APPENDIX 7. USEFUL RADAR INFORMATION

Figure 1. PRF ASSIGNMENTS

	RADAR		BEACON	
SET	NOMINAL PRF	PERIOD	NOMINAL PRF	PERIOD
A	350 pps	2860 usec	350 pps	2860 usec
B	355	2820	355	2820
C	360	2780	360	2780
D	365	2740	365	2740
E	370	2700	370	2700
F	1200	833	400	2500
G	1170	855	390	2565
H	1140	877	380	2631
I	1070	935	357	2805
J	1050	952	351	2856
K	1030	971	343	2913
L	1185	844	395	2532
M	1155	866	385	2598
N	1125	888	375	2664

Figure 2. ASR PARAMETERS

RADAR PARAMETERS	ASR-4B	ASR-5 AND 6	ASR-7
Nominal PPI Range	60 nmi	60 nmi	60 nmi
Accuracy			
Azimuth	± 1% displ.dia.	± 1% displ.dia.	± 1% displ.dia.
Range	±.02R	±.02R	±.02R
Resolution			
Azimuth	2.25°	2.25°	2.25°
Range	1.5 ~c/2	1.5 ~c/2	1.5 ~c/2 or 1%
Antenna			
Main			
Pattern Shape	$\csc^2\theta$	$\csc^2\theta$	$\csc^2\theta$
Beamwidth			
Azimuth	1.5°	1.5°±0.15°	1.5°±0.15°
Elevation	~5°	~5°	~5°
Max Gain dBir	+34	+34	+34
Scan Rate rpm	15	15	12.75
Polarization	Vert/Circular	Vert/Circular	Vert/Circular
Passive			
Pattern Shape			
Beamwidth			
Azimuth			
Elevation			
Max Gain dBir			
Polarization			
RF Frequency MHz	2700-2900	2700-2900	2700-2900
PRF pps	710-1200	710-1200	710-1200
Peak Power Output	400 kW	400 kW	400 kW
Pulse Duration, ~ (us)	0.833	0.833	0.833
Receiver Noise Figure (dB)	4.0	4.0	4.5
Sensitivity			
Normal (dBm)	-109	-109	-108
MTI (dBm)	-107	-107	-106
Normal Log (dBm)	-	-	-106
MTI Log (dBm)	-	-	-104
MTI Improvement Factor (dB)			
Subclutter Visibility (dB)	25	25	25
Cancellation Ratio (dB)	30	30	30
Antenna Tilt Capability			
(Nose of Beam)	-2° to +7°	-2° to +7°	-2° to +7°
IF Bandwidth			
Normal Receiver (MHz)	2.1-2.7	2.1-2.7	2.1-2.7
MTI Receiver (MHz)	4-5	4-5	4-5
Maximum Remoting Cable Length	12000 Feet	12000 Feet	12000 Feet
RG-11A/U Armored (for direct burial)			
RG-216U (for burial in ducts or conduit)			

1/Reference to lower 3 dB point ~ = duration of transmitted pulse
c = velocity of light dBir = dB with respect to an isotropic radiator

Figure 2. ASR PARAMETERS (CONT'D)

RADAR PARAMETERS	ASR-8	ASR-9
Nominal PPI Range	60 nmi	60 nmi
Accuracy		
Azimuth		
Range		
Resolution		
Azimuth		
Range		
Antenna		
Main		
Pattern Shape	$\csc^2\theta$	
Beamwidth		
Azimuth	$\geq 1.35^\circ$	
Elevation	$\geq 4.8^\circ$	
Max Gain dBir	$\geq +33.5$	
Scan Rate rpm	12.5	
Polarization	Vert/Circular	
Passive		
Pattern Shape	$\csc^2\theta$	
Beamwidth		
Azimuth	$\geq 1.35^\circ$	
Elevation	$\geq 4.8^\circ$	
Max Gain dBir	$\geq +32.5$	
Polarization	Vert/Circular	
RF Frequency	2700-2900	2700-2900
PRF	710-1200	710-1200
Peak Power Output	1 MW	
Pulse Duration, $\tilde{}$ (us)	0.6 ± 0.05 us	
Receiver Noise Figure (dB)	4.0	
Sensitivity		
Normal (dBm)	-110	
MTI (dBm)	-108	
Normal Log (dBm)	-109 to -110	
MTI Log (dBm)	-106 to -108	
MTI Improvement Factor (dB)	34	
Subclutter Visibility (dB)	28	
Cancellation Ratio (dB)		
Antenna Tilt Capability (Nose of Beam)	1/ -2.5° to +2.5°	
IF Bandwidth		
Normal Receiver (MHz)	2.0-2.33	
MTI Receiver (MHz)	4-5	
Maximum Remoting Cable Length	20000 Feet	
RG-11A/U Armored (for direct burial)		
RG-216U (for burial in ducts or conduit)		

1/Reference to lower 3 dB point
c = velocity of light
$\tilde{}$ = duration of transmitted pulse
dBir = dB with respect to an isotropic radiator

Figure 3. ASR FEATURES

RADAR FEATURES	ASR-4B	ASR-5 and 6	ASR-7	ASR-8	ASR-9
Overall Functions					
IAGC					
STC-1			X	X	
-2			X	X	
-3			X	X	
-4			X		
Normal Receiver					
IAGC	X	X			
FTC-1	X	X			
-2	X	X			
STC-1	X	X			
-2	(adj at site)	(adj at site)			
-3					
-4					
Integr. (Enhanced) Video	X	X	X	X	
R.G. Integr. Video	X	X			
Log FTC Normal Receiver					
Integr. (Enhanced) Video			X	X	
R.G. Integr. Video					
MTI Receiver					
Single Canceler A	X	X	X	X	
B	X	X	X	X	
Double Canceler	X	X	X	X	
Double Canceler w Veloc. Shape	X	X	X	X	
FTC-1	X	X			
-2	X	X			
STC-1	X	X			
-2	(adj at site)	(adj at site)			
-3					
-4					
PRF Stagger	X	X	X	X	
Integ. (Enhanced) Video			X	X	
R.G. Integr. Video	X	X			
Log FTC, MTK Receiver					
Integr. (Enhanced) Video			X	X	
R.G. Integr. Video					

Figure 4. ATCBI TRANSMITTER AND RECEIVER

CHARACTERISTIC	ATCBI-3	ATCBI-4	ATCBI-5
ATCBI Transmitter			
Frequency	1030 ±0.2MHz	1030 ±0.2MHz	1030 ±0.2MHz
Pulse Width	0.8 ±0.1us	0.8 ±0.1us	0.8 ±0.1us
Peak Power	50 to 1585W	50 to 1580W	50 to 3160W
Pulse-Pair Spacing			
Mode 1	3 ±0.1us	3 ±0.1us	3 ±0.1us
Mode 2	5 ±0.1us	5 ±0.1us	5 ±0.1us
Mode 3/A	8 ±0.1us	8 ±0.1us	8 ±0.1us
Mode B	17 ±0.1us	17 ±0.1us	17 ±0.1us
Mode C	21 ±0.1us	21 ±0.1us	21 ±0.1us
Mode D	25 ±0.1us	25 ±0.1us	25 ±0.1us
Pulse Repetition Frequency (PRF)[1]	425 max	450 max	450 max
Mode Interlace	X,Y,Z,XY,XXY XYZ	X,Y,Z,XY,XXY XYZ,XYXZ	X,YXZ,XY,XXY, XYZ,XYXZ
SLS/ISLS	cabled	switch selectable	switch selectable
Stagger	switch selectable	switch selectable	switch selectable
ATCBI Receiver			
Frequency	1090MHz	1090MHz	1090MHz
3dB Bandwidth	8 to 10MHz	8 to 10MHz	8 to 10MHz
Tangenitial Sensitivity	-87dBm	-87dBm	-87dBm
STC	switch selectable	switch selectable	switch selectable
Remoting (Maximum Cable Length)	12,000 ft	25,000 ft	20,000 ft

[1]Maintain at assigned prf. Primary ASR radar prf is counted down for beacon trigger.

Figure 5. ATCRBS TIMING

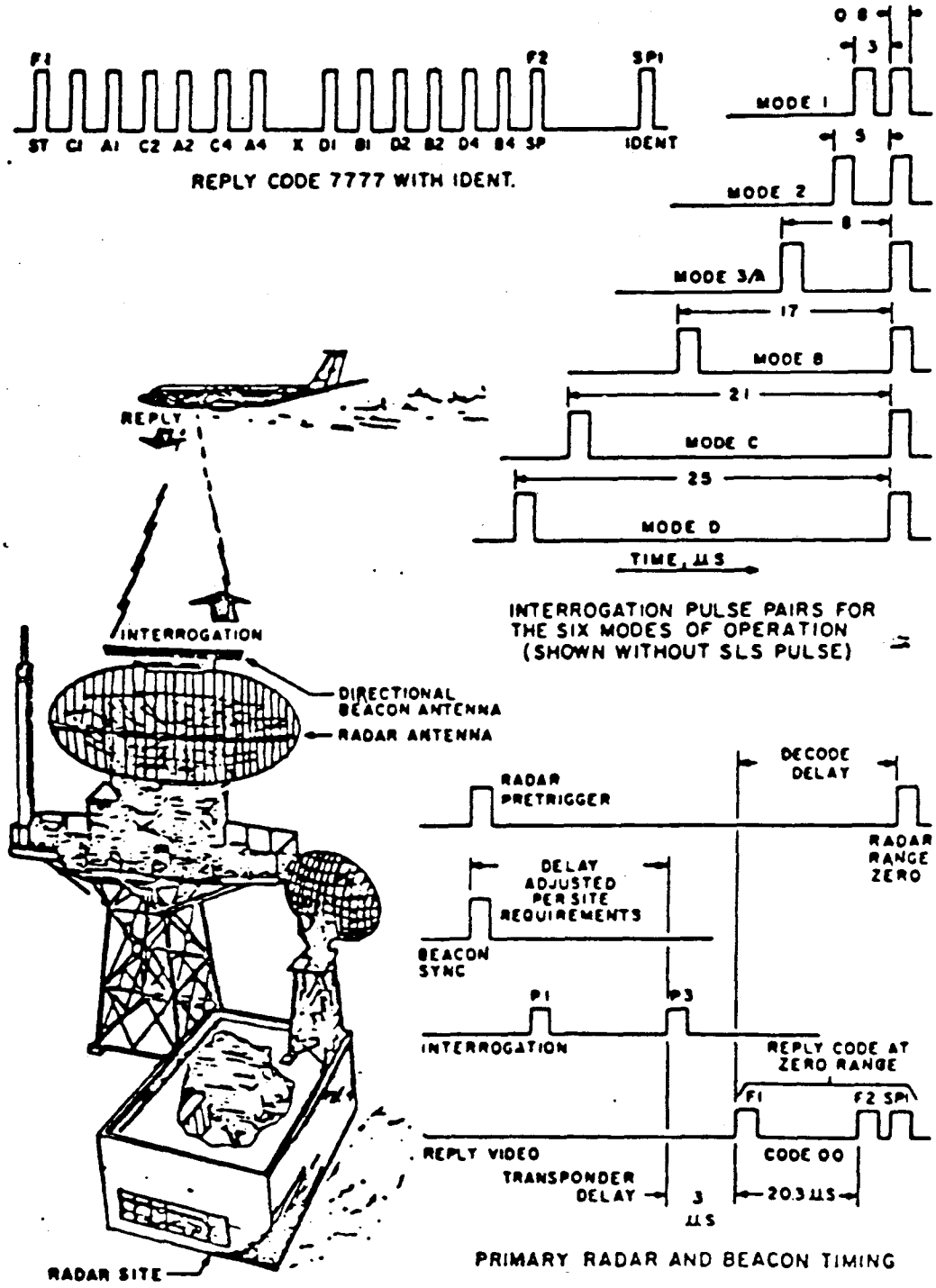

Figure 6. ATCBI DIGITAL SENSITIVITY WITH STC FOR LRR

Range (nmi)	1	2	4	8	16	32	64	128
Time (ps)	15	28	52	100	200	400	800	1600
Digital sensitivity with STC off (dBm)	-87	-87	-87	-87	-87	-87	-87	-87
Attenuation - stc (dB)	46	40	34	28	22	16	10	4
Digital Sensitivity with STC on (-dBm) a. Calculated b. Measured	-41	-47	-53	-59	-65	-71	-77	-83
Coupling factor plus test-set cable attenuation (dB)	31	31	31	31	31	31	31	31
Test-set attenuator setting (dB below 1mW)	10	16	22	28	34	40	46	52

Figure 7. ATCBI DATA FOR STC CURVES FOR LRR

Gain Reduction in dB Versus Range								Range of Recovery	Rate of Recovery
Initial Level	Time from P3 – μs (Range – nmi)								
15.36 (1)	27.7 (2)	52 (4)	102 (8)	200 (16)	398 (32)	794 (64)	1585 (128)	nmi	dB
36	30	24	18	12	6	0		64.0	6
37	31	25	19	13	7	1		71.8	6
38	32	26	20	14	8	2		80.6	6
39	33	27	21	15	9	3		90.5	6
40	34	28	22	16	10	4	0	101.6	6
41	35	29	23	17	11	5	0	114.0	6
42	36	30	24	18	12	6	0	128.0	6
43	37	31	25	19	13	7	1	143.7	6
44	38	32	26	20	14	8	2	161.3	6
45	39	33	27	21	15	9	3	181.0	6
46	40	34	28	22	16	10	4	203.2	6
47	41	35	29	23	17	11	5	228.1	6
48	42	36	30	24	18	12	6	256.0	6
49	43	37	31	25	19	13	7	287.4	6
50	44	38	32	26	20	14	8	322.5	6
40	34	28	22	15	8	1		70.7	6 and 7
41	35	29	23	16	9	2		78.0	6 and 7
42	36	30	24	17	10	3		86.1	6 and 7
43	37	31	25	18	11	4	0	95.1	6 and 7
44	38	32	26	19	12	5	0	105.0	6 and 7
45	39	33	27	20	13	6	0	115.9	6 and 7
46	40	34	28	21	14	7	0	128.0	6 and 7
47	41	35	29	22	15	8	1	141.3	6 and 7
48	42	36	30	23	16	9	2	156.0	6 and 7
49	43	37	31	24	17	10	3	172.3	6 and 7
50	44	38	32	25	18	11	4	192.2	6 and 7
44	38	32	26	18	10	2		76.1	6 and 8
45	39	33	27	19	11	3		83.0	6 and 8
46	40	34	28	20	12	4		90.5	6 and 8
47	41	35	29	21	13	5	0	98.7	6 and 8
48	42	36	30	22	14	6	0	107.6	6 and 8
49	43	37	31	23	15	7	0	117.4	6 and 8
50	44	38	32	24	16	8	0	128.0	6 and 8

Figure 8. ATCBI DIGITAL SENSITIVITY WITH STC FOR ASR

Range (nmi)	1	2	4	8	16	32	48
Time (μs)	15	28	52	100	200	400	600
Digital sensitivity with stc off (dBm)	−87	−87	−87	−87	−87	−87	−87
Attenuation − stc (dB)	44	38	32	26	20	14	10.5
Digital sensitivity with stc on (−dBm) a. Calculated b. Measured	−43	−49	−55	−61	−67	−73	−76.5
Coupling factor plus-test-set cable attenuation (dB)	31	31	31	31	31	31	31
Test-set attenuator setting (dB below 1mW)	12	18	24	30	36	42	45.5

Figure 9. ATCBI DATA FOR STC CURVES FOR ASR

Gain Reduction in dB Versus Range								*Range of Recovery*	*Rate of Recovery*
Initial Level	*Time from PJ − μs (Range − nmi)*								
15.36 (1)	*27.7 (2)*	*52 (4)*	*102 (8)*	*200 (16)*	*398 (32)*	*794 (64)*	*1585 (128)*	*nmi*	*dB*
36	30	24	18	12	6	0		64.0	6
37	31	25	19	13	7	1		71.8	6
38	32	26	20	14	8	2		80.6	6
39	33	27	21	15	9	3		90.5	6
40	34	28	22	16	10	4	0	101.6	6
41	35	29	23	17	11	5	0	114.0	6
42	36	30	24	18	12	6	0	128.0	6
43	37	31	25	19	13	7	1	143.7	6
44	38	32	26	20	14	8	2	161.3	6
45	39	33	27	21	15	9	3	181.0	6
46	40	34	28	22	16	10	4	203.2	6
47	41	35	29	23	17	11	5	228.1	6
48	42	36	30	24	18	12	6	256.0	6
49	43	37	31	25	19	13	7	287.4	6
50	44	38	32	26	20	14	8	322.5	6