eight transmitters are used, six in regular operation and two in standby. The transmitters are identical, except that the higher power units have an additional stage of power amplification. There are eight antennas, one for each of the above six frequencies, and two broadband monopole antennas for standby or emergency use. The six antennas associated with the regular transmitters are half-wave modified "ohmic" vertical dipoles, connected with rigid coaxial line. Calibration of the transmitter frequencies is accomplished by signals obtained from the United States frequency standard at Boulder, Colo., and transmitted to Ft. Collins by means of a microwave link operating in the 1000 Mc/s band.

J.P. Robertson

# PUBLIC CLASS III B COAST STATIONS

(VHF MARITIME RADIOTELEPHONE SERVICE)



# PUBLIC CLASS IIB COAST STATIONS CONNECTED TO TELEPHONE NETWORK

(3 MC Frequency Band Except for the Great Lakes and Mississippi Valley)

