MONOSYNC— A NEW DECODER

INTRODUCTION

In 1968 Marconi first introduced the Monosync system of pulse distribution, whereby all the output signals of a synchronizing generator may be conveyed on a single coaxial cable, so greatly simplifying the problems of pulse distribution and assignment and significantly reducing the cost of studio installation.

A further major advantage of Monosync is the ease with which pulse and subcarrier timing can be adjusted by means of tapped delay lines and phase shifters in the coding and decoding equipment. This greatly simplifies both the initial installation of a studio centre and the future addition of further studio facilities.

A previous article[1] has described the encoding and decoding arrangements in some detail, so it is only necessary to restate the most important features of the system before describing more fully the new decoder.

THE CODED PULSE WAVEFORM

The choice of coded waveform is very important in achieving good overall performance. It must be capable of distribution by normal video circuits without suffering distortion which could affect the duration and relative timing of the regenerated pulses.

The Monosync coded waveform is shown in figure 1. The start and finish of each of the input signals is transmitted by a sequence of short pulses having approximate sine-squared shape with an H.A.D of 0·3 μs. The pulses are alternately positive and negative going with the subcarrier information inserted in two 10 μs bursts per line period.

The advantages derived from this form of coded waveform are:

(a) No low-frequency components, therefore no l.f tilt effects and immunity to hum picked up in distribution by simple highpass filter in decoder

(b) Spectrum of pulses falls to zero at 1/0·3 μs = 3·3MHz therefore pulses do not interfere with subcarrier regeneration and simple filter removes subcarrier from pulse circuits

(c) Alternate positive and negative pulses ease the detection of closely spaced edges

(d) Subcarrier bursts occur regularly at two bursts per line period even during field interval, thereby eliminating the possibility of phase modulation at field rate.

THE CODER

This consists of two 5¼in plug-in modules which convert the synchronizing generator signals into the coded waveform previously described.

The unit has its own built-in power supply and can be fitted with optional delay boards. These delay boards allow the output waveform timing to be adjusted in steps of 25ns up to a maximum of 3·125 μs.

The subcarrier bursts are added after the delay so that even very small delay variations, due for example to changes in temperature, have no effect on the subcarrier phase.

T.T.L microcircuits are used in the pulse circuits and there are no operational controls.

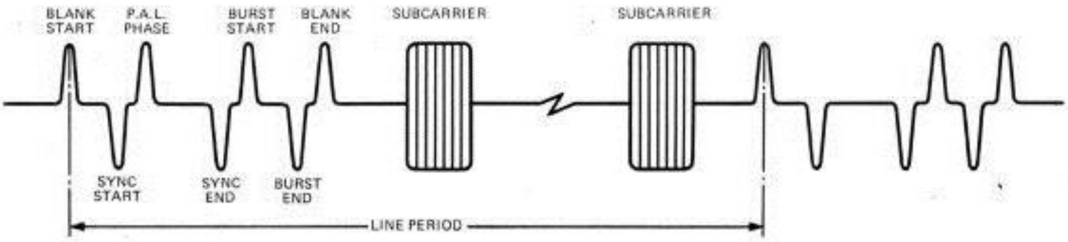

Fig.1 The Monosync coded waveform.

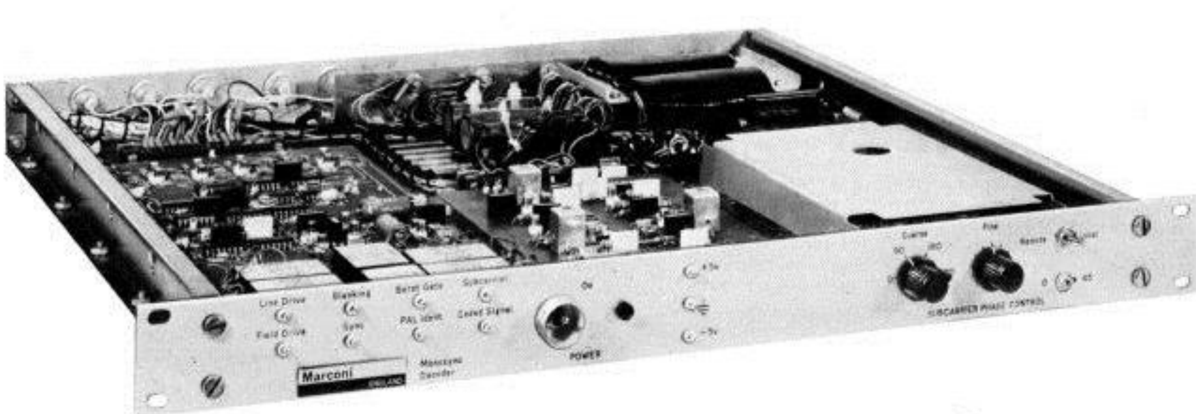

Fig.2 The new decoder.

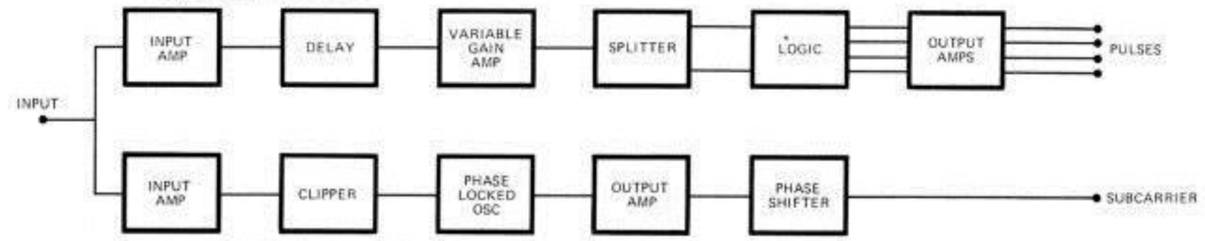

Fig.3 Decoder block diagram.

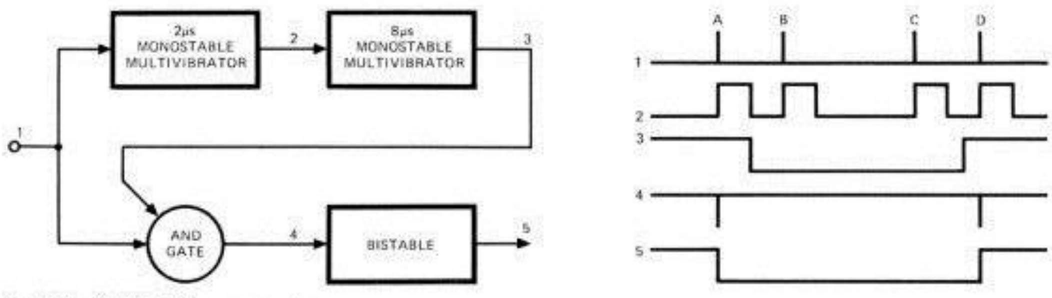

Fig.4 Simplified blanking regenerator.

THE NEW DECODER

Figure 2 shows a general view of the new decoder from which it can be seen that the unit has been repackaged in a 1$\frac{3}{4}$in × 19in rack mounting panel, which, since normally only a single decoder is used at any one location, makes the best use of the available rack space.

The four printed wiring boards housed within the unit perform the following functions:

Pulse regeneration
Subcarrier regeneration }
Pulse delay } Optional facilities
Subcarrier phase shift }

Input and output connectors are BNC with the coded input signal looped through. The regenerated output signals are Line and Field Drive, Blanking, Sync, Burst Gate, PAL Ident and Subcarrier. The pulses are 2 or 4V negative going into 75Ω with the exception of the PAL Ident which is a 1V squarewave. Subcarrier is a 1V or 2V sinewave. The input and output signals together with the power supply voltages can be monitored at front panel test points.

All the essential timing information provided by the sync generator is precisely reproduced by the regenerated pulses, the only exception being the widths of the Line and Field Drive pulses which are preset in the decoder, and the start of Field Drive which is 0·75µs late with respect to Field Blanking.

Figure 3 is a block diagram of the decoder. The coded signal input to the pulse regeneration circuit passes through a high-impedance input stage to the tapped delay line board. Two editions of this board permit maximum delays of 375ns or 3·125µs and, in each case, the delay is adjustable in 25ns steps.

After delay the signal passes to a subcarrier trap and variable gain stage. The gain available is sufficient to give correct decoder operation when the coded signal is transmitted over a maximum of 4,000ft of T3304 coaxial cable.

At this point the signal is split into separate paths representing the positive and negative parts of the waveform and passed to the t.t.l logic circuits. These make use of the fact that the pulses have a regular periodic pattern to select only those input pulses required to regenerate a particular output signal. As an example of the operation figure 4 shows how the Blanking Signal is reproduced from the positive going part of the coded waveform. The 2 μs multivibrator is triggered by the pulses A B C D and the 8 μs multivibrator triggered by the back edge of the 2 μs pulses A and D. Pulses B and C do not retrigger the 8 μs multivibrator since the trigger input is inoperative during the timing period. The output of the 8 μs multivibrator is used to gate the input pulses in such a way as to allow pulses A and D only to pass through, i.e the leading and trailing edges of blanking. It can be seen that by this method of gating neither of the multivibrator timings needs to be precise, thus eliminating the need for preset adjustments. The blanking waveform is regenerated by clocking a type D flip with pulses A and D. Similar techniques are used to derive the other output pulses. Additional benefits of this system of pulse decoding are that the output signals are unimpaired by genlocking and that either 525 or 625 line pulses can be handled without circuit modification.

Continuous subcarrier is regenerated by a crystal oscillator phase locked to the subcarrier bursts of the coded signal. In this way the reproduced subcarrier is free of any phase modulation which might occur if it were transmitted continuously and superimposed on the pulse signal.

The subcarrier phase shifter permits full 360 degree control of the regenerated subcarrier phase by course and fine front-panel controls, or from a remote control panel connected to the decoder via a multiway plug and socket. Alternatively, the phase shifter can be used in conjunction with the BO3-3610 Phase Comparator to give automatic control of subcarrier phase.

The excellent stability of operation and lack of distortion to the transmitted signals can be appreciated from measurements made on a typical Coder, Decoder combination.

Pulse jitter	Less than 5ns
Subcarrier jitter	Less than 0·2 degrees
Variation of subcarrier phase with temperature and for new decoder alone:	Less than 1 degree for 10°C temperature change
Pulse jitter due to 1V peak-to-peak hum on coded signal	Less than 10ns
Change in pulse and subcarrier delay with +6% change of mains voltage	Less than 5ns and 0·25 degree

CONCLUSION

The excellent performance and reliability of the Monosync system of pulse distribution has been proved by its daily use in a large number of television stations over the last five years. Whilst retaining all the best features of the earlier equipment, use of the latest components and circuit techniques has enabled this new decoder to be restyled, thereby saving valuable rack space.

REFERENCE

1 H. D. Kitchin and A. Tucker: Monosync Pulse Coding, Sound and Vision broadcasting, Vol. 9, No. 3, winter 1968.