

After Sales Technical Documentation

RAE/RAK-1N Series

Accessories

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Non-Serviceable Accessories

Battery Pack BLK-4S (0670153)

Purpose	a two cell Li Ion battery by SONY
Capacity	730 mAh
Battery connector	4 pin pad plate
Weight	82.5 ± 5 g
Charge time	2.5h
Charge voltage	8.4 ± 0.1 V
Charge current	800 mA
Volume	t.b.d.

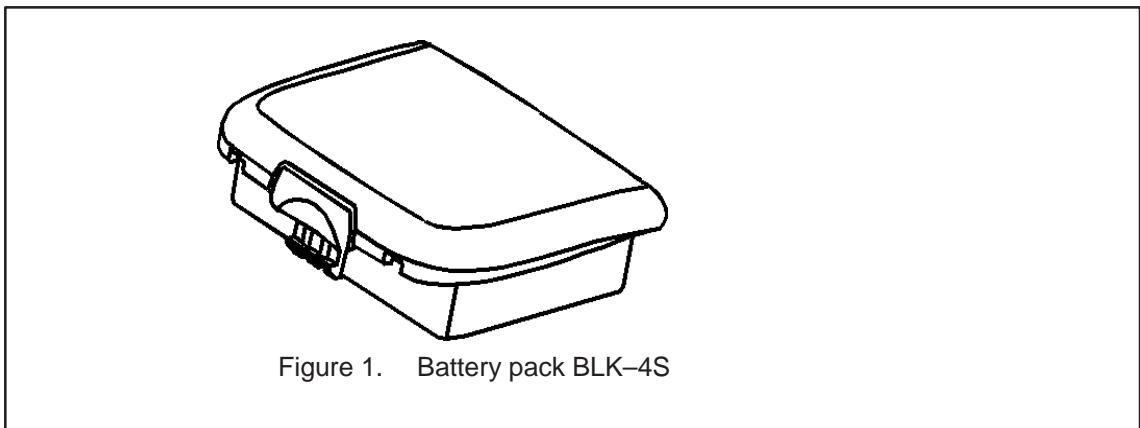
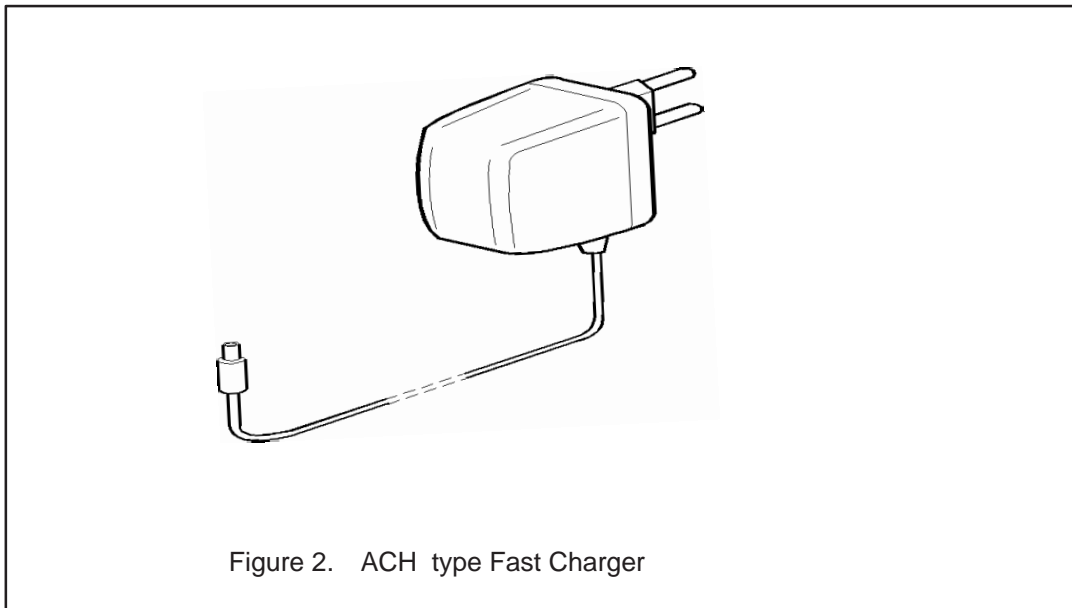


Figure 1. Battery pack BLK-4S

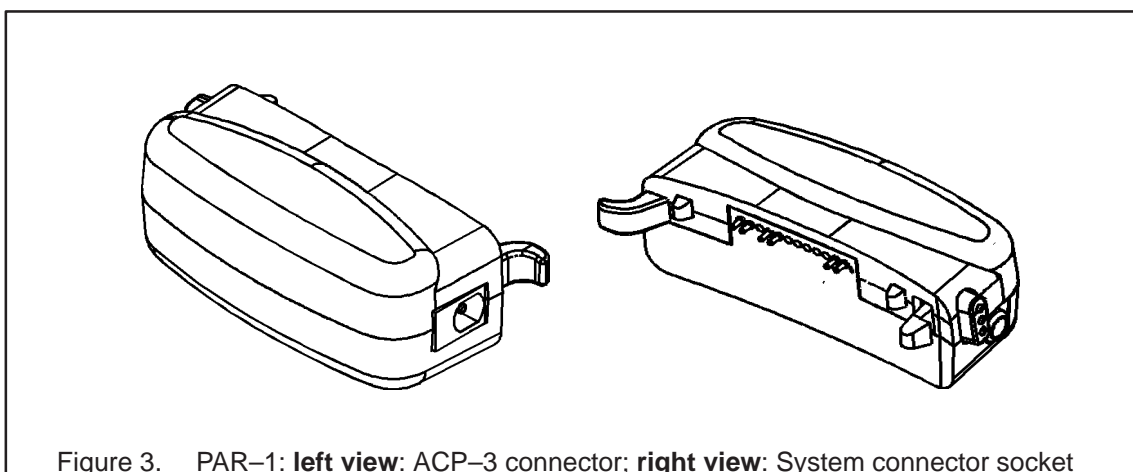
Universal Fast Charger ACH xxx

Purpose	fast charging of battery with transceiver
Charger type	switching mode power supply
Operation	constant current charging with limited voltage (12V nominal)
Input voltage	90–264 V 50 or 60 Hz
Mains plug type	Detachable AC cord to match any plug with local AC cord
DC connector	standard DC connector 3.8 mm
Weight	without AC cable 85 g, with AC cable 110 g
Volume	54 cm ³
Cable length	AC cable 200 mm; DC cable min. 300 mm, max. 2 m
Protection	output current limiting, max. 830 mA output voltage limiting, max. 13 V (unloaded)
Approvals	Specific for country where sold



Power Adapter Module PAR-1 (0680028)

Purpose	Connects ACP-3 and DLR-1 to RAE-1N system connector
DC connector	DC jack (thr. hole) for DC connector (3.8 mm) in ACP-3 (HEC2781-010010)
RS connector	Stereo jack for stereo plug (2.5 mm) in DLR-1 (HSJ2080-01-010)
Syst. con. socket	Pin probe (6 pin), thr. hole
Weight	8 g
Volume	10 cm ³



RS232 Adapter Cable DLR-1 (073077)

Purpose	Connects an external computer with RAE-1N (via PAR-1) see below
Cable length	950mm ± 25 mm (3 wire, ∅3.5 mm)
D connector	D9 connector female
Stereo connector	Stereo plug (∅2.5 mm) with ∅3.5 mm strain relief

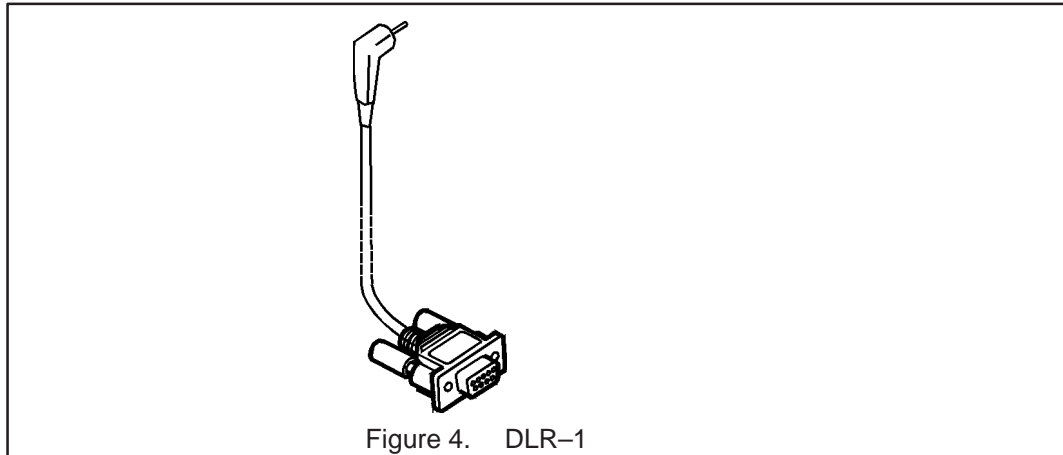


Figure 4. DLR-1

Connection

The connection of DLR-1 cable is shown below. The signals are routed directly from end to end of the cable. The shield of the cable is connected only in the PC connector side, directly to the shield pin of the D-connector.

The connection to the communicator side is soldered.

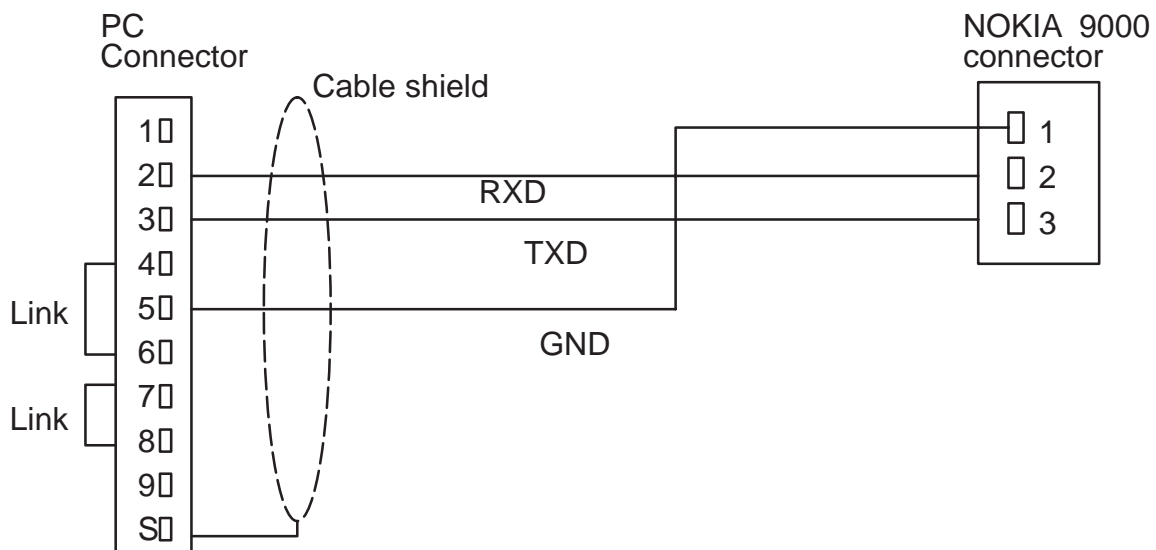


Figure 5. Circuit diagram of DLR-1 cable

Cigarette Lighter Charger LCH-2 (0675005)

Purpose	charging adapter for car environment; input voltage 9...32 V
Charger type	Switching mode power supply
Operation	quick charge (< 0.5–2.5 h), trickle charge
Protection	input fused, output current limit
Connectors	output: 3.8 mm standard DC plug; input: D 21 / 23 mm
Weight	<120 g
Cable	2 m curly cable

NOTE! The current version of LCH-2 does not indicate (led illumination) in a correct way what is the status of the charging with Li batteries.

For quick car installation, the user can utilise the Cigarette Lighter Charger LCH-2, Power Adapter PAR-1, and RS232 serial cable DLR-1 Mobile

Holder MBR-1 cannot be used in this context.

Serviceable Accessories

Spare Battery Charger DCH-4 (0675107)

Purpose	BLK-4S stand alone charger for spare batteries
Charger type	Linear mode power supply
Operation	quick charge (2.5 h)
DC connector	DC jack (thr. hole) for DC connector (3.8 mm) in ACP-3 (HEC2781-010010)
Battery connector	4 pin spring
Oper. input voltage	12 Vdc \pm 1V
Weight	61 g
Input current	800 mA \pm 80 mA
Charging temp.	0-45 °C

The DCH-4 Desktop Charger is designed for standalone charging of a spare battery, which is only the Lithium type specified for the phone. There is no battery type detection in the desktop charger. In a standard configuration, rapid charging is possible by connecting the desktop charger to an ac power outlet via a suitable constant current ac adapter (ACH-4, ACP-3). This is connected to the dc connector, X130.

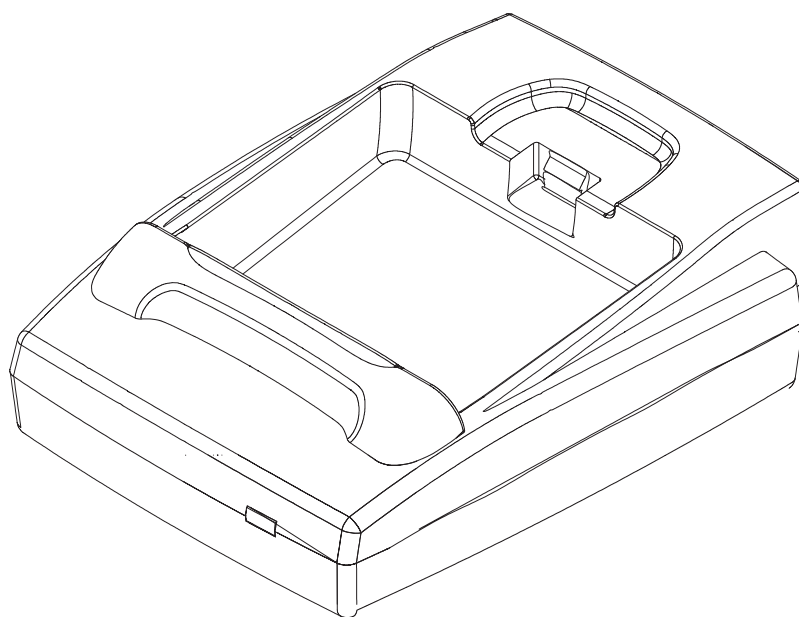


Figure 6. Spare battery Charger DCH-4

Operation

The device has a dc plug input connector for the ACP-3 charger and 4-pin output connector for an extra battery. Recommended charging temperature is between 0 ... 45 degrees centigrade. Charge control of the spare battery is done with a constant voltage controller and dissipative transistor located in a desktop charger PCB.

Charging indication

Charge is indicated with two LEDs, red and green. They both shed their light into same mechanical light guide.

Red LED indicates that the battery is not full. This color is shown to user until current to battery decreases under 65mA.

Green LED indicates that the battery is full but charging of the Lithium battery continues after green indication to ensure the maximum capacity. Charging is stopped completely after current to battery decreases below 30mA. Green LED stays visible until battery or charger is removed.

When battery is disconnected and charger is connected, LEDs are off.

When charger is disconnected and battery is connected, LEDs are off.

Battery is not discharged so there is no harm in leaving the battery to desktop charger for long periods. For example during trips it is a benefit to carry both spare battery and desktop charger together in small space.

When full battery is reconnected to desktop charger, LED color is first red and after couple of seconds it turns green. Red color is shown because charge is started again and correct indication is given only after measured current value settles down.

Charge Control

Charge current for the battery is supplied through a series pass transistor in desktop charger. This transistor is fully on when voltage of the battery is under maximum value: 8.4V or 8.2V, depending on battery chemistry. During this condition charger is supplying a constant current to the battery. After voltage rises to maximum value, pass transistor controller IC: N115 limits the voltage so that current to battery begins to decrease. This is the same action as in linear regulators.

Energy equal to voltage difference over pass transistor times current through it transforms to heat. This requires big PCB area to dissipate the heat. Current begins to fall rapidly after highest battery voltage is reached so heat load comes in intensive transient. Large copper area in PCB is required to absorb the peak heat energy. Some energy losses are also transformed to heat in diode and current measuring resistor after pass transistor.

Battery voltage feedback to controller is taken from battery terminal so that there is no voltage drops of series elements. Current to battery is measured by instrumentation amplifier which outputs absolute voltage proportional to voltage difference of its inputs.

Small resistor R112 is put to make this little voltage difference in main current path. Voltage gain over R112 is 83 in the amplifier. This is compared to two reference voltages. First determines the current at which LED color is changed: 65mA. Second reference is put for stopping the charge at lower current value: 30mA. This is made to ensure that there is no capacity loss in Li-Ion battery if it remains in desktop charger many days.

Different Charging Voltages

Two cell Lithium-Ion carbon technology requires 8.4V constant voltage charging. Two cell Lithium-Ion graphite technology must be charged by 8.2V constant voltage. Because the controller is already set to 8.4V charging, higher voltage reference and voltage divider from reference to battery voltage is required to feed 8.4V to controller and maintain 8.2V in battery line for graphite batteries. Because the reference is zener, its voltage is not stable unless current is set high enough. Voltage tolerance of charger sets minimum current value at this voltage: 10V. Nominal charger voltage makes zener current high. This also makes high leakage current path from battery to regulator input. V148 is cutting this current path when either charger or battery is disconnected. Battery chemistry is detected by battery type sense resistor which is connected to ground inside battery pack. Connecting battery biases pin 5 of N110 so that either voltage is selected when charging starts. V147 controls the voltage shown to charge controller N115. If V147 conducts battery voltage is directly fed to controller resulting 8.4V charging. If V147 is off, voltage divider makes battery voltage 8.2V.

DC Characteristics

Table 1. Battery type sense resistor values inside battery pack

Notes	Typical / Nominal
Operating input voltage:	12 Vdc \pm 1V
Max. input current:	800 mA \pm 70 mA
Charge voltage (type sense resistor: 100k)	8.4 V
Charge voltage (type sense resistor: 68k)	8.2 V
Typical power consumption	10 mA

Table 2. Supply Voltages and Power Consumption

Notes	Typical / Nominal
Operating input voltage:	12 Vdc \pm 1V
Max. input current:	800mA \pm 70mA

External Signals and Connections

Table 3. List of connectors

Connector Name	Code	Notes
Fast charger ac adapter connector	X130	2-pole DC-jack
Spare battery connector	X120	To the flex cable of 4-pin spare battery.

Table 4. Fast charger ac adapter connector X130

Signal Name	Pin / Conn.	Notes
VDC	1	supply voltage input
GND	2	common ground
–	3	mechanical support pin, connected to ground

Table 5. Spare battery connector

Signal Name	Pin / Conn.	Pin / Conn. Outlook contacts	Notes
VBAT	X153	1	battery positive terminal
BTYPE	X152	2	battery type sensing terminal
SPARE PIN	X151	3	not connected
GND	X150	4	common ground

Outlook contacts are referred so that 1 is nearest to edge of desktop charger and 4 is most inner pin.

Mechanical Characteristics

Unit	Dimensions (mm) (W x L x H)	Weight (g)	Enclosure (material etc.), colour
DCH-4	71.0 x 91.5 x 27.0	56	Material: ABS / PC Color: Warm black
PCB	63.9 x 83.6 x 1.0		
DC jack X130 for ACH-4	3.8 x 1.3, centre contact positive		

Environmental Conditions

Table 6. Allowed Ambient Temperature (charging)

Environmental parameter	Unit	Use
Low air temperature	°C	+ 0
High air temperature	°C	+45

Table 7. Allowed Ambient Temperature (transportation and storage)

Environmental parameter	Unit	Use
Low air temperature	°C	-40
High air temperature in unventilated enclosures 1)	°C	+85
High air temperature in ventilated enclosures or outdoor air	°C	+40

Assembly

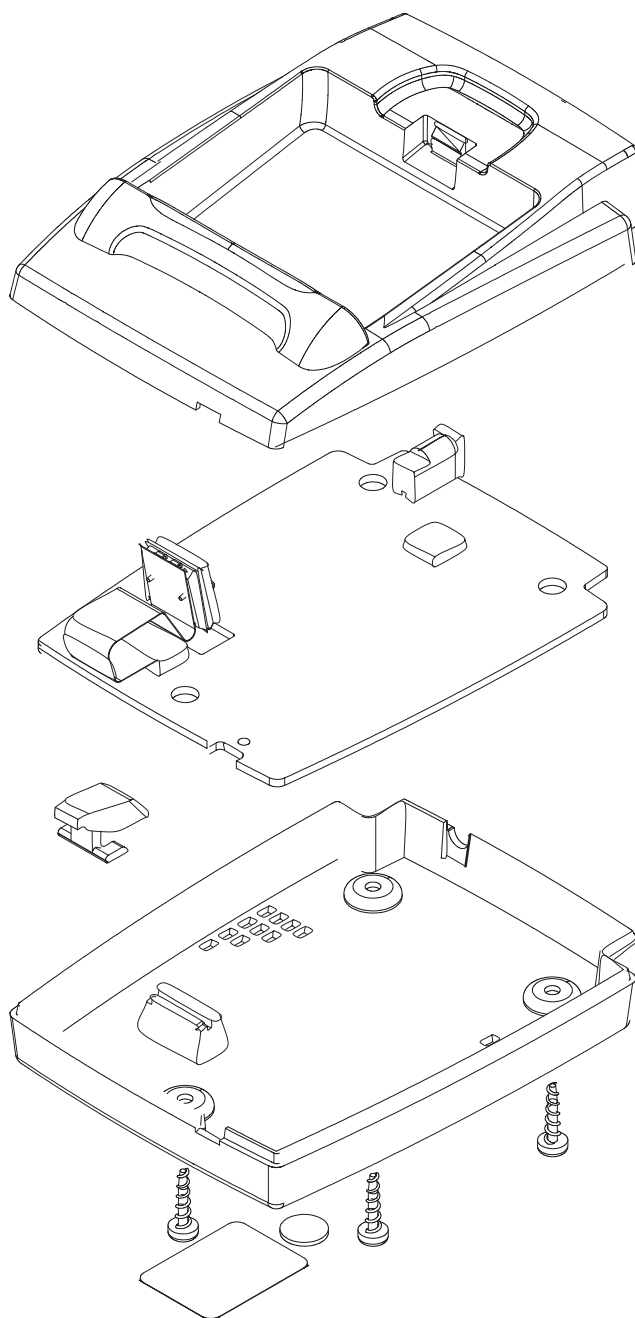


Figure 7. Exploded view DCH-4

CARK60 Hands-Free Car Kit (0086052)

Information on this package is covered in the Vehicle Installation Guide P.N 0275190. This is a similar document ,adapted for the service manual, to the one included with the actual sales package