

## 1 Overview

The SB9600 and SBEP protocols are used inside Motorola radios for communication between high-level components such as the display module, radio, EEPROM, backlighting/illumination, front-panel controls, etc. They are also used to program the radios.

## 2 Bus description

The SB9600 / SBEP bus consists of two bi-directional signals - a BUSY signal and a DATA signal (SBUS).

## 3 SB9600

The radio starts off in SB9600 mode. In this mode messages are a fixed length and end with a CRC.

### 3.1 Message CRC

CRC appears to be CRC-8 with polynomial 0xF3, reflected. Appendix [A](#) shows a table which you can use to calculate the CRC for arbitrary messages. This table was derived from analysis of messages on the SBUS of a Motorola GM-1200 radio.

## 4 SBEP

An extended form of communication is available on the SBUS that allows sending packets that are of a variable length, and of a different format to the SB9600 messages. This is used, for example, to send text to the display unit.

Communication with a device in SBEP mode is initiated with a SB9600 message which specifies both the destination device for subsequent communication and the baud rate.

An acknowledgement message indicates whether the switch to SBEP mode was successful.

## 4.1 SBEP Checksum

SBEP messages do not use the SB9600 CRC. Instead they use a simpler checksum which is the sum of all bytes in the message, modulo 0xFF then XOR'd with 0xFF.

## 5 SBUS Waveforms

All traces are recorded from a Motorola GM1200 and show SBUS+ and BUSY lines.

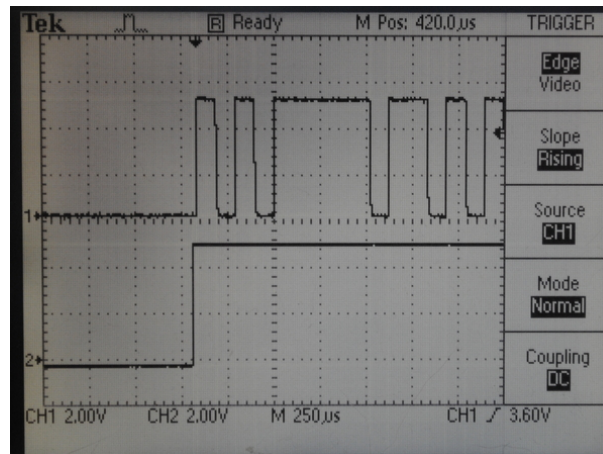


Figure 1: Beginning of SB9600 transaction (Button press)

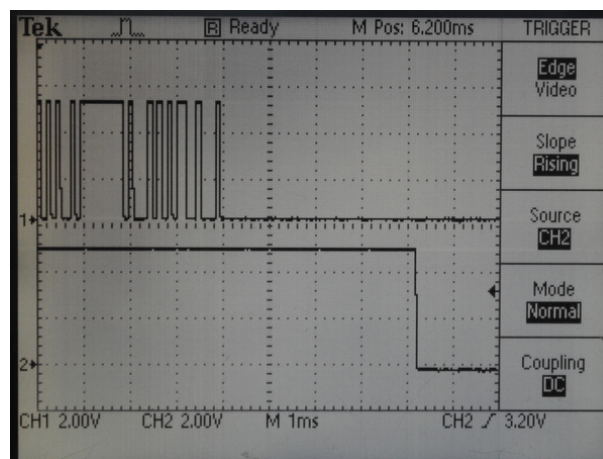


Figure 2: End of SB9600 transaction

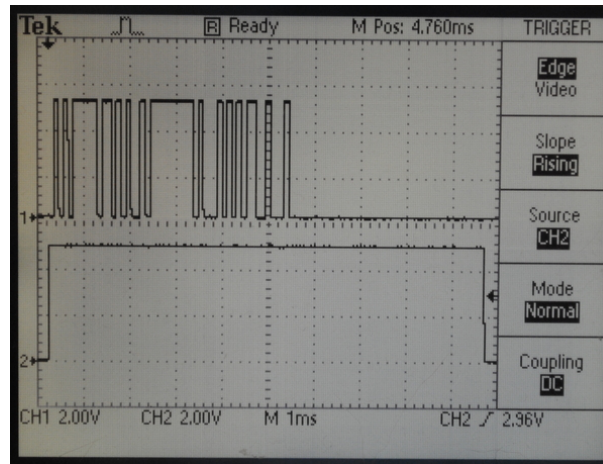


Figure 3: A complete SB9600 transaction (Button press)

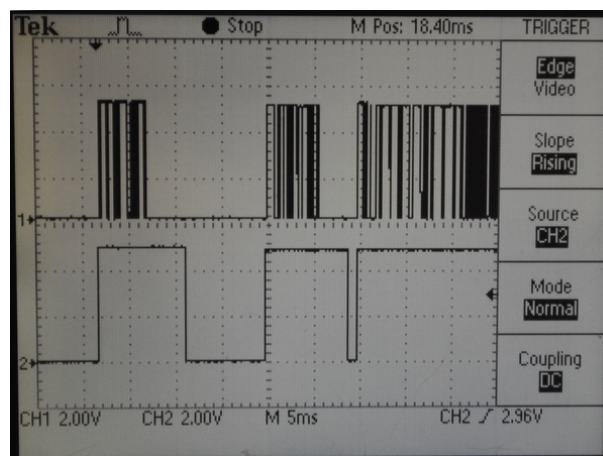


Figure 4: Button press, enter SBEP mode, response and SBEP message

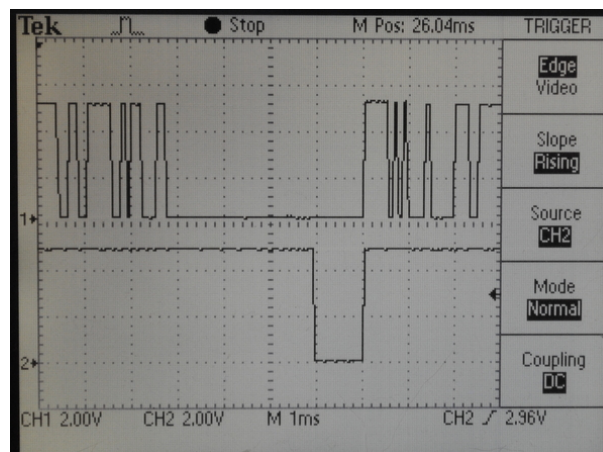


Figure 5: Transition between request to enter SBEP mode and SBEP mode. Note ACK packet has slightly bigger signal.

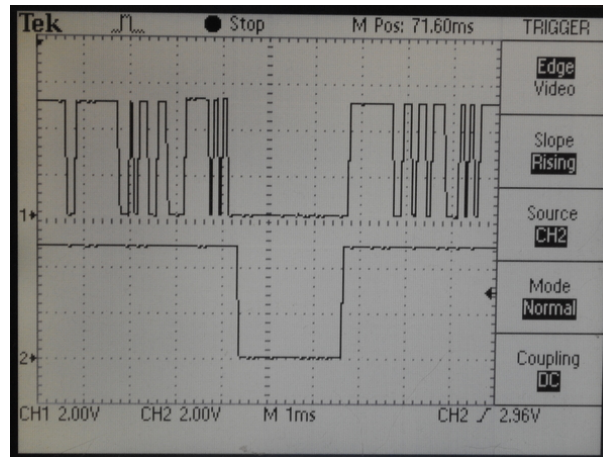


Figure 6: Transition between request to enter SBEP mode and SBEP mode

Figure 7 shows a complete transaction; *a*) button press *b*) enter SBEP mode packet *c*) ACK packet (slightly bigger signal) *d*) SBEP message *e*) ACK packet (slightly bigger signal) *f*) another Enter SBEP mode packet *g*) ACK packet *h*) beginning of another message

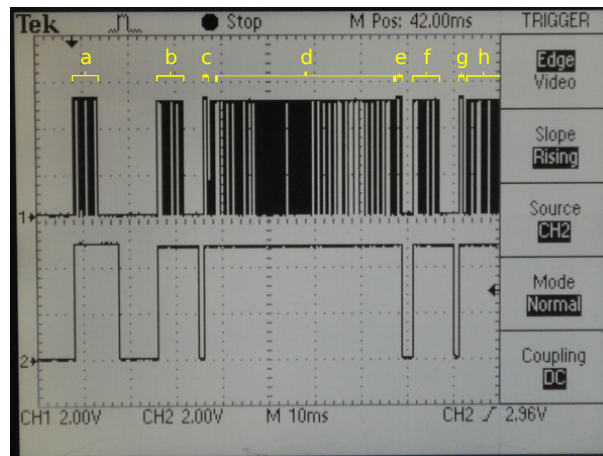


Figure 7: A complete transaction

# Appendices

## A SB9600 CRC quick calculation table

To calculate a CRC for a data stream, set  $crc = 0$ . Then, for each byte  $b$  in the data stream update  $crc$  such that:

$$crc = table[crc \oplus b]$$

## A.1 Table

0x00, 0x99, 0xad, 0x34, 0xc5, 0x5c, 0x68, 0xf1, 0x15, 0x8c, 0xb8, 0x21, 0xd0, 0x49, 0x7d, 0xe4, 0x2a, 0xb3, 0x87, 0x1e, 0xef, 0x76, 0x42, 0xdb, 0x3f, 0xa6, 0x92, 0x0b, 0xfa, 0x63, 0x57, 0xce, 0x54, 0xcd, 0xf9, 0x60, 0x91, 0x08, 0x3c, 0xa5, 0x41, 0xd8, 0xec, 0x75, 0x84, 0x1d, 0x29, 0xb0, 0x7e, 0xe7, 0xd3, 0x4a, 0xbb, 0x22, 0x16, 0x8f, 0x6b, 0xf2, 0xc6, 0x5f, 0xae, 0x37, 0x03, 0x9a, 0xa8, 0x31, 0x05, 0x9c, 0x6d, 0xf4, 0xc0, 0x59, 0xbd, 0x24, 0x10, 0x89, 0x78, 0xe1, 0xd5, 0x4c, 0x82, 0x1b, 0x2f, 0xb6, 0x47, 0xde, 0xea, 0x73, 0x97, 0x0e, 0x3a, 0xa3, 0x52, 0xcb, 0xff, 0x66, 0xfc, 0x65, 0x51, 0xc8, 0x39, 0xa0, 0x94, 0x0d, 0xe9, 0x70, 0x44, 0xdd, 0x2c, 0xb5, 0x81, 0x18, 0xd6, 0x4f, 0x7b, 0xe2, 0x13, 0x8a, 0xbe, 0x27, 0xc3, 0x5a, 0x6e, 0xf7, 0x06, 0x9f, 0xab, 0x32, 0xcf, 0x56, 0x62, 0xfb, 0x0a, 0x93, 0xa7, 0x3e, 0xda, 0x43, 0x77, 0xee, 0x1f, 0x86, 0xb2, 0x2b, 0xe5, 0x7c, 0x48, 0xd1, 0x20, 0xb9, 0x8d, 0x14, 0xf0, 0x69, 0x5d, 0xc4, 0x35, 0xac, 0x98, 0x01, 0x9b, 0x02, 0x36, 0xaf, 0x5e, 0xc7, 0xf3, 0x6a, 0x8e, 0x17, 0x23, 0xba, 0x4b, 0xd2, 0xe6, 0x7f, 0xb1, 0x28, 0x1c, 0x85, 0x74, 0xed, 0xd9, 0x40, 0xa4, 0x3d, 0x09, 0x90, 0x61, 0xf8, 0xcc, 0x55, 0x67, 0xfe, 0xca, 0x53, 0xa2, 0x3b, 0x0f, 0x96, 0x72, 0xeb, 0xdf, 0x46, 0xb7, 0x2e, 0x1a, 0x83, 0x4d, 0xd4, 0xe0, 0x79, 0x88, 0x11, 0x25, 0xbc, 0x58, 0xc1, 0xf5, 0x6c, 0x9d, 0x04, 0x30, 0xa9, 0x33, 0xaa, 0x9e, 0x07, 0xf6, 0x6f, 0x5b, 0xc2, 0x26, 0xbf, 0x8b, 0x12, 0xe3, 0x7a, 0x4e, 0xd7, 0x19, 0x80, 0xb4, 0x2d, 0xdc, 0x45, 0x71, 0xe8, 0x0c, 0x95, 0xa1, 0x38, 0xc9, 0x50, 0x64, 0xfd