numbers and more complex symbols on the display. This may be done by small T.V. type rasters, beam forming tubes, or Lissajou shapes, but one of the most satisfactory ways of doing this is to generate small X and Y waveforms which represent the form of letters and numbers, and display these during the intertrace period. This must be done by very fast waveforms, so as not to use up too much valuable intertrace time, which in turn would limit the range of the radar.

This requirement has been responsible for one of the most important advances in radar displays in the U.K. of recent years, the provision of the double deflection system.

The main deflection system handles the radar timebase, and positions the beam at the correct D.C. position during the intertrace period. During this period, a high speed, small aperture deflection coil, situated behind the main coil, captures the beam, and writes the required characters. By this means, it is possible to write a letter or number of extreme clarity in 20/uS. A high performance radar display can deflect the beam a full tube diameter in 50/uS. This, including flyback time, allows three identification characters to be written in an intertrace period of 160/uS.

The position of each aircraft is obtained from the tracking radar operator's display, either by extracting the X and Y co-ordinates of the appropriately positioned intertrace mark, or by automatic tracking. This information together with the aircraft identity, height, estimated times of arrival etc., is converted to digital form, and fed to the computer. Successive positions of the aircraft enables the velocity to be found. The computer operating at a clock rate of a megacycle or more, performs at such a rate that negligeable delays occur between the insertion and availability of the data.

This can be read out onto the original display as a tracking aid and supplimented on an adjacent tabular display, or made available upon a synthetic display unit in an uncluttered form, with selection carried out as required.

The synthetic radar display receives step deflectional waveforms, decoded from the computer store. The character information is displayed in the same manner as for the raw radar, but the video is now simple brightness pulses. Aircraft appear in ther correct position, usually represented by a small direction vector, and two identifying letters, and move in synchronism with the aircraft on the basic radar display, but controlled now by the computer.

However, each aircraft position now takes only 110/uS (50/uS positioning plus 60/uS for 3 characters). Thus at a display rate of 20 cps, around 400 aircraft positions can be available for display, in a store sequence.

The basic requirements for a modern comprehensive radar display now become apparent:

1) For the small airfield:
   a) raw radar.
   b) calibration e.g. range rings.
   c) simple marking.
2) Large airfield requirements:
   a) raw radar.
   b) calibration by range rings or video maps.
   c) alpha - numeric identification.
   d) more complex video inputs, such as direction finder bearing lines, secondary radar and range and bearing marks.
   e) the ability to perform as a synthetic display.

Fig. 1

A Modern Transistorised Radar Display.

The advent of transistors has made possible system and devices of greater complexity, without increase of size and power. In fact, in most instances, there has been considerable reduction in both these parameters.

The minimum size of a radar display is limited by the size of the cathode ray tube, and Fig. 1 shows about the minimum possible for a 12" C.R.T. However, only approximately half the deflection power that was necessary for a valve display is required for this complex transistorised equipment.

The main operational units are:

1) the main timebase deflection amplifiers.
2) the nigh speed character deflection amplifiers.
3) the video amplifiers

together with the high voltage tube supply, focus supplies and general services.

Main Deflection Amplifier

The function of this unit is to convert the small input voltage deflection waveforms to the fairly large coil currents and to provide range switching (expansion) and off-centring facilities.

In order to achieve a high quality display, great