

**RTCA Special Committee 209**

**ATCRBS / Mode S Transponder MOPS Maintenance**

**Meeting #7**

**In Joint Session with Eurocae WG-49**

**Eurocontrol Headquarters, Brussels  
20 – 24 August 2007**

**Summary of the Results of Updating 735B for the  
TCAS Version**

**As Submitted to ARINC by: Dr. Roland Mallwitz, DFS  
and Robert Saffell, Rockwell Collins  
Results Summarized here by: Gary Furr**

**SUMMARY**

This Working Paper presents the results of the effort to update 735B with regard to the TCAS Version in the Data Link Capability Report by showing the comments submitted to ARINC by Dr. Roland Mallwitz and Robert Saffell and discussing the final result agreed to by ARINC/AEEC.

## **1.0 Changes submitted to ARINC for 735B**

During the meeting of RTCA SC-209 Working Group 1, which ended on 1 June 2007 at RTCA, Working Paper ModeS-WP02-19 outlined the agreement of SC-209 regarding the changes required to 735B. This document was then taken forward as input to the ICAO ASP Technical Subgroup (TSG) meeting in Paris in July for their consideration.

Coming out of the TSG meeting, Dr. Roland Mallwitz was tasked to consolidate the comments to 735B that were reviewed by the TSG, including those related to the TCAS Version and submit them to ARINC prior to the end of the comment period.

The following two (2) pages represent a “Cover Letter” sent by Roland to ARINC with the final agreed TSG suggestion regarding the TCAS Version as stated therein.

A teleconference was held by ARINC to review all of the industry comments on the draft of 735B and among those comments was a set of comments from Robert Saffell of Rockwell Collins. Bob commented that there should be NO change to the Attachment 19G containing the 735A definition of the TCAS Version because of the requirement for backward compatibility. Instead, Bob proposed submitting a new Attachment 19K to carry the definition of the TCAS Version for 735B compatible equipment. After discussion, it was agreed by ARINC that Attachment 19G would remain as defined in 735A and that a new Attachment 19K would define the new TCAS Version for 735B.

Please see the pages following the Mallwitz cover letter for all of the pages offered by Bob Saffell.

Dear Mr. Prisaznuk,

In conjunction with the request from RTCA SC147 and EUROCAE WG75 to provide information on the TCAS version for monitoring, the Technical Subgroup (TSG) of ICAOs Aeronautical Surveillance Panel (ASP), during their meeting from 2-6 July 2007, briefly reviewed the proposal on updating ARINC Project Paper 735B (Excerpt from TSG minutes see Attachment A). The TSG has active participation of members from various RTCA and EUROCAE committees including SC186, SC209, WG49 and WG75.

With regard to the indication of the TCAS version it was noted that a previous proposal using Bit 72 in the TCAS message as a version indication was not agreeable. Bit 72 has been assigned by ICAO to the indication that TCAS is Hybrid Surveillance capable, as this information is in some states regarded at least as important as the TCAS version.

**Current ICAO Annex 10 Vol. IV Am 82:**

*Bit Coding*

48	0	ACAS failed or on standby
	1	ACAS operating
69	0	ACAS II
	1	ACAS III
70	0	ACAS generating TAs only
	1	ACAS generating TAs and RAs
71	0	ACAS not fitted
	1	ACAS fitted
72	0	no Hybrid Surveillance
	1	with Hybrid Surveillance

The group was more in favour of a proposal made by MIT Lincoln Lab, which covered both indications, but also provides space for possible future expansions. The proposal was slightly amended and forwarded to the TCAS manufacturers and got positive response. Please find the proposal below (changes in **bold**):

**Change proposal for DO-185B, DO-181D, ED-73C and Annex 10, Vol. IV:**

*Bit Coding*

48	0	ACAS failed, on standby or not available
	1	ACAS operating
69	0	<b>no Hybrid Surveillance</b>
	1	<b>Hybrid Surveillance</b>
70	0	ACAS generating TAs only
	1	ACAS generating TAs and RAs

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Bit	72	71	
	0	0	DO-185?? (6.04A)
	0	1	DO-185A
	1	0	<b>DO-185B</b>
	1	1	<b>For future versions or enhancements (see Registers E5<sub>16</sub> &amp; E6<sub>16</sub>)</b>

This coding is agreed assuming that there will be no Hybrid Surveillance implemented with the existing Version 7.0. Otherwise the coding is **NOT** backward compatible. In addition, several alignments and corrections are necessary for a new attachment covering DO-185B and its backward compatibility.

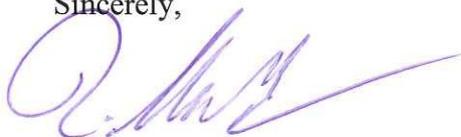
It should be noted that the responses from the manufacturers to the TSG contained the remark that the draft ARINC 735B does not contain any provision to include **TCAS hardware and software versions** as agreed in previous discussions (definitions are in attachment B). In executing monitoring programs to identify serious issues with airborne equipment it has been proved useful to provide this information and determine, if there is a problem of a single unit or a series. It is therefore requested to provide this information to the transponder (generated by a DO-185B compatible TCAS). At least DO-181D compatible transponders will be capable to handle this information.

In addition to the discussions above, several other issues have been identified (detailed comments in the attached form):

- Mode A coding: The coding of Mode A codes in DO-185x ARINC 735x do not match with ICAO Annex 10, Vol IV. The TSG took an action to contact European manufacturers on their implementation (comment #5).
- Sensitivity Level Command (SLC) with Surveillance Identifier (SI)-Codes: ARINC 735x does not convey SI-Codes (just II Codes, Interrogator Identifier). The TSG took an action to identify operational requirements (if any).
- A parallel barometric altitude input to TCAS via transponder and ADC may cause serious incidents. A clarification in the new proposed text is necessary (#2).
- The ratio of detected errors/ # of messages and undetected errors/ # of messages needs to be corrected (#9)
- The 24-bit aircraft address is not only used for Mode S surveillance, but also for communications and other purposes. Therefore, and in line with ICAO definitions, the term "Mode S address" should be changed to "24-bit aircraft address". Similar changes are intended for DO-181D and ED 73C (#s 7, 8, 11).
- It is at least irritating to find "tbd" several times in a document issued for comment (#10).

It is our perception that at least comments #2, #9 and #15 out of the comment form are solved prior to publication. However, due to the parallel activities by RTCA and EUROCAE working groups to update transponder and TCAS MOPS and expecting stable drafts around the end of this year, consideration should be given to a slight delay of 735B for covering DO-185B correctly.

Sincerely,



Roland Mallwitz

(ASP Chairman)

**ATTACHMENT 19K**  
**TCAS TO TRANSPONDER (TX) DATA LINK CAPABILITY REPORT**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**

**Table 19k-1a:** Label 270: SEGMENT 0  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit (MSB)		0		
8	Label 3 rd Digit		0		
9	GICB 1 (MSB)	1	0		
10	GICB 1		0		[1]
11	GICB 1		0		
12	GICB 1 (LSB)		1		
13	GICB 2 (MSB)	0	0		
14	GICB 2		0		[1]
15	GICB 2		0		
16	GICB 2 (LSB)		0		
17	BDS1 (MSB)	1	0	33	
18	BDS1		0	34	[1]
19	BDS1		0	35	
20	BDS1 (LSB)		1	36	
21	BDS2 (MSB)	0	0	37	
22	BDS2		0	38	[1]
23	BDS2		0	39	
24	BDS2 (LSB)		0	40	
25	Segment Number Bit_0 (LSB)	0	0		
26	Segment Number Bit_1		0		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)		0		
29	Continuation Bit		1		
30	Request/Delivery Bit		0		[2]
31	Pad		0		[2]
32	Parity		(Odd)		

**ATTACHMENT 19K**  
**TCAS TO TRANSPONDER (TX) DATA LINK CAPABILITY REPORT**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**

**Table 19k-1b:** Label 270: SEGMENT 1  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	Not Used by TCAS	0	0	41	
10	Not Used by TCAS		0	42	
11	Not Used by TCAS		0	43	
12	Not Used by TCAS		0	44	[3]
13	Not Used by TCAS		0	45	
14	Not Used by TCAS		0	46	
15	Not Used by TCAS		0	47	
16	BIT 48	As Required		48	[4], [5]
17	Not Used by TCAS	0	0	49	
18	Not Used by TCAS		0	50	
19	Not Used by TCAS		0	51	
20	Not Used by TCAS		0	52	
21	Not Used by TCAS		0	53	[3]
22	Not Used by TCAS		0	54	
23	Not Used by TCAS		0	55	
24	Not Used by TCAS		0	56	
25	Segment Number Bit_0 (LSB)	1	1		
26	Segment Number Bit_1		0		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)		0		
29	Continuation Bit		1		
30	Request/Delivery Bit		0		[2]
31	Pad		0		[2]
32	Parity		(Odd)		

**ATTACHMENT 19K**  
**TCAS TO TRANSPONDER (TX) DATA LINK CAPABILITY REPORT**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**

**Table 19k-1c:** Label 270: SEGMENT 2  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	Not Used by TCAS	0	0	57	
10	Not Used by TCAS		0	58	
11	Not Used by TCAS		0	59	
12	Not Used by TCAS		0	60	
13	Not Used by TCAS		0	61	
14	Not Used by TCAS		0	62	
15	Not Used by TCAS		0	63	[3]
16	Not Used by TCAS		0	64	
17	Not Used by TCAS		0	65	
18	Not Used by TCAS		0	66	
19	Not Used by TCAS		0	67	
20	Not Used by TCAS		0	68	
21	BIT 69	As Required		69	[6], [9]
22	BIT 70	As Required		70	[7], [9]
23	BIT 71	As Required		71	[8], [9]
24	BIT 72	As Required		72	[8], [9]
25	Segment Number Bit_0 (LSB)		0		
26	Segment Number Bit_1		1		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	2	0		
29	Continuation Bit		0		[10]
30	Request/Delivery Bit		0		[2]
31	Pad		0		[2]
32	Parity	(Odd)			

**ATTACHMENT 19K**  
**TCAS TO TRANSPONDER (TX) DATA LINK CAPABILITY REPORT**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**

**NOTES:**

- [1]. For the Data Link Capability Report, Segment 0, the GICB Register or Buffer Number is equivalent to the BDS Buffer Number. This may or may not be the case for other messages to be transferred via the TGD protocol.
- [2]. The “SSM” field is not required for the TGD protocol since it is assumed that the data being sent to the Transponder is valid; otherwise, the TCAS should not be sending it. Status of the TCAS/Transponder system is provided to the Transponder by the TCAS via TXWORD2 (Label 274) and TXWORD3 (Label 275).
- [3]. These bits are not used by TCAS: therefore, TCAS should ensure that these bits are set to ZERO. These bits will be set by other equipment (i.e., transponder) in accordance with RTCA DO-218A or RTCA DO-181D.
- [4]. Bit 48, Coding:  
 Bit 48 should be set to ONE by a TCAS operating at a sensitivity level in the range of 2 through 7. Bit 48 should be set to ZERO by a TCAS operating at a sensitivity level of 1, or if TCAS has detected a failure, or if the TCAS is being powered down.
- [5]. This RF Message bit will be set to ZERO by the transponder if it detects a failure of the TCAS/Transponder interface.
- [6]. Bit 69 Coding:  
 0 = No Hybrid Surveillance Capability  
 1 = Hybrid Surveillance Capable
- [7]. Bit 70 Coding:  
 0 = ACAS generating Traffic Advisories (TA’s) only  
 1 = ACAS generating Traffic and Resolution Advisories (TA’s and RA’s)
- [8]. Bit 71, 72 Coding:

<b>Version Coding</b>		
<b>Bit 72</b>	<b>Bit 71</b>	<b>Meaning</b>
0	0	DO-185 ?? (6.04A)
0	1	DO-185A Compatible
1	0	DO-185B Compatible
1	1	Reserved for future versions or enhancements (see Attachment L for BDS register E5 <sub>16</sub> and E6 <sub>16</sub> )

- [9]. These RF Message bits will be set to ZERO by the transponder if it detects a failure of the TCAS/Transponder interface.
- [10]. The Continuation Bit in Segment may be set to ZERO since there are no further Data Link Capability Report data bits that are set by TCAS that would need to be transferred to the transponder in subsequent segments. If the Continuation Bit in Segment 2 is set to 1, then the Data Link Capability Report transfer should proceed in accordance with the TGD protocol.

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-1: Using Unit Part Number Coding**  
**Using Part Number Coding (Sample Part Number = 123-456-789-147)**

**Table 19L-1a:** Label 270: SEGMENT 0  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	GICB 1 (MSB)	E	1		
10	GICB 1		1		[1]
11	GICB 1		1		
12	GICB 1 (LSB)		0		
13	GICB 2 (MSB)	5	0		
14	GICB 2		1		[1]
15	GICB 2		0		
16	GICB 2 (LSB)		1		
17	ACAS Unit Part Number Status		0 or 1	33	[2]
18	Format Type (MSB)	0	0	34	[3]
19	Format Type (LSB)		0	35	
20	Part Number Digit 1 (MSB)	1	0	36	
21	Part Number Digit 1		0	37	
22	Part Number Digit 1		0	38	
23	Part Number Digit 1 (LSB)		1	39	
24	Part Number Digit 2 (MSB)	2	0	40	
25	Segment Number Bit_0 (LSB)		0		
26	Segment Number Bit_1		0		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	0	0		
29	Continuation Bit		1		
30	Request/Delivery Bit		0		[4]
31	Pad		0		[4]
32	Parity		(Odd)		

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-1: Using Unit Part Number Coding**  
**Using Part Number Coding (Sample Part Number = 123-456-789-147)**

**Table 19L-1b:** Label 270: SEGMENT 1  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	Part Number Digit 2	2	1	41	
10	Part Number Digit 2		0	42	
11	Part Number Digit 2 (LSB)		0	43	
12	Part Number Digit 3 (MSB)	3	0	44	
13	Part Number Digit 3		0	45	
14	Part Number Digit 3		1	46	
15	Part Number Digit 3 (LSB)		1	47	
16	Part Number Digit 4 (MSB)	4	0	48	
17	Part Number Digit 4		1	49	
18	Part Number Digit 4		0	50	
19	Part Number Digit 4 (LSB)		0	51	
20	Part Number Digit 5 (MSB)	5	0	52	
21	Part Number Digit 5		1	53	
22	Part Number Digit 5		0	54	
23	Part Number Digit 5 (LSB)		1	55	
24	Part Number Digit 6 (MSB)	6	0	56	
25	Segment Number Bit_0 (LSB)		1		
26	Segment Number Bit_1		0		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	1	0		
29	Continuation Bit		1		
30	Request/Delivery Bit		0		[4]
31	Pad		0		[4]
32	Parity		(Odd)		

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-1: Using Unit Part Number Coding**  
**Using Part Number Coding (Sample Part Number = 123-456-789-147)**

**Table 19L-1c:** Label 270: SEGMENT 2  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	Part Number Digit 6	6	1	57	
10	Part Number Digit 6		1	58	
11	Part Number Digit 6 (LSB)		0	59	
12	Part Number Digit 7 (MSB)	7	0	60	
13	Part Number Digit 7		1	61	
14	Part Number Digit 7		1	62	
15	Part Number Digit 7 (LSB)		1	63	
16	Part Number Digit 8 (MSB)	8	1	64	
17	Part Number Digit 8		0	65	
18	Part Number Digit 8		0	66	
19	Part Number Digit 8 (LSB)		0	67	
20	Part Number Digit 9 (MSB)	9	1	68	
21	Part Number Digit 9		0	69	
22	Part Number Digit 9		0	70	
23	Part Number Digit 9 (LSB)		1	71	
24	Part Number Digit 10 (MSB)	1	0	72	
25	Segment Number Bit_0 (LSB)		0		
26	Segment Number Bit_1		1		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	2	0		
29	Continuation Bit		1		
30	Request/Delivery Bit		0		[4]
31	Pad		0		[4]
32	Parity		(Odd)		

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-1: Using Unit Part Number Coding**  
**Using Part Number Coding (Sample Part Number = 123-456-789-147)**

**Table 19L-1d:** Label 270: SEGMENT 3  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	Part Number Digit 10	1	0	73	
10	Part Number Digit 10		0	74	
11	Part Number Digit 10 (LSB)		1	75	
12	Part Number Digit 11 (MSB)	4	0	76	
13	Part Number Digit 11		1	77	
14	Part Number Digit 11		0	78	
15	Part Number Digit 11 (LSB)		0	79	
16	Part Number Digit 12 (MSB)	7	0	80	
17	Part Number Digit 12		1	81	
18	Part Number Digit 12		1	82	
19	Part Number Digit 12 (LSB)		1	83	
20	Reserved	0	0	84	
21	Reserved		0	85	
22	Reserved		0	86	
23	Reserved		0	87	
24	Reserved		0	88	
25	Segment Number Bit_0 (LSB)		1		
26	Segment Number Bit_1		1		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	3	0		
29	Continuation Bit		0		
30	Request/Delivery Bit		0		[4]
31	Pad		0		[4]
32	Parity		(Odd)		

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-2: Using Unit Character Coding**  
**Using Character Coding (Sample Character Coding = AB-CDE-FGH)**

**Table 19L-2a:** Label 270: SEGMENT 0  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	GICB 1 (MSB)	E	1		
10	GICB 1		1		[1]
11	GICB 1		1		
12	GICB 1 (LSB)		0		
13	GICB 2 (MSB)	5	0		
14	GICB 2		1		[1]
15	GICB 2		0		
16	GICB 2 (LSB)		1		
17	ACAS Unit Part Number Status		0 or 1	33	[2]
18	Format Type (MSB)	1	0	34	[3]
19	Format Type (LSB)		1	35	
20	Character 1 (MSB)	A	0	36	
21	Character 1		0	37	
22	Character 1		0	38	
23	Character 1		0	39	
24	Character 1		0	40	
25	Segment Number Bit_0 (LSB)		0		
26	Segment Number Bit_1		0		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	0	0		
29	Continuation Bit		1		
30	Request/Delivery Bit		0		[4]
31	Pad		0		[4]
32	Parity		(Odd)		

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-2: Using Unit Character Coding**  
**Using Character Coding (Sample Character Coding = AB-CDE-FGH)**

**Table 19L-2b:** Label 270: SEGMENT 1  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	Character 1 (LSB)	A	1	41	
10	Character 2 (MSB)	B	0	42	
11	Character 2		0	43	
12	Character 2		0	44	
13	Character 2		0	45	
14	Character 2		1	46	
15	Character 2 (LSB)		0	47	
16	Character 3 (MSB)	C	0	48	
17	Character 3		0	49	
18	Character 3		0	50	
19	Character 3		0	51	
20	Character 3		1	52	
21	Character 3 (LSB)		1	53	
22	Character 4 (MSB)	D	0	54	
23	Character 4		0	55	
24	Character 4		0	56	
25	Segment Number Bit_0 (LSB)		1		
26	Segment Number Bit_1		0		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	1	0		
29	Continuation Bit		1		
30	Request/Delivery Bit		0		[4]
31	Pad		0		[4]
32	Parity		(Odd)		

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-2: Using Unit Character Coding**  
**Using Character Coding (Sample Character Coding = AB-CDE-FGH)**

**Table 19L-2c:** Label 270: SEGMENT 2  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	Character 4	D	1	57	
10	Character 4		0	58	
11	Character 4 (LSB)		0	59	
12	Character 5 (MSB)	E	0	60	
13	Character 5		0	61	
14	Character 5		0	62	
15	Character 5		1	63	
16	Character 5		0	64	
17	Character 5 (LSB)		1	65	
18	Character 6 (MSB)	F	0	66	
19	Character 6		0	67	
20	Character 6		0	68	
21	Character 6		1	69	
22	Character 6		1	70	
23	Character 6 (LSB)		0	71	
24	Character 7 (MSB)	G	0	72	
25	Segment Number Bit_0 (LSB)		0		
26	Segment Number Bit_1		1		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	2	0		
29	Continuation Bit		1		
30	Request/Delivery Bit		0		[4]
31	Pad		0		[4]
32	Parity		(Odd)		

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-2: Using Unit Character Coding**  
**Using Character Coding (Sample Character Coding = AB-CDE-FGH)**

**Table 19L-2d:** Label 270: SEGMENT 3  
TCAS TO TRANSPONDER (Tx)  
TX Coordination #1 Out Bus  
TX Coordination #2 Out Bus

<u>Bit</u>	<u>Function</u>	<u>Coding</u>		<u>RF Msg Bit</u>	<u>Notes</u>
1	Label 1 st Digit (MSB)	2	1		
2	Label 1 st Digit (LSB)		0		
3	Label 2 nd Digit (MSB)	7	1		
4	Label 2 nd Digit		1		
5	Label 2 nd Digit (LSB)		1		
6	Label 3 rd Digit (MSB)	0	0		
7	Label 3 rd Digit		0		
8	Label 3 rd Digit (LSB)		0		
9	Character 7	G	0	73	
10	Character 7		0	74	
11	Character 7		1	75	
12	Character 7		1	76	
13	Character 7 (LSB)		1	77	
14	Character 8 (MSB)	H	0	78	
15	Character 8		0	79	
16	Character 8		1	80	
17	Character 8		0	81	
18	Character 8		0	82	
19	Character 8 (LSB)		0	83	
20	Reserved	0	0	84	
21	Reserved		0	85	
22	Reserved		0	86	
23	Reserved		0	87	
24	Reserved		0	88	
25	Segment Number Bit_0 (LSB)		1		
26	Segment Number Bit_1		1		
27	Segment Number Bit_2		0		
28	Segment Number Bit_3 (MSB)	3	0		
29	Continuation Bit		0		
30	Request/Delivery Bit		0		[4]
31	Pad		0		[4]
32	Parity		(Odd)		

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-3: Using Software Part Number Coding**  
**Using Part Number Coding (Sample Part Number = 123-456-789-147)**

Encoding of the “270” Words for transfer of the Software Part Number using Part Number Coding proceeds exactly as for transfer of the Unit Part Number using Part Number Coding as defined in Attachment L-1 with the following exception:

The GICB1\_\_GICB2 encoding in Segment “0” shall be set to “E6” hex ( “1110 0110” binary).

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**  
**Attachment L-4: Using Software Character Coding**  
**Using Character Coding (Sample Part Number = 123-456-789-147)**

Encoding of the “270” Words for transfer of the Software Part Number using Character Coding proceeds exactly as for transfer of the Unit Part Number using Character Coding as defined in Attachment L-2 with the following exception:

The GICB1\_\_GICB2 encoding in Segment “0” shall be set to “E6” hex ( “1110 0110” binary).

**ATTACHMENT 19L**  
**TCAS TO TRANSPONDER (TX) ACAS UNIT and SOFTWARE PART NUMBER**  
**RTCA/DO-185B COMPATIBLE EQUIPMENT**

The following notes apply equivalently to Attachments L-1 –through- L-4.

**NOTES:**

- [1]. For the ACAS Unit Part Number, Segment 0, the GICB Register or Buffer Number is equivalent to the BDS register in which the data should be stored in the transponder.
- [2]. ACAS Unit Part Number Status:0 = INVALID, 1 = VALID
- [3]. Format Type Coding:

<b>Format Type Coding</b>		
<b>Bit 2</b>	<b>Bit 3</b>	<b>Meaning</b>
0	0	Part Number (P/N) Coding
0	1	Character Coding
1	0	Reserved
1	1	Reserved

- 1). When available it is recommended to use the part number.  
P/N Digits are BCD encoded. Digit 1 is the first left digit of the part number.
  - 2). If the part number is not available, the first 8 characters of the commercial name can be used with the format type “01”.
  - 3). If format type “01” is used, the coding of character 1 to 8 shall be as defined in Table 3-7 of Chapter 3, ICAO Annex 10, Volume IV. Character 1 is the first left character of the ACAS unit type.
  - 4). For operational reasons, some military installations may not implement this format.
- [4]. The “SSM” field is not required for the TGD protocol since it is assumed that the data being sent to the Transponder is valid; otherwise, the TCAS should not be sending it.