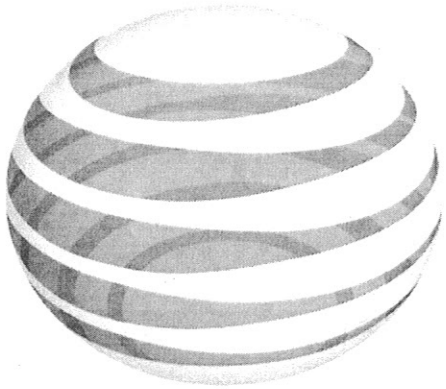

BASIC ELECTRICITY MANUAL

CORRESPONDENCE COURSE WORKBOOK

NOTICE

FEBRUARY 2002

CT208 - WorkBook

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E-3200

BASICS OF BASIC ELECTRICITY

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TERM	UNIT	SYMBOLS		DC FORMULAS		AC FORMULAS	
		DC	AC	SERIES	PARALLEL	SERIES	PARALLEL
CHARGE	COULOMB	Q	Q	*1 COULOMB = 6.28 x 10^{18} ELECTRONS			
CURRENT	AMPERE	I_T I_1 I_2 I_3 etc	I_T I_R I_L I_C I_{LP} I_{CP}	$I_T = I_1 = I_2 = I_3$	$I_T = I_1 + I_2 + I_3$	$I_T = I_R = I_L = I_C$	$I_T = \sqrt{I_R^2 + I_L^2}$ $I_T = \sqrt{I_R^2 + I_C^2}$ $I_{LP} = I_L - I_C$ $I_{CP} = I_C - I_L$
				* $I = \frac{E}{R}$		* $I_T = \frac{E_T}{Z}$; $I_R = \frac{E_R}{R}$; $I_L = \frac{E_L}{X_L}$; $I_C = \frac{E_C}{X_C}$	
VOLTAGE (EMF)	VOLT	E_T E_1 E_2 E_3 etc	E_T E_R E_L E_C E_{LS} E_{CS}	$E_T = E_1 + E_2 + E_3$	$E_T = E_1 = E_2 = E_3$	$E_T = \sqrt{E_R^2 + E_L^2}$ $E_T = \sqrt{E_R^2 + E_C^2}$ $E_{LS} = E_L - E_C$ $E_{CS} = E_C - E_L$	$E_T = E_R = E_L = E_C$
				* $E = IR$		* $E_T = I_T Z$; $E_R = I_R R$ $E_L = I_L X_L$; $E_C = I_C X_C$	
CONDUCTANCE	SIEMEN	G_T G_1 G_2 etc			$G_T = \frac{1}{R_T}$ $G_T = G_1 + G_2 + G_3$		
				* $G = \frac{1}{R}$ $G = \frac{I}{E}$			
RESISTANCE	OHM	R_T R_1 R_2 R_3	R	$R_T = R_1 + R_2 + R_3$	$R_T = \frac{1}{G_T}$ $R_T = \frac{E_T}{I_T}$ $R_T = \frac{R_1 R_2}{R_1 + R_2}$	* $R = \frac{E_R}{I_R}$	
				* $R = \frac{E}{I}$ $R = \frac{1}{G}$			
POWER	WATT	P_T P_1 P_2 P_3	AP TP PF	* $P = EI$ $P = IR \times I$ $P = E \times E/R$ $P_T = P_1 + P_2 + P_3$ $P_T = E_T I_T$		* AP = APPARENT POWER $AP = E_T I_T$ TP = TRUE POWER $TP = E_R I_R$ PF = POWER FACTOR = $\frac{TP}{AP}$	
FREQUENCY	HERTZ		f			* $f = \frac{1}{T}$; $f = \frac{X_L}{2\pi L}$; $f = \frac{1}{2\pi C X_C}$	
PERIOD	SECOND		T			* $T = \frac{1}{f}$	
PHASE DIFFERENCE	DEGREES		θ			$\sin\theta = \frac{E_L}{E_T}$ or $\frac{X_L}{Z}$ $\sin\theta = \frac{E_C}{E_T}$ or $\frac{X_C}{Z}$	$\sin\theta = \frac{I_L}{I_T}$ or $\frac{Z}{X_L}$ $\sin\theta = \frac{I_C}{I_T}$ or $\frac{Z}{X_C}$

* FORMULA GOOD FOR BOTH SERIES AND PARALLEL

BASICS OF BASIC ELECTRICITY

TERM	UNIT	SYMBOLS		DC FORMULAS		AC FORMULAS	
		DC	AC	SERIES	PARALLEL	SERIES	PARALLEL
INDUCTANCE	HENRY	L_T L_1 L_2	L_T L_1 L_2	M = 0 $L_T = L_1 + L_2$ M AIDING $L_T = L_1 + L_2 + 2M$ M OPPOSING $L_T = L_1 + L_2 - 2M$	M = 0 $L_T = \frac{L_1 L_2}{L_1 + L_2}$	* $L = \frac{X_L}{2\pi f}$	
MUTUAL INDUCTANCE	HENRY	M	M	* $M = k\sqrt{L_1 L_2}$ k = COEFFICIENT OF COUPLING			
INDUCTIVE REACTANCE	OHM		X_L X_{LS}			$X_{LS} = X_L - X_C$ * $X_L = 2\pi f L$ $X_L = \frac{E_L}{I_L}$	
CAPACITANCE	FARAD	C_T C_1 C_2	C_T C_1 C_2	$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$ $C_T = \frac{C_1 C_2}{C_1 + C_2}$	$C_T = C_1 + C_2 + C_3$	* $C = \frac{1}{2\pi f X_C}$	
CAPACITIVE REACTANCE	OHM		X_C X_{CS}			$X_{CS} = X_C - X_L$ * $X_C = \frac{1}{2\pi f C}$ $X_C = \frac{E_C}{I_C}$	
IMPEDANCE	OHM		Z			$Z = \sqrt{R^2 + X_L^2}$ $Z = \sqrt{R^2 + X_C^2}$ $Z = \sqrt{R^2 + X_{LS}^2}$ $Z = \sqrt{R^2 + X_{CS}^2}$	* $Z = \frac{E_T}{I_T}$

COLOR CODE

0 = BLACK	5 = GREEN
1 = BROWN	6 = BLUE
2 = RED	7 = VIOLET
3 = ORANGE	8 = GRAY
4 = YELLOW	9 = WHITE

PREFIXES

SYMBOL	NAME	VALUE	POWER OF TEN
M	MEGA	1,000,000	10^6
K	KILO	1,000	10^3
m	MILLI	0.001	10^{-3}
μ	MICRO	0.000001	10^{-6}
$\mu\mu$	MICRO-MICRO	0.000000000001	10^{-12}

* FORMULA GOOD FOR BOTH SERIES AND PARALLEL