

KEYING POLARITY AND ARRANGEMENT

Most telegraph or digital communications are based on bi-stable systems, that is, equipment that can be conditioned to one of two states, hitherto referred to as Mark and Space, which are then keyed in some recognisable manner in order to communicate intelligence (e.g. by a telegraph code).

The allocation of these two states to correspond to Mark or Space is arbitrary: the only requirement being that all equipment in the circuit is preset to the same relationship. When the bi-stable state is one of voltage or current, as is the case in Model 12 T/P, the allocation is known as the "Polarity". When the bi-stable state is represented by two frequencies the allocation of states is known as the "Arrangement".

International standardisation of arrangement is being pursued, but is unfortunately not yet agreed.

Consideration of the problem is simplified if the two states are considered in terms of the Idle and Active conditions of the Teleprinter or Morse Key.

Radio Circuits

Nomenclature - To indicate the state of the radiated signal the internationally recommended terms "Arrangement 1" and "Arrangement 2" have been adopted for Inter-Service use. These are defined as follows:-

Arrangement 1. When the higher radiated frequency is used to indicate the Active condition of the telegraph apparatus and the lower radiated frequency is used to indicate the Idle condition.

Arrangement 2. When the higher radiated frequency is used to indicate the Idle condition of the telegraph apparatus and the lower radiated frequency is used to indicate the Active condition.

Present usage of arrangement varies widely, and the importance of knowing which arrangement is in use is vital in net working, when it is essential for all stations using the net to use the same arrangement. It is also desirable to know this information when setting watch on a broadcast or fixed service.

Line Circuits. The characteristic or parameter which is used to convey intelligence via line circuits is normally either voltage or current or Audio Tones. Although the term Arrangement is applied to radiated signal at r.f. it can be shown that inadvertent reversal of either Line Polarities, or tones, in Transmitter or Receiver Auxiliary equipments will result in reversal of either the radiated arrangement or the receiver line polarity. In either case it results in a loss of intelligence.

In R.N. line circuits the polarity is normally as follows:-

	Double Current -80V/0/+80V	Single Current ON/OFF
Idle Condition = Position Z = T/P Mark = Morse Space	-80V	ON
Active Condition = Position A = T/P Space = Morse Mark	+80V	OFF

Teleprinter and Terminal Equipment

In the case of teleprinter and associated equipment the terms Mark and Space do not have a precise meaning with relation to the condition of equipment and should no longer be used. The following equivalent conditions are described:-

Idle = (Teleprinter Stop Signal and T/P Mark
(Contact position 'Z'
(Morse Space

Active = (Teleprinter Start Signal or T/P Space
(Contact position 'A'
(Morse Mark

The only internationally recognised nomenclature is Position 'A' and Position 'Z', and these terms should therefore normally be used when referring to the signalling condition of teleprinter systems.

Setting up of Terminal Equipment

Some, but by no means all, radio and telegraph terminal equipment has facilities for reversing polarity or arrangement. It is the R.N. intention that in all future telegraph systems it shall be possible to select either arrangement 1 or 2. The selection of the required polarity on the teleprinter will not in itself guarantee emission of the right arrangement for the circuit. In the case of most radio systems it can well happen that in the sequence of events between aerial and telegraph equipment the frequency arrangement may be changed a number of times. Similarly, polarity may change within the terminal equipment in the case of line systems, and in systems employing both radio and line techniques.

It will be appreciated that when internal changes occur then:

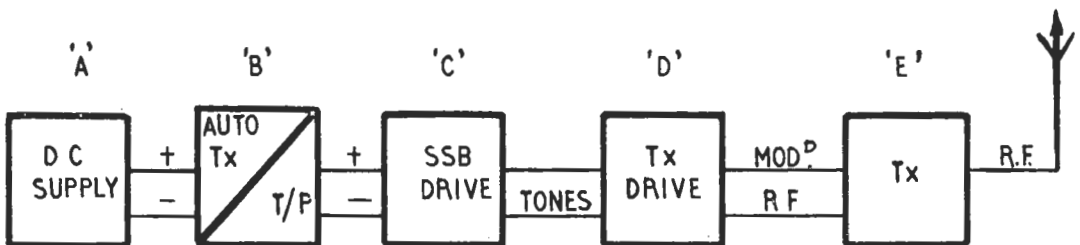
- (a) An even number of reversals up to the point of observation results in no overall change of arrangement or polarity up to that point.

but

- (b) An odd number of reversals results in an overall reversal at the same point.

It is therefore important that when setting up telegraph equipment, full account is taken of the whole system from aerial through to the teleprinter.

Schematic Diagram of a Typical Transmitting Terminal

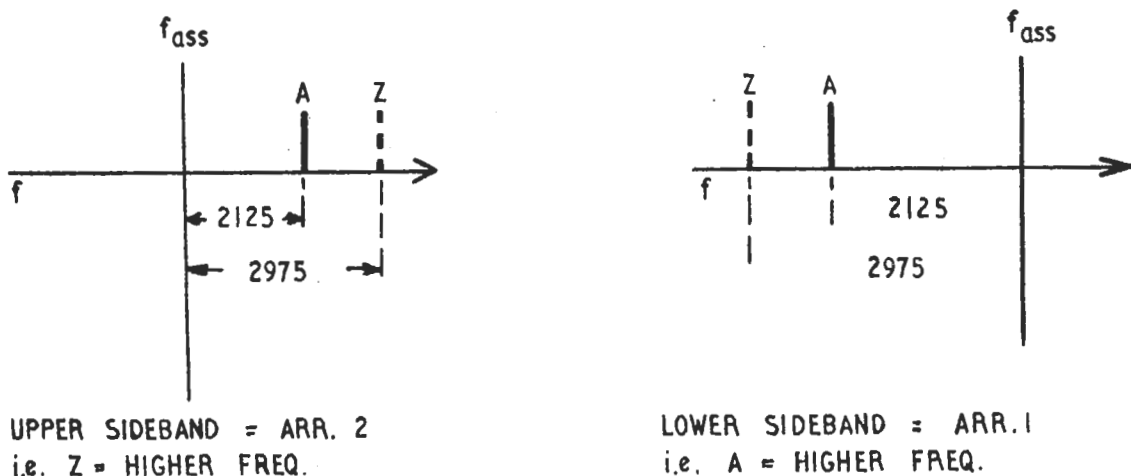


A reversal of the radiated arrangement would result from any one of the following:-

- A - A reversal of the d.c. output of 'A' or of the input to 'B'.
- B - A reversal of the keyed d.c. output of 'B'.
- C - A reversal of tones in the s.s.b. drive equipment.
- D - A reversal of the tone input to the Tx drive or the movement of the reversing switch when one is fitted.
- E - An inversion of the transmitted sideband.

Effect of Choice of Sideband on Radiated 'Arrangement'

The 'Arrangement' of a two-tone modulated s.s.b. transmission will depend upon the choice of sideband which is radiated by the transmitter, e.g. a single channel two-tone modulated signal using the tones 2125 c/s (Active) and 2975 c/s (Idle) when transmitted as an upper sideband will radiate 'Arrangement 2'. If the lower sideband is used then the radiated signal becomes Arrangement 1.

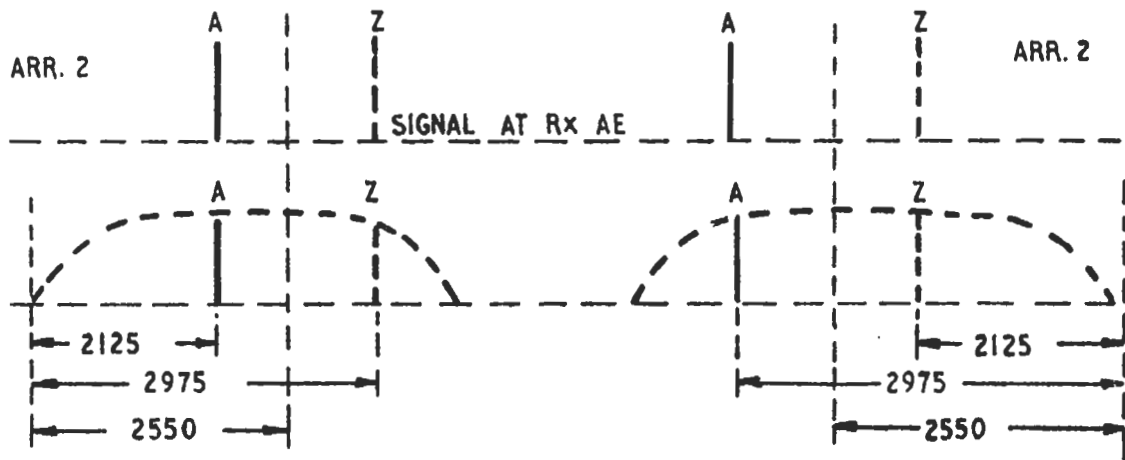


Diag. 5-2

It should be noted that when a signal of this nature is used to simulate f.s.t., then for reasons of compatibility, the transmitted sideband is shifted by plus or minus 2550 c/s in order to place the radiated frequencies equally spaced around the assigned frequency.

When this type of signal arrives at the receiver terminal it is necessary to know the 'Arrangement', and to consider the treatment required in order to obtain the desired arrangement or polarity at the output terminals of the receiver.

If the signal arriving at the receiver aerial is dealt with as an upper sideband, then the arrangement will be preserved as far as the receiver output terminals. If, however, the receiver is tuned to accept the signal as a lower sideband then the arrangement will be reversed during the passage of the signal through the receiver, e.g.



Rx. TUNED TO ACCEPT
 SIGNAL AS AN USB.
 TONES THEREFORE
 DEMODULATED AS
 2125c/s FOR A
 2975c/s FOR Z
 i.e. Z = HIGHER FREQ.
 = ARR. 2

Rx TUNED TO ACCEPT
 SIGNAL AS LOW S.B.
 TONES THEREFORE
 DEMODULATED AS
 2125 = Z
 2975 = A
 i.e. A = HIGHER FREQ.
 = ARR. 1
 = REVERSE OF
 INCOMING ARRANGEMENT