Society of Antiquaries of Scotland

Radar in Scotland

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Chapter 3

Architecture of radar

All radar systems comprise essentially three elements: transmitter, receiver (and their associated aerial systems) and power supply. The architecture of radar stations necessarily reflects this. Most of the permanent stations in Scotland were powered from the National Grid, but were nonetheless provided with electricity generators to cover any interruption in the mains supply. Stations north of Loth, as well as those in Orkney, Shetland, the Western Isles and other offshore islands, were not connected to the Grid and thus had both main and stand-by generators.

Chain Home

The backbone of the early warning system in Scotland between 1938 and 1946 was Chain Home. This was a long-range early warning radar, based on radio equipment developed for atmospheric research, and the first station, at Bawdsey in Suffolk, was handed over to the RAF in September 1937. CH operated by sending pulses of radio energy at a wavelength of around 10 to 13 metres, with a back-up wavelength of 6 to 7 metres (Swords, 1986: 196). The dipole aerials were half the length of the wavelength, ie for CH the aerials were up to 6½ metres long. This floodlit an area in front of the station through an arc of around 60°, centred on a bearing known as the line of shoot. The re-radiated or reflected radio energy would be received and the time taken for the pulse to be transmitted, re-radiated and received meant that the range could be calculated. Height and bearing of the target was calculated by comparison of the signal received at different aerials. Measurement of distance, range and bearing allowed for the position of the target to be pinpointed. More detailed information on the technical details of CH and other British radars can be found in Swords (1986).

Although CH had been designed and introduced into service before the outbreak of war in September 1939, development continued throughout the war to give increased range, improve definition, fill gaps in the coverage of individual stations, limit the effects of jamming and so on.

As the Home Chain was being hurriedly set up in the period before and after the outbreak of war, it was necessary to provide radar cover quicker than a full permanent, protected CH station could be built. This resulted in sites developing over time as rushed

emergency cover was gradually replaced with the permanent stations appearing. There were three stages in the provision of CH stations: Advance, Intermediate and Final, although it should be emphasised that not all stations had all three stages; some started life as Intermediate stations, whilst some went straight from Advance CH to Final.

Advance Chain Home

Advance CH stations were the first of the three stages of CH stations and were usually set up under hurried circumstances when cover was urgently required in a particular area. They came in several different forms, and there was no 'standard' Advance CH. The first one set up in Scotland was the emergency station at Drone Hill in September 1938, which had the equipment in wheeled trailers and used telescopic 70 foot Merryweather towers. Generally, however, most Advance CH sites had the transmitter and receiver housed in wooden huts with aerials mounted on a variety of different masts, usually 70, 87, 90 or 105 foot.

Intermediate Chain Home

The Intermediate stage used wooden huts for the equipment, as Advance CH stations did, but the aerials were mounted on two 240 foot wooden towers, one for the transmitter aerials and one for the receiver. Both towers would then be used as receiver towers when the Final CH station replaced the Intermediate. Broad

9 A 70 foot transportable tower made by Merryweather, with a receiver trailer behind.
(© Frank Roberts)

Bay is an example of a site which reached the Intermediate CH stage but was never replaced with a Final CH station. More unusual was Brenish, which was an Intermediate CH but had the aerials mounted on two 120 foot towers.

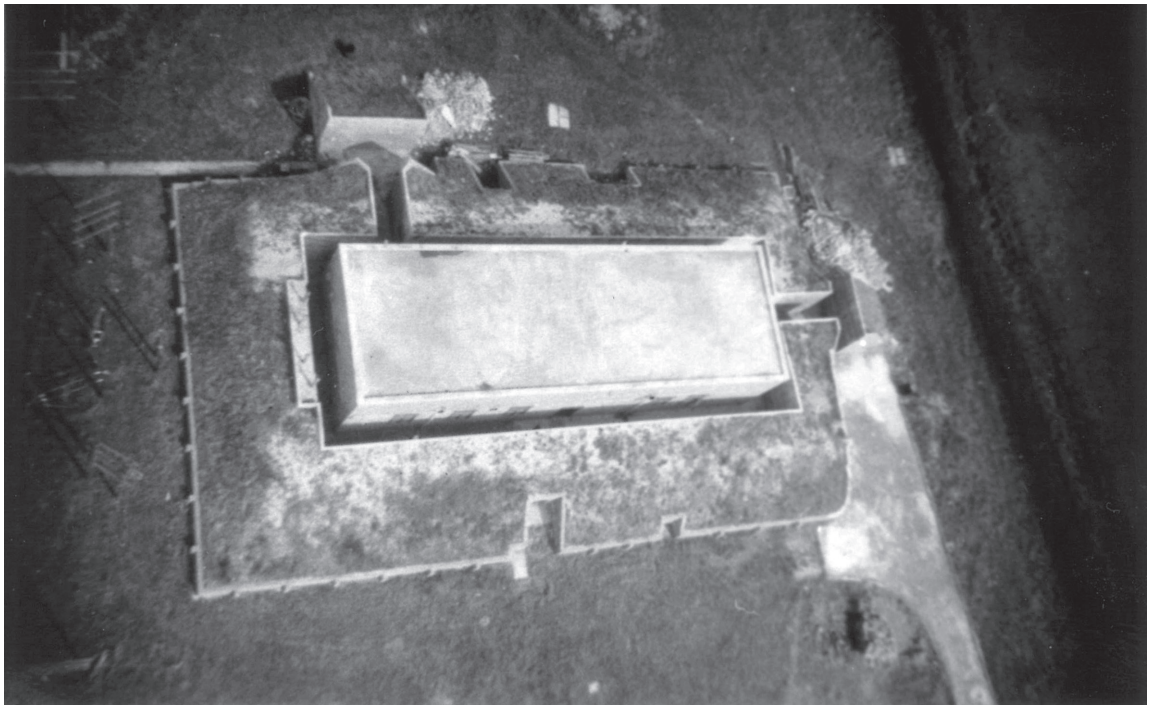
Final Chain Home

Final CH was the ultimate development of the CH system, with equipment housed in protected brick or concrete buildings and the aerials on large steel or wooden towers or masts. There were two different types of CH station which determined the structures and layout which would appear on the Final station. These were East Coast and West Coast stations, although these terms are not entirely geographically accurate, since some West Coast stations were actually on the east coast of Scotland. The descriptions given for the two refer to Final CH stations, since Advance and Intermediate stations were the same for both East Coast and West Coast types.

East Coast Chain Home

The East Coast stations were built on the pattern of the first station at Bawdsey. As such, these stations had two transmitters housed together in a single brick Type A Transmitter Block with two receivers in a Type A Receiver Block. These blocks were protected brick buildings, surrounded by revetted blast walls and with a 5½ foot thick layer of shingle enclosed within the roof in order to dissipate the shock of a direct hit bomb blast.

Transmitter aerials were suspended from steel towers, four of which ran in a line in front of the Transmitter Block, spaced about 180 feet between centres. The towers themselves were built by three different companies, Blaw Knox



10 A Type A Transmitter Block, from above, taken in 1945.
(© Murray Cass)

Ltd, Radio Communication Company Ltd and JL Eve Construction Company Ltd, and each company's towers were slightly different in design. The Blaw Knox towers were 358 feet 2 inches high, those of RCC were 358 feet high and the JL Eve towers were 357 feet 11¾ inches high. Each had cantilevered platforms at 50 feet, 200 feet and 350 feet, and these generally were known as 350 foot towers.

The receiver aerials were mounted on 240 foot wooden towers, the four towers forming a rhombus centred on the Receiver Block. Although there were four transmitter towers and four receiver towers, not all of these carried aerials. It was originally planned for CH to be able to operate on any one of four different frequencies in order to make it difficult to jam the stations – if jammed, they would simply switch to a different frequency. Each tower would have carried the aerials for one of the frequencies, hence four frequencies and four transmitter and four receiver towers. However, it was decided that four separate frequencies were not required and only two were ever used. This meant that only two of each of the towers were used. However, this did not remain the case. From mid-1941 onwards, new transmitter aerial arrays were erected which, rather than being suspended between the platforms on individual towers, were strung like a curtain between towers, and hence were known as curtain arrays. Since these were slung between towers, it required three towers to carry the two different arrays. Most of the stations retained their towers as originally constructed, even though one 350 foot and two 240 foot towers were, essentially, redundant.

The East Coast CH stations in Scotland (Drone Hill, Douglas Wood, Schoolhill, Hillhead and Netherbutton) all followed this pattern, with one exception. Although Hillhead had the two Type A blocks and four 240 foot receiver towers, it had four 325 foot guyed transmitter masts normally found on West Coast stations.

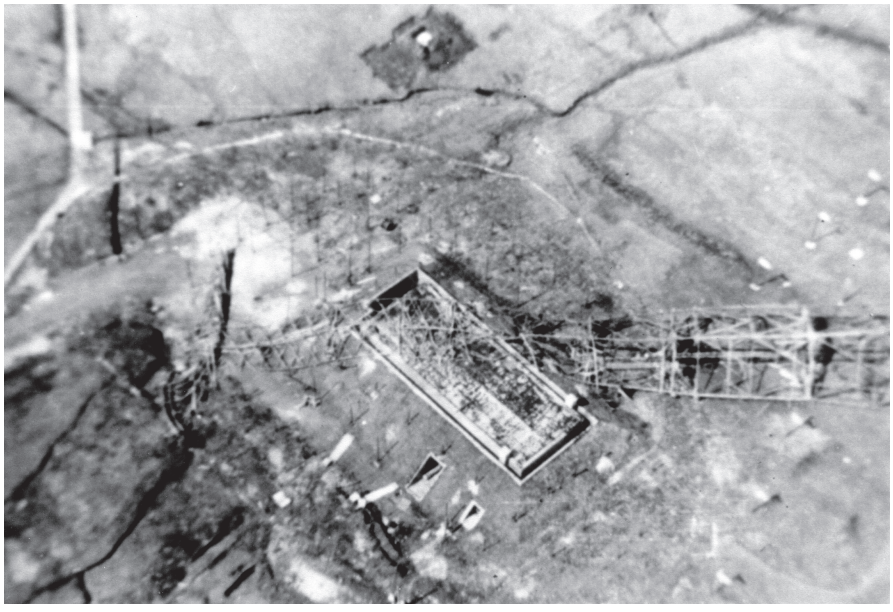
11 A typical East Coast type Final CH station, with the four 350 foot steel transmitter towers on the left and the four 240 foot wooden receiver towers on the right.

Scotland, unlike the rest of the UK, also had a group of non-standard East Coast stations which had technical buildings like the Type A of standard East Coast stations, but to a new 1940 design, known as Type A1. These stations (Noss Hill, Skaw, Tannach and Whale Head) had one Type A1 Transmitter Block and one Type A1 Receiver Block. Transmitter aerials were carried on two 350 foot towers (except at Tannach, which had 325 foot guyed masts) and receiver aerials on two 240 foot towers. Interestingly, the six 350 foot steel towers used at Noss Hill, Skaw and Whale Head had been removed from CH stations in England where they were spare, and re-erected at these three sites. The two towers at Noss Hill came from Great Bromley and Staxton Wold, the two at Skaw from Pevensey and Ventnor, and those at Whale Head from Poling and Rye.

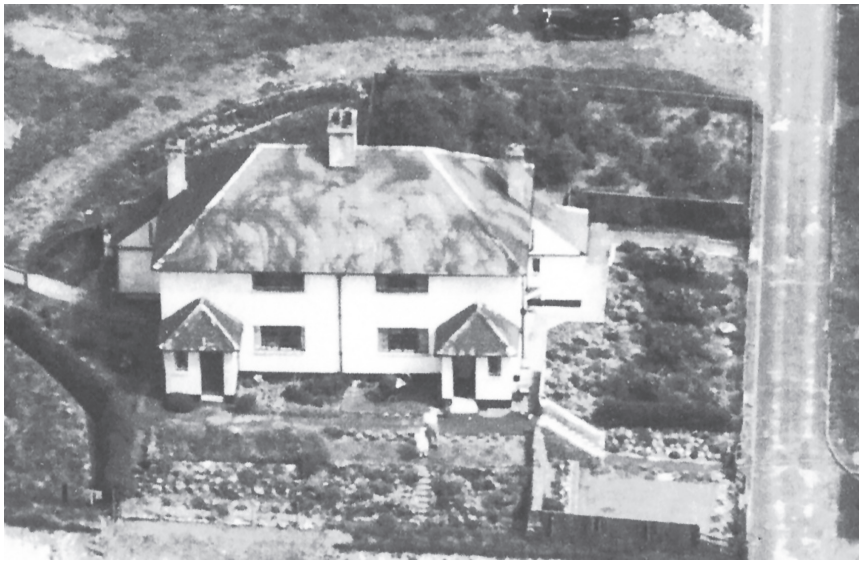
Another distinctive structure found on East Coast CH stations was the Warden's Quarters. Security of the stations pre-war was provided by two civilian wardens who were accommodated in two semi-detached houses built on the station. Later, these houses would be used by the RAF for other purposes, often as quarters for the Station Commanding Officer.

West Coast Chain Home

The West Coast CH stations marked a crucial change in policy with the belief that dispersal was the best form of protection. Thus, instead of having a single Transmitter Block containing two transmitters, and a single Receiver Block containing two receivers, West Coast stations had two Transmitter Blocks and two Receiver Blocks, each containing one set. Buildings were either Type B or Type C. The former was similar to the Type A but without the protected roof. The only station in Scotland with Type B buildings (only one Transmitter Block and one Receiver Block) was North Cairn, which was also unusual for a West Coast station in that it had two 350 foot steel transmitter towers, with two 240 foot wooden receiver towers. The other West Coast stations in Scotland (at Kilkenneth, Loth, Saligo and Sango) each had Type C buildings: two for transmitters and two for receivers. The Type C building was, unlike



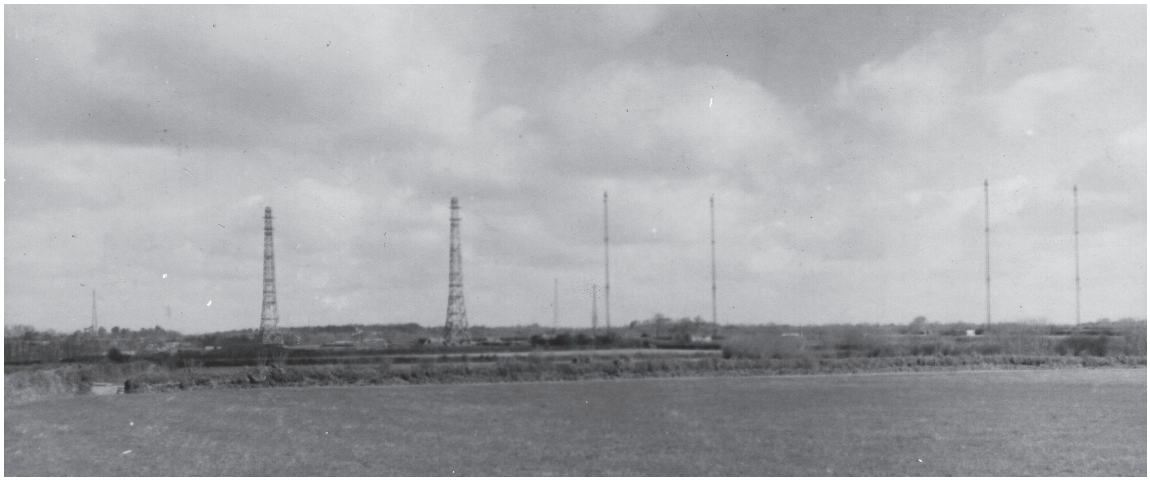
12 A Type A1 Transmitter Block from above, taken in 1947.
(© Andrew Laurenson, via Leslie Smith)



13 Warden's Quarters.
(© Jim Corbett Collection)

all the other types, constructed from reinforced concrete, rather than brick. The buildings at Sango were completely earthed over for extra protection, but those at Kilkenneth, Loth and Saligo were not.

The aerial structures were also largely different on the West Coast stations. Transmitter aerials were slung in a curtain between four 325 foot guyed masts, arranged in two pairs, one pair to each curtain array. Receiver aerials were mounted on two 240 foot wooden towers. There were, of course, exceptions to this: North Cairn as already mentioned had 350 foot transmitter towers. Loth was even more unusual in that the transmitter aerials were mounted on two 180 foot towers and the receiver aerials were on two 120 foot towers.



14 A typical West Coast type Final CH station, with the two 240 foot receiver towers at centre left and the four 325 foot transmitter masts in the centre and right of the photograph.
(© Historical Radar Archive)

15 Type C Transmitter Block at Saligo, taken in 1996. (© Historical Radar Archive)

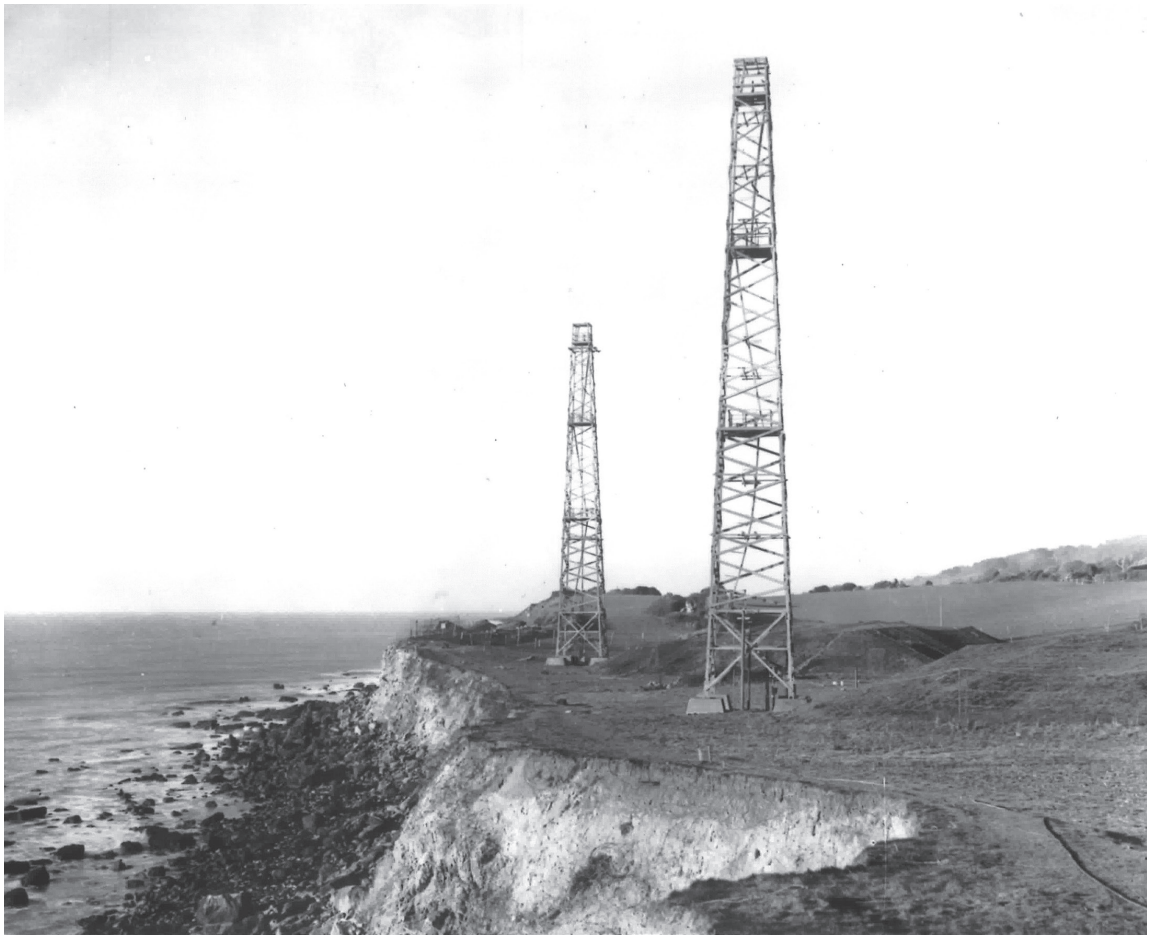
Buried Reserve

In order to provide back-up should the main station go off the air, the decision had been made to construct underground buildings housing stand-by equipment. This programme was accelerated following air attacks on radar stations in the south of England on 12 August 1940. Type E buildings, which were built below ground from brick, were constructed at Drone Hill, Douglas Wood and Netherbutton, and these Buried Reserves would have one building for the transmitter and one for the receiver. At Drone Hill and Douglas Wood these were at opposite ends of the station, next to their respective surface sites, ie the Buried Reserve transmitter was next to the transmitter site on the surface, and the same with the receivers. At Netherbutton, the two Buried Reserve buildings were together on a separate site a little distance from the main station. Similar buildings made of reinforced concrete, known as Type F buildings, were constructed at Schoolhill, which, like Netherbutton, had a separate Buried Reserve site, although at Schoolhill it was adjacent to the surface station. The Buried Reserves had two 120 foot wooden towers, one for the transmitter aerials and the other for the receiver aerials. The four stations named above were the only ones in Scotland to have underground Buried Reserves. The scheme was eventually abandoned because it was very difficult to keep these underground buildings free from water.

Remote Reserve

The simpler alternative to constructing underground Buried Reserves was to construct surface buildings which were located some distance from the main station and therefore likely to escape any attack on the main site. These were known as Remote Reserves, which consisted of two Type C buildings with two 120 foot towers. Hillhead, Loth, Noss Hill, Skaw, Tannach and Whale Head all had Remote Reserve sites.

Brenish, Broad Bay, Kilkenneth, North Cairn, Saligo and Sango were the only CH stations in Scotland to have no reserve site of either type (TNA, AVIA 7/334).



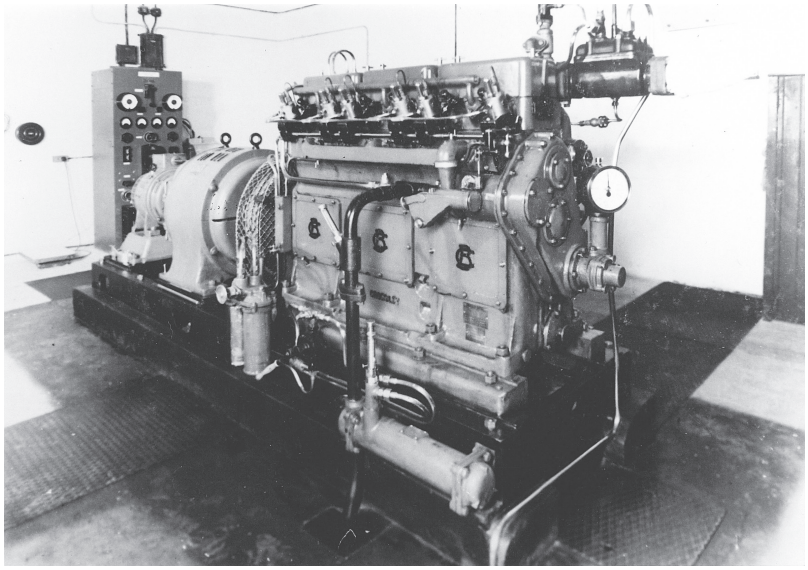
16 A typical Remote Reserve site, with two 120 foot towers and the technical buildings hidden under camouflage netting.
(© Imperial War Museum London CH15174)

Power House/Stand-by Set House

The other principal structure found on CH stations was the Stand-by Set House, which housed an electric generator, usually diesel-driven, to provide sufficient power to maintain technical operations if there was an interruption to the mains supply. The Stand-by Set House was a protected brick building with earth traverses, but was distinctive internally by the shelf which supported the generator coolant header tank.

For stations north of Loth, and on the islands, there was no mains supply and a Main Power House would be provided, in addition to a Stand-by Set House. Whereas the Stand-by Set House was usually located relatively close to the Transmitter Block so that, in the event of a failure in the power supply, Radar Mechanics could quickly start up the generator and get the station back on the air, the Power House could be some distance away. Since the Power House was operating 24 hours a day, there would be no rush to start it up; it was running all the time.

17 A typical East Coast CH Stand-by Set House.
(© Historic Environment Scotland)



18 A Crossley electric generator inside a Power House.
(© Historical Radar Archive)

Mobile Radio Unit

Associated with CH was the MRU, designated AMES Type 9. This was a transportable radar unit originally intended as a reserve for CH stations and eventually used overseas. They were used to provide temporary radar cover prior to, or instead of, construction of a full CH station.

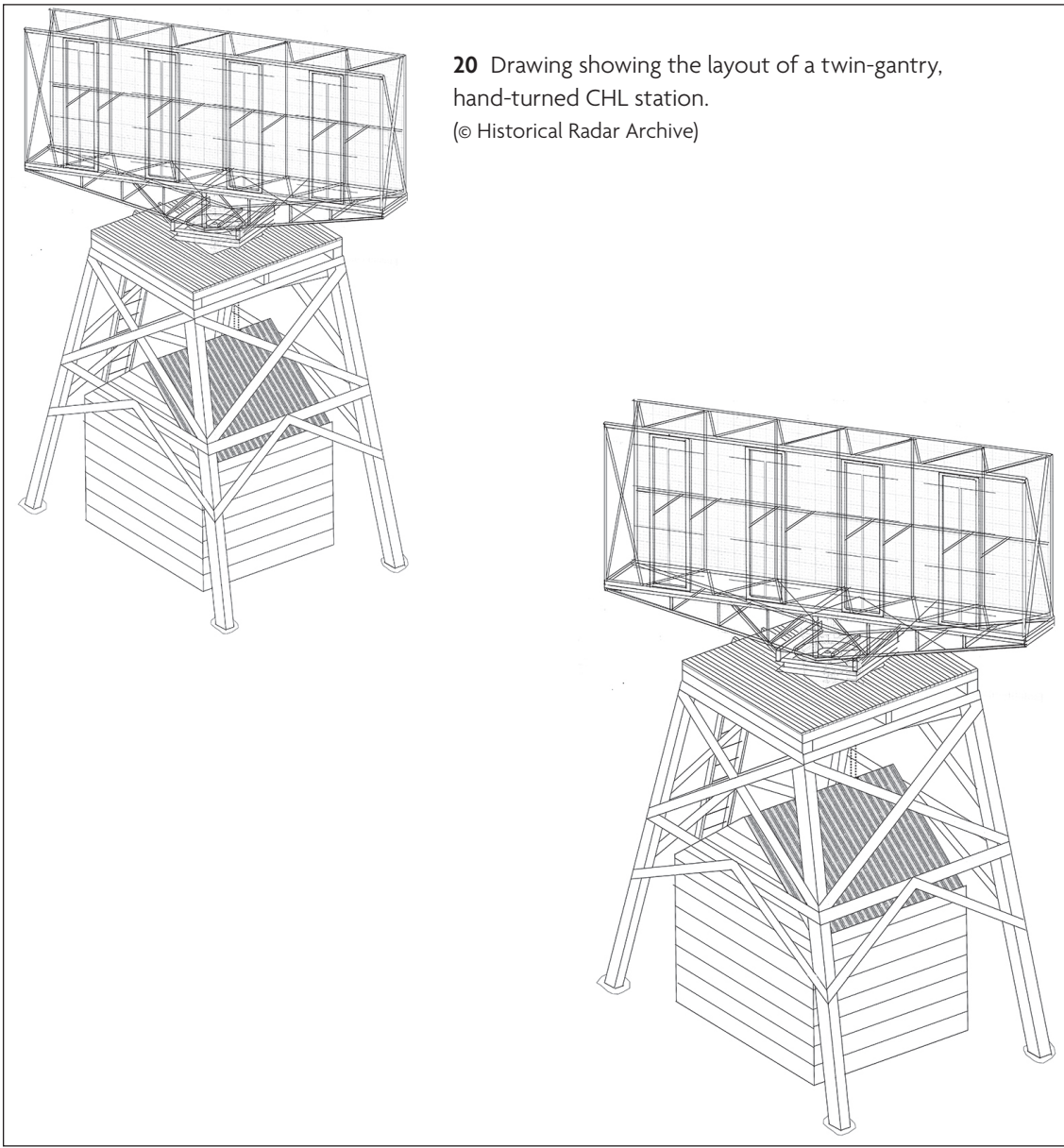
Chain Home Low

CHL grew out of the work by the Army team at Bawdsey who were developing a radar known as CD, or Coast Defence, for plotting shipping. The Air Ministry saw the value of this equipment and most of the sets were used to supplement the coverage given by CH, providing improved detection of low-flying aircraft in particular. The Admiralty also appreciated the usefulness of the equipment

19 A Mobile Radio Unit.
(© Imperial War Museum London CH15200)

and set up several stations in Orkney, Shetland and northern Scotland for tracking U-boats attempting to break out of the North Sea. The equipment operated on a wavelength of 1½ metres, much shorter than the 11 to 13 metres of CH. This gave a narrow 'beam' which allowed for the aerials to be rotated, described as a 'radio lighthouse' (Swords, 1986: 236). This allowed for more precise plotting of targets, particularly when the Plan Position Indicator (PPI) map-like displays were introduced, although CHL and CDU had no provision for determining the height of an aircraft. The main advantage with the shorter wavelength was that it provided coverage at lower heights than was generally possible with CH, allowing for earlier detection of low-flying aircraft and also for the detection of ships and surfaced submarines.

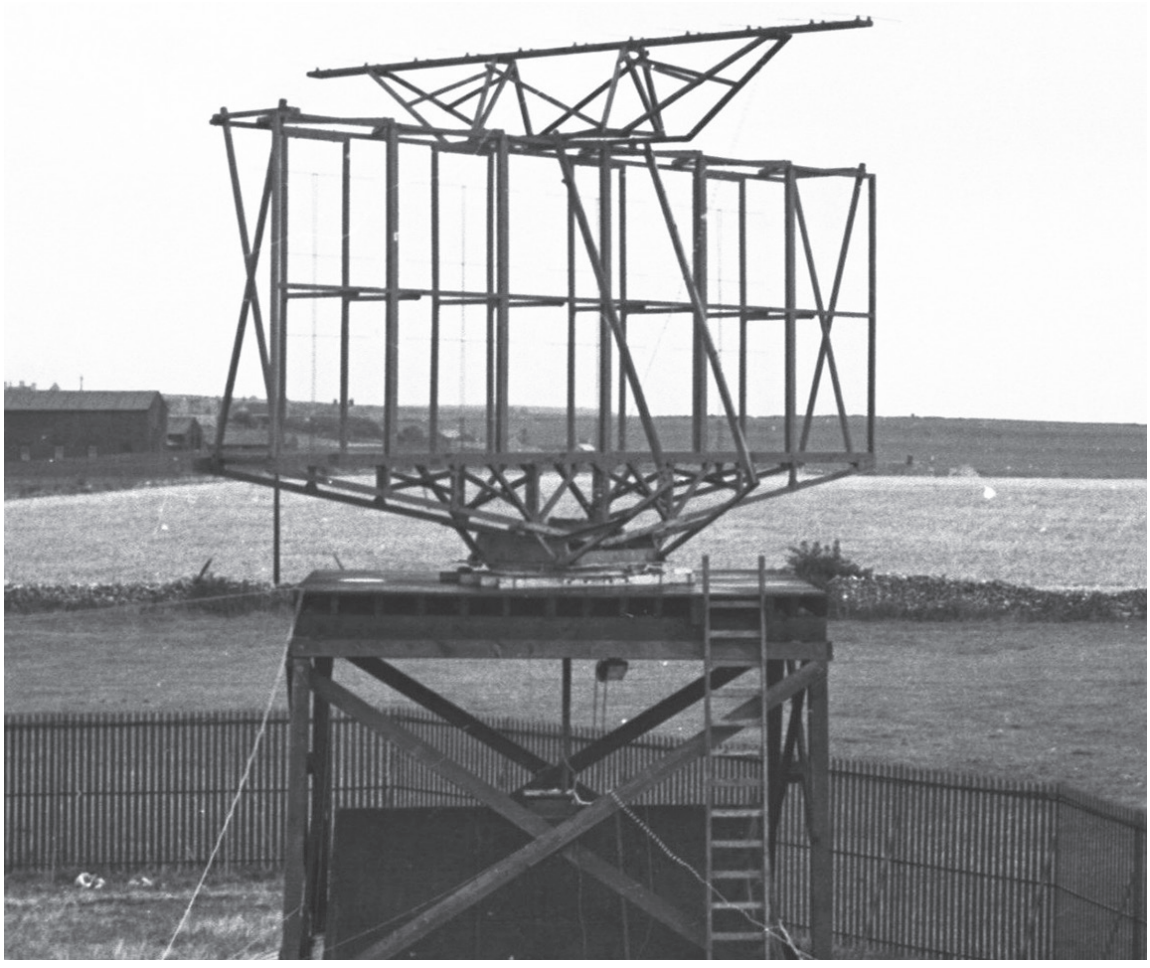
The first CHL and CDU stations were built from November 1939 onwards and were twin-gantry stations, with separate aerial arrays for transmitting and receiving. These gantries, which were 20 feet high, each straddled a hut containing the transmitter or receiver, and were located between 100 and 200 feet apart. At CHL stations the Transmitter Hut measured 18 feet by 15 feet; the Receiver Hut measured 20 feet by 18 feet and was larger because it housed not only the receiver but also the plotting table and telephone switchboard. In the case of the CDU stations the Transmitter Hut and Receiver Hut were the same size, both 14 feet square. The first stations (Anstruther, Sumburgh and Fair Isle) employed wooden huts, but the later stations had huts made of concrete (Saxavord) or brick (South Ronaldsay and Dunnet Head) to withstand the weather.



20 Drawing showing the layout of a twin-gantry, hand-turned CHL station.
(© Historical Radar Archive)

Sumburgh and Fair Isle eventually had their wooden huts encased in concrete shells.

In both CHL and CDU stations, the aerials were turned by hand using a modified bicycle frame, upturned and bolted to the floor, with the pedals replaced by wooden handles. This mechanism was linked to the aerial array shaft by a chain which ran up through a hole in the roof. This drive was later replaced by Hopkins turning gear which used toothed gears to drive the array from a steering wheel. Eventually hand turning was replaced by power turning. Many of the twin-gantry stations later converted to using only one of the gantries, either with the receiving array having a single transmitting Yagi aerial mounted on top, or with the aerials in the array itself divided between transmitting and receiving. This was an intermediate step



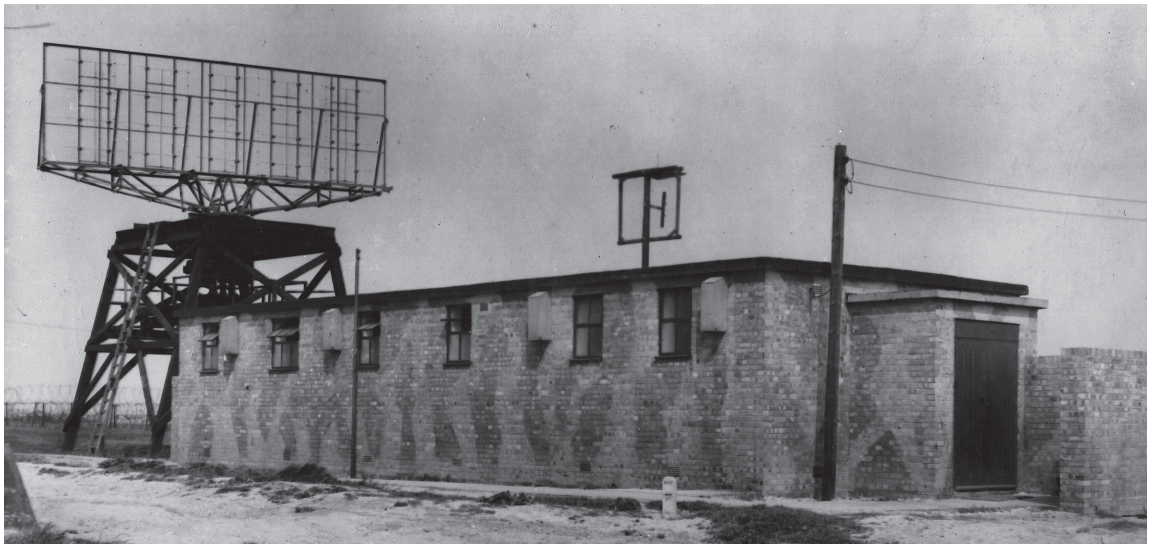
21 A single-gantry CHL with a Yagi transmitter aerial mounted on top of the receiver array.
(© Historical Radar Archive)

between the twin-gantry CHLs and the new CHLs about to arrive.

From 1941 onwards combined transmitter and receiver buildings were built from brick. These replaced the earlier twin-gantry equipment on older stations and were constructed on all new stations. These combined T & R Blocks measured 50 feet by 18 feet, with a single 20 foot aerial gantry either at the end or at the side of the building. This combined common aerial working (a single aerial array for both transmitting and receiving) and power turning to greatly improve the operation of the equipment. Although many of these stations were built in 1942, they were nonetheless known as 1941 Type stations.

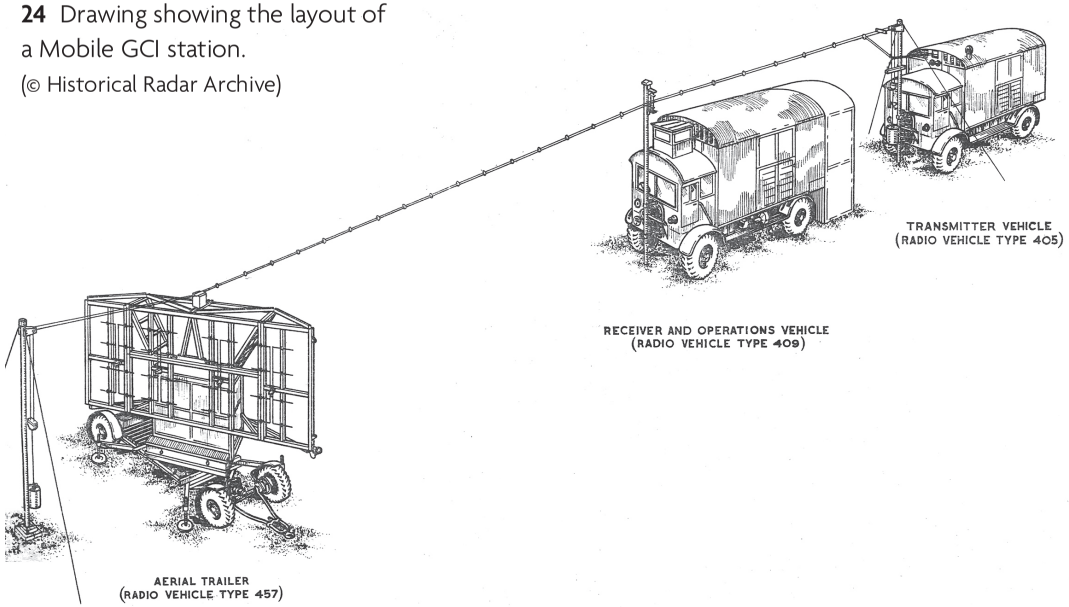
A few 1941 Type CHL stations on the Scottish islands did not have a brick-built combined T & R Block. Instead, a prefabricated wooden hut to identical dimensions was used, surrounded by a brick blast wall, as shown by the photograph of Clett in Illustration 51. These huts were of the type used by Intermediate GCI stations shown in Illustrations 25 and 26.

From December 1941 onwards, on some low-lying stations in England an additional

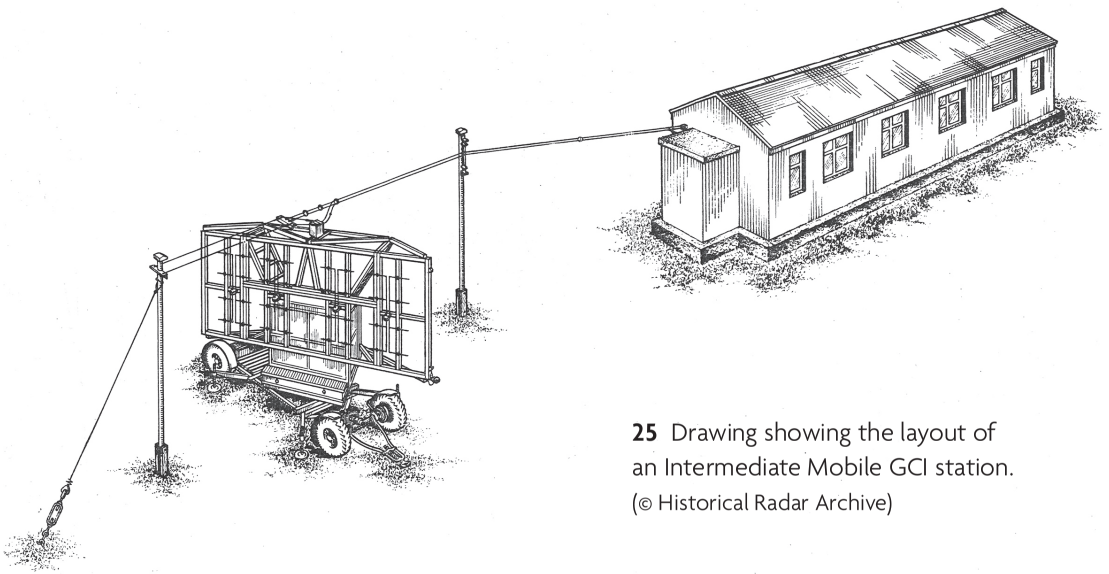


22 A typical 1941 Type CHL with brick-built combined T & R Block and rotating aerial array on a 20 foot gantry.
(© Historical Radar Archive)

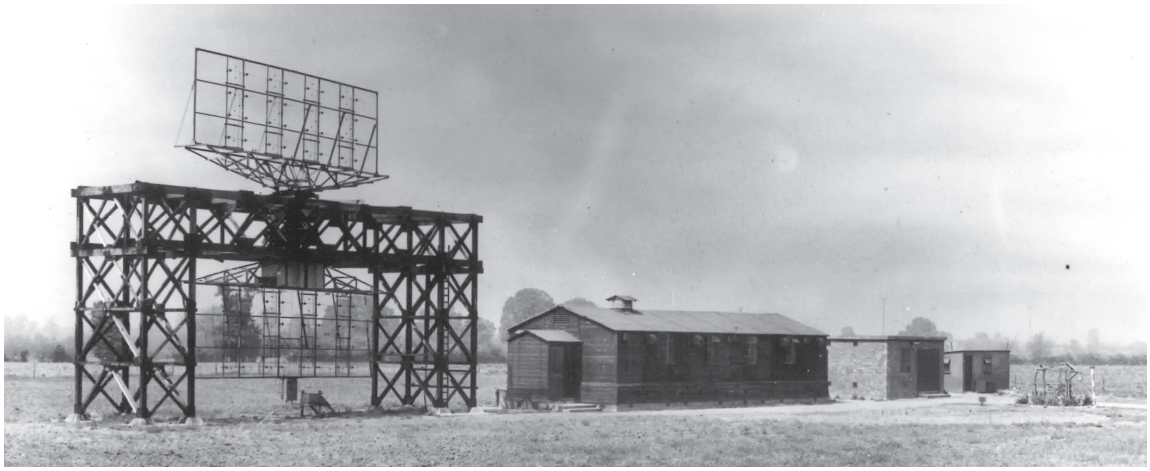
23 A CD/CHL station.
(© Historical Radar Archive)



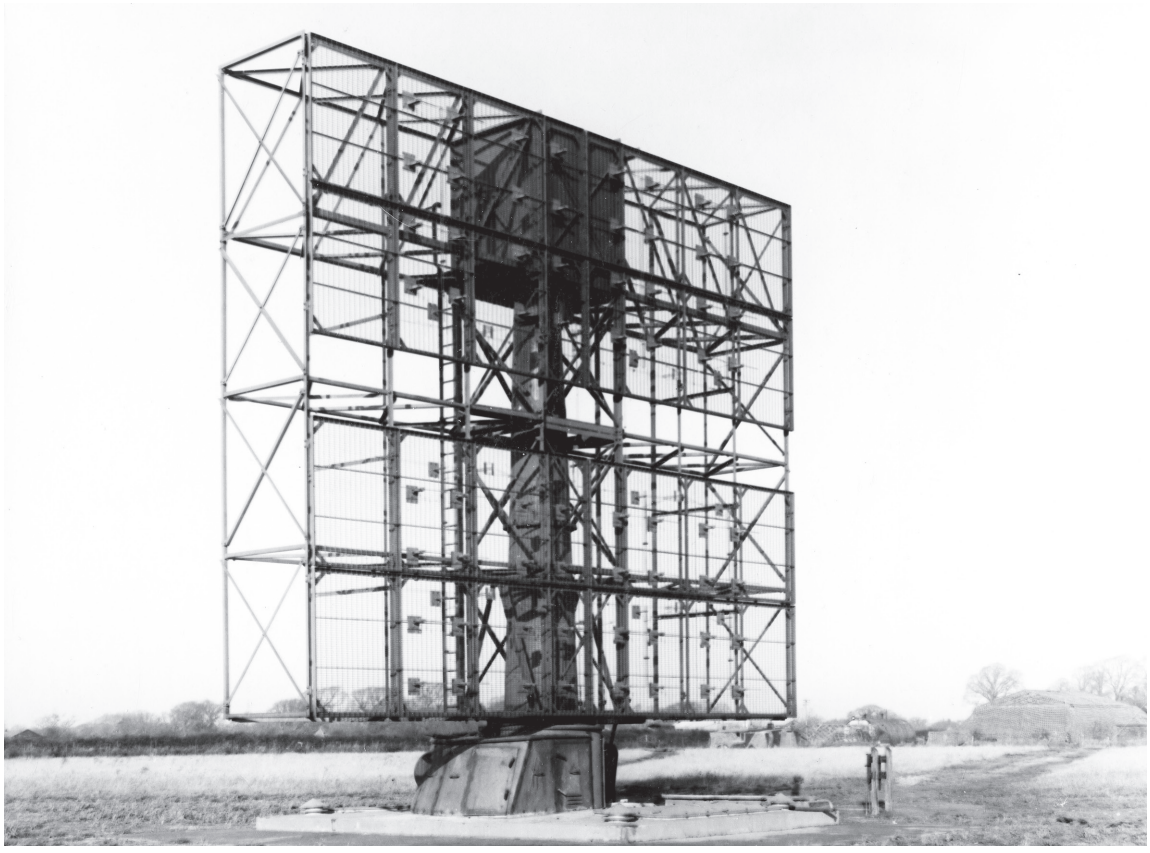
24 Drawing showing the layout of a Mobile GCI station.
(© Historical Radar Archive)



25 Drawing showing the layout of an Intermediate Mobile GCI station.
(© Historical Radar Archive)



26 An Intermediate Transportable GCI station.
(© Imperial War Museum London CH15195)



27 A Final GCI station, with the Happidrome Operations Room under camouflage netting in the background on the right and the Type 7 aerial array in the foreground.
(© Imperial War Museum London CH15188)

28 Type 15 GCI convoy technical vehicles.
(© Historical Radar Archive)

CHL equipment, known as Chain Home Low (Tower), was installed on a 185 foot tower, although none of the CHL stations in Scotland ever had such towers built.

Coast Defence/Chain Home Low

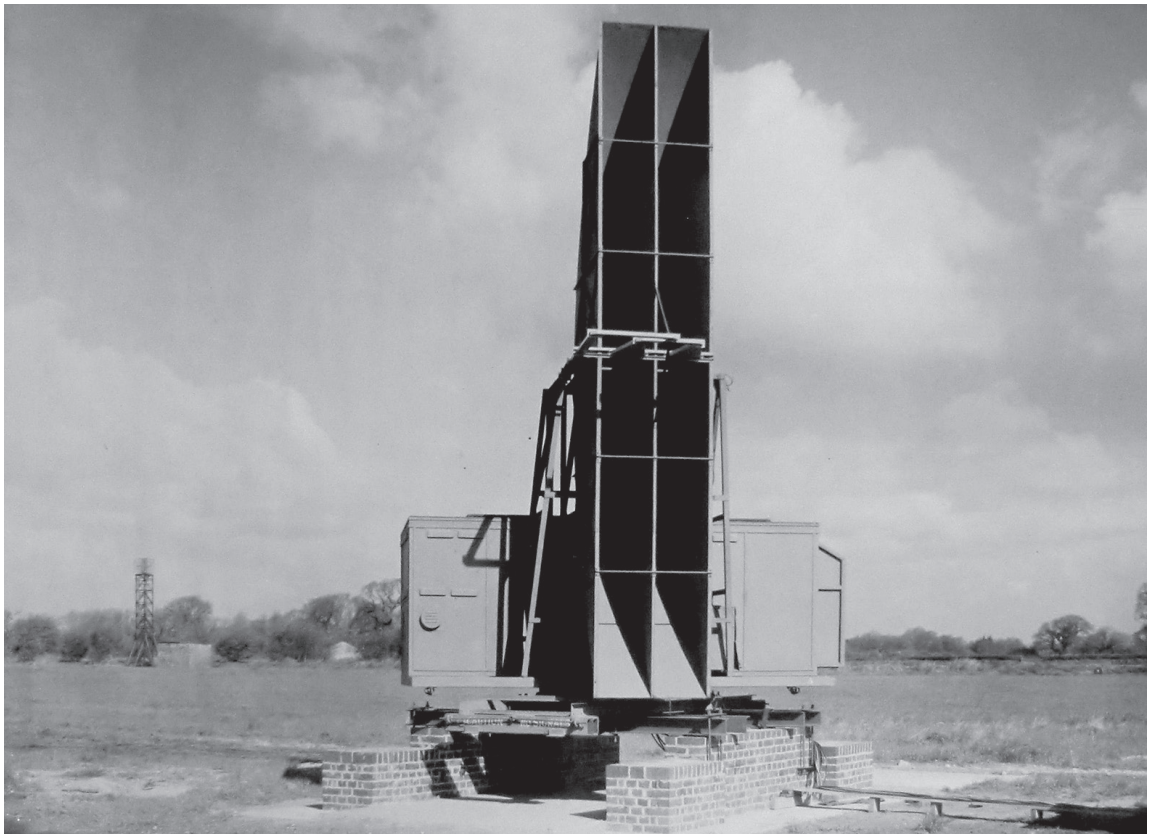
Although the RAF and Royal Navy 1½ metre stations for plotting shipping and low-flying aircraft, CHL and CDU respectively, were very much the same, the equivalent Army design, known as CD/CHL, was architecturally very different, even if the equipment was the same. The combined T & R Block was of concrete construction, but the aerial gantry was mounted on the roof of the building, rather than as a separate free-standing structure. To support the weight of the gantry and aerial array, four buttresses were built into the walls.

These stations were operated by Army personnel in the case of Gin Head, jointly by RAF and Royal Navy personnel at Crannoch Hill, and by staff from all three services (and hence were known as Triple Service stations) at The Law and Westburn.

29 A Type 13 Mk I radar.
(© Historical Radar Archive)

Ground Control of Interception

GCI stations were built to control night fighters directly from the radar stations themselves, thereby providing the accurate close control necessary for successful interceptions at night. These stations came in four stages of development: Mobile, Intermediate Mobile, Intermediate Transportable and Final. Mobile GCI was composed, as the name suggests, of fully mobile equipment, with the transmitter and receiver in lorries and the aerial arrays on wooden cabins on four-wheeled trailers. These mobile convoys could be set up in 12 hours, so coverage could be provided quickly where

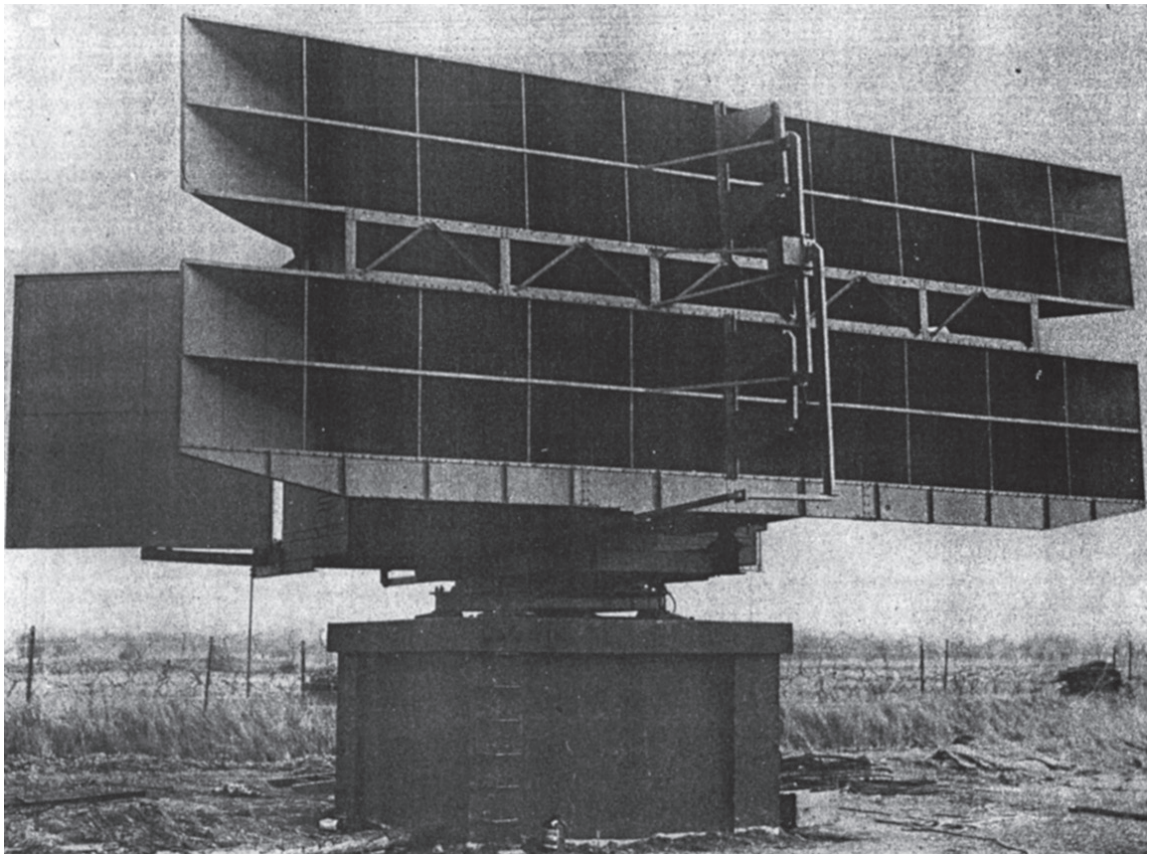


30 A Type 13 Mk II radar, demounted and operating at a Final GCI station.
(© Historical Radar Archive)

required. However, conditions in these mobile stations were not ideal, and Intermediate Mobile stations had a wooden hut for the Operations Room, although the aerial system on trailers continued in use. Another improvement came in the form of the Intermediate Transportable GCI, which also used a wooden hut as the Operations Room. However, the wheeled aerial arrays were replaced by a fixed n-shaped aerial gantry with an aerial array above, and one below, the aerials being at a height of 35 feet and 10 feet respectively. All three of these stages (Mobile, Intermediate Mobile and Intermediate Transportable) were designated as AMES Type 8.

The ultimate development was the Final GCI which was designated AMES Type 7. This had a brick Operations Block, known as the 'Happidrome' after a popular BBC radio programme starring Harry Korris, first broadcast in February 1941. The aerial system consisted of a huge power-turned aerial array measuring 54 feet by 25 feet and 5 feet wide, with the transmitters and receivers housed in an underground well beneath the array. Only one Final GCI station was built in Scotland, at Dirleton, although the Happidrome was under construction at Fullarton when the Final station there was cancelled, so this was never completed.

There was another type of mobile GCI, the Type 15, which was designed for overseas



31 A Type 14 Mk III radar at a Final GCI station.
(© Historical Radar Archive)

use, although some did operate in Scotland, primarily for training purposes. It evolved from the Type 8, but the aerial was mounted on an Austin lorry chassis and therefore was self-propelled rather than on a towed trailer.

In addition to these radars, which all operated on a 1½ metre wavelength, there were also some GCI radars which operated on the much shorter 10 cm wavelength, producing a narrower beam allowing for much more accurate plotting. These were the Type 13 Centimetric Height (CMH) and Type 14 PPI radars. When deployed together, these were known as the Type 21 radar. The aerial of the Type 13 moved, or 'nodded' up and down, providing very accurate height information on aircraft, whereas the Type 14 aerial continuously rotated, producing an accurate map-like display of aircraft in the area. Both Type 13 and Type 14 were mobile radars, but these could be demounted from their vehicles and installed at Final GCI stations. The Type 13 Mk I, whilst designed for height-finding, was later used almost exclusively to provide additional radar cover against very low-flying aircraft, as at Deerness.

Chain Home Beam

Chain Home Beam stations operated with GCI equipment (sometimes described as CHL equipment, but the transmitters and receivers

were the same as GCI) and GCI aerial systems, but with a 1941 Type CHL combined T & R Block. Their appearance was therefore an odd mix of a CHL brick technical building with an Intermediate Transportable GCI aerial array. Although CHB stations used GCI equipment, they did not control fighters directly as GCI stations did, but passed plots into the reporting organisation and basically acted as CH early warning stations in locations where there was insufficient room to construct a full CH station.

Coast Defence (Chain Home Extra Low)

The various CD radars, which operated on a wavelength of 10 cm, were sometimes known collectively as Chain Home Extra Low. This referred to the fact that the very short wavelength produced a very narrow beam, which meant that very low-flying aircraft and even submarine periscopes could be detected. The CHEL description covered the sets designated as AMES Types 30–58, but those relevant to Scotland are Types 30, 31, 34, 37, 41, 50, 51, 52, 54, 55 and 57.

The Type 30, also known as Naval Type 273, only existed at the five Naval CDU stations (the initial two stations on Fair Isle having been replaced by one 1941 Type station): Dunnet Head, Fair Isle, Sumburgh (Grutness), Saxavord and South Ronaldsay. The Type 30 equipment was housed in the CHL combined T & R Block (except at Dunnet Head, where the old Transmitter Hut from the original twin-gantry station was used) and therefore had no specific building for it. There was, however, a Perspex lantern erected on the roof of each building to protect the Type 30/Type 273 paraboloids from the weather.

The Type 31, also designated CD No 1 Mk V, was housed in a wooden cabin, known as a Gibson Box, which measured 11 feet by 6 feet 11 inches and was 8 feet high. Mounted above the cabin was the hand-turned paraboloid aerial system, which was collapsible for travelling. The Type 41 was identical to the Type 31 but used a medium-power transmitter, as opposed to the low-power set in the Type 31.

The Type 34 and Type 54 were essentially the same, the latter being a high-power version of the low-powered former. Rosehearty was the only station in Scotland equipped with these two radars (the Type 34 being upgraded to the Type 54), which consisted of a 200 foot steel tower with the paraboloid and cabin housing the equipment at the top, reached via a lift. There was another version with the equipment in a hut at the bottom of the tower, and no lift, but this did not exist in Scotland.

The Type 37 was a fully mobile equipment housed in a wooden cabin on a four-wheeled trailer, with two parabolic dishes attached to the side of the cabin.

The Type 50, also known as Naval Type 277, was built at Cockburnspath, Hesta Geo and

32 A Type 30 (Naval Type 273) Perspex lantern mounted on a ship, but identical to the lantern used at Naval CDU stations.
(© Bob Jenner)

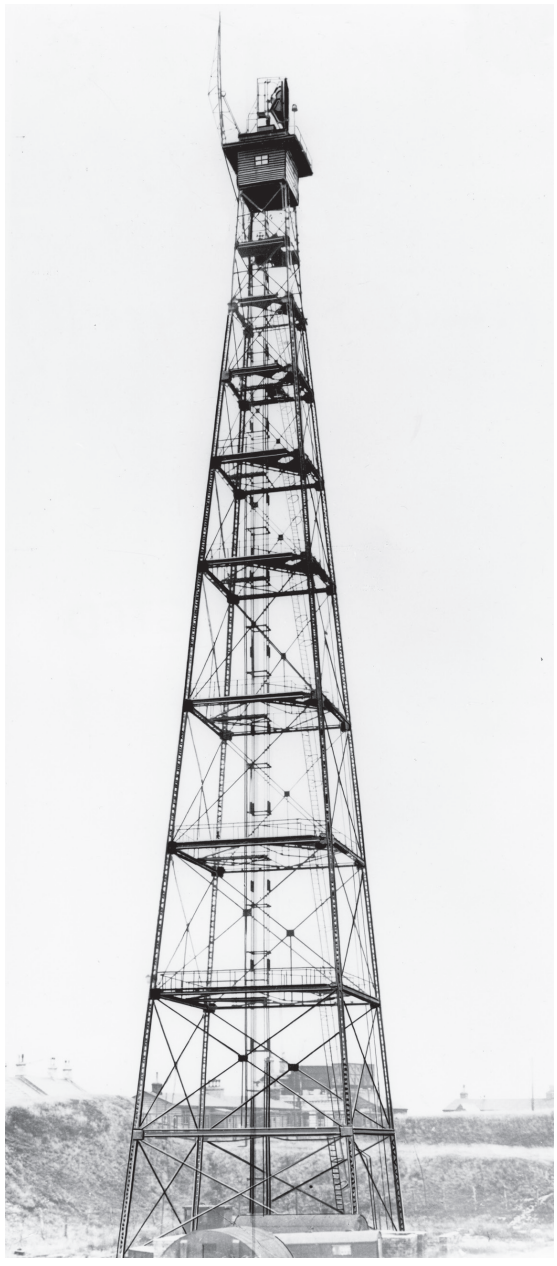
33 A Type 31 radar as usually deployed, in its transportable wooden cabin.
(© Historical Radar Archive)

South Ronaldsay, and was a Naval radar used to detect surface vessels and very low-flying aircraft. At Cockburnspath and Hesta Geo the sets were used for interception training. The equipment was housed in a brick building with a 'cheese' type paraboloid mounted above (so called because this type of reflector resembled a wheel of cheese cut in half).

There were only three Type 51 stations in the UK, and Deerness was the only station in Scotland equipped with this radar (the others were Beachy Head and Truleigh Hill in Sussex). This equipment was housed in a building at Deerness which was straddled by a gantry, with the 10 foot diameter paraboloid above.

Much more common was the Type 52, which became the standard high-power 10 cm early warning set, replacing the low-power Type 31 at most sites. The Type 52 consisted of a Nissen hut containing the equipment, straddled by a 21 foot high steel gantry, topped by the 10 foot diameter paraboloid.

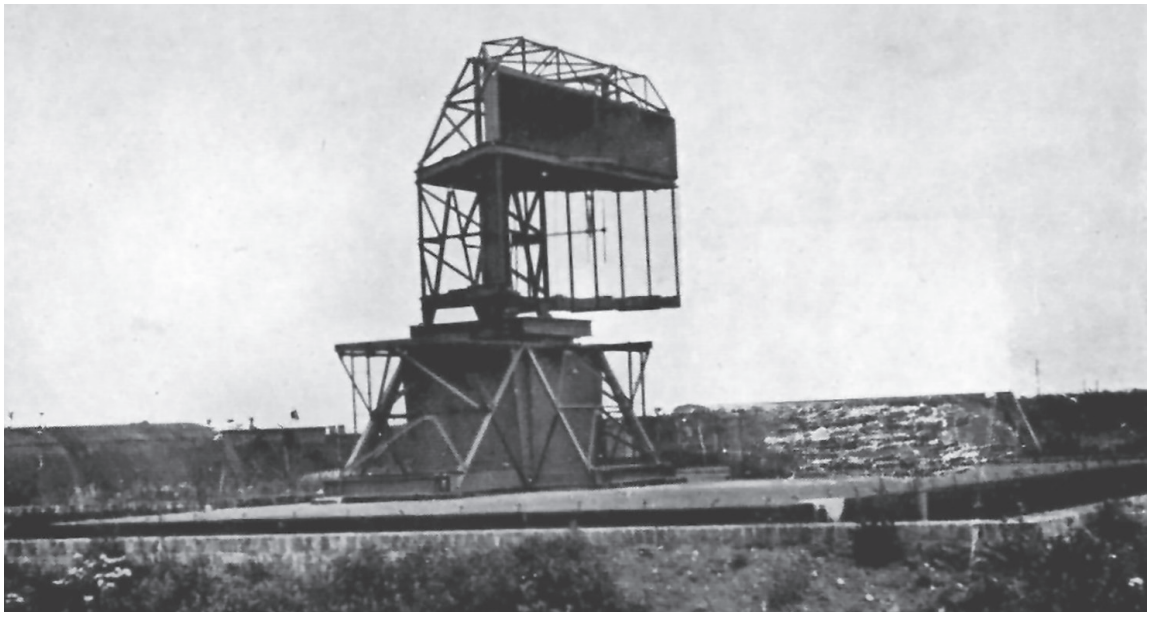
Only one Type 55 radar was constructed in Scotland. The set was installed on the 200



34 A Type 54 radar.
(© Alan Aitken)

foot cantilever of one of the 350 foot steel transmitter towers at Douglas Wood CH station, and can be seen in Illustration 71.

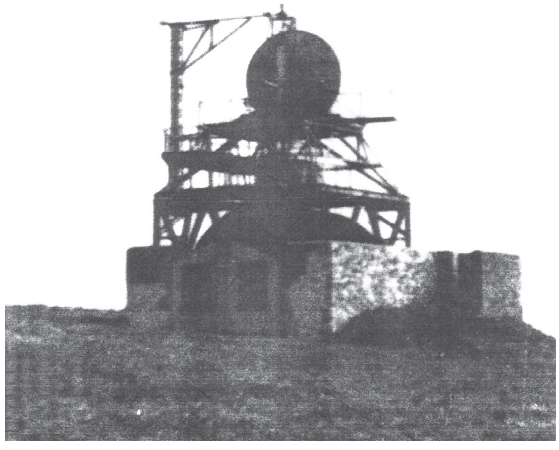
The last of the centimetric CD sets was the Type 57, which, like the Type 37, was housed



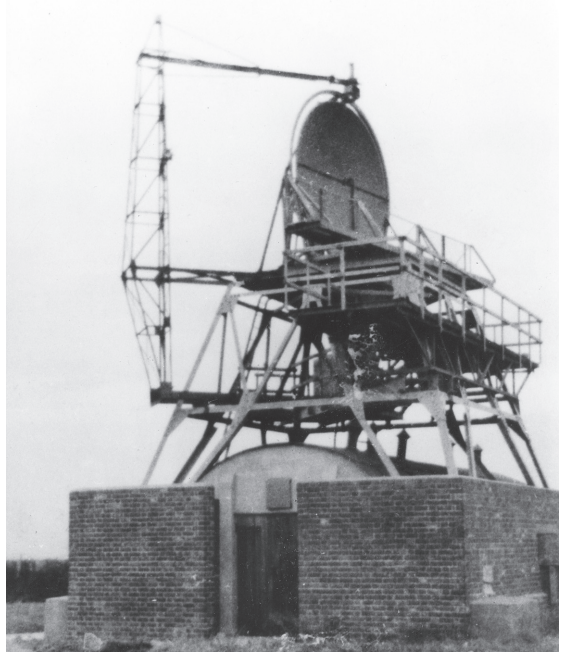
35 A Type 50 radar.
(© Historical Radar Archive)

in a wooden cabin mounted on a turntable on a four-wheeled trailer. However, the Type 57 employed a 'cheese' aerial system fixed to the top of the cabin of this mobile set.

It is clear that although these radars all come under the generic name of CD or CHEL, the radar sets used very different aerial systems and mountings and were extremely varied in appearance.



36 A Type 51 radar.
(© Historical Radar Archive)

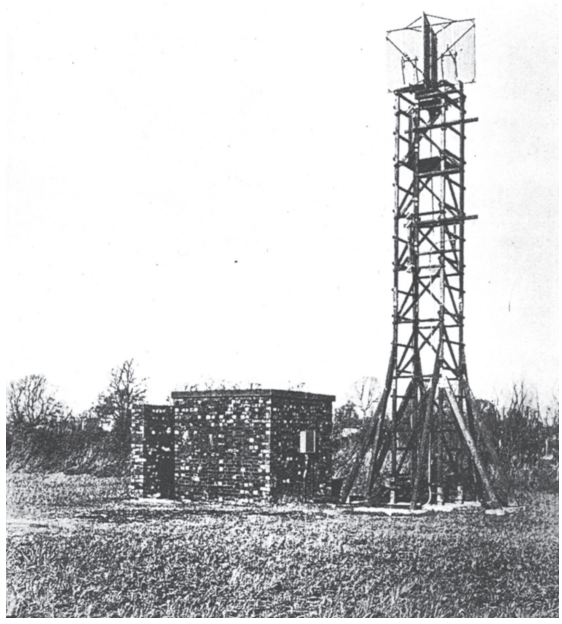


37 A Type 52 radar.
(© Historical Radar Archive)

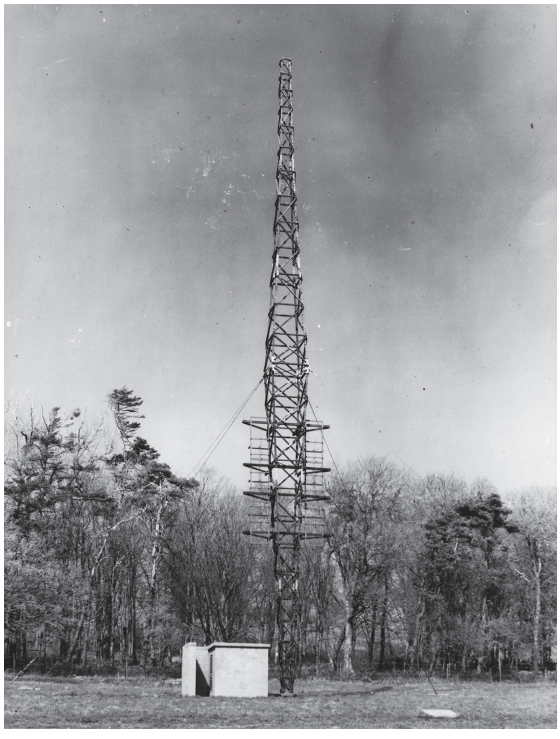
Identification Friend or Foe

Identification Friend or Foe was equipment which sent out a signal to aircraft which, if the aircraft was friendly, would trigger a transponder in the aircraft to return a particular signal, thereby identifying it as friendly. Aircraft that did not return the signal were classed as 'X' plots or unidentified, until confirmed as hostile. The lack of an IFF signal could not be assumed to automatically indicate a hostile aircraft because it took some considerable time for all aircraft to be fitted with equipment, and there was always the possibility of equipment failure in aircraft that did have IFF sets.

Three marks of IFF were used during the Second World War. Mk I operated on CH frequencies and Mk II on CH, Advance



39 An IFF Mk III tower with the cubicle to the left.
(© Historical Radar Archive)



38 An IFF Mk III 105 foot guyed mast, with the cubicle to the left.
(© Historical Radar Archive)

40 A pole-mounted aerial system for IFF Mk III at CHL stations.
(© Historical Radar Archive)

CH and Army Anti-Aircraft Gun-Laying radar frequencies (with a modified Mark IIG covering the CHL and GCI frequencies and a Mk IIN covering Naval radars and CHL stations). However, a need for a universal IFF set on its own frequency was identified, and this led to the development of IFF Mk III. The latter equipment was housed in a small brick cubicle, distinctive for the L-shaped wall protecting the cubicle entrance. Next to the cubicle was the IFF mast or tower, which came in two different forms: either a 105 foot guyed mast or a tower-mounted rotating array set on a distinctive Maltese-cross-shaped base. At CHL stations the IFF Mk III aerial was mounted on a wooden pole beside the 1941 Type combined T & R Block.