

RAF Type R.1598 SBA localiser receiver: note the Pye Type 299 aerial connector at the side and a Type W198 4-pt plug for connecting a marker receiver Type R.1599.

Photograph courtesy Ray Robinson VK2NO.

One Saturday afternoon in the late 1950s (when most of us had to work or attend school in the mornings, as many readers may recall), the proprietor of our local surplus store showed our usual group of gathered radio amateurs a rather battered American 'Command' receiver operating on 10 meters. It had evidently not been modified by an amateur, as shown by an official tuning dial calibrated from 28-41MHz, but having British connectors fitted on the front and side. As nobody knew its use and there was no circuit available, it met with little interest, but eventually sold for a modest sum. In subsequent years, I occasionally heard of more of these 10 meter 'Command' receivers being sold, each one fitted with a Pye and a Type W connector, but its use remained unknown.

It was only a few years ago that I was given a civilian technical manual detailing SBA and intercom systems installed in the post-war Vickers Viking aircraft, where I finally discovered the use, name, function, and technical details of this receiver. Additionally, I found a description written by Ray Robinson, posted on his website in 2016.

Appendix 1 describes the operation of the SBA system in a nutshell, and Appendix 2 is a short illustrated description of one of the variations of the in WW2 commonly fitted RAF aircraft SBA receivers, Type R.1124A and Type R.1125A.

DATA SUMMARY

Organisation: US Army Air Force, RAF.

Developer/maker: USA developed and produced BC-455-B receiver, modified for SBA in the UK in WW2 by the RAF and US air force.

Year of Introduction: Believed early 1941.

Purpose: (Interim) Standard Beam Approach.

Frequency: SBA localiser. 28-41MHz band.
SBA Marker beacon 38MHz. (700Hz and 1700Hz).

Aerials: Localiser receiver: 33 inch vertical rod;
Marker beacon receiver: 16 inch horizontal. See page 3.

Power supply: 28V aircraft accumulators.

Command Beam Approach

(Fitted in American built aircraft.)

Date of issue: Aug. 2024.

Remarks

The Command Beam Approach (C.B.A.) was a radio receiving system that was installed in aircraft that were manufactured in the United States for the azimuthal runway approach. It used the ground installation of the Standard Beam Approach (SBA), installed in most WW2 British RAF airfields.

In the early stages of WWII, aircraft procured in the USA for the British RAF, such as the B-17C, were not fitted with Standard Beam Approach equipment. As a measure of using the SBA system, American 'Command' BC-455-B receivers (part of the standard fitting of the American SCR-274-N 'Command' radio installation) were modified to the SBA band 28-41 MHz for the reception of standard beam approach transmissions of localiser signals. These modified receivers were known as RAF Type R.1598 (with stores number 10D/17116).

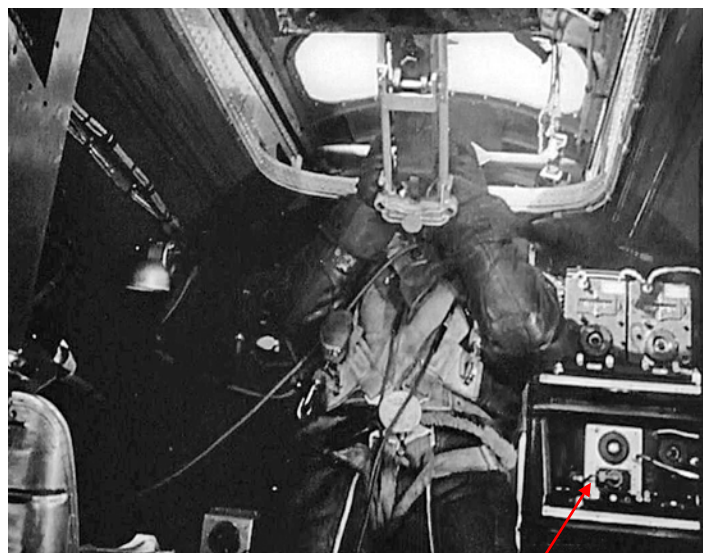
A BC-357 marker beacon receiver, modified from its original 75 MHz to receive the SBA inner and outer marker beacon signals operating on 38 MHz, was known as RAF Type R.1599 (with stores number 10D/17117).

The normal remote control facilities provided by radio control box BC-450-A were used, which only required the replacement of the original tuning dial with another calibrated for 28-41 MHz.

As this version of airborne SBA was integrated into the 'Command' radio system of the aircraft, it was named CBA, short for Command Beam Approach, designated by the RAF as ARI5409.

The CBA system was audio based and had no meter nor flashing lamps for outer and inner marker beacons.

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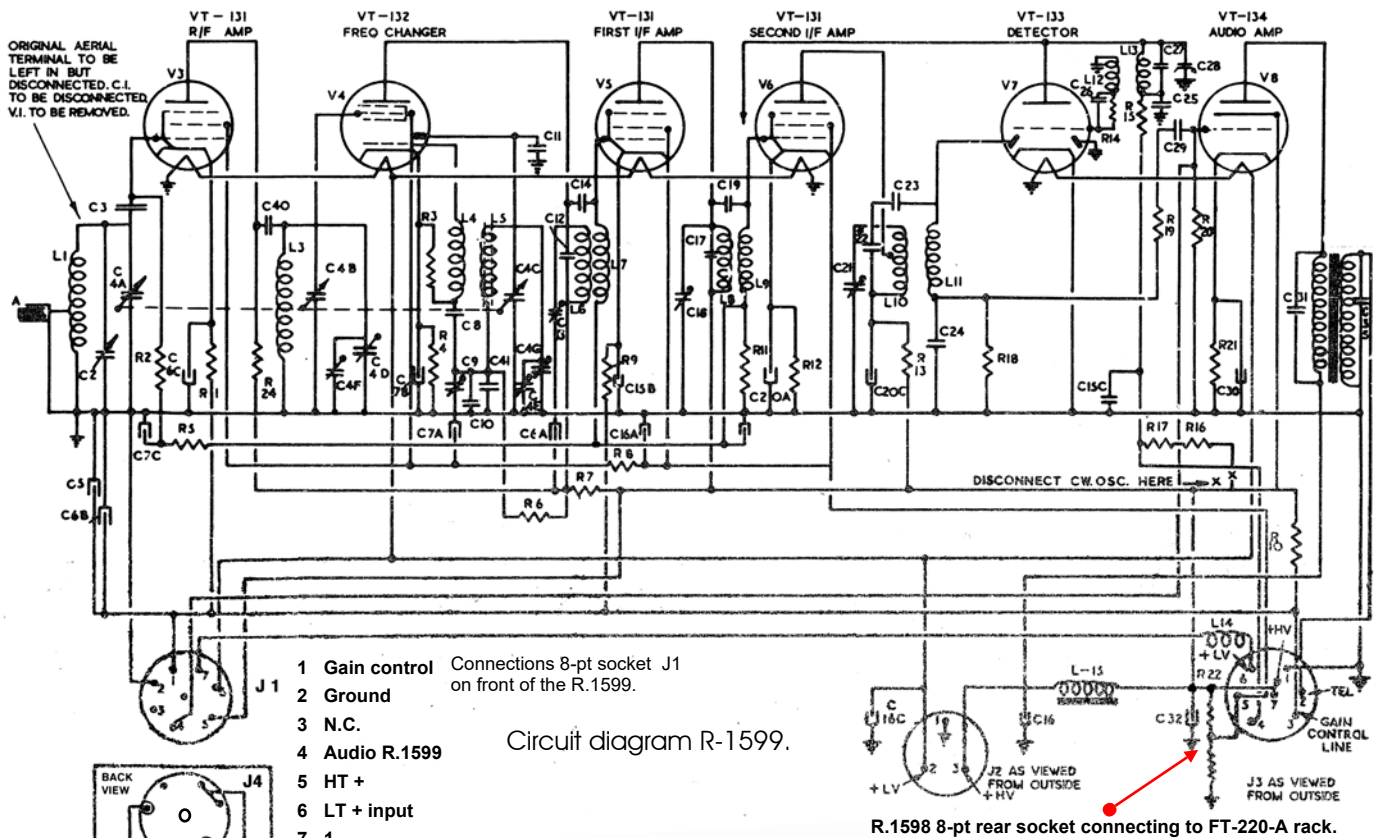


Photograph Dave Stinson via Ray Robinson.

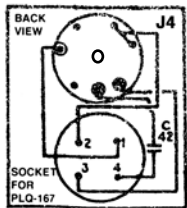
British 'Pye' and 'W' connector.

A modified BC-455, used as SBA localiser receiver, fitted in a B-17 on the left-hand side of the SCR-274-N command radio rack, below the two command transmitters. It replaced one of the three existing receivers. Note the British 'W' and 'Pye' connectors. The receiver should be positioned on the left-hand side of the rack due to the projection of the Pye coaxial aerial plug.

Type R-1599 SBA localiser receiver.



Circuit diagram R-1599.



Adaptor F-230-A-CBA

- 1 Ground Connections 4-pt W198
- 2 LT + type socket to R.1599.
- 3 HT +
- 4 Audio R.1599



Radio Control Box BC-450-A.

One of the three original receivers in the FT-220-A rack was replaced by the R.1598, providing SBA functionality. Neither this rack nor the radio control box BC-450-A required modification, apart from a replacement tuning dial on the control box.

Remarks (continued from previous page).

The marker receiver Type R.1599 obtained its power from the Type R.1598 receiver, and its AF output was fed to the grid of the R.1598 AF output valve, thus providing amplification of marker beacon signals and at the same time superposing them onto the localiser signals. The gain control affected only the R.1598. As the localiser receiver was not required to receive CW signals, the CW-off-MCW switch on the control box provided MCW on both operating positions. A vertical rod aerial was used for the reception of the localiser beam signals, and a separate horizontal wire aerial was used for the marker receiver.

In retrospect, it may be concluded that fitting the R.1598/R.1599 combination in American made aircraft procured by the RAF saved much in weight, space, and time of fitting, as most items were already present in the standard SCR-247-N Command installation.

Noted is that after WW2 CBA receivers were fitted in commercial Vickers Viking aircraft.

Origin of CBA modification.

The USAAF VIII Bomber Command (which was re-designated as Eighth Air Force in February 1944) arrived in the UK in June 1941. They took over RAF airfields which were equipped with Standard Beam Approach ground systems. As their aircraft were not fitted with SBA, it is believed but not confirmed that, as an interim, adopted the British modification of two existing receivers in the aircraft. These were marked with a stamp reading 'Mod CBA'.

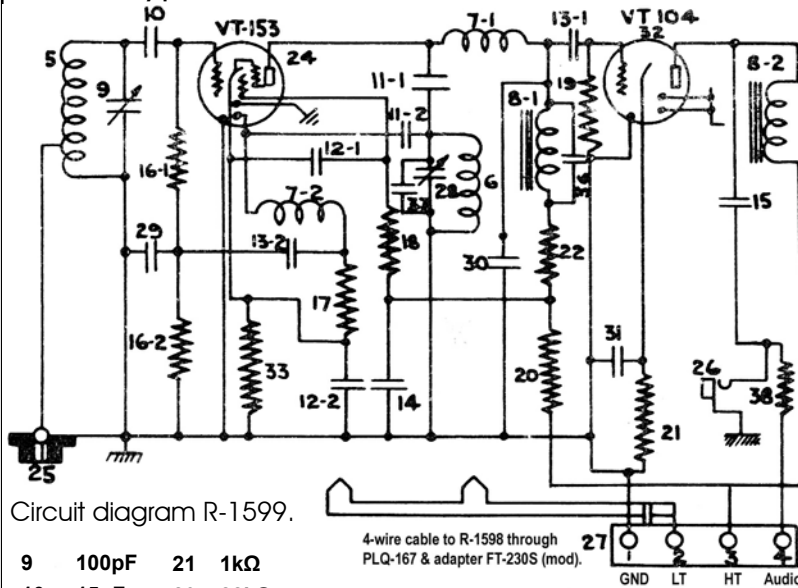


Apart from the RAF equipment number of the modified 'Command' SBA, known as ARI 5409, no technical 'Air Publication' has been found to date. It may be assumed but not yet confirmed that these relative minor modifications were devised by the RAF as they had to face with this problem much earlier with their USA built aircraft.

Modification changes BC-455-B.

The BC-455-B modifications to Type R.1598 primarily involved changing its original frequency from 6-9 MHz to 28-41 MHz while retaining the original IF at 2830 kHz. By reducing the number of turns on each tuned coil, the RF coil set was adjusted for the frequency range of 28-41 MHz. Movable powered-iron cores were only retained in the local oscillator, and adjustment was achieved by positioning the turns during production. The aerial coil was tapped for a low impedance aerial feed and connected to a Type 229 (Pye) connector fitted on the left-hand side of the case. The original aerial terminal was no longer used. Because the reception of CW was no longer necessary or desirable, the CW oscillator was permanently disconnected from the HT. Two connection changes were made to the 8-point socket J1 to take the HT voltage supply to the marker receiver and the latter's audio signal to the control grid of audio amplifier V8. Adapter FT-230-A was modified into FT-230-A-CBA to enable connection to the R.1599 by fitting a 4-pt Type W198 plug.

Type R-1599 SBA marker receiver.



Circuit diagram R-1599.

9	100pF	21	1kΩ
10	15pF	20	22kΩ
11	50pF	21	1kΩ
12	4nF	22	6.8kΩ
13	1500pF	28	18pF
14	.5μF	29	150pF
15	34nF	30	75pF
16	1MΩ	31	500pF
17	560kΩ	33	560Ω
18	270kΩ	36	2nF
19	22kΩ	37	60pF
20	22kΩ	38	500kΩ

Component values R.1599.

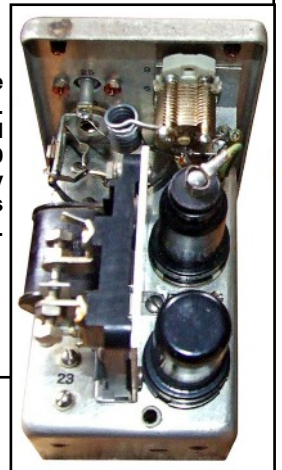
Modification changes BC-357.

The modifications made to the BC-357 to convert it for reception of SBA marker beacon signals at a nominal frequency of 38 MHz instead of 75 MHz. These modifications accommodated the audio modulation frequencies used on British outer and inner marker beacon transmitters, which were 700 Hz and 1700 Hz. Additionally, the audio output from the anode of the second valve was fed to point 4 of the output socket. The relay was disconnected, as visual indication of the marker signals was no longer required. The shorting contact of the relay jack was bent away to avoid short-circuiting the audio output when no plug was inserted. As no American modified BC-357 could be traced, it is assumed that this also had the 'MOD CBA' stamp.



American marker beacon receiver BC-357 (part of RC-43) modified as SBA marker receiver Type R.1599 (above).

Photographs courtesy Ben Nock, MWM.



Internal view of the R.1599 chassis (right). The relay was not used and disconnected, C9 had a larger capacity and the socket 26 was relocated in the circuit.

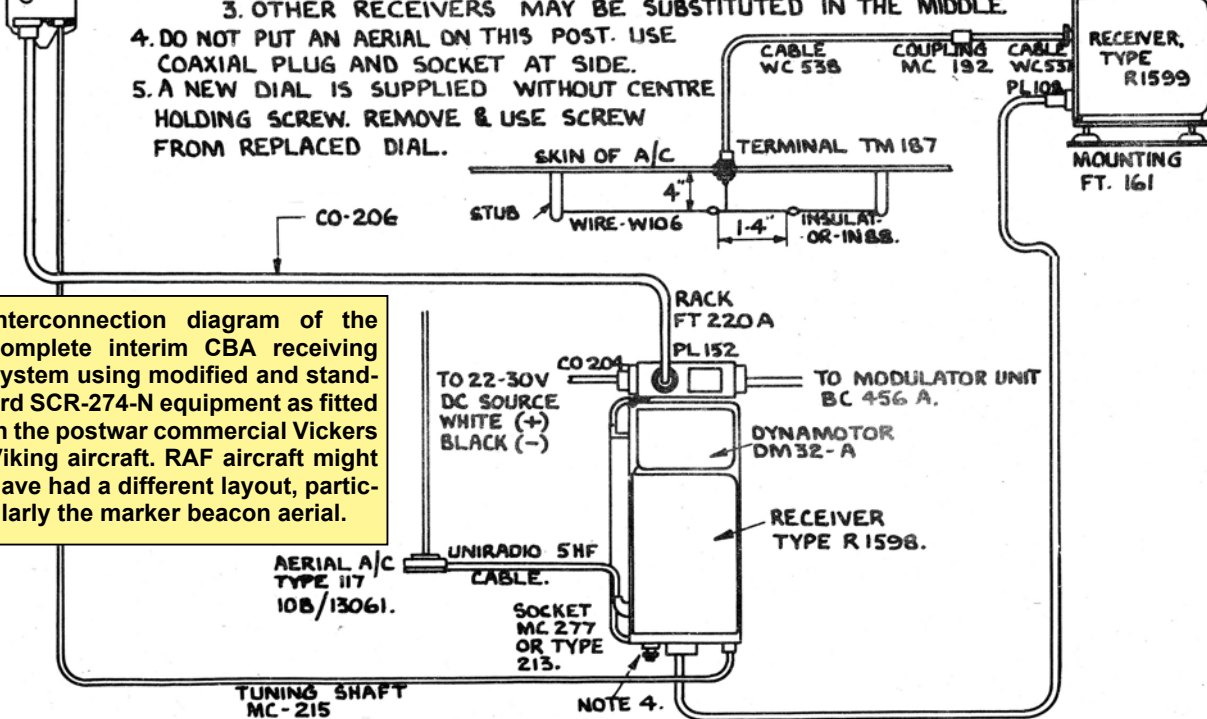
RADIO CONTROL BOX BC-450-A. NOTE 3.



NOTES-

1. RECEIVER INSTALLED IN POSITION SHOWN
2. 5 BA WHIP MAY ALREADY BE INSTALLED
3. OTHER RECEIVERS MAY BE SUBSTITUTED IN THE MIDDLE.
4. DO NOT PUT AN AERIAL ON THIS POST. USE COAXIAL PLUG AND SOCKET AT SIDE.
5. A NEW DIAL IS SUPPLIED WITHOUT CENTRE HOLDING SCREW. REMOVE & USE SCREW FROM REPLACED DIAL.

Interconnection diagram of the complete interim CBA receiving system using modified and standard SCR-274-N equipment as fitted in the postwar commercial Vickers Viking aircraft. RAF aircraft might have had a different layout, particularly the marker beacon aerial.



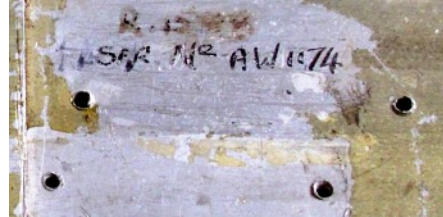
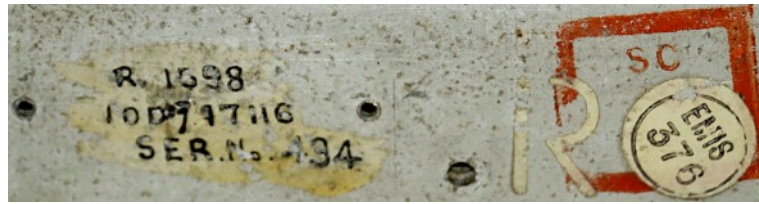
Type plates.

Type plates photographed by Ben Nock G4BXD, from modified BC-455-B receivers in the collection of his Military Wireless Museum. The top two were most likely modified by the American air force in the UK, and the one below by the RAF.



The original type plates of RAF modified BC-455-B receivers were removed and marked with handwritten lettering.

The meaning of the letter R and stamp EMIS 376 is unknown, and possibly may mean refurbished.



Photographs of handwritten type and serial numbers of his own R.1598 (left) and from an auction, are shown here with kind permission of Ray Robinson, VK2NO. One may speculate that the second with s/n AW 1174 was modified in the RAAF.

Acknowledgements:

- With many thanks to Ray Robinson, VK2NO, for permission to publish photographs taken of his Type R.1598 receiver.
- Photograph of SBA control unit courtesy Jerry Proc, Canada.
- Two photographs of RAF SBA receiver units were retrieved from various not yet identified Internet sources.
- Ben Nock, G4BXD, of the Military Wireless Museum kindly took photos of RAF and American modified SBA/CBA receivers, providing evidence of two sources of modification.
- Many thanks to Dave Thompson and Alf Fisher of the now closed Signals Museum at RAF Henlow, for confirmation on SBA type numbers and eventually finding the correct ARI number.

References:

- Wikipedia: SBA. https://en.wikipedia.org/wiki/Lorenz_beam
- Command Beam Approach and Bendix intercom systems, fitted in the Vickers Viking, Viking Accessories Manual, Pt. G, Item 3, n.d.
- Standard notes for Wireless Maintenance Mechanics, RAAF Publication 315, April 1944.
- The versatile BC-357, Short Wave Magazine, Volume VII, Jan. 1950, pp 851-853.
- Command Sets, G. E. White, CQ, Oct. 1965, pp 34-37.
- https://airwaysmuseum.com/Lorenz_system_article.htm

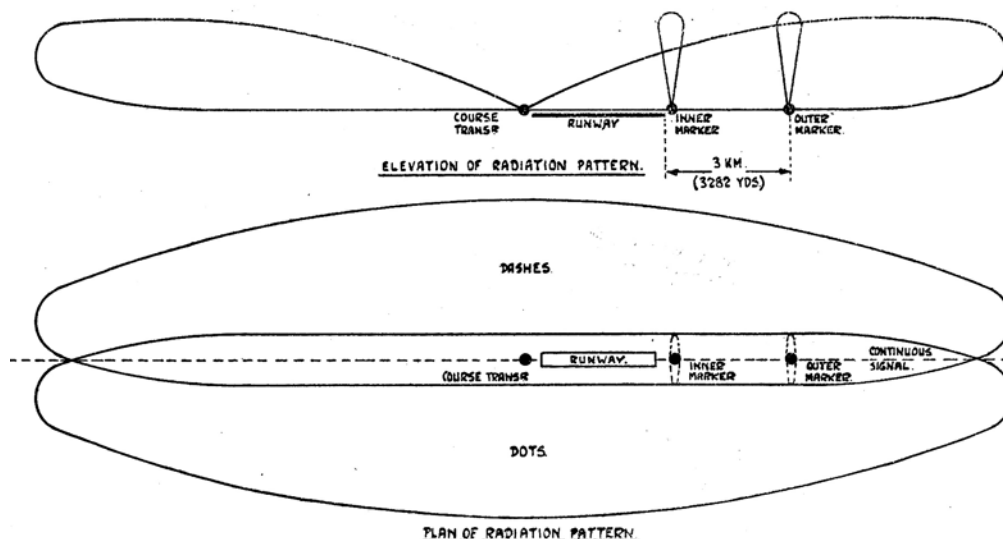
Appendix 1: Operation of the SBA system.

Operation of the SBA system.

The Standard Beam Approach was an airborne receiving equipment that provided pilot-interpreted audio signals, giving accurate indications of the runway azimuthal approach. The main beacon transmitter, also known as the localiser, of the ground installation radiated an omnidirectional

beam that was switched alternately to the left and right of the line of approach. When flying to the left of the correct approach, the pilot heard the Morse letter 'A' at an audio frequency of 1150 Hz; on the right, he heard 'N'; on the correct path, he heard a combination of the two, resulting in a steady 1150 Hz note. Other transmissions

allowed the pilot to identify the beacon and home in on the airfield. Marker beacons were sited along the approach path and indicated by their characteristic signals (outer marker 700Hz and inner marker 1700Hz) the distance to the touch-down point.



Radiation pattern from beam approach aerial system.

Appendix 2: Original RAF Standard Beam Approach receiver.



SBA Localiser Receiver Type R.1124A



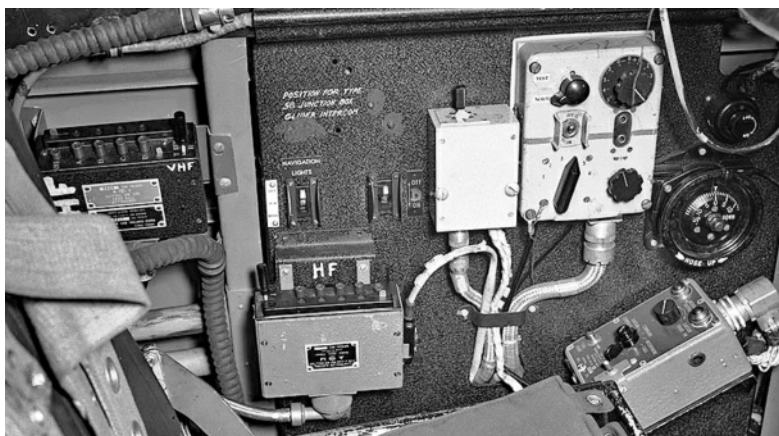
SBA Marker Beacon Receiver Type R.1125A.



SBA Control Unit, Type 227.



SBA Power Unit Type 296.

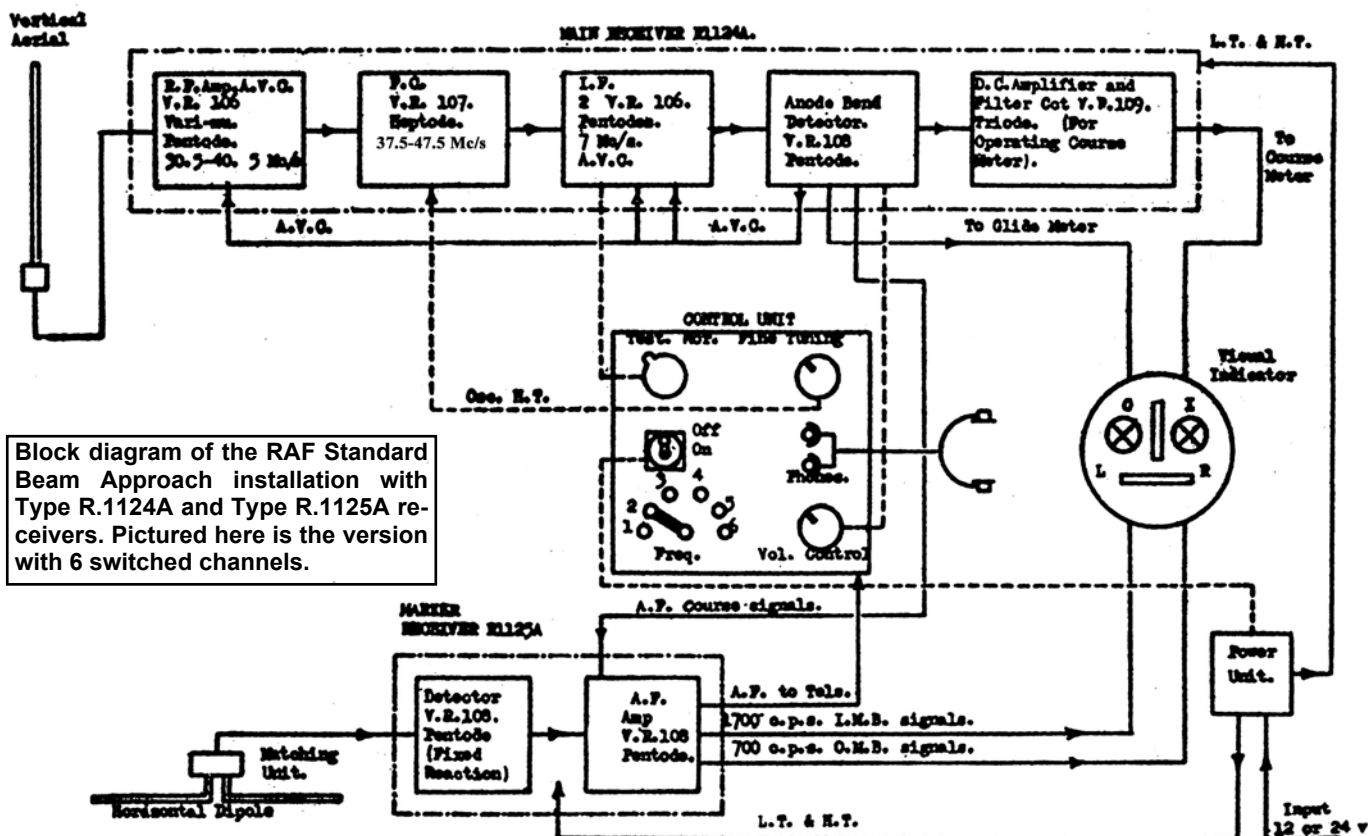


SBA Control Unit Type 227 fitted in a Canadian Lancaster aircraft on the left-hand side panel of the pilot. (Photograph courtesy Jerry Proc).

SBA Visual Indicator fitted on the pilot's dashboard (right). The vertical scale was not used in the RAF and in later versions, the two marker neon lamps were taken out of service. The visual indications were only used in addition to the distinctive aural indications.



There were several variations of this installation. Shown here is a version fitted in heavy aircraft with 6 fixed frequencies. Another version used variable tuning with a remote control. The red band found on the main components indicated that modification M2 was completed or complied with.



Block diagram of the RAF Standard Beam Approach installation with Type R.1124A and Type R.1125A receivers. Pictured here is the version with 6 switched channels.