

## FREEDOM POWER INVERTER

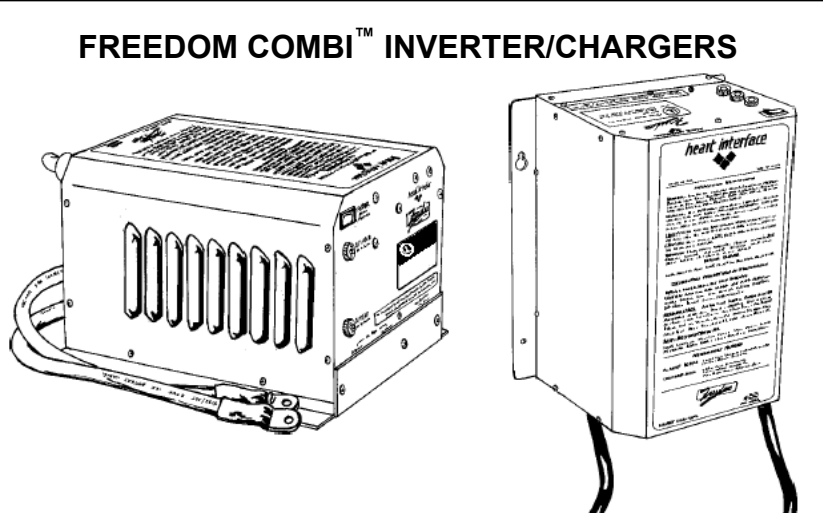
In recent years Winnebago Industries has utilized several models of power inverters in our coaches. In this article we are providing information that will cover the Freedom series 1500 watt inverter and remote control panel.

### Inverter/Charger at 1500 watts with 75-amp 3-stage Charger

Freedom 15-12 produces 1500 watts of microprocessor-regulated, continuous AC household power from 12-volt DC power. The inverter/charger charges your batteries quickly and accurately when supplied with electricity from your RV's generator or campground hookup. Freedom 15-12 provides automatic transfer switching between inverter power and incoming AC power. The charger provides automatic, 3-stage, temperature sensitive charging and manual battery equalization for optimal care of your batteries.

**Features**  
1500-Watt Continuous Output with 5500-Watt Surge

Freedom 15-12's inverter provides up to 1500 watts of 120-volt modified sine-wave power from a deep cycle battery bank. The inverter/charger output is crystal-controlled at 60 Hz. The inverter has a high surge of 5500 watts to start large loads and its modified sine wave is compatible with most appliances such as medium-sized microwaves, TVs, VCRs, desktop computers, lights and power tools. An idle mode reduces battery power consumption when loads are removed from the inverter. A low battery protection circuit protects the batteries from over-discharge. The inverter provides a momentary surge of three times the inverter rating for starting electric motors.



FREEDOM COMBI™ INVERTER/CHARGERS

### Specifications

Battery Voltage	12 VDC
AC Input Voltage	120 VAC
AC Output Connections	Single
AC Input Connections	Single
<b>INVERTER</b>	
Max Continuous Output Power AC	1500 W
Surge Power AC Amps	55 A
<b>CHARGER</b>	
Max Charge Output DC Amps	75A
Charger Control	3-Stage
Equalization	Yes
Battery Type Settings	wet/gel/agsm
Temperature Sensitive Charging	Yes

### 3-Stage Temperature Sensitive Battery Charging

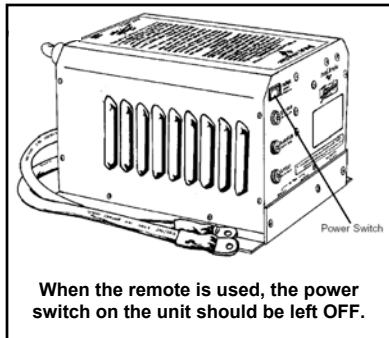
The 75-amp, 3-stage, automatic battery charger initializes each time AC power is used with Freedom 15-12, providing an efficient and complete charge to the battery. Freedom 15-12 charges wet, gel or AGM deep cycle batteries in three stages: bulk, acceptance and float. High efficiency ensures the longest possible battery life between charges. Freedom 15-12 comes with a built-in battery temperature sensor to control voltage and optimize the battery life cycle. Freedom 15-12 can be used with the remote control panel included or with link instrumentation to manually engage an equalizing charge cycle.

### Automatic 30 A Transfer Switch

The internal 30-amp transfer switch allows Freedom 15-12 inverter/charger to connect to an external AC source and transfer the source power directly to the loads. When the external AC power source is disconnected, the transfer switch allows automatic switching back to the inverter.

### Power Sharing for Reduced Output

Freedom 15-12's unique power sharing feature automatically reduces the AC power consumption of the battery charger allowing AC power to be delivered to a load. This allows other loads to operate without the inconvenience of a tripped breaker.



**Protection and Energy Saving Features**

Freedom 15-12 is circuit breaker protected. Models with dual branch rated circuit breakers (20/20, 20/25, 15/15) are available. The INVERT/CHARGE breakers on the front of the unit protect the inverter/charger from over current conditions. Output circuit breakers protect the output AC circuits. A thermostat-controlled fan cools the inverter/charger so it can operate continuously at its rated power level. When using Freedom 15-12 in invert mode and the battery voltage drops to 10 volts, the inverter will shut off automatically. In a high battery voltage condition at 15.5 volts, Freedom 15-12 will also shut off automatically.

When an AC load is not present, Freedom 15-12's Inverter Idle Circuit reduces battery power consumption.

**Normal Operation Indications:**

The panel shows AC IN (status), DC VOLTS, DC AMPS (charger or inverter current), and INCOMING AC BREAKER AMPS setting plus CHARGE, INVERT and BATTERY STATE. The display is updated once per second.

**Normal Operation Mode-Controls:**

The remote comes On automatically when the Freedom Combi is connected to a charged battery or external AC power. The following buttons are used:



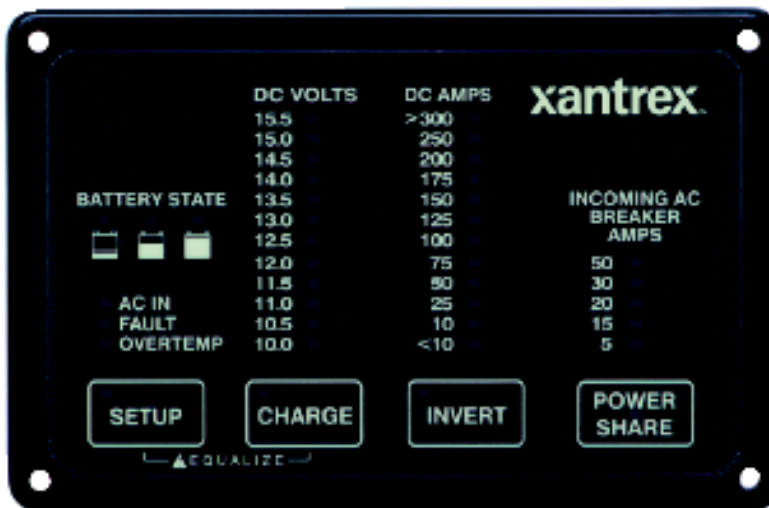
Blinking indicates SETUP mode.



When the CHARGE LED is On (solid green), the Battery

Charger is ON and charging. When the LED is Off, the charger

**Remote Control Panel**



**Power Up Indications and Default Values:**

When power is first applied to the remote, there is a delay of up to 4 seconds, while the remote and the Freedom Inverter/Charger establish communications.

LED	Indication	Meaning
BATTERY STATE	MID	Assumed battery state (Will take approx. 15 min. to reflect actual value)
AC IN	On	If external AC Power is available
FAULT	Off	If operation is normal
OVERTEMP	Off	If operation is normal
CHARGE	On	Freedom charging
INVERT	Off	Invert function Off

is Off. Charging automatically begins when external AC power is detected.



When the INVERT LED is On (solid green), the Freedom inverter is inverting (making AC power from the DC battery source). When the INVERT LED is Off the power is present (AC IN LED On) and the INVERT LED is blinking green, the inverter is in standby, waiting for external AC power to be removed to begin inverting. When there is no external AC power, a blinking green LED indicates the inverter is in the Idle Mode. Idle mode is explained in the SETUP section.



POWER SHARE limits the amount of external AC current used by the charger and transfer loads. If the total AC load is larger than the AC power available, the external AC circuit breaker may trip. Reduce the POWER SHARE setting to reduce AC power consumption by the charger and transfer loads thus reducing the total AC load.

Before you plug in to an external AC source, note the breaker size. Press POWER SHARE until the appropriate "INCOMING AC BREAKER" LED is On. For example, plug in to a 20 Ampere external AC power source, press POWER SHARE

until the 20 Amp "INCOMING AC BREAKER" LED is on.

Setting the POWER SHARE feature to a lower "INCOMING AC BREAKER" size may limit charger output. Available POWER SHARE settings may vary by inverter/charger model.

#### Set Up Mode:

Enter the SETUP mode by pressing and holding SETUP for 5 seconds until the LED blinks. The remote is connected to a 458 Series if at least one DC VOLTS LED is On. After 5 seconds of no activity, the Remote Control Panel automatically exits from the SETUP mode. Use the Control Panel buttons to select the SETUP features.

Refer to the following template:

The screenshot shows a remote control panel with several sections:

- Note:** Amp hours are not resettleable on standard units.
- Set Battery Capacity (Amp-hours):** A vertical list of checkboxes for values: 458, 2000, 1500, 1200, 1000, 800, 600, 400, 200, 100, 50.
- Set Idle Mode (Watts):** A vertical list of checkboxes for values: 458, 20, 15, 10, 5, 0.
- Standard (Watts):** A vertical list of checkboxes for values: 458, 20, 15, 10, 5, 0.
- Battery State:** Three LEDs labeled AC In, Fault, and Overtemp.
- Set Battery Type:** A vertical list of checkboxes for values: 458, AGM, Get2, Get1, Wet.
- Standard:** A vertical list of checkboxes for values: 458, AGM, Get2, Get1, Wet.
- Warm gel:** A vertical list of checkboxes for values: 458, AGM, Get2, Get1, Wet.
- Cool gel:** A vertical list of checkboxes for values: 458, AGM, Get2, Get1, Wet.
- Warm wet:** A vertical list of checkboxes for values: 458, AGM, Get2, Get1, Wet.
- Cool wet:** A vertical list of checkboxes for values: 458, AGM, Get2, Get1, Wet.
- Buttons:** Four buttons labeled Setup, Set Ahrs, Set Idle, and Set Type.

#### Set Ahrs Battery Capacity (Amp-Hours)

Applies only to Series 458 inverter/chargers.

Using CHARGE, set the Amp-Hour rating of the battery bank. The Freedom 458 Series inverter/charger uses this information to determine the charge parameters for the battery. Default setting: 600 Amp-hours (value may vary by model).

#### Set Idle Idle Load (Watts)

Changing this setting is not normally recommended.

Using INVERT, select Idle setting. If present loads are less than the selected value, the inverter will remain in Idle Mode. Idle mode prevents unnecessary power drain on the battery. When an AC appliance is turned On and

the load draw exceeds the idle value, the unit begins full power inverting. When the appliance is turned Off, the inverter returns automatically to Idle mode. A setting of "0" disables Idle Mode.

Default setting: Freedom: 4 Watts, 458 Series: 5 Watts

#### Set Type Battery Type

This setting is important. Check your settings.

Using POWER SHARE, set the Battery Type. The charger uses this information to set charging values for the three stage automatic charger. Be sure to set the correct type. Default: Freedom-Cool (<80 F) Wet cell; 458 Series-Wet cell.

Setting the Battery Type correctly is important. 458 series only selections: Wet, Gel 1, Gel 2 or AGM. Freedom the following selections apply:

- Cool Wet Cell: <80 F
- Warm Wet Cell: >80 F
- Cool Gel Cell: <80 F
- Warm Gel Cell: >80 F

#### Low Power Mode:

When no external AC power is available, the remote panel LED's can be turned Off to conserve battery power. Turning off the INVERT function (with external AC absent) activates the low power mode.

In this Low Power Mode, if one of the front panel keys is pressed, the display will become active. Press SETUP, CHARGE or POWER SHARE and the unit will display data for a short period of time, then return to the Low Power Mode. If INVERT is pressed, the selected function is activated and Low Power Mode is cancelled.

#### Equalizing Charge Mode:

The Remote Control Panel has a special charging mode that improves the condition of wet cell

batteries. Equalizing helps maintain battery capacity and extends life by deliberately overcharging batteries for a short period of time. Do not equalize gel cell batteries.

**CAUTION: Equalizing may cause the DC system voltage to exceed 16 volts. Be sure to disconnect any equipment not rated for this voltage. Equalizing causes the battery to release hydrogen from your battery and may reach explosive concentrations in a closed environment. Make sure the battery area is well ventilated. Do not smoke or operate spark causing devices in the vicinity of batteries being equalized.**

#### Procedure:

EQUALIZE mode must be started manually. To begin equalizing, enter SETUP mode, then hold both SETUP and CHARGE until the Battery STATE LEDs start blinking.


Equalizing should only be engaged after the batteries have been fully charged by the normal battery charging cycle. The Equalizing charge cycle lasts approximately 8 hours. The Equalize charge cycle can be terminated at any time by interrupting the external AC power to the charger or by pressing CHARGE. The unit will return to normal display and operation after the completion of the Equalize cycle.


How often should you equalize? It is recommended that after 30 deep cycles or every 6-8 months the batteries should be equalized. Check with the battery manufacturer for specific battery requirements.

#### Battery State LEDs

The BATTERY STATE LEDs indicate the approximate state of the battery bank. It is based on the battery voltage sampled over a period of time under the present load conditions. The battery state does not represent the actual Amp-hour capacity remaining in the battery.

Lowest State: Voltage is low. Charging is recommended.

 Middle State: Battery is in normal range.

 Highest State: Battery voltage is at its highest and the battery is charged.

Note: Depending on battery size and condition, loads connected to the battery may affect the battery voltage and the BATTERY STATE display.

**Error Indications:**

The FAULT LED indicates a possible error has been detected and the Freedom Combi had shut down to protect itself and the electrical system. The source of the error must be corrected before restarting the Freedom's inverter/charger functions. However, an OVERTEMP error will reset automatically, and operation will resume when the unit has cooled sufficiently.

LED Indication	Fault LED	Error Detected	Possible Solution
OVERTEMP On	Off	Over temperature shutdown.	Increase air circulation and allow to cool.
BATTERY STATE Empty blinking	On	Low Battery Shutdown (too low to continue inverting)	Charge Batteries.
Empty On	On	Battery Overload. (excessive ripple voltage during charge)	Select lowest Power Share setting. Turn off DC Loads. Restart Charger
15.5 VDC blinking	On	High battery shutdown	Check other charging sources connected to the battery.
AC IN blinking	On	AC Backfeed. (external AC power detected at inverter output)	Disconnect incoming AC power and correct wiring.
INVERT blinking	On	Inverter overload. (too much AC load on inverter)	Reduce AC load on inverter. Reset by pressing INVERT Off and On.
CHARGE blinking	On	Charger overload (Battery voltage too low to charge)	Check batteries. Turn Off all DC loads. Restart charger.

Typical Power Consumption									
Appliance	Typical Wattage	Appliance Run Times / Amp Hours							
		5 Min.	15 Min.	30 Min.	1 Hr.	2 Hr.	3 Hr.	8 Hr.	24 Hr.
13" Color TV	50	.33	1	2	4	8	12	32	96
19" Color TV	100	.66	2	4	8	16	24	64	192
VCR	50	.33	1	2	4	8	12	32	96
Lamp	100	.66	2	4	8	16	24	64	192
Blender	300	2	6	12					
Laptop Computer	50	.33	1	2	4	8			
Curling Iron	50	.33	1	2					
3/8 Power Drill	500	3.3	10	20					
Icemaker*	200			2.6	5.2	10.4	15.6	41.6	83.2
Coffee Maker	1000	6.6	20	40	80	160			
3 cu' Refrigerator*	150			2	4	8	12	32	96
20 cu' Refrigerator*	750			21	42	84	126	336	672
Compact Microwave	750	5	15	30	60	120	180		
Full Size Microwave	1500	10	30	60	120	240	360		
Vacuum	1100	7.3	22	44	88	176	264		

Number in each box represents the total Amp hours used (@ 12 volt DC) based on various continuous run times.  
 \*Note refrigeration is typically calculated using a 1/3-duty cycle.

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