No 161 25p

# RADIO, TV & ELECTRONICS DATA BOOK

*Compiled by B. BABANI*

BERNARDS RADIO MANUALS

# Radio, Television and Electronics

# DATA BOOK

*Compiled by B. BABANI*

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## OHMS LAW FOR D.C.

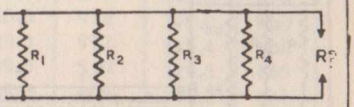
AMPERES = Volts ÷ Resistance
" = Watts ÷ Volts
" = $\sqrt{\text{Watts} \div \text{Resistance}}$

VOLTS = Resistance x Amperes
" = Watts ÷ Amperes
" = $\sqrt{\text{Watts x Resistance}}$

WATTS = $(\text{Amperes})^2$ x Resistance
" = $(\text{Volts})^2$ ÷ Resistance
" = Amperes x Volts

RESISTANCE = Volts ÷ Amperes
" = $(\text{Volts})^2$ ÷ Watts
" = Watts ÷ $(\text{Amperes})^2$

## RESISTANCES IN PARALLEL




$$R = \frac{1}{\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}+\frac{1}{R_4}+\text{etc.}}$$

2 PARALLEL RESISTANCES

$$R = [R_1 \times R_2] \div [R_1 + R_2]$$

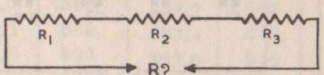
3 PARALLEL RESISTANCES

$$R = \frac{R_1 \times R_2 \times R_3}{[R_1 \times R_2]+[R_2 \times R_3]+[R_1 \times R_3]}$$

4 PARALLEL RESISTANCES

$$R = \frac{R_1 \times R_2 \times R_3 \times R_4}{[R_1 \times R_2 \times R_3]+[R_2 \times R_3 \times R_4]+[R_3 \times R_4 \times R_1]+[R_4 \times R_1 \times R_2]}$$

## RESISTANCES IN SERIES




$R = R_1 + R_2 + R_3 + \text{etc.}$

## OHMS LAW FOR A.C.

Where I = current in amperes
Z = impedance in ohms
E = voltage across Z
P = wattage
X = degrees of phase angle

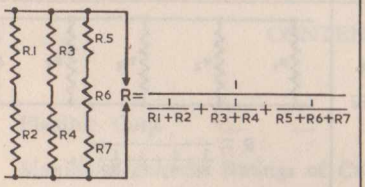
E = $P \div (I \cos X)$.
= $\sqrt{PZ \div \cos X}$.
= IZ

Z = $P \div (I \cos X)$.
= $E \div I$
= $(E^2 \cos X) \div P$.

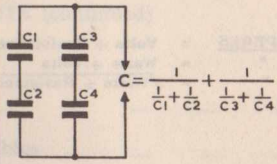
P = $IE \cos X$
= $(E^2 \cos X) \div Z$. = $I^2 Z \cos X$

I = $P \div (E \cos X)$.
= $E \div Z$
= $\sqrt{P \div (Z \cos X)}$.

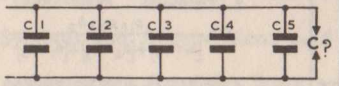
## RESISTANCES
IN SERIES—PARALLEL




## CONDENSERS
IN SERIES—PARALLEL

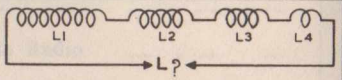



## CONDENSERS
IN PARALLEL




$C = C1 + C2 + C3 + C4 + C5 + \text{etc.}$

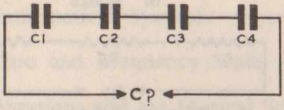
## INDUCTANCES
IN SERIES




WHERE THERE IS NO MUTUAL INDUCTANCE.

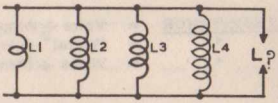
$L = L1 + L2 + L3 + L4 + \text{etc.}$

## CONDENSERS
IN SERIES




$C = \dfrac{1}{\frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3} + \frac{1}{C4} + \text{etc.}}$

## INDUCTANCES
IN PARALLEL




$L = \dfrac{1}{\frac{1}{L1} + \frac{1}{L2} + \frac{1}{L3} + \frac{1}{L4} + \text{etc.}}$

## WAVELENGTH AND FREQUENCY TABLE.

This table enables all calculations for wavelength and frequency to be arrived at. Although the table only covers a limited scale it is quite easy to cover any range required by following the method: If the figure in column A is multiplied by 10 the answer in column B must be divided by 10, or if the figure in column A is divided by 100 the answer in column B must be multiplied by 100. If column A is used to denote wavelength, then the answer in column B will be in Megacycles, or if column A is used for Frequency in Megacycles, the answer in coumn B will denote the equivalent wavelength in metres. This table is based on the fact that the frequency in kilocycles is equal to 299,820 ÷ by the wavelength in metres, whilst the wavelength in metres is equal to 299,820 ÷ by the frequency in kilocycles.

| FREQUENCY AND WAVELENGTH TABLE. | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B |
| 299.8 | 1000 | 313.3 | 957 | 328.0 | 914 | 344.2 | 871 |
| 300.1 | 999 | 313.6 | 956 | 328.4 | 913 | 344.6 | 870 |
| 300.4 | 998 | 314.0 | 955 | 328.8 | 912 | 345.0 | 869 |
| 300.7 | 997 | 314.3 | 954 | 329.1 | 911 | 345.4 | 868 |
| 301.0 | 996 | 314.6 | 953 | 329.5 | 910 | 345.8 | 867 |
| 301.3 | 995 | 314.9 | 952 | 329.9 | 909 | 346.2 | 866 |
| 301.6 | 994 | 315.3 | 951 | 330.2 | 908 | 346.6 | 865 |
| 301.9 | 993 | 315.6 | 950 | 330.6 | 907 | 347.0 | 864 |
| 302.2 | 992 | 315.9 | 949 | 330.9 | 906 | 347.4 | 863 |
| 302.5 | 991 | 316.2 | 948 | 331.3 | 905 | 347.8 | 862 |
| 302.8 | 990 | 316.6 | 947 | 331.7 | 904 | 348.2 | 861 |
| 303.1 | 989 | 316.9 | 946 | 332.1 | 903 | 348.6 | 860 |
| 303.5 | 988 | 317.3 | 945 | 332.4 | 902 | 349.0 | 859 |
| 303.8 | 987 | 317.6 | 944 | 332.8 | 901 | 349.4 | 858 |
| 304.1 | 986 | 317.9 | 943 | 333.1 | 900 | 349.8 | 857 |
| 304.4 | 985 | 318.3 | 942 | 333.5 | 899 | 350.2 | 856 |
| 304.7 | 984 | 318.6 | 941 | 333.9 | 898 | 350.7 | 855 |
| 305.0 | 983 | 319.0 | 940 | 334.2 | 897 | 351.1 | 854 |
| 305.3 | 982 | 319.3 | 939 | 334.6 | 896 | 351.5 | 853 |
| 305.6 | 981 | 319.6 | 938 | 335.0 | 895 | 351.9 | 852 |
| 305.9 | 980 | 319.9 | 937 | 335.4 | 894 | 352.3 | 851 |
| 306.3 | 979 | 320.3 | 936 | 335.7 | 893 | 352.7 | 850 |
| 306.6 | 978 | 320.7 | 935 | 336.1 | 892 | 353.1 | 849 |
| 306.9 | 977 | 321.0 | 934 | 336.5 | 891 | 353.6 | 848 |
| 307.2 | 976 | 321.4 | 933 | 336.9 | 890 | 354.0 | 847 |
| 307.5 | 975 | 321.7 | 932 | 337.3 | 889 | 354.4 | 846 |
| 307.8 | 974 | 322.0 | 931 | 337.6 | 888 | 354.8 | 845 |
| 308.1 | 973 | 322.3 | 930 | 338.0 | 887 | 355.2 | 844 |
| 308.4 | 972 | 322.7 | 929 | 338.4 | 886 | 355.6 | 843 |
| 308.8 | 971 | 323.1 | 928 | 338.8 | 885 | 356.1 | 842 |
| 309.1 | 970 | 323.4 | 927 | 339.2 | 884 | 356.5 | 841 |
| 309.4 | 969 | 323.8 | 926 | 339.5 | 883 | 356.9 | 840 |
| 309.8 | 968 | 324.1 | 925 | 339.8 | 882 | 357.4 | 839 |
| 310.1 | 967 | 324.5 | 924 | 340.3 | 881 | 357.8 | 838 |
| 310.4 | 966 | 324.8 | 923 | 340.7 | 880 | 358.2 | 837 |
| 310.8 | 965 | 325.2 | 922 | 341.1 | 879 | 358.6 | 836 |
| 311.0 | 964 | 325.5 | 921 | 341.5 | 878 | 359.0 | 835 |
| 311.3 | 963 | 325.9 | 920 | 341.9 | 877 | 359.5 | 834 |
| 311.7 | 962 | 326.2 | 919 | 342.3 | 876 | 359.9 | 833 |
| 312.0 | 961 | 326.6 | 918 | 342.7 | 875 | 360.4 | 832 |
| 312.3 | 960 | 327.0 | 917 | 343.0 | 874 | 360.8 | 831 |
| 312.7 | 959 | 327.3 | 916 | 343.4 | 873 | 361.2 | 830 |
| 313.0 | 958 | 327.7 | 915 | 343.8 | 872 | 361.6 | 829 |

| FREQUENCY AND WAVELENGTH TABLE. | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B |
| 362.1 | 828 | 381.9 | 785 | 404.1 | 742 | 428.9 | 699 |
| 362.5 | 827 | 382.4 | 784 | 404.6 | 741 | 429.5 | 698 |
| 363.0 | 826 | 382.9 | 783 | 405.2 | 740 | 430.1 | 697 |
| 363.4 | 825 | 383.4 | 782 | 405.7 | 739 | 430.8 | 696 |
| 363.9 | 824 | 383.9 | 781 | 406.3 | 738 | 431.4 | 695 |
| 364.3 | 823 | 384.4 | 780 | 406.8 | 737 | 432.1 | 694 |
| 364.7 | 822 | 384.9 | 779 | 407.4 | 736 | 432.6 | 693 |
| 365.2 | 821 | 385.4 | 778 | 407.9 | 735 | 433.3 | 692 |
| 365.7 | 820 | 385.9 | 777 | 408.5 | 734 | 433.9 | 691 |
| 366.1 | 819 | 386.4 | 776 | 409.0 | 733 | 434.5 | 690 |
| 366.5 | 818 | 386.9 | 775 | 409.6 | 732 | 435.1 | 689 |
| 367.0 | 817 | 387.4 | 774 | 410.2 | 731 | 435.8 | 688 |
| 367.4 | 816 | 387.9 | 773 | 410.7 | 730 | 436.4 | 687 |
| 367.9 | 815 | 388.4 | 772 | 411.3 | 729 | 437.1 | 686 |
| 368.3 | 814 | 388.9 | 771 | 411.8 | 728 | 437.7 | 685 |
| 368.8 | 813 | 389.4 | 770 | 412.4 | 727 | 438.3 | 684 |
| 369.2 | 812 | 389.9 | 769 | 413.0 | 726 | 439.0 | 683 |
| 369.6 | 811 | 390.4 | 768 | 413.6 | 725 | 439.6 | 682 |
| 370.1 | 810 | 390.9 | 767 | 414.1 | 724 | 440.3 | 681 |
| 370.6 | 809 | 391.4 | 766 | 414.7 | 723 | 440.9 | 680 |
| 371.1 | 808 | 391.9 | 765 | 415.3 | 722 | 441.6 | 679 |
| 371.5 | 807 | 392.4 | 764 | 415.8 | 721 | 442.3 | 678 |
| 372.0 | 806 | 392.9 | 763 | 416.4 | 720 | 442.9 | 677 |
| 372.4 | 805 | 393.4 | 762 | 417.0 | 719 | 443.5 | 676 |
| 372.9 | 804 | 394.0 | 761 | 417.6 | 718 | 444.2 | 675 |
| 373.4 | 803 | 394.5 | 760 | 418.2 | 717 | 444.8 | 674 |
| 373.8 | 802 | 395.0 | 759 | 418.8 | 716 | 445.5 | 673 |
| 374.3 | 801 | 395.5 | 758 | 419.3 | 715 | 446.2 | 672 |
| 374.8 | 800 | 396.0 | 757 | 419.9 | 714 | 446.8 | 671 |
| 375.2 | 799 | 396.6 | 756 | 420.5 | 713 | 447.6 | 670 |
| 375.7 | 798 | 397.1 | 755 | 421.1 | 712 | 448.2 | 669 |
| 376.2 | 797 | 397.6 | 754 | 421.7 | 711 | 448.8 | 668 |
| 376.7 | 796 | 398.2 | 753 | 422.3 | 710 | 449.5 | 667 |
| 377.1 | 795 | 398.7 | 752 | 422.9 | 709 | 450.2 | 666 |
| 377.6 | 794 | 399.2 | 751 | 423.5 | 708 | 450.9 | 665 |
| 378.2 | 793 | 399.8 | 750 | 424.1 | 707 | 451.5 | 664 |
| 378.6 | 792 | 400.3 | 749 | 424.7 | 706 | 452.2 | 663 |
| 379.0 | 791 | 400.8 | 748 | 425.3 | 705 | 452.9 | 662 |
| 379.5 | 790 | 401.4 | 747 | 425.9 | 704 | 453.6 | 661 |
| 380.0 | 789 | 401.9 | 746 | 426.5 | 703 | 454.3 | 660 |
| 380.5 | 788 | 402.4 | 745 | 427.1 | 702 | 455.1 | 659 |
| 381.0 | 787 | 402.9 | 744 | 427.7 | 701 | 455.7 | 658 |
| 381.4 | 786 | 403.5 | 743 | 428.3 | 700 | 456.3 | 657 |

| FREQUENCY AND WAVELENGTH TABLE. | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B |
| 457.0 | 656 | 489.1 | 613 | 526.0 | 570 | 568.9 | 527 |
| 457.7 | 655 | 489.9 | 612 | 526.9 | 569 | 570.1 | 526 |
| 458.4 | 654 | 490.7 | 611 | 527.9 | 568 | 571.1 | 525 |
| 459.1 | 653 | 491.5 | 610 | 528.8 | 567 | 572.2 | 524 |
| 459.8 | 652 | 492.4 | 609 | 529.7 | 566 | 573.3 | 523 |
| 460.5 | 651 | 493.1 | 608 | 530.7 | 565 | 574.4 | 522 |
| 461.3 | 650 | 493.9 | 607 | 531.6 | 564 | 575.5 | 521 |
| 462.0 | 649 | 494.8 | 606 | 532.5 | 563 | 576.6 | 520 |
| 462.7 | 648 | 495.7 | 605 | 533.5 | 562 | 577.7 | 519 |
| 463.4 | 647 | 496.5 | 604 | 534.5 | 561 | 578.8 | 518 |
| 464.1 | 646 | 497.3 | 603 | 535.4 | 560 | 579.9 | 517 |
| 464.8 | 645 | 498.0 | 602 | 536.4 | 559 | 581.1 | 516 |
| 465.6 | 644 | 498.9 | 601 | 537.3 | 558 | 582.2 | 515 |
| 466.4 | 643 | 499.7 | 600 | 538.3 | 557 | 583.3 | 514 |
| 467.0 | 642 | 500.5 | 599 | 539.2 | 556 | 584.4 | 513 |
| 467.7 | 641 | 501.4 | 598 | 540.2 | 555 | 585.5 | 512 |
| 468.5 | 640 | 502.2 | 597 | 541.2 | 554 | 586.6 | 511 |
| 469.2 | 639 | 503.1 | 596 | 542.2 | 553 | 587.8 | 510 |
| 469.9 | 638 | 503.9 | 595 | 543.2 | 552 | 588.9 | 509 |
| 470.7 | 637 | 504.7 | 594 | 544.1 | 551 | 590.2 | 508 |
| 471.4 | 636 | 505.6 | 593 | 545.1 | 550 | 591.3 | 507 |
| 472.1 | 635 | 506.5 | 592 | 546.1 | 549 | 592.5 | 506 |
| 472.9 | 634 | 507.3 | 591 | 547.1 | 548 | 593.7 | 505 |
| 473.6 | 633 | 508.2 | 590 | 548.1 | 547 | 594.9 | 504 |
| 474.4 | 632 | 509.0 | 589 | 549.1 | 546 | 596.1 | 503 |
| 475.2 | 631 | 509.9 | 588 | 550.1 | 545 | 597.3 | 502 |
| 475.9 | 630 | 510.8 | 587 | 551.1 | 544 | 598.4 | 501 |
| 476.7 | 629 | 511.6 | 586 | 552.2 | 543 | 599.6 | 500 |
| 477.4 | 628 | 512.5 | 585 | 553.2 | 542 | 600.8 | 499 |
| 478.2 | 627 | 513.4 | 584 | 554.2 | 541 | 602.1 | 498 |
| 478.9 | 626 | 514.3 | 583 | 555.2 | 540 | 603.3 | 497 |
| 479.7 | 625 | 515.2 | 582 | 556.3 | 539 | 604.5 | 496 |
| 480.5 | 624 | 516.0 | 581 | 557.3 | 538 | 605.7 | 495 |
| 481.3 | 623 | 516.8 | 580 | 558.3 | 537 | 606.9 | 494 |
| 482.0 | 622 | 17.7 | 579 | 559.4 | 536 | 608.2 | 493 |
| 482.8 | 621 | 518.7 | 578 | 560.4 | 535 | 609.4 | 492 |
| 483.6 | 620 | 519.6 | 577 | 561.5 | 534 | 610.6 | 491 |
| 484.4 | 619 | 520.5 | 576 | 562.5 | 533 | 611.9 | 490 |
| 485.1 | 618 | 521.4 | 575 | 563.6 | 532 | 613.1 | 489 |
| 485.9 | 617 | 522.3 | 574 | 564.6 | 531 | 614.4 | 488 |
| 486.7 | 616 | 523.2 | 573 | 565.7 | 530 | 615.6 | 487 |
| 487.5 | 615 | 524.2 | 572 | 566.8 | 529 | 616.9 | 486 |
| 488.3 | 614 | 525.1 | 571 | 567.8 | 528 | 618.2 | 485 |

| FREQUENCY AND WAVELENGTH TABLE. | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B |
| 619.5 | 484 | 679.9 | 441 | 753,2 | 398 | 844.6 | 355 |
| 620.7 | 483 | 681.4 | 440 | 755.1 | 397 | 847.1 | 354 |
| 622.1 | 482 | 683.0 | 439 | 757.1 | 396 | 849.4 | 353 |
| 623.3 | 481 | 684.6 | 438 | 759.1 | 395 | 851.8 | 352 |
| 624.6 | 480 | 686.1 | 437 | 761.0 | 394 | 854.2 | 351 |
| 625.9 | 479 | 687.7 | 436 | 762.8 | 393 | 856.5 | 350 |
| 627.3 | 478 | 689.2 | 435 | 764.8 | 392 | 859.1 | 349 |
| 628.6 | 477 | 690.8 | 434 | 766.7 | 391 | 861.6 | 348 |
| 629.9 | 476 | 692.4 | 433 | 768.7 | 390 | 864.1 | 347 |
| 631.2 | 475 | 694.0 | 432 | 770.7 | 389 | 866.5 | 346 |
| 632.5 | 474 | 695.6 | 431 | 772.7 | 388 | 869,1 | 345 |
| 633.9 | 473 | 697.3 | 430 | 774.7 | 387 | 871.6 | 344 |
| 635.2 | 472 | 698.9 | 429 | 776.8 | 386 | 874.2 | 343 |
| 636.6 | 471 | 700.6 | 428 | 778.8 | 385 | 876.7 | 342 |
| 637.9 | 470 | 702.2 | 427 | 780.8 | 384 | 879.2 | 341 |
| 639.3 | 469 | 703.8 | 426 | 782.8 | 383 | 881.8 | 340 |
| 640.6 | 468 | 705.5 | 425 | 784.8 | 382 | 884.4 | 339 |
| 642.1 | 467 | 707.1 | 424 | 786.9 | 381 | 887.1 | 338 |
| 643.4 | 466 | 708.8 | 423 | 789.0 | 380 | 889.7 | 337 |
| 644.8 | 465 | 710.5 | 422 | 791.1 | 379 | 892.3 | 336 |
| 646.2 | 464 | 712.2 | 421 | 793.2 | 378 | 895.1 | 335 |
| 647.6 | 463 | 713.9 | 420 | 795.3 | 377 | 897.7 | 334 |
| 649.1 | 462 | 715.6 | 419 | 797.4 | 376 | 900.3 | 333 |
| 650.4 | 461 | 717.3 | 418 | 799.5 | 375 | 903.1 | 332 |
| 651.8 | 460 | 719.1 | 417 | 801.7 | 374 | 905.8 | 331 |
| 653.2 | 459 | 720.7 | 416 | 803.8 | 373 | 908.6 | 330 |
| 654.6 | 458 | 722.5 | 415 | 805.9 | 372 | 911.3 | 329 |
| 656.1 | 457 | 724,2 | 414 | 808.1 | 371 | 914.1 | 328 |
| 657.5 | 456 | 725.9 | 413 | 810.3 | 370 | 916.9 | 327 |
| 658.9 | 455 | 727.7 | 412 | 812.5 | 369 | 919.7 | 326 |
| 660.4 | 454 | 729.5 | 411 | 814.7 | 368 | 922.5 | 325 |
| 661.9 | 453 | 731.3 | 410 | 817.1 | 367 | 925.4 | 324 |
| 663.3 | 452 | 733.1 | 409 | 819.2 | 366 | 928.2 | 323 |
| 664.8 | 451 | 734,9 | 408 | 821.4 | 365 | 931.1 | 322 |
| 666.3 | 450 | 736,7 | 407 | 823.8 | 364 | 934.1 | 321 |
| 667.8 | 449 | 738,5 | 406 | 826.1 | 363 | 936.9 | 320 |
| 669.2 | 448 | 740.3 | 405 | 828.3 | 362 | 939.8 | 319 |
| 670.7 | 447 | 742.1 | 404 | 830.4 | 361 | 942.8 | 318 |
| 672.2 | 446 | 744.1 | 403 | 832.8 | 360 | 945.8 | 317 |
| 673.8 | 445 | 745.8 | 402 | 835.2 | 359 | 948.8 | 316 |
| 675.3 | 444 | 747.7 | 401 | 837.5 | 358 | 951.8 | 315 |
| 676.9 | 443 | 749.4 | 400 | 839.8 | 357 | 954.8 | 314 |
| 678.3 | 442 | 751.3 | 399 | 842.2 | 356 | 957.9 | 313 |

| FREQUENCY AND WAVELENGTH TABLE. | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B |
| 961.1 | 312 | 1115. | 269 | 1327. | 226 | 1638. | 183 |
| 964.1 | 311 | 1119. | 268 | 1333. | 225 | 1647. | 182 |
| 967.2 | 310 | 1123. | 267 | 1338. | 224 | 1656. | 181 |
| 970.3 | 309 | 1127. | 266 | 1344. | 223 | 1665. | 180 |
| 973.4 | 308 | 1131. | 265 | 1351. | 222 | 1675. | 179 |
| 976.7 | 307 | 1136. | 264 | 1357. | 221 | 1684. | 178 |
| 979.8 | 306 | 1141. | 263 | 1362. | 220 | 1694. | 177 |
| 983.1 | 305 | 1145. | 262 | 1369. | 219 | 1703. | 176 |
| 986.2 | 304 | 1149. | 261 | 1375. | 218 | 1713. | 175 |
| 989.4 | 303 | 1153. | 260 | 1381. | 217 | 1723. | 174 |
| 992.8 | 302 | 1158. | 259 | 1388. | 216 | 1733. | 173 |
| 996.2 | 301 | 1162. | 258 | 1395. | 215 | 1743. | 172 |
| 999.4 | 300 | 1167. | 257 | 1401. | 214 | 1753. | 171 |
| 1003. | 299 | 1171. | 256 | 1407. | 213 | 1763. | 170 |
| 1006. | 298 | 1176. | 255 | 1414. | 212 | 1774. | 169 |
| 1009. | 297 | 1180. | 254 | 1421. | 211 | 1784. | 168 |
| 1013. | 296 | 1185. | 253 | 1428. | 210 | 1794. | 167 |
| 1016. | 295 | 1190. | 252 | 1435. | 209 | 1806. | 166 |
| 1020. | 294 | 1195. | 251 | 1442. | 208 | 1817. | 165 |
| 1024. | 293 | 1199. | 250 | 1448. | 207 | 1828. | 164 |
| 1027. | 292 | 1204. | 249 | 1454. | 206 | 1839. | 163 |
| 1030. | 291 | 1209. | 248 | 1463. | 205 | 1851. | 162 |
| 1034. | 290 | 1214. | 247 | 1470. | 204 | 1862. | 161 |
| 1037. | 289 | 1219. | 246 | 1477. | 203 | 1873. | 160 |
| 1041. | 288 | 1224. | 245 | 1484. | 202 | 1885. | 159 |
| 1045. | 287 | 1229. | 244 | 1492. | 201 | 1898. | 158 |
| 1048. | 286 | 1234. | 243 | 1499. | 200 | 1910. | 157 |
| 1052. | 285 | 1239. | 242 | 1507. | 199 | 1923. | 156 |
| 1056. | 284 | 1244. | 241 | 1514. | 19 | 1934. | 155 |
| 1059. | 283 | 1249. | 240 | 1523. | 197 | 1947. | 154 |
| 1063. | 282 | 1255. | 239 | 1531. | 196 | 1960. | 153 |
| 1066. | 281 | 1260. | 238 | 1538. | 195 | 1973. | 152 |
| 1070. | 280 | 1265. | 237 | 1545. | 194 | 1986. | 151 |
| 1074. | 279 | 1270. | 236 | 1553. | 193 | 2000. | 150 |
| 1078. | 278 | 1276. | 235 | 1562. | 192 | 2012. | 149 |
| 1082. | 277 | 1281. | 234 | 1570. | 191 | 2025. | 148 |
| 1086. | 276 | 1287. | 233 | 1578. | 190 | 2040. | 147 |
| 1090. | 275 | 1293. | 232 | 1587. | 189 | 2053. | 146 |
| 1094. | 274 | 1298. | 231 | 1595. | 188 | 2067. | 145 |
| 1098. | 273 | 1303. | 230 | 1603. | 187 | 2082. | 144 |
| 1102. | 272 | 1309. | 229 | 1612. | 186 | 2097. | 143 |
| 1106. | 271 | 1315. | 228 | 1620. | 185 | 2110. | 142 |
| 1110. | 270 | 1321. | 227 | 1629. | 184 | 2127. | 141 |

| FREQUENCY AND WAVELENGTH TABLE. | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B |
| 2142. | 140 | 2306. | 130 | 2498. | 120 | 2726. | 110 |
| 2157. | 139 | 2323. | 129 | 2521. | 119 | 2751. | 109 |
| 2173. | 138 | 2342. | 128 | 2541. | 118 | 2776. | 108 |
| 2188. | 137 | 2361. | 127 | 2563. | 117 | 2808. | 107 |
| 2204. | 136 | 2380. | 126 | 2585. | 116 | 2828. | 106 |
| 2221. | 135 | 2399. | 125 | 2607. | 115 | 2855. | 105 |
| 2237. | 134 | 2417. | 124 | 2630. | 114 | 2883. | 104 |
| 2254. | 133 | 2438. | 123 | 2653. | 113 | 2911. | 103 |
| 2272. | 132 | 2458. | 122 | 2677. | 112 | 2939. | 102 |
| 2289. | 131 | 2478. | 121 | 2701. | 111 | 2969. | 101 |
| | | | | | | 2998. | 100 |

## CALCULATION OF CORRECT RESISTOR FOR SELF BIAS.

From Ohms law:-

$$R = \frac{\text{Grid Bias Voltage x 1,000}}{\text{Total Cathode Current in mA. x number of valves involved}}$$

For Triodes, total cathode current = plate current.
For Pentodes and Tetrodes, total cathode current = plate plus screen currents.
For Pentagrid, total cathode current = plate plus screen plus oscillator plate currents.

Example. - Find Bias resistor for two 6K6 valves operating in push-pull with 315 volts on the plates.

Grid Bias = 21 volts
Screen Current = 4 mA.
Plate Current = 25.5 mA. ∴ Total Cathode Current = 29.5 mA.
Therefore

$$R = \frac{21 \times 1{,}000}{29.5 \times 2} = \frac{21{,}000}{59} = 355 \text{ ohms approximately.}$$

When over biased operation is used the advised bias resistor value will be shown under Ratings and current applications for the type of valve involved in Bernards "Comprehensive Radio Valve Guides".

## REACTANCE FORMULAS.

Reactance is measured in ohms and is defined as the resistance against the flow of an A.C. in any componenr due to its capacity or inductance. Amongst other factors it is variable due to the frequency of the A.C.

Reactance in ohms of a condenser is equal to 1 divided by ( 6.283 x frequency of A.C. in cycles per second x capacity of condenser in farads).

Reactance of a coil is equal to (6.283 x frequency of A.C. in cycles per second x inductance of coil in henries).

Reactance of a condenser and a coil in series is equal to the reactance of the coil on its own minus the reactance of the condenser.

## RESONANT FREQUENCY.

This is the condition when a condenser and coil in a tuning circuit are so adjusted as to produce resonance. The formula for this condition is as follows:-

Frequency of resonance = $1 \div [6.283$ (square root of the coil inductance in henries multiplied by the condenser capacity in farads)$]$.

Capacity in farads of a condenser in a resonant circuit = $1 \div [39.478 \times (\text{resonant frequency})^2 \times$ inductance of the coil in circuit in henries$]$.

Inductance in henries of a coil in a resonant circuit = $1 \div [39.478 \times (\text{resonant frequency})^2 \times$ capacity of the condenser in circuit in farads$]$.

## POWER RATINGS OF FIXED RESISTANCES.

| Wattage Rating → | 0·5 Watt. | | 1·0 Watt. | | 2·0 Watts. | | 3·0 Watts. | | 5·0 Watts. | |
|---|---|---|---|---|---|---|---|---|---|---|
| OHMS. | Amps. | Volts. | Amps. | Volts. | Amps. | Volts. | Amps. | Volts. | Amps. | Volts. |
| 50 | .1 | 5 | .141 | 7 | .2 | 10 | .25 | 12.2 | .32 | 15.8 |
| 100 | .07 | 7 | .10 | 10 | .141 | 14.1 | .173 | 17.3 | .224 | 22.4 |
| 250 | .045 | 11 | .063 | 16 | .089 | 23.1 | .108 | 27.2 | .141 | 35.5 |
| 500 | .032 | 16 | .045 | 22 | .061 | 32.5 | .076 | 39 | .100 | 50 |
| 750 | .025 | 20 | .036 | 27 | .051 | 39 | .062 | 49 | .083 | 60 |
| 1000 | .022 | 22 | .032 | 32 | .045 | 45 | .055 | 55 | .071 | 71 |
| 2000 | .016 | 32 | .022 | 45 | .032 | 62 | .040 | 77 | .050 | 100 |
| 3000 | .013 | 39.5 | .018 | 55 | .026 | 77 | .032 | 95 | .041 | 124 |
| 4000 | .011 | 45 | .016 | 62.5 | .022 | 89 | .027 | 110 | .035 | 141 |
| 5000 | .010 | 50 | .014 | 71 | .020 | 100 | .025 | 121 | .032 | 159 |
| 6000 | .009 | 55 | .013 | 77 | .018 | 110 | .022 | 135 | .029 | 173 |
| 7000 | .008 | 59 | .012 | 84 | .017 | 118 | .021 | 145 | .027 | 188 |
| 8000 | .008 | 63 | .011 | 89 | .016 | 125 | .020 | 154 | .025 | 200 |
| 9000 | .0075 | 67 | .0105 | 95 | .015 | 135 | .018 | 164 | .023 | 212 |
| 10000 | .007 | 71 | .010 | 100 | .014 | 141 | .017 | 172 | .022 | 225 |
| 15000 | .0058 | 86 | .008 | 121 | .011 | 172 | .014 | 213 | .018 | 265 |
| 20000 | .0055 | 100 | .007 | 141 | .010 | 200 | .012 | 245 | .016 | 315 |
| 25000 | .0045 | 110 | .0063 | 158 | .009 | 225 | .011 | 272 | .014 | 355 |
| 30000 | .004 | 124 | .0058 | 174 | .0082 | 244 | .010 | 300 | .013 | 389 |
| 40000 | .0035 | 140 | .005 | 200 | .0071 | 282 | .0087 | 344 | .011 | 448 |
| 50000 | .003 | 159 | .0043 | 225 | .0063 | 317 | .0077 | 386 | .010 | 500 |
| 75000 | .0025 | 194 | .0036 | 275 | .0052 | 387 | .0062 | 475 | .008 | 613 |
| 100000 | .0021 | 220 | .003 | 309 | .0044 | 440 | .0055 | 550 | .007 | 707 |
| 200000 | .0015 | 321 | .0023 | 441 | .0032 | 631 | .004 | 770 | .005 | 1000 |
| 250000 | .0014 | 350 | .002 | 500 | .0028 | 700 | .0035 | 861 | .0045 | 1120 |
| 500000 | .001 | 500 | .0014 | 700 | .002 | 1000 | .0025 | 1200 | .003 | 1581 |
| 750000 | .0008 | 612 | .0012 | 866 | .0016 | 1224 | .002 | 1500 | .0026 | 1937 |
| 1000000 | .0007 | 709 | .001 | 1000 | .0014 | 1410 | .0017 | 1720 | .0022 | 2250 |

# WORLD TIME IN ALL COUNTRIES

DIFFERENCE BETWEEN LOCAL TIME AND GREENWICH MEAN TIME.

The differences marked + indicate the number of hours ahead of G.M.T.
Differences marked — indicate number of hours behind G.M.T.

| | |
|---|---|
| Aden | +3 |
| Afghanistan | +4½ |
| Alaska* | -8 |
| Albania | +1 |
| Algeria | +1 |
| Andorra | +1 |
| Angola | +1 |
| Argentina | -3 |
| Australia | |
| a) New South Wales | |
| Queensland | |
| Tasmania | +10 |
| b) N.Territery | |
| S.Australia | +9½ |
| Austria | +1 |
| Azores | -2 |
| Bahamas | -5 |
| Bahrain | +4 |
| Barbados (W.I) | -4 |
| Bechuanaland | +2 |
| Belgian Congo | |
| Leopoldville | +1 |
| Elisabethville | +2 |
| Stanleyville | +2 |
| Belgium | +1 |
| Bermuda | -4 |
| Bolivia | -4 |
| Borneo | +8 |
| Brazil | |
| a) Eastern & | |
| Coastal | -3 |
| (Manaos) | -4 |
| Bulgaria | +2 |
| Burma | +6½ |
| Cambodia | +7 |
| Cameroons | +1 |
| Canada | |
| a) Newfoundland | -3½ |
| b) Labrador | |
| Nova Scotia | |
| Quebec** | -4 |
| c) Ontario | -5 |
| d) Manitoba | -6 |
| e) Alberta | -7 |
| f) Br. Columbia | -8 |
| g) Yukon | -9 |
| Canary Islands | ±0 |
| Canton Islands | -11 |
| Cap Verde Islands | -2 |
| Central African Rep | +1 |
| Ceylon | +5½ |
| Chatham Isl. | +12¾ |
| Chile | -4 |
| China | |
| People's Rep. | +8 |
| Taiwan | +8 |
| Christmas Isl. | -9 |
| Colombia | -5 |
| Comoro Isl. | +3 |
| Cook Isl. | -10½ |
| Costa Rica | -6 |
| Cuba (W.I) | -5 |
| Curacao | -4½ |
| Cyprus | +2 |
| Czechoslovakia | +1 |
| Dahomey | +1 |
| Denmark | +1 |
| Dominican Rep. | -5 |
| Ecuador | -5 |
| Egypt | +2 |
| Ellice Island | +12 |
| El Salvador | -6 |
| Eritrea | +3 |
| Ethiopia | +3 |
| Falkland Islands | -4 |
| Fiji Islands | +12 |
| Finland | +2 |
| France | +1 |
| French Congo | +1 |
| French West Africa | ±0 |
| Gabon | +1 |
| Gambia | ±0 |
| Germany | +1 |
| Gibraltar | ±0 |
| Gilbert Isl. | +12 |
| Goa (Port India) | +5½ |
| Ghana | ±0 |
| Great Britain | ±0 |
| Greece | +2 |
| Greenland | |
| Thule area | -4 |
| Other areas | -3 |
| Guadeloupe | -4 |
| Guam | +10 |
| Guatemala | -6 |
| Guiana (British) | -3¾ |
| Guiana (Dutch) | -3,4 |
| Guiana (French) | -4 |
| Guinea | ±0 |
| Guinea (Port.) | -1 |
| Guinea (Sp.) | +1 |
| Haiti (W.I) | -5 |
| Hawaiian Isl. | -10 |
| Holland | +1 |
| Honduras (Rep.) | -6 |
| Honduras (British) | -6 |
| Hong Kong | +8 |
| Hungary | +1 |
| Iceland | -1 |
| India | +5½ |
| Indonesia | |
| a) North Sumatra | +6½ |
| b) South Sumatra | +7 |
| c) Java, Borneo, Bali | +7½ |
| d) Celebes | +8 |
| e) Molucca Isl. | +8 |
| Iran (Persia) | +3½ |
| Iraq | +3 |
| Ireland (Eire) | ±0 |
| Israel | +2 |
| Italy | +1 |
| Ivory Coast | ±0 |
| Jamaica (W.I) | -5 |
| Japan | +9 |
| Johnston Isl. | -11 |
| Jordan | +2 |
| Kenya | +3 |
| Korea (South) | +8½ |
| Korea (North) | +9 |
| Kuwait | +3 |
| Laos | +7 |
| Lebanon | +2 |
| Leeward Islands | -4 |
| Liberia | -¾ |
| Libya | +2 |
| Luxembourg | +1 |
| Macau | +8 |
| Madagascar | +3 |
| Madeira | -1 |
| Malaya | +7½ |
| Malta | +1 |
| Marshall Isl. | +12 |
| Martinique | -4 |
| Mauretania | ±0 |
| Mauritius | +4 |
| Mexico*** | -6 |
| Midway | -11 |
| Monaco | +1 |
| Mongolia (Outer) | +8 |
| Morocco | ±0 |
| Mozambique | +2 |
| Nepal | +5,4 |
| Neth. Antilles | -4½ |
| New Caledonia | +11 |
| New Guinea (Dutch) | +9½ |
| New Guinea (Austral.) | +10 |
| New Hebrides | +11 |
| New Zealand | +12 |
| Nicaragua | -6 |
| Niger | +1 |
| Nigeria | +1 |
| Norfolk Isl. | +11½ |
| Norway | +1 |
| Pakistan | |
| a) West | +5 |
| b) East | +6 |
| Panama | -5 |
| Paraguay | -4 |
| Peru | -5 |
| Philippine Isl. | +8 |
| Poland. | +1 |
| Portugal | ±0 |
| Puerto Rico(W.I.) | -4 |
| Reunion | +4 |
| Rhodesia | +2 |
| Roumania | +2 |
| Ryukyu Isl. | +9 |
| Samoa Isl. | -11 |
| S.Pierre | -4 |
| S. Tome | ±0 |
| Sarawak | +8 |
| Saudi Arabia | +3 |
| Senegal | ±0 |
| Seychelles Isl. | +4 |
| Sierre Leone | ±0 |
| Singapore | +7½ |

| | |
|---|---|
| Solomon Isl. | +11 |
| Somaliland | +3 |
| Spain | +1 |
| Sudan | +2 |
| Sudan (French) | ±0 |
| Surinam | -3½ |
| Sweden | +1 |
| Switzerland | +1 |
| Syria | +2 |
| Tanganyika | +3 |
| Tangier | ±0 |
| Tahiti | -10 |
| Tasmania | +10 |
| Tchad | +1 |
| Thailand | +7 |
| Tibet | +6 |
| Togo | ±0 |
| Trinidad (B.W.I) | -4 |
| Tunisia | +1 |
| Turkey | +2 |
| Uganda | +3 |
| Union of So. Af. | +2 |
| Upper Volta | ±0 |
| Uruguay | -3 |
| U.S.S.R. | |
| Moscow | +3 |
| Leningrad | +3 |
| Baku | +4 |
| Sverdlovsk | +5 |
| Tashkent | +6 |
| Novosibirsk | +7 |
| Irkutsk | +8 |
| Yakutsk | +9 |
| Khabarovsk | +10 |
| Petropavlovsk | +11 |
| U.S.A. | -5 |
| Eastern Zone | -6 |
| Central Zone | -7 |
| Mountain Zone | -8 |
| Pacific Zone | +1 |
| Vatican | -4½ |
| Venezuela | +7 |
| Vietnam | -4 |
| Virgin Isl. | -4 |
| Windward Isl. | +3 |
| Yemen | +1 |
| Yugoslavia | +3 |
| Zanzibar | |

* a) Ketchikan to Skagway -8
b) Skagway to 141°W long -9
c) 141°W long-162°W long -10
d) 162°W long to Western most point including the Aleutians -11

** exc. the watch shore & Gaspe regions -5

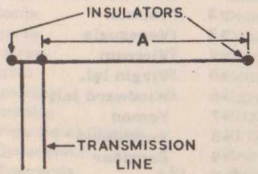
*** Pacific coast -7
Northern part -8

## W/K CALL AREAS BY STATES

| | | | | | |
|---|---|---|---|---|---|
| Alabama | 4 | Louisiana | 5 | Ohio | 8 |
| Alaska | KL7 | Maine | 1 | Oklahoma | 5 |
| Arizona | 7 | Maryland | 3 | Oregon | 7 |
| Arkansas | 5 | Massachusetts | 1 | Pennsylvania | 3 |
| California | 6 | Michigan | 8 | Rhode Island | 1 |
| Colorado | 10 | Minnesota | 10 | South Carolina | 4 |
| Connecticut | 1 | Mississippi | 5 | South Dakota | 10 |
| Delaware | 3 | Missouri | 10 | Tennessee | 4 |
| District of Columbia | 3 | Montana | 7 | Texas | 5 |
| Florida | 4 | Nebraska | 10 | Utah | 7 |
| Georgia | 4 | Nevada | 7 | Vermont | 1 |
| Idaho | 7 | New Hampshire | 1 | Virginia | 4 |
| Illinois | 9 | New Jersey | 2 | Washington | 7 |
| Indiana | 9 | New Mexico | 5 | West Virginia | 8 |
| Iowa | 10 | New York | 2 | Wisconsin | 9 |
| Kansas | 10 | North Carolina | 4 | Wyoming | 7 |
| Kentucky | 4 | North Dakota | 10 | | |

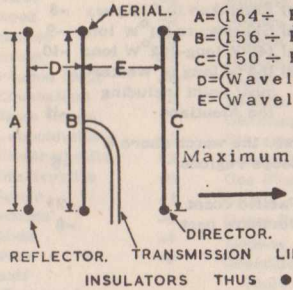
# FORMULAS FOR AERIALS CUT TO RESONATE AT ANY DESIRED FREQUENCY.

## LONG WIRE MULTIBAND ZEPPELIN AERIAL.



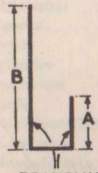

A= [164 (Number of Half Waves on the Aerial Required, Minus .05) ÷ (Frequency in Megacycles of most used brand)] yds.

## DIRECTOR AND REFLECTOR HALF WAVE AERIAL.



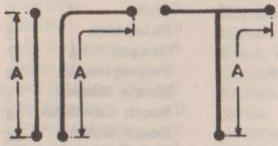

A=(164 ÷ Frequency in Megacycles) yds.
B=(156 ÷ Frequency in Megacycles) yds.
C=(150 ÷ Frequency in Megacycles) yds.
D=(Wavelength in metres x .125 x 1.094) yds.
E=(Wavelength in metres x .1 x 1.094) yds.

## J TYPE AERIAL FOR VERY HIGH FREQUENCIES.



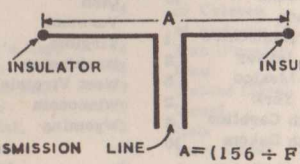

A=(Wavelength in metres ÷ 4) x 1.094 yds.
B=(Wavelength in metres x .75) x 1.094 yds

## MARCONI TYPE 1/4 WAVE AERIAL.



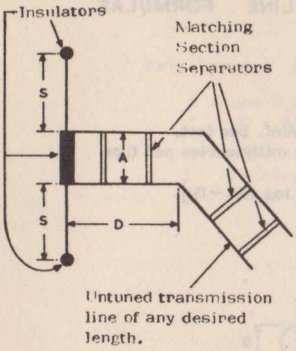

A=(Wavelength in metres ÷ 4) x 1.094 yds.

A HERE INCLUDES LENGTH OF LEAD IN HALF WAVE AERIAL.




A=(156 ÷ Frequency in Megacycles) yds.

## HALF WAVE Q MATCHED AERIAL.



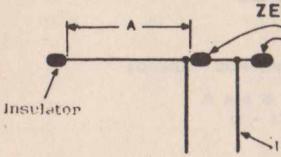

The dimension A depends upon the aerial impedance and the impedance of the transmission line and the impedance in ohms of the matching section is equal to

$$\sqrt{\text{Aerial Impedance in ohms} \times \text{Transmission line impedance in ohms}}$$

Therefore the dimension A is obtained by reference to the section dealing with transmission line formulas once the impedance of the matching section is obtained.

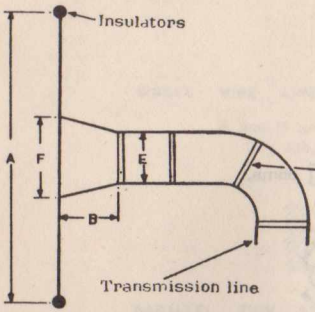
D = (78 ÷ Frequency in Megacycles) yds.
S = (78 ÷ Frequency in Megacycles) yds.

## ZEPPELIN AERIAL.




A = (156 ÷ (Frequency in Megacycles) yds.

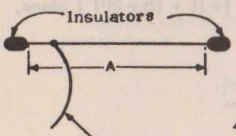
## HALF WAVE DELTA MATCHED AERIAL.




A = (156 ÷ Frequency in Megacycles) yds.
E is obtained according to the impedance of the transmission line.
B = (41 ÷ Frequency in Megacycles) yds.
F = (49.3 ÷ Frequency in Megacycles) yds.

## LONG WAVE AERIAL

ANY NUMBER OF HALF WAVES IN LENGTH



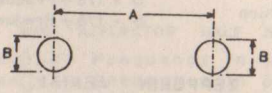

A = (164 × Number of half waves on the aerial minus .05 ) ÷ (Frequency in Megacycles) yds.

# TRANSMISSION AND FEEDER LINE FORMULAS.

## TWO WIRE LINE.

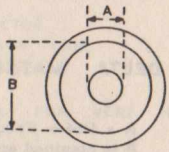
Let A = Wire centre spacing in inches.
B = Wire diameters in inches.
C = Line impedance in ohms.
D = Capacity of twin line feeder in mmf. per foot.
E = Inductance of twin line feeder in millihenries per foot.

$C = [276.36 \ [\log (2A \div B)]$. $D = 3.679 \ [\log (2A \div B)]$,
$E = .2812 \ [\log (2A \div B)]$.



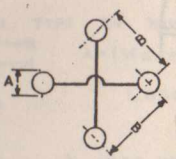

## CONCENTRIC LINE.

A and B are given in inches.
$C = 138.18 \ [\log (B \div A)]$ ohms.




## DOUBLE TWIN LINE.

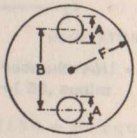
A and B are given in inches.
$C = 138.18 \ [\log (1.4142 \, 1B \div A)]$ ohms.




## SHIELDED TWIN LINE.

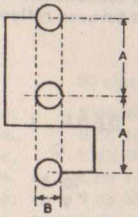
A, B and F are given in inches

$C = 276.36 \log \frac{2B}{A} \left[ \left( 1 - (B \div 2F)^2 \right) \right] \div \left[ 1 + (B \div 2F)^2 \right]$ ohms.



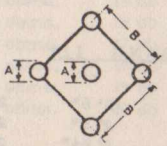
TWIN SINGLE LINE.

A and B are given in inches.
C = 207.3 [log (1.587401A ÷ B)] ohms



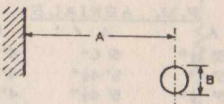

SQUARE CONCENTRIC LINE.

A and B are given in inches
C = 171.71 [log (1.148B ÷ A)] ohms




SINGLE WIRE LINE.

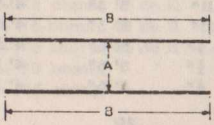
A and B are given in inches
C = 138.18 (log (4A ÷ B)) ohms.




PARALLEL THIN STRIP FOIL LINE.
A and B are given in inches.

$$C = 1188 \div \left[1 + 2.3 \log \left(\frac{(1 + 3.142B)}{A}\right) + \frac{3.142B}{A} + 1 + \frac{3.142B}{A}\right]$$

The formula for this type of line is only true when B is much greater than A.



## AERIAL DIMENSIONS.

A = dipole
B = reflector
C = 1st. director
D = 2nd. director
E = separation between directors and dipole
F = separation between reflector and dipole

### BAND 1

| Channel | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | 10' 10" | 11' 2" | 10' 5" | 10' 0" | 2' 2½" | 4' 5" |
| 2 | 9' 4" | 9' 8½" | 9' 0" | 8' 8" | 1' 11" | 3' 10" |
| 3 | 8' 6" | 8' 10" | 8' 2" | 7' 11" | 1' 9" | 3' 6" |
| 4 | 7' 9" | 8' 0" | 7' 5½" | 7' 2½" | 1' 7" | 3' 2" |
| 5 | 7' 2½" | 7' 5½" | 6' 11½" | 6' 9" | 1' 5" | 2' 10" |

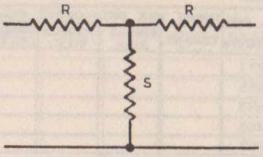
### BAND 111

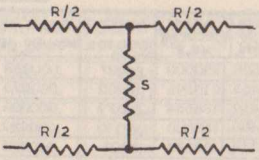
| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 6 | 2' 8" | 2' 9" | 2' 6" | 2' 5" | 1' 1" | 1' 1½" |
| 7 | 2' 7" | 2' 8" | 2' 5" | 2' 4" | 1' 0" | 1' 1¼" |
| 8 | 2' 6" | 2' 7¼" | 2' 4¼" | 2' 3" | 11½" | 1' 1" |
| 9 | 2' 5" | 2' 6¼" | 2' 3⅜" | 2' 2½" | 11¼" | 1' ¾" |
| 10 | 2' 4¼" | 2' 5¼" | 2' 3" | 2' 2" | 11" | 1' ½" |
| 11 | 2' 3½" | 2' 5" | 2' 2¼" | 2' 1" | 10¾" | 1' ¼" |
| 12 | 2' 3" | 2' 4½" | 2' 1½" | 2' 0" | 10½" | 1' 0" |
| 13 | 2' 2½" | 2' 3½" | 2' ½" | 1' 11½" | 10¼" | 11¾" |

### F.M. AERIALS

| Station | A | B | C | E | F |
|---|---|---|---|---|---|
| Wrotham | 5' 1¼" | 5' 6" | 4' 10½" | 1' ¾" | 2' 1" |
| North Hessery Tor | 5' 1" | 5' 4½" | 4' 10¾" | 1' 1" | 2' 1¾" |
| Sutton Coldfield | 5' ¼" | 5' 4½" | 4' 10¾" | 1' 1" | 2' 1¾" |
| Pontop Pike | 5' ¼" | 5' 4¾" | 4' 10¾" | 1' 1" | 2' 1¾" |
| Meldrum | 5' ¼" | 5' 4½" | 4' 10½" | 1' 1" | 2' 1¾" |
| Blaen Plwyf | 5' ¼" | 5' 4¾" | 4' 10½" | 1' 1" | 2' 1¾" |
| Holme Moss | 5' ¼" | 5' 6" | 4' 10" | 1' ¾" | 2' 1" |
| Wenvoe | 4' 11" | 5' 3" | 4' 9¾" | 1' ¾" | 2' 1" |
| Divis | 4' 11" | 5' 3" | 4' 9¾" | 1' ¾" | 2' 1" |
| Norwich | 4' 11" | 5' 3" | 4' 9¾" | 1' ¾" | 2' 1" |
| Rowbridge | 5' ¼" | 5' 4½" | 4' 10¾" | 1' 1" | 2' 1¾" |
| Kirk O'Shotts | 4' 11" | 5' 3" | 4' 9¾" | 1' ¾" | 2' 1" |
| Sandale | 4' 11" | 5' 3" | 4' 9¾" | 1' ¾" | 2' 1" |
| Rosemarie | 5' ¼" | 5' 6" | 4' 10" | 1' ¾" | 2' 1" |
| Llanddona | 5' ¼" | 5' 6" | 4' 10" | 1' ¾" | 2' 1" |
| Llangollen | 5' ¼" | 5' 6" | 4' 10" | 1' ¾" | 2' 1" |

## TELEVISION AERIAL ATTENUATORS.



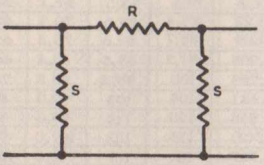

75 ohm Feeder - "T" Section.

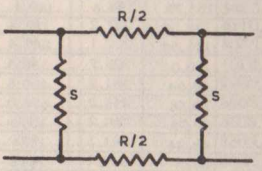
5 db R - 22 ohms. S - 120 ohms.
6 db R - 25 ohms. S - 100 ohms.
7 db R - 29 ohms. S - 84 ohms.
8 db R - 32 ohms. S - 71 ohms.
9 db R - 36 ohms. S - 61 ohms.
10 db R - 38 ohms. S - 56 ohms.
11 db R - 42 ohms. S - 46 ohms.
12 db R - 45 ohms. S - 39 ohms.
13 db R - 48 ohms. S - 35 ohms.
14 db R - 50 ohms. S - 31 ohms.
15 db R - 52 ohms. S - 26 ohms.
16 db R - 54 ohms. S - 22 ohms.
17 db R - 57 ohms. S - 19 ohms.
18 db R - 58 ohms. S - 17 ohms.
19 db R - 59 ohms. S - 16 ohms.
20 db R - 61 ohms. S - 15 ohms.

50 ohm Feeder - "H" Section.

5 db R - 14 ohms. S - 82 ohms.
6 db R - 17 ohms. S - 67 ohms.
7 db R - 19 ohms. S - 59 ohms.
8 db R - 22 ohms. S - 47 ohms.
9 db R - 24 ohms. S - 41 ohms.
10 db R - 26 ohms. S - 35 ohms.
11 db R - 28 ohms. S - 31 ohms.
12 db R - 30 ohms. S - 27 ohms.
13 db R - 32 ohms. S - 24 ohms.
14 db R - 33 ohms. S - 21 ohms.
15 db R - 35 ohms. S - 18 ohms.
16 db R - 37 ohms. S - 16 ohms.
17 db R - 37 ohms. S - 14 ohms.
18 db R - 38 ohms. S - 13 ohms.
19 db R - 38 ohms. S - 11 ohms.
20 db R - 50 ohms. S - 10 ohms.

## $\pi$ SECTIONS.




75 ohm Feeder

25 db R - 664 ohms. S - 83 ohms.
25 db R - 1,195 ohms. S - 80 ohms.
35 db R - 2,100 ohms. S - 78 ohms.
40 db R - 3,750 ohms. S - 76 ohms.
45 db R - 6,670 ohms. S - 76 ohms.
50 db R - 11,850 ohms. S - 75 ohms.
60 db R - 37,500 ohms. S - 75 ohms.

50 ohm Feeder

25 db R - 443 ohms. S - 56 ohms.
30 db R - 790 ohms. S - 53 ohms.
35 db R - 1,400 ohms. S - 52 ohms.
40 db R - 2,500 ohms. S - 51 ohms.
45 db R - 4,500 ohms. S - 50 ohms.

# S.W.G. TABLES.

| S.W.G. | DIA. IN INS. | AREA CIRCULAR MILS. | OHMS PER 1000 YDS. | OHMS PER POUND. (lb). | YARDS PER lb. | lbs. PER 1000 YDS | TURNS PER INCH CLOSE WOUND | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ENAMEL | SINGLE SILK. | DOUBLE SILK. | SINGLE COTTON. |
| 7/0 | .500 | 250000 | .12227 | .000053 | .449 | 2271 | | | | |
| 6/0 | .464 | 215296 | .14202 | .000073 | .511 | 1955 | | | | |
| 5/0 | .432 | 186624 | .16379 | .000096 | .589 | 1695 | | | | |
| 4/0 | .400 | 160000 | .19110 | .000132 | .688 | 1453 | | | | |
| 3/0 | .372 | 138384 | .2209 | .000175 | .797 | 1257 | | | | |
| 2/0 | .348 | 121104 | .2526 | .000229 | .910 | 1100 | | | | |
| 1/0 | .324 | 104976 | .2912 | .000305 | 1.049 | 953 | | | | |
| 1 | .300 | 105000 | .3396 | .000415 | 1.228 | 818 | | | | |
| 2 | .276 | 76176 | .4013 | .000580 | 1.446 | 692 | | | | |
| 3 | .252 | 63504 | .4815 | .000834 | 1.733 | 577 | | | | |
| 4 | .232 | 53824 | .5679 | .001162 | 2.046 | 489 | | | | |
| 5 | .212 | 44944 | .6804 | .001666 | 2.449 | 408 | | | | |
| 6 | .192 | 36864 | .8292 | .002476 | 2.987 | 335 | | | | |
| 7 | .176 | 30976 | .9870 | .003507 | 3.55 | 281 | | | | |
| 8 | .160 | 25600 | 1.194 | .005135 | 4.30 | 232 | | | | |
| 9 | .144 | 20736 | 1.474 | .007827 | 5.31 | 188 | | | | |
| 10 | .128 | 16384 | 1.866 | .012537 | 6.72 | 149 | 7.8 | | | 7.3 |
| 11 | .116 | 13456 | 2.272 | .018587 | 8.18 | 122 | 8.3 | | | 8.1 |
| 12 | .104 | 10816 | 2.826 | .02877 | 10 | 98.2 | 9.3 | | | 8.9 |
| 13 | .092 | 8464 | 3.612 | .04698 | 13 | 76.9 | 10.4 | | | 10.0 |
| 14 | .080 | 6400 | 4.776 | .08216 | 17 | 58.1 | 11.9 | | | 11.4 |
| 15 | .072 | 5184 | 5.897 | .12520 | 21 | 47.1 | 13.2 | | | 12.7 |
| 16 | .064 | 4096 | 6.611 | .2006 | 27 | 37.2 | 14.8 | 14.9 | 14.7 | 14.1 |
| 17 | .056 | 3136 | 9.747 | .3422 | 35 | 28.5 | 16.9 | 16.9 | 16.6 | 15.9 |
| 18 | .048 | 2304 | 13.27 | .6340 | 48 | 20.9 | 19.7 | 20.0 | 19.6 | 18.2 |
| 19 | .04 | 1600 | 19.11 | 1.315 | 69 | 14.5 | 23.5 | 23.8 | 23.3 | 21.3 |
| 20 | .036 | 1296 | 23.59 | 2.004 | 85 | 11.8 | 26.0 | 26.3 | 25.7 | 23.8 |
| 21 | .032 | 1024 | 29.85 | 3.209 | 108 | 9.3 | 29.2 | 29.4 | 28.6 | 26.3 |
| 22 | .028 | 784 | 38.99 | 5.475 | 140 | 7.12 | 33.0 | 33.3 | 32.3 | 29.4 |
| 23 | .024 | 576 | 53.07 | 10.14 | 191 | 5.23 | 38.3 | 38.5 | 37.1 | 34.5 |
| 24 | .022 | 484 | 63.16 | 14.37 | 228 | 4.4 | 42.4 | 42.6 | 40.0 | 37.1 |
| 25 | .020 | 400 | 76.42 | 21.03 | 275 | 3.63 | 46.5 | 46.5 | 43.5 | 40.0 |
| 26 | .018 | 324 | 94.35 | 32.06 | 339 | 2.94 | 51.5 | 51.8 | 48.5 | 43.5 |
| 27 | .0164 | 268.96 | 113.6 | 46.52 | 410 | 2.44 | 56.5 | 56.5 | 52.9 | 46.7 |
| 28 | .0148 | 219.04 | 139.6 | 70.14 | 503 | 1.99 | 62.5 | 62.1 | 57.8 | 50.5 |
| 29 | .0136 | 184.96 | 165.3 | 98.37 | 595 | 1.68 | 67.6 | 67.1 | 62.1 | 53.8 |
| 30 | .0124 | 153.76 | 198.8 | 142.4 | 716 | 1.4 | 74.6 | 73.0 | 67.1 | 57.5 |
| 31 | .0116 | 134.56 | 227.2 | 185.9 | 818 | 1.22 | 79.4 | 77.5 | 70.9 | 60.3 |
| 32 | .0108 | 116.64 | 262.1 | 247.4 | 944 | 1.06 | 85.7 | 82.6 | 75.2 | 63.3 |
| 33 | .010 | 100.0 | 305.7 | 336.5 | 1101 | .908 | 91.7 | 88.5 | 80.1 | 66.7 |
| 34 | .0092 | 84.64 | 361.2 | 469.8 | 1300 | .769 | 100 | 95.2 | 85.5 | 70.4 |
| 35 | .0084 | 70.56 | 433.2 | 676.0 | 1564 | .641 | 109 | 103 | 92.0 | 80.6 |
| 36 | .0076 | 57.76 | 529.2 | 1009 | 1906 | .525 | 120 | 112 | 99.0 | 86.2 |
| 37 | .0068 | 46.24 | 661.1 | 1574 | 2381 | .420 | 135 | 123 | 107.0 | 99.2 |
| 38 | .0060 | 36.0 | 849.1 | 2596 | 3058 | .327 | 151 | 137 | 118.0 | 100.0 |
| 39 | .0052 | 27.04 | 1130 | 4603 | 4070 | .246 | 175 | 154 | 130.0 | 109.0 |
| 40 | .0048 | 23.04 | 1327 | 6340 | 4777 | .209 | 189 | 164 | 137.0 | 114.0 |
| 41 | .0044 | 19.36 | 1579 | 8979 | 5687 | .176 | 208 | 179 | 151.0 | |
| 42 | .004 | 16.0 | 1911 | 13146 | 6880 | .145 | 227 | 192 | 161.0 | |
| 43 | .0036 | 12.96 | 2359 | 20040 | 8493 | .118 | 256 | 208 | 172.0 | |
| 44 | .0032 | 10.24 | 2985 | 32090 | 10753 | .093 | 285 | 227 | 185.0 | |
| 45 | .0028 | 7.84 | 3899 | 54750 | 14040 | .071 | 322 | 250 | 200.0 | |
| 46 | .0024 | 5.76 | 5307 | 101400 | 19113 | .052 | 377 | 278 | 217.0 | |
| 47 | .002 | 4.00 | 7642 | 210300 | 27527 | .036 | 444 | 312 | 238.0 | |
| 48 | .0016 | 2.56 | 11941 | 513500 | 43000 | .023 | | | | |
| 49 | .0012 | 1.44 | 21230 | 1623000 | 76466 | .013 | | | | |
| 50 | .001 | 1.00 | 30570 | 3365000 | 101000 | .009 | | | | |

| T.P.I.C.L.W.D. | TURNS PER SQUARE INCH. | | | | | CURRENT AT 1000. AMPS. PER SQUARE INCH. | SECTIONAL AREA OF WIRE IN SQUARE INCHES. | LENGTH PER OHM OF WIRE IN YARDS. |
|---|---|---|---|---|---|---|---|---|
| DOUBLE COTTON | ENAMEL. | SINGLE SILK. | DOUBLE SILK. | SINGLE COTTON | DOUBLE COTTON | | | |
| | | | | | | 196 | .1963 | 8179 |
| | | | | | | 169 | .1691 | 7042 |
| | | | | | | 147 | .1466 | 6105 |
| | | | | | | 126 | .1257 | 5233 |
| | | | | | | 109 | .1090 | 4531 |
| | | | | | | 95.1 | .0951 | 3961 |
| | | | | | | 82.5 | .0825 | 3434 |
| | | | | | | 70.7 | .0707 | 2945 |
| | | | | | | 59.9 | .0598 | 2491 |
| | | | | | | 49.9 | .0499 | 2077 |
| | | | | | | 42.3 | .0423 | 1761 |
| | | | | | | 35.3 | .0353 | 1469 |
| | | | | | | 28.9 | .0289 | 1206 |
| | | | | | | 24.3 | .0243 | 1013 |
| | | | | | | 20.1 | .0201 | 837 |
| | | | | | | 16.3 | .0163 | 678 |
| 7.1 | 58 | | | | 49 | 12.9 | .0129 | 536 |
| 7.7 | 69 | | | | 59 | 10.6 | .0106 | 440.1 |
| 8.5 | 86 | | | | 72 | 8.50 | .00849 | 354.1 |
| 9.4 | 108 | | | | 89 | 6.65 | .00665 | 276.9 |
| 10.6 | 141 | | | | 113 | 5.03 | .00503 | 209.9 |
| 11.9 | 175 | | | | 141 | 4.07 | .00467 | 169.9 |
| 13.2 | 219 | 216 | 210 | 193 | 169 | 3.22 | .00322 | 151.3 |
| 14.7 | 285 | 279 | 272 | 246 | 216 | 2.46 | .00246 | 102.6 |
| 16.9 | 388 | 392 | 376 | 324 | 285 | 1.81 | .00181 | 75.36 |
| 19.6 | 550 | 552 | 529 | 441 | 384 | 1.26 | .00126 | 52.33 |
| 21.3 | 676 | 676 | 640 | 552 | 451 | 1.02 | .00102 | 42.37 |
| 23.3 | 852 | 847 | 800 | 681 | 540 | .804 | .00080 | 33.51 |
| 25.6 | 1089 | 1089 | 1017 | 846 | 655 | .616 | .00062 | 25.64 |
| 29.4 | 1513 | 1568 | 1350 | 1169 | 860 | .452 | .00045 | 18.85 |
| 31.2 | 1789 | 1800 | 1590 | 1346 | 971 | .380 | .00038 | 15.84 |
| 33.3 | 2070 | 2160 | 1860 | 1568 | 1105 | .314 | .00031 | 13.09 |
| 35.7 | 2650 | 2600 | 2300 | 1850 | 1270 | .255 | .00025 | 10,608 |
| 37.9 | 3190 | 3170 | 2750 | 2100 | 1430 | .211 | .00021 | 8.803 |
| 40.3 | 3900 | 3800 | 3300 | 2500 | 1620 | .172 | .00017 | 7.163 |
| 42.4 | 4550 | 4450 | 3800 | 2800 | 1790 | .145 | .00014 | 6.050 |
| 44.6 | 5550 | 5300 | 4450 | 3250 | 1980 | .121 | .00012 | 5.030 |
| 46.3 | 6300 | 6000 | 5000 | 3550 | 2140 | .106 | .00011 | 4.405 |
| 48.1 | 7300 | 6800 | 5600 | 3950 | 2340 | .092 | .000092 | 3.817 |
| 50.1 | 8400 | 7800 | 6400 | 4350 | 2500 | .078 | .000078 | 3.271 |
| 52.1 | 10000 | 9000 | 7300 | 4850 | 2700 | .066 | .000066 | 2.770 |
| 57.5 | 12000 | 10000 | 8400 | 6400 | 2300 | .055 | .000055 | 2.309 |
| 60.2 | 14500 | 12500 | 9750 | 7370 | 3600 | .045 | .000045 | 1.890 |
| 63.3 | 18200 | 15000 | 11000 | 9650 | 4000 | .036 | .000036 | 1.513 |
| 66.7 | 22900 | 18500 | 13500 | 9900 | 4400 | .028 | .000028 | 1.178 |
| 70.4 | 30600 | 23500 | 16500 | 11500 | 4900 | .021 | .000021 | .885 |
| 72.5 | 35600 | 26500 | 18500 | 12600 | 5200 | .018 | .000018 | .750 |
| | 43000 | 32000 | 22000 | | | .015 | .000015 | .633 |
| | 51000 | 36500 | 25500 | | | .012 | .000012 | .520 |
| | 65000 | 43000 | 29000 | | | .010 | .00001 | .424 |
| | 81000 | 51200 | 34000 | | | .008 | | .336 |
| | 104000 | 62000 | 39500 | | | .0061 | | .256 |
| | 142000 | 72000 | 46500 | | | .0045 | | .188 |
| | 197000 | 97000 | 56000 | | | .0031 | | .131 |
| | | | | | | .0021 | | .048 |
| | | | | | | .0011 | | .047 |
| | | | | | | .0007 | | .033 |

COMPARISON BETWEEN

## BRITISH & U.S.A. WIRE GAUGES.

DIAMETERS IN INCHES.

| SIZE | S.W.G. | B.W.G. | B. & S. |
|---|---|---|---|
| 4/0 | .400 | .454 | .460 |
| 3/0 | .372 | .425 | .4096 |
| 2/0 | .348 | .380 | .3648 |
| 0 | .324 | .340 | .3249 |
| 1 | .300 | .300 | .2893 |
| 2 | .276 | .284 | .2576 |
| 3 | .252 | .259 | .2294 |
| 4 | .232 | .238 | .2043 |
| 5 | .212 | .220 | .1819 |
| 6 | .192 | .203 | .1620 |
| 7 | .176 | .180 | .1443 |
| 8 | .160 | .165 | .1285 |
| 9 | .144 | .148 | .1144 |
| 10 | .128 | .134 | .1019 |
| 11 | .116 | .120 | .0907 |
| 12 | .104 | .109 | .0808 |
| 13 | .092 | .095 | .072 |
| 14 | .080 | .083 | .0641 |
| 15 | .072 | .072 | .0571 |
| 16 | .064 | .065 | .0508 |
| 17 | .056 | .058 | .0453 |
| 18 | .048 | .049 | .0403 |
| 19 | .040 | .042 | .0359 |
| 20 | .036 | .035 | .032 |
| 21 | .032 | .032 | .0285 |
| 22 | .028 | .028 | .0253 |
| 23 | .024 | .025 | .0226 |
| 24 | .022 | .022 | .0201 |
| 25 | .020 | .020 | .0179 |
| 26 | .018 | .018 | .0159 |
| 27 | .0164 | .016 | .0142 |
| 28 | .0148 | .014 | .0126 |
| 29 | .0136 | .013 | .0113 |
| 30 | .0124 | .012 | .0100 |
| 31 | .0116 | .010 | .0089 |
| 33 | .010 | .008 | .0071 |
| 34 | .0092 | .007 | .0063 |
| 35 | .0084 | .005 | .0056 |
| 36 | .0076 | .004 | .005 |
| 37 | .0068 | - | .0045 |
| 38 | .006 | - | .004 |
| 39 | .0052 | - | .0035 |
| 40 | .0048 | - | .0031 |
| 41 | .0044 | - | .0028 |
| 42 | .0040 | - | .0025 |
| 43 | .0036 | - | .0022 |
| 44 | .0032 | - | .002 |
| 45 | .0028 | - | .0018 |
| 46 | .0024 | - | - |
| 47 | .002 | - | - |
| 48 | .0016 | - | - |
| 49 | .0012 | - | - |
| 50 | .001 | - | - |

# RESISTANCE WIRE DATA

| S. W. G. | NICKEL SILVER WIRE | | | | MANGANIN WIRE | | | | PLATINOID WIRE | | | | DIA. IN INCHES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RESISTANCE | | AMPERAGE REQUIRED FOR TEMPERATURE RISE OF | | RESISTANCE | | AMPERAGE REQUIRED FOR TEMPERATURE RISE OF | | RESISTANCE | | AMPERAGE REQUIRED FOR TEMPERATURE RISE OF | | |
| | OHMS PER 1000. FT. APPROX. | OHMS PER OUNCE APPROX. | 200°C. | 100°C. | OHMS PER 1000. FT. APPROX. | OHMS PER OUNCE APPROX. | 200°C. | 100°C. | OHMS PER 1000. FT. APPROX. | OHMS PER OUNCE APPROX. | 200°C. | 100°C. | |
| 8 | — | — | — | — | 9.6 | .008 | 61 | 39 | 9.5 | .008 | — | — | .160 |
| 10 | — | — | — | — | 15.0 | .018 | 39 | 27 | 14.9 | .018 | — | — | .180 |
| 12 | — | — | — | — | 22.7 | .042 | 28 | 21 | 22.7 | .042 | — | — | .104 |
| 14 | — | — | — | — | 38.3 | .12 | 17.5 | 11.7 | 38.4 | .12 | — | — | .080 |
| 16 | 34 | .17 | 14.2 | 8.1 | 59.6 | .30 | 10.1 | 7.2 | 59.7 | .31 | — | — | .064 |
| 18 | 59 | .53 | 9.4 | 6.1 | 107 | .95 | 7.6 | 5.1 | 108 | .95 | — | — | .048 |
| 20 | 109 | 1.7 | 6.3 | 4.1 | 190 | 2.9 | 5.1 | 3.6 | 189 | 2.9 | — | — | .036 |
| 21 | — | — | — | — | 241 | 4.9 | — | — | — | — | — | — | .032 |
| 22 | 180 | 5.04 | 4.2 | 3.1 | 315 | 8.8 | 3.8 | 2.6 | 316 | 8.7 | — | — | .028 |
| 23 | — | — | — | — | 428 | 15 | — | — | — | — | — | — | .024 |
| 24 | 292 | 12.25 | — | — | 510 | 21 | — | — | 509 | 22 | — | — | .022 |
| 25 | — | — | — | — | 617 | 32 | — | — | — | — | — | — | .020 |
| 26 | 437 | 27.56 | — | — | 763 | 48 | — | — | 764 | 48 | — | — | .018 |
| 27 | — | — | — | — | 918 | 70 | — | — | — | — | — | — | .0164 |
| 28 | 669 | 64.37 | — | — | 1166 | 112 | — | — | 1165 | 112 | — | — | .0148 |
| 30 | 917 | 121 | — | — | 1600 | 211 | — | — | 1601 | 212 | — | — | .0124 |
| 32 | — | — | — | — | 2105 | 367 | — | — | 2104 | 367 | — | — | .0108 |
| 34 | — | — | — | — | 2935 | 704 | — | — | 2933 | 705 | — | — | .0092 |
| 36 | — | — | — | — | 4303 | 1520 | — | — | 4305 | 1520 | — | — | .0076 |
| 38 | — | — | — | — | 6918 | 3900 | — | — | 6917 | 3901 | — | — | .006 |
| 40 | — | — | — | — | 10762 | 9530 | — | — | 10764 | 9531 | — | — | .0048 |
| 42 | — | — | — | — | 15413 | 19500 | — | — | 15416 | 19500 | — | — | .004 |
| 44 | — | — | — | — | 24083 | 48000 | — | — | 24087 | 48000 | — | — | .0032 |
| 46 | — | — | — | — | 42816 | 152000 | — | — | 48819 | 152000 | — | — | .0024 |

## EUREKA RESISTANCE WIRE.

CURRENT NECESSARY TO MAINTAIN GIVEN TEMPERATURE RISE, WIRE HELD STRAIGHT AND HORIZONTAL IN AIR WITH FREE RADIATION.

| SIZE S.W.G. | DIAM. INCH. | M/m. | AMPERES FOR A TEMPERATURE RISE OF | | | RESISTANCE PER 1000. YDS. AT 15·5°C. OHMS. | WEIGHT PER 1000 YDS. lbs. |
|---|---|---|---|---|---|---|---|
| | | | 100°C. | 200° C. | 300° C. | | |
| 8 | .160 | 4.06 | 29.0 | 44.5 | 57.9 | 34.5 | 233.5 |
| 9 | .144 | 3.65 | 24.0 | 37.2 | 48.7 | 42.6 | 189.0 |
| 10 | .128 | 3.25 | 20.1 | 30.8 | 40.0 | 54.0 | 149.2 |
| 11 | .116 | 2.94 | 18.5 | 28.1 | 36.4 | 65.7 | 122.8 |
| 12 | .104 | 2.64 | 14.8 | 22.4 | 29.0 | 81.8 | 98.6 |
| 13 | .092 | 2.33 | 12.6 | 18.8 | 24.5 | 104.4 | 77.1 |
| 14 | .080 | 2.03 | 10.5 | 15.5 | 20.1 | 138.1 | 58.4 |
| 15 | .072 | 1.82 | 9.3 | 13.4 | 17.4 | 170.6 | 47.3 |
| 16 | .064 | 1.62 | 8.1 | 11.5 | 15.1 | 215.9 | 37.4 |
| 17 | .056 | 1.42 | 7.0 | 9.8 | 13.0 | 281.9 | 28.6 |
| 18 | .048 | 1.21 | 5.75 | 8.2 | 11.0 | 384 | 21.0 |
| 19 | .040 | 1.01 | 4.6 | 6.7 | 9.2 | 552 | 14.6 |
| 20 | .036 | .91 | 4.1 | 6.0 | 8.3 | 682 | 11.8 |
| 21 | .032 | .81 | 3.6 | 5.4 | 7.4 | 864 | 9.35 |
| 22 | .028 | .71 | 3.1 | 4.6 | 6.5 | 1128 | 7.15 |
| 23 | .024 | .60 | 2.7 | 4.00 | 5.5 | 1535 | 5.24 |
| 24 | .022 | .55 | 2.4 | 3.55 | 5.0 | 1826 | 4.41 |
| 25 | .020 | .50 | 2.18 | 3.20 | 4.06 | 2211 | 3.64 |
| 26 | .018 | .45 | 2.00 | 2.90 | 3.60 | 2729 | 2.96 |
| 27 | .0104 | .41 | 1.82 | 2.68 | 3.21 | 3288 | 2.46 |
| 28 | .0148 | .37 | 1.66 | 2.42 | 2.85 | 4205 | 2.00 |
| 29 | .0136 | .34 | 1.54 | 2.22 | 2.58 | 4781 | 1.69 |
| 30 | .0124 | .31 | 1.40 | 2.00 | 2.30 | 5750 | 1.40 |
| 31 | .0116 | .29 | 1.30 | 1.81 | 2.13 | 6570 | 1.23 |
| 32 | .0108 | .27 | 1.20 | 1.64 | 1.94 | 7581 | 1.06 |
| 33 | .0100 | .25 | 1.08 | 1.46 | 1.77 | 8842 | .912 |
| 34 | .0092 | .23 | .98 | 1.30 | 1.60 | 10440 | .771 |
| 35 | .0084 | .21 | .85 | 1.13 | 1.42 | 12530 | .644 |
| 36 | .0076 | .19 | .75 | .98 | 1.26 | 15310 | .526 |
| 37 | .0068 | .17 | .66 | .83 | 1.09 | 19130 | .421 |
| 38 | .0060 | .15 | .58 | .70 | .93 | 24550 | .328 |
| 39 | .0052 | .13 | .50 | .58 | .78 | 32700 | .246 |
| 40 | .0048 | .12 | .46 | .52 | .70 | 38380 | .210 |
| 41 | .0044 | .11 | | | | 45678 | .176 |
| 42 | .0040 | .10 | | | | 55260 | .146 |
| 43 | .0036 | .09 | | | | 68070 | .118 |
| 44 | .0032 | .08 | | | | 86370 | .093 |
| 45 | .0028 | .07 | | | | 112800 | .072 |
| 46 | .0024 | .06 | | | | 153500 | .053 |
| 47 | .0020 | .05 | | | | 221000 | .036 |
| 48 | .0016 | .040 | | | | 345400 | .023 |
| 49 | .0012 | .030 | | | | 614000 | .013 |
| 50 | .0010 | .025 | | | | 884200 | .009 |

The resistance values given above are standard and are subject to the tolerance given in B.S.I. specification No. 115 of 1938.

Approximate Characteristics.

| | |
|---|---|
| Temperature Co-efficient | 0.000014 |
| Specific resistance | 49 microhms per cm. cube |
| Comparative resistance Copper-Unity | 28 |
| Specific Gravity | 8.92 |
| Thermo E.M.F. against Copper ( 20° to 200° C) | 0.5 millivolts per °C. |
| Melting point | 1,250° C |
| Tensile strength | 36 tons per square inch. |

## PROPERTIES AND CHARACTERISTICS OF RESISTANCE MATERIALS

| MATERIALS. | RESISTANCE RELATIVE TO COPPER. | RESISTANCE IN OHMS PER CIRCULAR MIL—FOOT. | TEMPERATURE COEFFICIENT OF RESISTIVITY PER °C. | RESISTANCE IN MICROHMS PER CUBIC CENTIMETRE. | RESISTANCE IN OHMS PER SQUARE MIL — FOOT. | RESISTANCE IN MICROHMS PER CUBIC INCH. |
|---|---|---|---|---|---|---|
| Kromore | 52.2 | 542.0 | +.0002 | 90.2 | 426.0 | 35.46 |
| Copper | 1.0 | 10.3 | +.0039 | 1.724 | 8.0 | 0.68 |
| Steel | 6.4 | 67.4 | +.0043 | 11.2 | 53.0 | 4.41 |
| Aluminium | 1.7 | 16.9 | +.0038 | 2.82 | 13.0 | 1.11 |
| Pure Iron | 5.8 | 60.2 | +.005 | 10.0 | 47.0 | 3.94 |
| Silver | 0.9 | 9.5 | +.0037 | 1.59 | 7.5 | 0.63 |
| Gold | 1.3 | 14.6 | +.0035 | 2.43 | 11.0 | 0.94 |
| Platinum | 5.8 | 60.2 | +.0031 | 10.0 | 47.0 | 3.94 |
| Tin | 6.6 | 67.5 | +.0043 | 11.4 | 54.0 | 4.49 |
| Zinc | 3.3 | 33.8 | +.0036 | 5.7 | 27.0 | 2.25 |
| Lead | 12.7 | 133.0 | +.0039 | 21.9 | 104.0 | 8.63 |
| Nickel | 6.0 | 61.4 | +.0059 | 10.2 | 48.0 | 4.02 |
| Advance | 28.4 | 295.0 | +.000014 | 49.0 | 232.0 | 19.31 |
| Eureka | 28.4 | 295.0 | +.000014 | 49.0 | 232.0 | 19.31 |
| Glowray | 58.0 | 602.0 | +.00001 | 100.0 | 473.0 | 39.4 |
| Climax | 50.4 | 524.0 | +.00069 | 87.0 | 412.0 | 34.28 |
| Constantan | 28.4 | 295.0 | +.000014 | 49.0 | 232.0 | 19.31 |
| Excello | 52.8 | 547.0 | +.00017 | 91.0 | 430.0 | 35.86 |
| Ideal | 28.0 | 295.0 | +.000014 | 49.0 | 232.0 | 19.31 |
| Manganin | 25.5 | 265.0 | +.000014 | 44.0 | 208.0 | 17.33 |
| Platinoid | 24.3 | 253.0 | +.0003 | 42.0 | 199.0 | 16.55 |
| Ia - Ia | 29.6 | 307.0 | -.000024 | 51.0 | 241.0 | 20.1 |
| Tungsten | 3.3 | 33.8 | +.0044 | 5.7 | 27.0 | 2.25 |
| Monel | 24.3 | 253.0 | +.0021 | 42.0 | 199.0 | 16.55 |
| Alumel | 19.1 | 199.0 | +.0011 | 33.0 | 156.0 | 13.10 |
| Chromel | 44.0 | 458.0 | +.00007 | 76.0 | 360.0 | 29.94 |
| Copel | 28.4 | 295.0 | +.000001 | 49.0 | 232.0 | 19.31 |
| Carbon | 2030.0 | 21070.0 | -.0005 | 3500.0 | 16555.0 | 1379.0 |
| Brightray | 58.0 | 602.0 | +.00019 | 100.0 | 473.0 | 39.4 |
| Dullray | 50.4 | 525.0 | +.0007 | 87.0 | 412.0 | 29.94 |
| Cupro | 15.0 | 157.0 | +.0003 | 26.0 | 123.0 | 10.24 |
| No-Mag. | 81.8 | 848.0 | +.00091 | 141.0 | 667.0 | 55.55 |
| Nicrome 5% | 52.8 | 547.0 | +.00105 | 91.0 | 430.0 | 35.86 |
| Nicrome 15% | 63.8 | 662.0 | +.0002 | 110.0 | 520.0 | 43.34 |
| " 80%20% | 63.2 | 656.0 | +.0001 | 109.0 | 515.0 | 42.95 |
| Corronil | 29.0 | 301.0 | +.00065 | 50.0 | 236.0 | 19.7 |
| Redray | 53.9 | 559.0 | +.00026 | 93.0 | 440.0 | 36.65 |
| Mangonic | 8.6 | 90.2 | +.0035 | 14.95 | 74.0 | 5.87 |
| B.B. | 23.2 | 241.0 | +.00021 | 40.0 | 189.0 | 15.76 |
| Ferry | 27.8 | 289.0 | +.00002 | 48.0 | 277.0 | 18.91 |
| Zodiac | 20.9 | 217.0 | +.00023 | 36.0 | 170.0 | 14.19 |
| Tarnac | 22.6 | 235.0 | +.000017 | 39.0 | 184.0 | 15.36 |
| Ferrozoid | 48.8 | 506.0 | +.00076 | 84.0 | 398.0 | 33.09 |
| Cromaloy 2 | 63.8 | 662.0 | +.00013 | 110.0 | 520.0 | 43.34 |
| Cromaloy 3 | 53.9 | 559.0 | +.00013 | 93.0 | 440.0 | 36.65 |
| Cromaloy 4 | 58.0 | 602.0 | +.00008 | 100.0 | 473.0 | 39.4 |
| Nickel-Silver 1 | 18.0 | 187.0 | +.00027 | 31.0 | 147.0 | 12.22 |
| " " 4 | 12.2 | 127.0 | +.00047 | 21.0 | 100.0 | 8.28 |
| Platinum Iridium | 18.0 | 187.0 | +.00082 | 31.0 | 147.0 | 12.22 |
| Platinum Silver | 18.2 | 190.0 | +.00028 | 31.4 | 148.0 | 12.38 |

## ELECTRICAL CABLE SIZES.

| NOMINAL AREA SQ. INCH. | OLD STANDARD No. S.W.G. | NEW STANDARD No. PER INCH | DIA. IN INCHES | WEIGHT PER 1000 YDS. IN lbs. | MAXIMUM RESISTANCE PER 1000 YDS IN OHMS. | LENGTH OF CIRCUIT PER VOLT DROP in FT | CAPACITY OF SINGLE CABLES IN AMPS |
|---|---|---|---|---|---|---|---|
| .001 | 1/20 | 1/.036 | 0.036 | 11.76 | 24.29 | 30 | 4.1 |
| .0015 | – | 1/.044 | 0.044 | 17.58 | 16.26 | 30 | 6.1 |
| .002 | – | 3/.029 | 0.062 | 23.37 | 12.61 | 30 | 7.8 |
| .003 | 3/20 | 3/.036 | 0.078 | 36.02 | 8.180 | 29 | 12.0 |
| .003 | 1/16 | 1/.064 | 0.064 | 37.20 | 7.688 | 29 | 12.9 |
| .0045 | – | 7/.029 | 0.087 | 54.39 | 5.387 | 26 | 18.2 |
| .007 | 7/20 | 7/.036 | 0.108 | 83.81 | 3.496 | 33 | 24.0 |
| .01 | – | 7/.044 | 0.132 | 125.4 | 2.340 | 39 | 31.0 |
| .0145 | – | 7/.052 | 0.156 | 174.9 | 1.676 | 45 | 37.0 |
| .0225 | 7/16 | 7/.064 | 0.192 | 264.9 | 1.106 | 56 | 46.0 |
| .03 | – | 19/.044 | 0.220 | 340.4 | 0.8637 | 61 | 53.0 |
| .04 | 19/17 | 19/.052 | 0.260 | 475.5 | 0.6184 | 71 | 64.0 |
| .06 | 19/16 | 19/.064 | 0.320 | 720.3 | 0.4085 | 83 | 83.0 |
| .075 | 19/15 | 19/.072 | – | 911.6 | 0.3225 | 90 | 97.0 |
| .10 | – | 19/.083 | 0.415 | 1212.0 | 0.2427 | 98 | 119.0 |
| .12 | 37/16 | 37/.064 | – | 1403.0 | 0.2097 | 104 | 130.0 |
| .15 | 37/15 | 37/.072 | 0.504 | 1776.0 | 0.1657 | 112 | 152.0 |
| .20 | – | 37/.083 | 0.581 | 2360.0 | 0.1247 | 123 | 185.0 |
| .25 | – | 37/.093 | – | 2963.0 | 0.09933 | 132 | 214.0 |
| .30 | – | 37/.103 | 0.721 | 3635.0 | 0.08089 | 145 | 240.0 |
| .40 | – | 61/.093 | 0.837 | 4886.0 | 0.06026 | 162 | 288.0 |
| .50 | – | 61/.103 | 0.927 | 5994.0 | 0.04913 | 173 | 332.0 |
| .60 | – | 91/.093 | – | 7290.0 | 0.04040 | 181 | 384.0 |
| .75 | – | 91/.103 | 1.133 | 8942.0 | 0.03294 | 185 | 463.0 |
| .85 | – | 127/.093 | – | 10175.0 | 0.02895 | 190 | 512.0 |
| 1.00 | – | 127/.103 | 1.339 | 12481.0 | 0.02360 | 200 | 595.0. |

## RADIO SOLDER COMPOSITION AND MELTING POINTS.

| COMPOSITION. | PERCENTAGE. | MELTING AT °F | COMPOSITION. | PERCENTAGE. | MELTING AT °F |
|---|---|---|---|---|---|
| Lead | 100 | 452 | Lead | 40 | 462 |
| Tin | – | | Tin | 60 | |
| Lead | 90 | 441 | Lead | 30 | 494 |
| Tin | 10 | | Tin | 70 | |
| Lead | 80 | 381 | Lead | 20 | 551 |
| Tin | 20 | | Tin | 80 | |
| Lead | 70 | 366 | Lead | 10 | 568 |
| Tin | 30 | | Tin | 90 | |
| Lead | 60 | 373 | Lead | – | 617 |
| Tin | 40 | | Tin | 100 | |
| Lead | 50 | 411 | | | |
| Tin | 50 | | | | |

## FLEXIBLE CORDS.

| SIZE | AREA IN SQ. INCH. | CURRENT RATING. IN AMPS. | RESISTANCE PER 1000. YDS. SINGLE CORE..... | MAXIMUM WEIGHT IN lbs. | YARDS PER POUND WEIGHT FOR TWIN SILK. (TWISTED) |
|---|---|---|---|---|---|
| 14/.0076 | .0006 | 2 | 39.7 | 3 | 17.6 |
| 23/.0076 | .0010 | 3 | 24.2 | 5 | 13.3 |
| 40/.0076 | .0017 | 5 | 13.8 | 10 | 9.75 |
| 70/.0076 | .0030 | 10 | 7.94 | 10 | 6.55 |
| 110/.0076 | .0048 | 15 | 5.05 | 10 | 4.66 |
| 162/.0076 | .0070 | 20 | 3.43 | 10 | 3.33 |

## MAXIMUM CURRENT RATING OF CABLES.

| SIZE | RATING IN AMPERES. A.C. & VOLTAGE DROP PER 100 FT. CORE IN ONE SHEATH. UP TO 4 | | UP TO 8 | | SIZE | RATING IN AMPERES A.C. & VOLTAGE DROP PER 100 FT. CORE IN ONE SHEATH. UP TO 2 | | UP TO 4 | |
|---|---|---|---|---|---|---|---|---|---|
| | AMPS. | VOLTS. | AMPS. | VOLTS. | | AMPS. | VOLTS. | AMPS. | VOLTS. |
| 1/.044 | 5 | 2.8 | 5 | 2.8 | 19/.052 | 78 | 1.75 | 62 | 1.4 |
| 3/.029 | 5 | 2.1 | 5 | 2.1 | 19/.064 | 102 | 1.55 | 82 | 1.19 |
| 3/.036 | 10 | 2.8 | 8 | 2.4 | 19/.083 | 147 | 1.35 | 119 | 1.04 |
| 7/.029 | 15 | 2.9 | 12 | 2.4 | 37/.072 | 190 | 1.28 | 151 | 0.98 |
| | UP TO 2 | | UP TO 4 | | 37/.083 | 229 | 1.26 | 183 | 0.98 |
| | | | | | 37/.103 | 298 | 1.28 | 238 | 0.98 |
| 7/.036 | 29 | 3.4 | 23 | 2.9 | 61/.093 | 358 | 1.38 | 286 | 1.04 |
| 7/.044 | 38 | 3.1 | 30 | 2.4 | 61/.103 | 413 | 1.50 | 330 | 1.15 |
| 7/.052 | 45 | 2.7 | 36 | 2.2 | 91/.103 | 530 | 1.80 | - | - |
| 7/.064 | 56 | 2.1 | 46 | 1.75 | 127/.103 | 648 | 2.10 | - | - |
| 19/.044 | 65 | 2.0 | 52 | 1.6 | | | | | |

## CAPACITY OF FUSES IN AMPERES.

| FUSE RATING IN AMPS. | TINNED COPPER WIRE | | STANDARD ALLOY WIRE | | FUSE RATING IN AMPS. | TINNED COPPER WIRE | | STANDARD ALLOY WIRE | |
|---|---|---|---|---|---|---|---|---|---|
| | DIA. | S.W.G. | DIA. | S.W.G. | | DIA. | S.W.G. | DIA. | S.W.G. |
| 1.8 | - | - | .0164 | 27 | 30 | .032 | 21 | - | - |
| 3 | .006 | 38 | .024 | 23 | 37 | .04 | 19 | - | - |
| 5 | .0084 | 35 | .032 | 21 | 46 | .048 | 18 | - | - |
| 8.5 | .0124 | 30 | - | - | 53 | .048 | 18 | - | - |
| 10 | .0136 | 29 | - | - | 60 | .056 | 17 | - | - |
| 15 | .02 | 25 | - | - | 64 | .056 | 17 | - | - |
| 17 | .022 | 24 | - | - | 83 | .072 | 15 | - | - |
| 20 | .024 | 23 | - | - | 100 | .08 | 14 | - | - |
| 24 | .028 | 22 | - | - | | | | | |

## FUSE WIRE TABLES.

FIGURES ARE APPROXIMATE AND FOR COMMERCIAL USE ONLY.

| FUSING CURRENT IN AMPERES | DIAMETER IN INCHES. COPPER | ALUMINIUM | TIN | ALLO—TIN. | LEAD. |
|---|---|---|---|---|---|
| 1 | .0020 | .0028 | .0076 | .0084 | .0084 |
| 2 | .0036 | .0040 | .0116 | .0136 | .0124 |
| 3 | .0044 | .0052 | .0148 | .018 | .0164 |
| 4 | .0052 | .0068 | .018 | .022 | .020 |
| 5 | .0060 | .0076 | .022 | .024 | .024 |
| 10 | .0100 | .0124 | .036 | .040 | .036 |
| 15 | .0124 | .0164 | .044 | .048 | .048 |
| 20 | .0156 | .0180 | .052 | .064 | .060 |
| 25 | .018 | .0220 | .064 | .072 | .072 |
| 30 | .020 | .024 | .072 | .080 | .078 |
| 35 | .023 | .028 | .076 | .092 | .084 |
| 40 | .024 | .030 | .084 | .096 | .096 |
| 45 | .026 | .032 | .092 | .104 | .104 |
| 50 | .028 | .036 | .096 | .116 | .108 |
| 60 | .032 | .040 | .110 | .128 | .124 |
| 70 | .036 | .044 | .122 | .144 | .136 |
| 80 | .040 | .048 | .134 | .160 | .150 |
| 90 | .044 | .052 | .144 | .168 | .162 |
| 100 | .048 | .056 | .152 | .180 | .174 |
| 120 | .052 | .064 | .176 | .202 | .196 |

## SYMBOLS & ABBREVIATIONS.

NORMALLY IN COMMON USE IN RADIO AND ELECTRICAL FORMULAE.

| REF NO. | SYMBOLS. | REF NO. | SYMBOLS. | REF NO. | SYMBOLS. | REF NO. | SYMBOLS. | REF NO. | SYMBOLS. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | 23 | D.A.V.C. | 45 | H | 66 | M. I. | 88 | T OR t |
| 2 | Ae. | 24 | db. | 46 | h | 67 | Mic. | 89 | T.R.F. |
| 3 | A.C. | 25 | D.C. | 47 | H F. | 68 | N | 90 | U.P.f. |
| 4 | A F. | 26 | D.C.C. | 48 | H.P. | 69 | O.L. | 91 | V |
| 5 | A.F.C. | 27 | D.F. | 49 | H T. | 70 | P | 92 | VA. |
| 6 | A.G.C. | 28 | D.h. | 50 | I | 71 | p.f. | 93 | $V_a$. |
| 7 | A M. | 29 | D.P.D.T. | 51 | i | 72 | P.M. | 94 | V.H.F. |
| 8 | A.T.C. | 30 | D.P.S.T. | 52 | I F. | 73 | Pot. | 95 | W |
| 9 | A.T. I. | 31 | D.S.C. | 53 | $I_a$. | 74 | P.V. | 96 | X |
| 10 | A.V.C. | 32 | E | 54 | I.h. | 75 | P.U. | 97 | $X_L$ |
| 11 | A.V.E. | 33 | E | 55 | J | 76 | Q | 98 | $X_C$. |
| 12 | B | 34 | F | 56 | K | 77 | R | 99 | $Y=\frac{1}{Z}$ |
| 13 | B.A. | 35 | f | 57 | L | 78 | $R_a$. | 100 | Z |
| 14 | B.F.O. | 36 | FM. | 58 | L F. | 79 | $R_d=\frac{L}{CR}$ | 101 | $\lambda$ |
| 15 | B.O.T. | 37 | G B. | 59 | L.S. | 80 | R F. | 102 | $\mu$ |
| 16 | B. S. | 38 | G. C. | 60 | L T. | 81 | $R_L$. | 103 | $\mu_o$. |
| 17 | $b=\frac{1}{X}$ | 39 | G.L. | 61 | M | 82 | $R_K$. | 104 | $\Omega$ |
| 18 | C | 40 | $g=\frac{1}{R}$ | 62 | M | 83 | R.M.S. | 105 | $\pi$ |
| 19 | cm. | 41 | $g_m$. | 63 | mm. | 84 | S | 106 | $\Phi$ |
| 20 | C.P. | 42 | G.I. | 64 | mA. | 85 | S.R. OR $\rho$ | 107 | $\phi$ OR $\Theta$ |
| 21 | C.R.T. | 43 | G.2. | 65 | M.C. | 86 | S.C.C. | 108 | $\omega$ |
| 22 | D | 44 | G.3. | | | 87 | S.W.G. | 109 | $\sigma$ |

1 Anode
2 Aerial
3 Alternating current
4 Audio frequency
5 Automatic frequency control
6 Automatic gain control
7 Amplitude Modulation
8 Aerial tuning condenser
9 Aerial tuning inductance
10 Automatic volume control
11 Automatic volume expansion
12 Magnetic flux density
13 British Association
14 Beat frequency oscillator
15 Board of Trade unit in Watt hour or Kilo Watt Hour.
16 British standards
17 Susceptance
18 Capacity
19 Centimetre
20 Candle power
21 Cathode Ray tube
22 Electrostatic flux density
23 Delayed A.V.C.
24 Decibel
25 Direct current
26 Double cotton covered
27 Direction finder
28 Directly heated
29 Double pole double throw
30 Double pole single throw
31 Double silk covered
32 Electromotive force (E.M.F.)
33 Earth
34 Filament
35 Frequency
36 Frequency modulation
37 Grid battery or Grid bias
38 Grid condenser
39 Grid leak
40 Conductance
41 Mutual conductance of valve
42 Control grid (grid one)
43 Screen grid (grid two)
44 Suppressor grid (grid three)
45 Magneto-Motive-Force (M.M.F.)
46 Heater
47 High Frequency
48 Horse Power
49 High tension (volts)
50 Current (r.m.s. value)
51 Instantaneous current
52 Intermediate frequency
53 Anode current
54 Indirectly heated
55 Joule
56 Specific inductive capacity or dielectric constant
57 Self inductance
58 Low frequency
59 Loudspeaker
60 Low tension (volts)
61 Mutual inductance
62 Metallising
63 Millimetre
64 Milliampere
65 Moving coil
66 Moving Iron
67 Microphone.
68 Negative
69 Output load
70 Power in watts or Positive
71 Power factor
72 Permanent Magnet
73 Potentiometer
74 Power valve
75 Pick-up
76 Quantity of electricity or charge
77 Resistance
78 Anode Resistance of Valve
79 Dynamic resistance of tuned circuit
80 Radio frequency
81 Load resistance
82 Cathode resistance
83 Root-mean-square value
84 Magnetic reluctance
85 Specific resistance
86 Single cotton cover
87 Standard Wire gauge
88 Time
89 Tuned radio frequency
90 Unity power factor
91 Potential difference (r.m.s. value)
92 Volt-ampere
93 Anode voltage
94 Very high frequency
95 Energy
96 Reactance
97 Inductive reactance
98 Capacitive reactance
99 Admittance
100 Impedance
101 Wavelength
102 Valve amplification factor
103 Magnetic Permeability of free space
104 Ohm
105 Ratio of Circumference to Diameter of Circle 3.14 (approx).
106 Magnetic flux
107 Phase angle
108 Angular frequency
109 Conductivity

# ABBREVIATIONS FOR C.W. WORK

| | |
|---|---|
| AA | All after |
| AB | All before |
| ABT | About |
| ADR | Address |
| AGN | Again |
| ANT | Antenna |
| BCI | Broadcast Interference |
| BCL | Broadcast listener |
| BK | Break; break me; break in |
| BN | All between; been |
| B4 | Before |
| C | Yes |
| CFM | Confirm; I confirm |
| CK | Check |
| CL | I am closing my station; call |
| CLD-CLG | Called; calling |
| CUD | Could |
| CUL | See you later |
| CUM | Come |
| CW | Continuous wave |
| DLD-DLVD | Delivered |
| DX | Distance |
| ECO | Electron-coupled oscillator |
| FB | Fine business; excellent |
| GA | Go ahead (or resume sending) |
| GB | Good-bye |
| GBA | Give better address |
| GE | Good evening |
| GG | Going |
| GM | Good morning |
| GN | Good night |
| GND | Ground |
| GUD | Good |
| HI | The telegraphic laugh; high |
| HR | Here; hear |
| HV | Have |
| HW | How |
| LID | A poor operator |
| MILS | Milliamperes |
| MSG | Message; prefix to cable |
| N | No |
| ND | Nothing doing |
| NIL | Nothing; I have nothing for you |
| NR | Number |
| NW | Now; I resume transmission |

## ABBREVIATIONS FOR C.W. WORK.

| | |
|---|---|
| OB | Old boy |
| OM | Old man |
| OP-OPR | Operator |
| OSC | Oscillator |
| OT | Old timer; old top |
| PBL | Preamble |
| PSE-PLS | Please |
| PWR | Power |
| PX | Press |
| R | Received as transmitted; are |
| RAC | Rectified alternating current |
| RCD | Received |
| REF | Refer to; referring to; reference |
| RPT | Repeat; I repeat |
| SED | Said |
| SEZ | Says |
| SIG | Signature; signal |
| SINE | Operator's personal initials or nickname |
| SKED | Schedule |
| SRI | Sorry |
| SVC | Service; prefix to service message |
| TFC | Traffic |
| TMW | Tomorrow |
| TNX-TKS | Thanks |
| TT | That |
| TU | Thank you |
| TVI | Television interference |
| TVL | Television listener |
| TXT | Text |
| UR-URS | Your; you're; yours |
| VFO | Variable frequency oscillator |
| VY | Very |
| WA | Word after |
| WB | Word before |
| WD-WDS | Word; words |
| WKD-WKG | Worked; working |
| WL | Well; will |
| WUD | Would |
| WX | Weather |
| XMTR | Transmitter |
| XTAL | Crystal |
| YF (XYL) | Wife |
| YL | Young lady |
| 73 | Best regards |
| 88 | Love and kisses |

## MULTIPLES AND SUBMULTIPLES

| | | | | | |
|---|---|---|---|---|---|
| **M** | Mega | $= 10^{6}$ | **μ** | micro | $= 10^{-6}$ |
| **k** | kilo | $= 10^{3}$ | **μμ** or **p** | micromicro or pico | $= 10^{-12}$ |
| **m** | milli | $= 10^{-3}$ | **c** | centi | $= 10^{-2}$ |

## SPEAKER OUTPUT TRANSFORMERS FORMULAS.

Ascertain the output valve load resistance from Bernards "Comprehensive Radio Valve Guides", or from manufacturers data sheets and also speaker speech coil impedance in ohms. NOTE. - When two valves operate in Push-Pull, reckon the output load resistance to be twice that of a single valve, and when two valves are operating in parallel reckon output load resistance to be half that of a single valve.

The speaker output transformer ratio is equal to:- Square root of [(optimum valve load resistance) ÷ (speaker speech coil impedance in ohms)] .

When extensions speakers are required to be used with the same speech coil impedance as that used in the normal internal speaker, the output transformer ratio is equal to:- Square root of [Number of speakers x (optimum valve load resistance) ÷ (single speaker speech coil impedance in ohms.)]

Output transformer ratio for extra speakers with different speech coil impedances. In this case it is necessary for each speaker to have its own output transformer.

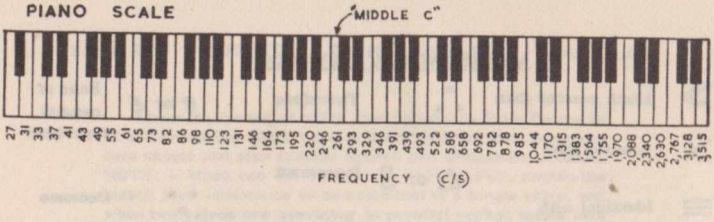
The output transformer ratio for each speaker is equal to:- Square root of [Number of speakers x (Optimum valve load resistance) ÷ ( Impedance in ohms. of speech coil of speaker being used)] .

### OUTPUT TRANSFORMERS
### TABLE OF RATIOS.

| VALVE LOAD (PLATE TO PLATE FOR P.P. OPERATION) | RATIOS | SPEECH COIL IMPEDANCES. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2.Ω | 3.Ω. | 5.Ω. | 8. Ω. | 10.Ω | 15.Ω. | 20.Ω | 25.Ω. |
| 4000 | | 44,7 | 36,5 | 28,3 | 22,4 | 20 | 16,4 | 14.1 | 12,6 |
| 5000 | | 50 | 40,8 | 31,6 | 25 | 22,4 | 18,3 | 15,8 | 14.1 |
| 6000 | | 54,8 | 44,7 | 34,6 | 27,4 | 24,5 | 20 | 17,3 | 15,5 |
| 8000 | | 63,3 | 51,6 | 40 | 31,6 | 28,3 | 23 | 20 | 17,9 |
| 10000 | | 70,7 | 57,7 | 44,7 | 35,3 | 31,6 | 25,8 | 22,4 | 20 |
| 12000 | | 77,5 | 63,3 | 49 | 38,7 | 34,6 | 28,3 | 24,5 | 22 |
| 14000 | | 83,7 | 68,3 | 53 | 41,8 | 37,4 | 30,6 | 26,5 | 23,7 |
| 16000 | | 89,4 | 73 | 56,6 | 44,7 | 40 | 32,8 | 28,3 | 25,3 |
| 20000 | | 100 | 81,6 | 63,2 | 50 | 44,7 | 36,5 | 31,6 | 28,3 |
| 25000 | | 111,8 | 91,3 | 70,7 | 55,9 | 50 | 40,8 | 35,3 | 31,6 |

## MATHEMATICAL SYMBOLS

| | | | | | |
|---|---|---|---|---|---|
| $\gg$ | Much greater than | $\therefore$ | Therefore | $e$ or $\varepsilon$ | Base of natural logarithm |
| $>$ | Greater than | $\Delta$ or $\delta$ | Increment | | |
| $\equiv$ | Identical with | | | $\because$ | Because |
| $\backsimeq$ | Approximately equal | $\parallel$ | Parallel | $\geqslant$ | Equal to or less than |
| $\neq$ | Not equal to | $-$ | Negative, minus or subtract. | $\leqslant$ | Equal to or greater than |
| $\Sigma$ | Sum of | $\times$ or $\cdot$ | Multiplied by | $\sqrt[n]{}$ | nth root |
| | | | | $j$ | Operator 90° |
| $\infty$ | Infinity | | | $h$ or $a$ | Operator 120° |
| | | $+$ | Positive, plus or add | $\int$ | Integration |
| $\ll$ | Much less than | $\mp$ | Negative or positive. Minus or plus | sin | sine |
| $<$ | Less than | | | cos | cosine |
| $\lvert n \rvert$ | Absolute value of n | $\pm$ | Positive or negative. Plus or minus | tan | tangent |
| | | $\div$ or $:$ | Divided | sec | secant |
| $\perp$ | Perpendicular | | | cosec | cosecant |
| $\angle$ | Angle | $=$ or $::$ | Equal to | cot | cotangent |
| $\propto$ | Varies as | antilog. | Antilogarithm | sinh | Hyperbolic sine, cosine, tangent (and similarly for other hyperbolic functions) |
| | | $\sin^{-1}$ or arc sin | Inverse sine (and similarly for other functions). | cosh | |
| log x | Logarithm of x to base 10 | | | tanh | |
| $\log_e$ x | Logarithm of x to base e. | | | | |




Piano scale showing the frequencies to which the keys are usually tuned, which is to a slightly different pitch from that used by physicists, based on Middle C = 256 c/s., and such scales are apt to be misleading. Frequencies of black keys can be obtained by multiplying the frequency of the white key below it by 1.05946. This scale is useful for the approximate calibration of oscillators and rough determination of resonant frequencies, etc.

## VIBRATIONS AND THE MUSICAL SCALE.

Ratio of vibrations of 1 octave in any part of the musical scale

| Note | C | D | E | F | G | A | B | C |
|---|---|---|---|---|---|---|---|---|
| Ratio | 1 | 9/8 | 5/4 | 4/3 | 3/2 | 5/3 | 15/8 | 2 |
| Decimal Ratio | 1 | 1.125 | 1.25 | 1.33 | 1.5 | 1.66 | 1.875 | 2 |
| Tonic Sol Fa Scale | Doh | Ray | Me | Fah | Sch | Lah | Te | Doh |

## STROBOSCOPE TABLE.

| FREQUENCY OF SUPPLY (C/S) | 15 | 25 | 33 | 40 | 50 | 60 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|---|---|
| RECORD SPEED 78. R.P.M. NO. OF BLACK SPOKES. | 23 | 38 | 51 | 62 | 77 | 92 | 123 | 139 | 154 |
| RECORD SPEED 45. R.P.M. NO. OF BLACK SPOKES. | 40 | 66 | 89 | 106 | 133 | 160 | 216 | 239 | 266 |
| RECORD SPEED 33.1/3. R.P.M. NO. OF BLACK SPOKES. | 54 | 90 | 120 | 144 | 180 | 216 | 288 | 324 | 360 |
| RECORD SPEED 16.2/3. R.P.M. NO OF BLACK SPOKES. | 108 | 180 | 240 | 288 | 360 | 432 | 576 | 648 | 720 |

To find the number of black spokes required for any speed and a.c. mains-frequency, the formula is:-

$$N = \frac{120.\ f}{r}$$

where N = number of black spokes
f = mains supply frequency
r = speed of record required

N.B. - 180 black spokes are required at 33.1/3 r.p.m. for 50 c/s. mains.

## METER FORMULAS FOR DIRECT CURRENT MEASUREMENTS.

(a) To find the ohms per volt resistance of a voltmeter. This value is equal to:-

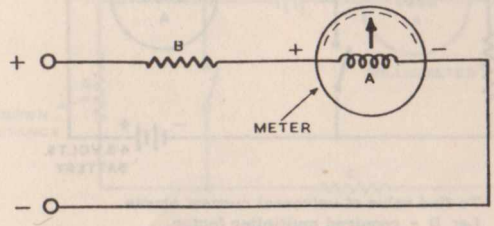
1 ÷ full scale current in amperes.

(b) To increase range of meter for voltage reading by any desired multiplier.

Let B = multiplier resistance value in ohms.

A = total meter resistance in ohms.

Then B = (required full scale reading in volts ÷ the full scale meter current in amperes) − A



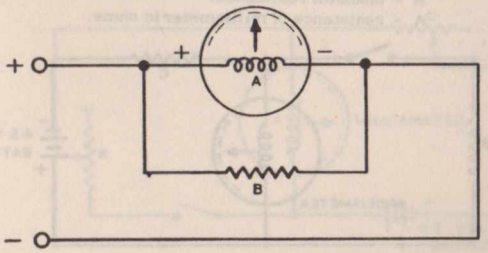

(c) To increase range of milliameter for current reading by any desired multiplier.

Let C = required multiplying factor

B = shunt resistance value in ohms

A = total meter resistance in ohms

Then B = A ÷ (C − 1).

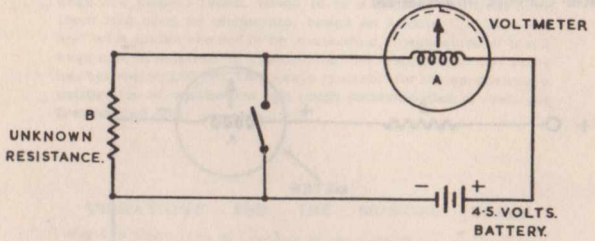


(d) To find ohmage value of unknown resistance by using a voltmeter and battery.

Let B = value of unknown resistance

A = resistance of voltmeter in ohms.

Then B = A [(Reading of voltmeter with closed switch ÷ Reading of Voltmeter with open switch) - 1]



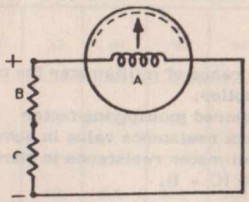

(e) To find value of universal current shunts.

Let D = required multiplier factor.

C + B = total resistance in ohms for lowest shunted current range required.

A = meter resistance in ohms

B = (A + B + C) ÷ D.

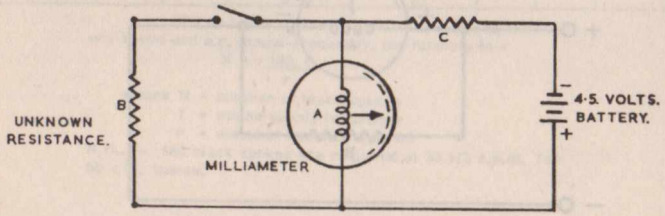



(f) To find ohmage value of unknown resistance by means of milliameter and battery.

Let C = series resistor for limiting battery current so as to give a reading on the meter scale when switch is open.

B = unknown resistance.

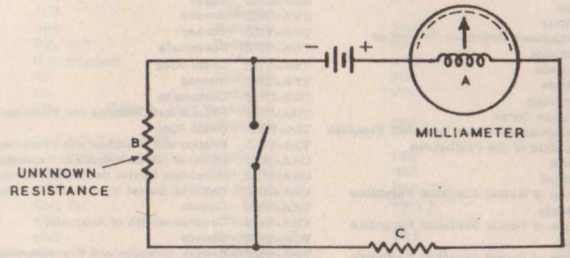
A = resistance of milliameter in ohms.



(g) To find ohmage value of unknown resistance by means of milliameter, battery and any known resistor.

Let C = known resistance value in ohms.
B = unknown resistance value in ohms.
A = Meter resistance in ohms.

Then B = [C + A] [Meter current reading with closed switch - meter current reading with open switch] ÷ [current meter reading with open switch]

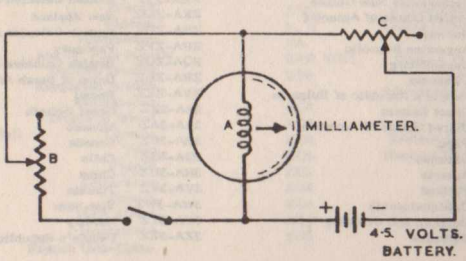



(h) To find the direct current resistance in ohms of an unidentified voltmeter or milliameter.

Let C and B = variable resistors.
A = unknown meter resistance.

Then connect circuit as shown in diagram with resistor C only being used in circuit, whilst B is disconnected by switch being open. With switch open vary C for full scale meter reading, then bring resistor B into circuit by closing switch, and vary B until the meter reading returns to half scale. Then, if the value of resistance B at this setting is checked by an ohmmeter, the reading shown is equal to the resistance of A. It is vital that resistance C is of sufficiently high value to prevent an off the scale meter reading. If the full scale current of the meter is known, it is easy to calculate value of C by the following formula:-

C = (1,000 times testing battery voltage used) ÷ (meter full scale current in **milliameters**).



## INTERNATIONAL COMMERCIAL RADIO STATION PREFIXES

| | |
|---|---|
| AAA-ALZ | United States of America |
| AMA-AOZ | Spain |
| APA-ASZ | Pakistan |
| ATA-AWZ | India |
| AXA-AXZ | Commonwealth of Australia |
| AYA-AZZ | Argentine Republic |
| BAA-BZZ | China |
| CAA-CEZ | Chile |
| CFA-CKZ | Canada |
| CLA-CMZ | Cuba |
| CNA-CNZ | Morocco |
| COA-COZ | Cuba |
| CPA-CPZ | Bolivia |
| CQA-CRZ | Portuguese Overseas Provinces |
| CSA-CUZ | Portugal |
| CVA-CXZ | Uruguay |
| CYA-CZZ | Canada |
| DAA-DMZ | Germany |
| DNA-DQZ | Belgian Congo |
| DRA-DTZ | Bielorussian Soviet Socialist Republic |
| DUA-DZZ | Republic of the Phillipines |
| EAA-EHZ | Spain |
| EIA-EJZ | Ireland |
| EKA-EKZ | Union of Soviet Socialist Republics |
| ELA-ELZ | Liberia |
| EMA-EOZ | Union of Soviet Socialist Republics |
| EPA-EQZ | Iran |
| ERA-ERZ | Union of Soviet Socialist Republics |
| ESA-ESZ | Estonia |
| ETA-ETZ | Ethiopia |
| EUA-EZZ | Union of Soviet Socialist Republics |
| FAA-FZZ | France and Colonies and Protectorates |
| GAA-GZZ | Great Britain |
| HAA-HAZ | Hungarian People's Republic |
| HBA-HBZ | Switzerland |
| HCA-HDZ | Ecuador |
| HEA-HEZ | Switzerland |
| HFA-HFZ | People's Republic of Poland |
| HGA-HGZ | Hungarian People's Republic |
| HHA-HHZ | Republic of Haiti |
| HIA-HIZ | Dominican Republic |
| HJA-HKZ | Republic of Colombia |
| HLA-HMZ | Korea |
| HNA-HNZ | Iraq |
| HOA-HPZ | Republic of Panama |
| HQA-HRZ | Republic of Honduras |
| HSA-HSZ | Thailand |
| HTA-HTZ | Nicaragua |
| HUA-HUZ | Republic of El Salvador |
| HVA-HVZ | Vatican City State |
| HWA-HYZ | France and Colonies and Protectorates |
| HZA-HZZ | Saudi Arabia |
| IAA-IZZ | Italy and Colonies |
| JAA-JSZ | Japan |
| JTA-JVZ | Mongolian People's Republic |
| JWA-JXZ | Norway |
| JYA-JYZ | Jordan |
| JZA-JZZ | Netherlands New Guinea |
| KAA-KZZ | United States of America |
| LAA-LNZ | Norway |
| LOA-LWZ | Argentine Republic |
| LXA-LXZ | Luxembourg |
| LYA-LYZ | Lithuania |
| LZA-LZZ | People's Republic of Bulgaria |
| MAA-MZZ | Great Britain |
| NAA-NZZ | United States of America |
| OAA-OCZ | Peru |
| ODA-ODZ | Lebanon |
| OEA-OEZ | Austria |
| OFA-OJZ | Finland |
| OKA-OMZ | Czechoslovakia |
| ONA-OTZ | Belgium and Colonies |
| OUA-OZZ | Denmark |
| PAA-PIZ | Netherlands |
| PJA-PJZ | Netherlands Antilles |
| PKA-POZ | Republic of Indonesia |
| PPA-PYZ | Brazil |
| PZA-PZZ | Surinam |
| QAA-QZZ | (Service abbreviations) |
| RAA-RZZ | Union of Soviet Socialist Republics |
| SAA-SMZ | Sweden |
| SNA-SRZ | People's Republic of Poland |
| SSA-SSM | Egypt |
| SSN-STZ | Sudan |
| SUA-SUZ | Egypt |
| SVA-SZZ | Greece |
| TAA-TCZ | Turkey |
| TDA-TDZ | Guatemala |
| TEA-TEZ | Costa Rica |
| TFA-TFZ | Iceland |
| TGA-TGZ | Guatamala |
| THA-THZ | France and Colonies and Protectorates |
| TIA-TIZ | Costa Rica |
| TJA-TZZ | France and Colonies and Protectorates |
| UAA-UQZ | Union of Soviet Socialist Republics |
| URA-UTZ | Ukrainian Soviet Socialist Republics |
| UUA-UZZ | Union of Soviet Socialist Republics |
| VAA-VGZ | Canada |
| VHA-VNZ | Commonwealth of Australia |
| VOA-VOZ | Canada |
| VPA-VSZ | British Colonies and Protectorates |
| VTA-VWZ | India |
| VXA-VYZ | Canada |
| VZA-VZZ | Commonwealth of Australia |
| WAA-WZZ | United States of America |
| XAA-XIZ | Mexico |
| XJA-XOZ | Canada |
| XPA-XPZ | Denmark |
| XQA-XRZ | Chile |
| XSA-XSZ | China |
| XTA-XTZ | France and Colonies and Protectorates |
| XUA-XUZ | Cambodia |
| XVA-XVZ | Viet-Nam |
| XWA-XWZ | Laos |
| XXA-XXZ | Portuguese Overseas Provinces |
| XYA-XZZ | Burma |
| YAA-YAZ | Afghanistan |
| YBA-YHZ | Republic of Indonesia |
| YIA-YIZ | Iraq |
| YJA-YJZ | New Hebrides |
| YKA-YKZ | Syrian Republic |
| YLA-YLZ | Latvia |
| YMA-YMZ | Turkey |
| YNA-YNZ | Nicaragua |
| YOA-YRZ | Roumanian People's Republic |
| YSA-YSZ | Republic of El Salvador |
| YTA-YUZ | Yugoslavia |
| YVA-YYZ | Venezuela |
| YZA-YZZ | Yugoslavia |
| ZAA-ZAZ | Albania |
| ZBA-ZJZ | British Colonies and Protectorates |
| ZKA-ZMZ | New Zealand |
| ZNA-ZOZ | British Colonies and Protectorates |
| ZPA-ZPZ | Paraguay |
| ZQA-ZQZ | British Colonies and Protectorates |
| ZRA-ZUZ | Union of South Africa |
| ZVA-ZZZ | Brazil |
| 2AA-2ZZ | Great Britain |
| 3AA-3AZ | Menaco |
| 3BA-3FZ | Canada |
| 3GA-3GZ | Chile |
| 3HA-3UZ | China |
| 3VA-3VZ | Tunisia |
| 3WA-3WZ | Viet-Nam |
| 3YA-3YZ | Norway |
| 3ZA-3ZZ | People's Republic of Poland |

| | |
|---|---|
| 4AA–4CZ | Mexico |
| 4DA–4IZ | Republic of the Philippines |
| 4JA–4LZ | Union of Soviet Socialist Republics |
| 4MA–4MZ | Venezuela |
| 4NA–4OZ | Yugoslavia |
| 4PA–4SZ | Ceylon |
| 4TA–4TZ | Peru |
| 4UA–4UZ | United Nations |
| 4VA–4VZ | Republic of Haiti |
| 4WA–4WZ | Yemen |
| 4XA–4XZ | State of Israel |
| 4YA–4YZ | International Civil Aviation Organisation |
| 5AA–5AZ | Libya |
| 5CA–5CZ | Morocco |
| 5LA–5LZ | Liberia |
| 5PA–5QZ | Denmark |
| 9AA–9AZ | San Marino |
| 9KA–9KZ | Kuwait |
| 9NA–9NZ | Nepal |
| 9SA–9SZ | Saar |

## INTERNATIONAL AMATEUR CALL SIGN PREFIXES.

| | |
|---|---|
| AC8 | Sikkim |
| AC4 | Tibet |
| AC5 | Bhutan |
| AP2 | Pakistan |
| BV, (C3) | Formosa |
| C (unofficial) | China |
| C3 | (See BV) |
| C9 | Manchuria |
| CE | Chile & Juan Fernandez Archipelago |
| CE9,KC4,LU-Z,VKØ VP8,ZL5, etc. | Antarctica |
| CE9 | (See VP8) |
| CEØ | Easter Island |
| CM, CO | Cuba |
| CN2 | Tangier |
| CN8 | Morocco |
| CP | Bolivia |
| CR4 | Cape Verde Islands |
| CR5 | Portuguese Guinea |
| CR5 | Principe Sao Thome |
| CR6 | Angola |
| CR7 | Mozambique |
| CR8 | Goa (Portuguese India) |
| CR9 | Macau |
| CRIØ | Portuguese Timor |
| CT1 | Portugal |
| CT2 | Azores |
| CT3 | Madeira Islands |
| CX | Uruguay |
| DJ,DL,DM | Germany |
| DU | Philippine Islands |
| EA | Spain |
| EA6 | Balearic Islands |
| EA8 | Canary Islands |
| EA9 | Ifni |
| EA9 | Rio de Oro |
| EA9 | Spanish Morocco |
| EAØ | Spanish Guinea |
| EI | Republic of Ireland |
| EL | Liberia |
| EQ | Iran |
| ET2 | Eritrea |
| ET3 | Ethiopia |
| F | France |
| FA | Algeria |
| FB8 | Amsterdam and St. Paul Islands |
| FB8 | Comoro Islands |
| FB8 | Kerguelen Islands |
| FB8 | Madagascar |
| FB8 | Tromelin Island |
| FC (unofficial) | Corsica |
| FD | Togo |
| FE8 | French Cameroons |
| FF8 | French West Africa |
| FG7 | Guadeloupe |
| FI8 | French Indo-China |
| FK8 | New Caledonia |
| FL8 | French Somaliland |
| FM7 | Martinique |
| FN | French India |
| FO8 | Clipperton Island |
| FO8 | French Oceania |
| FP8 | St. Pierre & Miquelon Islands |
| FQ8 | French Equatorial Africa |
| FR7 | Reunion Island |
| FS7 | Saint Martin |
| FU8, YJ1 | New Hebrides |
| FW8 | Wallis & Futuna Islands |
| FY7 | French Guiana & Inini |
| G | England |
| GC | Channel Islands |
| GD | Isle of Man |
| GI | Northern Ireland |
| GM | Scotland |
| GW | Wales |
| HA | Hungary |
| HB | Switzerland |
| HC | Ecuador |
| HC8 | Galapagos Islands |
| HE | Liechtenstein |
| HH | Haiti |
| HI | Dominican Republic |
| HK | Colombia |
| HKØ | Archipelago of San Andres and Providencia |
| HL | Korea |
| HP | Panama |
| HR | Honduras |
| HS | Thailand |
| HV | Vatican City |
| HZ | Saudi Arabia |
| II, IT1 | Italy |
| II | Trieste |
| I5 | Italian Somaliland |
| IS1 | Sardinia |
| JA, KA | Japan |
| JT1 | Mongolia |
| JY | Jordan |
| JZØ | Netherlands New Guinea |
| K, W | United States of America |
| KA | (See JA) |
| KAØ, KG6I | Bonin & Volcano Islands |
| KB6 | Baker, Howland & American Phoenix Islands |
| KC4 | (See CE9) |
| KC4 | Navassa Island |
| KC6 | Eastern Caroline Islands |
| KC6 | Western Caroline Islands |
| KG1 | (See OX) |
| KG4 | Guatanamo Bay |
| KG6 | Mariana Islands |
| KG6I | (See KAØ) |
| KH6 | Hawaiian Islands |

| | |
|---|---|
| KJ6 | Johnston Island |
| KL7 | Alaska |
| KM6 | Midway Islands |
| KP4 | Puerto Rico |
| KP6 | Palmyra Group, Jarvis Island |
| KR6 | Ryukyu Islands |
| KS4 | Swan Island |
| KS6 | American Samoa |
| KV4 | Virgin Islands |
| KW6 | Wake Island |
| KX6 | Marshall Islands |
| KZ5 | Canal Zone |
| LA | Jan Mayen |
| LA | Norway |
| LA | Svalbard |
| LU | Argentina |
| LU-Z | (See CE9, VP8) |
| LX | Luxembourg |
| LZ | Bulgaria |
| M | San Marino |
| MP4 | Bahrein Island |
| MP4 | Qatar |
| MP4 | Trucial Oman |
| OA | Peru |
| OD5 | Lebanon |
| OE | Austria |
| OH | Finland |
| OHØ | Aland Islands |
| OK | Czechoslovakia |
| ON4 | Belgium |
| OQ5, Ø | Belgium Congo |
| OX, KG1 | Greenland |
| OY | Faeroes |
| OZ | Denmark |
| PAØ, P11 | Netherlands |
| PJ | Netherlands West Indies |
| PJ2M | Sint Maarten |
| PK1,2,3, | Java |
| PK4 | Sumatra |
| PK5 | Netherlands Borneo |
| PK6 | Celebes & Molucca Islands |
| PX | Andorra |
| PY | Brazil |
| PYØ | Fernando de Naronha |
| PYØ | Trindade & Vaz Islands |
| PZ1 | Netherlands Guiana |
| SL,SM | Sweden |
| SP | Poland |
| ST2 | Sudan |
| SU | Egypt |
| SV | Crete |
| SV | Dodecanese |
| SV | Greece |
| TA | Turkey |
| TF | Iceland |
| TG | Guatemala |
| TI | Costa Rica |
| TI9 | Cocos Island |
| UA1,2,3,4,6 | European Russian Socialist Federated Soviet Republic |
| UA1 | Franz Josef Land |
| UA9,Ø | Asiatic Russian S.F.S.R. |
| UAØ | Wrangel Island |
| UB5 | Ukraine |
| UC2 | White Russian S.S.R. |
| UD6 | Azerbaijan |
| UF6 | Georgia |
| UG6 | Armenia |
| UH8 | Turkoman |
| UI8 | Uzbek |
| UJ8 | Tadzhik |
| UL7 | Kazakh |
| UM8 | Kirghiz |
| UN1 | Karelo-Finnish Republic |
| UO5 | Moldavia |
| UP2 | Lithuania |
| UQ2 | Latvia |
| UR2 | Estonia |
| VE,VO | Canada |
| VK | Australia (including Tasmania) |
| VK | Lord Howe Island |
| VK9 | Cocos Island |
| VK9 | Nauru Island |
| VK9 | Norfolk Island |
| VK9 | Papua Territory |
| VK9 | Territory of New Guinea |
| VKØ | (See CE9) |
| VKØ | Heard Island |
| VKØ | Macquarie Island |
| VO | (See VE) |
| VP1 | British Honduras |
| VP2 | Anguilla |
| VP2 | Antigua, Barbuda |
| VP2 | British Virgin Islands |
| VP2 | Dominica |
| VP2 | Granada & Dependencies |
| VP2 | Montserrat |
| VP2 | St. Kitts, Nevis |
| VP2 | St. Lucia |
| VP2 | St. Vincent & Dependencies |
| VP3 | British Guiana |
| VP4 | Trinidad & Tobago |
| VP5 | Jamaica (including Cayman Islands) |
| VP5 | Turks & Caicos Islands |
| VP6 | Barbados |
| VP7 | Bahama Islands |
| VP8 | (See CE9) |
| VP8 | Falkland Islands |
| VP8, LU-Z | South Georgia |
| VP8, LU-Z | South Orkney Islands |
| VP8, LU-Z | South Sandwich Islands |
| VP, LU-Z, CE9 | South Shetland Islands |
| VP9 | Bermuda Islands |
| VQ1 | Zanzibar |
| VQ2 | Northern Rhodesia |
| VQ3 | Tanganyika Territory |
| VQ4 | Kenya |
| VQ5 | Uganda |
| VQ6 | British Somaliland |
| VQ8 | Chagos Islands |
| VQ8 | Mauritius |
| VQ8 | Rodriguez Island |
| VQ9 | Seychelles |
| VR1 | British Phoenix Islands |
| VR1 | Gilbert & Ellice Islands & Ocean Island |
| VR2 | Fiji Islands |
| VR3 | Fanning & Christmas Islands |
| VR4 | Solomon Islands |
| VR5 | Tonga Islands |
| VR6 | Pitcairn Island |
| VS1 | Singapore |
| VS2 | Malaya |
| VS4 | Sarawak |
| VS5 | Brunei |
| VS6 | Hong Kong |
| VS9 | Aden & Socotra |
| VS9 | Maldive Islands |
| VS9 | Sultanate of Oman |
| VU2 | India |
| VU4 | Laccadive Islands |
| VU5 | Andaman & Nicobar Islands |
| W | (See K) |
| XE,XF | Mexico |
| XE4 | Revilla Gigedo |
| XV5 | (See 3W8) |
| XW8 | Laos |
| XZ2 | Burma |
| YA | Afghanistan |
| YI | Iraq |
| YJ | (See PU8) |
| YK | Syria |
| YN,YNØ | Nicaragua |
| YO | Roumania |
| YS | Salvador |

| | |
|---|---|
| YU | Yugoslavia |
| YV | **Venezuela** |
| YVØ | Aves Island |
| ZA | Albania |
| ZB1 | Malta |
| ZB2 | Gibraltar |
| ZC3 | **Christmas Island** |
| ZC4 | **Cyprus** |
| ZC5 | British North Borneo |
| ZC6 | Palestine |
| ZD1 | Sierra Leone |
| ZD2 | Nigeria |
| ZD3 | Gambia |
| ZD4 | (See 9G1) |
| ZD4 | Gold Coast, Togoland |
| ZD6 | Nyasaland |
| ZD7 | St. Helena |
| ZD8 | Ascension Island |
| ZD9 | Tristan de Cunha & Gough Islands |
| ZE | Southern Rhodesia |
| ZK1 | Cook Islands |
| ZK2 | Niue |
| ZL | Chatham Islands |
| ZL | Kermedec Islands |
| ZL | New Zealand |
| ZL5 | (See CE9) |
| ZM6 | British Samoa |
| ZM7 | Tokelau (Union) Islands |
| ZP | Paraguay |
| ZS1,2,4,5,6, | Union of South Africa |
| ZS2 | Prince Edward & Marion Islands |
| ZS3 | Southwest Africa |
| ZS7 | Swaziland |
| ZS8 | Basutoland |
| ZS9 | Bechuanaland |
| 3A | Monaco |
| 3V8 | Tunisia |
| 3W8, XV5 | Vietnam |
| 4S7 | Ceylon |
| 4W1 | Yemen |
| 4X4 | Israel |
| 5A | Libya |
| 9G1, ZD4 | Ghana |
| 9K2 | Kuwait |
| 9S4 | Saar |
| | Aldabra Islands |
| | Cambodia |
| | Nepal |

| TIME TABLE FOR TAPE RECORDING. | | | | | | |
|---|---|---|---|---|---|---|
| FEET. | METRES. | 15/16. I. P. S. | 1 7/8 · I. P. S. | 3 3/4 · I. P. S. | 7 1/2 · I. P. S. | 15. I. P. S. |
| 150 | 45 | 1.04 | 0.32 | 0. 16 | 0.08 | 4mins. |
| 210 | 63 | 1.28 | 0.44 | 0.22 | 0.11 | 5.6mins. |
| 300 | 90 | 2.08 | 1.04 | 0.32 | 0.16 | 8mins. |
| 450 | 135 | 3.12 | 1.36 | 0.48 | 0.24 | 12mins. |
| 600 | 180 | 4.16 | 2.08 | 1.04 | 0.32 | 16mins. |
| 900 | 270 | 6.24 | 3.12 | 1.36 | 0.48 | 24mins. |
| 1200 | 360 | 8.32 | 4.16 | 2.08 | 1.04 | 32mins. |
| 1800 | 540 | 12.48 | 6.24 | 3.12 | 1.36 | 48mins. |
| 2400 | 720 | 17.04 | 8.32 | 4.16 | 2.08 | 1hr.4mins. |

Above timing is for $\frac{1}{2}$ track monaural.
Double above time for $\frac{1}{4}$ track monaural.
Halve above time for $\frac{1}{4}$ track stereo.
Same as above time for $\frac{1}{4}$ track stereo.

## PRACTICAL AND THEORETICAL SYMBOLS.

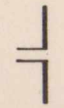
REF NO.

1 

2 

3 

4 

5 

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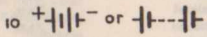
10 

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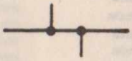
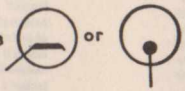
12 

13 

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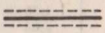
15 

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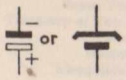
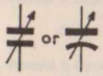
17 

18 

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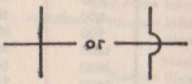
22 

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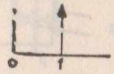
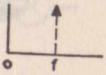
23 


24 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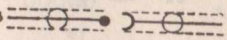
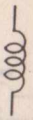
26 

27 

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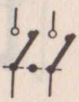
29 

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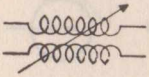
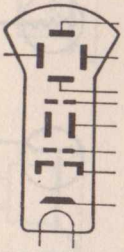
30 

31 

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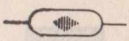
35 

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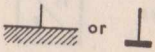
37 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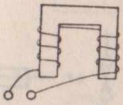
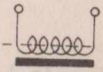
40 

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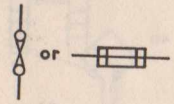
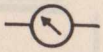
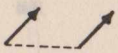
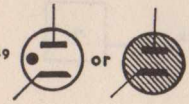
46 


47 

48 

49 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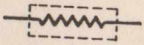
53 

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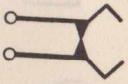
55 

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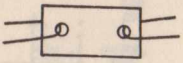
58 

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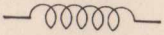
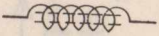
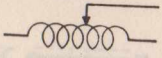
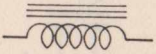
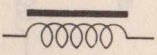
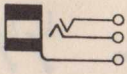
60 

61 

62 

63 

64 

65 

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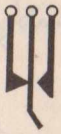

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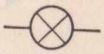

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or



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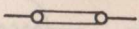

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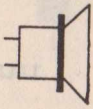

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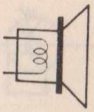

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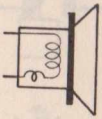

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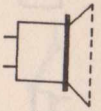

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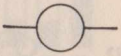

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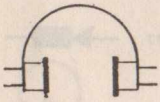
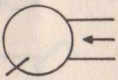
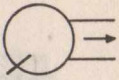
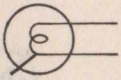
103 

104 

105 

106 

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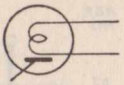
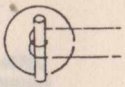
107 

108 

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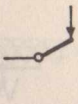
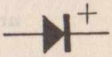
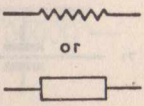
110 

111 

112 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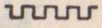
114 

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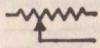
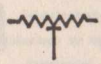
117 

118 

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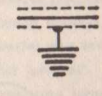
120 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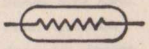
122 

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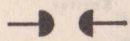
124 

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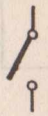
126 

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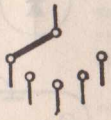
128 

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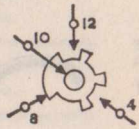
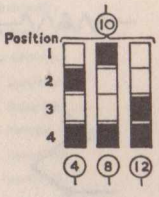
131 


132 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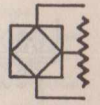
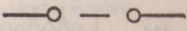
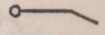
135 

136 

137 

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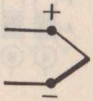
140 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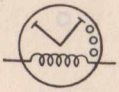
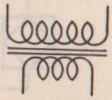
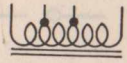
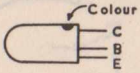
142 

143 

144 

145 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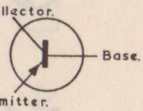
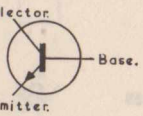
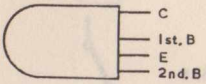
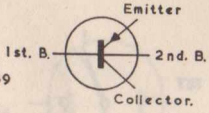
146 


147 


148 


149 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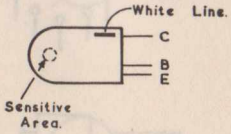
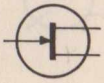
151 


152 

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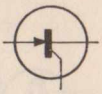
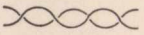
154 

155 

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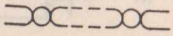

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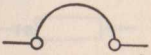
158 

159 

## KEY TO PRACTICAL AND THEORETICAL SYMBOLS

1. Aerial (general).
2. Aerial (transmitting).
3. Aerial (receiving).
4. Aerial (frame).
5. Aerial (dipole).
6. Alternating current (A.C.).
7. Amplifier (general).
8. Anode (general).
9. Audio frequency.
10. Battery.
11. Call point (general).
12. Cable joint.
13. Cathode (general).
14. Cathode (metallic and liquid).
15. Coaxial cable.
16. Condenser or capacitor (general).
17. Condenser or capacitor (electrolytic).
18. Condenser or capacitor (variable).
19. Condenser or capacitor (3 terminal twin).
20. Condenser or capacitor (variable differential).
21. Condenser or capacitor (non-polarised electrolytic).
22. Crossing of cable.
23. Carrier frequency.
24. Carrier frequency (suppressed).
25. Circuit breaker.
26. Coaxial plug and socket.
27. Coil (general).
28. Contactors (general).
29. Contactors (with interlock).
30. Coupling (variable).
31. C.R.T. (Cathode Ray Tube).
32. Demodulator.
33. Detector.
34. Direct current (D.C.).
35. Discharge lamp.
36. Earth (general).
37. Earth to chassis (with no direct earth connections).
38. ECHO suppressor.
39. Equaliser (attenuation).
40. Electromagnet.
41. Ferrox cube bead.
42. Filter (general).
43. Frequency changer.
44. Frequency meter.
45. Fuse (general).
46. Fuse (separable contacts).
47. Galvanometer.
48. Ganged control.
49. Gas filled discharge tube.
50. Grid (general).
51. Grid (varying potential).
52. Grid (screen).
53. Heater (general).
54. Heater (valve).
55. Impulsing spring.
56. Insulator (general).
57. Insulator (knuckle).
58. Insulated circuit crossing.
59. Indicator (general).
60. Inductor (general).
61. Inductor (with dust core).
62. Inductor (with sliding contact).
63. Inductor (with laminated core or L.F. choke).
64. Inductor (with ferromagnetic core).
65. Jack (branch type).
66. Key (non-locking type).
67. Key (locking type).
68. Lamp (signal or pilot).
69. Lamp (filament).
70. Lightning arrestor (general).
71. Line capacitance.
72. Link (general).
73. Loudspeaker (general).
74. Loudspeaker (M.C. or ribbon type).
75. Loudspeaker (M.C. or ribbon type with hum suppressor).
76. Loudspeaker (with diverging grid).
77. Mechanically operated contacts.
78. Microphone (general).
79. Microphone (carbon type).
80. Microphone (carbon type Push-Pull).
81. Microphone (capacitor type).
82. Microphone (Piezo electric type).
83. Microphone (moving coil type).
84. Meter (general).
85. Modulator.

86. Motor (gearless).
87. Motor (geared).
88. Negative sign.
89. Neon tube or photo-electric cell.
90. Neutral A.C.
91. Oscillation generator.
92. Piezo electric crystal or oscillating crystal.
93. Phone.
94. Plug and socket.
95. Positive sign.
96. Pre-set adjustment.
97. Permanent connection.
98. Press-Button.
99. Radio Station (receiving).
100. Radio Station (transmitting).
101. Radio Station (transmitting and receiving).
102. Receiver (general).
103. Receiver (double head gear).
104. Receiver Sound Recording Head (general).
105. Receiver Sound Reproducing Head (general).
106. Receiver Moving Coil type Recording or Reproducing Head.
107. Receiver Moving Iron type Recording or Reproducing Head.
108. Receiver Magnetic Recording or Reproducing Head.
109. Relay coil (general).
110. Relay contact (general).
111. Rectifier.
112. Resistor.
113. Resistor (protective type).
114. Resistor (non-reactive type).
115. Resistor (variable).
116. Resistor (potential divider or tapped resistor).
117. Resistor (potential divider variable).
118. Resistor (potential divider pre-set adjustment).
119. Screen (general).
120. Screen (conductor).
121. Selector Magnet (general).
122. Selenium cell or Barreter.
123. Solar Battery.
124. Spark gap (general).
125. Super Audio Frequency.
126. Switch S.P. (general).
127. Switch S.P. (two way).
128. Switch S.P. (multi-way).
129. Switch (main).
130. Switch (change-over).
131. Switch (multi-position rotary type).
132. Switch (multi-position rotary type Equivalent Block Diagram).
133. Television circuit.
134. Terminal or connection (general).
135. Terminating set or hybrid coil.
136. Testing point (general).
137. Test plug protector.
138. Thermal Element, Bimetallic (general).
139. Thermistor.
140. Thermo-couple (general).
141. Thermostat.
142. Time Switch (Elect.).
143. Transformer (general).
144. Transformer (auto).
145. Triode Transistor (general).
146. Triode Transistor (P-N-P type).
147. Triode Transistor (N-P-N type).
148. Tetrode Junction Transistor (general).
149. Tetrode Transistor (P-N-P type).
150. One reverse biased and two forward biased junction transistors (diode).
151. Photo-transistors.
152. Unijunction transistor.
153. P-N-P Field Effect Transistor.
154. Controlled Rectifier.
155. Twisted pair of wires (as in flex).

Two Motion Selector.

156. Non-bridging wiper and bank.
157. Bridging wiper and bank.
158. U-link.
159. Uniselector (general).

# PRACTICAL AND THEORETICAL SYMBOLS (EUROPEAN)

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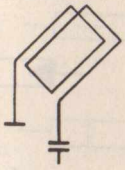

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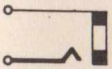

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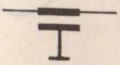

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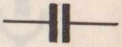

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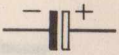

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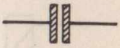

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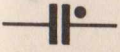

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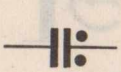

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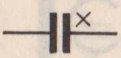

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or

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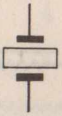

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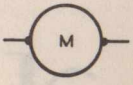

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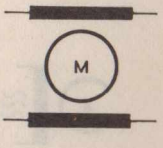

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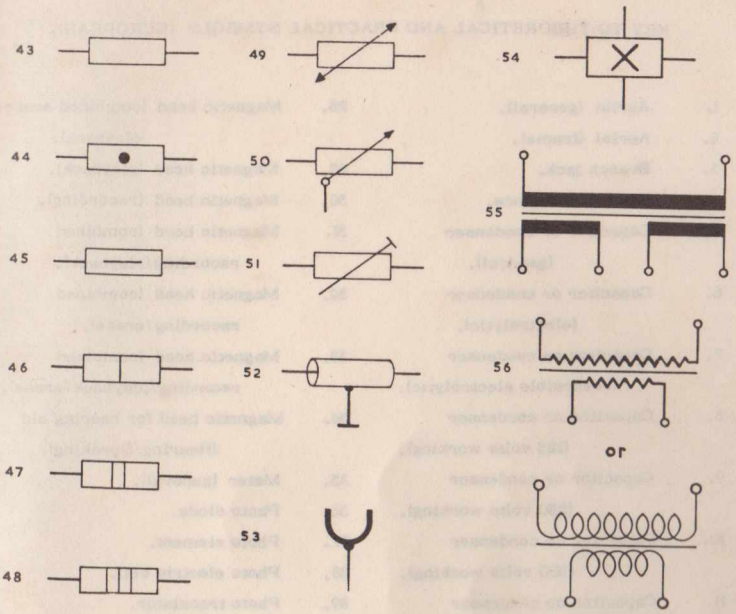
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## KEY TO THEORETICAL AND PRACTICAL SYMBOLS (EUROPEAN).

1. Aerial (general).
2. Aerial (frame).
3. Branch jack.
4. Cable capacitance.
5. Capacitor or condenser (general).
6. Capacitor or condenser (electrolytic).
7. Capacitor or condenser (reversible electrolytic).
8. Capacitor or condenser (125 volts working).
9. Capacitor or condenser (250 volts working).
10. Capacitor or condenser (500 volts working).
11. Capacitor or condenser (fine tuning).
12. Cathode (general).
13. Cathode (with heater).
14. Connection to chassis.
15. Crystals (general).
16. Crystals (oscillating).
17. Diode with stability limiter.
18. Discharge tube.
19. Electric Motor (general).
20. Electromagnet (general).
21. Fuse (general).
22. Inductive choke (H.F.only).
23. Inductive choke (L.F.only).
24. Key (morse).
25. Magnetic head (general).
26. Magnetic head (erase).
27. Magnetic head (erase H.F.).
28. Magnetic head (combined erase/playback).
29. Magnetic head (playback).
30. Magnetic head (recording).
31. Magnetic head (combined recording/playback).
32. Magnetic head (combined recording/erase).
33. Magnetic head (combined recording/playback/erase).
34. Magnetic head for hearing aid (Hearing/Speaking).
35. Meter (general).
36. Photo diode.
37. Photo element.
38. Photo electric cell.
39. Photo transistor.
40. Plug and socket.
41. Press-button switch.
42. Relay coil and contacts.
43. Resistor (general) $\frac{1}{4}$W.
44. Resistor $\frac{1}{10}$W.
45. Resistor $\frac{1}{2}$W.
46. Resistor 1W.
47. Resistor 2W.
48. Resistor 3W.
49. Resistor (variable).
50. Resistor (potential divider).
51. Resistor (preset).
52. Screened conductor.
53. Socket (inlet or outlet).
54. Sound generator or resonance producer.
55. Transformer (L.F.only).
56. Transformer (H.F.only).

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