B1 DATA CARRIER TERMINAL
CHANNEL LINE FREQUENCY ALLOCATION
AND
MODULATION PLAN

1. GENERAL

1.01 This section describes the modulation plan used in the B1 data carrier terminal unit and gives the frequency of the channels as they are applied to the connecting voice facility.

1.02 This plan provides means whereby six data subscribers may share the same voice-band facility in the transmission of data between two data terminals.

1.03 The plan which is used has reasonable spacing in frequency between the channels and requires a single base frequency oscillator from which all of the necessary carrier frequencies are derived. Any other channel frequency allocation would require two or more base frequency oscillators.

1.04 The voice facility must pass a band from 300 to 3253 cycles if all six channels are to be used. All of the broadband carrier facilities which use the type A channel banks pass this band as do type N and ON carrier.

2. DESCRIPTION OF MODULATION PLAN

2.01 Fig. 1 and 2 are simplified block diagrams of the B1 data carrier terminal unit. All unnecessary details have been removed to focus attention on the modulation plan. The two figures cover two transmission conditions: (1) when the input to the data channel is the F1 band and (2) when the input is the F2 band. The F1 data band is a band of frequencies from 1045 to 1295 cycles which is produced in the data set at the originating terminal. The F2 band is a band of frequencies from 2000 to 2250 cycles produced in the data set at the answering terminal. It should not be concluded from the two figures that all channels in a terminal must transmit the same input band. Any combination of the two inputs with the six data channels can be used.

2.02 Refer to Fig. 1 and consider transmission through channel 1. The F1 data band will modulate with a 1910-cycle carrier supplied to the amplitude modulator, designated M1. Two sidebands are produced; one is centered at 740 cycles and the other at 3080 cycles. The band centered at 3080 cycles is rejected by the BF1 bandpass filter and the 740-cycle band is applied to the transmitting line. All of the other channels may also be transmitting data signals but they are applied to the line at a different frequency, as shown.

2.03 At the receiving terminal REC, a receiving channel filter selects the channel 1 data from the combination of data and supervisory signals present on the receiving line. Demodulator D1 is also an amplitude modulator using a carrier frequency of 1910 cycles. The demodulator produces two sidebands centered at 1170 and 2650 cycles. The latter is rejected by the low pass filter which follows the demodulator, leaving only the F1 data band. Except for the effects of delay and attenuation distortion in the filters and frequency shift in the voice band facility and the data terminal, this signal is the same as the data signal applied to the data carrier terminal in channel 1 at the transmitting terminal.

2.04 Since the lower sideband from the modulator was selected by the channel filter (BF1), the data band on the voice facility is inverted with respect to its normal arrangement. For example, the marking frequency at the input to the data terminal is 100 cycles above the 1170-cycle center frequency, and the spacing frequency is 100 cycles below the center frequency. On the voice facility these conditions are interchanged; the marking frequency is below and the spacing frequency is above the center frequency.

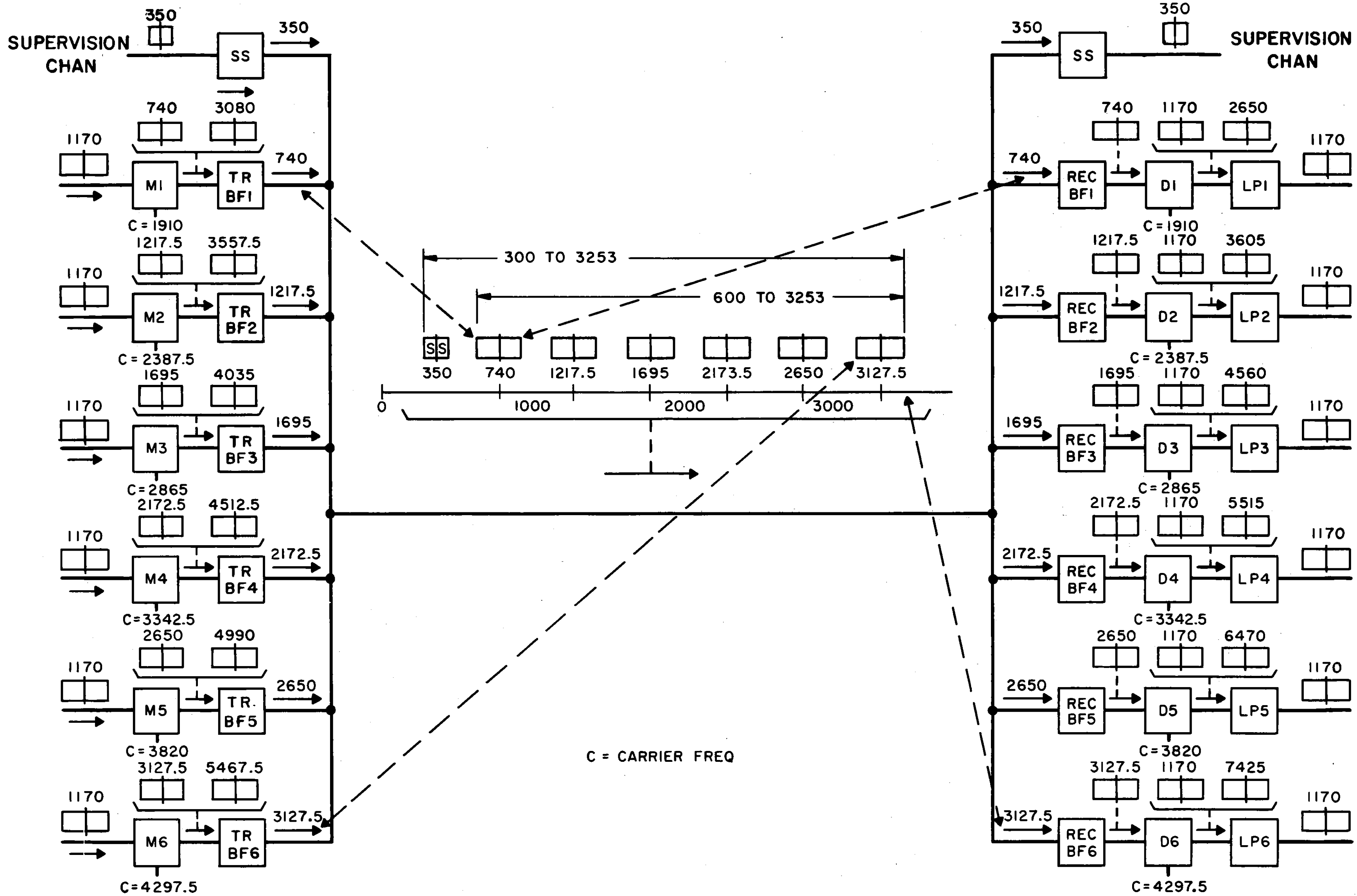

Fig. 1 — Simplified Block Diagram of Modulation Plan for F1 Data

2.05 An examination of the carrier frequencies used in Fig. 1 and 2 for the six channels will show that they are all multiples of 477.5 cycles. This permits the use of a single oscillator for the derivation of all of the carrier frequencies. The stability, in per cent, of all of the carriers will be equal to that of the base frequency oscillator. For the same channel line frequency allocation any submultiple of 477.5 cycles could also be used, but as this frequency is reduced the difficulty of selecting the desired harmonic for carrier purposes would increase and there are no offsetting advantages.

2.06 The plan shown in Fig. 1 and 2 and described above for the F1 data band has other advantages. The carrier frequencies used do not fall in the data band in any channel whether at line or data set frequency. However, the F1 data band at the input to the terminal overlaps the line frequency band in channel 2, and the F2 data band at the input overlaps the line frequency band in channel 4. This situation imposes signal balance requirements for the channel modulators and the demodulators, since a similar situation exists there.

2.07 The supervision channel which transmits off-hook and on-hook information, based on *M* lead signals, for all six data channels is also shown in Fig. 1 and 2. The band of frequencies used by this channel is centered at 350 cycles and is transmitted without further frequency shift through a supervision band filter (SS) to the voice facility. At the receiving terminal this band of frequencies is selected by the SS filter and converted into off-hook and on-hook signals which are applied to the E signaling lead to the trunk circuit.

3. CHANNEL LINE FREQUENCY ALLOCATION

3.01 The allocation of the six data and one supervisory channels is shown in Fig. 1 and 2. The six data channels require that the voice facility pass a band from 615 to 3253 cycles. The supervision channel widens the required band to 300 to 3253 cycles. This is based on data channel and supervision channel bandwidths of 250 and 100 cycles, respectively.

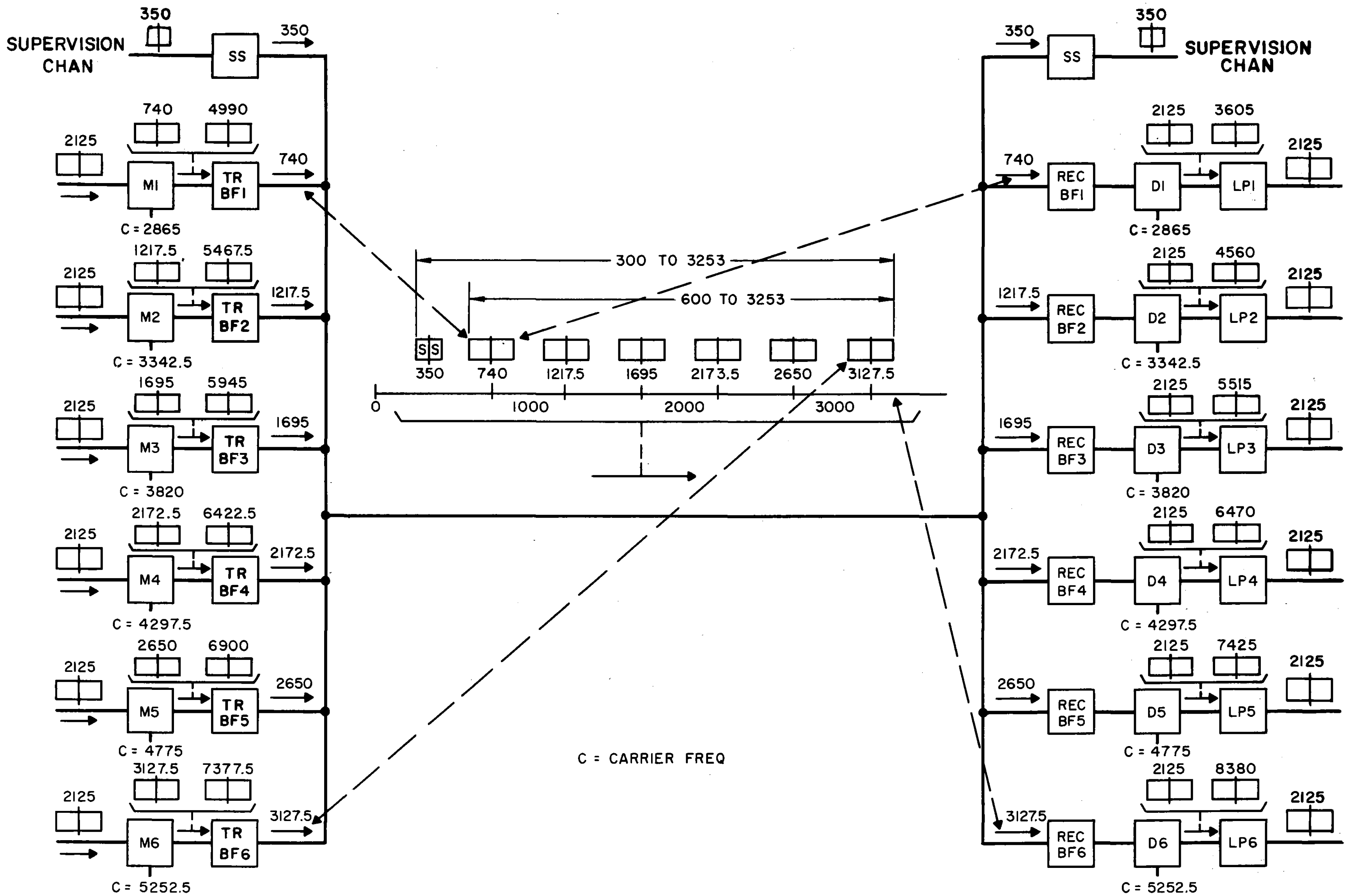

Fig. 2 — Simplified Block Diagram of Modulation Plan for F2 Data