STEL-9257
User's Manual

STEL-9257
5 - 65 MHz
QPSK Burst Receiver

intel

FOREWORD

The Telecom Component Products Division of Stanford Telecommunications, Inc., is pleased to provide its customers with this copy of the User's Manual for the STEL-9257 currently under development.

This User's Manual contains "*Preliminary Product Information*" for the prototype STEL-9257 for usage in high speed data, voice, and video systems.

The information in this User's Manual is subject to change, since the STEL-9257 is still under development.

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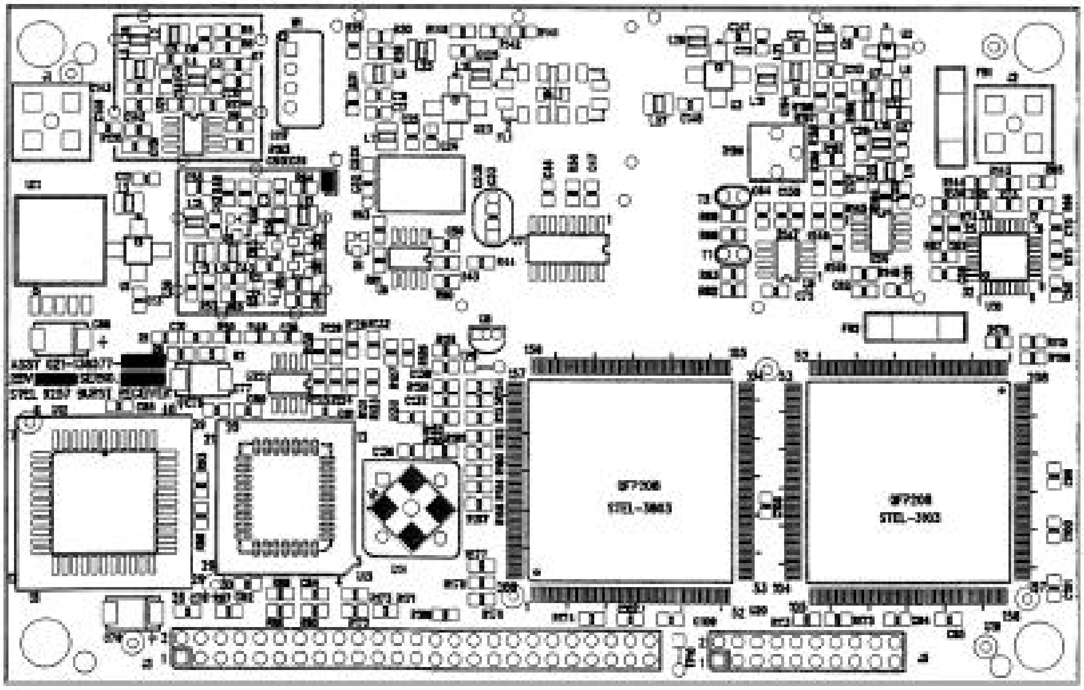


KEY FEATURES

- Compatible with IEEE Specification 802.14, MCNS, and DAVIC
- Burst QPSK demodulation
- Selectable Data rates
- Tunable 5-65 MHz RF input frequency
- Fast Acquisition time, short preamble, and short guard time to minimize overhead
- Tracking Bit Synchronizer for long packet lengths

MAC FRIENDLY FEATURES

- ♦ Received Signal Strength indicator (RSSI)
- ♦ Noise Power Measurement
- ♦ Noise Measurement Synchronization
- ♦ Carrier Frequency Error Estimator
- ♦ Acquisition Disable
- ♦ Multiple Packet Lengths for Mini-Slot Support
- ♦ Collision Detection

Stanford Telecom's STEL-9257 QPSK Burst Receiver provides a fast, easy solution for designing complete headend receiver systems for high speed data, voice, and video upstream applications.

HIGH PERFORMANCE UTILIZATION OF UPSTREAM SPECTRUM

The STEL-9257 achieves extremely fast acquisition times to minimize overhead. It uses differential encoding and coherent detection to provide a stable, robust performance in the presence of impulse noise. It will process and demodulate both fixed and variable packet length, and TDMA and FDMA signals over an input frequency range of 5-65 MHz.

A cable modem system may have the following burst profiles:

1. Initial registration (maximum uncertainty): Send long burst with data designed for frequency acquisition.
2. Station keeping: similar to 1 for periodic re-measurement of frequency offset.
3. Request: short burst for requesting service.
4. Short data: for sending small amount of data; use short FEC code word.
5. Long data: word for sending large amount of data; use long FEC code word.

The STEL-9257 can support these burst profiles using its burst length control pins, which operate very quickly (on adjacent bursts).

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Characteristic	Value
Input Characteristics	
Frequency Range	5 to 65 MHz (in 100 Hz steps)[DP1]
Modulation Types	Differentially Encoded QPSK
Input Signal Level	Scales with bit rate, see **Table 1**.
Burst-to-Burst Variation	Greater then ±6 dB from the nominally commanded level
Programmable Input Level Control	30 dB (1 dB Steps)
Input Noise Level Max	0 dBmV
Input Impedance	75 Ohms
Return Loss	> 15 dB
PLL Tuning Time	Approx. 30 ms
Input Carrier Freq. Accuracy	Computed using the formula: R_s * 1% - F_{max} * 25 PPM *where:* R_s = ±*Symbol Rate* F_{max} = *maximum carrier freq (in MHz)* (e.g., for 1.28 Msps and 65 MHz carrier, the required accuracy is ±11.8 kHz)
Composite Input Level Maximum	TBD
Undesired Input Power	-54 dBm for 66 to 74 MHz -15 dBm above 74 MHz
Performance	
RSSI Accuracy	±2 dB
BER	1 x 10^{-6} max. for E_b / N_o=13 dB 1 x 10^{-9} max. for E_b / N_o=15 dB
Excess Bandwidth	0.25 - 0.30
Channel Spacing	(1+α) X symbol rate
Guard Time between Bursts	4 symbols min (See Figure 1) 11 symbols for variable packet length mode
Preamble	14 symbols = 28 bits or (00 00 00 00 11 11 00 00 11 11 00 11 00 11) 16 symbols = 32 bits or (00 00 00 00 11 11 11 00 11 11 11 00 11 11 00 11) 16 symbols DAVIC or (11 00 11 00 11 00 11 00 11 00 11 00 00 00 11 01) 14 symbols STEL-9244 (11 11 11 00 00 11 00 00 00 00 00 00 00 00)

Characteristic	Value
Data Rate	Variable with 1 kbit per second resolution (see Table 1 for examples)
Burst Length	Programmable from 32 to 8192 symbols (see Table 2) or variable length
Probability of Missed Acquisition	10^{-6}, for E_b / N_o = 13 dB, (signal removed) Signal Level = nominal
Probability of False Acquisition	10^{-6} per packet period, for E_b / N_o = 13 dB, Input Level = nominal
Carrier Frequency Estimator	
Eb/No = 9 dB:	
Maximum Carrier Offset	5% R_s (R_s =symbol rate)
Accuracy (mean or bias)	mean ≤ 10% of carrier frequency offset
Repeatability (standard deviation)	σ ≤ 8% of carrier frequency offset
Eb/No = 13 dB:	
Maximum Carrier Offset	5% R_s (R_s =symbol rate)
Accuracy (mean or bias)	mean ≤ 7% of carrier frequency offset
Repeatability (standard deviation)	σ ≤ 6% of carrier frequency offset
Master Clock Input (Special Request Option)	
Frequency	25 MHz
Stability	±25 ppm (min)
Duty Cycle	45 / 55
Supply Voltages	
Digital (Typical)	+5 V ±5 % @ 0.82 A
Analog (Typical)	+12 V ±5 % @ 0.4 A
Environmental	
Operating Temperature Range	0 to 70° C
Storage Temperature Range	-40 to +85° C
Mechanical	
Dimensions	3.5” x 5.5” x 0.5”
Weight	< 1 pound

Table 1. Data Rates and Signal Levels

Burst Symbol Rate (Msps)	Allocated Bandwidth = Min Carrier Spacing (MHz)	Reference Standard	Burst QPSK Bit Rate (Mbps)	Signal Level (dBmV)			Signal Level (dBmV)	
				Min	Center	Max	Min (including -6 dB burst-to-burst)	Max (including +6 dB burst-to-burst)
0.128	0.166	DAVIC	0.256	-17	-2	13	-23	19
0.16	0.2	MCNS	0.32	-16	-1	14	-22	20
0.256	0.32	IEEE-802.14	0.512	-14	1	16	-20	22
0.32	0.4	MCNS	0.64	-13	2	17	-19	23
0.512	0.64	IEEE-802.14	1.024	-11	4	19	-17	25
0.64	0.8	MCNS	1.28	-10	5	20	-16	26
0.772	1.004	DAVIC	1.544	-9	6	21	-15	27
1.024	1.28	IEEE-802.14	2.048	-8	7	22	-14	28
1.28	1.6	MCNS	2.56	-7	8	23	-13	29
1.544	2.007	DAVIC	3.088	-6	9	24	-12	30
2.048	2.56	IEEE-802.14	4.096	-5	10	25	-11	31
2.56	3.2	MCNS	5.12	-4	11	26	-10	32

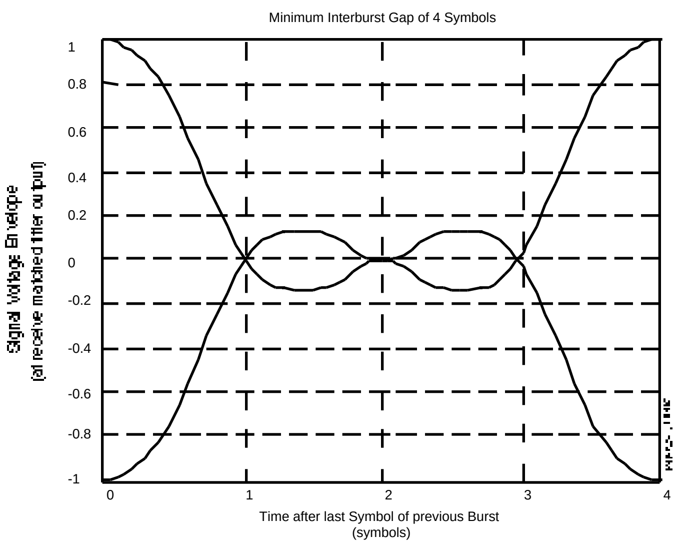


Figure 1. Burst Guard Time

Table 2. Mode Control Selection

Mode Control Pins			Mode of Operation
Pin 19	Pin 20	Pin 18	
0	0	0	Disable Acquisition
0	0	1	"A" packet length†*
0	1	0	"B" packet length**
0	1	1	"C" packet length†
1	0	0	"D" packet length
1	0	1	"E" packet length†
1	1	0	"F" packet length†
1	1	1	Variable Packet Length

† Packet length is programmable

**** Collision Length (See text)***

***** Default***

FUNCTIONAL DESCRIPTION

The STEL-9257 is a Burst QPSK Receiver designed for fast acquisition of TDMA burst signals. Figure 2 shows the three functional blocks of circuitry that comprise the STEL-9257 – Tuner, Digital Demod, and Microprocessor.

TUNER

The Tuner converts the RF input signal (5-65 MHz) into an IF signal, which is then filtered by a Surface Acoustic Wave (SAW) filter.

DIGITAL DEMOD

The Digital Demod is comprised of circuits that perform four functions: Digital Preprocessing, Demodulation, Synchronization and Estimation, and Timing and Control.

The Digital Preprocessing circuitry samples the IF signal, filters and decimates the samples, and then outputs digital samples to the subsequent processing blocks.

A FIR filter is used to filter the digital samples. The STEL-9257 transmit spectrum is designed for alpha = 0.25 - 0.30 (25% - 30% excess bandwidth) square root raised cosine. The transmit FIR filter coefficients shown in Figure 3 form a shaped / matched filter for use with the STEL-1108 and STEL-1109 digital QPSK Modulator chip.

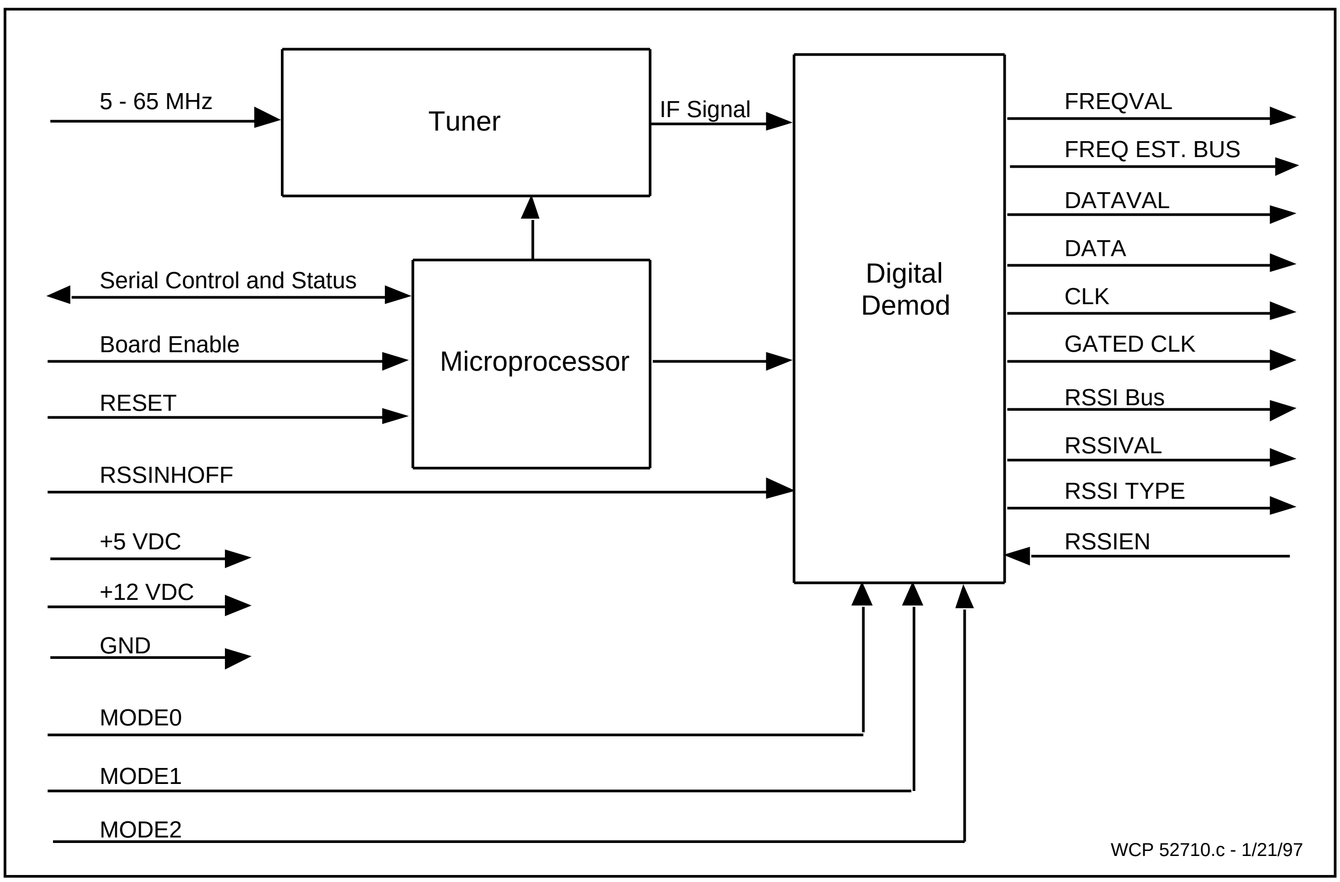


Figure 2. Receiver Block Diagram

0, 31	9	4, 27	-10	8, 23	2	12, 19	34
1, 30	-1	5, 26	18	9, 22	-58	13, 18	211
2, 29	-16	6, 25	43	10, 21	-99	14, 17	394
3, 28	-22	7, 24	41	11, 20	-76	15, 16	511

WCP 53701.c-10/29/97

Figure 3. FIR Filter Coefficients (α = 0.25)

MICROPROCESSOR

Upon external reset, the Microprocessor configures the Tuner and Digital Demod circuitry for operation. The Microprocessor then waits for external serial port commands. Each STEL-9257 is selected and enabled by asserting the Board Enable control signal (BEN) low.

INPUT LEVEL DYNAMIC RANGE

The input level dynamic range of the receiver is a function of E_b / N_o. In a typical data-over-CATV system, the E_b / N_o ratio will increase as the transmit level is increased. The STEL-9257 contains a programmable gain amp to permit nominal input signal level adjustment. The function can be controlled over a 30 dB range in 1 dB steps. Table 3 shows the values to be downloaded to the 9257 using the RF Gain Control command.

The STEL-9257 can maintain proper reception over an approximate ±6 dB range from nominal. Figure 4 shows the typical operational area. The S/N ratio can be derived from the chart by subtracting the noise level from the signal level. For QPSK modulation the E_b / N_o ratio can be calculated by subtracting 3 dB from the S/N ratio.

ADAPTIVE THRESHOLD FUNCTION

(Patent Pending)

In order for the adaptive threshold function to operate correctly, an occasional measurement of the background channel noise must be made by the STEL-9257. The measurement need only be performed frequently enough (on the order of minutes) to allow the STEL-9257 to track the average background channel noise level. The measurement period is a function of the RSSI integration length, which is a fixed at 191 symbols.

FREQUENCY ESTIMATOR

Since the bit error rate performance degrades as the carrier frequency varies from ideal (See Figure 5 and Figure 6), the 9257 incorporates a frequency estimator function. The Frequency Estimator function provides the user with an estimate of the received signal's frequency error in the form 8 bit signed number. If the received signal's frequency error is less than 5% of the symbol rate, the Frequency Estimator bus will output a frequency correction estimate that is accurate to within 7% of ideal. This function can be used to servo the transmitter to the correct transmission frequency. See the specification table for performance details. For a performance example see Figure 7.

For net-entry, a registration burst consisting of BPSK-like data, i.e. double each bit, can be used to improve the performance of the Frequency Estimator. Note: Frequency Estimator Output codes 127, 128, & 129 should be discarded and not used.

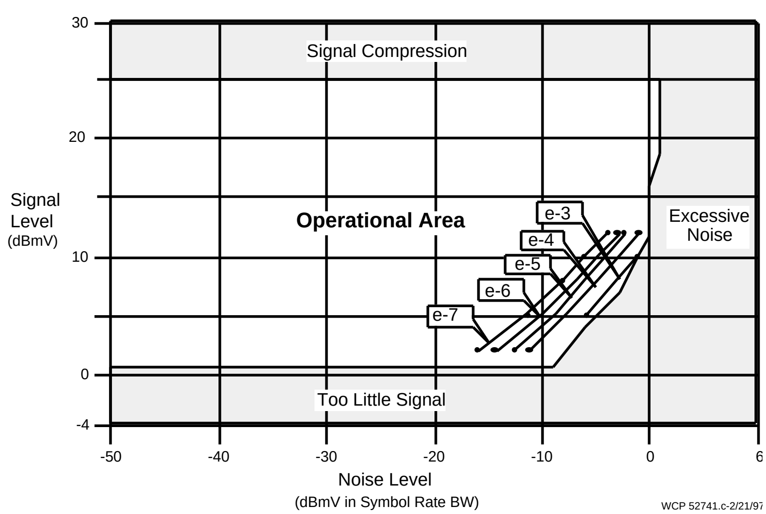


Figure 4. Burst Demod Dynamic Range (0.5 Msps case) (Preliminary)

Table 3. Gain Setting Table

Nominal Signal Level (dBmV)	RF Gain Setting For Symbol Rate =											
	.128 Msps	**.160 Msps**	**.256 Msps**	**.320 Msps**	**.512 Msps**	**.640 Msps**	**.772 Msps**	**1.024 Msps**	**1.280 Msps**	**1544 Msps**	**2.048 Msps**	**2.560 Msps**
26												54
25											57	59
24										60	62	64
23									62	65	67	69
22								64	67	70	72	74
21							67	69	72	75	77	79
20						68	72	74	77	80	82	84
19					69	73	77	79	82	85	87	89
18					74	78	82	84	87	90	92	94
17				72	79	83	87	89	92	95	97	99
16			73	77	84	88	92	94	97	100	102	104
15			78	82	89	93	97	99	102	105	107	109
14		74	83	87	94	98	102	104	107	110	112	114
13	75	79	88	92	99	103	107	109	112	115	117	119
12	80	84	93	97	104	108	112	114	117	120	122	124
11	85	89	98	102	109	113	117	119	122	125	127	129
10	90	94	103	107	114	118	122	124	127	130	132	134
9	95	99	108	112	119	123	127	129	132	135	137	139
8	100	104	113	117	124	128	132	134	137	140	142	144
7	105	109	118	122	129	133	137	139	142	145	147	149
6	110	114	123	127	134	138	142	144	147	150	152	154
5	115	119	128	132	139	143	147	149	152	155	157	159
4	120	124	133	137	144	148	152	154	157	160	162	164
3	125	129	138	142	149	153	157	159	162	165	167	169
2	130	134	143	147	154	158	162	164	167	170	172	174
1	135	139	148	152	159	163	167	169	172	175	177	179
0	140	144	153	157	164	168	172	174	177	180	182	184
-1	145	149	158	162	169	173	177	179	182	185	187	189
-2	150	154	163	167	174	178	182	184	187	190	192	194
-3	155	159	168	_172	179	183	187	189	192	195	197	199
-4	160	164	173	177	184	188	192	194	197	200	202	204
-5	165	169	178	182	189	193	197	199	202	205	207	
-6	170	174	183	187	194	198	202	204	207	210		
-7	175	179	188	192	199	203	207	209	212			
-8	180	184	193	197	204	208	212	214				
-9	185	189	198	202	209	213	217					
-10	190	194	203	207	214	218						
-11	195	199	208	212	219							
-12	200	204	213	217								
-13	205	209	218	222								
-14	210	214	223									
-15	215	219										
-16	220	224										
-17	225											

MODE CONTROL

The STEL-9257 can be disabled, operated in the fixed packet length mode, or operated in the variable packet length mode. The mode control signals (Mode 0, Mode 1, and Mode 2) must be set as for the desired mode of operation.

In the fixed packet length mode, the user may select six different packet lengths for the expected input signal packet length.

In the variable packet length mode, the STEL-9257 automatically detects the end of the data transmission burst (EOB). The EOB detection process prevents the DataValid signal from precisely framing the end of the packet, and also requires the guard time between data packets be set to a minimum of **11 symbols**. See Table 2 for more details.

Note that, per the MCNS spec, the headend MAC always knows the length of each upstream packet and should give this information to the headend receiver.

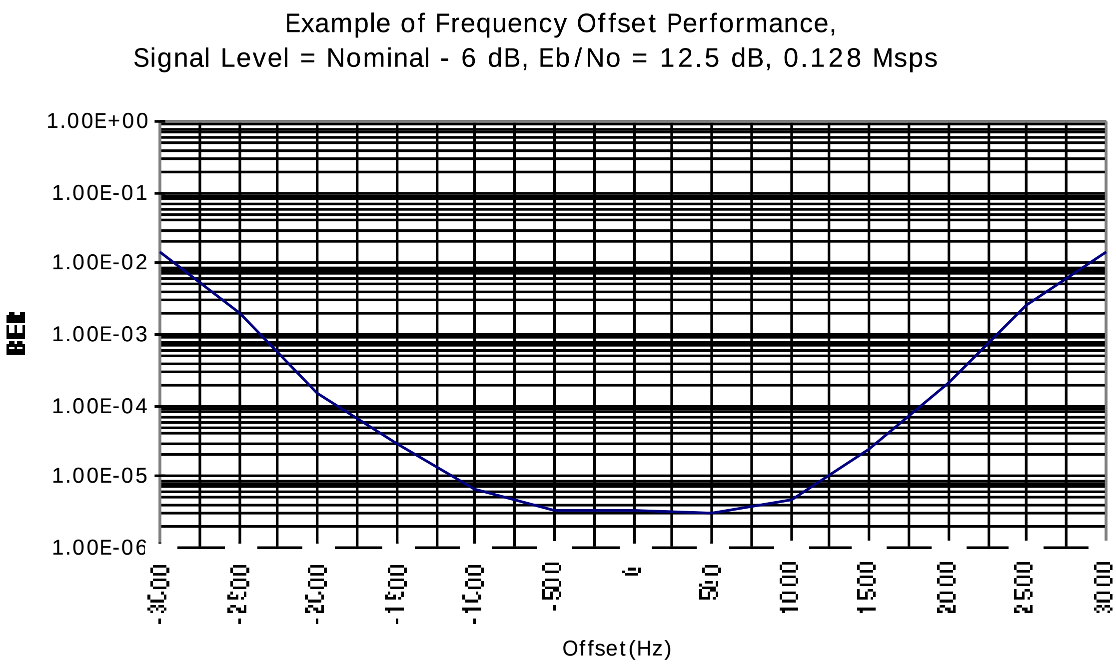


Figure 5. Example of BER vs Frequency Offset for .128 Msps

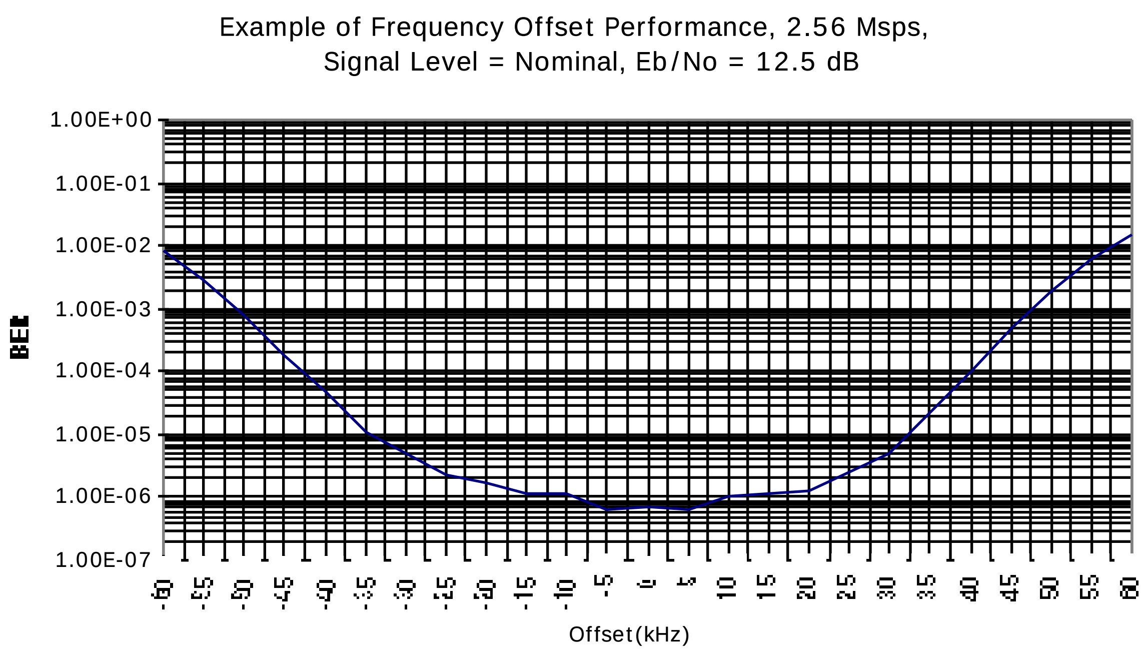


Figure 6. Example of BER vs Frequency Offset for 2.56 Msps

RSSI

Figure 13 shows the timing relationship between the RF input signal into the STEL-9257 and the received signal strength indicator (RSSI) signals output from the STEL-9257.

An RSSI Signal / Noise Accumulator measures the RF input signal power during a burst and the noise power between bursts. The accumulator integrates a sample of the RF input signal for a period of M1 symbols and the noise for a period of M2 symbols (M1 and M2 default values are both fixed at 191 symbols). The RF input signal path is temperature compensated, and the analog supply has local regulation, in order to provide an RSSI measurement accuracy of ± 2 dB over a temperature range of 0 to 70°C. The RSSI DATA bus outputs the RSSI measurement as a parallel, 8-bit value (RSSI0-RSSI7). Use the RSSI signal and noise strength look-up tables (Table 4 through Table 15) to convert the resulting hexadecimal (8 bit) RSSI value to an absolute power reading. (Note: The Standard Deviation is the expected variation in the RSSI measurement in units of LSB's. The absolute power values are based on a 75-ohm system.)Driving the RSSI Enable (RSSIEN) signal low enables the RSSI outputs. The RSSIVAL pulse latches in the RSSI DATA. Read the RSSI TYPE to determine if the value is a signal or noise measurement.

The absolute power measured is determined relative to the amount of gain that the 9257's variable gain amp. is programmed for. For example: for 0.128 Msps and a programmed nominal input level of + 10 dBmV (gain setting = 90), G = 13 - 10 = 3. If the RSSI Value = 72 hex, then the absolute power is 17- G = 17-3 = 14 dBmV.

For an example of the RSSI measurement behavior see Figure 8.

Noise measurements can be turned off by asserting noisehold (pin 17). They also may be delayed for the purpose of synchronization to time-slot boundries by asserting RSSINHOFF (Pin 23), or by programming the Noise Holdoff register to a non-zero value.

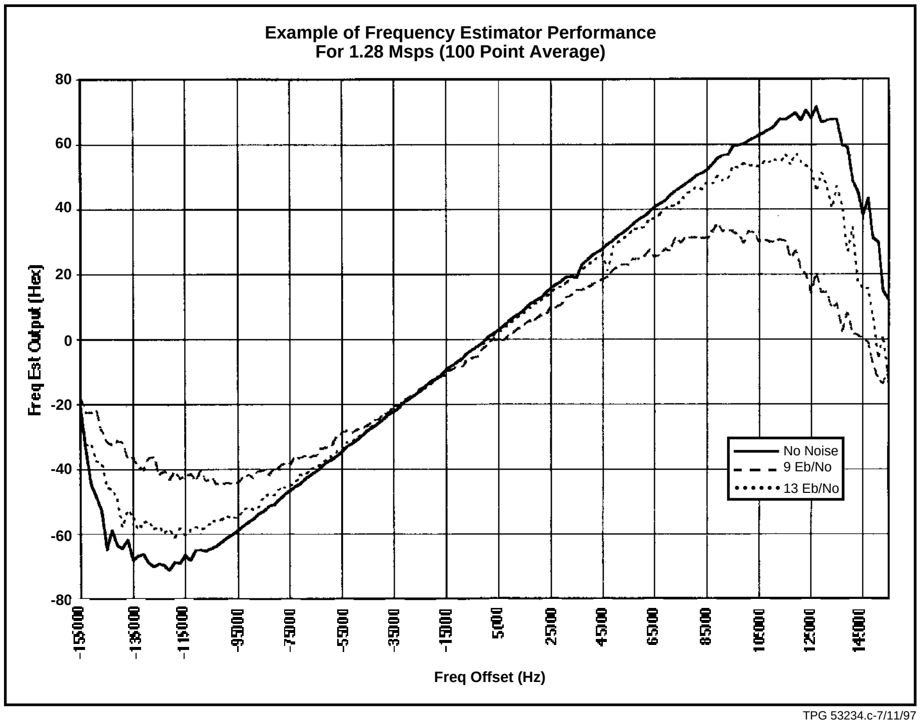


Figure 4A

Figure 7. Example for 1.28 Msps (100 point averages)

COLLISION

The collision output signal, Pin 40, is asserted when RF input energy is detected, but a valid signal is either not present, or is somehow corrupted. The following scenarios may cause collision to be asserted.

Condition	Action
1) A strong noise burst occurs when no CM is transmitting	Ignore collision
2) A noise burst occurs during the preamble of a CM transmission. No Data Valid is asserted.	Retransmit Packet
3) A CM transmits during the preamble of another CM packet. No Data Valid is asserted.	Resync CM and request retransmission
4) A CM transmits during the data portion of another CM packet, thus corrupting the desired data and continuing transmission after the first packet ends. Data Valid is asserted	Resync CM and request retransmission

The collision signal stays high for the length of time programmed into the collision register (command ID = 0Bh).

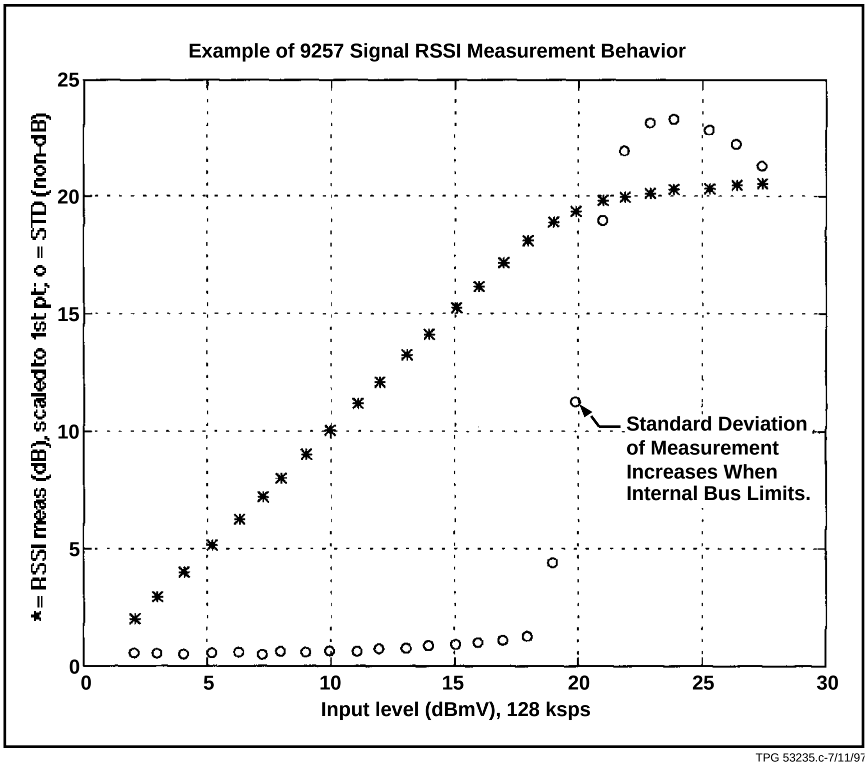


Figure 8. Example of STEL-9257 Signal RSSI Measurement Behavior

Table 4. 0.128 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
15	0.5	3-G	15	1.0	-9-G
18	0.5	4-G	17	1.0	-8-G
1B	0.5	5-G	1A	1.0	-7-G
1E	0.5	6-G	1D	1.0	-6-G
22	0.5	7-G	21	1.5	-5-G
27	0.5	8-G	24	1.5	-4-G
2C	0.5	9-G	29	2.0	-3-G
31	0.5	10-G	2E	2.0	-2-G
39	0.5	11-G	34	2.0	-1-G
41	0.5	12-G	3A	2.0	0-G
47	0.5	13-G	42	2.5	1-G
51	0.5	14-G	49	3.0	2-G
5B	0.5	15-G	52	3.0	3-G
66	0.5	16-G	5B	3.0	4-G
72	0.5	17-G	68	4.0	5-G
83	0.5	18-G	74	5.0	6-G
8C	0.5	19-G			
9D	0.5	20-G			
B1	0.5	21-G			
C2	1.0	22-G			
CD	1.5	23-G			
G = 13 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 5. 0.160 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
13	0.5	2-G	C	0.5	-15-G
15	0.5	3-G	C	0.5	-14-G
17	0.0	4-G	D	0.5	-13-G
1B	0.5	5-G	F	0.5	-12-G
1E	0.5	6-G	10	1.0	-11-G
22	0.5	7-G	12	1.0	-10-G
27	0.5	8-G	14	0.5	-9-G
2B	0.5	9-G	17	1.0	-8-G
31	0.5	10-G	19	1.0	-7-G
37	0.5	11-G	1C	1.0	-6-G
3E	0.5	12-G	20	1.5	-5-G
45	0.5	13-G	23	1.0	-4-G
4F	0.5	14-G	28	1.5	-3-G
58	0.5	15-G	2F	2.0	-2-G
63	0.5	16-G	34	2.5	-1-G
6F	0.5	17-G	3B	2.0	0-G
81	1.0	18-G	42	2.5	1-G
92	1.0	19-G	48	2.5	2-G
A3	1.0	20-G	50	3.0	3-G
B5	1.0	21-G	5A	3.5	4-G
C5	4.5	22-G	65	3.5	5-G
G = 14 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 6. 0.256 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
18	0.5	4-G	F	1.0	-13-G
1A	0.0	5-G	F	0.5	-12-G
1D	0.5	6-G	10	0.5	-11-G
21	0.5	7-G	12	1.0	-10-G
26	0.5	8-G	14	1.0	-9-G
2A	0.5	9-G	16	1.0	-8-G
2F	0.5	10-G	19	1.0	-7-G
36	0.5	11-G	1C	1.0	-6-G
3C	0.5	12-G	1F	1.0	-5-G
44	0.5	13-G	23	1.5	-4-G
4C	0.5	14-G	27	1.5	-3-G
56	0.5	15-G	2C	2.0	-2-G
61	0.5	16-G	34	2.0	-1-G
6C	0.5	17-G	3A	2.5	0-G
7A	1.0	18-G	41	2.5	1-G
87	1.0	19-G	49	3.0	2-G
97	1.0	20-G	4E	2.5	3-G
A9	1.0	21-G	58	3.5	4-G
BB	1.0	22-G	63	4.0	5-G
			6F	3.5	6-G
G = 16 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 7. 0.320 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
12	0.5	2-G	E	1.0	-15-G
14	0.0	3-G	C	0.5	-14-G
17	0.5	4-G	E	1.0	-13-G
19	0.5	5-G	E	0.5	-12-G
1D	0.5	6-G	10	0.5	-11-G
21	0.5	7-G	11	1.0	-10-G
24	0.5	8-G	14	1.0	-9-G
29	0.5	9-G	15	1.0	-8-G
2E	0.5	10-G	18	1.0	-7-G
34	0.5	11-G	1B	1.0	-6-G
3A	0.5	12-G	1E	1.0	-5-G
42	0.5	13-G	22	1.5	-4-G
4B	0.5	14-G	26	1.5	-3-G
53	0.5	15-G	2A	2.0	-2-G
5E	3.0	16-G	32	2.0	-1-G
69	0.5	17-G	39	2.5	0-G
75	1.0	18-G	3F	2.5	1-G
82	0.5	19-G	43	2.5	2-G
93	1.0	20-G	4C	3.0	3-G
A4	1.0	21-G	56	3.0	4-G
B6	1.5	22-G	60	3.5	5-G
C7	6.5	23-G			
G = 17 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 8. 0.512 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
15	0.5	4-G	D	0.5	-13-G
17	0.5	5-G	D	0.5	-12-G
1A	0.5	6-G	10	0.5	-11-G
1E	0.5	7-G	11	1.0	-10-G
21	0.5	8-G	12	1.0	-9-G
26	0.5	9-G	14	1.0	-8-G
2B	0.5	10-G	16	1.0	-7-G
30	0.5	11-G	19	1.0	-6-G
36	0.5	12-G	1C	1.0	-5-G
3D	0.5	13-G	1F	1.5	-4-G
44	0.5	14-G	23	1.5	-3-G
4D	0.5	15-G	27	1.5	-2-G
56	0.5	16-G	2C	2.0	-1-G
61	0.5	17-G	31	2.0	0-G
6D	1.0	18-G	3B	2.5	1-G
79	0.5	19-G	3E	2.5	2-G
87	1.0	20-G	46	2.5	3-G
98	1.0	21-G	4F	2.5	4-G
A9	1.0	22-G	59	3.0	5-G
C1	4.0	23-G	64	4.0	6-G
C9	7.0	24-G	70	4.0	7-G
D4	14.5	25-G			
G = 19 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 9. 0.640 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
12	0.0	9-G	9	0.5	-8-G
14	0.5	10-G	A	0.5	-7-G
17	0.0	11-G	C	0.5	-6-G
1A	0.5	12-G	E	0.5	-5-G
1D	0.0	13-G	F	0.5	-4-G
21	0.5	14-G	11	0.5	-3-G
25	0.5	15-G	13	1.0	-2-G
29	0.5	16-G	15	1.0	-1-G
2F	0.5	17-G	18	1.0	0-G
35	0.5	18-G	1B	1.0	1-G
3A	0.5	19-G	1E	1.0	2-G
41	0.5	20-G	23	1.5	3-G
49	0.5	21-G	26	1.5	4-G
52	0.5	22-G	2A	2.0	5-G
5D	1.0	23-G	30	2.0	6-G
67	0.5	24-G	39	2.0	7-G
73	0.5	25-G	40	2.5	8-G
82	1.0	26-G	44	2.5	9-G
8C	1.5	27-G	4C	3.5	10-G
99	3.0	28-G	56	3.0	11-G
AB	2.5	29-G	60	3.5	12-G
D4	14.5	25-G	6B	4.0	13-G
			7E	6.5	14-G
G = 20 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 10. 0.772 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
1C	0.0	13-G	F	0.5	-4-G
20	0.0	14-G	10	0.5	-3-G
24	0.5	15-G	12	1.0	-2-G
29	0.5	16-G	15	1.0	-1-G
2E	0.5	17-G	17	1.0	0-G
33	0.5	18-G	1A	1.0	1-G
39	0.5	19-G	1D	1.0	2-G
42	0.5	20-G	21	1.0	3-G
47	0.5	21-G	25	1.5	4-G
4F	0.5	22-G	2A	1.5	5-G
5A	0.5	23-G	2F	1.5	6-G
65	0.5	24-G	35	2.0	7-G
70	0.5	25-G	3B	2.5	8-G
74	1.0	26-G	42	2.5	9-G
81	1.0	27-G	4B	3.0	10-G
96	2.5	28-G	54	3.5	11-G
A1	4.5	29-G	5D	3.5	12-G
AB	6.5	30-G	6A	4.5	13-G
			76	5.0	14-G
			84	5.0	15-G
			8E	6.5	16-G
G = 21 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 11. 1.024 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
17	0.5	12-G	C	0.5	-5-G
1A	0.5	13-G	E	0.5	-4-G
1E	0.5	14-G	F	1.0	-3-G
22	0.5	15-G	11	1.0	-2-G
26	0.5	16-G	13	1.0	-1-G
2A	0.5	17-G	15	1.0	0-G
30	0.5	18-G	19	1.0	1-G
34	0.5	19-G	1B	1.0	2-G
3B	0.5	20-G	1F	1.0	3-G
43	0.5	21-G	22	1.5	4-G
4A	0.5	22-G	27	2.0	5-G
54	0.5	23-G	2C	1.5	6-G
61	0.5	24-G	31	2.0	7-G
68	1.0	25-G	39	2.0	8-G
75	1.0	26-G	41	2.5	9-G
82	1.0	27-G	46	3.0	10-G
8F	1.5	28-G	4E	3.0	11-G
9A	3.5	29-G	59	3.5	12-G
			63	4.0	13-G
			6F	4.0	14-G
G = 22 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 12. 1.280 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
16	0.5	12-G	C	0.5	-5-G
19	0.5	13-G	D	0.5	-4-G
1C	0.5	14-G	E	0.5	-3-G
20	0.5	15-G	10	0.5	-2-G
24	0.5	16-G	12	1.0	-1-G
29	0.5	17-G	14	1.0	0-G
2D	0.5	18-G	17	1.0	1-G
32	0.5	19-G	1A	1.0	2-G
38	0.5	20-G	1D	1.0	3-G
41	0.5	21-G	21	1.5	4-G
47	0.5	22-G	25	1.5	5-G
50	0.5	23-G	29	1.5	6-G
59	1.0	24-G	31	2.0	7-G
64	1.0	25-G	37	2.0	8-G
70	1.0	26-G	3B	2.0	9-G
7F	1.0	27-G	42	2.5	10-G
89	1.0	28-G	4A	2.5	11-G
95	2.5	29-G	53	3.0	12-G
A2	5.0	30-G	5E	3.5	13-G
			68	4.0	14-G
G = 23 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 13. 1.544 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
18	0.5	12-G	B	0.5	-6-G
1B	0.5	13-G	D	0.5	-5-G
1F	0.5	14-G	E	0.5	-4-G
22	0.5	15-G	10	0.5	-3-G
26	0.5	16-G	12	1.0	-2-G
2C	0.5	17-G	14	1.0	-1-G
31	0.5	18-G	16	1.0	0-G
36	0.5	19-G	19	1.0	1-G
3D	0.5	20-G	1C	1.0	2-G
44	0.5	21-G	1F	1.5	3-G
4C	0.5	22-G	24	1.5	4-G
57	0.5	23-G	28	1.5	5-G
62	1.0	24-G	2C	1.5	6-G
6C	1.0	25-G	32	2.0	7-G
78	1.0	26-G	39	2.5	8-G
84	1.0	27-G	3F	2.0	9-G
93	1.0	28-G	47	3.0	10-G
A4	1.5	29-G	50	3.5	11-G
BC	1.0	30-G	5A	3.5	12-G
C9	6.5	31-G	65	4.0	13-G
			71	4.0	14-G
			84	5.5	15-G
G = 24 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 14. 2.048 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
1C	0.5	14-G	F	0.5	-3-G
20	0.5	15-G	11	1.0	-2-G
24	0.5	16-G	12	1.0	-1-G
28	0.5	17-G	15	1.0	0-G
2D	0.5	18-G	18	1.0	1-G
32	0.5	19-G	19	1.0	2-G
38	0.5	20-G	1E	1.0	3-G
4	0.5	21-G	21	1.5	4-G
46	0.5	22-G	25	1.5	5-G
4F	0.5	23-G	29	2.0	6-G
58	0.5	24-G	2F	2.0	7-G
62	1.0	25-G	34	2.0	8-G
72	1.0	26-G	3D	2.5	9-G
7B	1.0	27-G	42	2.5	10-G
89	1.0	28-G	49	2.5	11-G
99	1.0	29-G	52	3.0	12-G
A9	1.5	30-G	5D	4.0	13-G
B8	4.5	31-G	69	4.0	14-G
			76	4.5	15-G
G = 25 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

Table 15. 2.560 Msps, RSSI Signal Conversion Table

Signal			Noise		
RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)	RSSI Value (Hex)	Typical Standard Deviation (LSB)	Absolute Power (dBmV)
17	0.5	13-G	D	0.5	-4-G
1A	0.5	14-G	E	0.5	-3-G
1D	0.5	15-G	10	0.5	-2-G
21	0.5	16-G	11	1.0	-1-G
25	0.5	17-G	14	1.0	0-G
29	0.5	18-G	14	1.0	1-G
2E	0.5	19-G	18	1.0	2-G
33	0.5	20-G	1A	1.0	3-G
3A	0.5	21-G	1D	1.0	4-G
41	0.5	22-G	22	1.0	5-G
48	0.5	23-G	25	1.5	6-G
52	1.0	24-G	2B	1.5	7-G
5C	1.0	25-G	30	2.0	8-G
66	1.0	26-G	36	2.0	9-G
72	1.0	27-G	40	2.5	10-G
84	1.0	28-G	43	3.0	11-G
8E	1.0	29-G	4C	3.0	12-G
9C	4.0	30-G	56	3.0	13-G
B3	4.5	31-G	60	3.5	14-G
BA	5.0	32-G	6C	4.5	15-G
G = 26 - Nominal Input Signal Level Corresponding to RF Gain Setting (dBmV)					

STEL-9257 BENCH TEST

Configure the STEL-9257 for bench tests by removing it from the host system. Attach a test fixture to the STEL-9257 (see the schematic diagram, Figure 9). The test fixture interfaces the STEL-9257 to a Bit Error Rate Tester and Computer. Additional test equipment is also required for DC power and RF input signal generation.

The computer may use a factory supplied Graphical User Interface (GUI) (see Figure 10) to format and send commands from an external PC to the STEL-9257 and to display command status bytes.

- The user selects an available PC COM Port (COM 1 or COM 2). If all COM ports are busy, an error message will display on the PC monitor.
- The Command List displays the list of available commands. Mouse-clicking on one of the commands allows the user to select from a list of options or to input parameter values in an input field.
- The parameter units are displayed to the left of the input field.
- The Transmit button sends the input command values.
- The Command Status window displays the status bytes from the STEL-9257.
- The Clear Status button clears the Command Status window.

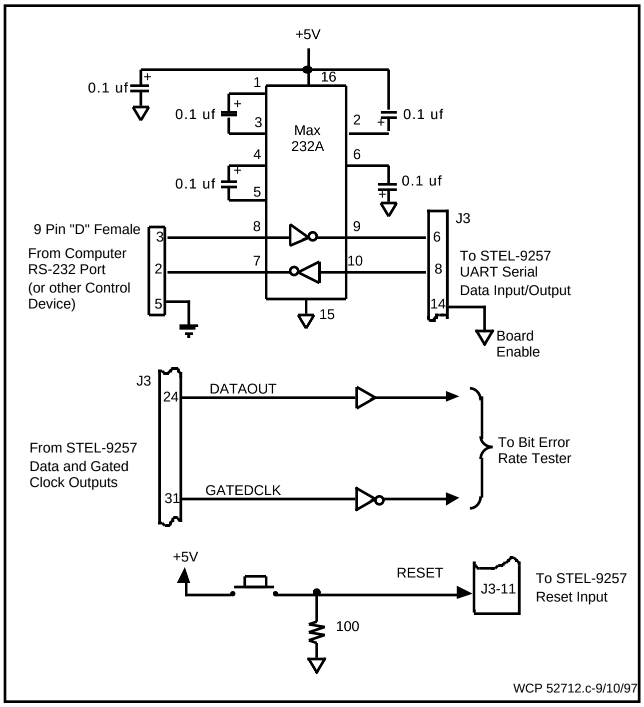


Figure 9. STEL-9257 Simple Test Fixture

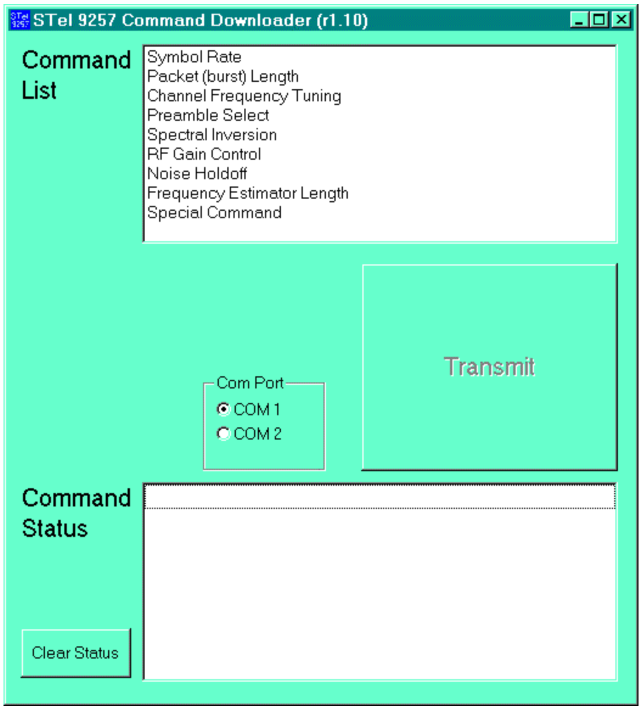


Figure 10. GUI

MECHANICAL CHARACTERISTICS

Figure 11 shows the layout dimensions of the STEL-9257.

MOUNTING

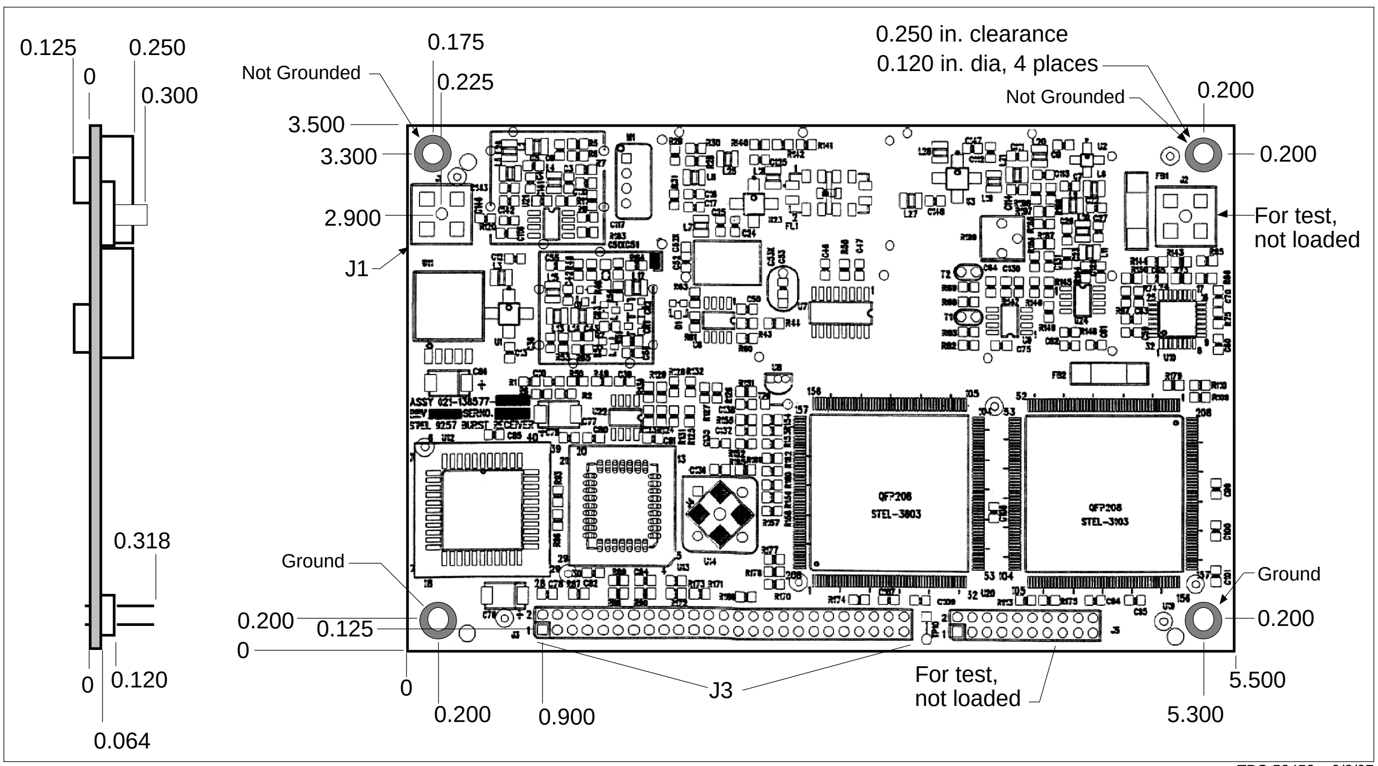
The STEL-9257's overall dimensions of 3.5" x 5.5" x 0.5" allow mounting as a daughter card. There are four mounting holes, one at each corner of the circuit card. A bottom clearance of 0.125 inches is required so standoffs are required when mounting the STEL-9257 as a daughter board or in a chassis. Note the mounting hardware dimensions (standoffs, washers, etc.) to ensure that the adjacent traces, pads, and component leads are not shorted out by exceeding the mounting pads' diameters (0.25 in). In allocating mounting space, the primary factors to consider are air flow for cooling and clearance for the interconnecting cable connectors and cable bend radii.

SHIELDING

RF shielding is provided for portions of the STEL-9257 circuitry, however if used in an EMI environment, additional shielding may be required due to the low signal sensitivity of the STEL-9257.

INTERFACE CONNECTORS

Table 15 lists the STEL-9257 interface connectors by reference designator, and provides the part number (P/N) and purpose of each connector. Pin-out data for multi-contact connectors is provided by Table 16.



TPG 53452.c-9/8/97

Figure 11. Board Mechanical Layout

Table 15. I/O Connectors

Ref. Des.	P/N	Purpose/Signal Name	Remarks
J1	Applied Engineering, 2009-1511-000	SIGNAL IN (5-65 MHz Input)	SMB
J3	Digikey, S2211-25-ND	Digital I/O and Power	A single 50-pin connector, see Table 16 for pin definitions.

Table 16. J3 Pin Definitions

Pin #	Signal Name	Description
1	+5V	Digital Power
2	+5V	Digital Power
3	+12V	Analog Power
4	GND	Ground
5	+12V	Analog Power
6	RXDATA	Input. Serial Data Input for configuring the STEL-9257 (i.e., download commands). 10 K pullup.
7	GND	Ground
8	TXDATA	Output. Serial status data from STEL-9257.
9	+5V	Digital Power
10	GND	Ground
11	RESET	Input. Active high. Must be held high for >100 us after STEL-9257 is powered up. 10 K pullup.
12	GND	Ground
13	+5V	Digital Power
14	BEN	Input. Board Enable, Active Low. For each serial command byte sent, BEN is polled. Command bytes are ignored if BEN is high. 10 K pullup.
15	GND	Ground
16	GND	Ground
17	NOISEHOLD	Input. Active high. Noise measurements are disabled when NOISEHOLD is asserted. 1 K pulldown.
18	MODE0	Input. Mode control signal for selection of burst length. 1 K pulldown.
19	MODE2	Input. Mode control signal for selection of burst length. 1 K pulldown.
20	MODE1	Input. Mode control signal for selection of burst length. 1 K pullup.
21	RESERVED	Reserved.
22	RESERVED	Reserved.
23	RESERVED	Reserved.
24	DATAOUT	Output. Demodulated data extracted from the data packet.
25	DATAVAL	Output. Data Valid. Active high output that frames entire data packet.
26	RSSITYPE	Output. Type of RSSI measurement data available on RSSI data bus (high for signal measurement data and low for noise measurement data).
27	CLKOUT	Output. Recovered clock output. Runs continuously with the rising edge occurring at the center of each demodulated data bit.
28	RSSIVAL	Output. Valid RSSI data pulse (width = 1 symbol). Rising edge occurs after a new RSSI signal or noise measurement is completed.
29	RSSIEN	Input. Active low input that enables the RSSI output lines. 10 K pulldown.
30	RESERVED	Reserved. 1 K pulldown
31	GATEDCLK	Output. Gated clock output that is only present while valid data if being output [i.e., CLKOUT (pin 27) gated by DataVal (pin 25)].
32	RSSI7	Output. RSSI Bus bit (msb)
33	RSSI6	Output. RSSI Bus bit
34	RSSI5	Output. RSSI Bus bit
35	RSSI4	Output. RSSI Bus bit
36	RSSI3	Output. RSSI Bus bit
37	RSSI2	Output. RSSI Bus bit
38	RSSI1	Output. RSSI Bus bit
39	RSSI0	Output. RSSI Bus bit (lsb)
40	COLLISION	Output. Presence of a signal was detected, but the STEL-9257 failed to locate the signal's preamble or unique word within the specified time-out period. The collision signal goes high and stays high for the time programmed into the collision register.
41	FREQVAL	Output. Valid Frequency Estimator data pulse.
42	FREQ7	Output. Frequency Estimator bit 7
43	FREQ6	Output. Frequency Estimator bit 6
44	FREQ5	Output. Frequency Estimator bit 5
45	FREQ4	Output. Frequency Estimator bit 4
46	FREQ3	Output. Frequency Estimator bit 3
47	FREQ2	Output. Frequency Estimator bit 2
48	FREQ1	Output. Frequency Estimator bit 1
49	FREQ0	Output. Frequency Estimator bit 0
50	RESERVED	Reserved.

STATUS BYTES

The STEL-9257 outputs the status bytes to the command source as described below.

Acknowledge Command, "A" (0x41)

The STEL-9257 received a valid command.

Bad Checksum, "S" (0x53)

The STEL-9257 received a command packet whose checksum was different from a microprocessor computed checksum.

Bad Command, "C" (0x43)

The STEL-9257 received an invalid command.

DOWNLOAD COMMANDS

The STEL-9257 is factory set to default operating values prior to shipment. The user may change these values using the download commands described below. Note that changing the default values may adversely affect the performance of the STEL-9257.

Stanford Telecom includes a graphical user interface (GUI) program for user communications with the STEL-9257. The GUI accepts each user command selection, then constructs and transmits the command packet.

Users with their own STEL-9257 interface program may construct the command packets using the format described below.

Each command packet consists of:

1. A start transmission byte (STX = 0x02)
2. Two data bytes representing the command ID. The first data byte has an ASCII value corresponding to the character representing the upper nibble of the command ID. The second data byte has an ASCII value corresponding to the character representing the lower nibble of the command ID.
3. Up to eight data bytes - each pair of bytes have ASCII values corresponding to the characters representing the upper and lower nibble of up to four Parameters. The Parameter definitions vary for each command ID. For some command IDs, Parameter 0 through 3 may mean a 32 bit word value from least significant to most significant byte. For other command IDs, Parameter 0 may be the only parameter needed to specify a toggle condition. For still other command IDs, Parameter 0 may specify one of several indexed items.
4. Two data bytes representing the checksum. The first data byte has an ASCII value corresponding to the character representing the upper nibble of the checksum, the second data byte has an ASCII value corresponding to the character representing the lower nibble of the checksum. The checksum equals the sum of ASCII values in (2) and (3) modulo 256.
5. An end of transmission byte (ETX = 0x03).

For example, to turn Spectral Inversion ON, construct an 8 byte command packet consisting of:

1. A start transmission byte (STX = 0x02)
2. Two data bytes. The command ID for Spectral Inversion is 0x18. Thus, the first data byte has an ASCII value = 0x31 corresponding to the character '1' representing the upper nibble of the command ID. The second data byte has an ASCII value = 0x38 corresponding to the character '8' representing the lower nibble of the command ID.
3. Two data bytes representing either an ON condition (0x01) or OFF condition. If Spectral Inversion is to be commanded ON, then the lone Parameter value is set to 0x01. The first data byte has an ASCII value = 0x30 corresponding to the character '0' representing the upper nibble of this Parameter. The second data byte has an ASCII value = 0x31 corresponding to the character '1' representing the lower nibble of this Parameter.
4. Two data bytes representing the checksum value. Adding the ASCII values in (2) and (3) above yields a checksum of 0xCA. The first data byte has an ASCII value = 0x43 corresponding to the upper case character 'C' representing the upper nibble of the checksum. The second data byte has an ASCII value = 0x41 corresponding to the upper case character 'A' representing the lower nibble of the checksum.
5. An end of transmission byte (ETX = 0x03).

Symbol Rate Command (ID = 26_h)
Default = 1.28 Msps

The Symbol Rate command allows the user to enter a data rate from 0.128 through 3.125 megasymbols/sec. To enter a symbol rate of 1.234 megasymbols/sec, scale the value by 1000 so that the input value becomes 1234-= 4D2h. Thus:

Parameter 0 = 0xD2 (least significant byte)

Parameter 1 = 0x04 (most significant byte)

For the above example, the transmitted command packet is as follows:

STX	CMD ID	PARAM 0	PARAM 1	CHECK SUM	ETX
0x02	0x32 0x36	0x44 0x32	0x30 0x34	0x34 0x32	0x03

Packet (Burst) Length Command (ID = 0Bh) Default = 512 symbols

The user may program the STEL-9257 to six different data transmission lengths by using the Packet Length command.

Set the three most significant bits (MSBs) of Parameter 1 as follows:

000 for Packet Length A / Collision Length*

001 for Packet Length B (Default)

010 for Packet Length C

011 for Packet Length D

100 for Packet Length E

101 for Packet Length F

* Setting 000 is used for Collision Length also. Collision Length is the length of time in symbols that the demodulator waits after detecting a collision condition before it re-enters the Acquisition State in order to acquire a new burst. 9257 users may want to use the 000 setting for Collision Length exclusively.

The 5 least significant bits (LSBs) of Parameter 1 together with all 8 bits of Parameter 0 comprise a 13 bit unsigned integer corresponding to the Packet Length from 0 through 8191 in symbols.

To transmit the Packet Length command for Packet Length B (3 MSBs of Parameter 1 = 1 * 2^13 = 8192) and a packet length of 7450 symbols (Parameter value = 8192 + 7450 = 15642):

STX	CMD ID	PARAM 0	PARAM 1	CHECK SUM	ETX
0x02	0x30 0x42	0x31 0x41	0x33 0x44	0x35 0x42	0x03

RF Tuning Frequency Command (ID = 1D$_h$) Default = 10 MHz

The user may tune the STEL-9257 to any RF input frequency between 5.0000 and 65.0000 MHz with a resolution of 100 Hz. The RF Tuning Frequency Command sets the signal carrier's center frequency. The default frequency is 10.0 MHz.

For example, to configure the STEL-9257 to receive a 58.5 MHz RF input, scale the value by 10000 so that the input value is 585000 = 8ED28h. Thus:

Parameter 0 = 0x28 (least significant byte)

Parameter 1 = 0xED

Parameter 2 = 0x08 (most significant byte)

For the above example, the transmitted command packet is as follows:

STX	CMD ID	PARAM 0	PARAM 1	PARAM 2	CHECK SUM	ETX
0x02	0x31 0x44	0x32 0x38	0x45 0x44	0x30 0x38	0x44 0x30	0x03

Preamble Select Command (ID = 25$_h$) Default = 16 symbol NH

The Preamble Select Command defines the unique word bit pattern. Each data burst consists of a preamble followed by a data packet.

The user can select one of four predefined preambles:

1. Newman Hoffman 16 symbol

   00 00 00 00 11 11 11 00 11 11 11 00 11 11 00 11

   For this preamble, the parameter value = 0

2. Newman Hoffman 14 symbol

   00 00 00 00 11 11 00 00 11 11 00 11 00 11

   For this preamble, the parameter value = 1

3. DAVIC 16 symbol

   11 00 11 00 11 00 11 00 11 00 11 00 00 00 11 01

   For this preamble, the parameter value = 2

4. STEL-9244 14 symbol

   11 11 11 00 00 11 00 00 00 00 00 00 00 00

   For this preamble, the parameter value = 3

To choose the Newman Hoffman 14 symbol preamble, the transmitted command packet is as follows:

STX	CMD ID	PARAM 0	CHECK SUM	ETX
0x02	0x32 0x35	0x30 0x31	0x43 0x38	0x03

Spectral Inversion Command (ID = 18$_h$) Default = Off

The user may send the Spectral Inversion command to toggle the spectral relationship of the I and Q data if the data is out-of-phase. Thus, Parameter value = 0 for spectral inversion OFF

Parameter value = 1 for spectral inversion ON

To specify spectral inversion OFF, transmit the following command packet:

STX	CMD ID	PARAM 0	CHECK SUM	ETX
0x02	0x31 0x38	0x30 0x30	0x43 0x39	0x03

Set Gain Command (ID = $2C_h$)
Default = 137_{10}

Refer to the Gain Setting Table (Table 3) for the appropriate RF gain setting as a function of both the nominal signal value and symbol rate. Note that the table specifies input value as a decimal integer.

At a nominal signal level of 17 dBmV with a symbol rate of 1.024 Msps, the appropriate RF gain value is 89 = 59h.

For the above example, the transmitted command packet is as follows:

STX	CMD ID	PARAM 0	CHECK SUM	ETX
0x02	0x32 0x43	0x35 0x39	0x45 0x33	0x03

Noise Holdoff Command (ID = 21_h)
Default = 0 symbols

The user may specify the number of symbols to wait between noise measurements.

To send the Noise Holdoff command with a holdoff of 28 = 1Ch symbols, thus,

Parameter 0 = 0x1C (least significant byte)

Parameter 1 = 0x00 (most significant byte)

For the above example, the transmitted command packet is as follows:

STX	CMD ID	PARAM 0	PARAM 1	CHECK SUM	ETX
0x02	0x32 0x31	0x31 0x43	0x30 0x30	0x33 0x37	0x03

Frequency Estimator Length Command (ID = 24_h)
Default = 203 symbol

The Frequency Estimator Length Command specifies the number of symbols to average in determining the reference frequency offset.

If the number of symbols = 230 = E6h, the transmitted command packet is as follows:

STX	CMD ID	PARAM 0	CHECK SUM	ETX
0x02	0x32 0x34	0x45 0x36	0x45 0x31	0x03

IMPLEMENTATION NOTES

When integrating the STEL-9257 with other circuitry, the following factors should be taken into consideration.

POWER-ON CONFIGURATION

After power is applied to the STEL-9257, the RESET input must be asserted for > 1ms.

DATA AND CLOCK OUTPUTS

During input signal demodulation, the STEL-9257 outputs the data and the data clock to the host on the DATA and CLK lines. The data bits will be framed by the Data Valid (DATAVAL) signal.

SPECTRAL INVERSION

If the host detects that the spectral relationship of the I and Q data is inverted, it can send the Spectral Inversion command. This command inverts the Q channel relative to the I channel.

The net effect is to interchange the I and Q data bits after differential decoding.

BOARD ENABLE

The Board Enable command allows multiple boards to be connected to the serial bus. A board is enabled for serial communication by asserting the BEN control line low, and while it is held low, multiple I/O operations can be performed. A board is disabled for serial communications by asserting the BEN control line high.

PROGRAMMABLE GAIN CONTROL

The Programmable Gain Control command allows control of the input level dynamic range over a 30 dB range in 1 dB steps. See gain setting table on the next page.

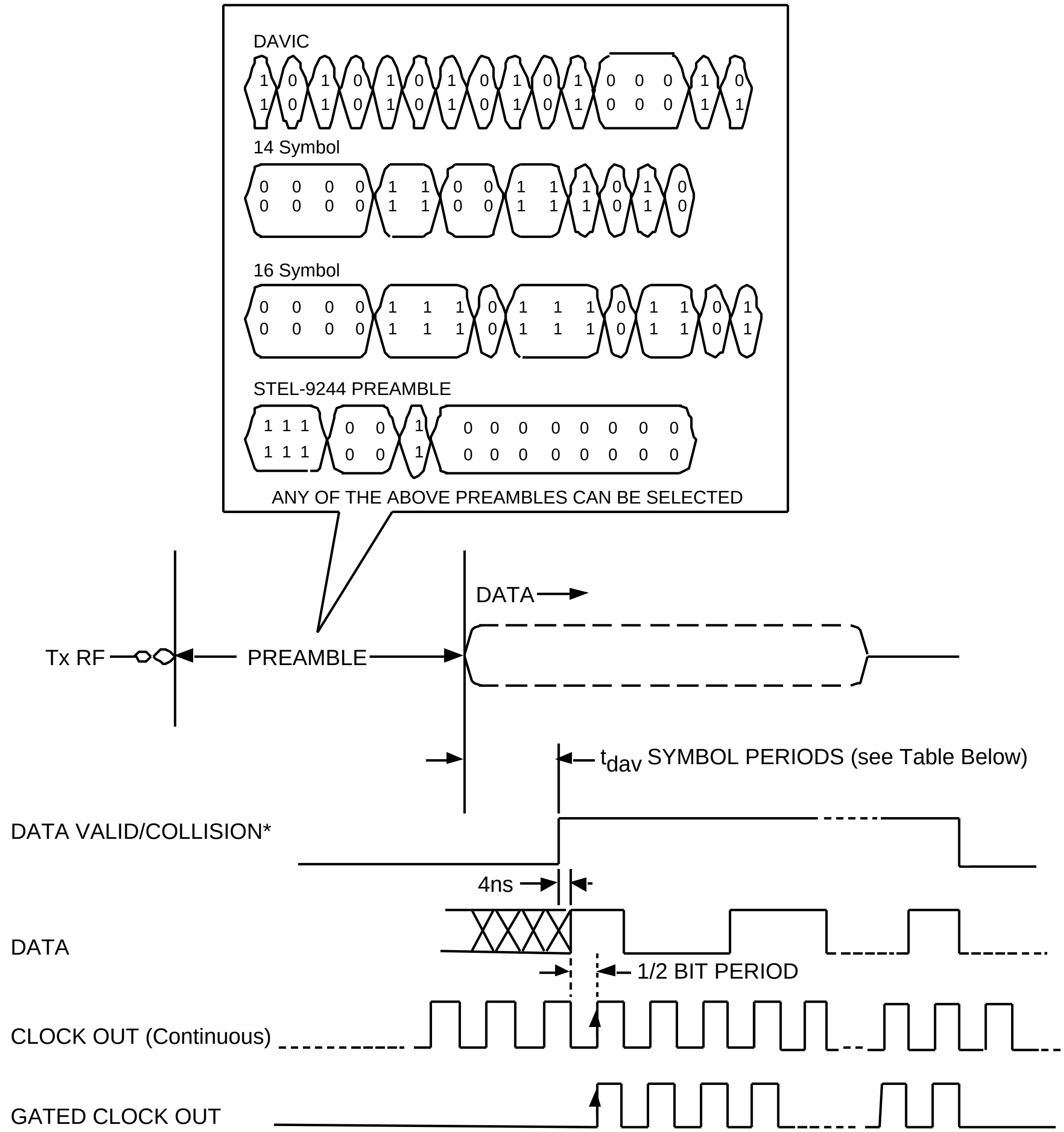
SERIAL INTERFACE

The STEL-9257 is configured by sending download commands from an external PC over the serial interface to a micro-processor, which in turn configures the internal circuitry. The microprocessor responds to each command by outputting a status byte. The interface is a serial TTL interface that uses industry standard UART timing at a baud rate of 19200 bps with 1 start bit, 8 data bits, 1 stop bit, and no parity checking. To send a command to the microprocessor, construct a data packet using the following format:

Field	Bytes	Range	Notes
STX	1	0x02	Start transmission (value fixed)
Cmd ID	2	“00” to “2E”	ASCII representation of BCD hex value
Param 0	2	“00” to “FF”	
Param 1	2	“00” to “FF”	
Param 2	2	“00” to “FF”	
Param 3	2	“00” to “FF”	
Checksum	1	0x00 to 0xFF	Excludes STX, checksum, and ETX bytes
ETX	1	0x03	End transmission (value fixed)

Refer to the Download Commands Section for examples.

TIMING DIAGRAMS



Symbol Rate	t_{dav}
0.128 -> 0.320 Msps	39 symbols
0.512 -> 0.772 Msps	40 symbols
1.024	41 symbols
1.28	42 symbols
1.544	43 symbols
2.048	44 symbols
2.56	45 symbols

TPG 53450.c-10/29/97

Figure 12. Data Timing Diagram

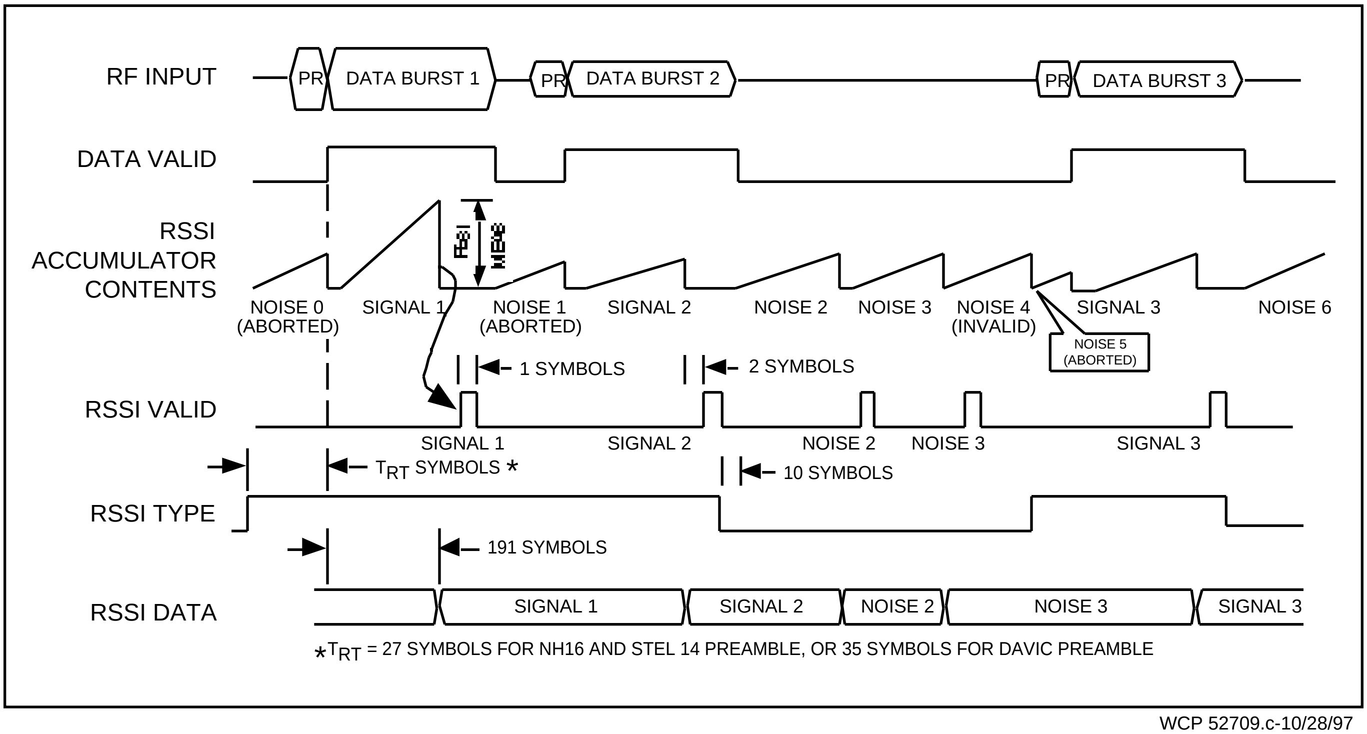


Figure 13. RSSI Timing Diagram*

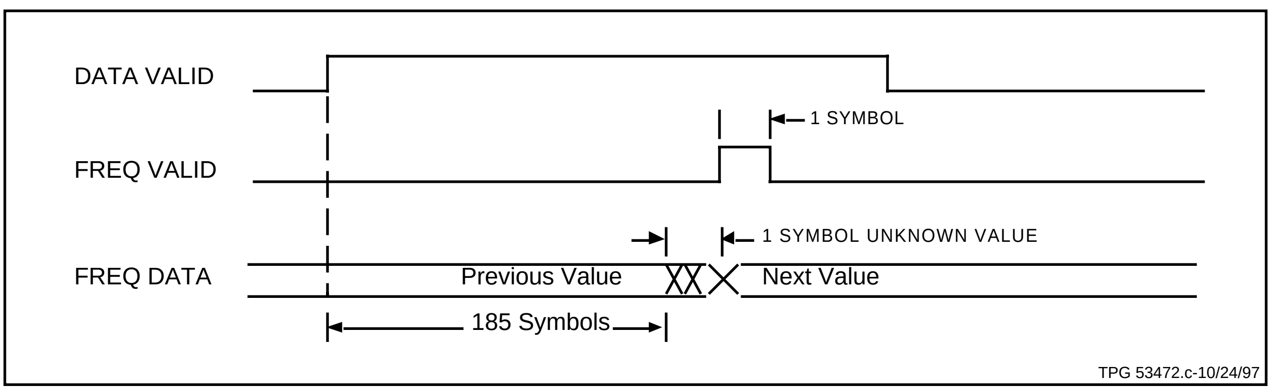


Figure 14. Frequency Estimator Timing Diagram*

* Note: Jitter on all outputs signals is ± 40 ns.

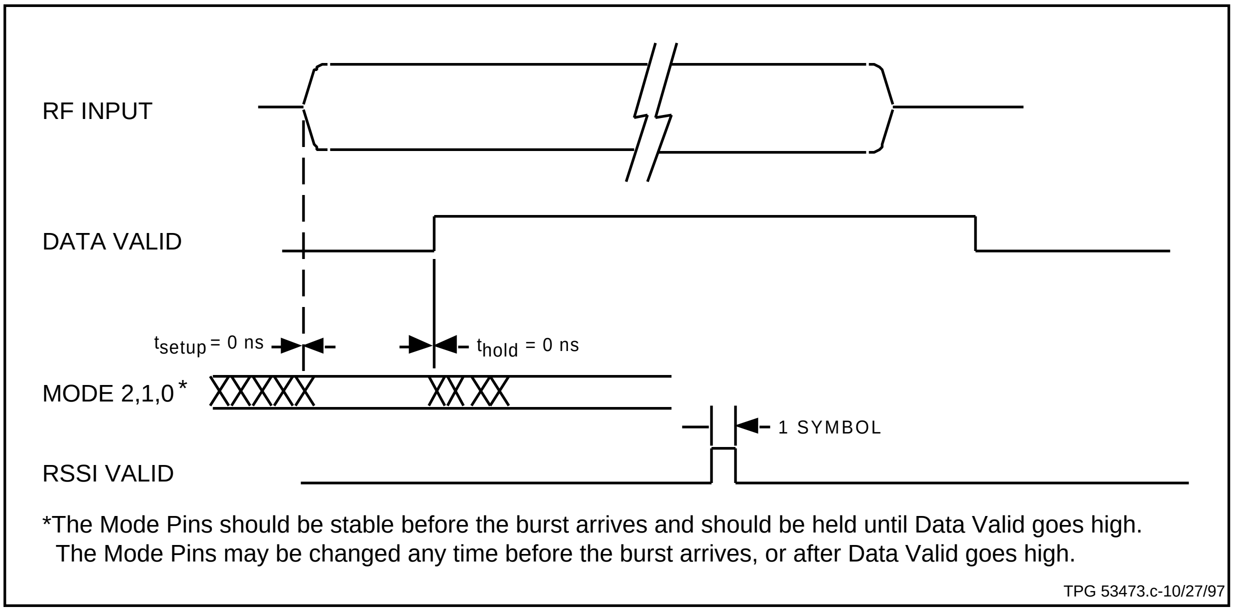


Figure 15. Input Control Signals Timing Diagram

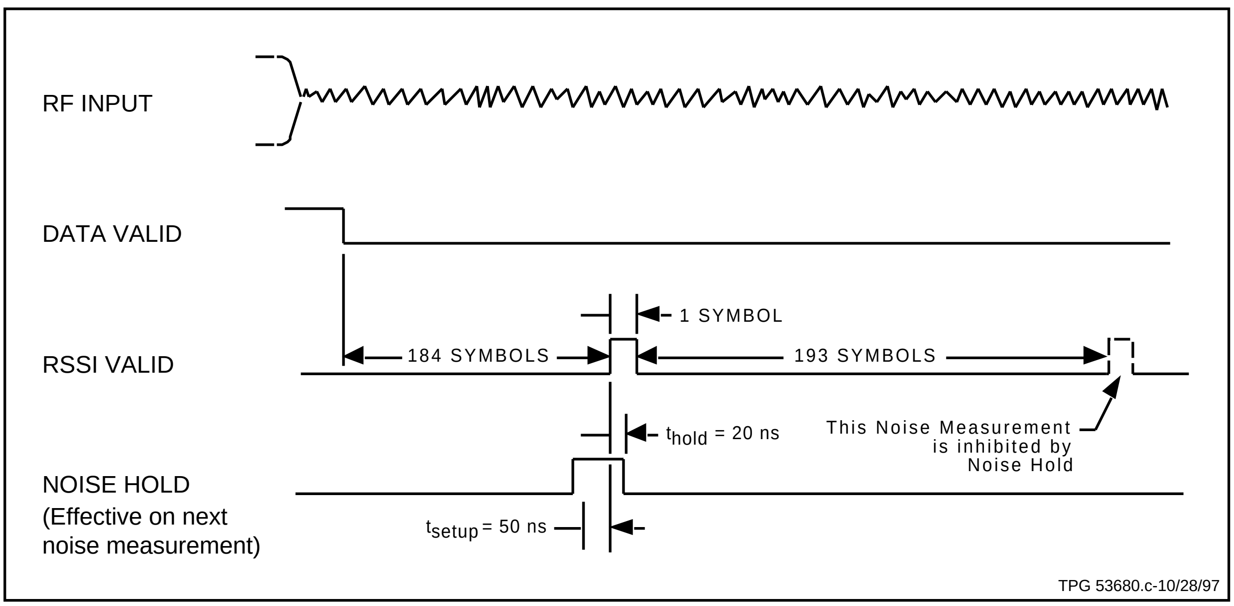


Figure 16. Noise Hold Control Signals Timing Diagram

For Further Information Call or Write

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