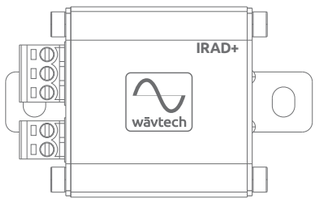
IRAD+

IGN-REM Generator + Delay

Owner's Manual



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v0124

⚠ **WARNING**	This symbol means important instructions. Failure to heed them can result in serious injury or death.
⚠ **CAUTION**	This symbol means important instructions. Failure to heed them can result in injury or property damages.

⚠ WARNING

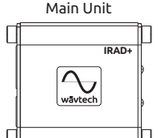
- **FOR USE WITH 12V NEGATIVE GROUND VEHICLE APPLICATIONS ONLY.** Using this product other than in its designed application may result in fire, injury or product damage.
- **MAKE THE CORRECT WIRING CONNECTIONS AND USE PROPER FUSE PROTECTION.** Failure to connect wiring correctly or use appropriate fuse protection may result in fire, injury or product damage. Ensure proper fusing of all system power wiring and install a 6-ampere in-line fuse (not included) with the +12V lead to the unit's power supply connector.
- **DISCONNECT THE NEGATIVE BATTERY TERMINAL BEFORE INSTALLATION.** Failure to do so may result in fire, injury or damage to the unit.
- **DO NOT ALLOW CABLES TO BECOME ENTANGLED IN SURROUNDING OBJECTS.** Arrange wiring and cables to prevent obstructions when driving. Cables or wiring that obstruct or hang up on places such as steering wheel, brake pedals, etc. can be extremely hazardous.
- **DO NOT DAMAGE VEHICLE SYSTEMS OR WIRING WHEN DRILLING HOLES.** When drilling holes in the chassis for installation, take precautions so as not to contact, puncture or obstruct brake lines, fuel lines, fuel tanks, electrical wiring, etc. Failure to take such precautions may result in fire or an accident.
- **DO NOT UTILIZE OR CONNECT TO ANY PART OF VEHICLE SAFETY SYSTEMS.** Bolts, nuts or wires used in the brake, airbag, steering or any other safety-related systems or fuel tanks should NEVER be used for mounting, power or ground connections. Using such parts may disable control of the vehicle or result in fire.

⚠ CAUTION

- **STOP USE IMMEDIATELY IF A PROBLEM OCCURS.** Failure to do so may result in personal injury or damage to the product. Return it to your authorized Wāvtech dealer.
- **HAVE AN EXPERT DO THE WIRING AND INSTALLATION.** This unit requires special technical skill and experience for wiring and installation. To insure safety and proper function, always contact the authorized dealer where you purchased the product to have it done professionally.
- **INSTALL THE UNIT SECURELY WITH SPECIFIED PARTS.** Be sure to use only the included parts and specified installation accessories (not included). Use of other than designated parts may damage this unit. Install the unit securely so that it will not come loose during a collision or sudden jolt.
- **ROUTE WIRING AWAY FROM SHARP EDGES AND MOVING PARTS.** Arrange cables and wiring away from sharp or pointed edges and avoid moving parts such as seat hinges or rails to prevent pinching or wear. Use loom protection where appropriate and always use a grommet for any wiring routed through metal.
- **NEVER RUN SYSTEM WIRING OUTSIDE OR UNDERNEATH THE VEHICLE.** All wiring must be routed, secured and protected inside the vehicle. Failure to do so may result in fire, injury or property damage.
- **INSTALL THE UNIT IN A DRY AND VENTILATED LOCATION.** Avoid mounting locations where the unit will likely be exposed to high moisture or heat without adequate ventilation. Moisture penetration or heat buildup may result in product failure.

Package Contents:

Main Unit



Terminals

Power/Output

Mounting Tabs
(detachable)

Accessories Required for Installation (not included)**:**

- 18AWG Wire
- In-line Fuse Holder w/6A fuse
- Battery Ring Terminal
- Ground Terminal
- Wire Crimp Connectors
- Grommets and Loom
- Cable Ties
- Mounting Screws

Warranty & Service Care

Wāvtech warrants this product to be free from defects in material and workmanship for a period of one (1) year when purchased from an authorized Wāvtech retailer within the United States. This warranty will be extended to a period of two (2) years when the installation is performed by an authorized Wāvtech retailer. A valid sales receipt is required to verify eligibility of purchase and installation.

This warranty is valid only to the original purchaser and is not transferrable to subsequent parties. This warranty is void if the product serial number has been altered or removed. Any applicable implied warranties are limited in duration to a period of express warranty as provided herein beginning with the date of the original purchase at retail, and no warranties, whether expressed or implied, shall apply to this product thereafter. Some states do not allow limitations on implied warranties, therefore these exclusions may not apply to you. This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

If your product needs service, you should contact Wāvtech Customer Service to receive a Return Authorization (RA) Number. Any product received without an RA number will be returned to sender. Once your product is received and inspected by customer service, Wāvtech at its sole discretion, will be repair or replace it with a new or remanufactured product at no charge. Damage caused by the following is not covered under warranty: accident, abuse, failure to follow instructions, misuse, modification, neglect, unauthorized repair or water damage. This warranty does not cover incidental or consequential damages. This warranty does not cover the cost of removing or reinstalling the product. Cosmetic damage and normal wear are not covered under warranty.

For Service within the United States:
Wāvtech Customer Service: (480) 454-7017
Monday – Friday, 8:00am to 4:00pm MST

Important Notice for International Customers:
For products purchased outside the United States of America or its Territories, please contact your local distributor concerning specific procedures for your country's warranty policy. International purchases are not covered by Wāvtech, LLC.

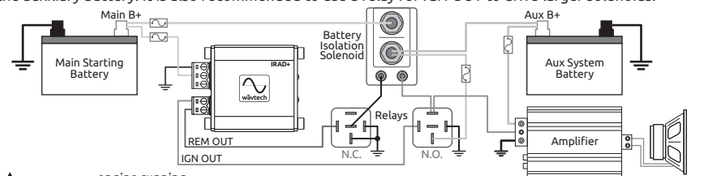
Specifications

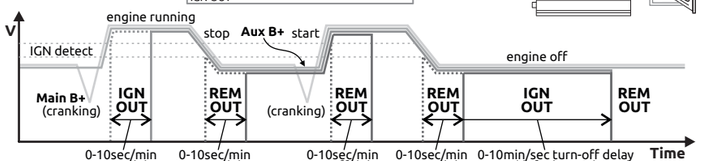
Operating Voltage (B+)			3V-18V
Ignition Detect Threshold (B+)			V_{HIGH}-V_{LOW} = ≥0.5V
Trigger Threshold (REM IN)		DC	≥5V
		Square	≥5Vp (<3.6kHz)
		Sine	≥5Vp (<400Hz)
Output Voltage (at max load)			<3% from B+
Current Capacity	Single Output		3A
	Dual Outputs		3A each
	Parallel Output		6A
Ignition Detect Mode (IDM)	IGN OUT Delay	Range	0-10 sec/min
		Defaults	On=0s, Off=0s
	REM OUT Delay	Range	0-10 sec/min
		Defaults	On=0s, Off=0s
	Output Order	Turn-On	IGN-REM
		Turn-Off	IGN→REM (normal)
			REM→IGN (reverse)
Switched Trigger Mode (STM)	IGN OUT Delay	Range	0-10 sec/min
		Defaults	On=0s, Off=0s
	REM OUT Delay	Range	0-10 sec/min
		Defaults	On=0s, Off=0s
	Output Order	Turn-On	IGN-REM
		Turn-Off	IGN-REM (normal)
			REM-IGN (reverse)
Relay Control Mode (RCM)	IGN OUT Delay	Range	0-10 sec/min
		Defaults	On=0s, Off=3m
	REM OUT Delay	Range	0-10 sec/min
		Defaults	On=0s, Off=0s
Current Draw	Max		6A
	Idle (no load)		<22mA
	Sleep		<2.7mA
External Fuse (not included)			0.5A to 5A
Minimum Wire Gauge			18AWG
Product Dimensions		Chassis Only	0.79"x1.55"x1.46"
			20x38x37.2mm
		Incl. Tabs	0.87"x1.55"x2.4"
			22x38x61mm

Notes:
1. An external in-line fuse is required, but not included. Its rating should match the expected max total current draw, but must not exceed 6A.
2. Ignition detect thresholds may be set between any two voltages within 3-18V with a difference of at least 0.5V.
3. REM IN can accept pulsed voltages ≥5Vp at <3.6kHz for a square wave or <400Hz for a sine wave when at least 1sec of turn-off delay is applied to IGN OUT (normal order) or REM OUT (reverse order or when unlinked).
4. All specifications are subject to change without notice.

Example-3: Stop-Start Relay/Solenoid Control Mode with Delays

For certain cases such as stop-start enabled vehicles with larger aftermarket sound systems, off-road or marine applications, the IRAD+ may be used to automatically control battery isolation based upon engine running status. In Relay Control Mode, the IRAD+'s REM OUT turns on when the engine shuts off and turns off when the engine is running again. This needs to be changed to an active ground via an automotive relay in "normally closed" configuration in order to control the solenoid. At the same time, IGN OUT keeps components activated during stop-start events while temporarily powered by the auxiliary battery. It is also recommended to use a relay for IGN OUT to drive larger solenoids.

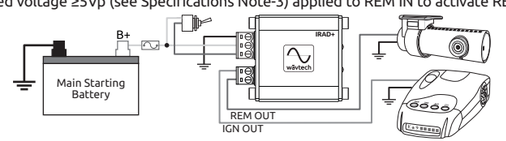




Note: When changed to Relay/Solenoid Control Mode (RCM), the default for IGN OUT turn-off delay is set to 3min. This can be adjusted from 1-10 minutes or changed to seconds if needed. In this mode, REM OUT is dedicated to controlling when the relay/solenoid connects and disconnects the auxiliary battery. For vehicles with more sensitive thresholds, the REM OUT turn-on/off delays can also be adjusted to prevent triggering the solenoid too frequently, but after the IGN OUT's turn-off delay expires it will automatically turn off REM OUT no matter its delay setting.

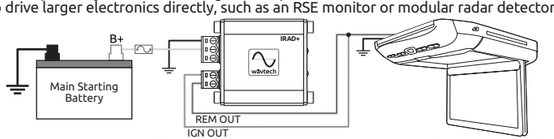
Example-4: Ignition Detect Mode & Switched Trigger Mode with Unlinked REM OUT

In some applications it may be desirable to have two separately activated triggers, one from ignition and one from a switched, intermittent or pulsed source. When REM OUT is unlinked, the IRAD+ can be used to simultaneously generate an ignition output via IGN OUT while also allowing a switched ≥5V DC or pulsed voltage ≥5Vp (see Specifications Note-3) applied to REM IN to activate REM OUT separately.



Example-5: Ignition Detect Mode with Paralleled Outputs

The IRAD+'s outputs may be connected together in parallel for a total continuous current of 6A max, enough to drive larger electronics directly, such as an RSE monitor or modular radar detector system.



Note: If setting any turn-on or turn-off delays, make sure to apply the same delays to both IGN OUT and REM OUT.

Introduction

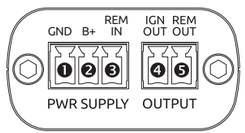
Welcome to Wāvtech, where expertise and innovation come together to create exceptional mobile audio performance and integration solutions. Built for the professional installer, our products are simply the best available for unlimited OEM and aftermarket upgrade possibilities.

Features

- Automatic Ignition Generator with Dual Outputs
- Switched Trigger Isolator/Generator with Dual Outputs
- Stop-Start System Solution with Automatic Relay/Solenoid Control
- Independently Adjustable Turn-On/Off Delays, up to 10sec or 10min
- Reversible Turn-off Order for Ultimate Pop-Noise Mitigation
- Hold/Override over Ignition Detect for Continuous Operation
- Unlink Mode for Independent Remote and Ignition Outputs
- 3A Continuous Current per Output or 6A in Parallel to a Single Load

Wiring Connections

A minimum of 18AWG wire is recommended for all IRAD wiring connections. Always protect the B+ wire with a 5-amp fuse (max).



❶ Ground (GND): The GND terminal must be connected to a bare metal part of the same ground plane as the vehicle battery chassis ground. This wire should be as short as possible and terminated with a ground specific terminal such as an EARL terminal to prevent from coming loose.

❷ Battery (B+): The B+ terminal (a.k.a. +12V) must be connected to the main starting battery or any power lead with constant battery voltage in order to monitor resting voltage (engine off) vs. charging voltage (engine running) and generate an ignition output based upon engine running status. In special installations where the IRAD+ is not used for ignition detection, this lead may be connected to a switched power lead but the ignition detection voltage threshold must be programmed accordingly to activate/deactivate IGN OUT.

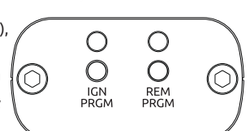
❸ Remote Input (REM IN): The REM IN terminal may be wired to any switched voltage source ≥5V to trigger both outputs manually if automatic ignition detection is not programmed, or to override ignition detection activation/deactivation at any time.

❹ Ignition Output (IGN OUT): This terminal provides a switched ignition output based upon engine running status (or any detected voltage change >0.5V at B+) if programmed.

❺ Remote Output (REM OUT): This terminal provides an additional switched remote output linked to IGN OUT with its own delays and normal/reverse turn-off order. It can be activated via ignition detection and REM IN, or unlinked from IGN OUT as a separate output only activated by REM IN.

Operation Modes, Settings & Functions

The IRAD+'s factory default mode is Switched Trigger Mode (STM), since ignition detect thresholds have not been programmed yet. All output delays are set to 0sec with IGN OUT and REM OUT outputs linked in normal turn-off order. If using the IRAD+ only in STM, no programming is necessary and the unit may simply be connected to power, ground and a switched trigger lead with ≥5V via REM IN to generate switched outputs from IGN OUT and REM OUT. If any delays, reverse turn-off order, etc. are needed, follow the procedure for each setting accordingly. If using the IRAD+ to generate an ignition output, follow the steps below to program the ignition detect thresholds to enable Ignition Detect Mode (IDM).



Mode-1: Ignition Detect Mode (IDM)

Step-1: Start the engine and let it idle until the alternator's charging voltage has mostly stabilized.

Step-2: Long-press the IGN PRGM button for ~5sec until the red LED begins to flash. The IRAD+ is now learning the alternator's charging voltage and will turn solid red when finished (~30sec).

Step-3: Shut off the engine and then short-press the IGN PRGM button once. The red LED will begin flashing again to indicate the IRAD+ is now learning the battery's rest voltage and will turn off when finished (~30sec).

Notes:

- After finishing Step-3 above, confirm successful programming by starting the engine. The IRAD+'s outputs should turn on. If not, check that the two voltages are at least 0.5V apart while repeating the threshold programming process above. If the voltages are too close, it may require waiting longer or applying a load (e.g. turn on headlights) after Step-2 for the battery's rest voltage to settle more after charging. If the outputs shut off sometimes while the engine is still running, add some turn-off delay IGN OUT to prevent dropouts.

Mode-2: Switched Trigger Mode (STM)

The IRAD+ starts in STM by default and does not require any programming to be activated by REM IN. If ignition thresholds are programmed, REM IN may still be used to override ignition detect whenever ≥5V is applied, either to activate manually or hold the outputs on. All IDM settings will apply, such as delay.

Mode-3: Relay/Solenoid Control Mode (RCM)

For stop-start enabled vehicles and other special applications, the IRAD+ has an alternative output operation mode for automatic battery isolation control (see Example-3). Ignition thresholds must be programmed first before the mode can be changed from IDM to RCM as follows:

Step-1: Long-press the REM PRGM button for ~5sec and release. Both LED's will alternate flashing blue-red to confirm RCM. Changing back to regular IDM is done the same way, where the blue LED will light solid briefly indicating that REM OUT has returned to regular output function.

Note: When changed to RCM, all delays are set to 0sec except IGN OUT's turn-off delay is set to 3min. Any changes will be stored in RCM, and any previous changes made in IDM will be restored if the mode is changed back.

Setting-1: Turn-On Delay

Step-1: Short-press the chosen output's PRGM button once, and its LED will begin to flash slowly.

Step-2: While flashing, short-press the same button once for each count of delay needed, up to 10x. The default delay increment is 1sec per count. If no press count is entered, it will be stored as zero.

Step-3: After entering the desired amount of delay, the LED will time-out after ~5sec, turn solid briefly and then flash back the count of delay that was stored before turning off.

Setting-2: Turn-Off Delay

Step-1: Press the chosen output's PRGM button for ~2sec and release. Its LED will begin to flash fast.

Step-2: While flashing, short-press the same button once for each count of delay needed, up to 10x. The default delay increment is 1sec per count (except in RCM where IGN OUT turn-off delay default is 3min). If no press count is entered, it will be stored as zero.

Step-3: After entering the amount of delay, the LED will time-out after ~5sec, turn solid briefly and then flash back the count of delay that was stored before turning off.

Setting-3: Seconds/Minutes

This setting allows either output's turn-on or turn-off delay increment to be toggled from seconds to minutes or minutes to seconds.

Step-1: Follow the same procedure (Step-1 above) to enter either output's turn-on or turn-off delay programming mode.

Step-2: While the LED is flashing, long-press the output's PRGM button for ~5sec and release. When changed to minutes, the LED will turn solid briefly and flash slow 3x. When changed to seconds, the LED will flash fast 15x. Any delay count already set will be changed to the new increment.

Function-1: Normal/Reverse Turn-Off Order (STM or IDM)

This function allows the turn-off order of the two outputs to be reversed. Normal order is the default, where IGN OUT turns off first, then REM OUT. Reverse order is REM OUT turns off first, then IGN OUT.

Step-1: Press the REM PRGM button for ~2sec and release to enter its turn-off delay setting mode.

Step-2: While the blue LED is flashing, long-press the REM PRGM button for ~10sec. When changed to reverse order, the blue LED will flash first and red LED last. When changed to normal order, the red LED will flash first and blue LED last.

Function-2: REM Unlink (IDM only)

This function allows REM OUT and its settings to be unlinked from IGN OUT for cases where both a generated ignition output and switched trigger output are needed separately from one IRAD+. When unlinked, REM OUT will only activate when ≥5V is applied to REM IN while IGN OUT will only respond to ignition detection. Ignition thresholds must be programmed first in order to unlink REM OUT.

Step-1: Long-press the REM PRGM button for ~10sec. The blue LED will flash to confirm REM OUT is unlinked and any previous turn-on/off delays are reset to 0sec default. Changing back to linked operation is done the same way, except the red LED will flash to indicate REM OUT is re-linked.

Function-3: Partial Delete or Factory Reset

There are two options for partial delete to help minimize re-programming, as well as a full factory reset:

1. **Delete Thresholds:** Long-press the IGN PRGM button for ~10sec. The red LED will begin flashing slowly after 5sec, and after 10sec will flash fast to indicate the ignition detect thresholds have been deleted and mode is returned to STM. All delays, sec/min changes and turn-off order are preserved.
2. **Delete Delays:** Long-press both the IGN PRGM and REM PRGM buttons at the same time for ~5sec, and release when both LEDs start flashing slowly. Only the delays are deleted while ignition detect thresholds, turn-off order and current operating mode are preserved.
3. **Factory Reset:** Long-press both the IGN PRGM and REM PRGM buttons at the same time for ~10sec. Both LEDs will start flashing slowly at 5sec and after 10sec will flash fast to indicate full reset is done.

PRGM Button Press Guide

Button	1st Press	2nd Press	Result
IGN PRGM	Short	Short 0-10x	Turn-on Delay
		5sec	Seconds/Minutes
	2sec	Short 0-10x	Turn-Off Delay
		5sec	Seconds/Minutes
	5sec	wait ~30s	Learn B+ Von
		↳short 1x	Learn B+ Voff
	10sec	-	Delete Thresholds
REM PRGM	Short	Short 0-10x	Turn-on Delay
		5sec	Seconds/Minutes
	2sec	Short 0-10x	Turn-Off Delay
		5sec	Seconds/Minutes
		10sec	Norm/Rev Order
	5sec	-	IDM/RCM
	10s	-	REM Link/Unlink
IGN PRGM + REM PRGM	5sec	-	Delete Delays
	10sec	-	Factory Reset

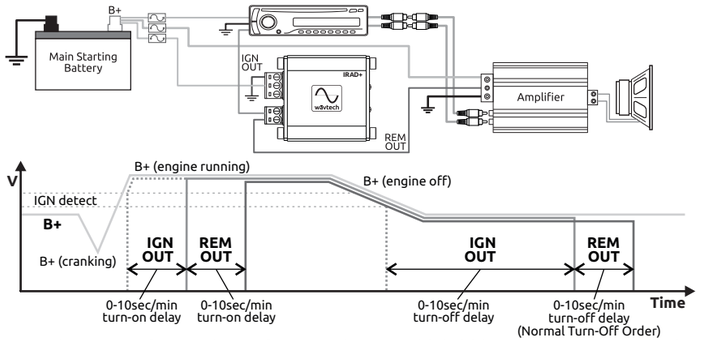
Notes:

- Short-press is a momentary press less than 1sec.
- 2sec press must be released in less than 5sec.
- 5sec press must be released in less than 10sec.
- 10sec press can be released after LED flashing/change.

LED Programming Indications

LED	Context		Flashing	Meaning
Red	Program Ignition		slow 30x (30s)	learning B+
			fast 15x	thresholds deleted
	Delay	On	slow (5s timeout)	ready for input
		Off	fast (5s timeout)	ready for input
	Delay Count		fast 3x each	count in sec
			1x each	count in min
	Sec/Min		fast 15x	changed to sec
			slow 3x	changed to min
	Re-link		fast 10x	REM is re-linked
Blue	Delay	On	slow (5s timeout)	ready for input
		Off	fast (5s timeout)	ready for input
	Delay Count		fast 3x each	count in sec
			1x each	count in min
	Sec/Min		fast 15x	changed to sec
			slow 3x	changed to min
	Unlink		fast 10x	REM is unlinked
	IGN/RCM		3s solid	changed to IDM
Red & Blue	Turn-Off Order		fast Red→Blue	IGN OUT first
			fast Blue→Red	REM OUT first
	IGN/RCM		slow Red↔Blue 4x	changed to RCM
	Delete/ Reset		5x both slow	delays deleted
			8x both fast	factory reset

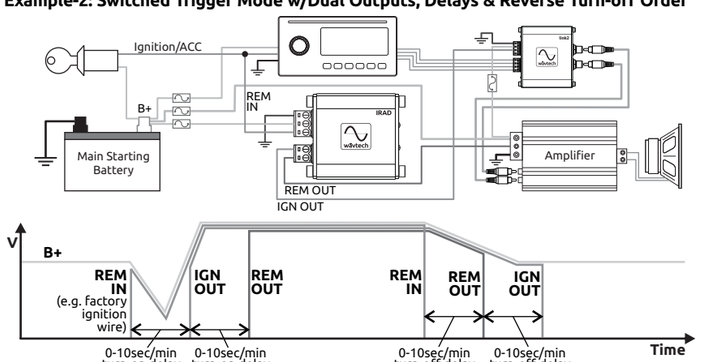
Example-1: Ignition Detect Mode w/Dual Outputs, Delays & Normal Turn-off Order



Notes: This is just one of many applications for generated outputs with linked delays, where in normal turn-off order REM OUT follows IGN OUT delays based upon engine running status. The additional settings available are:

- The turn-off order may be reversed if required to eliminate turn-off pop so that REM OUT turns off first, followed by IGN OUT. See "Turn-Off Order" section for programming.
- Ignition Detection Mode (IDM) can be overridden as Switched Trigger Mode (STM) at any time by applying ≥5V to REM IN, allowing the outputs to be activated manually or hold them on after the engine is shut off.
- If only one ignition generated output is required, REM OUT may be unlinked from IGN OUT and then manually activated independently by applying any switched trigger ≥5V to REM IN. See "REM OUT Unlink" and Example-5.

Example-2: Switched Trigger Mode w/Dual Outputs, Delays & Reverse Turn-off Order



Notes:

- For cases where using an available switched +12V wire as a remote results in start-up timing conflicts between components, the IRAD+ may be used for its delays and reverse turn-off order capabilities to eliminate pop noise.
- For cases where an available trigger is at least 5V but intermittent, pulsed or sensitive to current draw, the IRAD+ can isolate and generate a reliable switched trigger boosted to battery voltage (B+) by using its turn-off delay.