

POWER SYSTEMS II
HANDOUTS

OUTLINE

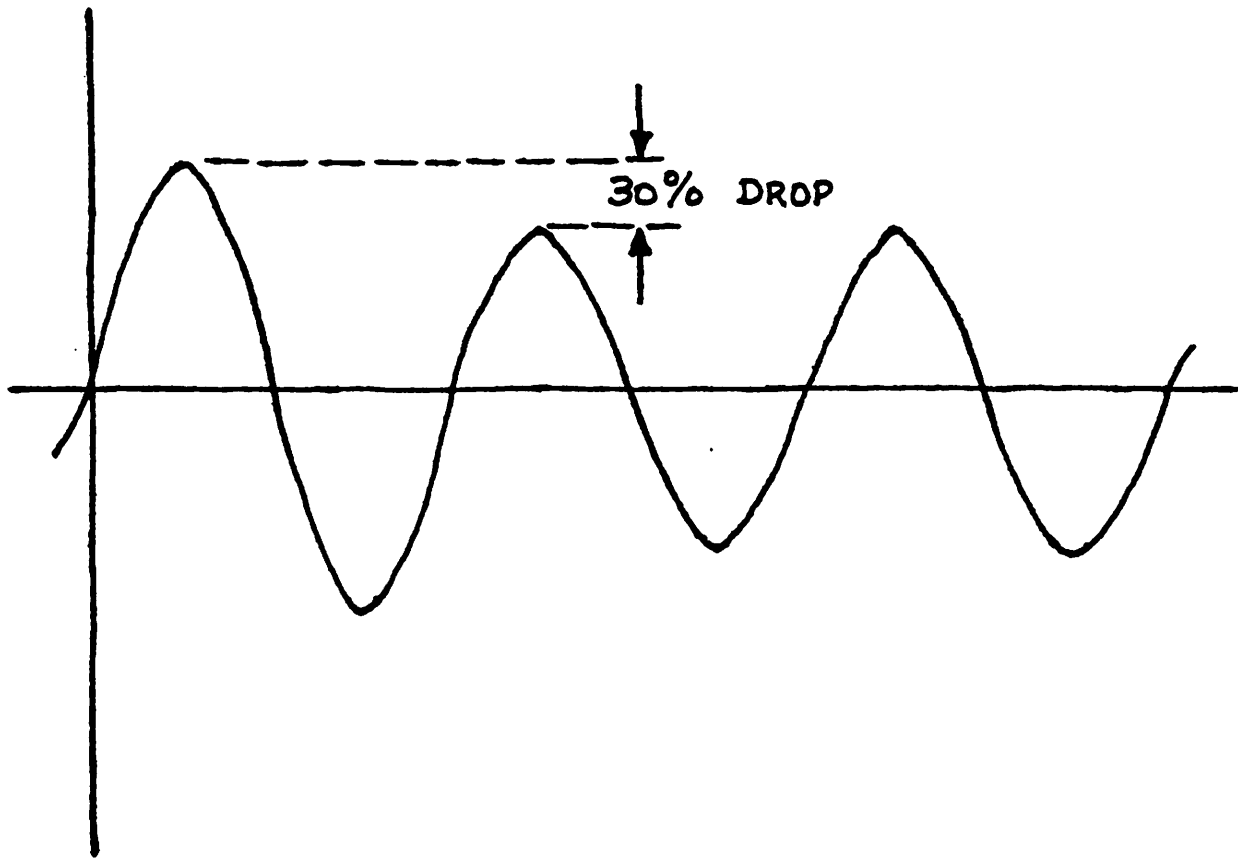
1. Disturbances on power lines
2. Effect of overloading distribution system
3. Poor workmanship in electrical work and computer operation
4. An overview of power line treatment devices
5. Cost-benefit analysis of power line treatment devices

DISTURBANCES ON POWER LINES

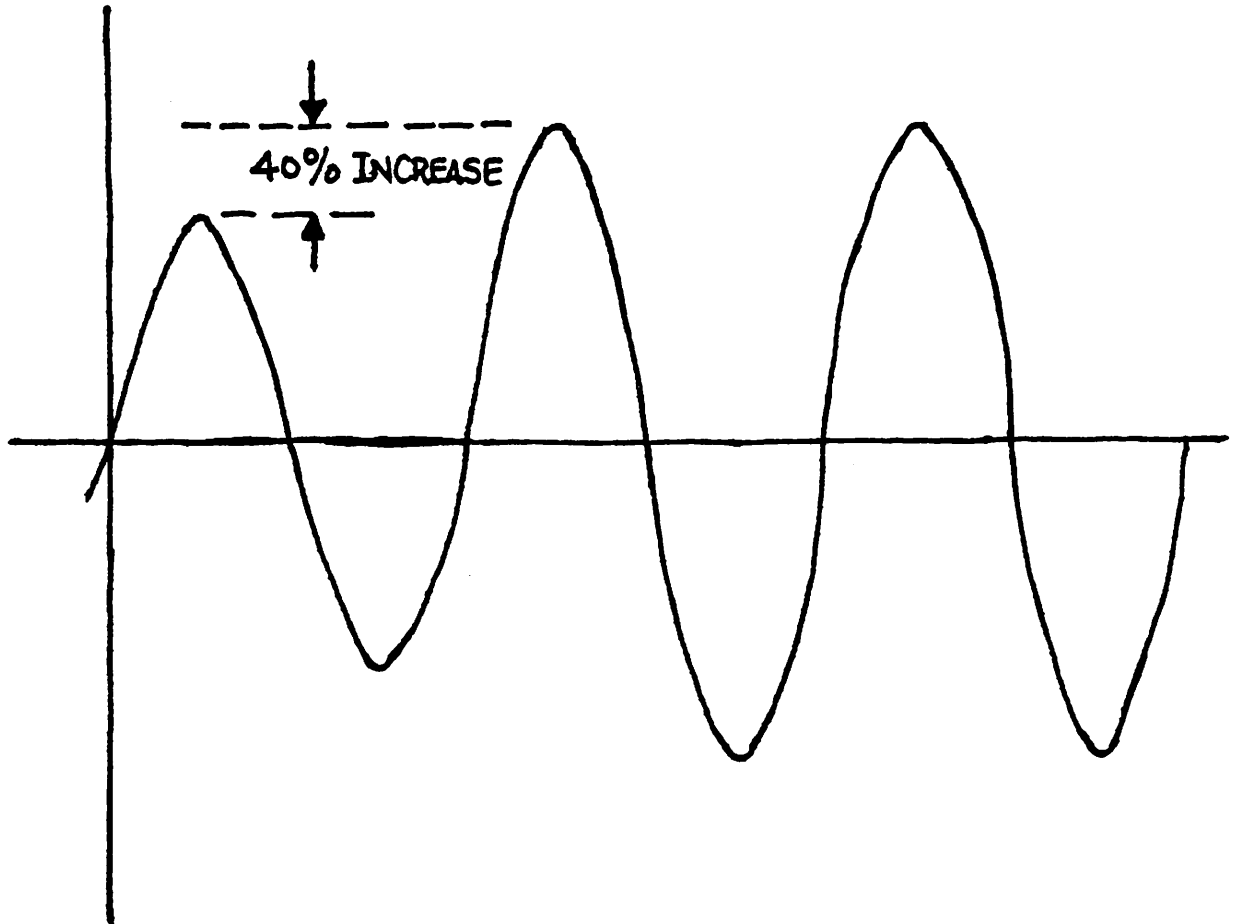
1. SAG - (1-10 cycles) increase in voltage
2. Surge - (1-10 cycles) decrease in voltage
3. Long term average - (hours) increase or decrease in voltage
4. Dropout - momentary loss in voltage
5. Blackout
6. Noise
 - a. Common - mode
 - b. Normal - mode
7. Harmonic distortion
8. Frequency stability

DISTURBANCE - SAG

18-196

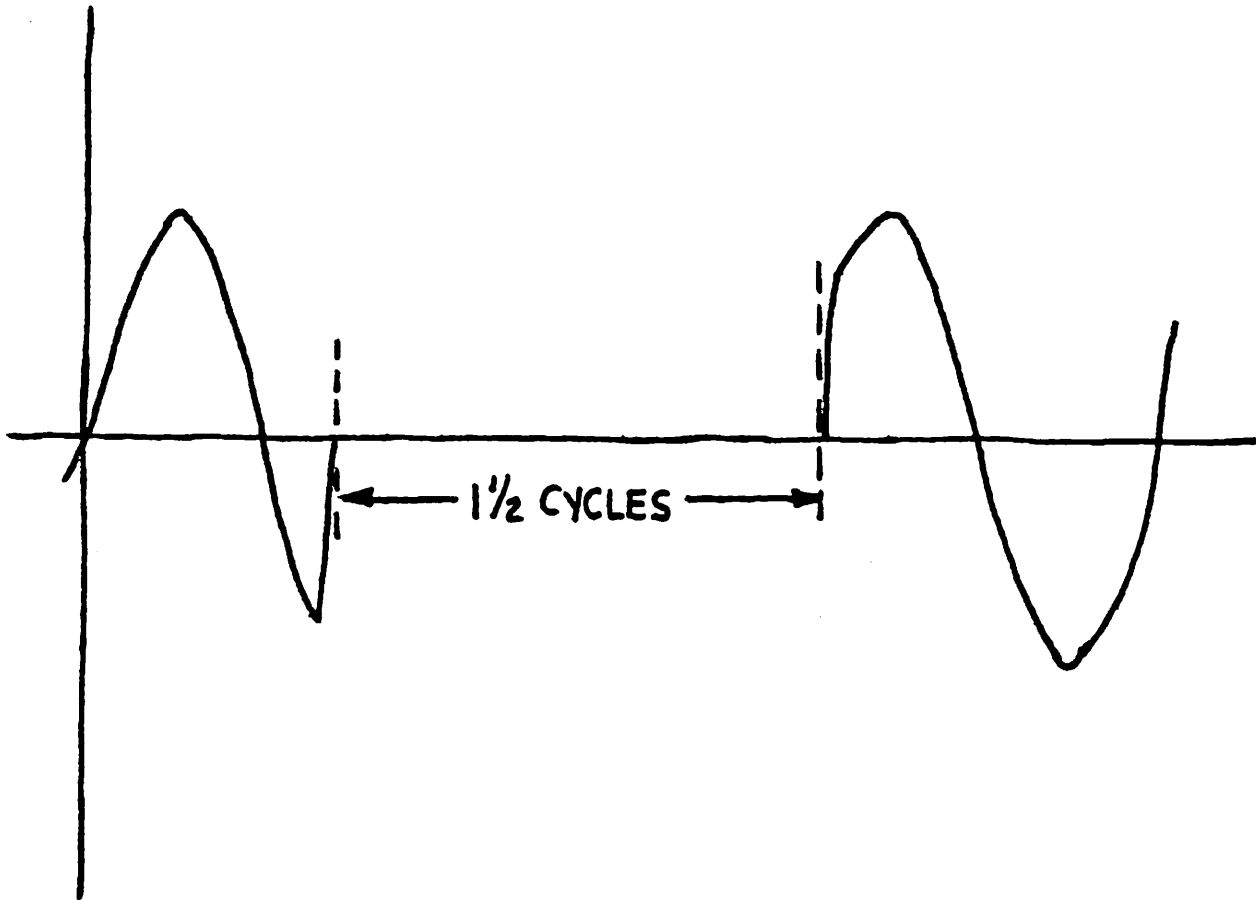


DISTURBANCE - SURGE



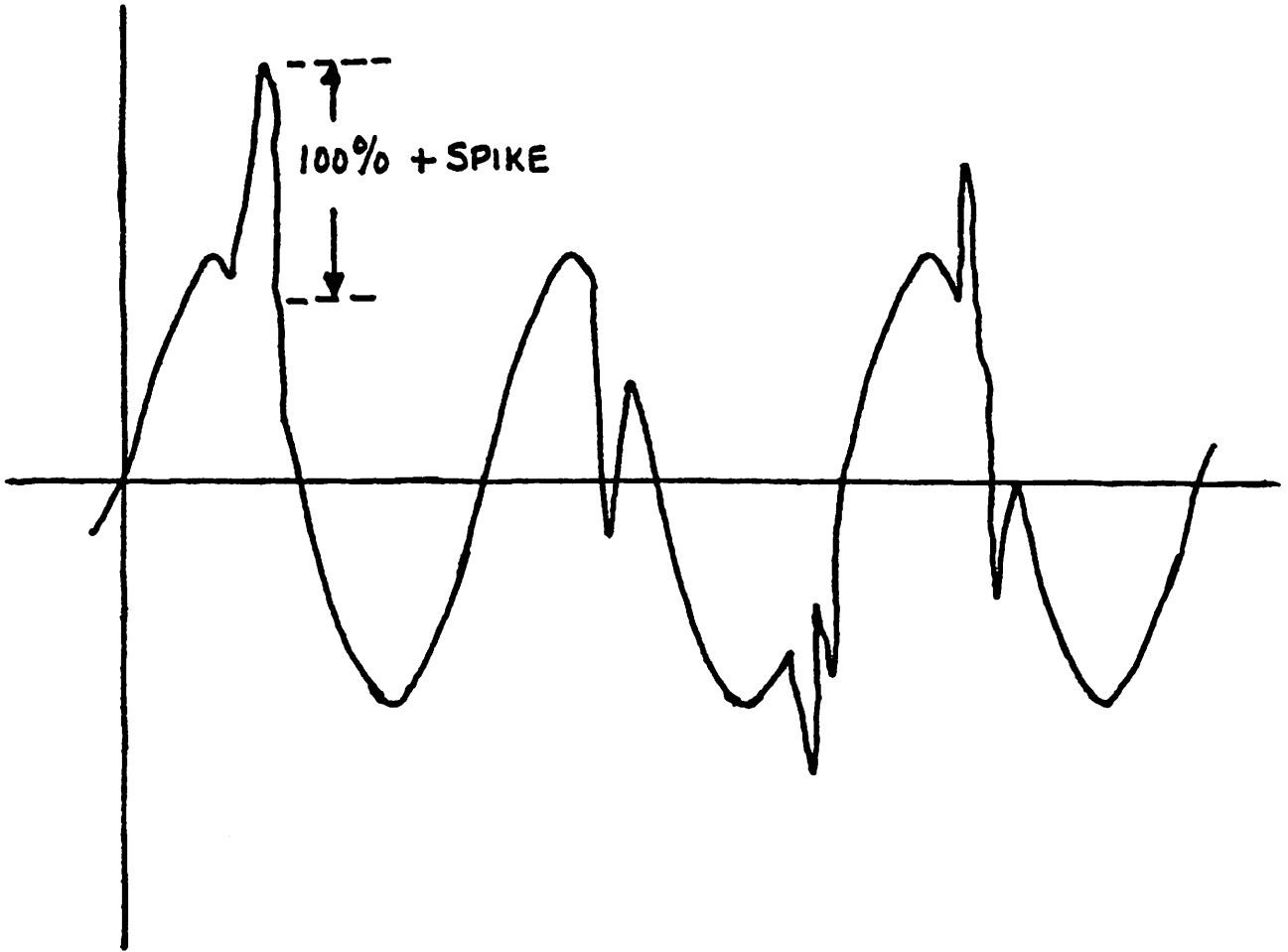
DISTURBANCE-DROP-OUT

18-198



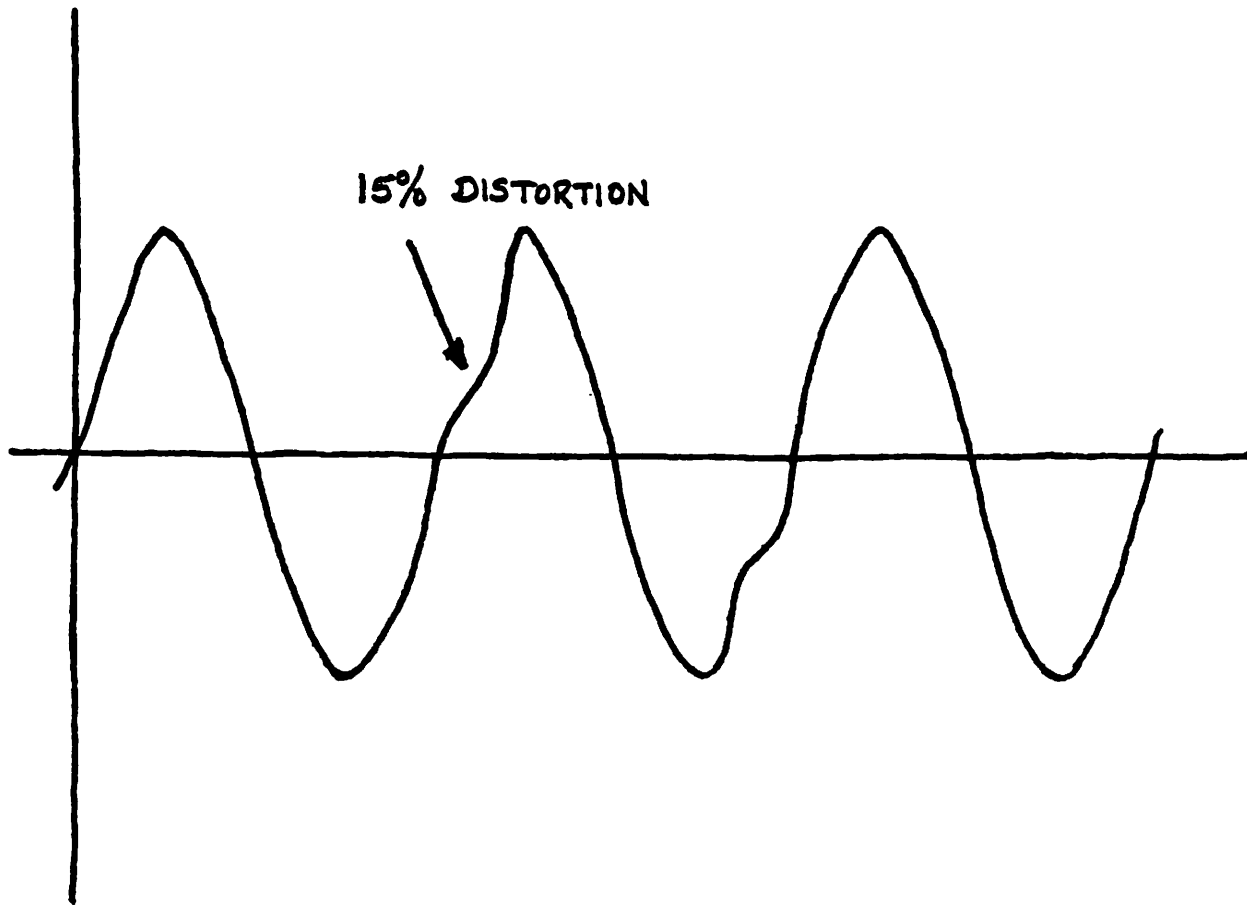
DISTURBANCE-IMPULSE NOISE

18-199

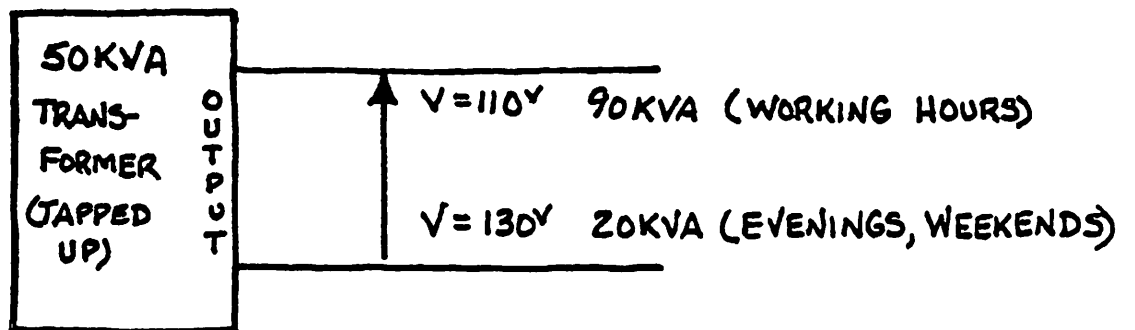


DISTURBANCE-HARMONIC DISTORTION

18-200



OVERLOADING ELECTRICAL SYSTEM



POOR WORKMANSHIP IN ELECTRICAL WORK
AND COMPUTER OPERATION

1. Loose connections
2. Aluminum wiring
3. Poor quality outlets / plugs
4. Undersizing wire
5. Undersizing ground wire
6. Poor quality circuit breakers

OVERVIEW OF POWER LINE TREATMENT DEVICES

1. Super or ultra Isolation Transformer - Suppresses common-mode noise only. (1 million to 1) Does NOT regulate.
2. SCR Tap Switching Autotransformers - Good response time (1 cycle) to correct voltage sags. No noise rejection properties.
3. Line Conditioner - Will suppress common-mode noise and normal-mode noise about 1 million to 1. Also regulates output voltage with good response time (1 cycle) with input varying ± 20% of normal.
4. Motor-Generator - AC motor with AC generator. Rejects all external noise. Regulates sags, surges and with flywheel can "ride through" short drop-outs (1-5 cycles). Could survive a blackout if equipped with Diesel, however, some down time would occur.
5. UPS (Uninterruptible Power Supply) - Solves all power disturbance problems including frequency stability problems and blackouts to the limit of battery back-up in minutes. If equipped with a Diesel-Generator will NOT cause downtime since Diesel can start during normal UPS back-up time.

COST - BENEFIT ANALYSIS OF POWER LINE
TREATMENT DEVICES

			Power Problem Eliminated				
			Noise	Sag / Surge	Brownout	Drop-out	Blackout
Type of Equipment	% Relative Cost	% Problems Corrected					
UPS	100	100	Yes	Yes	Yes	Yes	Yes
Motor-Generator	50	96	Yes	Yes	Yes	Some	No
Line Conditioners	40	90	Yes	Yes	Yes	No	No
Voltage Regulators	15	40	No	Yes	Yes	No	No
Isolation Transformers	15	25	Some	No	No	No	No
Spike Suppressors	20	40	Most	No	No	No	No
Relative Problem Frequency			50%	30%	10%	6%	4%