DUTY CYCLE FORMULA

I. TRANSMIT DATA BYTES

BYTE VALUES	PURPOSE/USE	CODE	ONES
AAH	PREAMBLE	10101010	4
1	DATA	00110001	3
2	DATA	00110010	3
3	DATA	00110011	4
4	DATA	00110100	3
5	DATA	00110101	4
6	DATA	00110110	4
7	DATA	00110111	5
8	DATA	00111000	3
9	DATA	00111001	4
0	DATA	00110000	2
0DH	CR	00001101	3
0AH	LF	00001010	2
54H	TEMP(T)	01010100	3
52H	HEART®	01010010	3
20H	SPACE	00100000	1
3AH	COLON (:)	00111010	2
2CH	COMMA (,)	00101100	3
D	DATA MESS	01000100	2
R	SYNC	01010010	3
06H	MESS OK	00000110	2
26H	SEND DATA	00100110	3
14H	CMD	00010100	2
Q	SYNC	01010001	3
11H	RETRANS	00010001	2
2DH	MINUS	00101101	4
2EH	PERIOD	00101110	4

II. TRANSMISSION SPEC

A. 4800 BAUD
B. 1 START BIT AND 1 STOP BIT
C. BIT SENT PER CHAR: 10
D. TRANSMISSION FOR ONE BIT: 2.0833XE-4 SEC
E. TRANSMISSION FOR ONE BYTE (10 X 2.0833E-4): 2.083E-3
F. NO. OF BYTES TRANSMITTED FOR 100 MSEC: 48 BYTES

III. MESSAGE FORMAT

A. PREAMBLE

BYTE	NUMBER	TOTAL	ONES (ON TIME)
AAH	50	50 X 5-	250
FFH	1	1	9
00H	1	1	1
Q	1	1	4
R	1	1	4
	TOTAL	**54**	**268**

DUTY CYCLE FOR PREAMBLE=(BITS ON/(TOTAL BYTES x 10))x100%
= (268/540) x 100%
= (49%)

TIME TO SEND PREAMBLE APPROXIMATELY 100 MSEC
THIS REMAINS CONSTANT

B. DATA TRANSMISSION MESSAGE FORMAT
1 BYTE TO ADDRESS (BINARY)
1 BYTE FROM ADDRESS (BINARY)

1 FUNCTION CMD	ASCII	
1 TOTAL NO. OF BYTES	(BINARY)	
X BYTES MESSAGE	(ASCII)	
1 BYTE CRC	(BINARY)	
1 BYTE CRC	(BINARY)	

C. TYPICAL MESSAGE (WORST CASE)

HEADER	**BYTE**	**BYTES**	**NO. OF ONES**
TO ADDR	EEH		6
FM ADD	EEH		6
TOTAL BYTE MESS			6
	TOTAL HEADER BITS ON	**3**	**18**

MESSAGE TEXT(TEMP ONLY)
T17:17,-377.77 Temp Format

TEMP DATA	T		3
TIME	1		4
	7		5
	:		2
	1		4
	7		5
	,		3
TEMP	-		4
	3		4
	7		5
	7		5
	.		4
	7		5
	7		5
TEMP MESS BITS ON	**58**	**14**	**58**

MESSAGE TEXT (HEART)
H17:17,177.7 Heart Format

R		3
1		4
7		5
:		2
1		4
7		4
,		3
1		4
7		5
7		5
.		4
7		5
TEMP MESS BITS ON	**12**	**48**

D. DUTY CYCLE FOR VARIOS MESSAGE FORMATS

1. SINGLE MESSAGE (TEMP)

HEADER,TEMP,TEMP,CRC

	BYTES	ONES ON	(TOTAL ONES ON + BYTES)
HEADER	3	18+3	21

TEMP MESS	14	58+14	62
TEMP MESS	14	58+14	62
CRC (FFFFH)	2	16+2	18
TOTAL ON	33		163

DUTY CYCLE = (BITS ON/(BYTES x 10)) x 100%
= (163/330) x 100%
= (49.3%)

2. SINGLE MESSAGE (TEMP,HEART)

HEADER,TEMP,HEART,CRC

	BYTES	ONES ON	(TOTAL ONES ON + BYTES)
HEADER	3	18+3	21
TEMP	14	58+14	62
HEART	12	48+12	60
CRC	2	16+2	18
	31		161

DUTY CYCLE = (161/310) X 100%
= **52%**

3. MULTIPLE TEMP MESSAGE

HEADER,6 SINGLE TEMP,CRC

	BYTES	ONES ON
HEADER	3	21
TEMP(12)	84	372
CRC	2	18
	89	411

DUTY CYCLE = (411/890)x100%
= **46%**

4. MULTIPLE TEMP,HEART MESSAGE

HEADER,3 TEMP,3HEART,CRC

	BYTES	ONES ON
HEADER	3	21
TEMP(3)	42	182
HEART(3)	36	180
CRC	2	18
	82	401

DUTY CYCLE = 401/820 x 100%
= **48.9%**

E. SUMMARY

	MESSAGE PORTION	**DUTY CYCLE(DC)**	**TOTAL BYTES**	**100 MSEC CYCLES(100MC)**
1.	PREAMBE	49.0	54	1.124
2.	SINGLE TEMP MESS(STM)	49.3	33	0.689
3.	SINGLE TEMP, HEART(STHM)	52.0	31	0.645
4.	MULT TEMP MESS(MTM)	46.0	89	1.85
5.	MULT TEMP,HR MESS(MTHM)	48.9	82	1.70

APPROXIMATELY **48** BYTES ARE SENT IN 100 MSEC CYCLE

FOR TYPICAL MESSAGE

OVERALL WEIGHTED DUTY CYCLE PER 100MS(OWDCP100MS)
=((100MC PREABLE)x(DC PREAMBLE)+(100MC STM)x(DC STM))/(100MSEC PREAMBLE+100MSEC STM)

OWDCP100MS-STM = (1.124(49) + .69(49.3))/(1.124+.69)
= 55+34/ 1.814
= **49%**
OWDCP100MS-STHM = (1.123(49)+ 0.645(52))/(1.12+0.645)
= 55+33.5/1.765
= **50%**

OWDC100MS-MTM = (1.123(49)+1.85(46))/(1.12+1.85)
= 55+85.1/2.97
= **47%**
0WDC100MS-MTHM = (1.123(49)+1.7(48.9)/(1.12+1.7)
= 55+83.1/2.82
= **48.9%**

UPON REVIEW OF TAKING THE TOTAL TRANSMISSION FOR A SINGLE TRANSMISSION AS WELL AS MULTIPLE READINGS TRANSMISSION, THE WEIGHTED AVERAGE DUTY CYCLES REMAINED UNDERS 51%. THEREFORE, WE WIIL ASSUME A **DUTY CYCLE OF 60%** FOR A WORST CASE TRANSMISSION DUTY CYCLE.