



**BasketKeeper +(Gatekeeper Systems model B-9361)
Theory of Operation**

The Gatekeeper Systems B-9361 BasketKeeper + contains a microprocessor (an TI CC2510F16) with a 2.4 GHz transceiver, an 8 kHz receiver and two Buzzers. The CC2510F16 uses an internal 32 KHz RC oscillator as its system clock and an external 26 MHz crystal oscillator. The 8 kHz receiver uses an LC oscillator to set its resonant frequency.

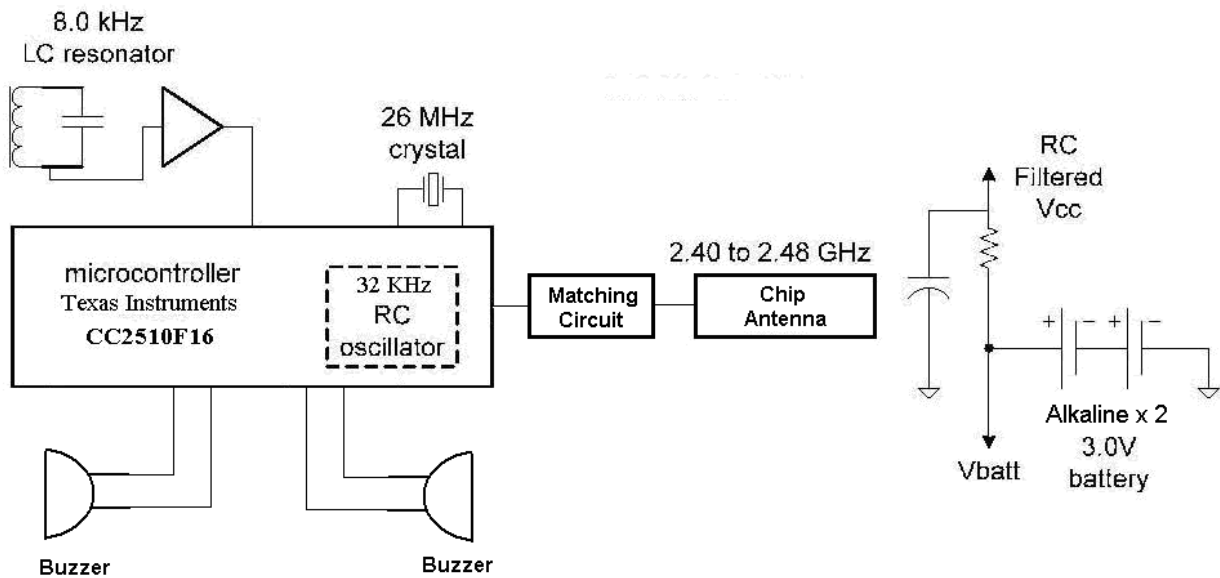


Figure 1 - B-9361 Architecture

The operation of the B-9361's 8 kHz receiver and 8 kHz field related firmware and behavior is the same as the prior generation of Gatekeeper Systems, Inc. 8 kHz receive-only wheels, e.g. the W-9200 GS2 wheel. 8 kHz lock codes have the same effect on the B-9361 as they do on the W-9200. The 8 kHz receiver in the B-9361 has more sensitive than the receiver (i.e. effective range) used at the GS2 wheel.

The B-9361 has two, mutually exclusive, modes which affect the characteristics of its RF emissions: operational mode and program download mode. Operational mode transmissions are modulated at 20 kbps FSK (Frequency Shift Keying), with a deviation of 19 kHz (Carson's rule bandwidth about 80 kHz). Program download mode transmissions are modulated with 500 kbps MSK (Minimum Shift Keying), with a -20 dB bandwidth of roughly 1.5 MHz. An example program download mode emission mask for the 500 kbps MSK modulation is shown in Figure 2.



Figure 2 – Program Download mode emission mask

In program download mode, the B-9361 only transmits (ACK packets) in response to program download packets (also sent by either Door Manager or SmartKey2). The maximum transmission rate from the B-9361 in program download mode is one 0.4 millisecond transmission every 15 milliseconds. More precisely, the B-9361 sends one 0.4 millisecond ACK every 2.5 milliseconds for three consecutive ACKs, followed by 35 milliseconds of RF inactivity during which time the B-9361 writes to its internal flash memory. The timeline of transmissions during a program download operation is shown in Figure 3.

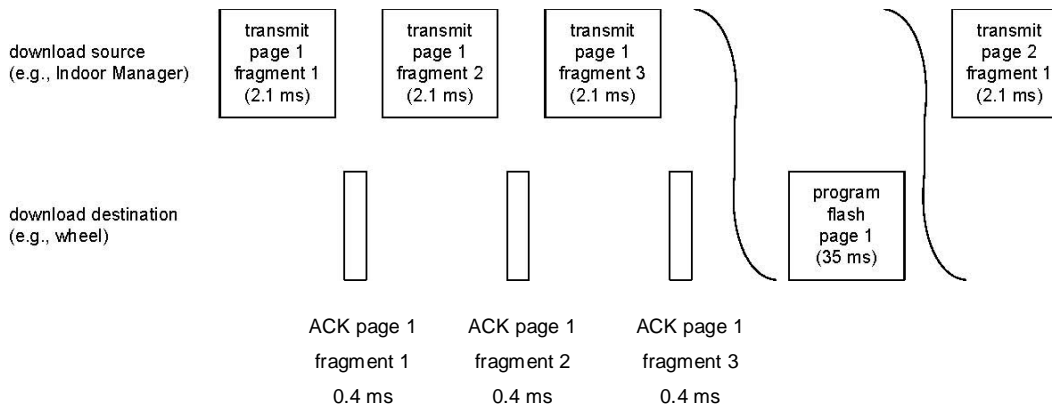


Figure 3 – Program Download timeline

¹ Future firmware versions might dynamically adjust output power as a battery life optimization measure; the hardware permits that.

B-9361 RF Channel Plan

The B-9361 divides the complete 2400 ó 2483.5 MHz operating band is divided into 256 channels, numbered 0 through 255.

When operating with 500 kbps MSK modulation (program download mode), the center frequency of the Nth channel is $2401.0 + 0.3142N$ MHz and the Max Power setting is +1dBm

When operating with 20 kbps FSK modulation (uplink mode), the center frequency of the Nth channel is $2401.0 + 0.2000N$ MHz and the Max Power setting is 0 dBm

Note that channels 0..7 and 248..255 in download mode and channels 0..1 and 255 in uplink mode are not available for transmission from the B-9361 because of excessive power at the band edge.

The firmware in the B-9361 prevents the prohibited channels from being used ó the channels are being retained in the GS2V2 system logical channel map because future protocol-compatible products with improved power amplifier ramping and/or improved band edge filtering may be able to use one or more of those prohibited channels.

The following table shows the entire channel map, with the forbidden channels highlighted.

Channel	Operational mode center frequency (MHz)	Download mode center frequency (MHz)	41	2409.2	2413.9	85	2418	2427.7
			42	2409.4	2414.2	86	2418.2	2428
			43	2409.6	2414.5	87	2418.4	2428.3
0	2401.0	2401.0	44	2409.8	2414.8	88	2418.6	2428.6
1	2401.2	2401.3	45	2410	2415.1	89	2418.8	2429
2	2401.4	2401.6	46	2410.2	2415.5	90	2419	2429.3
3	2401.6	2401.9	47	2410.4	2415.8	91	2419.2	2429.6
4	2401.8	2402.3	48	2410.6	2416.1	92	2419.4	2429.9
5	2402.0	2402.6	49	2410.8	2416.4	93	2419.6	2430.2
6	2402.2	2402.9	50	2411	2416.7	94	2419.8	2430.5
7	2402.4	2403.2	51	2411.2	2417	95	2420	2430.8
8	2402.6	2403.5	52	2411.4	2417.3	96	2420.2	2431.2
9	2402.8	2403.8	53	2411.6	2417.7	97	2420.4	2431.5
10	2403	2404.1	54	2411.8	2418	98	2420.6	2431.8
11	2403.2	2404.5	55	2412	2418.3	99	2420.8	2432.1
12	2403.4	2404.8	56	2412.2	2418.6	100	2421	2432.4
13	2403.6	2405.1	57	2412.4	2418.9	101	2421.2	2432.7
14	2403.8	2405.4	58	2412.6	2419.2	102	2421.4	2433
15	2404	2405.7	59	2412.8	2419.5	103	2421.6	2433.4
16	2404.2	2406	60	2413	2419.9	104	2421.8	2433.7
17	2404.4	2406.3	61	2413.2	2420.2	105	2422	2434
18	2404.6	2406.7	62	2413.4	2420.5	106	2422.2	2434.3
19	2404.8	2407	63	2413.6	2420.8	107	2422.4	2434.6
20	2405	2407.3	64	2413.8	2421.1	108	2422.6	2434.9
21	2405.2	2407.6	65	2414	2421.4	109	2422.8	2435.2
22	2405.4	2407.9	66	2414.2	2421.7	110	2423	2435.6
23	2405.6	2408.2	67	2414.4	2422.1	111	2423.2	2435.9

24	2405.8	2408.5	68	2414.6	2422.4	112	2423.4	2436.2
25	2406	2408.9	69	2414.8	2422.7	113	2423.6	2436.5
26	2406.2	2409.2	70	2415	2423	114	2423.8	2436.8
27	2406.4	2409.5	71	2415.2	2423.3	115	2424	2437.1
28	2406.6	2409.8	72	2415.4	2423.6	116	2424.2	2437.4
29	2406.8	2410.1	73	2415.6	2423.9	117	2424.4	2437.8
30	2407	2410.4	74	2415.8	2424.3	118	2424.6	2438.1
31	2407.2	2410.7	75	2416	2424.6	119	2424.8	2438.4
32	2407.4	2411.1	76	2416.2	2424.9	120	2425	2438.7
33	2407.6	2411.4	77	2416.4	2425.2	121	2425.2	2439
34	2407.8	2411.7	78	2416.6	2425.5	122	2425.4	2439.3
35	2408	2412	79	2416.8	2425.8	123	2425.6	2439.6
36	2408.2	2412.3	80	2417	2426.1	124	2425.8	2440
37	2408.4	2412.6	81	2417.2	2426.5	125	2426	2440.3
38	2408.6	2412.9	82	2417.4	2426.8	126	2426.2	2440.6
39	2408.8	2413.3	83	2417.6	2427.1	127	2426.4	2440.9
40	2409	2413.6	84	2417.8	2427.4	128	2426.6	2441.2
129	2426.8	2441.5	172	2435.4	2455	215	2444	2468.6
130	2427	2441.8	173	2435.6	2455.4	216	2444.2	2468.9
131	2427.2	2442.2	174	2435.8	2455.7	217	2444.4	2469.2
132	2427.4	2442.5	175	2436	2456	218	2444.6	2469.5
133	2427.6	2442.8	176	2436.2	2456.3	219	2444.8	2469.8
134	2427.8	2443.1	177	2436.4	2456.6	220	2445	2470.1
135	2428	2443.4	178	2436.6	2456.9	221	2445.2	2470.4
136	2428.2	2443.7	179	2436.8	2457.2	222	2445.4	2470.8
137	2428.4	2444	180	2437	2457.6	223	2445.6	2471.1
138	2428.6	2444.4	181	2437.2	2457.9	224	2445.8	2471.4
139	2428.8	2444.7	182	2437.4	2458.2	225	2446	2471.7
140	2429	2445	183	2437.6	2458.5	226	2446.2	2472
141	2429.2	2445.3	184	2437.8	2458.8	227	2446.4	2472.3
142	2429.4	2445.6	185	2438	2459.1	228	2446.6	2472.6
143	2429.6	2445.9	186	2438.2	2459.4	229	2446.8	2473
144	2429.8	2446.2	187	2438.4	2459.8	230	2447	2473.3
145	2430	2446.6	188	2438.6	2460.1	231	2447.2	2473.6
146	2430.2	2446.9	189	2438.8	2460.4	232	2447.4	2473.9
147	2430.4	2447.2	190	2439	2460.7	233	2447.6	2474.2
148	2430.6	2447.5	191	2439.2	2461	234	2447.8	2474.5
149	2430.8	2447.8	192	2439.4	2461.3	235	2448	2474.8
150	2431	2448.1	193	2439.6	2461.6	236	2448.2	2475.2
151	2431.2	2448.4	194	2439.8	2462	237	2448.4	2475.5
152	2431.4	2448.8	195	2440	2462.3	238	2448.6	2475.8
153	2431.6	2449.1	196	2440.2	2462.6	239	2448.8	2476.1
154	2431.8	2449.4	197	2440.4	2462.9	240	2449	2476.4
155	2432	2449.7	198	2440.6	2463.2	241	2449.2	2476.7

156	2432.2	2450	199	2440.8	2463.5	242	2449.4	2477
157	2432.4	2450.3	200	2441	2463.8	243	2449.6	2477.4
158	2432.6	2450.6	201	2441.2	2464.2	244	2449.8	2477.7
159	2432.8	2451	202	2441.4	2464.5	245	2450	2478
160	2433	2451.3	203	2441.6	2464.8	246	2450.2	2478.3
161	2433.2	2451.6	204	2441.8	2465.1	247	2450.4	2478.6
162	2433.4	2451.9	205	2442	2465.4	248	2450.6	2478.9
163	2433.6	2452.2	206	2442.2	2465.7	249	2450.8	2479.2
164	2433.8	2452.5	207	2442.4	2466	250	2451.0	2779.6
165	2434	2452.8	208	2442.6	2466.4	251	2451.2	2479.9
166	2434.2	2453.2	209	2442.8	2466.7	252	2451.4	2480.2
167	2434.4	2453.5	210	2443	2467	253	2451.6	2480.5
168	2434.6	2453.8	211	2443.2	2467.3	254	2451.8	2480.8
169	2434.8	2454.1	212	2443.4	2467.6	255	2452.0	2481.1
170	2435	2454.4	213	2443.6	2467.9			
171	2435.2	2454.7	214	2443.8	2468.2			

B-9361 RF Channel Selection

As noted above, the B-9361 never generates an unsolicited transmission. In an operational system, the Door Manager will periodically broadcast a Site Configuration message which contains, among other information, the active data channel for that particular system³. Once a B-9361 has received a Site Configuration, it will tune to the correct channel to receive status polls from the Door Manager, and respond with status messages on the same channel as the status poll was received on.

The conditions under which the B-9361 emits status messages are configurable via the Door Manager.

Examples of such conditions are:

- 1 Periodic status reporting
- 2 Report on change of BasketKeeper + state, e.g. locking or unlocking
- 3 Report detection of Door Manager announce field with RSSI above programmed threshold.

³ The Site Configuration message can be very loosely compared to the Dynamic Host Configuration Protocol (DHCP), as it contains a variety of parameters which configure the B-9361's behavior on the GS2V2 wireless network.