

RCA NEAR-INFRARED LASER-BEAM DETECTORS

PHOTOMULTIPLIER TUBES

PHOTOCELLS

COMMERCIAL TYPES

DEVELOPMENTAL TYPES



RADIO CORPORATION OF AMERICA

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HARRISON, N.J.
PIT-704 7/65

RCA LASER-BEAM DETECTORS

Photomultipliers For Near-Infrared Detection Service

Commercial or Developmental ^a Type	Spectral Response	Wavelength of Max. Response ^b Angstroms	Number of Stages	Window		Photocathode Material	Dynodes	
				Material ^c	Shape		Secondary-Emitting Surface	Structure

Dormer-Window Type

C70038D	(h)	5400	10	0080	Dormer	K-Na-Cs-Sb	Be-O	Circular Cage
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3/4"-Diameter Head-On Types

C70042C ^k	S-20	4200	10	7056	Plano-Concave	K-Na-Cs-Sb	Be-O	In-Line
C70102B ⁿ	S-1	8000	10	0080	Plano-Concave	Ag-O-Cs	Be-O	In-Line

1-1/2"-Diameter Head-On Type

7102	S-1	8000	10	0080	Plano-Plano	Ag-O-Cs	Be-O ^g	Circular-Cage
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2"-Diameter Head-On Types

C70007A	S-1	8000	12	0080	Convexo-Concave	Ag-O-Cs	Be-O	In-Line
4459	S-20	4200	12	7056	Convexo-Concave	K-Na-Cs-Sb	Be-O	In-Line
4463	S-20	4200	10	7056	Plano-Plano	K-Na-Cs-Sb	Be-O	Venetian-Blind
7265	S-20	4200	14	0080	Plano-Concave	K-Na-Cs-Sb	Be-O	In-Line
7326	S-20	4200	10	0080	Plano-Concave	K-Na-Cs-Sb	Be-O	In-Line

3"-Diameter Head-On Type

4464	S-20	4200	10	0080	Plano-Plano	K-Na-Cs-Sb	Be-O	Venetian-Blind
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5"-Diameter Head-On Type

4465	S-20	4200	10	0080	Plano-Plano	K-Na-Cs-Sb	Be-O	Venetian-Blind
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^a Type numbers with prefix C are developmental types. Each of these C numbers identifies a particular laboratory tube design but the number and the identifying data are subject to change. No obligations are assumed as to future manufacture unless otherwise arranged.

^b Measured in amperes/watt.

^c 0080 = Corning Lime Glass
7056 = Corning Borosilicate Glass, or equivalent materials.

^d Averaged over any interval of 30 seconds maximum.

^e Operation at room temperature or below is recommended.

^f At wavelength of maximum response. Radiant sensitivity values at other wavelengths are shown in Fig. 3.

^g Light source is a tungsten-filament lamp operated at a color temperature of 2870°K.

^h The approximate spectral response range, at the 10 percent points, is from 3000 angstroms to 7500 angstroms.

ⁱ Supply voltage (E) is across a voltage divider providing 1/6 of E between cathode and dynode No.1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No.10 and anode.

^k This tube type has been assigned the commercial designation 8644. A variant of this type having a "potted" voltage-divider network and an integral magnetic shield, the RCA Dev. Type C70042CP1, has been assigned the commercial designation 8645.

Maximum Ratings			Typical Characteristics at Specified Voltage and 22° C							
Anode-to-Cathode Volts	Average Anode mA ^d	Ambient Temp. ^e ° C	Anode-to-Cathode Volts	Sensitivity				Current Amplification	EADCI lm	ENI lm
				Radiant ^f		Luminous ^g				
				Cathode A/W	Anode A/W	Cathode A/lm	Anode A/lm			
2000	1	85	1250 ⁱ	0.11	5.5x10 ⁴	3x10 ⁻⁴	15	5x10 ⁴	1x10 ^{-10y}	-
2100	0.5	85	1500 ⁱ	0.065	5.2x10 ³	1.5x10 ⁻⁴	12	8x10 ⁴	1x10 ^{-10m}	2.5x10 ⁻¹²
1500	0.01	75	1250 ⁱ	0.0024	1.2x10 ²	2.5x10 ⁻⁵	1.25	5x10 ⁴	3x10 ^{-7p}	1.3x10 ⁻¹¹
1500	0.01	75	1250 ⁱ	0.0027	4.2x10 ²	3x10 ⁻⁵	4.5	1.5x10 ⁵	4.3x10 ^{-7p}	1.5x10 ⁻¹⁰
2000	0.01	75	1250 ^r	0.0019	1.4x10 ³	2x10 ⁻⁵	15	7.5x10 ⁵	3x10 ^{-7p}	1.5x10 ⁻¹⁰
2800	1	85	1800 ^r	0.064	4.3x10 ⁴	1.5x10 ⁻⁴	100	6.6x10 ⁵	1x10 ^{-10s}	1.1x10 ⁻¹²
2500	1	85	2000 ⁱ	0.068	1.1x10 ⁴	1.6x10 ⁻⁴	25	1.6x10 ⁵	4x10 ^{-10t}	3.8x10 ^{-12v}
3000	1	85	2400 ^v	0.064	1.3x10 ⁶	1.5x10 ⁻⁴	3000	2x10 ⁷	2x10 ^{-10w}	7.5x10 ⁻¹³
2400	1	85	1800 ⁱ	0.064	9.6x10 ³	1.5x10 ⁻⁴	22.5	1.5x10 ⁵	5x10 ^{-11x}	1.9x10 ⁻¹²
2500	1	85	2000 ⁱ	0.068	1.1x10 ⁴	1.6x10 ⁻⁴	25	1.6x10 ⁵	4x10 ^{-10t}	3.8x10 ^{-12v}
2500	1	85	2000 ⁱ	0.068	1.1x10 ⁴	1.6x10 ⁻⁴	25	1.6x10 ⁵	4x10 ^{-10t}	3.8x10 ^{-12v}

m With supply voltage adjusted to give a luminous sensitivity of 30 amperes/lumen.

s With supply voltage adjusted to give a luminous sensitivity of 300 amperes/lumen.

n A "ruggedized" type.

t With supply voltage adjusted to give a luminous sensitivity of 12 amperes/lumen.

p With supply voltage adjusted to give a luminous sensitivity of 4 amperes/lumen.

u Maximum value.

v With the following cathode-to-anode voltage distribution; 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1.25, 1.5, 1.75, and 2.

q Tube may have Mg-O secondary-emitting surface.

w With supply voltage adjusted to give a luminous sensitivity of 1000 amperes/lumen.

r With the following cathode-to-anode voltage distribution; 2, 1.4, 1, 1, 1, 1, 1, 1, 1, 1, 1, and 1.

x With supply voltage adjusted to give a luminous sensitivity of 20 amperes/lumen.

PHOTOMULTIPLIER CHARACTERISTICS

TYPICAL QUANTUM-EFFICIENCY CURVES

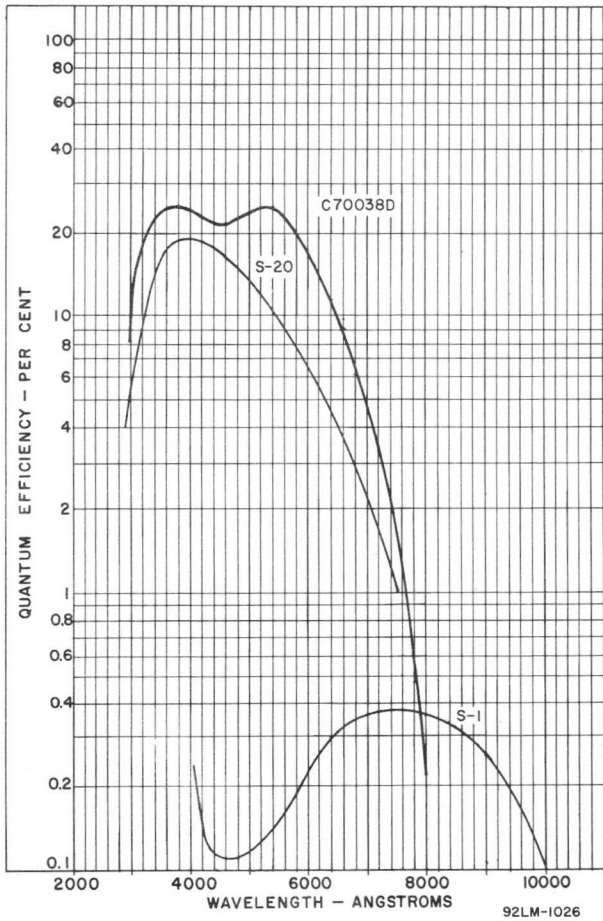


Fig. 1

TYPICAL RISE-TIME CURVES

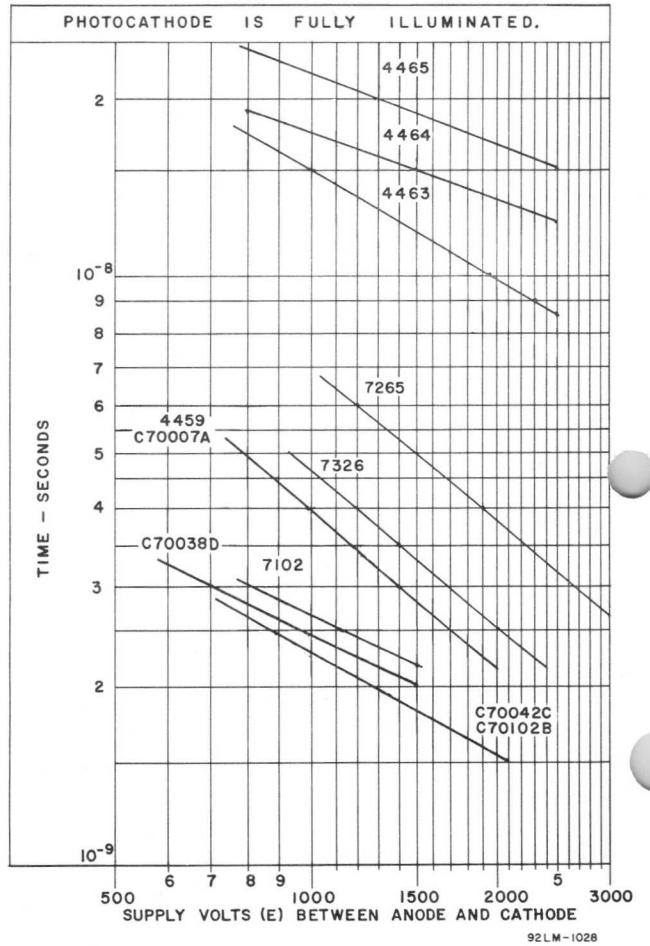


Fig. 2

TYPICAL ABSOLUTE SPECTRAL RESPONSE CURVES

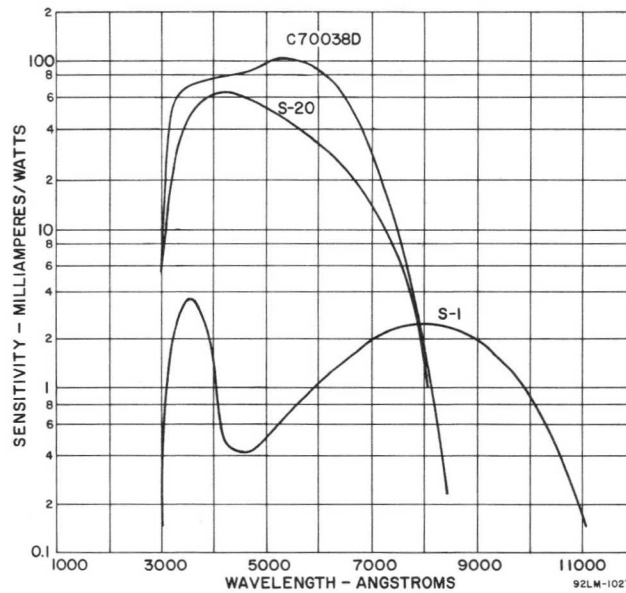


Fig. 3

TYPICAL LASERS AND APPROXIMATE EMISSION WAVELENGTHS

The tabulated emission wavelengths are approximate and are listed only for guidance purposes to aid the user in making an initial selection of an appropriate RCA laser-beam detector.

LASER	APPROXIMATE EMISSION WAVELENGTHS Angstroms
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LASER	APPROXIMATE EMISSION WAVELENGTHS Angstroms
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CRYSTALS

$Al_2O_3:Cr^{3+}$	6934 6943 7000 7040
$BaF_2:Nd^{3+}$	10,640
$CaF_2:Dy^{3+}$	23,600
$CaF_2:HO^{3+}$	20,940
$CaF_2:Nd^{3+}$	10,460
$CaF_2:Sm^{3+}$	7090
$CaF_2:Tm^{3+}$	11,250
$CaMoO_4:Nd^{3+}$	10,660
$CaWO_4:Er^{3+}$	16,120
$CaWO_4:HO^{3+}$	20,460 20,590 20,620
$CaWO_4:Nd^{3+}$	10,580 10,600 10,640 10,650
$CaWO_4:Pr^{3+}$	10,390
$CaWO_4:Tm^{3+}$	11,160 19,110
$LaF_3:Nd^{3+}$	10,420 10,640
$SrF_2:Nd^{3+}$	10,370 10,470
$SrF_2:Sm^{2+}$	6970
$SrMoO_4:Nd^{3+}$	10,590 10,610 10,630 10,640 10,650
$SrWO_4:Nd^{3+}$	10,600 10,610 10,630
$PbMoO_4:Nd^{3+}$	10,590

GLASS

Ba crown glass Yb	10,580 10,640
Nd in Ba glass	10,600

SEMICONDUCTORS

GaAs	8400
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LIQUIDS

Benzene	7460 8050 8820
Bromo-naphthalene	7670
Cyclohexane	8670
Nitrobenzene	7650 8520 9550
Pyridine	7460 8060
Toluene	7460

GAS

A	20,620
Ar	16,180 16,940 17,890 20,620
He	20,600
He+Ne	6330 11,180 11,530 11,600
Kr	16,900 17,850 18,250 19,220 21,160 21,880
Ne	16,900 16,940 21,080
Ne+O	8450
Xe	20,070 20,260

SILICON PHOTOCELLS for Near-Infrared Detector Service

Type	Spectral Response	Ambient Temp. Range °C	Sensitive Area (Av.)		Characteristics at 27°C Typical Sensitivity ^e		
			in ²	cm ²	Illum. ^d uA/fc	Luminous mA/lm	Radiant at 8600 Angstroms A/W
SQ2539 ^a	(b)	-100 to +125 ^o	0.278	1.795	14.5	7.13	0.58
SQ2540 ^a	(b)	-100 to +125 ^o	0.586	3.783	29	7.13	0.58

a Types SQ2539 and SQ2540 are available without attached flexible leads. They are identified by the designations SQ2539V1 and SQ2540V1, respectively.

c Light source is a tungsten-filament lamp operated at a color temperature of 2870°K. The sensitive surface of the cell is fully illuminated. The illumination on the cell is 100 foot-candles.

b Maximum response occurs at about 8600 ± 750 angstroms. The approximate spectral response range, at the 10 per-cent points, covers the range from 3750 to 10,800 angstroms.

d Short-circuit current.

SILICON PHOTOCELL CHARACTERISTICS

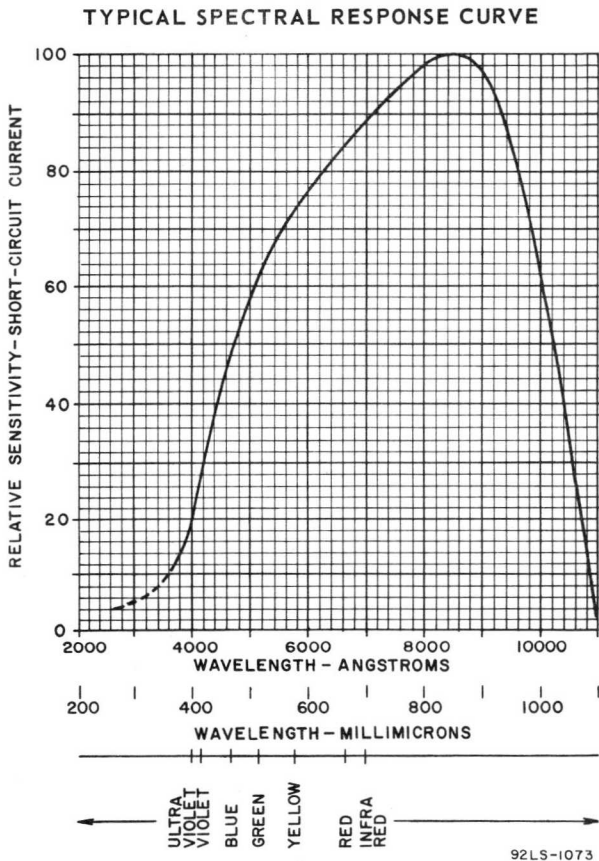


Fig. 4

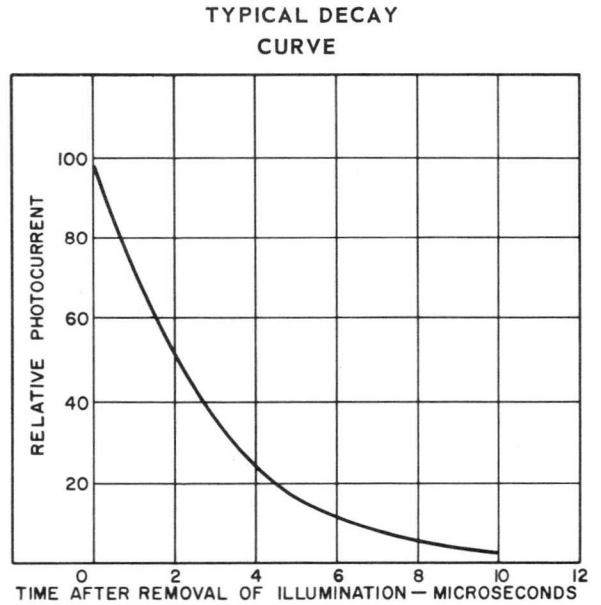


Fig. 5

GERMANIUM PHOTOCELLS for Near-Infrared Monitor Service

RCA Type	Spectral Response	MAXIMUM RATINGS			CHARACTERISTICS AT 25°C						
		Voltage Between Terminals dc Volts	Power Dissipation ^a Watt	Ambient Temp. Range °C	Voltage Between Terminals dc Volts	SENSITIVITY			Typical Luminous A/lm	Typical Radiant at 1.5 microns A/W	Max. Dark Current μA
						Illumination ^b μA/fc					
Min.	Typical	Max.									
SQ2516	S-14	50	0.03	-40 to +50	45	0.3	0.7	-	0.014	0.52	35

^a The power dissipation ratings apply up to the maximum rated ambient temperature.

^b Light source is a tungsten-filament lamp operated at a color temperature of 2870° K.

GERMANIUM PHOTOCELL CHARACTERISTICS

TYPICAL SPECTRAL RESPONSE CURVE

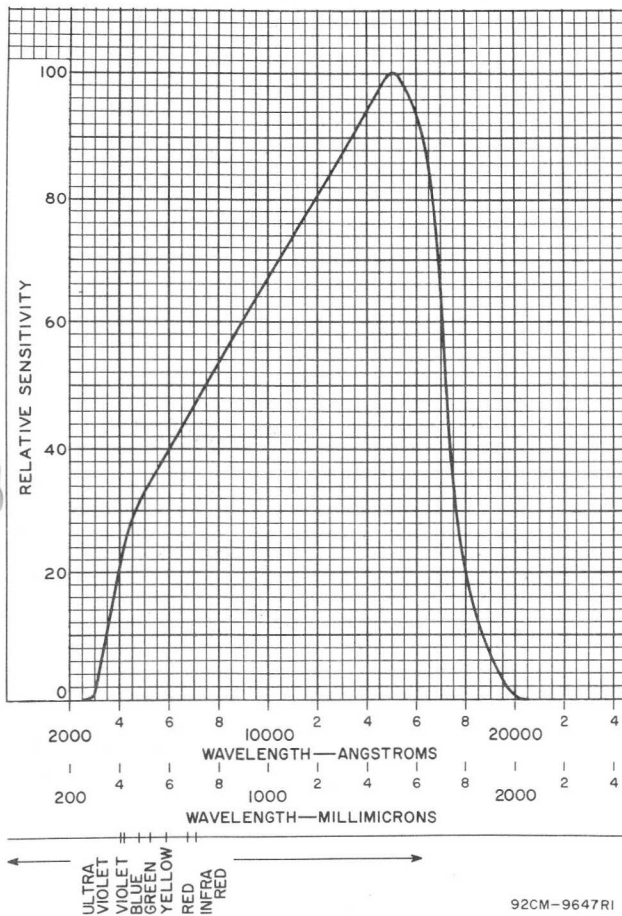


Fig. 6

TYPICAL DECAY CURVE

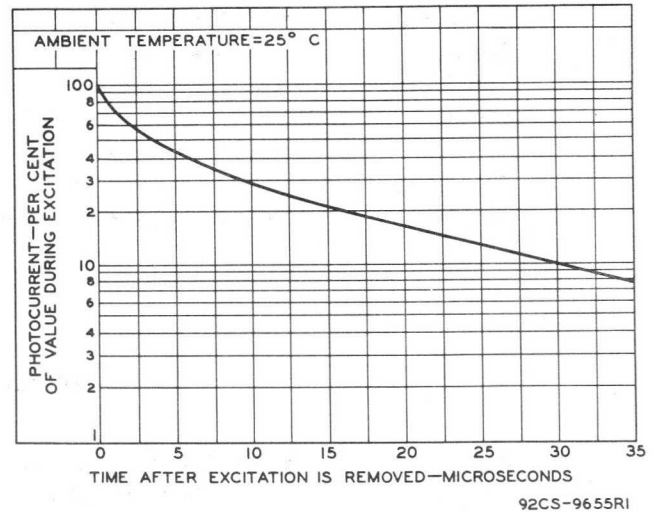


Fig. 7

TYPICAL EQUIVALENT NOISE INPUT CURVE

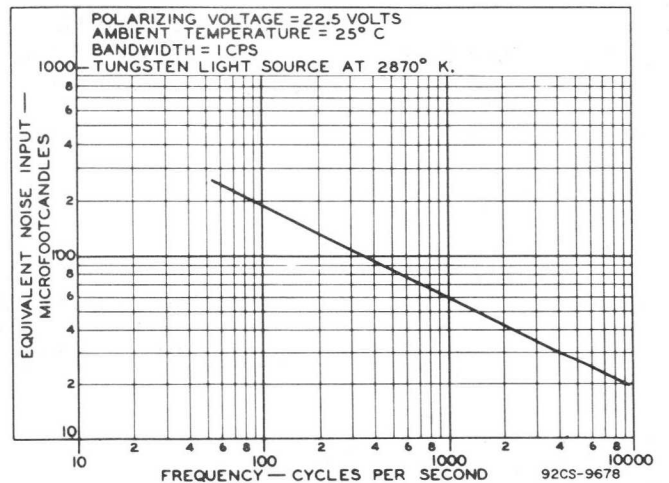


Fig. 8

FIELD OFFICES

Newark	32 Green St., Newark, N.J. 07102	(201) 485-3900
Washington	1725 K St., N.W., Washington, D.C. 20006	(202) 337-8500
Dayton	224 N. Wilkinson St., Dayton, Ohio 45402	(513) 461-5420
Hollywood	6363 Sunset Blvd., Hollywood, Calif. 90028	(213) 461-9171
Detroit	714 New Center Building, Detroit, Mich. 48202	(313) 875-5600
Des Plaines	446 E. Howard Ave., Des Plaines, Illinois 60018	(312) 827-0033
Dallas	210-C Court Terrace, Exchange Park North, Dallas, Texas 75235	(214) 351-5361
Los Altos	4546 El Camino Real, Los Altos, Calif. 94022	(415) 948-8996
Needham	64 A Street, Needham Heights, Mass. 02194	(617) 444-7200

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Geneva	118 Rue du Rhone, Geneva, Switzerland Cable: RADIOCORP	35 75 00 to 09
Montreal	1001 Lenoir Street, Montreal 30, Quebec Cable: VICTORADIO	(514) 933-7551
Hong Kong	1641 Union House, Connaught Road C, Hong Kong Cable: RADIOINTER	239529, 239522

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