A P P E N D I X

BRIEF SUMMARY OF TESTS

TEST NO.1.

Test was carried out using Mobile A510 Set in jungle communicating to fixed A510 Station at F.T.C..

Able (Fixed Station) used an end fed inclined aerial on H condition.

Able 1 (Mobile Set) used a whip aerial.

The Frequency used was 3,450 Kc..

Test commenced with Able 1 in secondary jungle, 2 miles from base. Able 1 (who was with foot ambush demonstration) then moved ½ mile into jungle on foot, first through primary jungle, then into secondary jungle. A condensation of results obtained is below.

Time	Strength		Comments
	Able to Able 1	Able 1 to Able	
1430	5	5	Commenced walking.
1457	5	5	In primary jungle.
1520	5	5 (At times 3)	In secondary jungle. Some intelligibility lost due to movement of Able 1.
1535	5	5	Able 1 stationary in middle of jungle at administration area.
1547	5	-	Communication lost due to electrical noise at base.
1602	5	5	Noise gone, Able still near administration area.
1625	5	5	Walking back towards transport.

TEST NO.2 - 9/4/'52.

Test carried out with Able (A510 at F.T.C.) on long wire aerial and Able 1 (A510 Mobile). In conjunction with Able 1 was Able 2, a 68 Set.

Frequency 4,240 Kc.

Time	Location	Strength	Remarks
1500	1 Ula Tiram (1.75 mls.)	Able to Able 1 - 4 Able to Able 2 - 2 Able 1 to Able - 4 Able 2 to Able - 5	Able 1 on whip 7'6" Able 2 on whip 11 ft. Static and electrical noise present.
1530	2 (3.2 mls. South)	Able to Able 1 - 5 Able to Able 2 - - Able 1 to Able - 3 Able 2 to Able - 2	Noise (electrical) present as well as X's. Able 1 on 7'6 whip Able 2 on 11 ft. whip. Tests carried out using signallers as operators indicate that our assessment of strength is substantially correct.
1615	"	Able to Able 1 - 5 Able 1 to Able-1to3 Able 2 - not heard	Electrical noise continues Able 1 on whip.
1630	"	Able to Able 1 - 5 Able 1 to Able - 5	Long wire aerial for Able 1.
1645	3 (5 miles South)	Able to Able 1-4to5 Able1 toAble 1-4to5 Able 2 (on whip not heard)	Wire aerial for Able 1 C.W. interference and static.

TEST NO.3 - 11/4/'52.

Comparisons were made for different frequencies at Positions 1 and 2 and measurements of field strength were taken. on 3.45 Mc.

Considerable amount of time was lost in taking measurement owing to the difficulty of operation of this equipment by one man the receiver and calibrating oscillator being 100 yards apart.

Able - (A510 Base Station), Able 1 - (A510 Mobile Set).
Baker - (Fixed 68 Set), Baker 1 - (Mobile Set).

Time Hrs.	Position	Frequency	Strength	Remarks
1000	1 (1¾ mls.)	2000 Kc.	Able to Able 1 - 5 Able 1 to Able - 5	Slight Xs. Able 1 on whip.
		3450 Kc.	Able to Able 1 - 5 Able 1 to Able - 5	Slight Xs. Able 1 on whip.
		6435 Kc.	Able to Able 1 - 4 Able 1 to Able - 1	More Xs than on other channel. Able 1 on whip.
		9860 Kc.	Able to Able 1 - 3 Able 1 to Able - 3	Morse interference blots out 9860 Kc. channel. Able 1 on whip.
		3900 Kc.	Baker to Baker 1-5 Baker 1 to Baker-5	Baker 1 on whip. Baker on end fed wire.
		3450 Kc.		Measurements taken on Able 1 and Baker 1.
1120	2 (3.2 mls.)	2000 Kc.	Able to Able 1 - 3 Able 1 to Able - 3	Loud crashes of Xs Able 1 on whip.
		3450 Kc.	Able to Able 1 - 5 Able 1 to Able-3to5	Able 1 on whip. Loud crashes of Xs
		3450 Kc.	Able to Able 1 - 5) Able 1 to Able - 5)	Wire aerial Able 1
		" "	Able to Able 1 - 5) Able 1 to Able - 5)	Whip aerial at Able
		3450 Kc.		Measurements taken of Able 1 on wire and whip aerial under various conditions.

TEST NO.4 - 12/4/'52.

Ground wave tests continued. Some conditions of test 3 repeated for measurement purposes and then Able 1 moved further on to point 3 and moved into rubber plantation. Able has long wire aerial and Able 1 has whip unless otherwise specified.

Time Hrs.	Position	Frequency	Strength	Remarks
0850	2 (3.2 mls.)	3450 Kc.	Able to Able 1 - 4 Able 1 to Able - 4	Noise generally low but loud Ks. once every 4 secs.
		9860 Kc.	Able 1 to Able-Nil	Interfering signal
0940	3 (5 mls.)	3450 Kc.	Able to Able 1 - 4 Able 1 to Able - 4	
0950		"	Meter	Measurement carried out.
1001	"	"	Able to Able 1 - 4 Able 1 to Able - 4	Able 1 moved from roadside right into plantation and now covered completely by canopy of leaves
	"	"	Able to Able 1 - 2 Able 1 to Able - 3	Able with whip as well as Able 1.
1012	"	2004 Kc.	Nil	Change to 2004 Kc.
	"	3450 Kc.	Able to Able 1 - 4 Able 1 to Able-3-4	Whip on Able 1 Wire on Able as before.
	"	6450 Kc.	Able to Able 1 - 3 Able 1 to Able - 3	" "

TEST NO.5 - 12/4/'52.

A sky wave R.T. test between Tanglin Mess and the F.T.C. was carried out. Distance approximately 35 miles. Able 1 at Tanglin. Able at F.T.C.

Time	Frequency	Strength	Remarks
1715	6485 Kc.	Able to Able 1 - 2 to 5 Able 1 to Able - 2 to 5	Fades cause drop in strength. Able using dipole. Able 1 using end fed.
1735	3450 Kc.	Nil	Heavy noise.
1750	6485 Kc.	Able to Able 1 - 2 to 5 Able 1 to Able - 1 to 4	Fades. End fed aerial at Able 1. Dipole at Able.
1800	9865 Kc.	Able to Able 1 - 1 to 2 Able 1 to Able - 1 to 2	Heavy morse interferences blots out signals. End fed aerials both ends
1850	6485 Kc.	Able to Able 1 - 2 to 4 Able 1 to Able - 2 to 3	Morse interference at Able.

TEST NO.6 - 13/4/'52.

Sky-wave tests between Tanglin and the F.T.C. were continued (Distance 35 miles). Fading existed most of the time and the range of strengths is given in order to indicate approximately the effect of these fades. Unless otherwise specified Able (at F.T.C.) used the higher voltage B-battery and Able 1 (at Tanglin) the standard batteries. The whole day's tests were carried out with only the A510 circuits as means of communication.

Time Hrs.	Frequency	Strength	Remarks
1000	6485 Kc.	Able to Able 1 - 3 to 5	Test commenced in heavy rain at Tanglin. Able on dipole, Able 1 on end fed wire aerial.
1020	3450 Kc.	Nil	
1040	6485 Kc.	Able to Able 1 - 3 to 5 Able 1 to Able - 4 to 5	Dipole at Able End fed aerial at Able 1.
	"	Able to Able 1 - 2 to 3 Able 1 to Able - 2	End fed aerials both ends.
1112	5180 Kc.	Able to Able 1 - 2 to 3 Able 1 to Able - 2	" "
1150	9865 Kc.	Able to Able 1 - 1 Able 1 to Able - 1	End fed aerials both ends. Heavy Q.R.M. and Q.R.N. becoming pronounced at Able 1.
1230	6485 Kc.	Able to Able 1 - 4 to 5 Able 1 to Able - 4 to 5	Able using dipole Able 1 using end-fed aerial.
1400	6485 Kc.	Able to Able 1 - 3 to 5 Able 1 to Able - 2 to 5	" "
1530	3450 Kc.	Able to Able 1 - 3 to 5 Able 1 to Able ?	Both stations using end fed aerials. Contact lost on this channel.
1545	6485 Kc.	Able to Able 1 - 4 to 5 Able 1 to Able - 1 to 3	Q.R.M. present & Q.R.N. increasing. Able on dipole. Able 1 on long wire.
1600	"	Able to Able 1 - 3 to 5 Able 1 to Able - 3 to 5	High voltage B-Battery now on Able 1.
1620	9865 Kc.	Able to Able 1 - Nil Able 1 to Able - 1	Able heard Able 1 only once on R.T., but heard Able 1. O.K. on C.W.
1645	6485 Kc.	Able to Able 1 - 5 Able 1 to Able - 5	Some fades.
		Able 1 to Able - 5	Able 1 whispering.

TEST NO.7 - 14/4/'52

In this test wire aerials were used at each end, unless otherwise stated. Able was at the F.T.C.. Able 1 at point 4, approximately 9 miles south of the F.T.C., mainly through rubber.

Time Hrs.	Frequency Kc/s.	Strength	Remarks
1010	3450	Able to Able 1 - 5 Able 1 to Able - 3	Able 1 using L condition of aerial. Able using H condition. Conditions quiet.
1026	"	Able to Able 1 - 2 Able 1 to Able - 2	Able 1 on whip. Able on wire.
1027	"	Able to Able 1 - 4 to5 Able 1 to Able - 4 to5	Wire aerials as previously.
1030	6485	Able to Able 1 - 5 Able 1 to Able - 3*	Dipole at Able, wire at Able 1 *C.W. interference at Able.
1050	2004	Nil	Unsatisfactory, long wire aerial at Able 1.
1100	3450	Able to Able 1 - 5 Able 1 to Able - 5	Able 1 and Able aerials as before on this channel.
1115	9365	Nil	Xs higher on this channel.
1130	3450	Able to Able 1 - 4to 5 Able 1 to Able - 5	

TEST NO.8 - 14/4/'52

Able still at F.T.C.; Able 1 at position 5 approximately 8 miles north of the F.T.C..

Time Hrs.	Frequency Kc/s	Strength	Remarks
1510	6485	Able to Able 1 - 3 to 5 Able 1 to Able - 5	Able on dipole (25 ft.) Able 1 on 8-10 ft. high end-fed aerial in rubber plantation.
1520	"	Able to Able 1 - 2 Able 1 to Able - 2	Able changed to low dipole (5 ft. high).
1525	"	Able to Able 1 - 5 Able 1 to Able - 3 to 5	Able reverts to previous aerial condition.
1530	"	Able to Able 1 - 3 to 5 Able 1 to Able - 1 to 5	Able 1 and Able both on end-fed aerials. Fading at both ends.
1535	"	Able to Able 1 - 5 Able 1 to Able - 5	End-fed aerial Able 1. Dipole on Able.
1600	3450	Able to Able 1 - 2 to 3 Able 1 to Able - 1 to 2	End-fed aerials both ends. Static higher on this channel.
1610	6485	Able to Able 1 - 5 Able 1 to Able - 3 to 5	Dipole Able. End-fed aerial Able 1.
	"	Able to Able 1 - 2	Low dipole Able.
1615	"	Able to Able 1 - 5 Able 1 to Able - 3 to 5	Dipole Able (25 ft.) and Dipole Able 1 (20 ft.)

Tests were carried out by one A510 (Able 1) moving off with Training Exercise which was using 68 Sets. Able was at the F.T.C.. Test commenced on 6485 Kc. with Able 1 at Point 6 approximately 8½ miles North East.

Time Hrs.	Frequency	Strength	Remarks
1015	6485 Kc.	Able to Able 1 - 4 to 5 Able 1 to Able - 4 to 5	Able on normal dipole Able 1 on low dipole. Noise and interference low.
1030	4240 Kc.	Able to Able 1 - 2 Able 1 to Able - 3 to 4	Able 1 having interference from local 68 Set.
1040	6485 Kc.	Able to Able 1 - 4 to 5 Able 1 to Able - 2 to 4	Aerial conditions as previously on this channel.
	"	Able to Able 1 - 2 Able 1 to Able - 2	Able replaces higher dipole by 6 ft. dipole.

Tests were now concluded at this position and Able replaced dipole with end fed aerial (H condition) and Able 1 used whip. Able 1 then communicated from vehicle moving towards F.T.C. At first signal of Able was blotted out by ignition noise but Able 1 was received by Able at strength 1 to 2.

6485 Kc.	Able to Able 1 - 1 to 2 Able 1 to Able - 2	3 to 4 miles.
"	Able to Able 1 - 5 Able 1 to Able - 4	2 miles.
	Able to Able 1 - 5 Able 1 to Able - 5	1 mile.

Able 1 then called into F.T.C. and frequency was changed to 3450 Kc. and Able 1 then moved south towards Johore Bahru. At a distance of about 5 miles Able's strength was 5 at Able 1 and the strength of Able 1 at Able was varying, depending on position, from 2 to 5. It was not until about 8 miles from camp that Able 1 at Able dropped to strength varying from 1 to 3 and Able at Able 1 to strength 3 to 4 depending on exact position. Able 1 reported later that he heard Able calling until about 10 miles.

The next contact was made by sky-wave on 6485 Kc. with Able 1 at position 7 near Johore Bahru water tower.

Time	Frequency	Strength	Remarks
1230	6485 Kc.	Able to Able 1 - 5 Able 1 to Able - 3 to 5	Able on high dipole Able 1 on 10 ft. dipole Noise quiet.
1233	6485	Able to Able 1 - 5 Able 1 to Able - 3	Able 1 dipole on ground.
		Able 1 to Able - 5	Able 1 raises dipole again. Change from strength 3 to 5 is noted.
1420	"	Able to Able 1 - 3 to 5 Able 1 to Able - 3 to 5	Able 1 aerial 8 ft. high. In Johore Bahru (Position8) Noise and interference higher at Able. Fading

TEST NO.9 (Contd)

Message was then sent to Able 1 in the form "Boy, Joy, Toy, Coy, Rat, Tat, Sat etc." and was read at least 80% correctly.

Next contact was made by Able 1 from Hee Soon on Singapore Island, Position 9.

Time Hrs.	Frequency	Strength	Remarks
1630	6485 Kc.	Able to Able 1 - 5 Able 1 to Able - 3 to 4	Fading both ends. Able 1 aerial 15 ft. high dipole. Able - same high dipole. Fades drop Able 1 signal to 1 at times. Static now heavy. Able 1 reads message of unconnected words from Able, at least 80% correctly.
1705	4280 Kc.	Able to Able 1 - 3 to 4 Able 1 to Able - 3 to 5	Q.R.N. and Xs high. Both Able and Able 1 on dipole.
1715	6485 Kc.	Able to Able 1 - 5 Able 1 to Able - 3 to 5	Fading both ends.

TEST NO.10 - 20/4/'52

3 Set Net.

Two sets in jungle (Able 1 and Able 2) separated from one another.

Third Set at F.T.C. (Able).

Able 1 and Able 2 used whip aerials. Able used inclined wire.

In carrying out the test Able 1 and Able 2 were mobile. It took some time before each was in a position close enough for satisfactory intercommunication, but communication between each and Able was at most times satisfactory. Only a very brief summary is given and much of earlier stages of test is not given.

(1) Frequency - 3450 Kc.

Able 1 - 400 yards in primary jungle from road.

Able 2 - 200 yards off road on track leading to foot ambush area in secondary jungle.

Able - F.T.C.

Distances:- Able to Able 1 - 3 miles
Able to Able 2 - 1¾ miles
Able 1 to Able 2 - 2¼ miles

Strengths

Able 1 to Able	Able 2 to Able	Able 1 to Able 2	Able 2 to Able 1	Able to Able 1	Able to Able 2
3	4	2 - 3	3 - 4	5	5

(2) Frequency - 3450 Kc.

Able 1 moves 500 yards further into jungle and down into deep gulley with 200 ft. sides.

Strengths

Able 1 to Able	Able 2 to Able	Able 1 to Able 2	Able 2 to Able 1	Able to Able 1	Able to Able 2
2 - 3	4	-	2	5	5

(3) Frequency - 2004 Kc.

Position as (2) above.

Able 1 to Able	Able 2 to Able	Able 1 to Able 2	Able 2 to Able 1	Able to Able 1	Able to Able 2
2	5	Nil	Nil	-	5

Able 1 then comes out of gulley

TEST NO.10 - (Cont'd)

(4) Change to Frequency - 6485 Kc.

(Able 1 is now out of gulley)

Able using T Aerial.

Able 1 to Able	Able 2 to Able	Able 1 to Able 2	Able 2 to Able 1	Able to Able 1	Able to Able 2
2 - 3	2 - 3	4	4	3 - 5	5

MEASUREMENTS OF FIELD STRENGTH

It is to be noted that the fields measured are very low indeed; for lower in many cases than can normally be measured by usual F.I. meters. The fields less than 1 mV/m must therefore be treated with some reserve. It should be noted, however, that the adapted A510 used for the measurement has been re-calibrated since the return from Malaya and there is every confidence that the results indicated below are of the right order. More measurements were not taken as it was found that the measuring method was rather cumbersome to use in view of the limited time available.

Date	Test (See above)	Position	Condition (All C.W.)	Field Strength µV/m
12/4/52	3	1	(a) A510 on Ground normal whip 7 ft.	4.9 µV/m
			(b) 68 Set with its whip 11 ft.	4.9 µV/m NOTE: Relative measurements previously taken on 68 Set indicated higher fields than the A510 as would be expected with longer whip. Small differences in position cause large changes in field where the sets are in trees
	3	2	(a) A510 long wire aerial & counter poise.	[illegible] µV/m
			(b) Whip aerial A510 on ground.	0.56 µV/m
			(c) As b but with counterpoise.	0.69 µV/m
			(d) As (b) but high battery 135V in parallel with 90V (this was in error).	0.9 µV/m
			(e) As c with higher battery (in parallel).	1.07 µV/m
12/4/52	4	3	(a) A510 on ground. Whip aerial counterpoise 135V battery (correctly in place now).	3.53 µV/m
			(b) As a. No counterpoise.	1.9 µV/m
			(c) 90V Battery. No counterpoise.	[illegible] µV/m

MEASUREMENT OF THUNDERSTORM - 11/4/'52

A heavy thunderstorm hit the F.T.C. and induction in long wire aerial was at times sufficient to cause shocks. After the worst of the storm had passed, a measurement was taken of the noise. Crashes varied widely in amplitude but occurred at the rate of 70 in 90 secs. A large number of individual crashes were recorded and the median value noted.

The median F.I. turned out to be about 5 μV/meter but many individual crashes were at least twice this and some probably more than 10 times this value. As the storm was passing quickly it was not possible to measure both median and peak values.

MEASUREMENT OF NOISE RECEIVED ON A 6½ Mc. DIPOLE

These were obtained by substituting a signal generator (since calibrated) for the aerial and adjusting level until meter reading on the adapted A510 (used for F.I. measurements) gave the same readings as the noise. The values obtained varied from day to day and, of course, according to time of day. As the aerial was the one also used for other tests it was not always possible to take measurements at the same time each day. To obtain such measurements a recorder is really necessary. The average values obtained are approximately as follows :-

Time Hrs.	F.I. (Median) in db relative to 1 μV/m	Frequency of Noise Crashes.
0700	+ 3	2 per second.
0900	- 3	1 per second.
1000	- 12	1 in 5 seconds.
1200	- 17	Varying from no crashes to 1 in 3 secs. Noise 10 db lower when no crashes existed.
1400	- 10	1 in 2 secs.
1600	- 6	Continuous noise and burst at 2 per second.
1800	- 3	Continuous bursts at least 4 per second.
2000	+ 1	" "
2400	+ 5	" "