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17 September 1956

MEMORANDUM FOR FILE

SUBJECT: G. E. Micro-Wave Exhibit Type VA-2 (25 Channel)

1. A visit was made to the G. E. Microwave Radio Relay Exhibit held in Washington, D. C., 11 September 1956. Agency OC-E members in attendance were: [redacted] 25X1A9a

2. The G. E. Engineering & Sales staff had set up two terminal units, with 2 ft. parabolic dishes on opposite sides of a large room and were utilizing four (4) channels in conjunction with a Stromberg Carlson Relaymatic Telephone Board. The equipment is capable of twenty-five (25) channel operation employing time-division multiplexing using a "quadriphase" system for channel timing. The manufacturer claimed the basic simplicity of the timing signal is a new approach for time division syncronization systems and is more adequate to meet present day standards for microwave reliability.

3. The equipment operates in the 1700-1850MC band for government applications and will supply 20 watts of peak power to the antenna. The microwave transmitter is crystal controlled (90MC overtone) with six (6) stages of amplification, and using a GL-2C39B lighthouse tube in the final. Transmitter tuning is conventional and may be metered by tip jacks on the front panel. The output of the transmitter is fed through a duplexer filter to a low loss stryoflex coaxial transmission line to the antenna. A six (6) ft. parabolic reflector with a dipole mounted in a weatherproofed cup with a nominal beam width of 6 degrees, at the - 3db points, is normally used as the antenna system. The diameter of the parabolic reflector, plus the transmission line losses, however, are a function of the allowable system signal to noise ratio. In a properly engineered system the manufacturer claimed a 30db "fade margin" i.e. the received signal could drop to 1/1000 of its optimum value through path attenuation, transmitter power drop, antenna misalignment etc. before the signal to noise ratio would drop to an unusable value.

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4. The microwave receiver consists of a variable atennuator, input cavity, mixer, and i.f. amplifier. The transmit/receive frequencies are separated by 60MC and mixer injection voltage is obtained from the transmitter to obtain the 60MC i.f. signal. Printed circuits are used in the three (3) stage i.f. amplifier. The attenuator, a calibrated front panel control, allows the operator to visually determine, in conjunction with an external oscilloscope, the "operating margin" of the RF path, associated with the receiver, without interuption of communications. The amplitude of the received signal could be varied if system performance had changed from its normal operating status.

5. The master sync generator consists of a 8.929KC oscillator, the output of which drives a phase inverter, which produces two sine waves of equal amplitude and frequency but of opposite phase. A 90 degree phase shifter is associated with each phase inverter and each phase inverter with phase shifter produce two sine waves which differ by 90 degrees. The resultant output consists of 4 sine waves of the same frequency but differ in phase by 90° degrees and noted as phase A,B,C,D. To form a channel pulse a phase divider network is connected between any of the two phases and the output is utilized to trigger a saw tooth generator. Dependant upon the value of the resistors in the phase divider network, the saw tooth generator will cause the channel to be generated at the mid-point of the time space allocated for that particular channel. With a sync generator frequency of 8.929 KC a complete "revolution" or frame takes a total of 112 microseconds. In a 25 channel system this time allocated for a channel is 4 microseconds with a 4 microsecond guard and marker pulse and a 4 microsecond guard space. The presence of an audio modulating signal causes the channel pulse to be formed earlier or later in the time space. Nominal 100% modulation is plus or minus one microsecond. The receiving sync circuit is similar to the transmit sync system however a marker selector detector is used to detect the distinctive marker pulse and maintain sync with the received wave train.

6. The equipment is housed in a standard W. E. rack with the units hinged where rear panel access is desired. This arrangement permits a maintenance technician to check a unit while in operation without walking around. Floor space is also conserved compared to to conventional racking.

7. Dependant upon the complexity of the system desired which may modify an estimate, a system cost estimate is approximately $1000 per mile in flat country.

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