IS YOUR SYSTEM PAYING TOO MUCH FOR PLANT POWER?

James K. Waldo
Rocky Mountain District Engineer

Teleprompter Cable TV
El Paso, Texas

In a time when power is paid for at a premium, there is no reason for you to pay more for power at your system than you actually use, and if each separate power supply is not individually metered chances are you are. In order to avoid over payment, you must begin to think in terms of conservation and monitoring of actual power use. With those two elements at hand, chances are you can successfully negotiate changes in your contract with your local power company. By monitoring the actual amount of power consumed with a kilowatt meter, you can show local representatives the actual amount of power you have used. If you are afraid of disrupting relations with the power company, don't be. Over the past several years they have become used to such things. But with careful metering of your power system and a tactful approach to power company representatives, you could reduce the amount you pay for electricity by a substantial sum.

There are several ways to approach your local power company in the event you suspect you are paying too much for system plant power. The methods that will be described in the subsequent transcript have been used successfully. Systems presently metered at each power supply should be paying for only that power actually consumed.

When you are sure you are paying too much for power, how do you approach and prove your suspicions to the power company? What reactions should you expect?

If each system power supply isn't metered, chances are you are paying too much.

Step one - if you're going to be successful, train your mind to think as follows: How much power is consumed at the primary of the power supply? How much power is consumed at the primary of the power supply under no load? How much power is consumed at the primary with only one trunk station? One trunk station with an extender, etc.? Relative to system plant power costs--why should we think only of consumed power at the primary of each main supply and not system amplifier power requirements? Is the primary of your system power supply really relative to the primary of your home fuse or circuit breaker box?

Some of you are probably asking yourselves, "Why now should I stir-up my company's or my relationship with the local power company? Why should I cause embarrassment to my company, or myself, or my predecessor?" The answer is simple. If you aren't paying too much you don't have to create waves. If you ARE paying too much you are obligated to your company, if not yourself, to get the power costs reduced. You have already paid too much over a period of time. No one likes paying for a dead horse.

Call your local power company commercial representative to set-up a meeting, the first on your own home ground. After introductions are over and the coffee is poured, explain to the representative that you are paying too much for system plant power. When you explain how you know, the representative will no doubt defend the present contract between your company and his. And well he should; a signed agreement or contract is usually legal and binding in any man's language. However, most power companies in my experience want to charge only for the power their customer consumes and will be concerned. The old standard, "If you aren't satisfied with your present billing, you can meter each power supply location," is seldom heard anymore. The cost is more than both parties are normally willing to bear.

Prior to any meeting with the power company we assume the following has been done on the bench only: Using a VOM or DVM of known calibration measure the voltage drop across a one ohm wirewound resistor connected in series on the primary of the power supply. The resistor should have a wattage rating somewhere between 25 and 50 watts with a tolerance of 1 to 5%. This voltage drop reading divided by the known series resistance of one ohm equals the current in the circuit of the power supply under no load. Record this current reading.

Connect each type of amplifier used in your system individually to the secondary of your power supply. Again, this is done on the bench only. Each different amplifier now creates a different load to the power supply. For each case again read the voltage drop across the one ohm resistor. The new reading divided by one is the new current requirement of the circuit.

Once the current requirement for each device is recorded,(See Example 1) simply determine how many devices you have on a power supply from your system maps or field observation, then multiply the total of each type of amplifier by its individual current requirement. Now total all current requirements for the total current requirements of all amplifiers. Don't forget to include the no load current requirement of the power supply alone. (See Example 2.)

Example 1 (using Jerrold Starline equipment):

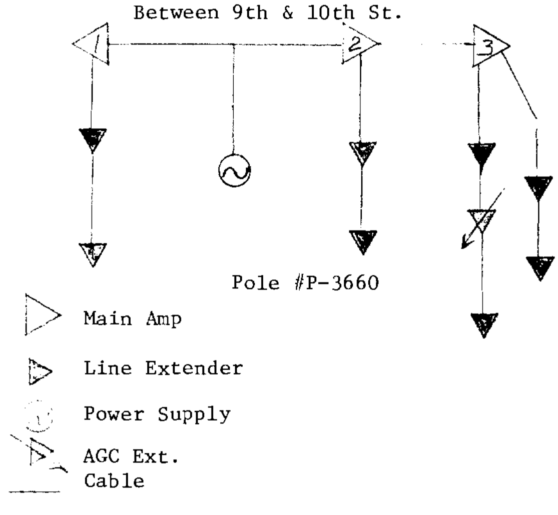
SPS-30/60	Power Supply	1.15 amps
SP-1	Trunk/AGC/Dist. Amp	.17 amps
SP-2	Trunk/Dist. Amp	.15 amps
SP-3	Trunk/AGC Amp	.10 amps
SP-4	Trunk Amp	.10 amps
SP-5	Distribution Amp	.10 amps
SLE-300	Line Extender	.09 amps
SLE-300A	Line Extender	.15 amps

(The above current drains are approximated.)

It's a fact that all power transformers have some inductance. And when inductance is operating in an AC circuit, voltage and current are out of phase to some degree. Whenever the current leads or lags the voltage, the power factor in the circuit decreases. It has been written that for most power supplies - if 60 HZ AC is used - the power factor can be disregarded as negligible. This may be true if we were concerned with only one power supply and/or unregulated transformers. In a cable system, of course, we are concerned with several main power supplies and possibly hundreds of power packs, all of the regulated type normally. My experience with Jerrold systems is that a power factor of approximately .9 (90%) exists on the primary of the main power supply and I have used this number. I have not considered the trunk and distribution cable in the system because of its negligible effect.

Example 2: Power Supply Number 9

Power Supply Number 9
On 7th Ave. East
Between 9th & 10th St.



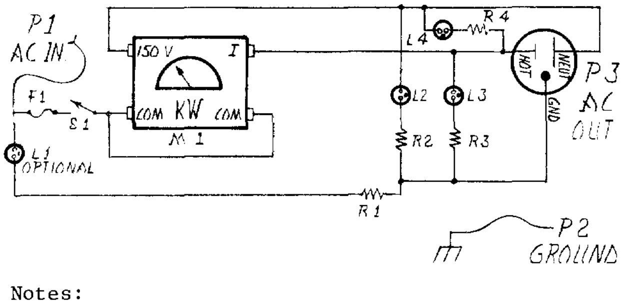
		Amt.	Current Rqd.	Total Current Rqd.
SPS-30/60	Power Supply	1	1.15A	1.15A
SLE-300	Extenders	8	.09A	.72A
SLE-300A	Extender/AGC	1	.15A	.15A
SP-1	Trunk/AGC/Dist. Amp	1	.17A	.17A
SP-2	Trunk/Dist. Amp	1	.15A	.15A
SP-3	Trunk/AGC Amp	1	.10A	.10A
	Subtotal			2.44 Amps

Kilowatt hour consumption per month equals -- P=EI=117.5 volts x 2.44 amps=286.7 watts x 24 x 30.4=209,176 watts per month ÷ 1000 = 209.18 KWH per month x .9 (90%) power factor equals 188.3 KWH per month.

Another method, and the most accurate, of determining the power consumed at the primary of a power supply is by using a kilowatt meter. This method is virtually the same type used by the power company metering your supply. The procedure is as follows: Connect a Weston kilowatt meter to the primary of the power supply under test. Read and record the results as indicated on the meter. The meter is a model 432, part number 9902007. The 432 has the following ranges: normal volts 300/150, normal amps 10/5, watts - maximum 3/1.5KW and a minimum 1.5/.75KW and does this through the use of two scales both of which are mirrowed. This meter sells for about $400 and is accurate to ± .5%.

Each reading should be monitored with the meter in its calibrated position, either horizontally or vertically, before recording. This reading times 24 x 30.4 ÷ 1000 equals the KWH per month. When using the kilowatt meter, power factor can be disregarded as the meter is reading true power, not apparent power. This method is normally more acceptable to the power company. Once this method is accepted, the power company will normally want to take a random 15% sampling once a year for varification. See Diagrams 1 & 2.

Diagram 1: Wattmeter Adaptor



Notes:
F1 - 20A slow-blow, may use breaker for F1 & S1
L1 - L4 & R1 - R4 - Neon Panel Lamps may use a commercial outlet tester for L2 - L4
M1 - Wattmeter, ±0.5%, Weston Model 432: #9902007 (1.5KW + 750W) or #990100B (1.5KW)
P1 & P2 - Heavy duty alligator clips, P1 has a large insulated cover

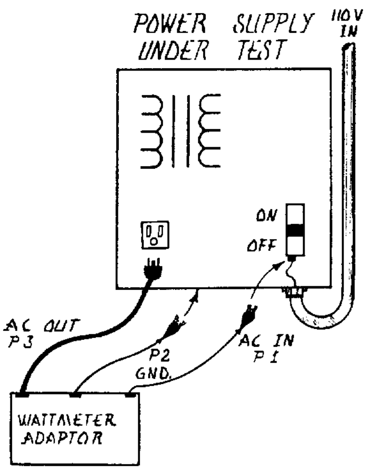
Notes for Diagram 1 continued:

P3 - 115V, 25A 3 wire plug with strain relief
Note: There is no connection between the power wiring and chassis ground.

Outlet Test:

L2	L3	L4	
Off	On	On	OK
Off	On	Off	Open Neutral
Off	Off	On	Open ground, Hot & Neutral may be reversed
On	Off	On	Hot and Neutral reversed

Diagram 2: Supply Under Test



The adaptor measures power without outages by paralleling the breaker in the supply. When the breaker is turned off, power goes through the meter to the outlet in the supply.

Operating Insturctions:

1. Turn switch off. Connect ground clip.
2. Connect AC out plug to outlet. If the test lights show the outlet is improperly wired, repair it before proceeding.
3. Connect AC clip to line side of main breaker.
4. Turn switch on, then turn breaker off.
5. Measure power, the meter must be flat or upright. The meter reads correctly when the pointer covers its reflected image.
6. Turn breaker on, then turn switch off.
7. Disconnect AC clip, then AC plug, then ground clip.

SAFETY FIRST

It is recommended that this testing is done with TWO men.
Do not test during rain or snow.
Always connect the ground clip.
Check that the switch is off before connecting or disconnecting the unit.

Power consumed at the primary of a main power supply is directly related to power consumed in your home as recorded on the power company kilowatt hour meter attached to the side of the house. Both are measured prior to the subsequent system and therefore encompass all of the power consumed by both systems.

In summary: Don't expect to negotiate a new contract during your first meeting with the power company. Chances are the commercial service representative won't understand most of what you say. Most representatives will want something in writing to take back to their leader. Yes, I mean all of your calculations and accusations in writing. You will no doubt have several meetings before an agreement is reached.

Try and determine the basis of your last or existing contract so you can show the power company the obvious mistakes and how they came about. If you can prove tactfully why the past method of calculation is a mistake, it will be to your benefit.

Remember the simplest method of showing actual power consumed, short of power company kilowatt hour metering, is by using the Weston kilowatt meter. Total up the consumed kilowatt hours per month for each station and divide this number by the number of stations. This then is the total average kilowatt hours consumed by each station. The billing for one station then times the total stations is your total cost per month.

The second and least desirable method, which is performed on the bench only, is to calculate via a one ohm resistor connected in the primary of the supply, the current demand first for a no-load power supply and then each subsequent required piece of electronics. These current cunsumption requirements obtained on the bench for each type of electronics used in your system are then directly equated to your power supplies in your system and its associated electronics. The total current times the primary voltage (E.I.A. standard approximately 117.5 volts) equals the watts. This number x 24 x 30.4 (30.4 equals the average days in a month) divided by 1000 times a power factor of 90% equals the KWH for the month for that supply.

Instead of using each individual amplifier current requirement, I have been most successful in using the highest requirement for a trunk station times all trunk stations and the same for extenders. This seems to satisfy the power companies and leaves room for unanticipated sheath currents and an amplifier failure of some sort causing excessive current requirements.

Acknowledgements:

John Messmer - Gill Cable, San Jose, California
Bob Miller - Gill Cable, San Jose, California
John Yaninek - Gill Cable, San Jose, California