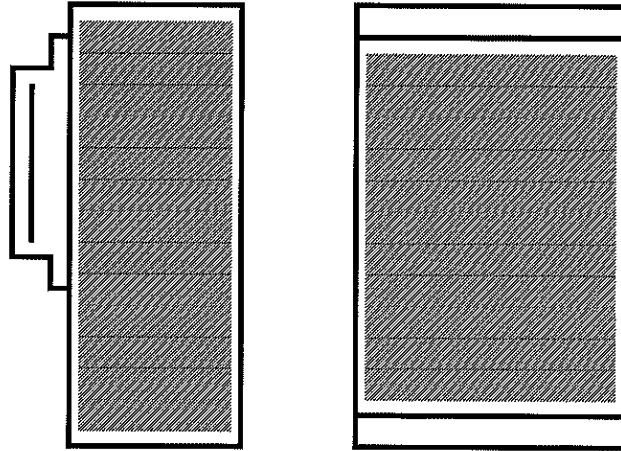


NDS PRODUCTS

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ND-20 PERSONAL RATE ALARM

OPERATION MANUAL

(OPTIONS INCLUDED)

111 ANDERSON, PASADENA TX 77506, PHONE 713/475-2986, FAX 713/477-6741



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NOTE: DUE TO NDS PRODUCTS' CONTINUING PROGRAM OF RESEARCH & DEVELOPMENT, ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE AND MAY BE VARIED AT OUR DISCRETION.

1.0 USER CAUTION AND WARNINGS:

THE EQUIPMENT HEREIN IS DESIGNED AND MANUFACTURED IN COMPLIANCE WITH ALL APPLICABLE SAFETY STANDARDS; NEVERTHELESS, CERTAIN HAZARDS ARE INHERENT IN THE USE OF ALL ELECTRONIC EQUIPMENT. ADEQUATE WARNINGS ARE INCLUDED IN THIS MANUAL AND ON THE PRODUCT ITSELF TO COVER HAZARDS THAT MAY BE ENCOUNTERED IN NORMAL USE AND SERVICING OF THIS EQUIPMENT. NO OTHER PROCEDURES ARE WARRANTED BY NDS. IT SHALL BE THE OWNER'S OR USER'S RESPONSIBILITY TO ASSURE THAT THE PROCEDURES HEREIN ARE METICULOUSLY FOLLOWED, AND ESPECIALLY THE WARNING AND CAUTIONARY NOTES ARE HEEDED. FAILURE ON THE PART OF THE USER IN ANY WAY TO FOLLOW THE PRESCRIBED PROCEDURES SHALL OBSOLVE NDS PRODUCTS AND ITS AGENTS FROM ANY RESULTING LIABILITY.

READ YOUR OPERATION MANUAL

2.0 WARRANTY:

NDS PRODUCTS WARRANTS THAT THE PRODUCTS COVERED HEREBY SHALL BE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS FOR A PERIOD OF ONE YEAR FROM DATE OF NDS SHIPMENT (GM TUBE IS WARRANTED BY THE OEM FOR 90 DAYS). THE FOREGOING WARRANTY DOES NOT APPLY TO ANY PRODUCTS WHICH HAVE BEEN SUBJECT TO MISUSE (INCLUDING STATIC DISCHARGE), NEGLIGENCE, ACCIDENT, OR MODIFICATION. NDS PRODUCTS' SOLE OBLIGATION TO BUYER HEREUNDER FOR PRODUCTS FAILING TO MEET THE AFORESAID WARRANTY SHALL BE, AT NDS PRODUCTS' DISCRETION, TO REPAIR AND RECALIBRATE THE NONCONFORMING PRODUCT OR TO REPLACE THE NONCONFORMING PRODUCT WHERE WITHIN THE WARRANTY PERIOD: 1) THE BUYER HAS RETURNED THE NONCONFORMING PRODUCT TO NDS PRODUCTS, FREIGHT PREPAID, & 2) NDS PRODUCTS HAS DETERMINED THE PRODUCT IS NONCONFORMING AND THAT SUCH NONCONFORMITY IS NOT A RESULT OF IMPROPER USE, REPAIR, MODIFICATION OR OTHER MISUSE BY THE BUYER.

THE FOREGOING WARRANTY AND REMEDIES ARE EXCLUSIVE AND ARE MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE. NDS PRODUCTS NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OR USE OF ITS PRODUCTS AND NDS PRODUCTS MAKES NO WARRANTY WHATSOEVER FOR PRODUCTS NOT MANUFACTURED BY NDS PRODUCTS. NDS PRODUCTS SHALL NOT BE LIABLE FOR DAMAGES DUE TO DELAYS IN DELIVERIES OR USE AND SHALL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND; WHETHER ARISING FROM CONTRACT, TORT, OR NEGLIGENCE, INCLUDING BUT NOT LIMITED TO, LOSS OF PROFITS, LOSS OF GOODWILL, OVERHEAD OR OTHER LIKE DAMAGES.

3.0 DESCRIPTION:

THE MODEL ND-20 IS A DUAL RANGE PERSONAL RADIATION ALARM WHICH PROVIDES AN IMMEDIATE AUDIBLE INDICATION OF CHANGING RADIATION LEVELS.

THE SIGNALS ARE HIGH PITCHED "CHIRPS" WHICH INCREASE IN FREQUENCY TO THE PROPORTION OF THE GAMMA, BETA OR X-RAY PRESENT. THE DUAL RANGE ALARM FEATURE PROVIDES A HIGH RANGE FOR NORMAL MONITORING PURPOSES, SUCH AS DURING RADIOGRAPHY (NOT ANNOYING TO THE USER) AND A LOW RANGE THAT IS ESPECIALLY USEFUL IN CHECKING FOR LEAKAGE FROM X-RAY OR RADIOACTIVE SOURCES AND FOR DETERMINING IF EXCESSIVE STRAY RADIATION EXISTS.

THE CONSTRUCTION OF THE UNIT IS DESIGNED FOR LONG, DEPENDABLE SERVICE UNDER EXTREME CONDITIONS. THE MODEL ND-20 IS HOUSED IN A DIE-CAST ALUMINUM CASE WITH .09 INCH MATERIAL THICKNESS FOR ADDED DURABILITY.

4.0 SPECIFICATIONS:

4.1 DETECTOR: HALOGEN QUENCHED, GEIGER MUELLER TUBE. EFFECTIVE LENGTH AND DIAMETER 1.100 INCH x 0.482 INCH. WALL THICKNESS IS 30mg/cm SQUARED.

4.2 ALARM: SOLID STATE, AUDIO-TONE TRANSDUCER WHICH EMITS 100 dBs AT 6 INCHES.

4.3 CONTROLS: SWITCH SELECTED

- LOW RANGE : 60 CHIRPS/MIN IN A 1 mR/hr FIELD.

- HIGH RANGE: 60 CHIRPS/MIN IN A 10 mR/hr FIELD.

4.4 POWER: ON/OFF SWITCH.

4.5 BATTERY: 9 VOLT TRANSISTOR, ALKALINE FOR LONGER LIFE

4.6 BATTERY LIFE: APPROXIMATELY 6 MONTHS IN NORMAL USE, 8 HOURS/DAY, 5 DAYS/WEEK AT LOW RADIATION LEVELS.

4.7 SIZE: 4.375 INCHES HIGH x 2.375 INCHES WIDE x 1.25 INCHES DEEP (NOT INCLUDING BELT LOOP).

4.8 WEIGHT: 8 OUNCES APPROX. INCLUDES BATTERY.

4.9 CALIBRATION CONTROLS: NONE, FACTORY SET/ADJUSTABLE.

5.0 LIMITATION (SATURATION) * CAUTION *

IT IS A WELL KNOWN PHENOMENON THAT ALL GEIGER-MUELLER SURVEY METERS SATURATE OR OVERLOAD AT SOME POINT (THIS MAY BE CALLED FLOODING OR JAMMING). THIS PARTICULAR MODEL WILL SATURATE WHEN IN A RADIATION FIELD IN EXCESS OF 1000 R/hr WHEN IT HAS BEEN PROPERLY MAINTAINED. IF THE RADIATION FIELD IS IN EXCESS OF 1000 R/hr, ONE OF TWO EVENTS WILL OCCUR: 1) THE INSTRUMENT WILL EMIT A CONTINUOUS "CHIRP" AND ONCE IT REACHES SATURATION, IT WILL STOP, OR 2) IF THE INSTRUMENT IS TURNED ON IN A FIELD IN EXCESS OF 1000 R/hr, THE INSTRUMENT WILL NOT REACT.

ALTHOUGH A 1000 R/hr FIELD IS EXTREMELY HIGH AND MAY NEVER BE ENCOUNTERED, PROPER RADIATION SAFETY PROCEDURES AND REGULATIONS SHOULD BE OBSERVED WHEN MAKING ANY TYPE OF RADIATION SURVEY.

6.0 INSTRUMENT OPERATION:

THE ND-20 COMES WITH AN INSTALLED 9 VOLT BATTERY. WHEN THE POWER SWITCH IS FIRST TURNED ON, A SINGLE CHIRP SHOULD BE HEARD. IF THE UNIT IS OPERATING PROPERLY, A LOW FREQUENCY (ABOUT 400/SEC) "MOTORBOATING" SOUND WILL BE HEARD WHEN THE UNIT IS HELD CLOSE TO THE EAR IN A QUIET LOCATION.

THE INSTRUMENT SHOULD BE CHECKED PERIODICALLY BY MOVING THE UNIT TOWARD OR AWAY FROM A RADIATION SOURCE. WHILE DOING THIS, OBSERVE THE RATE CHANGE OF CHIRPS.

NOTE: DO NOT USE WHEN THE TEMPERATURE IS ABOVE 55 DEGREES CENTIGRADE.

7.0 MAINTENANCE:

- 7.1 WHEN THE INSTRUMENT IS ON, YOU WILL HEAR A CONTINUOUS, LOW FREQUENCY "MOTOR-BOATING" SOUND WHEN HELD NEAR THE EAR. IF THERE IS NO SOUND, CHANGE THE BATTERY BY UNSCREWING THE BACKPLATE AND INSTALLING NEW 9V BATTERY.**

- 7.2 KEEP INSTRUMENT FREE OF DIRT AND DUST.**

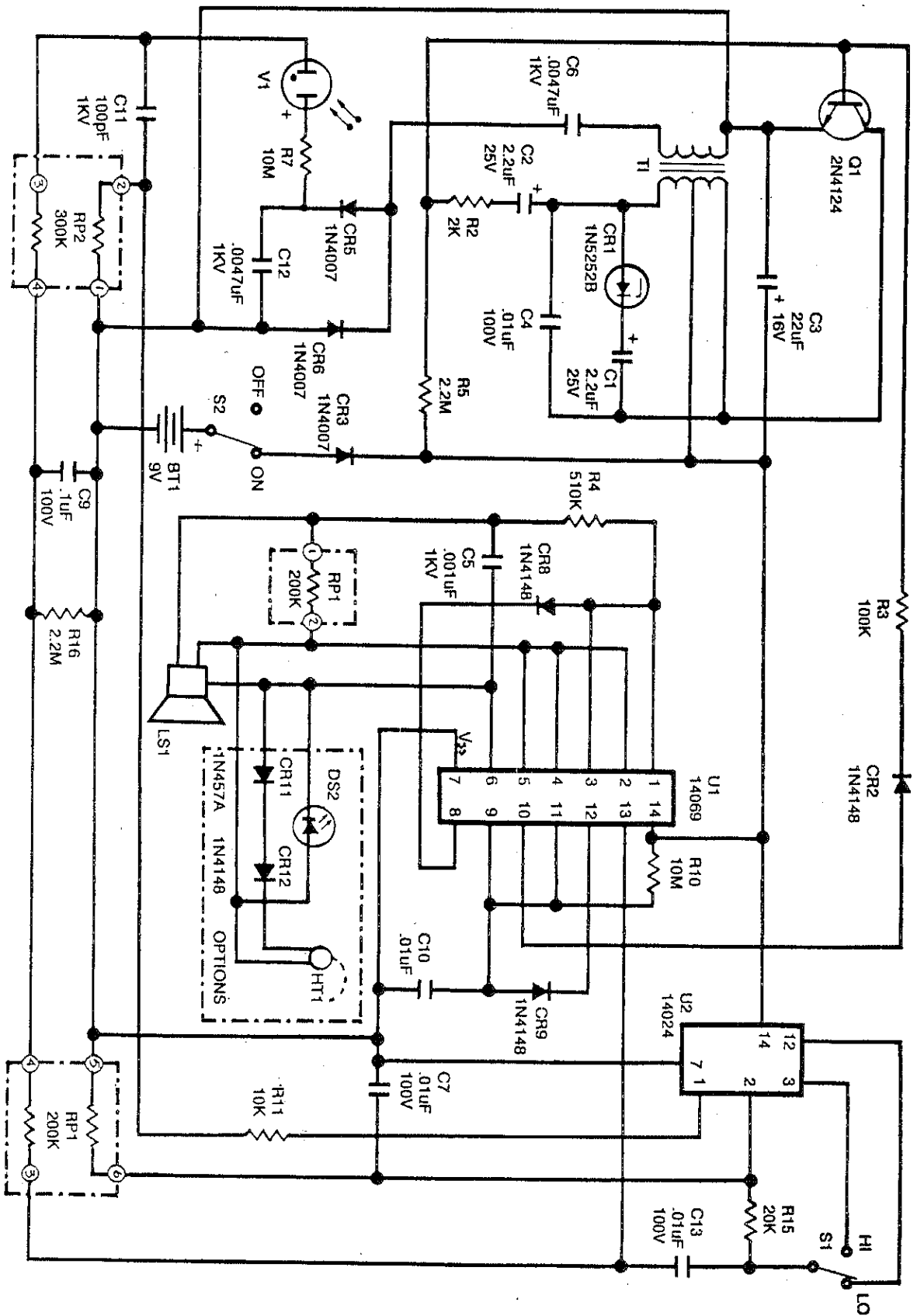
- 7.3 KEEP INSTRUMENT DRY. IF IT SHOULD GET WET DO NOT USE UNTIL COMPLETELY DRY.**

- 7.4 THE INSTRUMENT IS DESIGNED TO BE WORN ON THE BELT. THIS WILL REDUCE UNNECESSARY VIBRATIONS AND SHOCK THAT MAY CAUSE DAMAGE (SUCH AS KNOCKING UNIT OFF TABLES, LEDGES, ETC.). IF DROPPED, CHECK FUNCTIONALITY BEFORE REUSING.**

- 7.5 REMEMBER: THE ND-20 IS A SAFETY DEVICE DESIGNED TO REDUCE YOUR OVEREXPOSURES. WITH PROPER CARE IT WILL GIVE YOU LONG AND DEPENDABLE SERVICE.**

- 7.6 WARNING: THIS INSTRUMENT CONTAINS CMOS DEVICES. NO SERVICE SHOULD EVER BE ATTEMPTED BY OTHER THAN A COMPETENT TECHNICIAN THOROUGHLY FAMILIAR WITH THESE COMPONENTS. CURRENT LEAKAGE IN SOLDERING IRONS OR OTHER NON-GROUNDED TOOLS ALONG WITH STATIC ELECTRICITY CAN INSTANTLY DESTROY CMOS ICs. SINCE THIS UNIT HAS IC SOCKETS DO NOT ATTEMPT TO REMOVE OR REPLACE THE ICs WITHOUT OBSERVING ESD PRECAUTIONS.**

29-Sep-98		BILL OF MATERIAL		
980-0020-000		ND-20 PC ASSY WITH L/E OPTIONS	REV A	
ITM	PART NUMBER	DESCRIPTION	QTY	REF DESIG
1	100-1000-102	CAP CER DISC .001 uF 1 KV	1	C5
2	100-1000-472	CAP CER DISC .0047 uF 1 KV	2	C6, 12
3	100-0100-103	CAP CER DISC .01 uF 100V	4	C4,7,10,13
4	100-1000-101	CAP CER DISC 100.0 pF 1 KV	1	C11
5	110-0025-225	CAP ELE TANT 2.2 uF 25V	2	C1,2
6	110-0016-226	CAP ELE TANT 22.0 uF 16V	1	C3
8	115-0100-104	CAP PLY FILM .10 uF 100V	1	C9
9	150-0100-001	DIODE 1N4007 STANDARD RECOVERY	3	CR3,5,6
10	150-0150-001	DIODE 1N4148 HIGH SPEED SWITCHING	3	CR2,8,9
11	150-0300-001	DIODE 1N5252B ZENER	1	CR1
12	200-0100-001	IC 14024 14 PIN	1	U2
13	200-0300-001	IC 14069 14 PIN	1	U1
14	250-0100-202	RES CF 1/4W 5% 2.0 K OHM	1	R2
15	250-0100-225	RES CF 1/4W 5% 2.2 M OHM	2	R5,16
16	250-0100-103	RES CF 1/4W 5% 10.0 K OHM	1	R11
17	250-0100-106	RES CF 1/4W 5% 10.0 M OHM	2	R7,10
18	250-0100-203	RES CF 1/4W 5% 20.0 K OHM	1	R15
19	250-0100-104	RES CF 1/4W 5% 100.0 K OHM	1	R3
20	250-0100-514	RES CF 1/4W 5% 510.0 K OHM	1	R4
21	255-0006-204	RES NET 6 PIN 3 RES 200 K ISOL	1	RP1
22	255-0004-304	RES NET 4 PIN 2 RES 300 K ISOL	1	RP2
23	225-0100-014	SOCKET IC 14 PIN	2	XU1,2
24	370-0500-002	SWITCH SLIDE ON/OFF SPDT	2	S1, 2
25	405-0100-001	TRANSDUCER CASE	1	XLS1
26	400-0100-001	TRANSDUCER ELEMENT	1	LS1
27	450-6816-001	TRANSFORMER MINI 50VRMS	1	T1
28	475-0100-001	TRANSISTOR 2N4124 NPN	1	Q1
29	500-0713-001	GM TUBE ASSY 713	1	V1
30	551-0015-005	ND PERSONAL ALARM PC BD	1	
OPT	150-0150-001	DIODE 1N4148 HIGH SPEED SWITCHING	1	CR12
OPT	150-0200-001	DIODE 1N457A SWITCHING	1	CR11
OPT	020-0500-001	EARPHONE/EAR LOOP/3 FT CABLE	1	HT1
OPT	050-0500-001	EARPHONE JACK	1	J1
OPT	580-0200-005	LED RED SUNBRIGHT	1	DS2
OPT	581-0200-005	LED SOCKET STRAIGHT	1	XDS2
990-0020-000		ND-20 UNIT ASSY	REV A	
ITM	PART NUMBER	DESCRIPTION	QTY	REF DESIG
1	980-0020-000	ND-20 PC ASSY	1	
2	600-0V22-001	BATTERY 9.0V EV22	1	
3	605-0009-001	BATTERY CLIP 9.0V	1	
4	650-0300-001	BRACKET BELT LOOP	1	
5	670-0500-001	ALARM CASE	1	
6	690-0020-001	DECAL ND-20	1	
8	775-0600-001	HDW LUG SOLDER #6	1	
10	780-0100-001	HDW RIVET 1/8 DIA HD	1	
11	780-0100-002	HDW RIVET 5/32 DIA HD	2	
18	410-0100-001	SCREEN AUDIO	1	



NBS PRODUCTS	
ND-20 CIRCUIT DIAGRAM	DATE: 5/95 ENGINEER: KES DATE: 5/95
DRAWN: M. SMITH CHECKED: NDS ENGINEER: KES	DATE: 5/95 DATE: 5/95 DATE: 5/95
Dwg: 8700020-001	SHEET 1 of 1
Rev: A	Rev:

