

# XTB-IIR Mode Programmable Options

## JV Digital Engineering

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The XTB-IIR is the enhanced repeater version of the XTB-II. Both units will boost the output of a X10 transmitter and also provide TW523 emulation. The XTB-IIR has expanded on the basic repeater capability included in the XTB-II, and there are many more mode options available to customize this unit for each installation. Because of the larger number of options available in the XTB-IIR, most mode numbers have been reassigned for this unit.

Programming the Mode Options in the XTB-IIR requires a sequence of X10 commands to be sent using a Maxi Controller plugged into its X10 Input receptacle. Mode commands can also be sent via the digital port. Each key should be pressed for about a second, and the gap between each key press must be less than 4 seconds. The XTB-II accepted mode programming on any housecode, but the XTB-IIR only accepts them on the selected housecode (default is P). All programming begins with the key sequence 9-8-2 on the selected housecode, followed by the **single key** for the parameter to change, and then either ON or OFF. For example, the key sequence 9-8-2-14-ON enables transmit on all 3-phases. The LED will flash for about a second after the last key is released if the command is accepted. The mode number, and its status ON or OFF is transmitted over both the powerline and digital port so the entry can be logged. The LED will flash 5 times if either an incorrect key sequence is entered or too much time elapsed between key presses.

It may be possible to get the XTB-IIR into a mode where it will not recognize mode commands in a high noise environment. Should this ever happen to you, the XTB-IIR can be reset to the default configuration by pressing the ALL OFF key on a Mini or Maxi Controller plugged into the X10 Boost receptacle while power is applied after being off at least 5 seconds. The ALL OFF key should be held for about 1 second after the LED illuminates. That normally happens almost immediately, but it can take several seconds for the watchdog timer to trigger if the PIC encounters a problem during initialization. If the PIC does not start quickly, just cycling power again should get it going. The LED will flash again after the key is released if the default reset is accepted. Normally the XTB-II transmits "P Status ON" when power is applied, and the LED will flash briefly.

The user programmable mode options are as follows: (default settings are in parentheses)

- 16 (on) Repeater Enable
- 15 (off) not used at this time (enabled TW523 mode in XTB-II)
- 14 (off) Enable 3-Phase Transmit (source must also transmit 3-phase)
- 13 (off) Delay Transmit Burst to reduce flashing of nearby dimmers
- 12 (off) Reduced Transmit Power
- 11 (off) Auto Retransmit of repeat following collision
- 10 (off) Abort Transmission on Collision
- 9 (on) Smart Bright/Dim Repeat for sequential commands
- 8 (off) Only One Repeat for each command to prevent repeater ping-pong
- 7 (off) High Command Storm Threshold 60/min. (OFF allows 20/min)
- 6 (on) AGC Enable (OFF for low gain fixed threshold)
- 5 (on) High AGC threshold or MSB of fixed threshold
- 4 (off) Alternate AGC window or LSB of fixed threshold
  - fixed threshold: 5-OFF 4-OFF 150 mV (min)
  - 5-OFF 4-ON 300 mV
  - 5-ON 4-OFF 450 mV
  - 5-ON 4-ON 600 mV (max)
- 3 (off) Variable Decode enable
- 2 (P) Housecode for Mode Programming after ALL OFF reset (9-8-2-2-ON)
- 1 (off) Return All Bits to the digital port with no error checking

**16 (ON) Repeater Enable:** This option enables the XTB-IIR repeater function. Like other repeaters, this outputs a high-power transmission in bit-sync with the second half of a received command while those bits are sent out the digital port to the automation controller. See Mode 14 for 3-phase systems.

**15 (OFF):** Not used at this time. This mode option enabled TW523 emulation in the XTB-II, but that is automatic in the XTB-IIR.

**14 (OFF) 3-Phase Transmit, Boost or Repeat:** This option enables 3-phase transmit, regardless of the source of the signal. The XTB-IIR normally masks the superfluous 3-phase bursts to concentrate its energy into the essential zero-crossing burst. This option has been included because 3-phase transmission may still be necessary in some installations. Output power is reduced when this mode is enabled. The source must also be set for 3-phase transmission for this to have an effect.

NOTE: When 3-Phase Transmit is enabled, the repeater **must be disabled** unless external controllers are ONLY on the same phase as the XTB-IIR.

**13 (OFF) Delay Transmit Burst:** This reduces the potential for dimmer flicker. It delays the zero-crossing transmit burst until just before the X10 reception window. The strong XTB-IIR signal can induce flicker in some dimmers during transmissions. Delaying the transmit burst appears to reduce or eliminate this effect. This option generates a shorter signal burst, and it should only be used if dimmer flicker becomes a problem. Note: This option must be turned off to obtain an accurate measurement when using the XTBM to check the XTB-IIR transmit frequency.

**12 (OFF) Reduced Transmit Power:** The XTB-IIR may actually deliver too much signal for some applications, and this option allows the transmit power to be reduced about 40%. Depending on the load, the actual transmitted voltage may not decrease that much. This option is automatically enabled when 3-phase transmission is enabled to prevent excessive drain on the power supply.

**11 (OFF) Auto Retransmit:** This option enables automatic retransmit of a command that was aborted due to a collision. Auto retransmit only works with repeated commands because a collision during a normal transmission would result in that command being corrupted.

**10 (OFF) Abort Transmission on Collision:** A collision is identified by a burst appearing in the timeslot when no burst is being transmitted. When this option is enabled, the XTB-IIR will immediately cease transmission of the existing command whenever a collision is identified. This is true regardless of the source of the signal. When a command is being repeated there is an option to re-transmit that command after the line has cleared.

**9 (ON) Smart Bright/Dim Repeat:** Bright and Dim commands deviate from normal X10 protocol because they can be strung together without gaps separating the commands. Dimmer modules interpret bright and dim commands differently, depending on how the commands are strung together. Most repeaters only transmit the second half of each bright or dim command, which can cause them to be interpreted incorrectly. With this option enabled, the XTB-IIR will repeat every bright or dim command in a sequence after the first half of the first command. The transmission ends in sync with the last received bright or dim command so that the XTB-IIR transmission will not conflict with another command closely following that sequence.

**8 (OFF) Only One Repeat:** When a repeater is used in an installation that has another repeater or certain two-way modules, it is possible for a command to be echoed back and forth continuously. This option prevents that ping-pong effect in those special situations. For example when this option is enabled, only A-1, A-ON will be repeated for the sequence A-1, A-ON, A-ON, A-ON. However, A-1 A-ON, A-1, A-ON will be repeated completely. Because bright and dim commands are a special case, they will all continue be repeated if the Smart Bright/Dim Repeat option is selected. Since the ping-pong effect with 2-way modules does not involve bright or dim commands, this allows the XTB-IIR to continue handling those commands properly while preventing the ping-pong effect with those modules. This option should only be used if necessary.

- 7 (OFF) High Command Storm Threshold:** The XTB-IIR will automatically shut off its transmitter when it detects continuous X10 traffic on the powerline. The XTB-IIR will normally pass a burst of about 120 X10 commands, or 20 per minute continuous. Choosing the High Threshold increases this to a burst of about 400 commands, or 60 per minute continuous. The lower limit should be adequate for most installations.
- 6 (ON) AGC Enable:** This option turns on the Automatic Gain Control (AGC) that adjusts the decode threshold above the background noise level. That allows the XTB-IIR to dynamically adjust its sensitivity for best performance in a given installation. When disabled, the XTB-IIR decodes X10 line signals with a fixed, but adjustable threshold. For particularly noisy environments, there are several fixed thresholds available.
- 5 (ON) Hi AGC Threshold:** When AGC is enabled, this increases the threshold another step. This is recommended for noisy environments when incoming X10 signals are strong. This option is on by default to provide the best rejection against possible noise from compact fluorescent bulbs, and can be turned off for better sensitivity if you have a relatively noise-free environment. When using fixed threshold, this bit determines the most significant bit of the threshold voltage. See the following table.
- 4 (OFF) Alternate AGC window:** It was found that the X10 RR501 RF transceiver occasionally does not transmit its third burst in the defined slot. It falls into the beginning of the Insteon window, which is where background noise is normally sampled to set the AGC threshold level. This option allows an alternate sampling slot to avoid this problem. The alternate slot may not be quite a good sampling point, but should be tried when having difficulty receiving signals from either a RR501 or TM751 transceiver. Other units may also exhibit this phenomenon. The alternate sampling point can also be selected for combined X10/Insteon systems to prevent the brief reduction in sensitivity immediately following an Insteon transmission.

When using fixed threshold, this bit determines the least significant bit of the threshold voltage:

<b>fixed threshold:</b>	<b>5-OFF</b>	<b>4-OFF</b>	<b>150 mV (min)</b>
	<b>5-OFF</b>	<b>4-ON</b>	<b>300 mV</b>
	<b>5-ON</b>	<b>4-OFF</b>	<b>450 mV</b>
	<b>5-ON</b>	<b>4-ON</b>	<b>600 mV (max)</b>

Note: Low gain is selected when using fixed thresholds for maximum noise margin. Use AGC enabled for maximum sensitivity (mode 6 ON).

- 3 (OFF) Variable Decode:** This option selects a variable decode rather than the X10 standard 48-cycle fixed count to decode a logic one. The variable decode monitors the background noise level for a logic zero, and decodes a logic one when there is a significant increase in cycle count above the average. This option is particularly useful when trying to recover low-level X10 signals just above the noise level.
- 2 (P) Housecode Select:** A 9-8-2-2-ON sequence sent IMMEDIATELY after an ALL OFF power-up default reset will set the selected house code to that used for the 9-8-2-2-ON sequence. The window to accept the housecode select is only open for 4 seconds after the default reset. If the housecode is not changed within that window, the XTB-IIR will only accept the default "P" housecode for programming mode commands.
- 1 (OFF) Return All Bits:** This option sends all data bits received over the powerline to the digital port without any error checking. Data is only delayed ½ cycle of 60Hz from real time. This option may be useful for diagnostics or for an enhanced automation controller that does its own error checking. However, since no error checking is performed, noise can cause erroneous "1" bits. This option produces half-cycle length data pulses rather than the standard narrow pulses, and may be useful to monitoring equipment. This option should be left off unless needed.