

MODEL

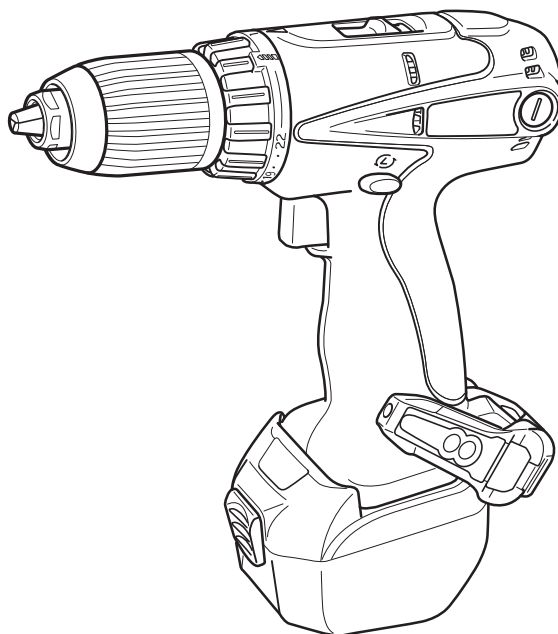
DS 14DAL

Hitachi
Power Tools

**CORDLESS DRIVER DRILL
DS 14DAL**

**TECHNICAL DATA
AND
SERVICE MANUAL**

D



LIST No. G858

Oct. 2006

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

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:

Symbols Utilized	Competitors	
	Company Name	Model Name
C	MAKITA	BDF440



CONTENTS

	Page
1. PRODUCT NAME	1
2. MARKETING OBJECTIVE	1
3. APPLICATIONS	1
4. SELLING POINTS	2
4-1. Selling Point Descriptions	3
5. SPECIFICATIONS	5
6. COMPARISONS WITH SIMILAR PRODUCTS	6
6-1. Comparisons of Specifications Listed on Catalogs	6
7. WORKING PERFORMANCE PER SINGLE CHARGE	7
8. PRECAUTIONS IN SALES PROMOTION	8
8-1. Safety Instructions	8
8-2. Inherent Drawbacks of Cordless Driver Drills Requiring Particular Attention During Sales Promotion	10
9. REFERENCE MATERIALS	12
9-1. Feedback System	12
10. REPAIR GUIDE	13
10-1. Precautions in Disassembly and Reassembly	13
10-2. Precautions in Disassembly and Reassembly of Battery Charger	21
11. STANDARD REPAIR TIME (UNIT) SCHEDULES.....	22
Assembly Diagram for DS 14DAL	

1. PRODUCT NAME

Hitachi 14.4 V Cordless Driver Drill, Model DS 14DAL

2. MARKETING OBJECTIVE

The new Model DS 14DAL is a compact and lightweight cordless driver drill. It is the upgraded version of the well-reputed Model DS 12DM. Features of the Model DS 14DAL include the following:

- (1) Greater maximum torque
- (2) Equipped with the Type EBM 1430R lithium-ion battery

We aim to expand sales with the Model DS 14DAL.

NOTE: The Type EBM 1430R 14.4 V lithium-ion battery that comes with the Model DS 14DAL is not interchangeable with the Type EBL 1430 lithium-ion battery that has already been on the market.

3. APPLICATIONS

- Tightening and loosening wood screws, tapping screws, machine screws and nuts
- Drilling into wood, metal and plastic materials

4. SELLING POINTS

Higher performance

Greater maximum torque

- Maximum torque 38 N·m (386 kgf·cm)

Improved overload durability (improved cooling efficiency)

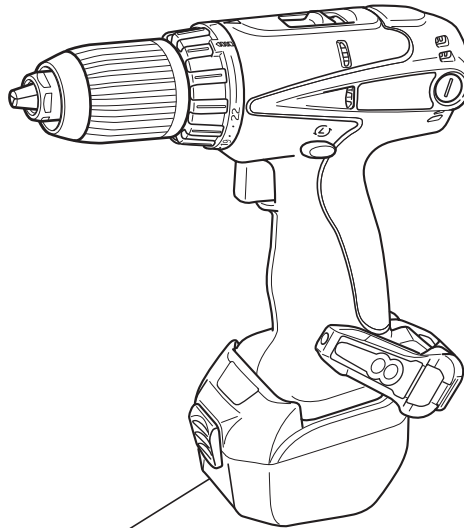
- Large radial fan
- Optimally designed cooling air path

22-stage clutch

- Fine torque adjustment

Manual tightening mechanism

- Usable as a manual screwdriver



Easier to operate

Hook with a yellow LED light

- LED light is convenient for operation in a dark place.
- Convenient for carrying and storing the tool.
- Angle-adjustable in 5 steps with one-touch simple operation
- Mountable on either side

Injection-molded case

- Big storage space
- Durable hinges

Slip-resistant clutch dial

- Soft and easy to turn thanks to the elastomer resin

Comfortably shaped handle

- Soft and slip-resistant thanks to the elastomer resin
- Slim handle

Long-life lithium-ion battery

The lithium-ion battery is of a safe design thanks to the built-in overdischarge protection circuit, overload protection circuit, and voltage monitoring circuit for each cell.

- The battery is equipped with the overdischarge protection circuit to prevent overdischarge (overuse) of the battery.
- The battery is equipped with the voltage monitoring circuit for each cell to prevent overcharge (excessive charging) of the battery.

	Model DS 14DAL + Type EBM 1430R (Lithium-ion battery)	C (Lithium-ion battery)
Number of charging/ discharging	Approx. 1,500	500

Easier to maintain

Externally replaceable carbon brushes

- The carbon brushes are singly replaceable.

Separate-type motor

- The armature is singly replaceable.

4-1. Selling Point Descriptions

4-1-1. Greater maximum torque

The Model DS 14DAL is a high-power driver drill with its maximum torque 38 N·m {386 kgf·cm} thanks to the adoption of the powerful rare-earth magnet motor that is well-reputed in the Model DS 12DM. It enables drilling large-diameter holes and tightening large-diameter screws. (See "7. WORKING PERFORMANCE PER SINGLE CHARGE" for comparison of working speed as a guide.)

	DS 14DAL	DS 12DM		C
Battery (Capacity [Ah])	EBM1430R (3.0)	EB1230HL (3.0)	EB1220BL (2.0)	
Entire length [mm]	203	203		186
Entire height [mm]	237	229	220	242
Entire width [mm]	76	73		79
Weight [kg]	1.6	1.7	1.6	1.6
Maximum torque [N·m]	38 {386 kgf·cm}	36 {367 kgf·cm}		38 (386 kgf·cm)

4-1-2. Long-life 14.4 V lithium-ion battery Type EBM 1430R

The Type EBM 1430R lithium-ion battery is equipped with the overdischarge protection circuit, overload protection circuit, and voltage monitoring circuit for each cell to prevent reduction of the battery life due to overdischarge (overuse) or overcharge (excessive charging). The Type EBM 1430R lithium-ion battery can be charged/discharged about 1,500 times, while C can be charged/discharged about 500.

Precautions for use of the Type EBM 1430R lithium-ion battery

The Type EBM 1430R lithium-ion battery is equipped with a protective function that automatically stops output to extend the battery life. The motor may stop automatically in either of the following case ① or ② even if the switch is depressed continuously during operation. This is because the protective function is activated.

The battery is not faulty.

- ① The motor may stop automatically when the remaining battery level is low (when the battery voltage is decreased to about 8 V). Charge the battery immediately in such case.
- ② The motor may stop if the Model DS 14DAL is overloaded. In such case, release the switch and eliminate the cause of the overload problem. Then the Model DS 14DAL is operable.

Please instruct the customers on the above precautions.

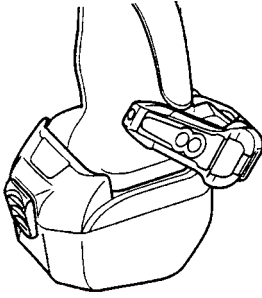
NOTE The Type EBM 1430R lithium-ion battery that comes with the Model DS 14DAL is not interchangeable with the Type EBL 1430 lithium-ion battery that has already been on the market.

4-1-3. Hook with a yellow LED light

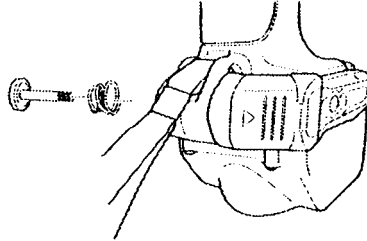
This hook is convenient for carrying the Model DS 14DAL by hanging on a belt and also for storing. In addition, the yellow LED light can be conveniently used as a subsidiary light for operation in a dark place. Features of the hook include the following:

- ① The hook is designed to be drawn out quickly when needed and retracted quickly when not needed with one-touch simple operation to prevent from interfering with other work. The hook angle is adjustable in 5 steps.
- ② The hook is mountable on either side. The hook can be easily mounted by using a flat-blade screwdriver or a coin.

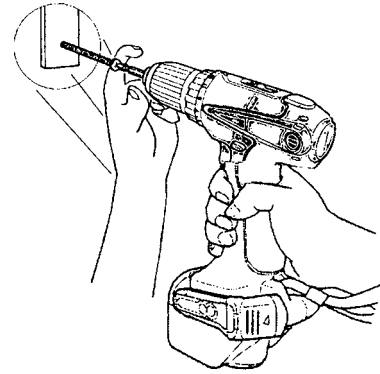
- ③ The yellow LED light is usable by turning on the independent light switch when needed. It is designed to light an object diagonally to avoid creating a shadow of the drill bit or the operator's hand supporting a screw. Thanks to the internal circuit, the LED light is automatically turned off about 15 minutes later.



① Angle-adjustable in 5 steps



② Mountable on either side



③ Diagonal lighting to avoid creating a shadow

4-1-4. Injection-molded case

The injection-molded case has enough storage space to accommodate many accessories. In addition, the case is more durable than the conventional one thanks to the new hinge brackets.

4-1-5. Improved overload durability (improved cooling efficiency)

The Model DS 14DAL is equipped with the same separate-type motor as a driver drill with a power cord. To improve the overload durability in continuous operation, the large radial fan increases the volume of air and the optimally designed cooling air path that is descended from the Model DS 12DM increases the cooling efficiency.

4-1-6. Slip-resistant 22-stage clutch dial

The 22-stage clutch dial ensures fine torque adjustment. The clutch dial is made of elastomer resin (soft resin). It is soft, slip-resistant and easy to operate for torque setting.

4-1-7. Manual tightening mechanism

When a screw cannot be driven completely with the torque set by the clutch dial, turn off the switch and use the Model DS 14DAL as a screwdriver by turning the main body manually (maximum manual tightening torque: 22.5 N·m {230 kgf·cm}).

4-1-8. Comfortably shaped handle

The handle is soft, slip-resistant, and comfortably fits in a hand thanks to the elastomer resin. In addition, the switch section of the handle is thinned for comfortable gripping.

4-1-9. Externally replaceable carbon brushes and separate-type motor

The carbon brushes are replaceable from the outside. The armature is also singly replaceable because the Model DS 14DAL is equipped with the same separate-type motor as a driver drill with a power cord. Thus the Model DS 14DAL is easier to maintain.

4-1-10. Others

- The switch terminal is isolated to prevent scratching the contact area due to vibration of the battery.
- The battery contact (holding) area of the housing is increased to prevent rattling of the battery due to wear.

5. SPECIFICATIONS

Capacity		Screw driving Wood screw 6.8 mm nominal dia. x 50 mm Machine screw 6 mm Drilling Metal Mild steel 13 mm (Thickness 1.6 mm) Aluminum 13 mm (Thickness 1.6 mm) Wood 27 mm (Thickness 18 mm)																									
Keyless chuck (13VLRG-N)		Mount type Screw-on (UNF 1/2" – 20) Preventive mechanism against loosening (tightening type) Diameter 1.5 to 13 mm																									
No-load rotation speed (when fully charged at 20°C)		Low: 0 to 350 rotations/min. High: 0 to 1,200 rotations/min.																									
Torque		Slip torque ... 0.49±0.3 N·m to 4.4±1.0 N·m {5±3 kgf·cm to 45±10 kgf·cm} (22 stages) Max. torque ... Low: 38.0 N·m {386 kgf·cm}/High: 10.0 N·m {102 kgf·cm}																									
Type of motor		Fan cooled rare-earth magnet motor																									
Type of switch		Trigger switch with pushing button for forward and reverse rotation changeover (with brake)																									
Handle configuration		T-type (with soft-grip handle)																									
Enclosure		Body Glassfiber reinforced polycarbonate resin (black) and thermoplastic elastomer (green) Battery ... Glassfiber reinforced polycarbonate resin (black) Charger .. ABS resin (black)																									
Battery (Type EBM 1430R)		Sealed cylindrical lithium-ion storage battery Nominal voltage DC 14.4 V Nominal life Charging/discharging: Approx. 1,500 times Nominal capacity 3.0 Ah																									
Charger (Model UC 18YRL)		Overcharge protection system (1) Battery voltage detection (- ΔV system) Battery temperature detection (dT/dt system) (2) Battery surface temperature detection (thermostat or thermistor) (3) 120 minutes timer (4) Stop current detection Power input: 95 W Charging time: Approx. 45 minutes [for Type EBM 1430R battery at 20°C] Operable ambient temperature range: 0 °C to 40°C The maximum allowable temperature of the Type EBM 1430R battery is 50°C Indication method of battery charging function <table><tr><th colspan="5">Indication of the pilot lamp</th></tr><tr><td rowspan="4">Charge status lamp (RED)</td><td>Before charging</td><td>Blinks (RED)</td><td>0.5 sec. ON 0.5 sec. OFF</td><td rowspan="3"></td></tr><tr><td>While charging</td><td>Lights (RED)</td><td>Stays ON continuously</td></tr><tr><td>Charging complete</td><td>Blinks (RED)</td><td>0.5 sec. ON 0.5 sec. OFF</td></tr><tr><td>Charging impossible</td><td>Flickers (RED)</td><td>0.1 sec. ON 0.1 sec. OFF</td><td>Malfunction in the battery or the charger.</td></tr><tr><td>Overheat lamp (GREEN)</td><td>Overheat standby</td><td>Lights (GREEN)</td><td>Stays ON continuously</td><td>Battery overheated. Unable to charge. (Charging will commence when battery cools.)</td></tr></table>	Indication of the pilot lamp					Charge status lamp (RED)	Before charging	Blinks (RED)	0.5 sec. ON 0.5 sec. OFF		While charging	Lights (RED)	Stays ON continuously	Charging complete	Blinks (RED)	0.5 sec. ON 0.5 sec. OFF	Charging impossible	Flickers (RED)	0.1 sec. ON 0.1 sec. OFF	Malfunction in the battery or the charger.	Overheat lamp (GREEN)	Overheat standby	Lights (GREEN)	Stays ON continuously	Battery overheated. Unable to charge. (Charging will commence when battery cools.)
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Weight	Net	Main body unit (including battery) 1.6 kg Charger unit (UC 18YRL, including cord) 0.6 kg																									
	Gross	DS 14DAL (2MRK) 4.2 kg																									
Standard accessories	(2MRK)	Charger (UC 18YRL) 1																									
		Battery (EBM 1430R) 2																									
		Phillips (plus) driver bit (No. 2) 1																									
		Case (injection-molded) 1																									

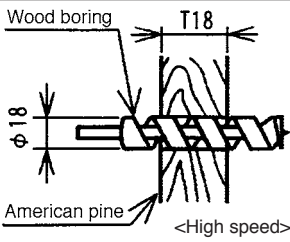
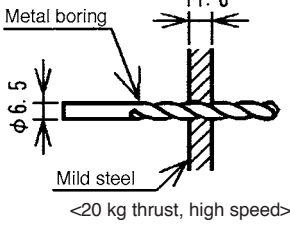
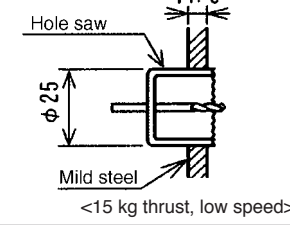
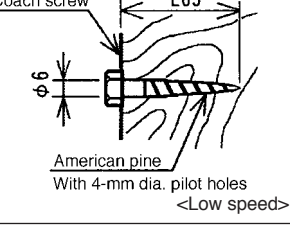
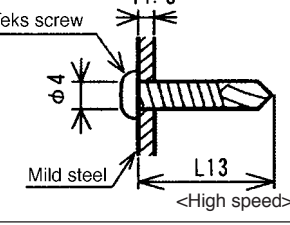
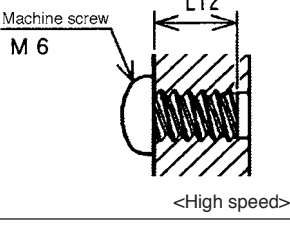
6. COMPARISONS WITH SIMILAR PRODUCTS

6-1. Comparisons of Specifications Listed on Catalogs

Maker			HITACHI			C
Model			DS 14DAL	DS 12DM		
Auxiliary symbol			2MRK	(2HLFK)	(2BLFK)	—
Capacity	Drilling	Mild steel	13 mm	13 mm		13 mm
		Aluminum	13 mm	13 mm		13 mm
		Wood	27 mm	27 mm		27 mm
	Screw driving	Wood screw	6.8 mm dia. x 50 mm	6.8 mm dia. x 50 mm		6.8 mm dia. x 50 mm
		Machine screw	6 mm	6 mm		6 mm
No-load rotation speed		Low	0 to 350/min	0 to 350/min		0 to 400/min
		High	0 to 1,200/min	0 to 1,200/min		0 to 1,400/min
Max. torque		Low	38.0 N·m {386 kgf·cm}	36.0 N·m {367 kgf·cm}		38.0 N·m {386 kgf·cm}
		High	10.0 N·m {102 kgf·cm}	9.0 N·m {92 kgf·cm}		Not listed
Slip torque			[22 positions]	[22 positions]		[16 positions]
			0.49 to 4.4 N·m {5 to 45 kgf·cm}	0.49 to 4.4 N·m {5 to 45 kgf·cm}		Not listed
Motor			DC magnet	DC magnet		DC magnet
Carbon brushes			External	External		Internal
2-speed gear			Provided	Provided		Provided
Manual tightening mechanism			Provided	Provided		Provided
Drill chuck	Capacity		13 mm	13 mm		13 mm
	Type		Keyless	Keyless		Keyless
	Sleeve material		Plastic	Plastic		Plastic
	Preventive mechanism against loosening		Tightening type	Tightening type		Tightening type
Switch	Feedback		Provided	Provided		Not listed
	Brake		Provided	Provided		Provided
Reversing switch			Push-button type	Push-button type		Push-button type
Clutch dial			Elastomer and polyamide resins	Elastomer and polyamide resins		Unknown
Spotlight			Provided	Provided		Provided
Hook			Provided (One-touch type)	Provided (One-touch type)		Provided (Fixed with fittings)
Strap			Provided	Provided		Provided
Battery	Type		EBM 1430R	EB 1230HL	EB 1220BL	—
	Nominal capacity (Ah)		3.0	3.0	2.0	3.0
	Nominal voltage (V)		14.4	12		14.4
	Nominal charging time (min.)		45	70	50	22
Overall length			203 mm	203 mm		186 mm
Overall height			237 mm	229 mm		242 mm
Overall width			76 mm	73 mm		79 mm
Weight			1.6 kg	1.7 kg		1.6 kg

7. WORKING PERFORMANCE PER SINGLE CHARGE

Drilling and fastening performance comparison per charge

Type of work	Maker	Model name	No. of drilling or fastening operations per charge				Drilling speed (sec./pc.)
			*0 0	*600 150	*1000 300	*1400 450	
 <p>Wood boring φ18 T18 American pine <High speed></p>	HITACHI	DS 14DAL	350				1.1
		DS 12DM	290				1.2
	C		375				1.0
 <p>Metal boring φ6.5 T1.6 Mild steel <20 kg thrust, high speed></p>	HITACHI	DS 14DAL	200				4.8
		DS 12DM	140				5.7
	C		215				4.5
 <p>Hole saw φ25 T1.6 Mild steel <15 kg thrust, low speed></p>	HITACHI	DS 14DAL	18				18.5
		DS 12DM	13				25.0
	C		20				17.3
 <p>Coach screw φ6 L65 American pine With 4-mm dia. pilot holes <Low speed></p>	HITACHI	DS 14DAL	150				4.2
		DS 12DM	110				5.7
	C		165				3.8
 <p>Teks screw φ4 T1.6 L13 Mild steel <High speed></p>	HITACHI	DS 14DAL	670				1.0
		DS 12DM	495				1.3
	C		740				0.9
 <p>Machine screw M 6 L12 Mild steel <High speed></p>	HITACHI	DS 14DAL	1150				0.5
		DS 12DM	880				0.6
	C		1140				0.5

*: Number of Teks screws or machine screws fastened per charge

The above table shows the test data when using batteries of nominal capacity 3.0 Ah.

NOTE) The above table shows an example of test data. As actually measurements may vary depending on ambient temperature, sharpness of drill bit, types of workpieces, working method, etc., this data should be used as a comparative guide only.

8. PRECAUTIONS IN SALES PROMOTION

8-1. Safety Instructions

In the interest of promoting the safest and most efficient use of the Model DS 14DAL cordless driver drill 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, 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 for use of the cordless 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 of inactivity, 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) 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.

(3) Do not use any voltage increasing equipment (transformer etc.) between the power source and the charger.

If the charger is used with voltage higher than that indicated on the unit, it will not function properly.

(4) Conduct battery charging at an ambient temperature range of 0°C – 40°C.

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 temperature under 0°C the thermostat will not function properly, and the storage battery may be overcharged. At temperature over 40°C, the storage battery cannot be sufficiently charged. The optimum temperature range is 20°C – 25°C.

(5) The battery charger should not be used continuously.

At high ambient temperature, 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 wait about 15 minutes before charging the next battery.

(6) Do not insert foreign objects into the air vents 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 flammable objects, to be dropped or inserted into the air vents. This could cause electrical shock, fire, or other serious hazards.

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

Special devices, such as a thermostat, are built into the storage battery and the 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.

(8) Disposal of the Type EBM 1430R storage battery

Ensure that all customers understand that Type EBM 1430R storage battery should be returned to the Hitachi power tool sales outlet or the authorized service center when it is no longer capable of being recharged or repaired. If thrown into a fire, the battery may explode.

B. Caution plates

(1) The following cautions are listed on the Name Plate attached to Type EBM 1430R storage battery.

For Europe

CAUTION

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

8-2. Inherent Drawbacks of Cordless Driver Drills Requiring Particular Attention During Sales Promotion

The cordless driver drill offers many advantages; it can be used in places where no power source is available, the absence of a cord allows easy use, etc. However, any cordless tool has certain inherent drawbacks.

Salespersons must be thoroughly familiar with these drawbacks in order to properly advise the customer in the most efficient use of the tool.

A. Suggestions and precautions for the efficient use of the tool

- (1) Use the cordless driver drill for comparatively light work.

Because they are battery driven, the output of the motor in cordless driver drills is rather low in comparison with conventional electric power tools. Accordingly, they are not suitable for continuous drilling of many holes in succession, or for drilling into particularly hard materials which creates a heavy load. Salespersons should recommend conventional electric power tools for such heavy work.

- (2) Drilling of large diameter holes should be conducted at low speed.

Instruct the customer that drilling of large diameter holes or other work which requires particularly strong torque should be done at low speed. Because there is less torque at high speed, attempting such work at high speed will not improve working efficiency.

- (3) Do not insert a foreign object into body vent holes.

The body of this tool has vent holes for improving the cooling efficiency. As a fan is built into the motor, a foreign object inserted through a vent hole may cause a failure. Please instruct customers to never insert a foreign object into the vent hole.

- (4) Avoid "Locking" of the motor.

Locking of the motor will cause an overload current that could result in burning of the motor and/or rapid deterioration of the battery. Salespersons should advise the customer to immediately release the switch and stop operation if the motor becomes locked. (A jammed drill bit can be disengaged from the workpiece material by setting the switch to reverse rotation, or by manually turning the main body of the tool.)

- (5) Variation in amount of work possible per charge

Although the nominal chargeable capacity of the storage batteries used with the Model DS 14DAL is 3.0 Ah, the actual capacity may vary within 10% of that value depending on the ambient temperature during use and charging, and the number of times the batteries have been recharged. It should be noted that other factors which may have a bearing on the amount of work possible per charge are the working conditions (ambient temperature, type and moisture content of the workpiece, sharpness of the drill bit, etc.) and the operational skill of the user.

- (6) Precautions in the use of HSS drill bits

Although the Model DS 14DAL is designed for drilling capacities of 27 mm in wood, and 13 mm in aluminum and mild steel, this capability is not as efficient as conventional electric power tools.

In particular, when drilling through aluminum material with a 13 mm drill bit, the drill tends to become locked when the drill bit penetrates through the material. For this reason, the customer should be cautioned to reduce the thrust on the main body of the drill when drilling completely through the material to avoid locking the tool. Repeated locking of the drill causes excessive current flow from the batteries which not only decreases the amount of work possible per charge, but could also result in burning of the motor.

(7) Securely tighten the sleeve of the keyless chuck.

The keyless chuck may slip during operation if the shape of the drill bit shank is cylindrical depending on the surface conditions, materials, etc. Please instruct the customers to retighten the keyless chuck more securely if the keyless chuck slips during operation. The holding force of the keyless chuck is increased as the tightening force of the keyless chuck is increased. The Model DS 14DAL is equipped with the locking device to prevent loosening of the keyless chuck. The sleeve makes noise when tightening or loosening. This is because of the locking device and there is no problem.

(8) Avoid continuous use.

Although the Model DS 14DAL can bear continuous operation under certain conditions, operating conditions are different depending on material of workpiece and sharpness of the drill bit in use. Please instruct the customers to avoid continuous use of the Model DS 14DAL and take a pause about 15 minutes after a single charge operation as a guide.

B. Suggestions and precautions for the efficient use of the charger and storage batteries

If the storage battery Type EBM 1430R 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 pilot lamp (red) may not be turned on when the battery is connected to the charger. Chargeable temperature ranges of each type of battery are specified as follows.

Type EBM 1430R: from 0°C to 50°C

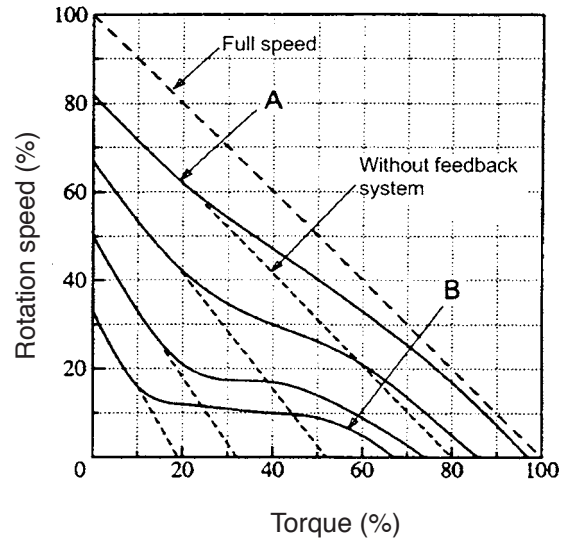
In such a case, the customer should be advised to place the battery in a shaded area with a good airflow, and allow sufficient cooling before recharging. This phenomenon is common to all existing batteries that employ a thermostat. The cooling time required before charging varies from a few minutes to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

9. REFERENCE MATERIALS

9-1. Feedback System

The Model DS 14DAL has the variable speed switch equipped with the feedback system. This feedback system ensures a sufficiently large torque even in the variable speed range. For example, when operating the Model DS 14DAL at a speed about 80% of the full speed, the maximum torque is about 95% of that at a full speed (curve "A"). Even when the Model DS 14DAL is operated at a speed about 30% of the full speed, the maximum torque does not decrease under about 65% of that at a full speed (curve "B") to ensure a sufficiently large torque at a low speed.

Besides, the braking function allows the driver unit to stop rotation immediately when the trigger switch is released, which is a convenient feature for continuous screw tightening or drilling works. The step-less variable speed mechanism controls the speed depending on the depressed amount of the trigger switch within the range from 0 to 350 cycles per minute for the low speed mode and from 0 to 1,200 cycles per minute for the high speed mode. Thanks to this mechanism, positioning is easily done for screw tightening and drilling works.



Schematic diagram of the feedback system

10. REPAIR GUIDE

Be sure to remove the storage batteries from the main body before servicing. Inadvertent triggering of the switch with the storage battery connected will result in danger of accidental turning of the motor.

10-1. Precautions in Disassembly and Reassembly

The **[Bold]** numbers in the descriptions below correspond to the item numbers in the Parts List and exploded assembly diagram for the Model DS 14DAL.

10-1-1. Disassembly

(1) Removal of the Hook Ass'y (W/Light) **[44]**

Remove the Special Screw M5 **[49]** with a flat-blade screwdriver or a coin. Remove the Hook Ass'y (W/Light) **[44]** and the Hook Spring **[48]**.

(2) Removal of the Carbon Brushes **[33]**

Remove the Brush Cap **[34]** first then pry the Carbon Brush **[33]** off with a flat-blade screwdriver (at the position of collars). Remove the Brush Caps **[34]** and the Carbon Brushes **[33]** at both sides.

(3) Removal of the Drill Chuck **[2]**

Perform the following steps (a) and (b) with the main unit mounted in the vise for removal of the Drill Chuck **[2]**. At this time, it is recommended to sandwich a cloth between the main unit and the vise to prevent the Housing Set **[37]** from being scratched.

(a) Fully open the jaws of the Drill Chuck **[2]** and remove the Special Screw (Left Hand) M6 x 23 **[1]** by turning clockwise (be careful that it is a left-handed screw).

(b) Hold the hexagonal portion at the tip of the Drill Chuck **[2]** with a 19-mm socket wrench as shown in Fig. 1 then turn it counterclockwise to remove the Drill Chuck **[2]**.

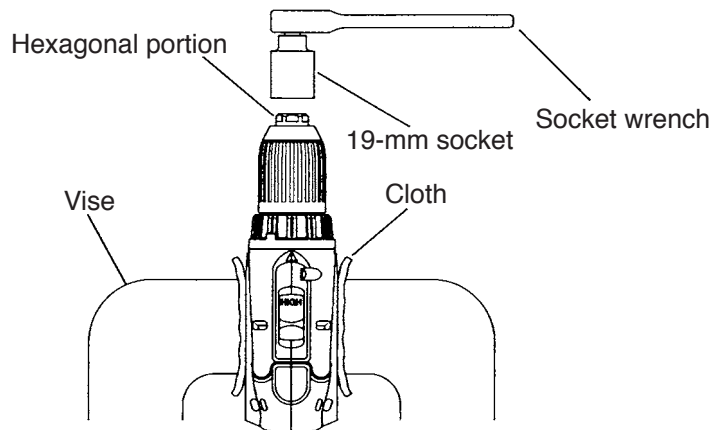


Fig. 1

(4) Adjust the Clutch Dial **[4]** to "1."

(5) Disassembly of the main unit

Remove the eight Tapping Screws (W/Flange) D3 x 16 (Black) **[35]** from the main unit. Holding the battery chamber of Housing (B) **[37]**, gently remove Housing (B) **[37]**.

Then the inside parts can be removed in an assembled or single state. All the parts can be easily removed by raising the Clutch Dial **[4]**. Parts are separated into the drive unit (an assembly of the armature and the gear unit), power supply unit, Pushing Button **[41]** and Strap (Black) **[47]**.

(6) Disassembly of the drive unit

- (a) Remove the Clutch Dial **[4]** and the Click Spring **[9]** from the Front Case **[8]**.

(Note) Do not remove the Nut **[5]** from the Front Case **[8]** in this step.

- (b) Remove the Shift Arm **[20]** from the Gear Box Ass'y **[3]** and remove the Shift Knob **[38]** from the Shift Arm **[20]**. Do not deform the Shift Arm **[20]** by applying excessive force.
- (c) Turn the Motor Spacer **[28]** until a click is heard counterclockwise viewing from the rear of the Armature **[29]**. Remove the Motor Spacer **[28]** from the Rear Case **[18]**. Thus the armature unit is separated from the gear unit.

(7) Disassembly of the armature unit

- (a) Removal of the Magnet **[30]**

Note that the magnetic force of the Magnet **[30]** is strong. Hold the Motor Spacer **[28]** securely and pull toward the back of the Armature **[29]** to remove (see Fig. 8).

(Note) Be careful that the ball bearing and the washer behind the Armature **[29]** may be attracted to the Magnet **[30]** and come off the Armature **[29]** when removing the Magnet **[30]**. Do not remove washer (M) that is attracted to the Magnet **[30]** by the magnetic force.

- (b) Removal of the Dust Guard **[31]**

Remove the Dust Guard **[31]** that is attracted to the Magnet **[30]** by the magnetic force (see Fig. 8).

- (c) Removal of the Motor Spacer **[28]**

Remove the Motor Spacer **[28]** from the Armature **[29]**. If it is too hard to remove, support the Motor Spacer **[28]** and press down the tip of the armature shaft of the Armature **[29]** with a hand press.

(8) Disassembly of the gear unit

- (a) Disassembly of the deceleration mechanism

Turn Plate (A) **[27]** mounted in the Rear Case **[18]** counterclockwise to remove. Take out the First Ring Gear **[26]**, Planet Gear (A) Set (4 pcs.) **[25]**, Pinion (B) **[24]**, Planet Gear (B) Set (4 pcs.) **[23]**, Pinion (C) **[22]** and Slide Ring Gear **[21]** in order. Then remove the Screw Set D3 x 12 (4 pcs.) **[19]** that connects the Front Case **[8]** with the Rear Case **[18]**. Take out Plate (B) **[17]**, Planet Gear (C) Set (3 pcs.) **[16]**, Carrier **[15]**, Ring Gear **[13]**, Needle Roller (C) Set (6 pcs.) **[14]**, Lock Ring **[12]**, six Steel Balls D5 **[11]** and six Rollers **[10]** from the Front Case **[8]** in order.

(Note) Do not lose small parts. Pay special attention to the six Steel Balls D5 **[11]**, six Rollers **[10]** and Needle Roller (C) Set (6 pcs.) **[14]** because they are apt to roll.

- (b) Disassembly of the clutch mechanism

Turn the Nut **[5]** counterclockwise to remove from the Front Case **[8]**. Take out the Spring **[6]** and the Thrust Plate **[7]** in order.

(Note) Do not disassemble the Front Case **[8]**.

(9) Disassembly of the power supply unit

Remove two Machine Screws (W/Sp. Washer) M3 x 4 **[39]** and a Machine Screw (W/Sp. Washer) M3 x 4 **[39]**. Then the DC-Speed Control Switch **[40]** and the Fin **[43]** can be removed.

(Note) Be careful in handling the FET and the internal wires of the DC-Speed Control Switch **[40]** as they are apt to be broken at their roots. Do not disconnect three FET internal wires and two terminal internal wires soldered to the DC-Speed Control Switch **[40]**.

10-1-2. Reassembly

Reassembly can generally be carried out as the reverse of the disassembly procedure, with some items to be noted as follows.

(1) Reassembly of the power supply unit

Perform wiring according to the wiring diagram (Fig. 2). Pay attention to the connecting direction of the internal wires and the terminals.

(Note) Be careful in handling the FET and the internal wires of the DC-Speed Control Switch [40] as they are apt to be broken at their roots.

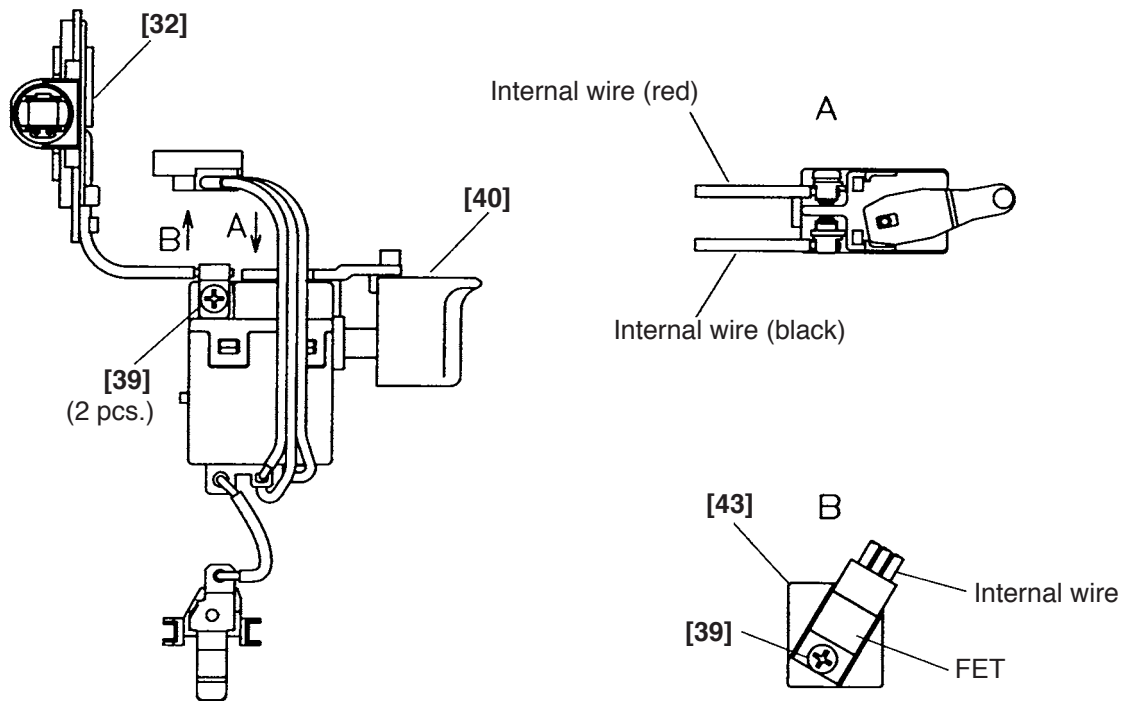


Fig. 2

(2) Reassembly of the clutch mechanism

Mount the Thrust Plate [7] and the Spring [6] to the Front Case [8] in order (see Fig. 3). At this time, align the notch of the Thrust Plate [7] with the protrusion of the Front Case [8].

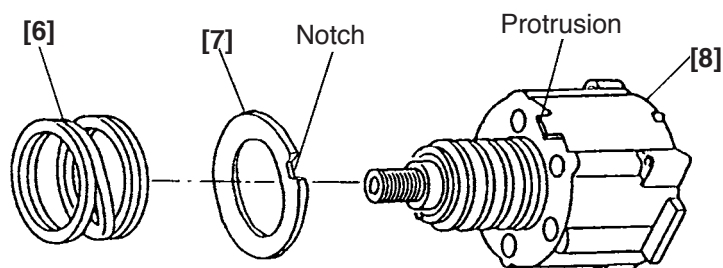


Fig. 3

(b) Screw the Nut [5] in the Front Case [8] (see Fig. 4).

Align the mark (i) on the Nut [5] with the mark on the Front Case [8] then screw it in. Rotate the Nut [5] about a turn clockwise to align the mark (ii) on the Nut [5] with the mark on the Front Case [8]. At this time, check that the "Y" surface of the Nut [5] is almost flush with the "Z" surface of the Front Case [8].

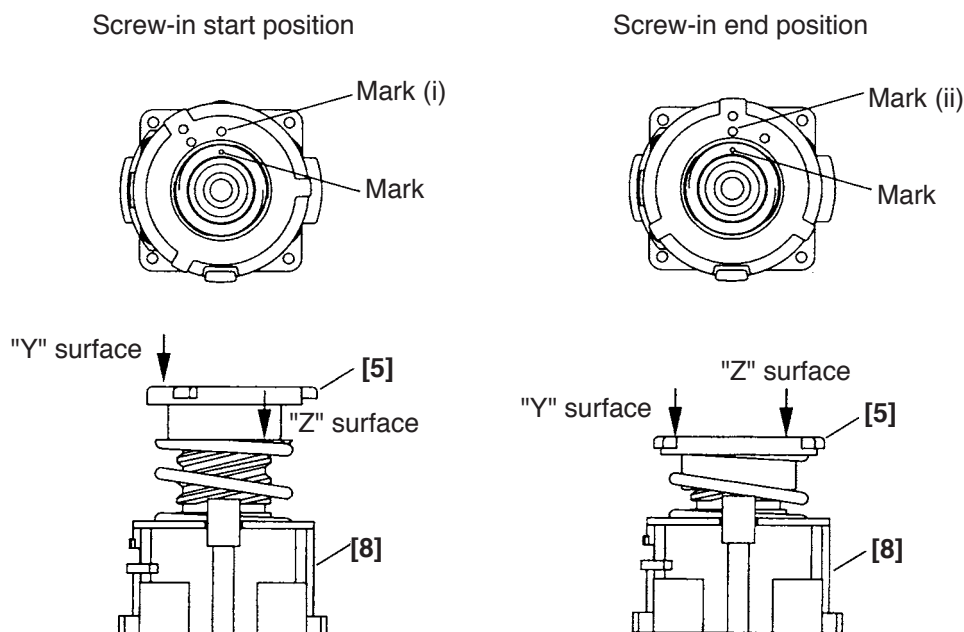


Fig. 4

(3) Reassembly of the manual tightening mechanism

(a) Mount the Lock Ring [12] to the Front Case [8] so that the protrusion of the Lock Ring [12] aligns with the concave portion of the Front Case [8] (see Fig. 5). At this time, mount the Lock Ring [12] so that the stepped protrusion faces forward.

(b) Mount Needle Roller (C) Set (6 pcs.) [14] (see Fig. 5).

(Note) Do not apply grease to the Lock Ring [12] and Needle Roller (C) Set [14]. Application of grease renders the manual tightening mechanism inoperative.

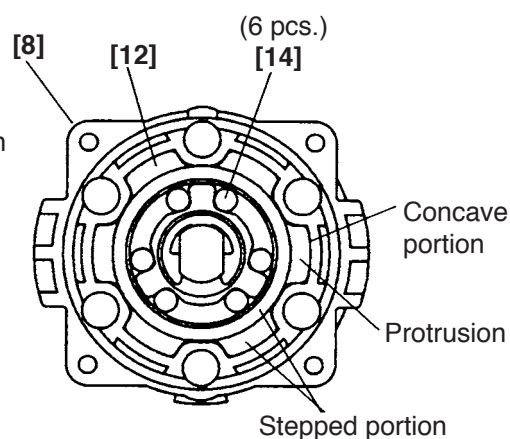


Fig. 5

(4) Reassembly of the deceleration mechanism

(a) Apply grease (Hitachi Motor grease No. 29) to the engaging portions of each gear, needle roller unit, and contacting surfaces of the steel balls of the ring gear properly.

(b) Mount the parts from the Roller [10] to Plate (A) [27] to the parts assembled in the above (3) in order (see Fig. 6).

- ① Mount the Roller [10] first then mount the Steel Balls D5 [11].
- ② Pay attention to the mounting direction of the Ring Gear [13], Carrier [15], Slide Ring Gear [21], Pinion (C) [22] and Pinion (B) [24] (see Fig. 6).
- ③ Mount the Front Case [8] to the Rear Case [18] so that the concave portion of the Front Case [8] aligns with the protrusion of the Rear Case [18] (see Fig. 11).

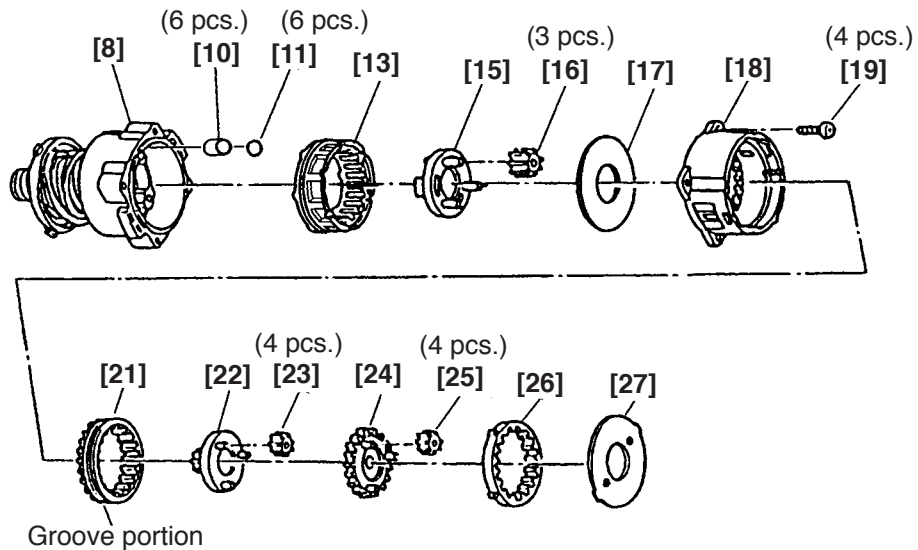


Fig. 6

- ④ Fit the protrusion of Plate (A) [27] in the concave portion of the Rear Case [18] and turn it clockwise viewing from the armature until it contacts the Rear Case [18] (see Fig. 7).

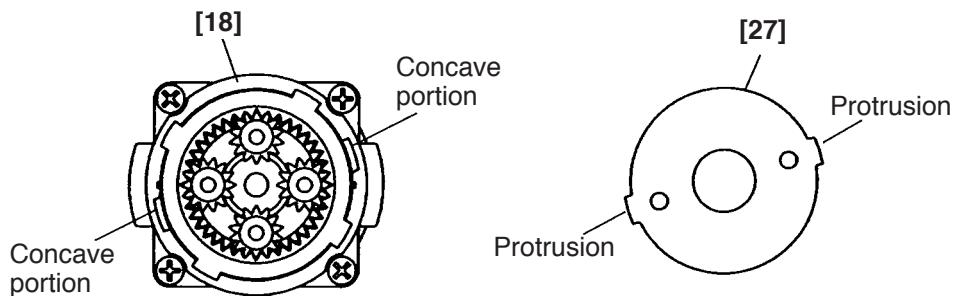


Fig. 7

(5) Reassembly of the armature unit

(a) Mounting the Motor Spacer [28]

Mount the Motor Spacer [28] to the Armature [29]. If it is too hard to mount, support the Motor Spacer [28] and press down the rear end of the armature shaft of the Armature [29] with a hand press.

(b) Mounting the Magnet [30]

Mount the Magnet [30] to the Armature [29] so that the notch of the Magnet [30] faces the rear of the Armature [29]. Hold each part securely as the Armature [29] may be attracted to the Magnet [30] by the strong magnetic force.

(Note) Be careful that the ball bearing and the washer at the rear of the Armature [29] may come off due to the magnetic force of the Magnet [30].

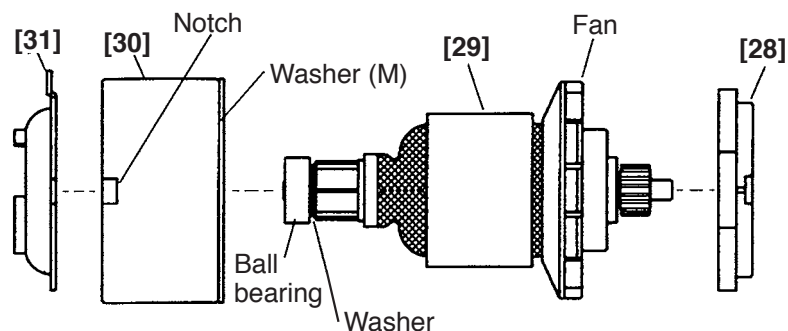


Fig. 8

(c) Mounting the Dust Guard [31]

Mount the Dust Guard [31] to the Magnet [30] so that the protrusion of the Dust Guard [31] aligns with the notch of the Magnet [30]. Hold each part securely as the Dust Guard [31] may be attracted to the Magnet [30] by the strong magnetic force (see Fig. 9).

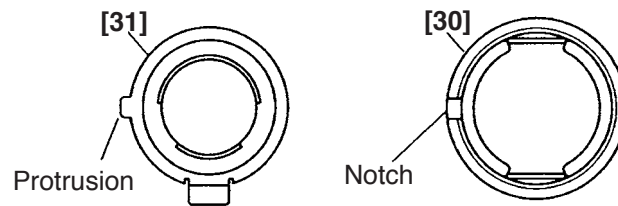


Fig. 9

(6) Reassembly of the drive unit

(a) Fit the protrusion of the Motor Spacer [28] in the concave portion of the Rear Case [18] engaging the pinion of the Armature [29] with Planet Gear (A) Set (4 pcs.) [25]. Turn it fully clockwise viewing from the rear of the Armature [29] (see Fig. 10).

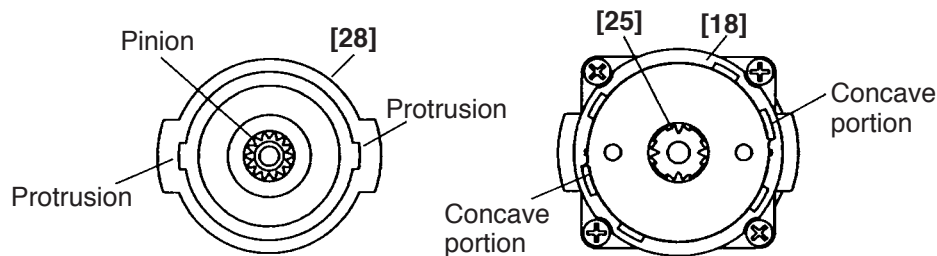


Fig. 10

(b) Mounting the Shift Arm [20] and the Shift Knob [38] (See Fig. 11.)

- ① Mount the Shift Arm [20] to the protruded side of the Rear Case [18] facing its bent portion forward. At this time, insert the protrusion of the Shift Arm [20] into the hole of the Rear Case [18] and check that the protrusion is inserted into the groove of the Slide Ring Gear [21] that is mounted in the Rear Case [18] (see Fig. 6).
- ② Insert the Shift Arm [20] into the groove of the Shift Knob [38] facing "LOW" indication on the Shift Knob [38] backward.

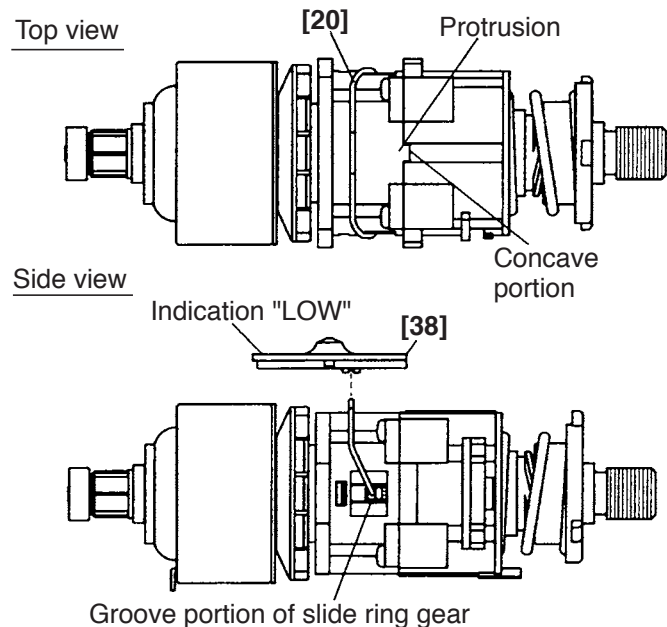


Fig. 11

(c) Mounting the Click Spring [9] and the Clutch Dial [4] (See Fig. 12.)

- ① Mount the Click Spring [9] to the Front Case [8].

② Mount the Clutch Dial [4].

The Nut [5] has three protrusions. One of these protrusions is wider than the others. The Clutch Dial [4] has three concave portions. One of these concave portions is wider than the others. Mount the Nut [5] to the Clutch Dial [4] aligning the wider protrusion of the Nut [5] with the wider concave portion of the Clutch Dial [4] (the wider concave portion of the Clutch Dial [4] is at the position where indicated with "1" viewing from the outside). Check that the protrusion of the Click Spring [9] is inserted into the groove inside the Clutch Dial [4].

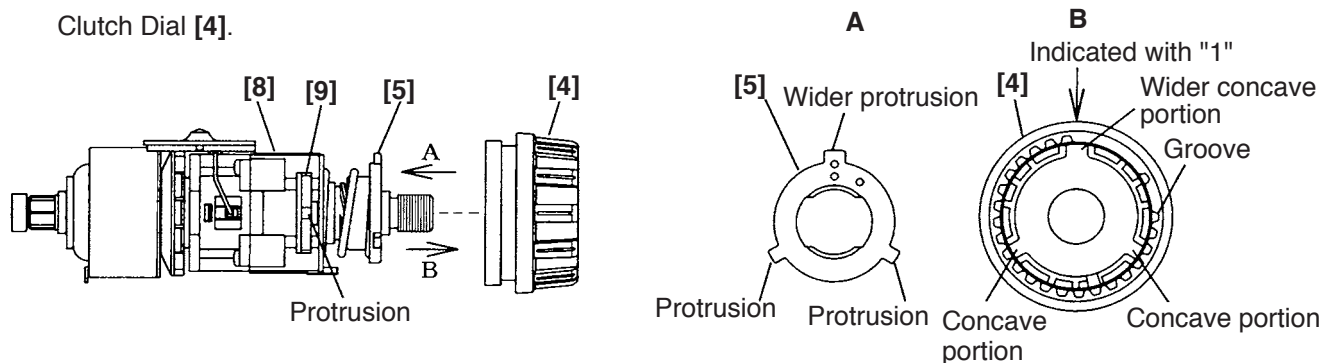


Fig. 12

(7) Reassembly of the main unit

- (a) Mount the power supply unit and the drive unit that were reassembled in the above procedure to Housing (A) [37]. At this time, align the protrusions of the Brush Block [32], Front Case [8] and Motor Spacer [28] with the concave portions of Housing (A) [37], the notch of the Magnet [30] with the protrusion of Housing (A) [37], and the groove of the Clutch Dial [4] with the protrusion of Housing (A) [37] (see Fig. 13).

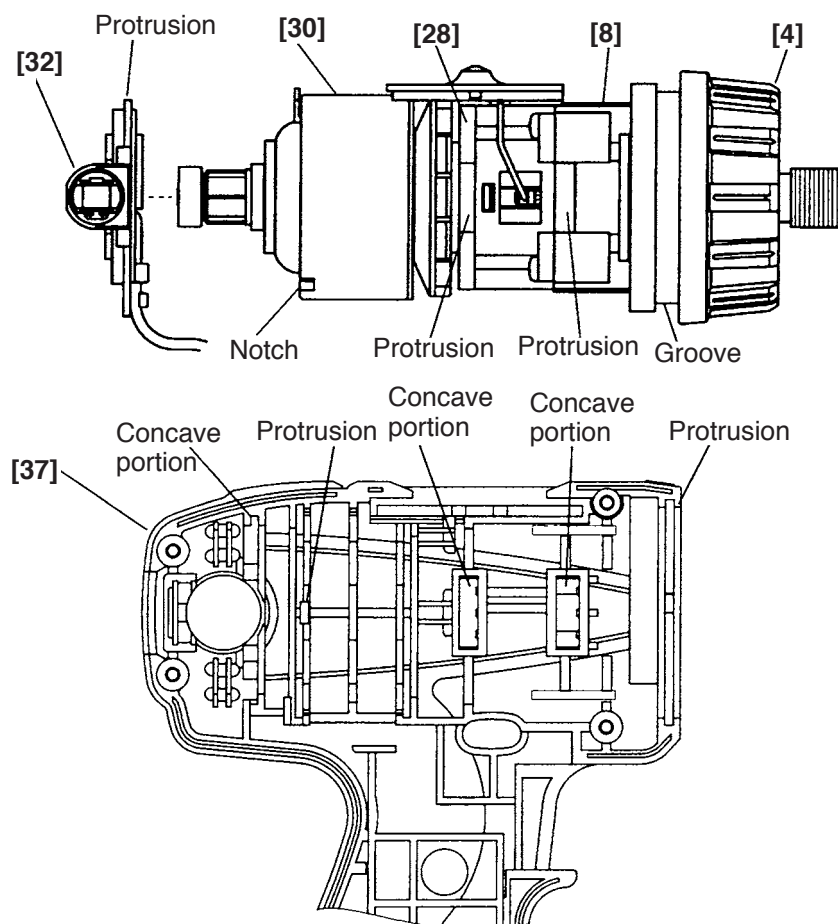


Fig. 13

Mount the Dust Guard [31] to the Brush Block [32] aligning the protrusion of the Dust Guard [31] with the concave portion of the Brush Block [32] (Fig. 14).

At this time, do not mount the DC-Speed Control Switch [40].

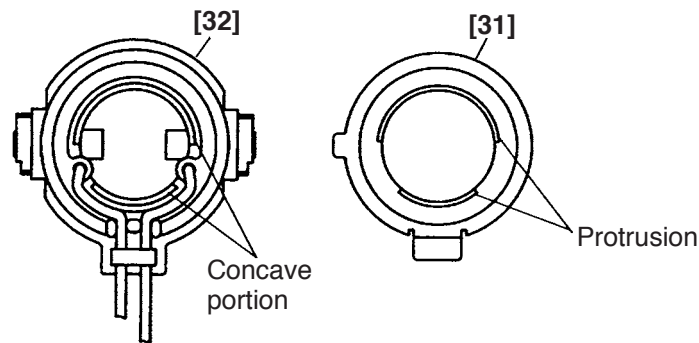


Fig. 14

(b) Apply silicone grease (Shin-Etsu Chemical KS609) to the surface of the Fin [43] where the Magnet [30] contacts. Then mount the Fin [43] to Housing (A) [37].

(Note) Be careful in handling the FET and the internal wires of the DC-Speed Control Switch [40] as they are apt to be broken at their roots.

(c) Mount the DC-Speed Control Switch [40] that was not mounted in the above step (a) to Housing (A) [37]. Mount the Pushing Button [41] to Housing (A) [37]. Check that the protrusion of the forward/reverse changeover lever of the DC-Speed Control Switch [40] is inserted into the U-shaped groove of the Pushing Button [41].

(d) Mount the Strap (Black) [47] to Housing (A) [37].

(e) Align Housing (A) [37] with Housing (B) [37] and secure it with the eight Tapping Screws (W/Flange) D3 x 16 (Black) [35].

(f) Verify proper operation of the Clutch Dial [4] and the Shift Knob [38]. When the reassembly procedure up to step (e) is completed, ensure that every indication on the Clutch Dial [4] from the number "1" to the drill mark "◁□□□" is aligned with the triangle mark on the Housing Set [37] respectively and the Clutch Dial [4] turns moderately. If any indication on the Clutch Dial [4] cannot reach the triangle mark on the Housing Set [37], correctly remount the Clutch Dial [4] referring to step (2) or (6) (c) as it is improperly mounted. Verify proper operation of the Shift Knob [38]. Check that the speed changes between high and low properly by shifting the Shift Knob [38]. If the speed cannot change properly or moderately, correctly remount the Shift Knob [38] referring to step (4) (b) or (6) (b) as it is improperly mounted.

(8) Mounting the Drill Chuck [2]

Mount the Drill Chuck [2] to the spindle and tighten the Special Screw (Left Hand) M6 x 23 [1].

(9) Mounting the Carbon Brushes [33]

Mount the two Carbon Brushes [33] to the Brush Block [32] and secure the two Brush Caps [34] to the Brush Block [32]. Check that the claws of the Carbon Brushes [33] are properly inserted into the brush tubes.

(10) Reassembly of the Hook Ass'y (W/Light) [44]

Check that the V-Lock Nut M5 [46] is mounted to the Hook Ass'y (W/Light) [44]. Mount the Hook Spring [48] and secure it with the Special Screw M5 [49]. Make sure to mount the Hook Spring [48] with its larger diameter side pointing inward the housing.

(11) Other precautions in reassembling

After completion of reassembly, check that the rotating direction of the Drill Chuck [2] matches the position of the Pushing Button [41]. When the Pushing Button [41] is pressed from the (R) side, the rotating direction of the Drill Chuck [2] should be clockwise as viewed from behind. Check that the runout of the Drill Chuck [2] is 0.8 mm or less at the position 110 mm away from the tip of the chuck using a 12-mm dia. test bar.

(12) Screw tightening torque

Special Screw (Left Hand) M6 x 23 [1]	: 3.92 — 4.9 N·m (40 — 50 kgf·cm)
Drill Chuck [2]	: 17.6 — 21.6 N·m (180 — 220 kgf·cm)
Screw Set D3 x 12 [19]	: 0.62 — 0.94 N·m (6 — 10 kgf·cm)
Brush Cap [34]	: 0.68 — 0.88 N·m (7 — 9 kgf·cm)
Tapping Screw (W/Flange) D3 x 16 (Black) [35]	: 1.0 — 1.6 N·m (10 — 16 kgf·cm)
Machine Screw (W/Sp. Washer) M3 x 4 [39]	: 0.29 — 0.39 N·m (3 — 4 kgf·cm)
Special Screw M5 [49]	: 1.47 — 2.45 N·m (15 — 25 kgf·cm)

10-2. Precautions in Disassembly and Reassembly of Battery Charger

Please refer to the Technical Data and Service Manual for precautions in disassembly and reassembly of the Battery Charger UC 18YRL.

11. STANDARD REPAIR TIME (UNIT) SCHEDULES

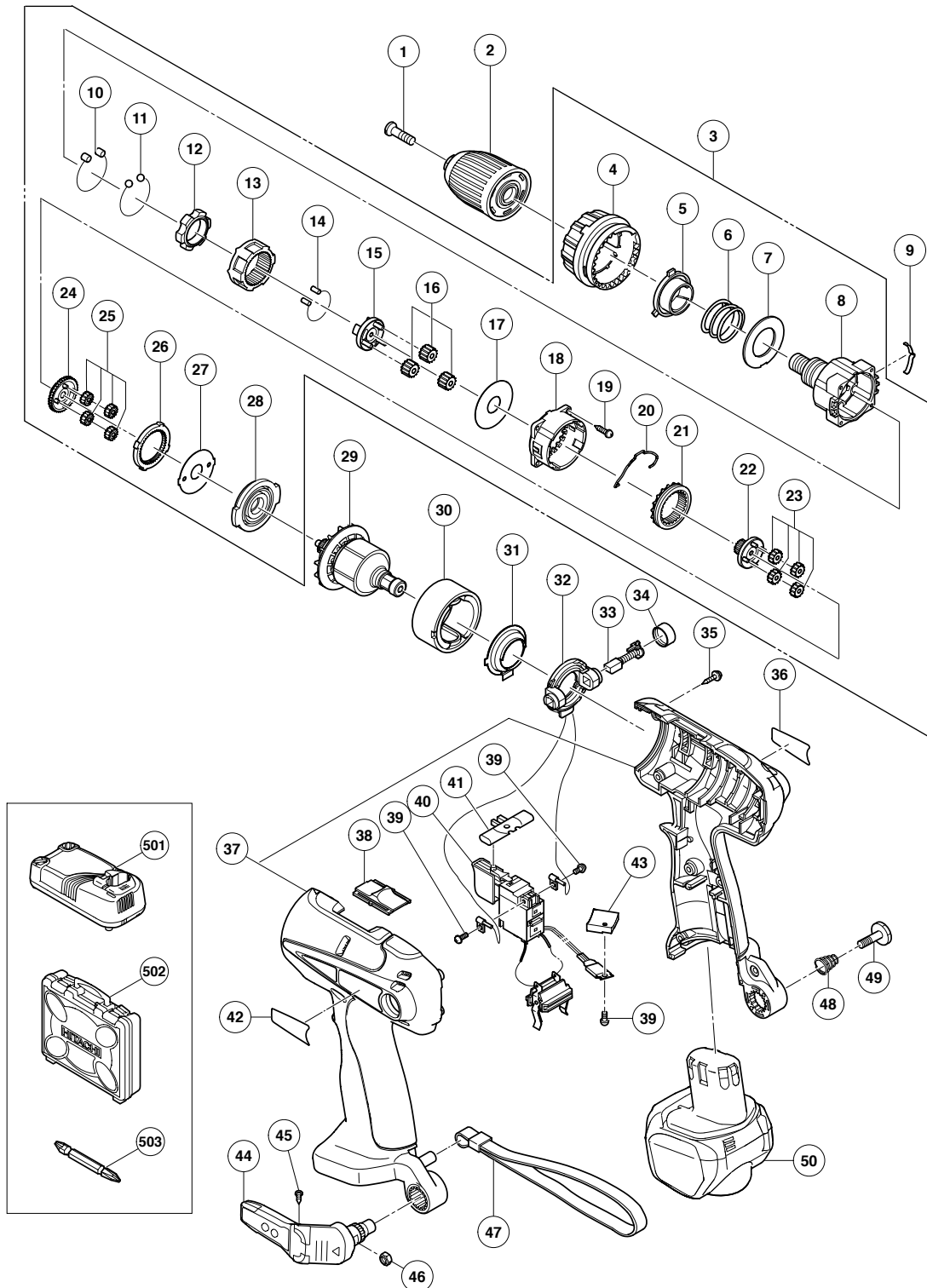
MODEL	Variable		10	20	30	40	50	60
	Fixed							
DS 14DAL		Work Flow						
	General Assembly				Housing (A).(B) Set			
				Armature Magnet Brush Block DC-Speed Control Switch Shift Knob				
				Gear Box Ass'y				
		Drill Chuck		Clutch Dial Nut Spring				
		Hook Ass'y		Front Case Click Spring Lock Ring Ring Gear Carrier Planet Gear (C) Set Rear Case Shift Arm Slide Ring Gear				
				Pinion (C) Planet Gear (B) Set Pinion (B) Planet Gear (A) Set First Ring Gear				

ELECTRIC TOOL PARTS LIST

■ CORDLESS DRIVER DRILL Model DS 14DAL

2006 · 10 · 11

(E1)



PARTS

DS 14DAL

ITEM NO.	CODE NO.	DESCRIPTION	NO. USED	REMARKS	
1	311-959	SPECIAL SCREW (LEFT HAND) M6X23	1		
2	320-684	DRILL CHUCK 13VLRG-N (W/O CHUCK WRENCH)	1		
3	322-460	GEAR BOX ASS'Y	1	INCLUD. 4-8, 10-28	
4	322-461	CLUTCH DIAL	1		
5	320-758	NUT	1		
6	320-757	SPRING	1		
7	320-756	THRUST PLATE	1		
8	326-755	FRONT CASE	1		
9	323-231	CLICK SPRING	1		
10	319-744	ROLLER	6		
11	306-936	STEEL BALL D5	6		
12	320-759	LOCK RING	1		
13	320-761	RING GEAR	1		
14	326-756	NEEDLE ROLLER (C) SET (6 PCS.)	6		
15	320-760	CARRIER	1		
16	320-782	PLANET GEAR (C) SET (3 PCS.)	3		
17	320-762	PLATE (B)	1		
18	320-763	REAR CASE	1		
19	312-712	SCREW SET D3X12 (4 PCS.)	4		
20	320-770	SHIFT ARM	1		
21	320-765	SLIDE RING GEAR	1		
22	320-764	PINION (C)	1		
23	320-781	PLANET GEAR (B) SET (4 PCS.)	4		
24	320-766	PINION (B)	1		
25	320-780	PLANET GEAR (A) SET (4 PCS.)	4		
26	320-767	FIRST RING GEAR	1		
27	320-768	PLATE (A)	1		
28	320-769	MOTOR SPACER	1		
29	360-769	ARMATURE DC14.4V	1		
30	322-520	MAGNET	1		
31	322-521	DUST GUARD	1		
32	320-774	BRUSH BLOCK	1		
33	999-054	CARBON BRUSH 5X6X11.5 (1 PAIR)	2		
34	319-918	BRUSH CAP	2		
35	313-687	TAPPING SCREW (W/FLANGE) D3X16 (BLACK)	8		
36		NAME PLATE	1		
37	326-753	HOUSING SET	1		
38	320-772	SHIFT KNOB	1		
39	320-777	MACHINE SCREW (W/SP. WASHER) M3X4	3		
40	324-827	DC-SPEED CONTROL SWITCH	1		
41	316-166	PUSHING BUTTON	1		
42		HITACHI LABEL	1		
43	320-776	FIN	1		
44	321-918	HOOK ASS'Y (W/LIGHT)	1	INCLUD. 45, 46	
45	321-672	TAPPING SCREW D2X6	2		
46	320-288	V-LOCK NUT M5	1		
47	306-952	STRAP (BLACK)	1		
48	319-926	HOOK SPRING	1		
49	319-927	SPECIAL SCREW M5	1		
50	326-752	BATTERY EBM 1430R (EUROPE)	2		

DS 14DAL[illegible]

OPTIONAL ACCESSORIES

[illegible]

[illegible]

