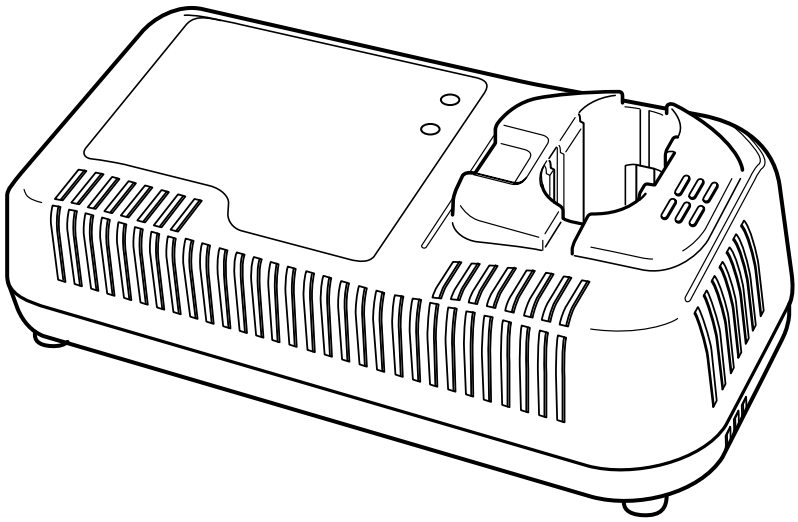
MODEL

UC 24YJ

Hitachi
Power Tools

CHARGER
UC 24YJ

TECHNICAL DATA
AND
SERVICE MANUAL



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LIST No. F889

Oct. 2003

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1. PRODUCT NAME

Hitachi Charger, Model UC 24YJ

2. MARKETING OBJECTIVE

As higher-power cordless tools have been developed through the years, higher-power and higher-capacity batteries have also been developed. There is an increasing demand for a charger that can charge such batteries. The new Model UC 24YJ is a general-purpose rapid charger that has been developed based on the current Model UC 24YC to meet the market demand. The Model UC 24YJ can charge batteries from 7.2 V to 24 V in shorter times than the current Model UC 24YC.

3. APPLICATIONS

Recharging of Hitachi batteries

Applicable batteries:

Battery type	Model	Voltage	Capacity
Ni-MH batteries	EB 9H	9.6 V	2.2 Ah
	EB 12H	12 V	
	EB 1222HL		
	EB 14H	14.4 V	
	EB 18H	18 V	
	EB 930H	9.6 V	3.0 Ah
	EB 1230H	12 V	
	EB 1230HL		
	EB 1430H	14.4 V	
	EB 1830H	18 V	
	EB 2430H	24 V	
Ni-Cd batteries	EB 7S	7.2 V	1.3 Ah
	EB 9S	9.6 V	
	EB 12S	12 V	
	EB 14S	14.4 V	
	EB 7B	7.2 V	2.0 Ah
	EB 9B	9.6 V	
	EB 9M		
	EB 12B	12 V	
	EB 1220BL		
	EB 12M		
	EB 14B	14.4 V	
	EB 1820	18 V	
	EB 18B		
	EB 24B	24 V	

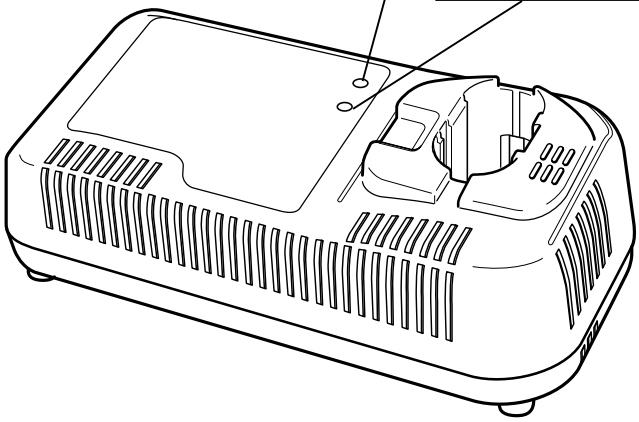
4. SELLING POINTS

Capable of charging batteries at low temperatures rapidly
(The charging time required for recharging a battery at a temperature of -5˚C is shortened from 2.5 hours to 40 minutes.)

Capable of charging conventional 7.2 V to 24 V batteries

Charging time indicator lamp indicates the time up to completion of charging in 3 steps (remaining charging time can be seen at a glance).

Charging status indicator lamp indicates the charging status.



Equipped with the battery revitalizing (trickle charging) function

4-1. Selling Point Descriptions

4-1-1. Capable of charging batteries at low temperatures rapidly

The Model UC 24YJ can charge a battery at a temperature of 5˚C or less. At first, the battery is charged at a low charging current. When the battery gets warm (over 5˚C), the charging current turns high. Thus a battery at a low temperature can be rapidly charged. (The time required for charging a 3.0-Ah Ni-MH battery at -5˚C is shortened from 2.5 hours to 40 minutes.)

4-1-2. Time up to completion of charging is indicated in 3 steps

Voltage and temperature of the battery are detected by the microcomputer during charging. The time up to completion of charging is assumed according to the result of detection and indicated in three steps by the charging time indicator lamp (red/orange/green). Thus the remaining charging time can be seen at a glance. (Refer to the table on page 4 for relationship between the charging time indication and the battery.)

○ When the charging time indicator lamp lights red continuously:

When the charging time indicator lamp lights red continuously after charging commences, charging will be completed about 30 minutes later. As charging proceeds, indication of the indicator lamp changes. When the remaining charging time is about 20 minutes, the charging time indicator lamp lights orange continuously. When the remaining charging time is about 5 minutes, the charging time indicator lamp lights green continuously.

○ When the charging time indicator lamp lights orange continuously:

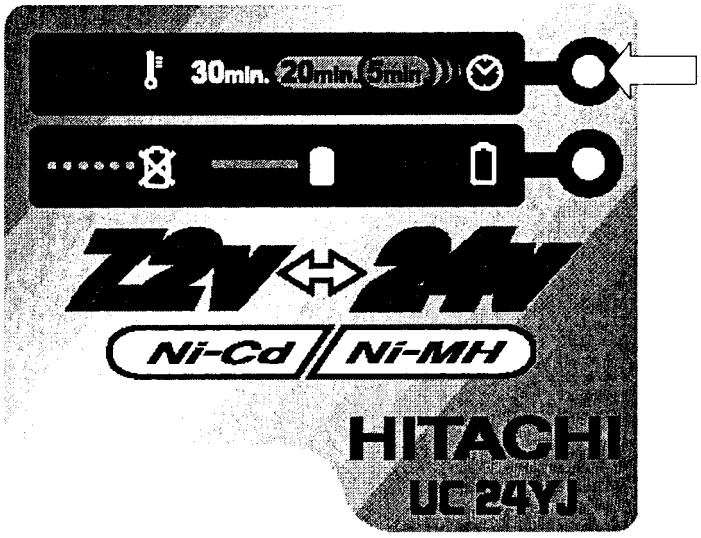
When the charging time indicator lamp lights orange continuously after charging commences, charging will be completed about 20 minutes later. As charging proceeds, indication of the indicator lamp changes. When the remaining charging time is about 5 minutes, the charging time indicator lamp lights green continuously.

○ When the charging time indicator lamp lights green continuously:

When the charging time indicator lamp lights green continuously after charging commences, charging will be completed about 5 minutes later.

○ Charging time lamp indication is only a guide, and may vary depending on the surrounding temperature and battery conditions.

○ Charging time lamp indication may switch to a longer indication (e.g. from green lighting (remaining time about 5 minutes) to red lighting (remaining time about 30 minutes)). This is because the Model UC 24YJ makes a correction according to the battery status when there is an error in the indication. This is not a malfunction of the charger or the battery.



Charging time indicator lamp

Lights red continuously:
30 minutes until charging is completed.

Lights orange continuously:
20 minutes until charging is completed.

Lights green continuously:
5 minutes until charging is completed.

Fig. 1 Charging time indication

Relationship between charging time indication and battery

Lamp indication	Battery type	Battery temperature	Battery status
Lights red continuously. (About 30 minutes until charging is completed)	Ni-MH	5˚C or less	No power
		40˚C or more	No power
		-5˚C to 50˚C	Near the end of service life or inactive due to extensive non-use periods
	Ni-Cd	-5˚C or less	No power or half power
		-5˚C to 55˚C	Near the end of service life or inactive due to extensive non-use periods
Lights orange continuously. (About 20 minutes until charging is completed)	Ni-MH	5˚C or less	Half power
		40˚C or more	Half power
		5˚C to 40˚C	No power or half power
	Ni-Cd	-5˚C to 55˚C	No power or half power
Lights green continuously. (About 5 minutes until charging is completed)	Ni-MH	-5˚C to 50˚C	Full power
	Ni-Cd	-5˚C to 55˚C	Full power

* No power: The battery is dead and has no power.
Half power: The battery has half the full power.
Full power: The battery is almost in the fully charged status.

4-1-3. Equipped with the battery revitalizing (trickle charging) function

Refer to "5-3-7. Revitalizing the battery (trickle charging)" on page 16 for details.

4-1-4. Capable of charging conventional 7.2 V to 24 V batteries

The Model UC 24YJ can charge conventional 7.2 V to 24 V batteries thanks to the charging controller.

5. SPECIFICATIONS

5-1. Specifications

Item	Description
Power source	AC single-phase, 50 Hz or 60 Hz Voltage 230 V
Power input	200 W
Charging system	Constant current charge with switching power source
Overcharging protection system	(1) Detecting the rate of change of the battery voltage ($\triangle^2$V) (2) Detecting the rate of change of the battery surface temperature (dT/dt) (3) Battery surface temperature detection (thermostat or thermistor) (4) Timer
Charging voltage	7.2 V ─ 9.6 V ─ 12 V ─ 14.4 V ─ 18 V ─ 24 V
Product weight	1.0 kg
Operating ambient temperature range	0 ˚C to 40 ˚C

5-2. Comparisons with Similar Products

Item \ Maker • Model		Unit	HITACHI			B		C
			UC 24YJ					
Battery type	Ni-MH	─	○ (Inserting type)			○ (Inserting type)		○ (Inserting type)
	Ni-Cd	─	○ (Inserting type)			○ (Inserting type)		○ (Inserting type)
Chargeable battery voltage		V	7.2 to 24			7.2 to 24		7.2 to 14.4
Charging time	Battery voltage	V	7.2 to 14.4	18	24	7.2 to 14.4	24	7.2 to 14.4
	Ni-MH 3Ah	min.	27	28	30	41	41	No applicable battery
	Ni-MH 2Ah	min.	No applicable battery			25	25	No applicable battery
	Ni-Cd 2Ah	min.	14	18	20	15	18	16
Charging current		A	9	7.5	6	Ni-MH: 7 Ni-Cd: 10	Ni-MH: 7 Ni-Cd: 8.5	9
Chargeable battery temperature range	Ni-MH	˚C	-5 to 50			0 to 60		[0 to 45]
	Ni-Cd	˚C	-5 to 55			0 to 60		[-5 to 55]
Overcharge protection system		─	$\triangle^2$V dT/dt Timer			Peak cut		Peak cut T Timer
Indication of the time up to completion of charging		─	○ (3 steps)			×		×
Service life of battery cycle	Ni-MH	Cycles	500			No indication on the catalog		No indication on the catalog
	Ni-Cd	Cycles	1000					
External dimensions		mm	110 x 226 x 75 (4-11/32" x 8-29/32" x 2-31/32")			160 x 202 x 79 (6-19/64" x 7-31/32" x 3-7/64")		140 x 192 x 68 (5-17/32" x 7-9/16" x 2-11/16")
Weight		kg	1.0 (2.2 lbs.)			1.0 (2.2 lbs.)		1.0 (2.2 lbs.)

[ ]: Estimated value

5-3. Explanation of the Specifications

5-3-1. Charging system (Common to the Model UC 24YC)

Most of rapid type chargers made by Hitachi and competitors are equipped with a switching power source system that controls constant charging current by turning on and off (switching) the control switch at high frequency (see Fig. 2). The Model UC 24YJ is also equipped with this system, however, the high frequency may cause noise in a television or a radio. To prevent this noise problem, avoid connecting the Model UC 24YJ to the same receptacle where a television or a radio is connected. In addition, keep a distance between the Model UC 24YJ and the television or the radio during charging. The rapid type chargers made by competitors have the same demerit due to the switching power source system.

Chargers equipped with the switching power source system (Examples)

HITACHI	Competitors	
	B	C
UC 24YJ UC 24YC	AL 15FC2498	DC 1439

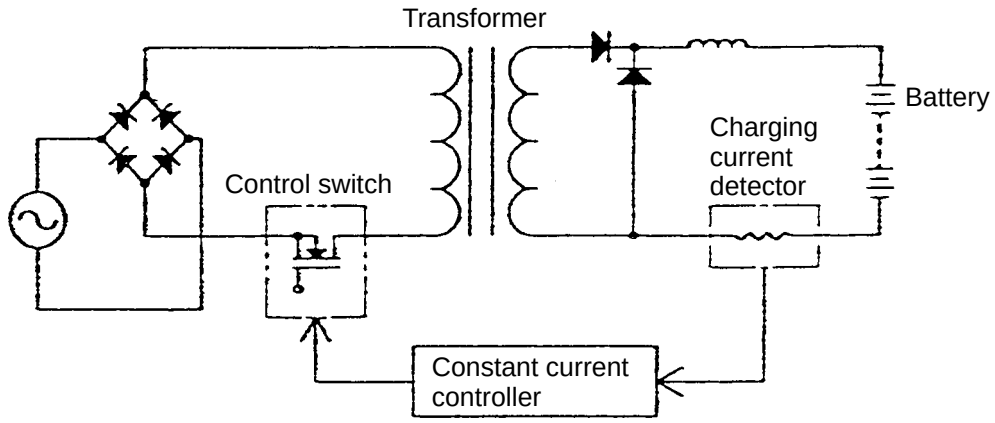


Fig. 2 Circuit diagram

5-3-2. Overcharge protection system

The Model UC 24YJ is equipped with a 4-way overcharge protection system ($\triangle^2V$, dT/dt, battery surface temperature sensor and timer) to protect overcharging.

(1) Stops charging after full charging by means of both $\triangle^2V$ overcharge protection system and dT/dt overcharge protection system:

As shown in Fig. 3, voltage and temperature of a battery increase suddenly near the end of charging. The $\triangle^2V$ overcharge protection system detects such a sudden rate of change in the battery voltage and stops charging just before the overcharge range (*). The dT/dt overcharge protection system detects a sudden rate of change in the battery temperature and stops charging just before the overcharge range. Normally the charging stop position by the $\triangle^2V$ overcharge protection system is almost the same as that by the dT/dt overcharge protection system. However, when the battery is inactive due to extensive non-use periods or near the end of the service life, the battery voltage does not change suddenly and charging may not be stopped by the $\triangle^2V$ overcharge protection system. The Model UC 24YJ is equipped with the dT/dt overcharge protection system as well as the $\triangle^2V$ overcharge protection system in order to prevent overcharge even in such cases. The Model UC 24YJ always stops charging just before the overcharge range. Thus the charging/discharging cycles of a battery is increased.

Charging/discharging cycles of a battery (ambient temperature 20°C)
• Ni-MH: about 500 cycles
• Ni-Cd: about 1,000 cycles

(*) In the overcharge range, the battery internal gas pressure rises rapidly due to generation of gas and it causes high temperature, oxidation of atmosphere that promote degradation. If charging is continued in such conditions, the safety valve will be activated and the electrolyte will be leaked from the battery.

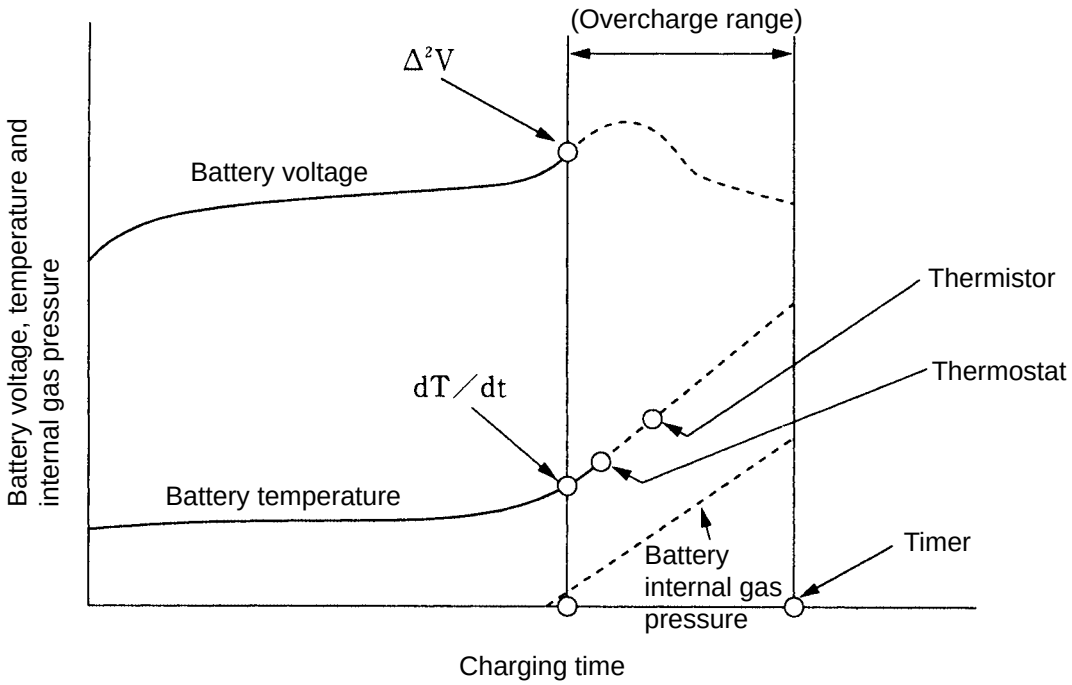


Fig. 3 Relationship between charging time and battery voltage, temperature and internal gas pressure

(2) Forcefully stops charging by means of battery internal temperature sensor:

As shown in Figs. 4 and 5, each of the applicable batteries is equipped with a built-in thermistor or thermostat to detect the battery temperature. Charging is stopped when the battery reaches the charging stop temperature even if the battery is not fully charged.

- When charging a high-temperature battery, the thermostat or the thermistor automatically controls to wait until the battery cools down and then start charging.
- In most cases of Ni-MH batteries, charging may stop before the battery is fully charged because the detecting temperature of the thermistor is set as low as 55˚C and the temperature rise is rapid when the battery temperature is high (see Fig. 6).

Control of charging according to battery temperature

Battery type	Model	When charging a high-temperature battery
Ni-MH batteries	EB 9H EB 12H EB 1222HL EB 14H EB 18H EB 930H EB 1230H EB 1230HL EB 1430H EB 1830H EB 2430H	When the battery temperature is over 50˚C, the charge time lamp flashes red in 0.6-second intervals. When the battery cools down to 50˚C, the charge time lamp lights red or orange or green continuously and starts charging.
Ni-Cd batteries	EB 7S EB 9S EB 12S EB 14S EB 7B EB 9B EB 9M EB 12B EB 1220BL EB 12M EB 14B EB 1820 EB 18B EB 24B	When the battery temperature is over 55˚C, the charge time lamp flashes red in 0.6-second intervals. When the battery cools down to 55˚C, the charge time lamp lights red or orange or green continuously and starts charging.

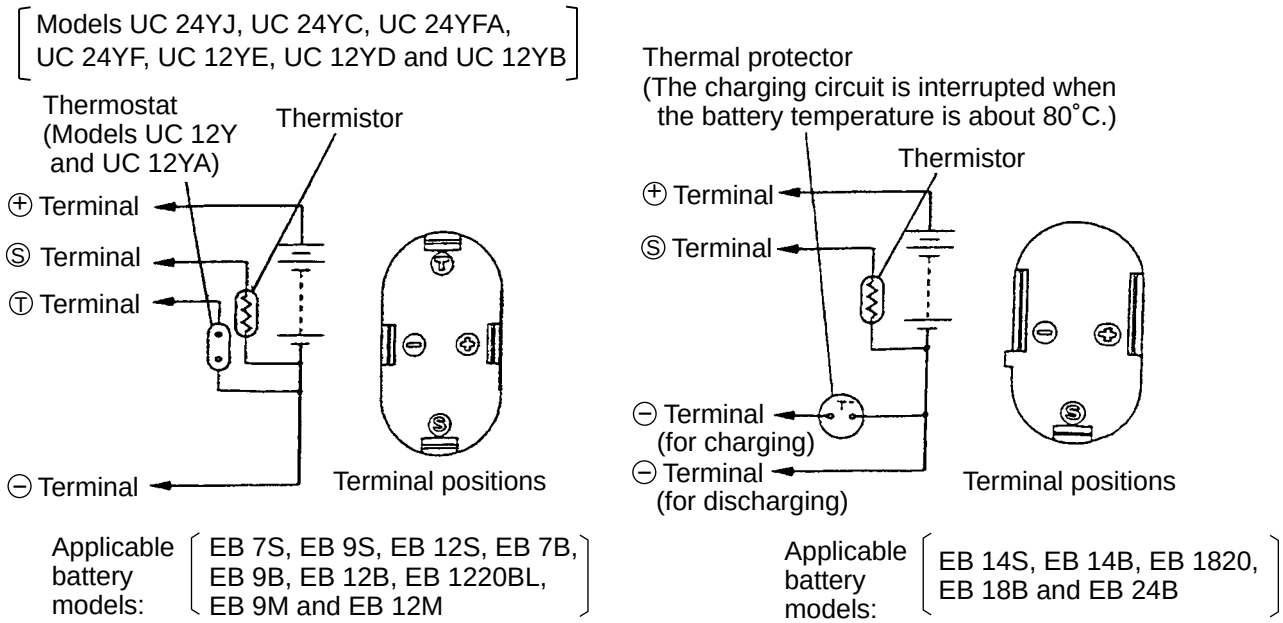


Fig. 4

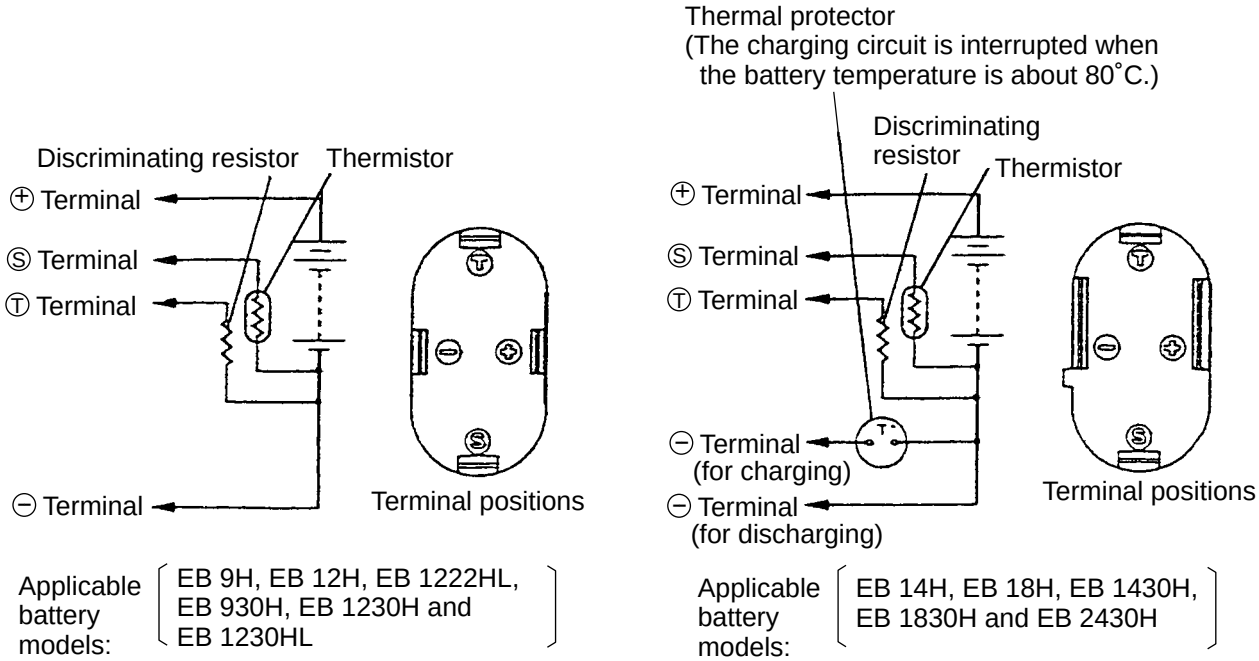


Fig. 5

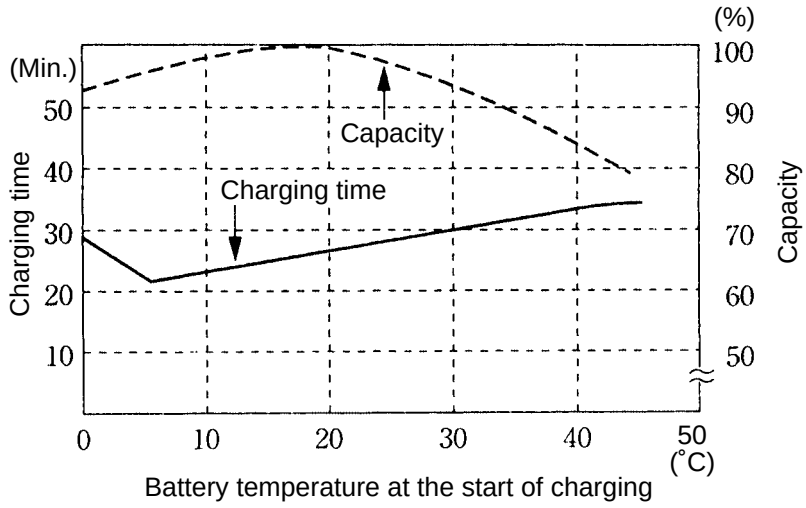


Fig. 6 Relationship between battery temperature at the start of charging, charging time and capacity In the case of Ni-MH batteries

(3) Forcefully stops charging by means of timer:

Should $\triangle^2V$ overcharge protection system, dT/dt overcharge protection system and battery surface temperature sensor fail, the timer stops charging.

5-3-3. Discrimination of batteries

A discriminating resistor is provided in each Ni-MH battery to distinguish from Ni-Cd batteries as shown in Fig. 5.

5-3-4. Lamp indications

The indicator lamps show the charging time and status as follows.

Lamp indications

Lamp indications				Status
Charge time lamp (red/orange/ green)	Charging time 30 minutes	Lit red	On continuously	30 minutes until charging complete.
	Charging time 20 minutes	Lit orange	On continuously	20 minutes until charging complete.
	Charging time 5 minutes	Lit green	On continuously	5 minutes until charging complete.
	Overheat standby	Flashing red	On 0.3 second, off 0.3 second	Battery overheated. Unable to charge. (Charging will commence when battery cools.)
Charge status lamp (red/ orange/ green)	Before charging	Flashing red	On 0.5 second, off 0.5 second	Power cord is connected to receptacle.
	Charging complete	Lit green	On continuously	
	Charging impossible	Flashing orange rapidly	On 0.1 second, off 0.1 second	Battery or charger malfunction.

5-3-5. Beeper

The beeper sounds when charging is completed and also when the charger or the battery is abnormal as shown in the following table.

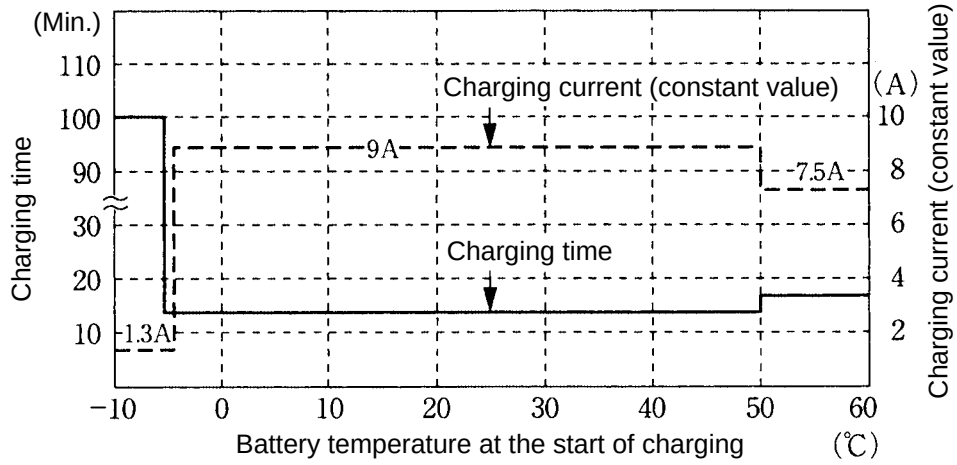
Conditions when the beeper sounds	Beeping sound
When charging is completed	A 6-second long beep
When the charger or the battery is abnormal	Short beeps for 5 seconds

5-3-6. Switching the charging current

The charging current is switched according to the temperature of the battery or the charger as described in (1) to (6) below (see Figs. 7 to 12).

(1) 7.2 V to 24 V Ni-Cd batteries

The charging current is switched (9 A/7.5 A/6 A/1.3 A) according to the battery temperature at the start of charging.



In the case of 2.0 Ah Ni-Cd batteries Models EB 7B/EB 9B/EB 9M/EB 12B/EB 1220BL/EB 12M/EB 14B

Fig. 7 Relationship between battery temperature at the start of charging, charging time and current

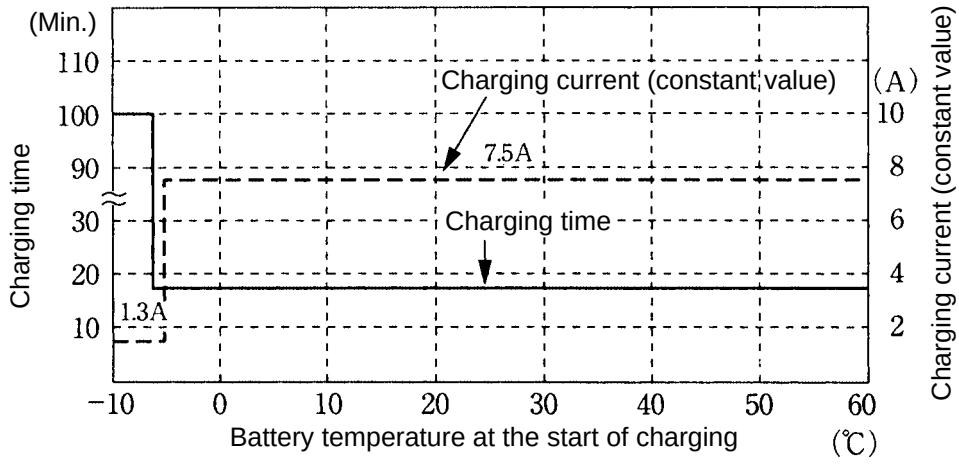
Relationship between temperature of battery/charger and charging current

Temperature	Charging current	Purpose
Battery temperature at the start of charging is between -5˚C and 50˚C.	9 A	——
Battery temperature at the start of charging is 50˚C or more.	7.5 A	Protection of the battery
Battery temperature at the start of charging is -5˚C or less.	1.3 A (*)	
Inside of the charger becomes hot during charging at 9 A (see Fig. 13).	Switch from 9 A to 6 A	Protection of the charger

(*) The battery is also charged at 1.3 A when the battery is near the end of its service life. Otherwise, the battery temperature becomes high due to the high internal resistance and it is dangerous.

(2) 18 V Ni-Cd batteries

The charging current is switched (7.5 A/5 A/1.3 A) according to the battery temperature at the start of charging.



In the case of 2.0 Ah Ni-Cd batteries Models EB 1820/EB 18B

Fig. 8 Relationship between battery temperature at the start of charging, charging time and current

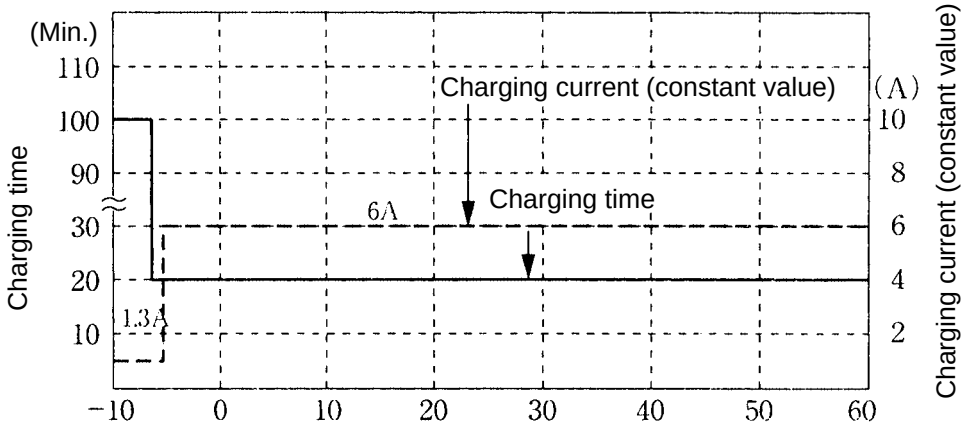
Relationship between temperature of battery/charger and charging current

Temperature	Charging current	Purpose
Battery temperature at the start of charging is between -5˚C and 55˚C.	7.5 A	——
Battery temperature at the start of charging is -5˚C or less.	1.3 A (*)	Protection of the battery
Inside of the charger becomes hot during charging at 9 A (see Fig. 13).	Switch from 7.5 A to 5 A.	Protection of the charger

(*) The battery is also charged at 1.3 A when the battery is near the end of its service life. Otherwise, the battery temperature becomes high due to the high internal resistance and it is dangerous.

(3) 24 V Ni-Cd batteries

The charging current is switched (6 A/1.3 A) according to the battery temperature at the start of charging.



In the case of 2.0 Ah Ni-Cd battery Model EB 24B

Fig. 9 Relationship between battery temperature at the start of charging, charging time and current

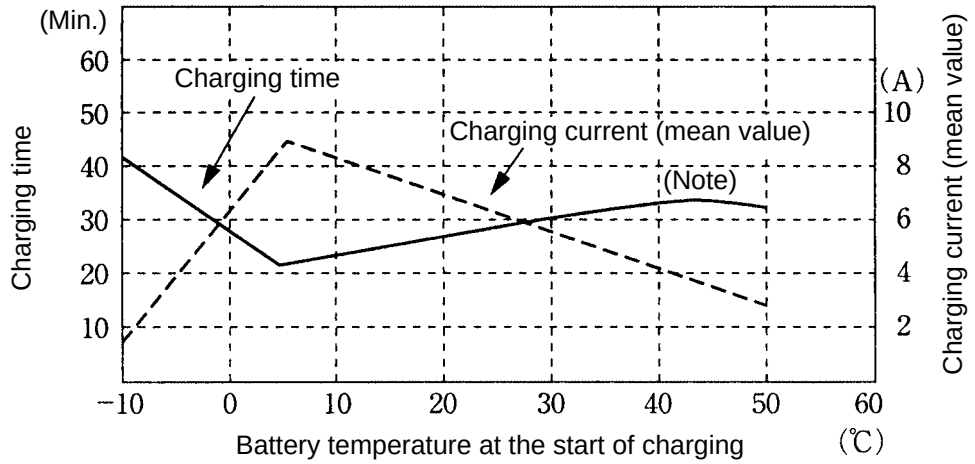
Relationship between temperature of battery/charger and charging current

Temperature	Charging current	Purpose
Battery temperature at the start of charging is between -5˚C and 55˚C.	6 A	——
Battery temperature at the start of charging is -5˚C or less.	1.3 A (*)	Protection of the battery

(*) The battery is also charged at 1.3 A when the battery is near the end of its service life. Otherwise, the battery temperature becomes high due to the high internal resistance and it is dangerous.

(4) 7.2 V to 14.4 V Ni-MH batteries

The charging current is switched (9 A/6 A/4 A/1.3 A) according to the battery temperature at the start of charging. Therefore, the charging time changes as shown in Fig. 10.



In the case of 3.0 Ah Ni-MH batteries Models EB 930H/EB 1230H/EB 1230HL/EB 1430H

Fig. 10 Relationship between battery temperature at the start of charging, charging time and current

Note) Charging times may be longer according to the increase in battery temperature. However, the thermistor that is a battery surface temperature sensor stops charging before the battery is fully charged. Thus charging is stopped at an early stage.

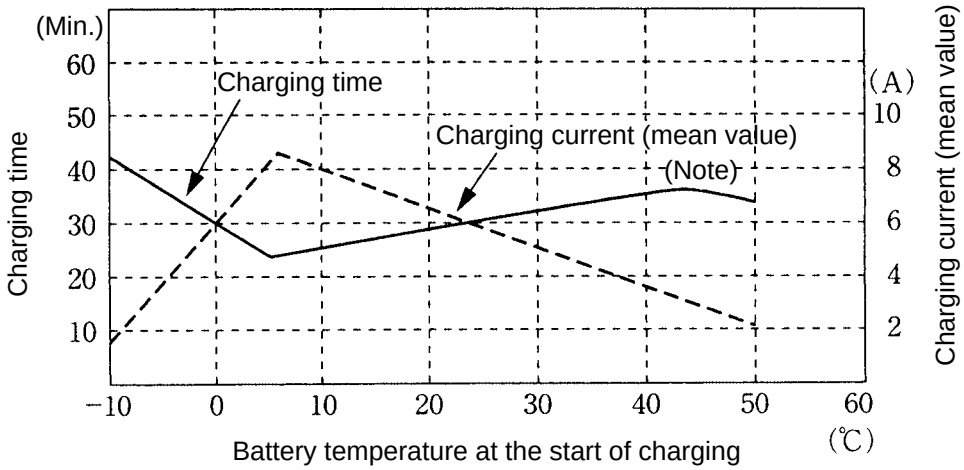
Relationship between temperature of battery/charger and charging current

Temperature	Charging current	Purpose
Battery temperature at the start of charging is between 5˚C and 40˚C.	9 A	——
Battery temperature at the start of charging is between 40˚C and 50˚C.	4 A	Protection of the battery
Battery temperature at the start of charging is between -5˚C and 5˚C.	Switch from 1.3 A to 4 A	Saving the charging time
Battery temperature at the start of charging is -5˚C or less.	1.3 A (*)	Protection of the battery
Battery temperature becomes over 45˚C during charging at 9 A or 6 A.	Switch from 9 A (6 A) to 4 A	
Battery temperature becomes over 5˚C during charging a low-temperature battery (5˚C or less).	Switch from 4 A to 6 A	Saving the charging time
Inside of the charger becomes hot during charging at 9 A (see Fig. 13).	Switch from 9 A to 6 A	Protection of the charger

(*) The battery is also charged at 1.3 A when the battery is near the end of its service life. Otherwise, the battery temperature becomes high due to the high internal resistance and it is dangerous.

(5) 18 V Ni-MH battery

The charging current is switched (7.5 A/6 A/5 A/4 A/1.3 A) according to the battery temperature at the start of charging. Therefore, the charging time changes as shown in Fig. 11.



In the case of 3.0 Ah Ni-MH battery Model EB 1830H

Fig. 11 Relationship between battery temperature at the start of charging, charging time and current

Note) Charging times may be longer according to the increase in battery temperature. However, the thermistor that is a battery surface temperature sensor stops charging before the battery is fully charged. Thus charging is stopped at an early stage.

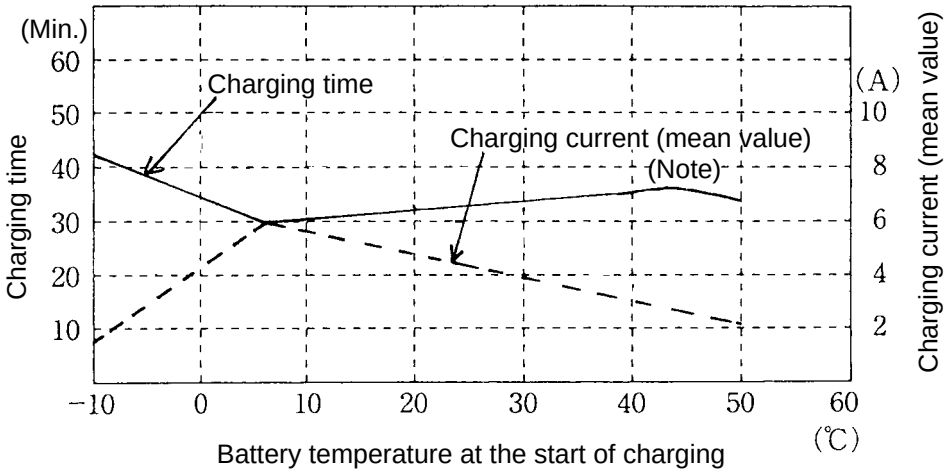
Relationship between temperature of battery/charger and charging current

Temperature	Charging current	Purpose
Battery temperature at the start of charging is between 5˚C and 40˚C.	7.5 A	——
Battery temperature at the start of charging is between 40˚C and 50˚C.	4 A	Protection of the battery
Battery temperature at the start of charging is between -5˚C and 5˚C.	Switch from 1.3 A to 4 A	Saving the charging time
Battery temperature at the start of charging is -5˚C or less.	1.3 A (*)	Protection of the battery
Battery temperature becomes over 45˚C during charging at 7.5 A or 6 A.	Switch from 7.5 A (6 A) to 4 A	
Battery temperature becomes over 5˚C during charging a low-temperature battery (5˚C or less).	Switch from 4 A to 6 A	Saving the charging time
Inside of the charger becomes hot during charging at 7.5 A (see Fig. 13).	Switch from 7.5 A to 5 A	Protection of the charger

(*) The battery is also charged at 1.3 A when the battery is near the end of its service life. Otherwise, the battery temperature becomes high due to the high internal resistance and it is dangerous.

(6) 24 V Ni-MH battery

The charging current is switched (6 A/4 A/1.3 A) according to the battery temperature at the start of charging. Therefore, the charging time changes as shown in Fig. 12.



In the case of 3.0 Ah Ni-MH battery Model EB 2430H

Fig. 12 Relationship between battery temperature at the start of charging, charging time and current

Note) Charging times may be longer according to the increase in battery temperature. However, the thermistor that is a battery surface temperature sensor stops charging before the battery is fully charged. Thus charging is stopped at an early stage.

Relationship between temperature of battery/charger and charging current

Temperature	Charging current	Purpose
Battery temperature at the start of charging is between 5˚C and 40˚C.	6 A	——
Battery temperature at the start of charging is between 40˚C and 50˚C.	4 A	Protection of the battery
Battery temperature at the start of charging is between -5˚C and 5˚C.	Switch from 1.3 A to 4 A	Saving the charging time
Battery temperature at the start of charging is -5˚C or less.	1.3 A (*)	Protection of the battery
Battery temperature becomes over 45˚C during charging at 6 A.	Switch from 6 A to 4 A	
Battery temperature becomes over 5˚C during charging a low-temperature battery (5˚C or less).	Switch from 4 A to 6 A	Saving the charging time

(*) The battery is also charged at 1.3 A when the battery is near the end of its service life. Otherwise, the battery temperature becomes high due to the high internal resistance and it is dangerous.

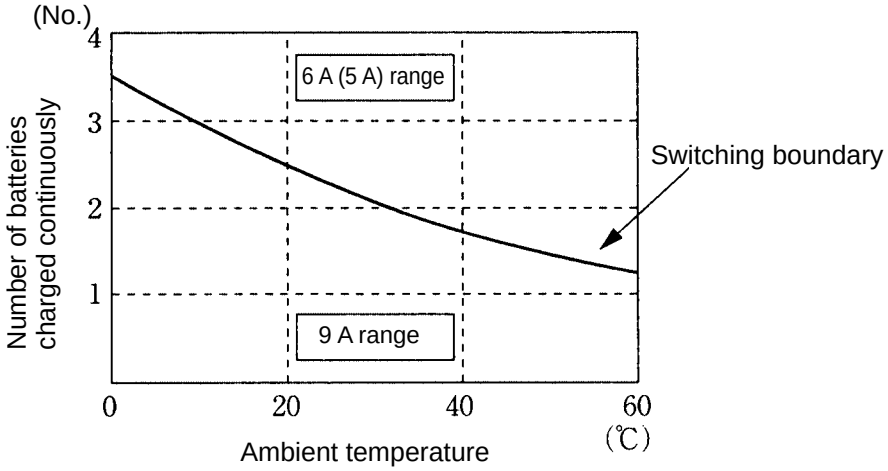


Fig. 13 Time required to switch from 9 A to 6 A (5 A)

5-3-7. Revitalizing the battery (trickle charging)

This is a function to charge a battery further after completion of charging as shown in Fig. 14 (repeats the following cycle 10 times: 1-hour pause and 15-minute charging at 1.3 A). A new battery or a battery that has not been used for extensive periods (6 months as a guide) may not be charged completely due to inert internal chemicals. Leave the battery inserted in the charger for 8 to 12 hours after completion of charging. The charger automatically "revitalizes" the battery by trickle recharging.

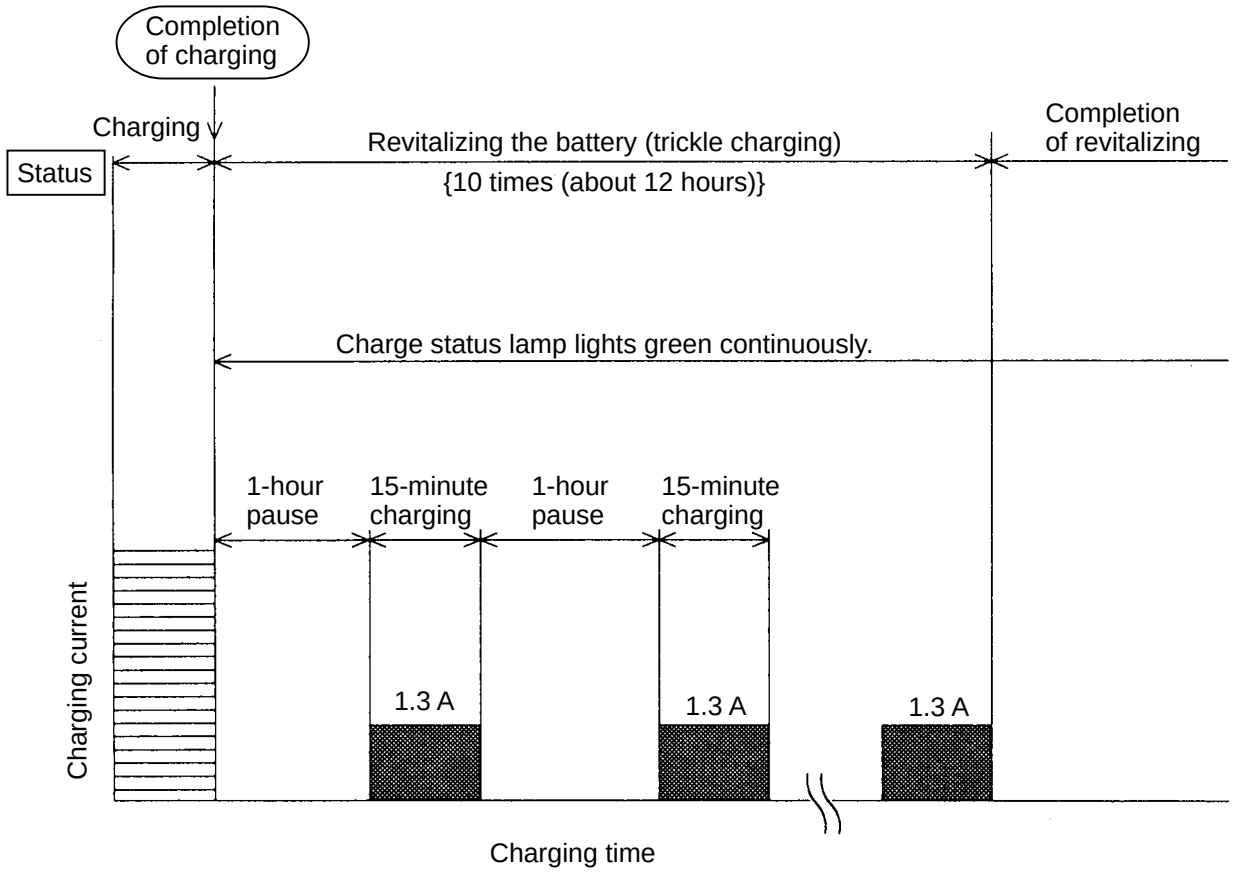


Fig. 14 Revitalizing the battery (trickle charging)

5-3-8. Safety device

The Model UC 24YJ is equipped with a safety device that stops charging (and extinguishes the lamp) if any of the following troubles occurs.

① The electrolyte adheres to the thermistor built in the battery. The battery temperature cannot be detected correctly in this case.

② The relay in the charger is at the end of its service life.

How to check whether it is a failure of the battery or the charger

If the lamp goes off, disconnect the power cord plug from the receptacle first. Wait 3 to 5 minutes then connect the power cord plug to the receptacle again.

In the case of ① , the lamp lights and the charger operates normally.

In the case of ② , the lamp does not light and the charger is at the end of its service life.

5-4. Batteries

5-4-1. Types and characteristics of batteries

Two types of batteries are available for electric power tools, Ni-Cd batteries and Ni-MH batteries. The characteristics of the Ni-Cd batteries and the Ni-MH batteries are described in the table below.

Item	Characteristics
Capacity	• Ni-MH batteries have higher capacity than Ni-Cd batteries.
Self-heating during charging	• Ni-MH batteries have higher self-heating value than Ni-Cd batteries.
Relationship between discharging capacity and temperature	• See Fig. 15.
Impact on the environment	• Ni-Cd batteries give impact on the environment as they include a harmful substance (cadmium). • Ni-MH batteries are environmentally friendly as they do not include any harmful substance.

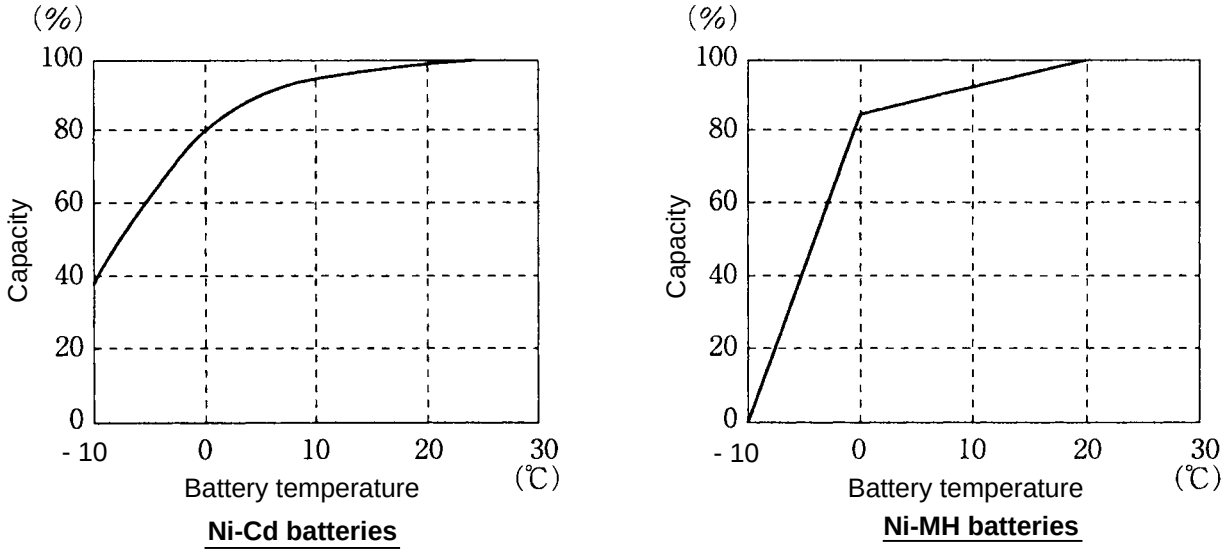


Fig. 15 Relationship between battery temperature and capacity

(*) If a Ni-MH battery is used (discharged) when the battery temperature is 0˚C or less, the battery performance is extremely low at first but it becomes normal near the end of the operation because the battery is warmed up. When the battery temperature is -10˚C or less and the capacity is 0, warm up the battery by charging.

5-4-2. Serial numbers of batteries

The serial number of a battery is indicated on the name plate or marked on the upper case of the battery.

○ Indication on the name plate of the battery

The numeral indicated at the serial number column means the last digit of the production year and the number of dots (total of 12) means the production month.

Example) Figure 16 shows the case when the production date is April 1998 (12 - 8 = 4 (April)).

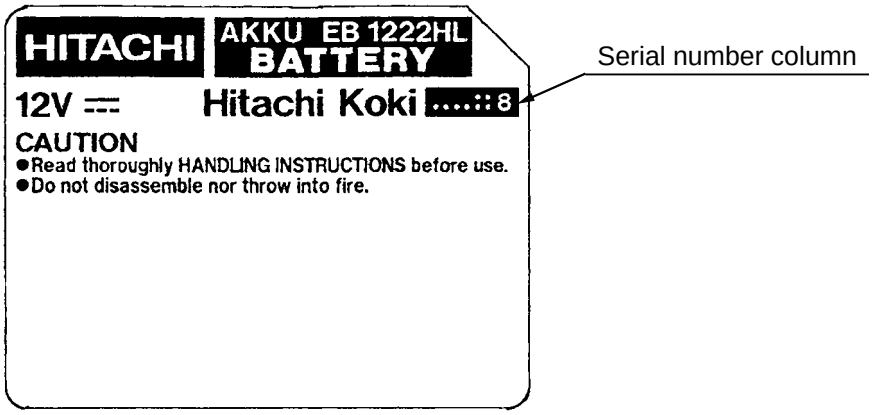


Fig. 16 Name plate

○ Marking on the upper case of the battery

The serial number is indicated with four digits (the last two digits of the production year + production week) by marking.

Example) Figure 17 shows the case when the production date is April 1998 (the 15th week = April).

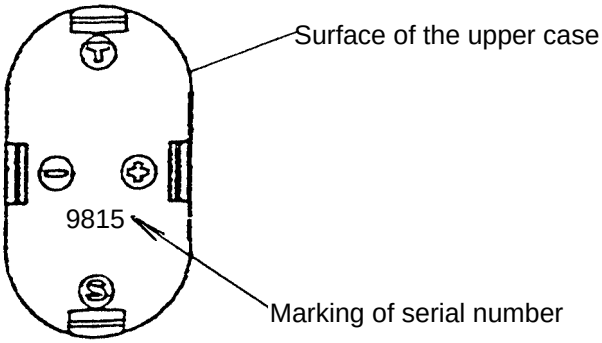


Fig. 17 Upper case of battery

6. PRECAUTIONS IN SALES PROMOTION

6-1. Safety Instructions

In the interest of promoting the safest and most efficient use of the Model UC 24YJ Charger by all of our customers, it is very important that at the time of sale the salesperson carefully ensures that the buyer seriously recognizes the importance of the contents of the Handling Instructions.

6-1-1. Handling instructions

Salespersons must be thoroughly familiar with the contents of the Handling Instructions in order to give pertinent advice to the customer.

(1) Connect the charger to an AC power outlet only.
Use of any other power source (DC outlet, fuel-powered generator, etc.) will cause the charger to overheat and burn out.

(2) Do not use any voltage-increasing equipment (transformer, voltage regulator, etc.) between the power source and the charger.
If the charger is used with voltage over and above that indicated on the unit, it will not function properly.

(3) Conduct battery charging in an ambient temperature range of 0 ˚C – 40 ˚C.
If charging is attempted when the ambient temperature is below -5 ˚C, overcharging occurs because the thermistor and thermostat do not function properly, thereby reducing the service life of the battery.
If charging is attempted when the ambient temperature is above 40 ˚C, it is possible to charge batteries with an Ⓢ terminal, the service life of the batteries may be considerably reduced.

(4) Do not use the charger for successive charging.
In very hot locations, if two or more batteries are charged successively the temperature of the charger will rise excessively, and might cause the charger to fail. Instruct the customer to wait at least 5 minutes before commencing next charging. Particular care is necessary in summer or tropical countries when the power source voltage is high.

(5) Do not insert foreign objects into the air vent on the charger.
The charger case is equipped with air vents to protect the internal electronic components from overheating. Caution the customer not to allow foreign materials, such as metallic or inflammable objects, to be dropped or inserted into the air vents. This could cause electrical shock, fire or other serious hazards.

(6) Do not attempt to disassemble the charger.
Incorrect parts replacement and/or wiring will cause malfunctions which could result in fire or other hazards. Instruct the customer to bring the charger to an authorized service center in the event repair or replacement is necessary.

6-2. Extra Precautions in Sales Promotion

The following points must be given during sales promotion.

6-2-1. Charging may not be possible when the battery temperature is high

Charging may not be possible if the temperature of the battery is high after it has been exposed to direct sunlight for a long time or immediately after it has been used.

The customer should be advised in such a case to place the battery in a shaded area with good airflow, and allow sufficient cooling before recharging. This phenomenon is common to all existing batteries and chargers which employ temperature sensitive overcharge protection devices. The cooling time required before recharging varies from a few minutes to about 30 minutes, depending on the load, duration of use and ambient temperature.

6-2-2. Inserting a battery into a charger in reverse direction can cause serious damage to the battery and the charger

Inadvertently inserting a battery into the charger in the reverse direction will not only make it impossible to charge the battery, it can also cause such damage as deformed terminals on the charger and the battery. Customers should be advised to confirm that the battery terminals are correctly aligned before inserting the battery into the charger.

6-2-3. B-2 (7.2 V) and B-3 (9.6 V) batteries cannot be recharged with the Model UC 24YJ

(1) Because the shape of the B-2 (7.2 V) battery is different from others, it cannot be connected to the Model UC 24YJ.

(2) Even if the B-3 (9.6 V) battery is connected to the Model UC 24YJ using the optional accessory adapter, recharging is not possible because the internal wiring of the battery is different from the others.

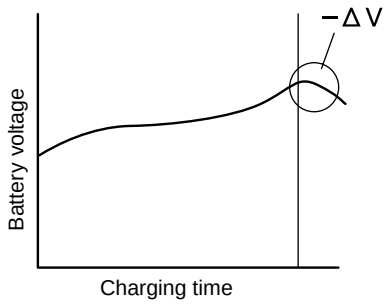
7. QUESTIONS AND ANSWERS ON MODEL UC 24YJ

Q1 What are typical charging methods?

A1 The most recent electronic charging methods are outlined below.

Method A

UC 12Y
UC 12YA

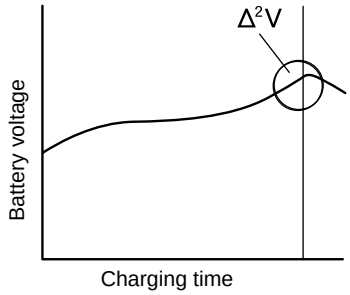


The descending voltage (−ΔV) of the battery in the final stage of charging is detected, and charging is automatically suspended.

−ΔV Charging method

Method B

UC 24YJ
UC 24YC
UC 24YF
UC 14YF2
UC 14YF
UC 12YF
UC 12YD
UC 12YB

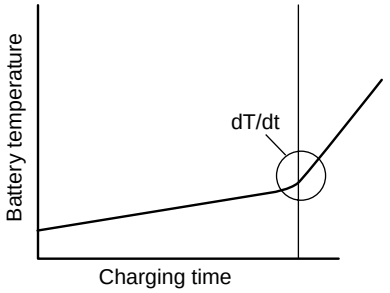


Voltage variation factor immediately before battery becomes fully charged in detected, and charging is automatically suspended.

$\triangle^2$V Charging method

Method C

UC 24YJ
UC 24YC



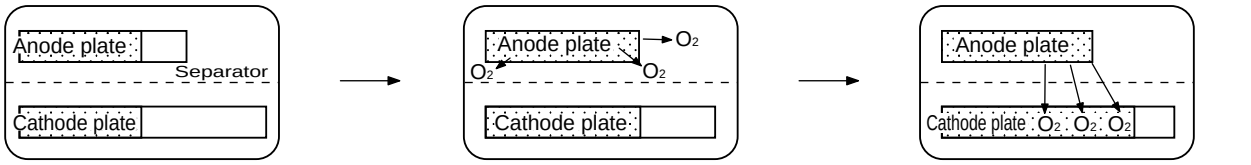
Sudden temperature rise just before full charging is detected and charging is suspended (Ni-MH battery)

dT/dt Charging method

Q2 Why was the $\triangle^2V$ microcomputer control system adopted for the Model UC 24YJ?

A2 If charging is continued after the battery has been fully charged, it will cause a large amount of oxygen gas (O_2) to be generated in a short period of time, as shown below. This proportionately accelerates degradation of the plates.

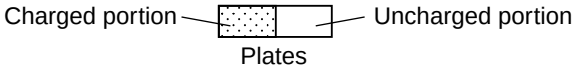
The $\triangle^2V$ microcomputer control system was adopted for the Model UC 24YJ charger in order to stop charging immediately before the battery is fully charged, thereby avoiding the generation of oxygen gas. This charging method applies no stress to the batteries.



Up to full charge. (Charging proceeds almost without deviation.)

Oxygen gas is generated when full charge is reached. (Anode is fully charged.)

Enters overcharge state and begins gas degradation with the cathode.



Q3 What is the difference between the $\triangle^2V$ microcomputer control system and the dT/dt system?

A3 Both systems cut off charging at almost the same point before the battery becomes fully charged.

The $\triangle^2V$ microcomputer control system detects a sudden voltage change which occurs just before the battery is fully charged and then suspends charging. The dT/dt system detects a sudden temperature rise which occurs just before the battery is fully charged and then suspends charging.

Q4 Is there any difference in the amount of work possible per charge of batteries charged with the $\triangle^2V$ microcomputer control system and those charged with dT/dt microcomputer control system?

A4 The dT/dt microcomputer control system may have a slightly shorter charging capacity (approx. 3 to 5 %). However, the amount of work possible per charge varies widely depending on the ambient temperature, the efficiency with which the battery charge is used, etc., so that there is essentially no difference between batteries charged with either system.

Q5 The battery charger is supposed to be used within a temperature range of 0 to 40 ˚C. What happens if it is used for charging at under 0 ˚C or above 40 ˚C?

A5 At temperatures of under 0 ˚C, battery overcharge will occur, resulting in damage to the battery plates because the plates may not function properly. At temperatures over 40 ˚C, sufficient charging cannot be attained, or the plates will be damaged and the recharging/discharging cycles of the batteries will be reduced by half compared to low-temperature charging, even if the battery is fully recharged.

Q6 What is the relationship between the upper limit of the chargeable temperature of the battery and of the battery charger?

A6 Relationships are indicated in the following table:

	Ni-Cd battery			Ni-MH battery	
	EB 7S, EB 7B EB 9S, EB 9B, EB 9M EB 12S, EB 12B EB 1220BL, EB 12M	EB 14S EB 14B	EB 1820 EB 18B EB 24B	EB 9H, EB 930H EB 12H, EB1222HL, EB 1230H, EB 1230HL, EB 14H, EB 1430H	EB 18H, EB 1830H, EB 2430H
UC 24YJ	55 ˚C	55 ˚C	55 ˚C	50 ˚C	50 ˚C
UC 24YC	60 ˚C	60 ˚C	60 ˚C	45 ˚C	45 ˚C
UC 24YF	60 ˚C	60 ˚C	60 ˚C	45 ˚C	45 ˚C
UC 14YF2	60 ˚C	60 ˚C	Charging impossible	45 ˚C	Charging impossible
UC 14YF	60 ˚C	60 ˚C	Charging impossible	Charging impossible	Charging impossible
UC 12YF	60 ˚C	Charging impossible	Charging impossible	Charging impossible	Charging impossible
UC 12YD	60 ˚C	Charging impossible	Charging impossible	Charging impossible	Charging impossible
UC 12YB	60 ˚C	Charging impossible	Charging impossible	Charging impossible	Charging impossible
UC 12Y	40 ˚C	Charging impossible	Charging impossible	Charging impossible	Charging impossible
UC 12YA	40 ˚C	Charging impossible	Charging impossible	Charging impossible	Charging impossible

8. GENERAL PRECAUTIONS

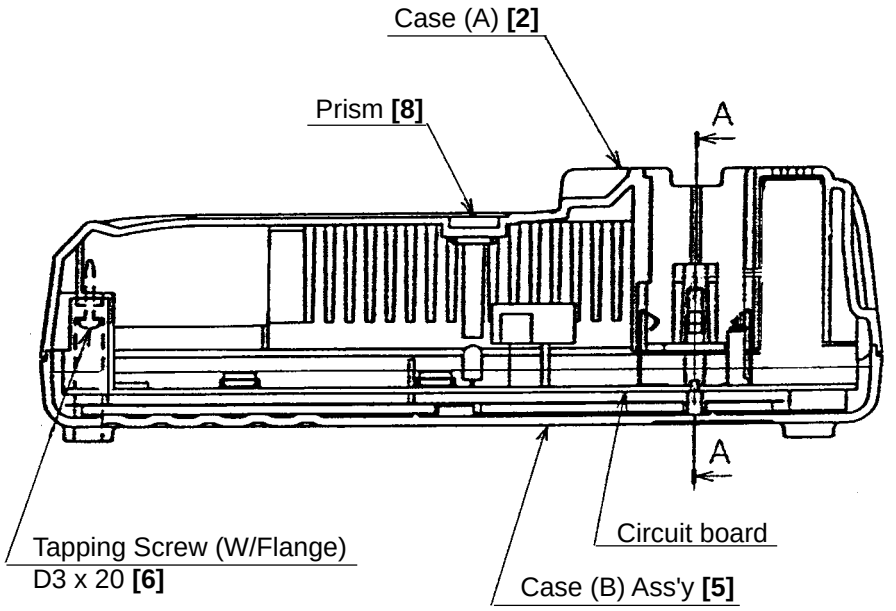
8-1. Model UC 24YJ

(1) The outer frame is composed of case (A) and case (B). A circuit board is built in.

(2) The prism is mounted to case (A).

(3) The terminal for charging, high-frequency transformer for power supply, microcomputer for control, IC, etc. are mounted on the circuit board.

(4) The circuit board is waterproof and secured to case (B) ass'y with urethane resin. It is impossible to remove only the circuit board.



A—A

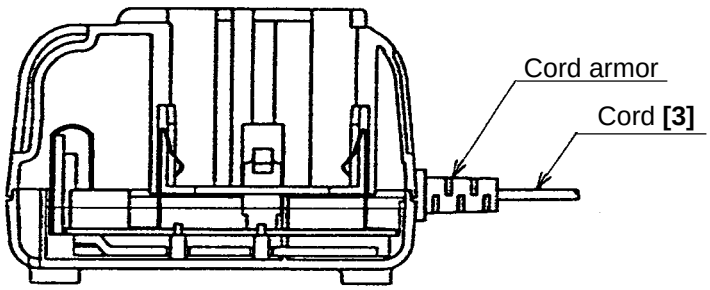
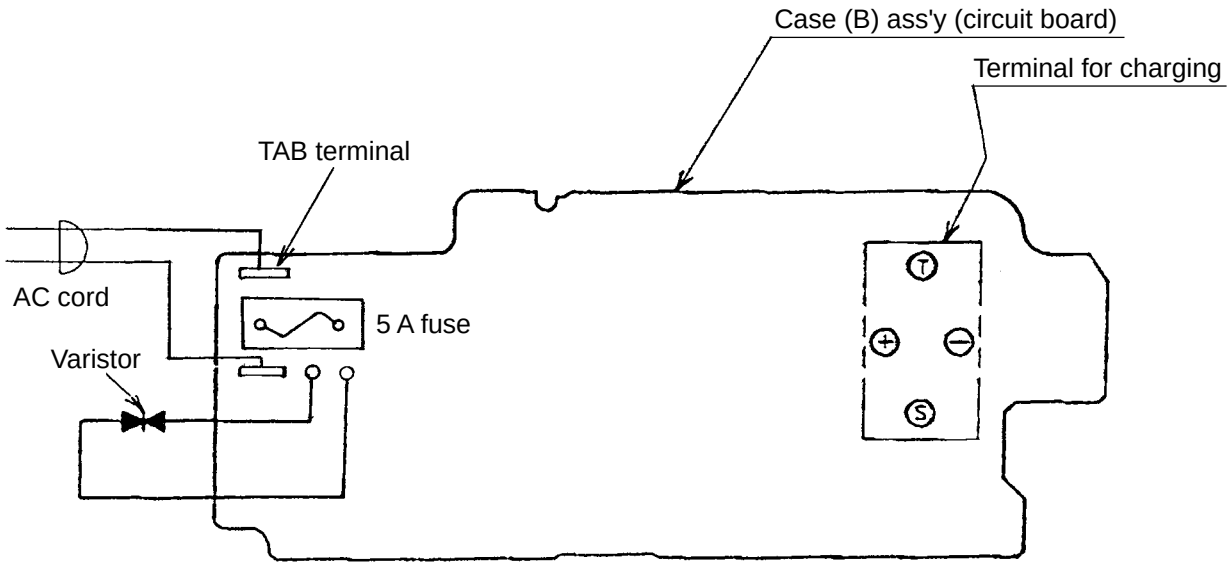


Fig. 18

8-2. Wiring Diagram



8-3. Pilot Lamp Indications

Refer to "5-3-4. Lamp indications" on page 10 for details.

9. PRECAUTIONS IN DISASSEMBLY AND REASSEMBLY

The **[Bold]** numbers in the descriptions below correspond to the item numbers in the Model UC 24YJ Parts List and exploded assembly diagram.

9-1. Disassembly

Remove the four Tapping Screws (W/Flange) D3 x 20 **[6]**, and separate Case (B) Ass'y **[5]** and Case (A) **[2]**.

9-2. Reassembly

Reassembly can be accomplished by following the disassembly procedures in reverse; however, special attention should be given to ensure that lamps, cord armor and charging terminals are properly installed in their prescribed grooves.

9-3. Confirmation after Reassembly

(1) Confirm the following when the battery is fully charged.

- Charge a Ni-MH battery to check that the charge time lamp lights red or orange or green continuously.
- After charging, check that the charge status lamp lights green continuously.

(2) Measure the insulation resistance and conduct a dielectric strength test.

- Insulation resistance: 10 MΩ or more between the plug blade of cord and the Name Plate or case fastening screws, with a DC 500 V megohm tester.
- Dielectric strength test:

  (a) Between the plug blade of cord and the charging terminal blade.

  (b) Between the plug blade of cord and the name plate or fastening screws on the case.

  Based on the voltage listed on the name plate, dielectric strength test should be conducted.

Voltage on the name plate	Test voltage
120 V	AC 1,240 V (1 minute)
230 V, 240 V	AC 3,750 V (1 minute)

CAUTION: Without fail, insulation resistance must be measured between the plug blade of cord and the name plate or fastening screws, and dielectric strength test must be conducted between the plug blade of cord and the charging terminal blade or between the plug blade of cord and the name plate or fastening screws on the case. Under no circumstances should testing be conducted between both blades of the plug, or both blades of the charging terminal, which may cause burn-out of the charger.

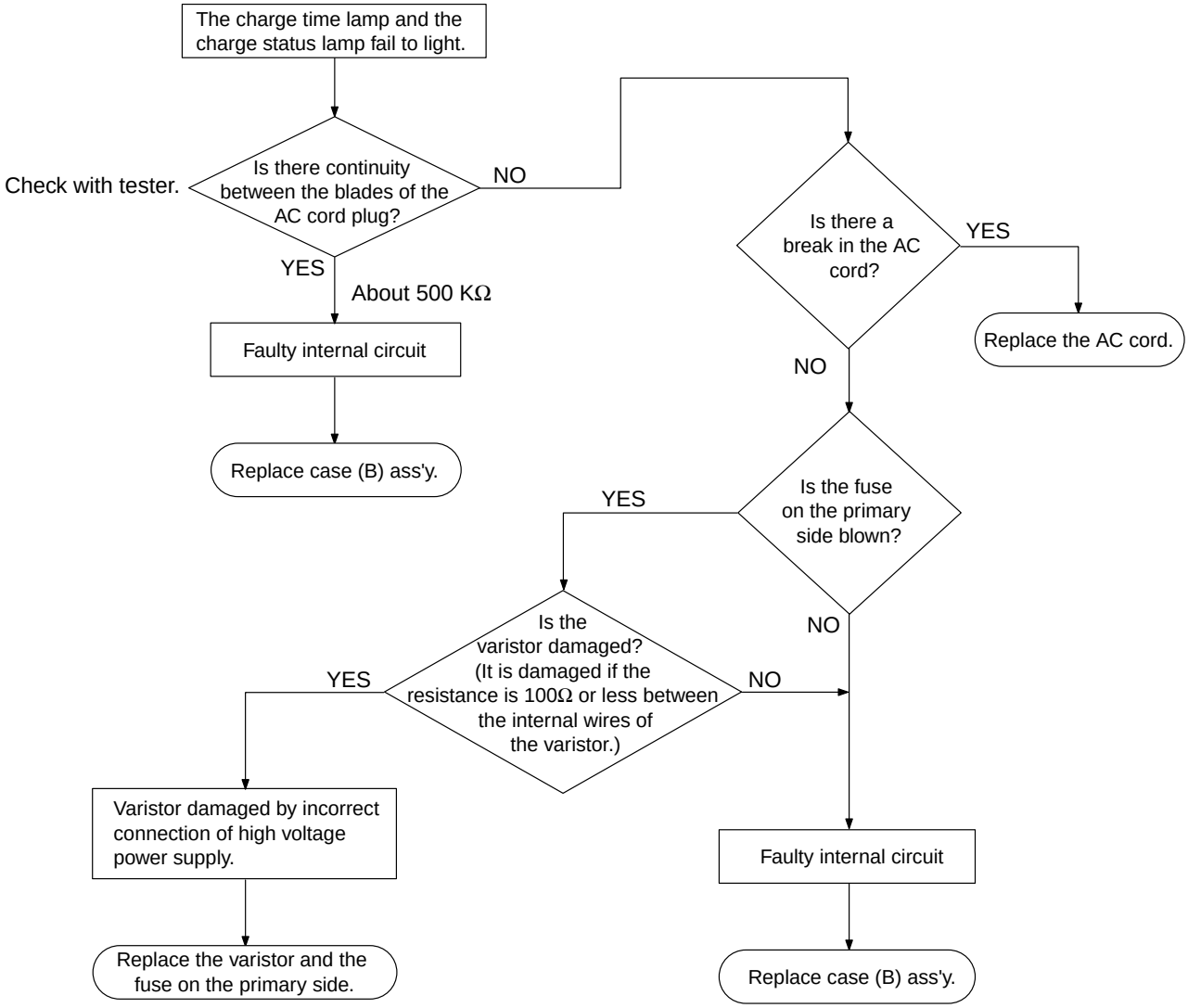
10. TROUBLESHOOTING GUIDE

10-1. Troubleshooting Based on Pilot Lamp Indications

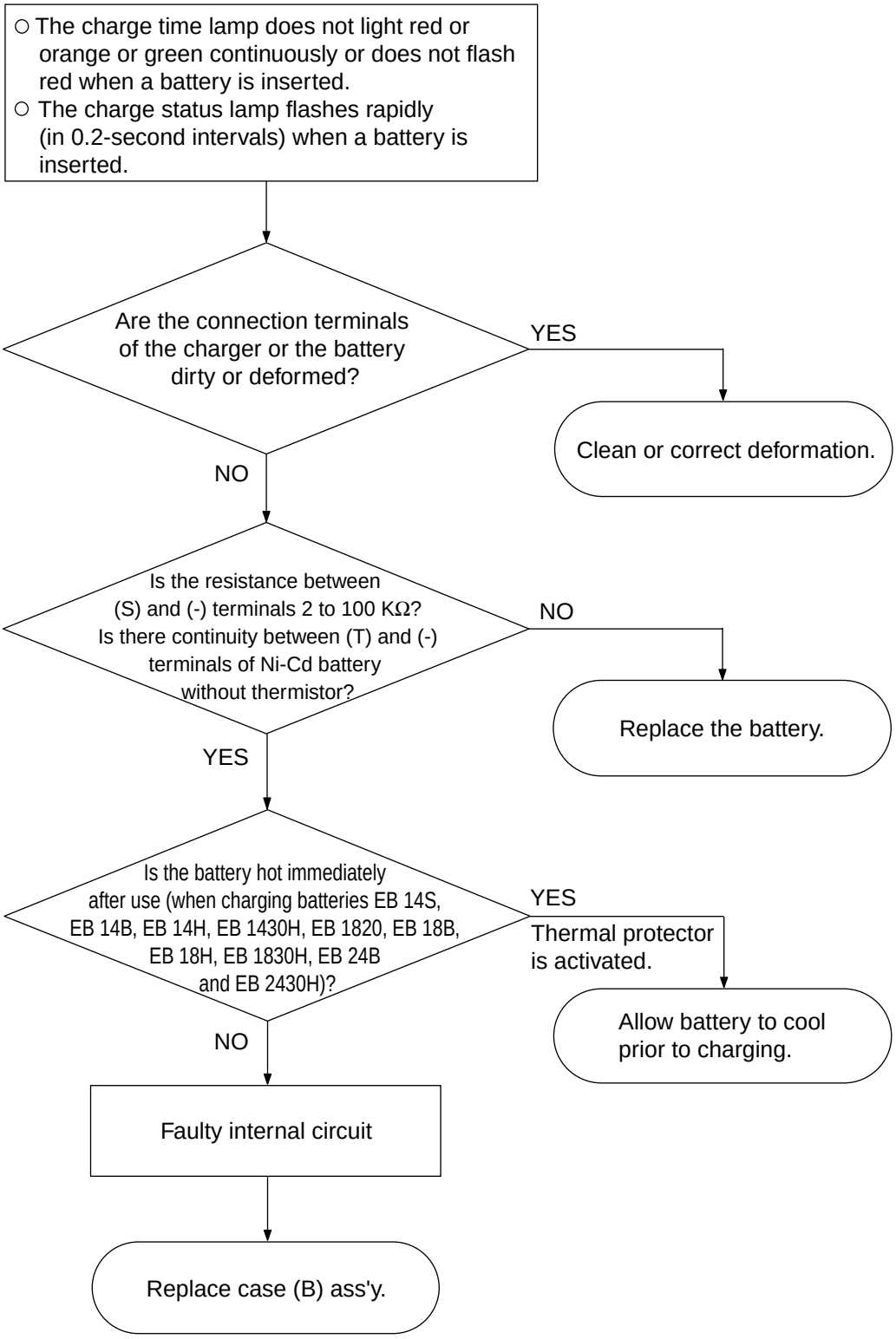
Phenomenon	Typical cause	Checking procedure
○ The charge time lamp and the charge status lamp fail to light.	(1) Faulty AC cord (2) Blown fuse (5 A) on primary side (3) Life of relay in case (B) ass'y (circuit board ass'y) ended.	Refer to trouble mode (A).
○ The charge time lamp does not light red or orange or green continuously or does not flash red when a battery is inserted. ○ The charge status lamp flashes orange rapidly (in 0.2-second intervals) when a battery is inserted.	(1) Poor contact of terminal (2) Faulty battery (broken) (3) Faulty case (B) ass'y (circuit board ass'y)	Refer to trouble mode (B).

10-2. Troubleshooting and Repair Procedures

(1) Trouble mode (A)



(2) Trouble mode (B)



11. STANDARD REPAIR TIME (UNIT) SCHEDULES

MODEL	Variable / Fixed	10	20	30	40	50	60 min.
		Work Flow					
UC 24YJ	General Assembly	Case (A) Fuse Prism	Case (B) Ass'y Cord Terminal (A) Terminal (B)				

Hitachi Power Tools

LIST NO. F889

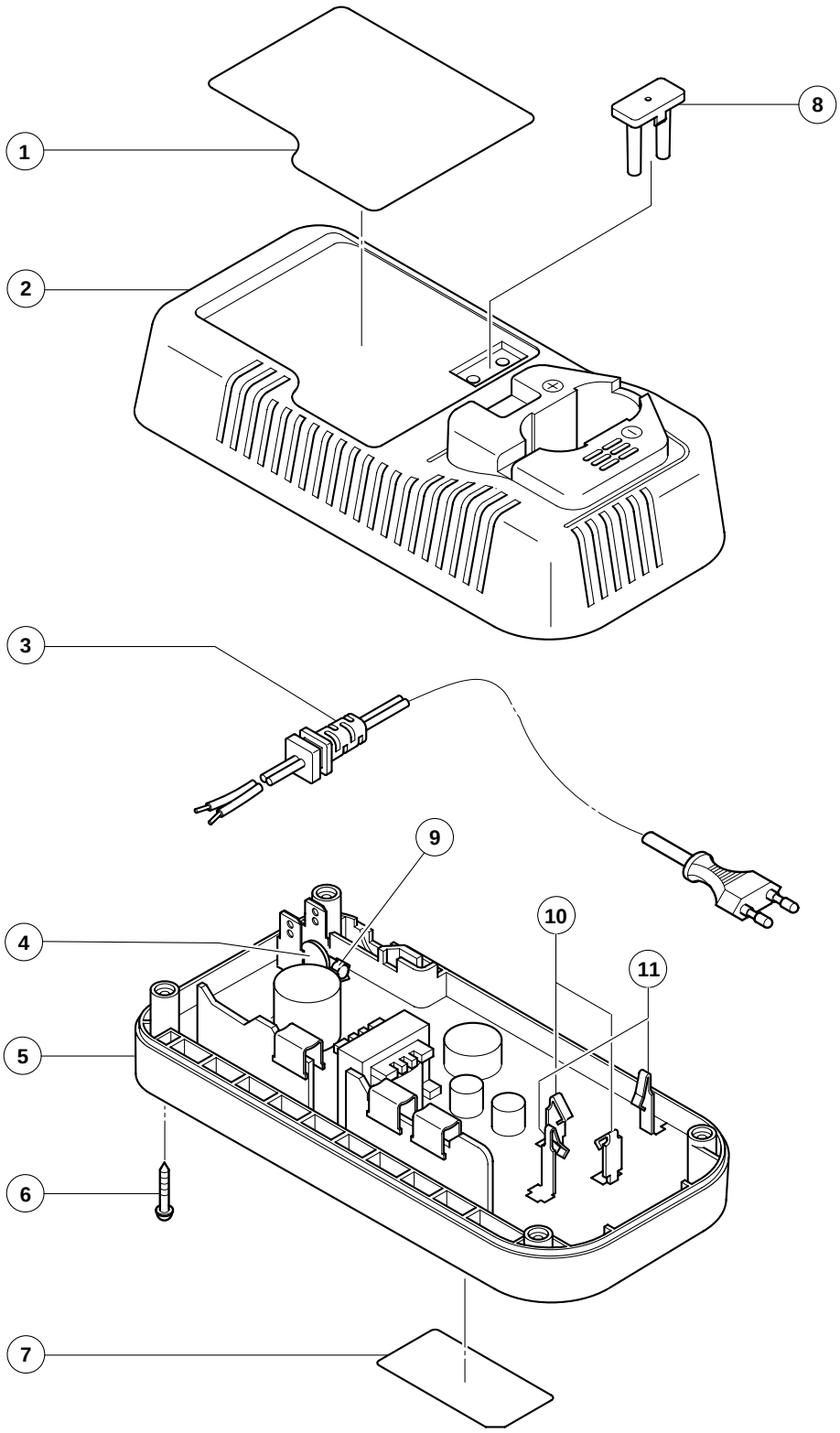
ELECTRIC TOOL PARTS LIST

■ CHARGER

2003・10・15

Model UC 24YJ

(E1)



PARTS

ITEM NO.	CODE NO.	DESCRIPTION	NO. USED	REMARKS	
1		HITACHI LABEL	1		
2	322-044	CASE (A)	1		
3	318-262	CORD	1		
4	322-358	VARISTOR	1		
5	322-359	CASE (B) ASS'Y	1	INCLUD. 4, 7, 9-11	
6	300-036	TAPPING SCREW (W/FLANGE) D3X20	4		
7		NAME PLATE	1		
8	321-679	PRISM	1		
9	322-360	FUSE (250V-5A)	1		
10	306-880	TERMINAL (A)	1		
11	306-881	TERMINAL (B)	1		

* ALTERNATIVE PARTS

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