

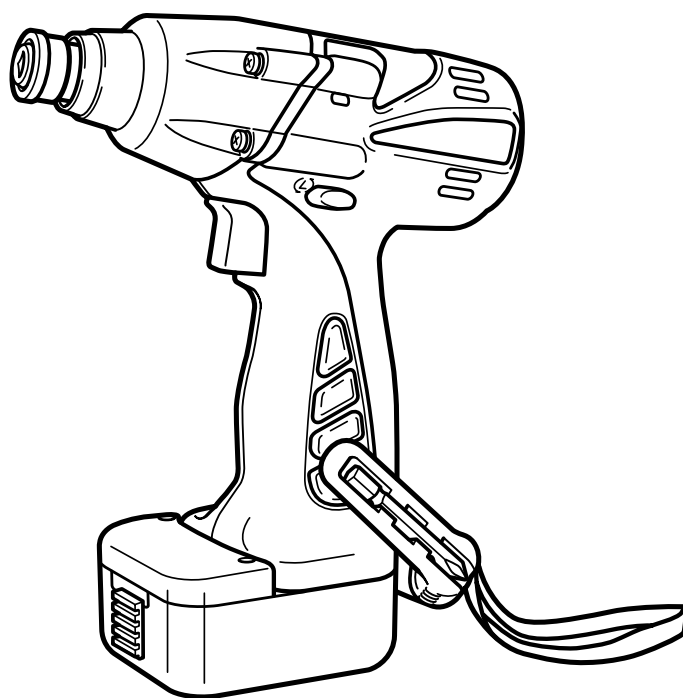
MODEL

WH 12DAF

HITACHI
POWER TOOLS

CORDLESS IMPACT DRIVER
WH 12DAF

TECHNICAL DATA
AND
SERVICE MANUAL



LIST No. F880

Feb. 2003

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

W

REMARK:

Throughout this TECHNICAL DATA AND SERVICE MANUAL, a symbol(s) is(are) used in the place of company name(s) and model name(s) of our competitor(s). The symbol(s) utilized here is(are) as follows:

| Symbol Utilized | Competitor | |
|-----------------|--------------|------------|
| | Company Name | Model Name |
| C | MAKITA | 6914D |
| P | DeWALT | DW977K |
| | | |



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1. PRODUCT NAME

Hitachi Cordless Impact Driver, Model WH 12DAF

2. MARKETING OBJECTIVE

The current high-grade Model WH 12DM is obtaining high evaluation in the cordless impact driver market that is expanding especially in Europe. The new Model WH 12DAF is a popular version that provides an excellent cost/performance ratio, inheriting the well-reputed features of the Model WH 12DM such as soft grip and belt hook. Vigorous sales promotion is anticipated with the introduction of the new Model WH 12DAF ahead of the competitors.

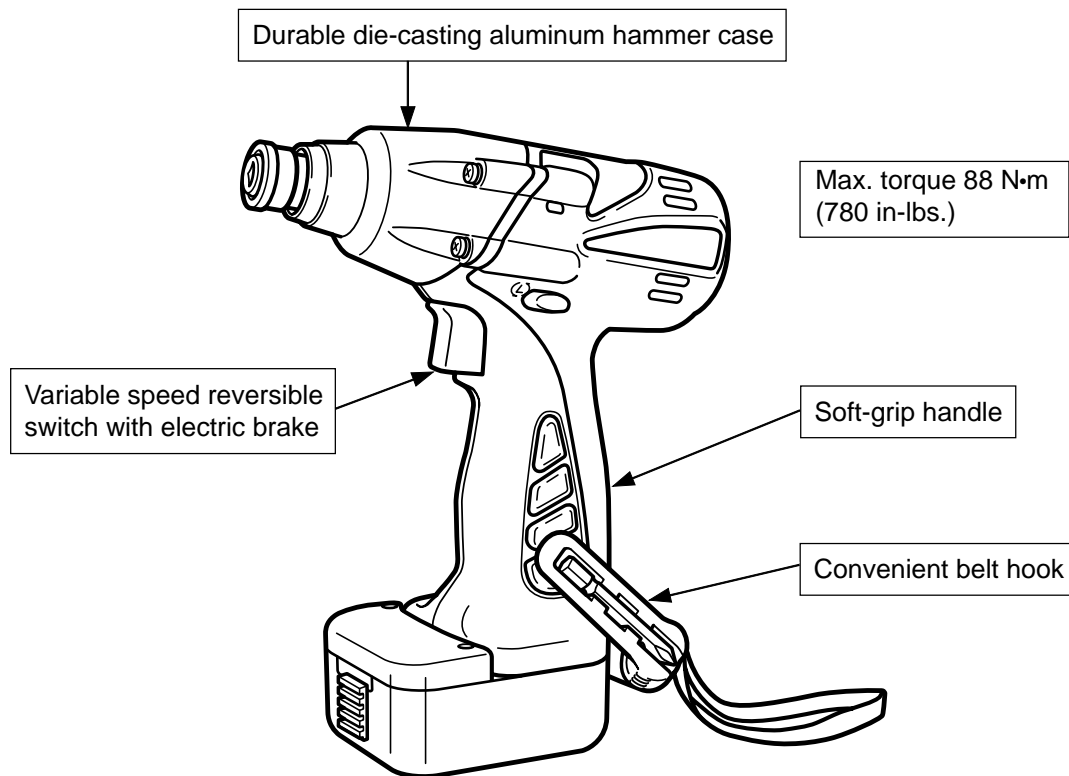
3. APPLICATIONS

- Tightening/loosening of small screws, tapping screws, wood screws, bolts, nuts, etc.
- Drilling into wood and various other materials (with use of optional accessory drill chuck adapter).

[Applicable Markets]

- Wood-product assembly: Tightening/loosening of wood screws
- Construction industry: Assembly of scaffolding, roofing, aluminum sashes, fencing, etc.; removal of plastic cones from concrete forms, mounting/removal of form ties; drilling into the wood frames of concrete forms, etc.
- Manufacturing industry: Assembly work for automobiles, rolling stock, shipbuilding, agricultural machinery and tools, industrial machines, steel furniture, etc.
- Utility industry: Assembly and installation of electric equipment, plumbing facilities, air conditioning (duct assembly, etc.), sanitary fixtures and various other facilities
- Service industry: General repair work; installation of advertising aids, automobile repair, assembly of garages and carports storage sheds, etc.
- Various other assembly, construction or repair facilities

4. SELLING POINTS



4-1. Selling Point Descriptions

(1) Max. torque 88 N·m (780 in-lbs)

The maximum torque of the Model WH 12DAF is 88 N·m (780 in-lbs.) thanks to the optimum striking design while maintaining high mechanical strength with the durable die-casting aluminum hammer case, etc.

(2) Soft-grip handle

The grip of the Model WH 12DAF is soft, slip-resistant and comfortable thanks to the soft resin (elastomer) covered on the handle.

(3) Convenient belt hook

A hook is very convenient if there is no place to put the impact driver temporarily. Although various kinds of hooks are on the market, there is a user demand for a standard accessory hook. To cope with this demand, the Model WH 12DAF is equipped with the hook having the following features as a standard accessory.

- ① The hook can be quickly slide out and can be slide in when not needed.
- ② The hook is mountable on either side to cope with the use by either right-handed persons and left-handed persons. The mounting position can be changed by using a flat-blade screwdriver or a coin.
- ③ The angle of the hook is adjustable in five steps (0, 20, 40, 60 and 80°). The hook can be adjusted to the optimum position according to the weight of the bit in use.

5-1. Specifications

- 3 -

| | | | | |
|-----------------------------|-------|--|-----------------|-------|
| Charger (Model UC 12SD) | | <ul style="list-style-type: none"> • Overcharge prevention circuit: A thermostat monitors the surface temperature of the battery and on detecting the temperature rise which occur on completion of charging, automatically turns off the unit to prevent the battery from overcharge. • Input capacity: 51 W • Indication method: Pilot lamp indicator of battery charging • Function: On During charging Off Charging completed | | |
| Charger (Model UC 24YFA) | | <ul style="list-style-type: none"> • Overcharge protection system: (1) Battery voltage detection (Δ^2V system) (2) Battery surface temperature detection (thermostat or thermistor) (3) 120-minute timer • Input capacity: 90 W • Charging time: Approx. 40 minutes [for type EB 1212S/EB 1214L battery at 20°C (68°F)] Approx. 50 minutes [for type EB 1220BL battery at 20°C (68°F)] Approx. 55 minutes [for type EB 1222HL battery at 20°C (68°F)] • Operable ambient temperature range: 0°C – 40°C (32°F – 104°F) The maximum allowable temperature of the type EB 1212S, EB 1214L and EB 1220BL battery is 60°C (140°F) and the type EB 1222HL battery is 45°C (113°F). | | |
| Weight | Net | Main body (with battery EB 1214L/EB 1220BL/EB 1222HL) 1.6 kg (3.5 lbs.) (with battery EB 1212S) 1.5 kg (3.3 lbs.) Charger unit (UC 12SD) (including cord) 1.4 kg (3.1 lbs.) Charger unit (UC 24YFA) (including cord) 0.6 kg (1.3 lbs.) | | |
| | Gross | WH 12DAF (SSK) (with extra battery) 5.1 kg (11.3 lbs.) WH 12DAF (SSK) 4.6 kg (10.2 lbs.) WH 12DAF (SLSK) (with extra battery) 5.3 kg (11.7 lbs.) WH 12DAF (SLSK) 4.7 kg (10.4 lbs.) WH 12DAF (BLFK) (with extra battery) 4.5 kg (9.9 lbs.) WH 12DAF (HLFK) 3.9 kg (8.6 lbs.) | | |
| Standard accessories | | Charger | Battery | Case |
| SSK (with extra battery) | | ○ UC 12SD x 1 | ○ EB 1212S x 2 | ○ x 1 |
| SSK | | ○ UC 12SD x 1 | ○ EB 1212S x 1 | ○ x 1 |
| SLSK (with extra battery) | | ○ UC 12SD x 1 | ○ EB 1214L x 2 | ○ x 1 |
| SLSK | | ○ UC 12SD x 1 | ○ EB 1214L x 1 | ○ x 1 |
| BLFK (with extra battery) | | ○ UC 24YFA x 1 | ○ EB 1220BL x 2 | ○ x 1 |
| HLFK | | ○ UC 24YFA x 1 | ○ EB 1222HL x 1 | ○ x 1 |

*1: In the case of tapping screws and wood screws, a minimum of M3 (1/8") is possible.

*2: This torque is based on tightening an M12 (15/32") bolt (strength grade: 12.9) for 3 sec. with a hexagon socket.

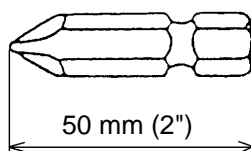
Pilot lamp indications (Model UC 24YFA)

| | | | | |
|---------------------------------------|--------------------------|----------|--|--|
| Red pilot lamp remains lit or flashes | Prior to charging | Blinks | 0.5 sec ON, 0.5 sec OFF ■ ■ ■ ■ ■ | |
| | During charging | Lit | Stays ON constantly ■■■■■■■■■■ | |
| | Charging completed | Blinks | 0.5 sec ON, 0.5 sec OFF ■ ■ ■ ■ ■ | |
| | Charging not possible | Flickers | 0.1 sec ON, 0.1 sec OFF ■ ■ ■ ■ ■ ■ ■ ■ | Storage battery or charger is faulty. |
| Green pilot lamp is lit | High battery temperature | Lit | Stays ON constantly ■■■■■■■■■■ | Charging not possible because storage battery temperature is too high. |

5-2. Optional Accessories

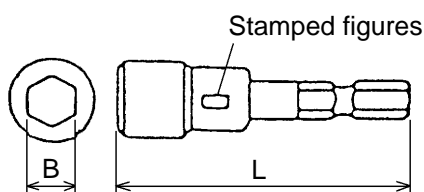
(1) Optional accessories

- Plus driver bit



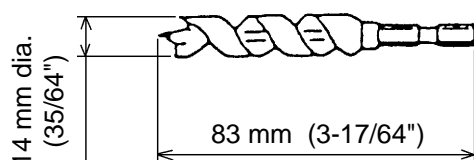
| Bit No. | Code No. |
|---------|----------|
| No. 2 | 992671 |
| No. 3 | 992672 |

- Hexagon socket



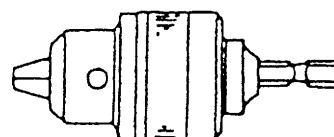
| Part Name | Stamped figures | L (mm) | B (mm) | Code No. |
|-----------------------------------|-----------------|----------------|-------------|----------|
| 4 mm Hexagon socket | 7 | 65 (2-9/16") | 7 (1/4") | 992689 |
| 5 mm Hexagon socket | 8 | 65 (2-9/16") | 8 (5/16") | 996177 |
| 6 mm Hexagon socket | 10 | 65 (2-9/16") | 10 (3/8") | 985329 |
| 5/16" Hexagon socket | 12 | 65 (2-9/16") | 12 (15/32") | 996178 |
| 8 mm Hexagon socket | 13 | 65 (2-9/16") | 13 (1/2") | 996179 |
| 10 mm Hexagon socket (small type) | 14 | 65 (2-9/16") | 14 (9/16") | 996180 |
| 10 mm Hexagon socket | 16 | 65 (2-9/16") | 16 (5/8") | 996181 |
| 10 mm Hexagon socket | 17 | 65 (2-9/16") | 17 (21/32") | 996182 |
| 1/2" Hexagon long socket | 21 | 166 (6-17/32") | 21 (53/64") | 996197 |

- Woodworking drill bit (Code No. 959183)



- Drill chuck adaptor set (Code No. 321823)

The drill chuck adaptor set permits mounting of various types of locally-available drill bits for a variety of drilling operations.



6. COMPARISONS WITH SIMILAR PRODUCTS

6-1. Specification Comparisons

| Item | | Maker | HITACHI | | C | P |
|---------------------------|--------------------|-------|---|--|-----------------------------------|---------------------------------|
| | | Model | WH 12DAF | WH 12DM | | |
| Capacity | Small screw | | M4 – M8 (5/32" – 5/16") *1 | M4 – M8 (5/32" – 5/16") *1 | M4 – M8 (5/32" – 5/16") | — |
| | Ordinary bolt | | M4 – M12 (5/32" – 15/32") | M5 – M12 (3/16" – 15/32") | M5 – M12 (3/16" – 15/32") | — |
| | High-strength bolt | | M4 – M10 (5/32" – 3/8") | M5 – M10 (3/16" – 3/8") | M5 – M10 (3/16" – 3/8") | — |
| Max. tightening torque *2 | | N•m | 88 (780 in-lbs., 900 kgf•cm) | 100(885 in-lbs., 1020 kgf•cm) | 98 (870 in-lbs., 1,000 kgf•cm) | 96 (850 in-lbs., 978 kgf•cm) |
| No-load rotation speed | | /min | 0 – 2,200 | 0 – 2,300 | 0 – 2,200 | 0 – 2,000 |
| Impact rate | | /min | 0 – 2,900 | 0 – 3,000 | 0 – 3,000 | 0 – 2,600 |
| Main body weight *3 | | kg | 1.6 (3.5 lbs.) : With EB 1214L/ EB 1220BL/ EB 1222HL | 1.6 (3.5 lbs.) | 1.7 (3.8 lbs.) | 2.1 (4.6 lbs.) |
| | | | 1.5 (3.3 lbs.) : With EB 1212S | | | |
| Overall length | | mm | 176 (6-15/16") | 167 (6-37/64") | 176 (6-15/16") | 220 (8-21/32") |
| Overall height | | mm | 226 (8-7/8") : With EB 1214L/ EB 1220BL/ EB 1222HL | 226 (8-7/8") | 232 (9-1/8") | 241 (9-1/2") |
| | | | 217 (8-1/2") : With EB 1212S | | | |
| Center height | | mm | 26 (1-1/64") | 26 (1-1/64") | 26 (1-1/64") | 42 (1-21/32") |
| Tool tip mounting system | | | Driver chuck | Driver chuck | Driver chuck | Driver chuck |
| Switch | Variable speed | | Equipped | Equipped | Equipped | Equipped |
| | Electric brake | | Equipped | Equipped | Equipped | Equipped |
| Type of motor | | | DC magnet | DC magnet | DC magnet | DC magnet |
| Voltage | | V | 12 | 12 | 12 | 12 |
| Battery | Type | | EB 1212S/EB1214L/ EB 1220BL/EB 1222HL | EB 1220BL/EB 1230HL | 1222 | DW9071 |
| | Nominal capacity | Ah | 1.2/1.4/2.0/2.2 | 2.0/3.0 | 2.0 | 1.7 |
| | Nominal voltage | V | 12 | 12 | 12 | 12 |
| Charger | Model | | UC 12SD/UC 24YFA | UC 14YF2 | DC 1411 | DW9107 |
| | Recharging voltage | V | 12/7.2 – 24 | 7.2 – 14.4 | 7.2 – 14.4 | 7.2 – 14.4 |
| | Charging time | min. | EB 1212S, EB 1214L Approx. 60/40min. | EB 1220BL Approx. 60 min. | 60 min. | 60 min. |
| | | | EB 1220BL *4 Approx. -/50 min. | EB 1230HLL Approx. 90 min. | | |
| | | | EB 1222HL *4 Approx. -/55 min. | | | |
| Standard accessories | | | • Plastic case • Charger (UC 12SD/UC 24YFA) | • Plastic case • Charger (UC 14YF2) | • Plastic case • Charger | • Plastic case • Charger |

*1: In the case of tapping screws and wood screws, a minimum of M3 is possible.

*2: Max. tightening torque is based on tightening an M12 (15/32") bolt (strength grade: 12.9) for 3 sec. with a hexagon socket.

*3: Main body weight does not include accessory tools (hexagon bit, etc.).

*4: This types of battery could not charge by Model UC 12SD.

6-2. Tightening Torque

6-2-1. Screw Diameter and Appropriate Tightening Torque

Generally speaking, the appropriate tightening torque for a screw can be determined by the strength grade of the screw and the material tightened. Tables 1 and 2, and Fig. 1 below list data relative to the strength grade of various screws and the appropriate tightening torque. For further reference, appropriate tightening torque is calculated with the following formula. Study and use this formula for accurate selection of tightening torque.

$$T = k \cdot d \cdot p$$

T: Appropriate tightening torque (kgf·cm)

d: Nominal diameter for the screw (mm)

p: Recommended axial tightening force to be applied to the screw (kgf)

$p = \text{rated axial stress (kgf/cm}^2\text{)} \times 0.8 \times \text{effective sectional area of the thread (mm}^2\text{)}$

K: Torque coefficient (0.17)

- Strength grade and rated axial stress of threads

Table 1

| Strength grade | 4.8 | 6.8 | 8.8 | 12.9 |
|---|------------|------|--|------|
| Rated axial stress (kgf/mm ²) | 29.1 | 43.7 | 58.2 | 95 |
| Material | Mild steel | | Alloy steel including Ni, Mn, Cr, etc. | |
| Heat treatment | None | | Processed-hard material | |

- Diameter and effective sectional areas of threads

Table 2

| Kind of thread (x pitch) | M5 x 0.8 mm (3/16") | M6 x 1 mm (1/4") | M8 x 1.25 mm (5/16") | M10 x 1.5 mm (3/8") | M12 x 1.75 mm (15/32") | M14 x 2 mm (9/16") |
|---|------------------------|---------------------|-------------------------|------------------------|---------------------------|-----------------------|
| Effective sectional area of thread (mm ²) | 14.2 | 20.1 | 36.6 | 58.0 | 84.3 | 115 |

- Thread diameter and appropriate tightening torque

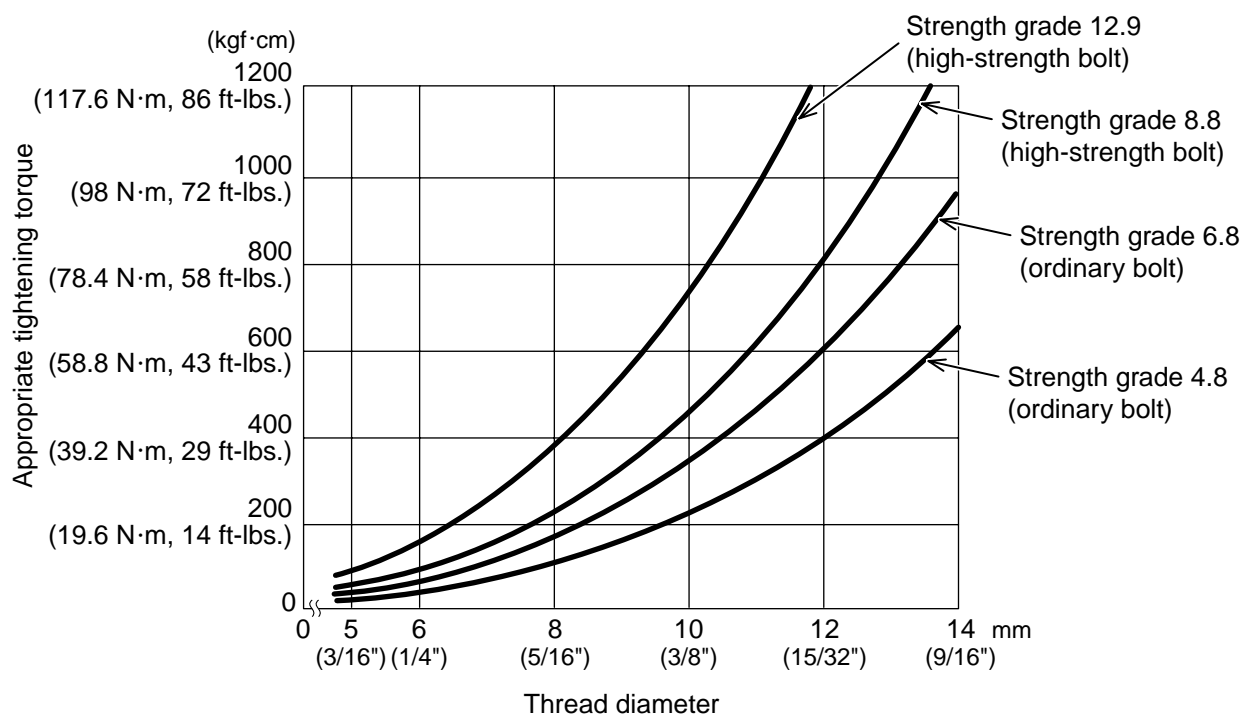


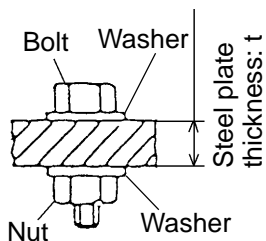
Fig. 1

6-2-2. Bolt Tightening Torque Characteristics

Figure 2 shows relationships between time and tightening torque for individual bolt types and sizes. While the data are useful for handy reference, actual tightening torque will vary depending on tightening conditions and other variables. For details, please refer to Para. 7-3, Tightening Torque Variation.

(Note)

- The term "tightening time" indicates the impact time after the lower surface of the bolt has come in contact with the material into which it is being tightened.
- In the tightening conditions shown in Fig. 2, the screws are being tightened directly into a steel plate; accordingly, the torque goes up very abruptly in comparison with ordinary bolt tightening conditions.



* The following bolts were utilized:
 Ordinary bolt; strength grade 4.8
 High-strength bolt; strength grade 12.9

Strength grade is read as follows:

| | |
|-----|-------------------------------|
| 4.8 | Yield point or durable force: |
| | (45,500 psi) |
| | Tensile strength of the bolt: |
| | (56,900 psi) |

• Model WH 12DAF

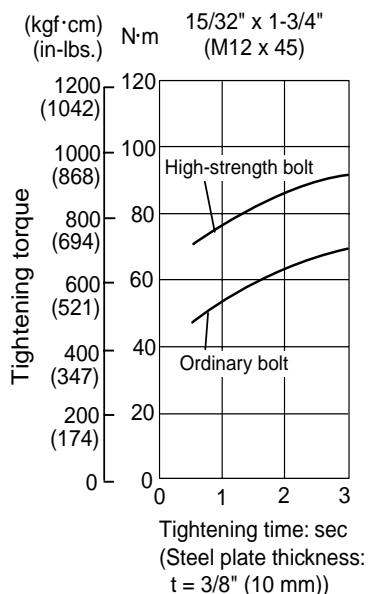
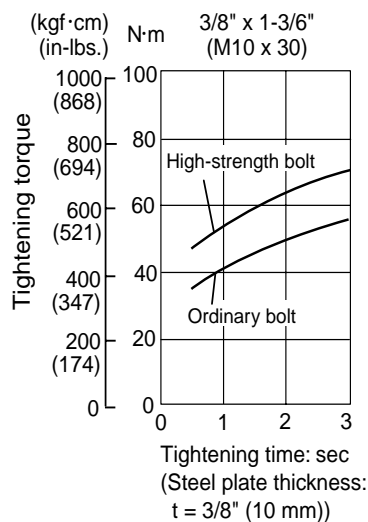
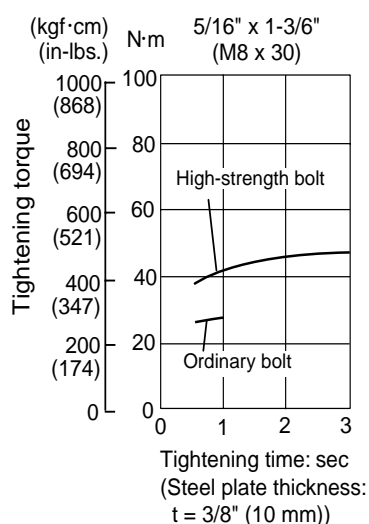


Fig. 2

6-3. Number of Screws or Bolts Driven

6-3-1. Per-Charge Working Capacity Comparisons

Test data on the number of screws which can be driven per battery charge by the new model vs. the previous models are shown in the table below. Please note that the data below are intended for general reference only as the number of screws which can be tightened per charge will vary slightly depending on screw tightening conditions, screw sizes, ambient temperatures and the charging capacity of the battery.

(1) Number of screws or bolts driven

| Tightening condition \ Model | HITACHI WH 12DAF | HITACHI WH 12DM | C | P |
|---|----------------------|-----------------------|------------------|--------------------|
| Battery (Nominal capacity) | EB 1214L (1.4 Ah) | EB 1222BL (2.0 Ah) | 1222 (2.0 Ah) | DW9071 (1.7 Ah) |
| Wood screw 4.5 mm dia. x 50 mm (soft wood) | 200 | 330 | 330 | 210 |
| Wood screw 4.5 mm dia. x 75 mm (hard wood) | 110 | 200 | 170 | 140 |
| Wood screw 4.5 mm dia. x 90 mm (hard wood) | 70 | 130 | 120 | 90 |
| Machine screw (M8 x 16 mm) | 700 | 1,000 | 1,000 | 850 |

7. PRECAUTIONS IN SALES PROMOTION

7-1. Safety Instructions

In the interest of promoting the safest and most efficient use of these tools by all 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, and fully understands the meaning of the precautions listed on the Caution Plate and Name Plate attached to each tool.

A. Handling Instructions

Salespersons must be thoroughly familiar with the contents of the Handling Instructions in order to give pertinent advice to the customer. In particular, they must have a thorough understanding of the precautions in the use of the cordless (battery charger type) electric power tools which are different from those of ordinary electric power tools.

- (1) Before use, ensure that the unit is fully charged.

New units are not fully charged. Even if the units were fully charged at the factory, long periods without use, such as during shipping, cause the storage battery to lose its charge. Customers must be instructed to fully charge the unit prior to use.

- (2) When charging storage batteries, use only the exclusive Model UC 12SD or UC 24YFA charger provided with the tool. Because of the designed rapid-charging feature (about one hour), use of other battery chargers is hazardous.

- (3) Follow prescribed steps in using the charger.

First connect the EB 12 storage battery to the Model UC 14YF or UC 14YF2 charger, then plug the charger into an AC outlet (ensuring that the voltage matches that indicated on the unit). If this order is reversed, the charger may not function properly.

- (4) Ensure the power source voltage is the same as that indicated on the Name Plate of the charger. Use of any other power source (DC outlet, fuel powered generator, etc.) will cause the charger to overheat and burn out.

- (5) Do not use any voltage increasing equipment (transformer, 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.

- (6) Conduct battery charging at an ambient temperature range of 0 °C — 40° C (32 °F — 104 °F).

Special temperature sensitive devices are employed in the charger to permit rapid charging. Ensure that customers are instructed to use the charger at the indicated ambient temperature range. At temperatures under 0 °C (32 °F), the thermostat will not function properly, and the storage battery may be over-charged. At temperatures over 40 °C (104 °F), the storage battery cannot be sufficiently charged. The optimum temperature range is 20 °C — 25 °C (68 °F — 77 °F).

- (7) The battery charger should not be used continuously.

At high ambient temperatures, if over three storage batteries are charged in succession, the temperature of the coils on the transformer will rise and there is a chance that the temperature fuse inserted in the interior of the transformer will inadvertently melt. After charging one battery, please charge the next battery after about a fifteen-minute interval.

- (8) 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 flammable objects, to be dropped or inserted into the air vents. This could cause electrical shock, fire or other serious hazards.

(9) Do not attempt to disassemble the storage battery or the charger.

Special devices, such as a thermostat, are built into the storage battery and charger to permit rapid charging. Incorrect parts replacement and/or wiring will cause malfunctions which could result in fire or other hazards. Instruct the customer to bring these units to an authorized service center in the event repair or replacement is necessary.

(10) Disposal of the Type EB 1212S, EB 1214L, EB 1220BL or EB 1222HL storage battery

Ensure that all customers understand that Type EB 1212S, EB 1214L, EB 1220BL or EB 1222HL storage batteries should be turned in to any Hitachi power tool sales outlet or authorized service center when they are no longer capable of being recharged or repaired. If thrown into a fire, the batteries may explode, or if discarded indiscriminately, leakage of the cadmium compound contained in the battery may cause environmental pollution.

B. Caution Plates

(1) The following precautions are listed on the Name Plate or Caution Plate attached to the main body of each tool.

For Asia and Oceania

CAUTION

- Read thoroughly **HANDLING INSTRUCTIONS** before use.

For the U.S.A. and Canada

Warning

- To reduce the risk of injury, user must read and understand Instruction Manual.

AVERTISSEMENT

- Afin de réduire le risque de blessures, l'utilisateur doit lire et bien comprendre le mode d'emploi.

(2) The following cautions are listed on the Name Plate attached to each Type EB 1212S, EB 1214L, EB 1220BL or EB 1222HL storage battery:

For Europe

- CAUTION**
- Read thoroughly **HANDLING INSTRUCTIONS** before use.
 - Do not disassemble nor throw into fire.

For the U.S.A. and Canada

- CAUTION**
- For safe operation, see Instruction Manual.
 - Use **HITACHI** charger recommended in instruction manual for recharging.

(3) The following caution is listed on the Name Plate attached to the Model UC 12SD or UC 24YFA charger.

< UC 12SD >

For the U.S.A. and Canada

- CAUTION** • For safe operation, see instruction manual.
- Charger HITACHI rechargeable battery types EB 1212S, FEB 12S and EB 1214L. Other types of batteries may burst causing personal injury and damage.
 - Charge between 50°F and 104°F. Rest 15 minutes between the charging of batteries.
 - Indoor use only. • Replace defective cord immediately.

< UC 24 YFA >

For the U.S.A. and Canada

- CAUTION**
- For safe operation, see Instruction Manual.
 - Charge HITACHI rechargeable batteries Type EB 7, EB 9, EB 12, EB 14 series and EB 24B. Other types of batteries may burst causing personal injury and damage.
 - Charge between 32 and 104°F.
 - Indoor use only.
 - Replace defective cord immediately.

7-2. Tightening Torque Inspection Prior to Operation

As described and shown in Para. 6-2-2, the output tightening torque of which the Model WH 12DAF is capable in excess of the rated tightening torque of certain bolts and screws. Accordingly, if the tightening time is prolonged for such bolts and screws, it could cause damage to their threads or, in the worst case, cause them to be sheared off. (This phenomenon is common to all existing impact drivers.) Particularly when tightening M6 (1/4") or smaller screws, tightening time must be kept extremely short: 0.5 seconds or less. The customer should be advised to carry out several screw tightening operations and adjust the tightening time as necessary by measuring the tightening torque with an appropriate torque wrench or driver before commencing continuous operation.

7-3. Tightening Torque Variation

The tightening torque of the cordless impact driver may vary slightly in accordance with the factors described below. Salespersons are requested to advise the customer to confirm that appropriate tightening torque is obtained by measuring the torque with an appropriate torque driver at the beginning of the tightening operations, and as necessary during the tightening operations. In addition, the torque values shown in Para. 6-2-1 above are useful as a handy reference, and may be utilized as tentative standards.

(1) Voltage of battery

Tightening torque is affected by the voltage output of the battery. Tightening torque decreases as the number of bolts tightened increases. This phenomenon is caused by the decline in voltage output of the battery due to the increasing number of bolts tightened. In particular, the tightening torque decreases rapidly just before the battery is fully discharged. As this phenomenon is an inherent drawback in any cordless impact driver, salespersons are requested to ensure that the customer is fully aware of and understands this characteristic.

(2) Effects of low ambient temperatures

The tightening torque required may be reduced at low ambient temperatures or under the influence of grease and different torque coefficients (dependent on manufacturing and finishing processes, and specified by bolt manufacturers).

(3) Different bolt diameter

Differences in bolt diameter will cause variation of the required levels of tightening torque. Generally speaking, tightening torque is higher for large bolts.

(4) Different materials being tightened

When a bolt is tightened into a soft material such as aluminum, plastic, wood, etc., the tightening torque is considerably less than when the bolt is tightened into a hard material such as steel.

(5) Different tightening conditions

The tightening torque may vary in accordance with bolt torque coefficient (dependent on manufacturing process, and specified by bolt manufactures), bolt grade and bolt length, even though the dimensions of the bolts are the same. Tightening torque may also vary depending on the surface finishing state of tightening materials (steel, aluminum, etc.), and materials to be tightened. In addition, if there is seal packing, clearance, etc., between tightening materials, the tightening torque is decreased.

(6) Wear and looseness of the socket

With extended use, the hexagonal portion of the socket which is fitted to the head of the bolt or drill bit, and/or hexagonal portion of the driver chuck which is fitted onto the anvil in the main body will become worn and loose. Wear and looseness will cause a proportionate loss of tightening torque.

In addition, use of an incorrect size socket (slightly larger than the bolt being tightened) will also result in decreased torque.

(7) Bolt and nut rotate together

Tightening torque that can be achieved will be considerably decreased if the bolt and nut rotate together during the tightening operation. The customer should be advised to carefully observe the operation and ensure this does not occur.

7-4. Suggestions and Precautions for the Efficient Use of the Charger and Storage Batteries

(1) Batteries may not be rechargeable immediately after use

If any of the storage batteries Types EB 1212S, EB 1214L, EB 1220BL and EB 1222HL is exposed to direct sunlight for an extended period or if the temperature of the battery is high immediately after it has been used in the tool, the battery may not be chargeable when the battery is connected to the charger. Chargeable temperature ranges of each type of battery are specified as follows.

Types EB 1212S, EB 1214L and EB 1220BL: from -5°C to 60°C (from 23°F to 140°F)

Type EB 1222HL: from 0°C to 45°C (from 32°F to 113°F)

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

8. OTHER PRECAUTIONS

(1) Check for cracks or other damage on the socket

Cracks or any other faults on the socket are very hazardous. In addition, cracks or other damage to accessories will cause loss of tightening torque efficiency. Advise the customer to inspect accessories often, and ensure there are no abnormalities.

(2) Socket dimensions

Without fail, utilize an appropriate socket which matches the bolt and/or nut dimensions. If the socket dimensions are larger than the bolts or nuts, it will not only cause insufficient tightening torque, but could also easily cause damage to the socket. Please refer to the tables in Para. 5-2 for appropriate socket dimensions.

(3) Hammering section lubrication

Frequent or continuous use of the tool will cause excessive temperature rise of the hammering section, resulting in depletion of the grease and subsequent increased wear of components which will, in turn, cause loss of tightening efficiency. Accordingly, it is necessary to periodically replenish the grease in the hammering section to ensure proper lubrication of moving and sliding components.

9. REPAIR GUIDE

WARNING: Without fail, remove the Types EB 1212S, EB 1214L, EB 1220BL or EB 1222HL battery from the main body before starting repair or maintenance work. Because the tool is cordless, if the battery is left in and the switch is activated inadvertently, the motor will start rotating unexpectedly, which could cause serious injury.

9-1. Precautions in Disassembly and Reassembly

The **[Bold]** numbers correspond to the item numbers in the Parts List and the exploded assembly diagram for the Model WH 12DAF.

9-1-1. Disassembly

(1) Removal of the Gear Box Ass'y **[1]**

Remove the four Tapping Screws (W/Sp. Washer) D4 x 35 **[6]** that connect the Hammer Case **[7]** with Housing (A).(B) Set **[32]**. Remove the Hammer Case **[7]**, the Inner Cover **[24]** and the Damper **[25]** together from Housing (A).(B) Set **[32]**. Remove the Retaining Ring **[26]**. Then the Gear Box Ass'y **[1]** can be removed.

(2) Removal of the Hook Ass'y **[37]**

Remove the Special Screw M5 **[44]** with a flatblade screwdriver or a coin then remove the Hook Ass'y **[37]** and the Hook Spring **[43]**.

(3) Removal of housing (B)

Remove the seven Tapping Screws (W/Flange) D4 x 20 **[30]** from the main body to remove housing (B).

(4) Remove the DC-Speed Control Switch **[34]**, the Fin **[42]** and the Motor **[27]** together. Remove the Pushing Button **[35]** and the Strap **[40]**.

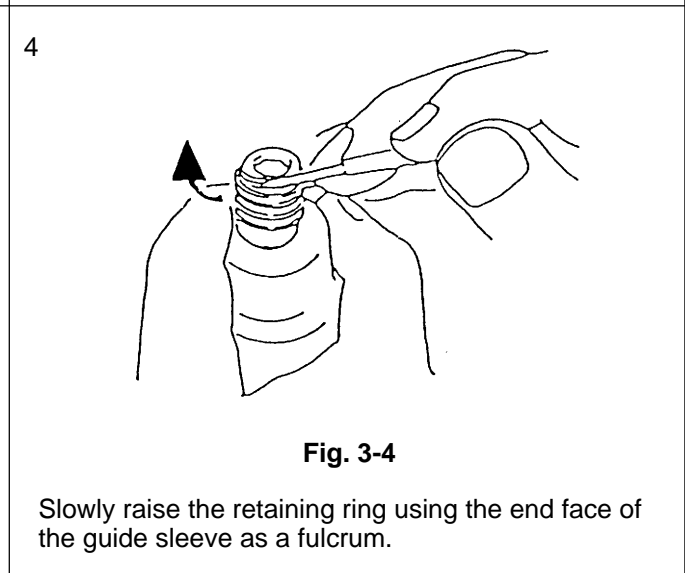
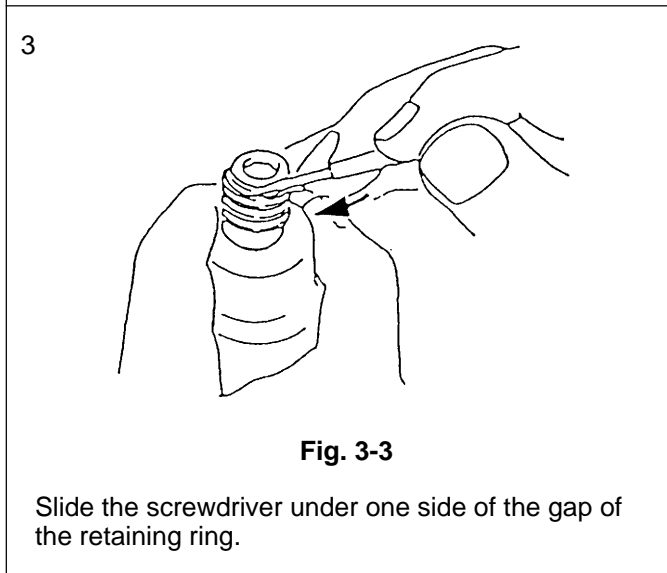
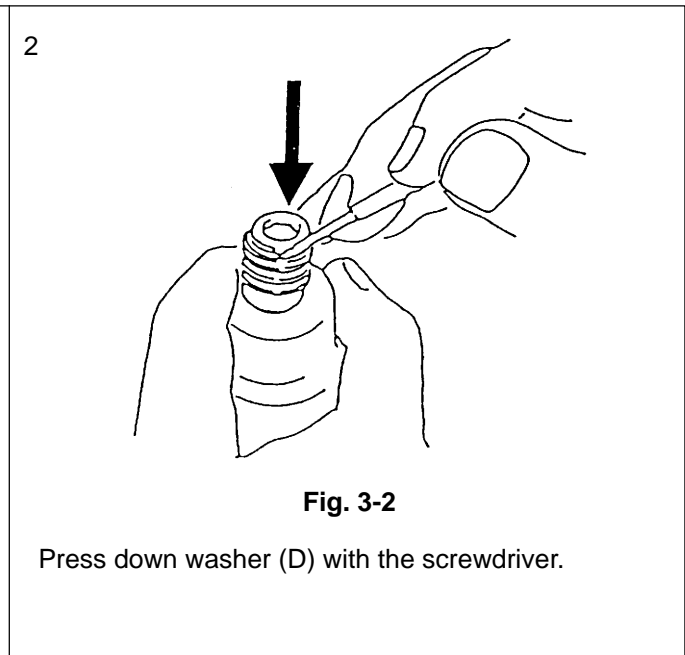
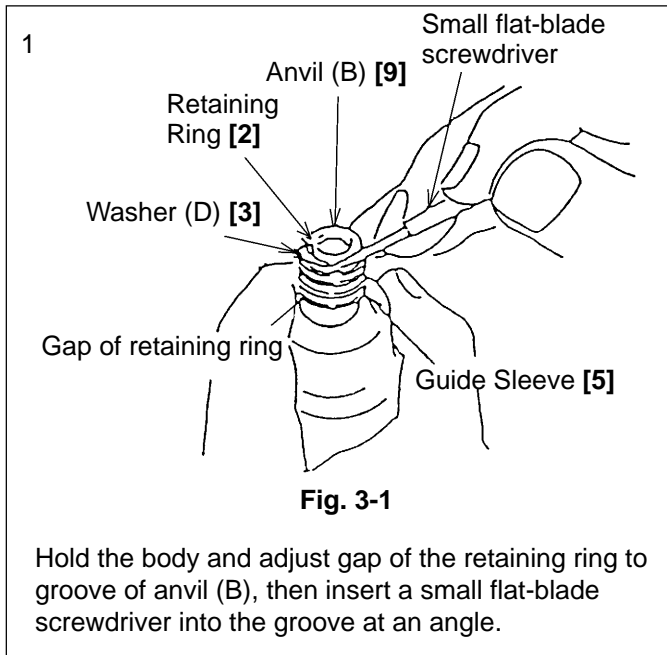
(5) Disassembly of the switch ass'y

Disconnect the Internal Wire (Red) **[28]**, the Internal Wire (Black) **[29]** from the DC-Speed Control Switch **[34]** with a soldering iron. Remove the Machine Screw (W/Sp. Washer) M3 x 4 **[41]** to remove the Fin **[42]** from the FET of the DC-Speed Control Switch **[34]**.

(Note) Do not disconnect the three FET internal wires soldered to the DC-Speed Control Switch **[34]**.

(6) Removal of the Guide Sleeve **[5]**

By following the procedure shown in Figs. 3-1 to 3-4, you can remove the Retaining Ring **[2]**, Washer (D) **[3]**, Guide Spring **[4]** and the Guide Sleeve **[5]** in this order. Be sure not to lose the Steel Ball D3.5 **[8]** in Anvil (B) **[9]**.



Then slowly raise the other side of the retaining ring with a screwdriver until it is free. The Guide Sleeve [5] can now be removed. Avoid quickly raising the retaining ring or it may fly out forcefully.

The retaining ring can also be easily removed by widening the gap of the retaining ring with the jig for retaining ring and slowly raising the retaining ring with a small flat-blade screwdriver.

(7)

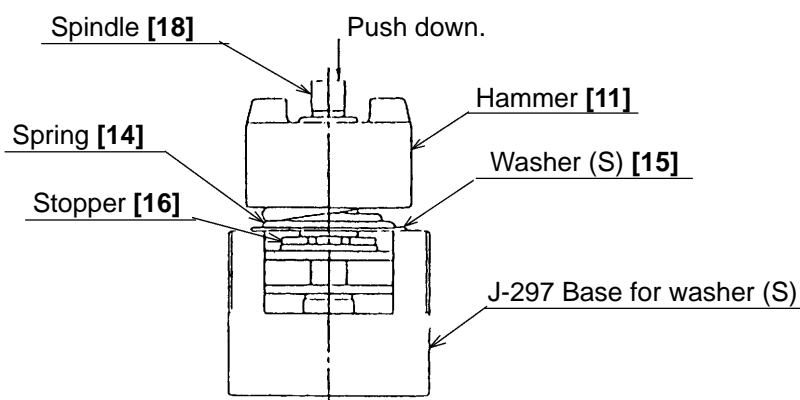


Fig. 4

Mount the hammer assembly onto the J-297 base for washer (S). With a hand press, push down the top of the Spindle [18] to compress the Spring [14]. In this position, remove the Stopper [16] with a flat-blade screwdriver, then release the hand press. (See Fig. 4.)

Remove the hammer assembly from the J-297 base for washer (S) and support the end surface of the Spindle [18]. With a hand press, push down either of the raised faces of the Hammer [11] to compress the Spring [14]. In this position, extract the two Steel Balls D5.556 [10] from the cam grooves of the Spindle [18] and the Hammer [11] with a small flat-blade screwdriver or a similar tool. Then, slowly release the hand press and lift the Hammer [11] and Washer (S) [15] together to extract them from the Spindle [18]. The Spring [14] can then be removed.

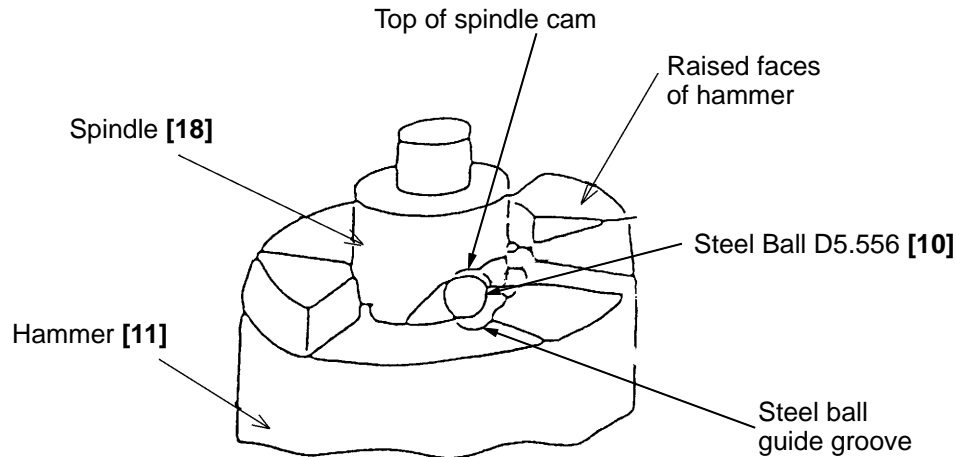


Fig. 5

9-1-2. Reassembly

Reassembly can be accomplished by following the disassembly procedures in reverse. However, special attention should be given to the following items.

(1) Reassembly of Housing (A) assembly

- (a) Be sure to follow the wiring diagram (Fig. 6) for proper wiring.
- (b) Pay attention to the polarity of the Motor [27] when soldering the Internal Wire (Red) [28] and Internal Wire (Black) [29] to the Motor [27]. The red-marked side of the Motor [27] is positive.
- (c) Mount the Motor [27] into housing (A) so as to pay attention to the position of the Internal Wire (Red) [28] and the depression for preventing motor body from rotating fit in housing (A).

(Note) Make sure that the Internal Wire (Red) [28] is passed under the motor so that it is not caught between the motor and housing (A).

- (d) Mount the DC-Speed Control Switch [34] to housing (A) so that the projection of the forwarding/reversing lever at the top of the switch is inserted into the U-shaped groove of the Pushing Button [35]. Secure the Fin [42] to the FET of the DC-Speed Control Switch [34] with the Machine Screw (W/Sp. Washer) D3 x 4 [41].

(Note) Make sure that the three internal wires from the FET are passed above the DC-Speed Control Switch [34]. To avoid pinching, be careful not to place the internal wire of the battery terminal on the terminal plate of the DC-Speed Control Switch [34].

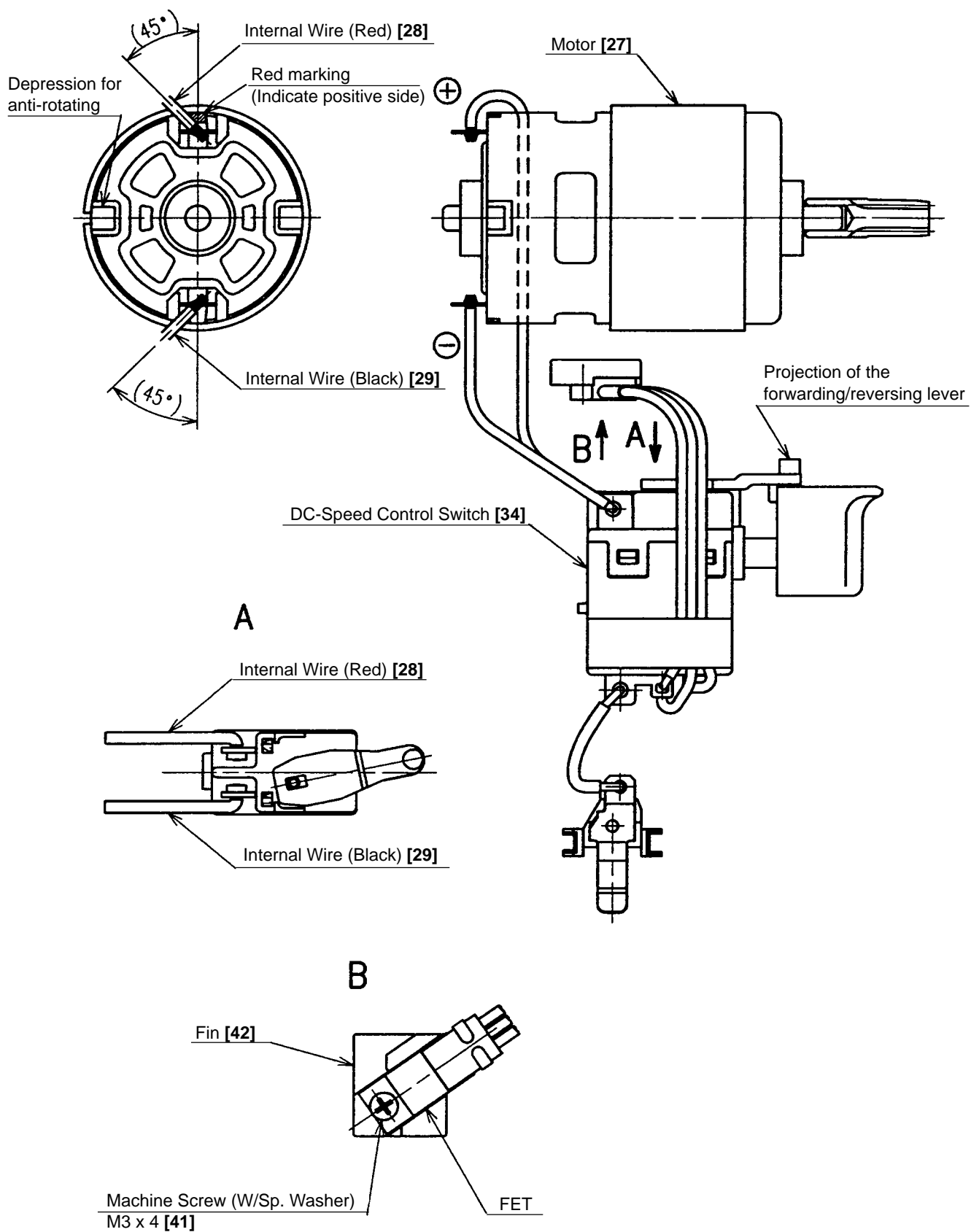


Fig. 6

(2) Reassembly of Housing (A).(B) Set **[32]**

Mount the Strap **[40]** and housing (B) to housing (A), and secure them with the seven Tapping Screws (W/Flange) D4 x 20 **[30]**.

(3) Reassembly of the mechanical parts

- (a) Put Washer (S) **[15]** onto the shaft of the Spindle **[18]** and mount the Hammer **[11]** containing the twenty-eight Steel Balls D3 **[12]**, Washer (J) **[13]** and the Spring **[14]** to the Spindle **[18]**.
- (b) Align the top of the cam groove on the Spindle **[18]** with the steel ball guide groove on the Hammer **[11]** as illustrated in Fig. 11. Press down either of the raised faces of the Hammer **[11]** with a hand press to compress the Spring **[14]** until the end surface of the Hammer contacts the flange of the Spindle **[18]**.
- (c) Insert the two Steel Balls D5.556 **[10]** into the steel ball guide groove. Check that the steel balls are properly inserted in the cam groove. Then release the hand press.
- (d) Mount the hammer assembly onto the J-297 base for washer (S). With a hand press, push down the top of the Spindle **[18]** to compress the Spring **[14]**. On this condition, mount the Stopper **[16]** onto the spindle shaft and then release the hand press.
- (e) Mount the Ring Gear **[21]**, Washer (C) **[22]**, Ball Bearing **[23]**, Inner Cover **[24]**, Damper **[25]** and the Retaining Ring **[26]** to the above reassembly. Furthermore, mount the other mechanical parts and Anvil (B) **[9]**, then the Hammer Case **[7]**.

(4) Mounting the Gear Box Ass'y **[1]** to the housing

Coat Housing (A).(B) Set **[32]** with Silicon Rubber (THREEBOND 1211) as shown in Fig. 7. Mount the Gear Box Ass'y **[1]** so that the pinion press-fitted in the Motor **[27]** properly meshes with the Idler Gear Set **[19]**. Check that Anvil (B) **[9]** turns smoothly. If not, the gear meshes improperly. Check the meshing condition. Tighten the four Tapping Screws (W/Sp. Washer) D4 x 35 **[6]**. Wipe the Silicon Rubber protruded from the housing with a cloth.

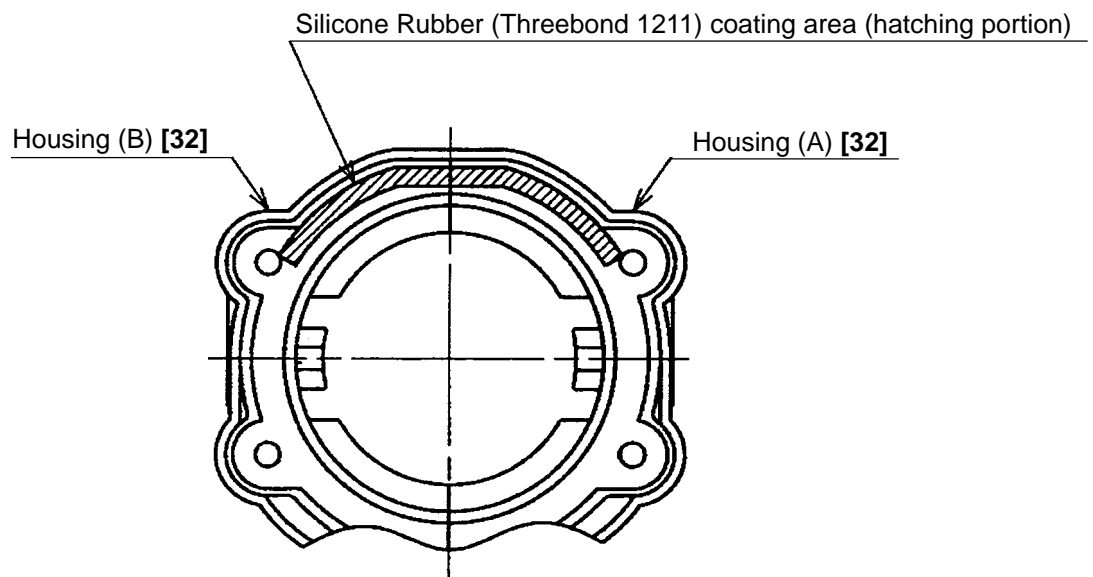


Fig. 7

(5) Reassembly of the Guide Sleeve [5]

Insert the Steel Ball D3.5 [8] into the hole of the Anvil (B) [9]. Mount the Guide Sleeve [5], the Guide Spring [4] and Washer (D) [3] in sequence. Mount the Retaining Ring [2] into the groove of anvil (B) using J-295 jigs (A) and (B) for retaining ring as illustrated in Fig. 8.

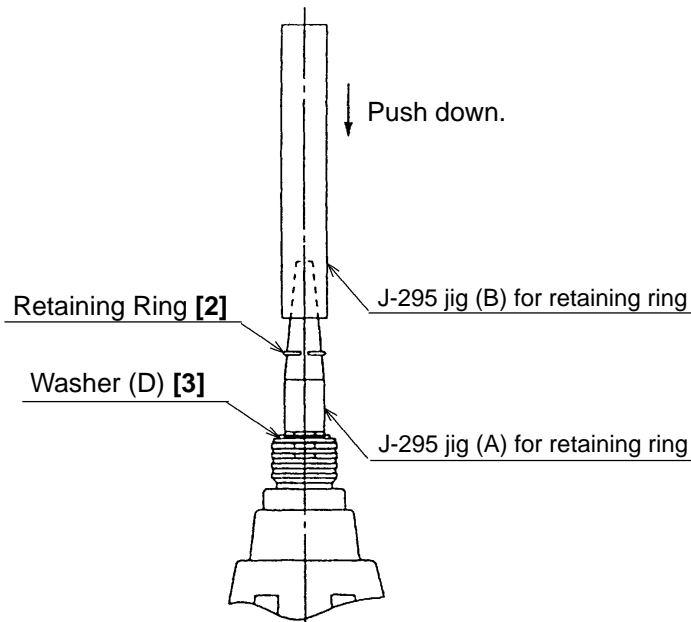


Fig. 8

(6) Reassembly of the Hook Ass'y [37]

Check that the V-Lock Nut M5 [38] is mounted to the Hook Ass'y [37]. Then mount the Hook Spring [43] and secure it with the Special Screw M5 [44]. (Mount the Hook Spring [43] with its larger-diameter side pointing toward the inside of the housing.)

(7) Check whether the direction of rotation of Anvil (B) [9] coincides with the directional markings on the push-on side of the Pushing Button [35]. When the Pushing Button [35] is turned to the (R) side, the direction of rotation of Anvil (B) [9] should be clockwise, as viewed from behind.

(8) Lubrication

(a) ATTOLUB MS No. 2

- Cam groove and sliding section of the Spindle [18]
- Cam groove and projection of the Hammer [11]
- 8 mm diameter hole and oil groove and upper surface of the claw of Anvil (B) [9]
- Sliding section between Anvil (B) [9] and the metal
- Two Steel Balls D5.556 [10]
- Pinion tooth flanks and front metal of the Motor [27]
- Tooth flanks of the Ring Gear [21]
- Twenty-eight Steel Balls D3 [12]
- Needle Roller [20]
- Tooth flanks and 5 mm diameter hole of the Idle Gear Set [19]

(b) HITACHI MOTOR GREASE No. 29

- Steel Ball D3.5 [8]
- Sliding section of Anvil (B) [9] and the Guide Sleeve [5]

(9) Screw tightening torque

- Tapping Screw (W/Sp. Washer) D4 x 35 **[6]** $1.96 \pm 0.49 \text{ N}\cdot\text{m}$ ($20 \pm 5 \text{ kgf}\cdot\text{cm}$, $17.4 \pm 4.3 \text{ in}\cdot\text{lbs.}$)
- Tapping Screw (W/Flange) D4 x 20 **[30]** $1.96 \pm 0.49 \text{ N}\cdot\text{m}$ ($20 \pm 5 \text{ kgf}\cdot\text{cm}$, $17.4 \pm 4.3 \text{ in}\cdot\text{lbs.}$)
- Machine Screw (W/Sp. Washer) M3 x 4 **[41]** $0.29 - 0.39 \text{ N}\cdot\text{m}$ ($3 - 4 \text{ kgf}\cdot\text{cm}$, $2.6 - 3.5 \text{ in}\cdot\text{lbs.}$)
- Special Screw M5 **[44]** $1.96 - 0.49 \text{ N}\cdot\text{m}$ ($20 \pm 5 \text{ kgf}\cdot\text{cm}$, $17.4 \pm 4.3 \text{ in}\cdot\text{lbs.}$)

9-2. Precautions in Disassembly and Reassembly of Battery Charger

Refer to the Technical Data and Service Manual for precautions in disassembly and reassembly of the Model UC 12SD or UC 24YFA Battery Charger.

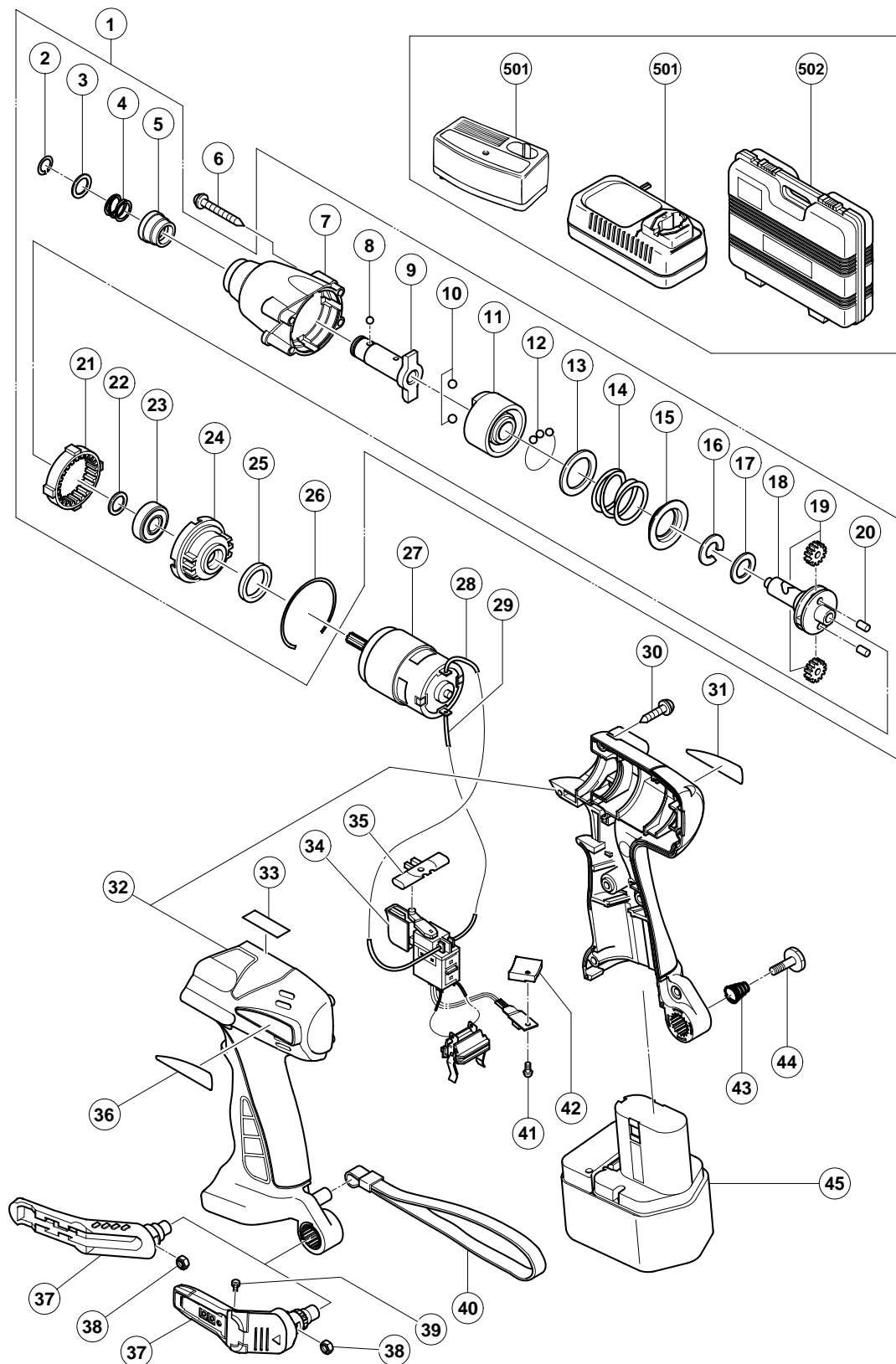
10. STANDARD REPAIR TIME (UNIT) SCHEDULES

| MODEL | Variable | | 10 | 20 | 30 | 40 | 50 | 60 min. |
|----------|----------|--|----|-----------------------------------|---|----|----|---------|
| | Fixed | | | | | | | |
| WH 12DAF | | Work Flow | | | | | | |
| | | | | | | | | |
| | | DC-Speed Control Switch Hook Ass'y | → | | Housing (A).(B) Set | | | |
| | | | | Inner Cover Damper Motor | | | | |
| | | General Assembly | → | | | | | |
| | | Guide Sleeve | | Hammer Case Anvil Ring Gear | Hammer Steel Ball Spring Spindle Idle Gear Set Needle Roller Ball Bearing (6001VV) | | | |
| | | Gear Box Ass'y | → | | | | | |

ELECTRIC TOOL PARTS LIST

■ CORDLESS IMPACT DRIVER Model WH 12DAF

2003 • 2 • 25
(E1)



PARTS

WH 12DAF

| ITEM NO. | CODE NO. | DESCRIPTION | NO. USED | REMARKS | |
|----------|----------|--|----------|-----------------------------|--|
| 1 | 321-914 | GEAR BOX ASS'Y | 1 | INCLUD. 2-5, 7-26 | |
| 2 | 315-984 | RETAINING RING | 1 | | |
| 3 | 315-983 | WASHER (D) | 1 | | |
| 4 | 320-409 | GUIDE SPRING | 1 | | |
| 5 | 321-885 | GUIDE SLEEVE | 1 | | |
| 6 | 306-305 | TAPPING SCREW (W/SP. WASHER) D4X35 (BLACK) | 4 | | |
| 7 | 321-881 | HAMMER CASE | 1 | | |
| 8 | 319-535 | STEEL BALL D3.5 (10 PCS.) | 1 | | |
| 9 | 321-915 | ANVIL (B) | 1 | | |
| 10 | 959-154 | STEEL BALL D5.556 (10 PCS.) | 2 | | |
| 11 | 321-886 | HAMMER | 1 | | |
| 12 | 321-934 | STEEL BALL D3 (10 PCS.) | 28 | | |
| 13 | 315-978 | WASHER (J) | 1 | | |
| 14 | 316-170 | SPRING | 1 | | |
| 15 | 316-172 | WASHER (S) | 1 | | |
| 16 | 316-171 | STOPPER | 1 | | |
| 17 | 321-888 | WASHER | 1 | | |
| 18 | 321-889 | SPINDLE | 1 | | |
| 19 | 321-882 | IDLE GEAR SET (2 PCS.) | 2 | | |
| 20 | 321-883 | NEEDLE ROLLER | 2 | | |
| 21 | 321-891 | RING GEAR | 1 | | |
| 22 | 321-890 | WASHER (C) | 1 | | |
| 23 | 600-1VV | BALL BEARING 6001VVCMP52L | 1 | | |
| 24 | 321-892 | INNER COVER | 1 | | |
| 25 | 321-894 | DAMPER | 1 | | |
| 26 | 321-893 | RETAINING RING | 1 | | |
| 27 | 321-874 | MOTOR | 1 | | |
| 28 | 321-876 | INTERNAL WIRE (RED) 115L | 1 | | |
| 29 | 321-877 | INTERNAL WIRE (BLACK) 60L | 1 | | |
| 30 | 301-653 | TAPPING SCREW (W/FLANGE) D4X20 (BLACK) | 7 | | |
| * | 31 | NAME PLATE | 1 | | |
| | 32 | 321-913 HOUSING (A).(B) SET | 1 | | |
| * | 33 | CAUTION PLATE | 1 | | |
| | 34 | 321-917 DC-SPEED CONTROL SWITCH | 1 | | |
| | 35 | 321-871 PUSHING BUTTON | 1 | | |
| | 36 | HITACHI LABEL | 1 | | |
| * | 37 | 320-287 HOOK ASS'Y | 1 | INCLUD. 38 | |
| * | 37 | 321-918 HOOK ASS'Y (W/LIGHT) | 1 | INCLUD. 38, 39 FOR USA, CAN | |
| | 38 | 320-288 V-LOCK NUT M5 | 1 | | |
| * | 39 | 321-672 TAPPING SCREW D2X6 | 2 | FOR USA, CAN | |
| | 40 | 318-349 STRAP (YELLOW) | 1 | | |
| | 41 | 320-777 MACHINE SCREW (W/SP. WASHER) M3X4 | 1 | | |
| | 42 | 320-776 FIN | 1 | | |
| | 43 | 319-926 HOOK SPRING | 1 | | |
| | 44 | 319-927 SPECIAL SCREW M5 | 1 | | |
| * | 45 | 321-652 BATTERY EB 1212S (W/ENGLISH N.P) | 2 | | |
| * | 45 | 320-608 BATTERY EB 1214L (W/ENGLISH N.P.) | 2 | | |
| * | 45 | 320-606 BATTERY EB 1214L (W/ENGLISH N.P.) | 2 | FOR NZL, CHN | |
| * | 45 | 320-686 BATTERY EB 1222HL (W/ENGLISH N.P) | 1 | | |
| * | 45 | 320-387 BATTERY EB 1220BL (W/ENGLISH N.P.) | 2 | | |
| | | | | | |

STANDARD ACCESSORIES

WH 12DAF

[illegible]

OPTIONAL ACCESSORIES

[illegible]

[illegible]

