Communication:

Language and Symbology

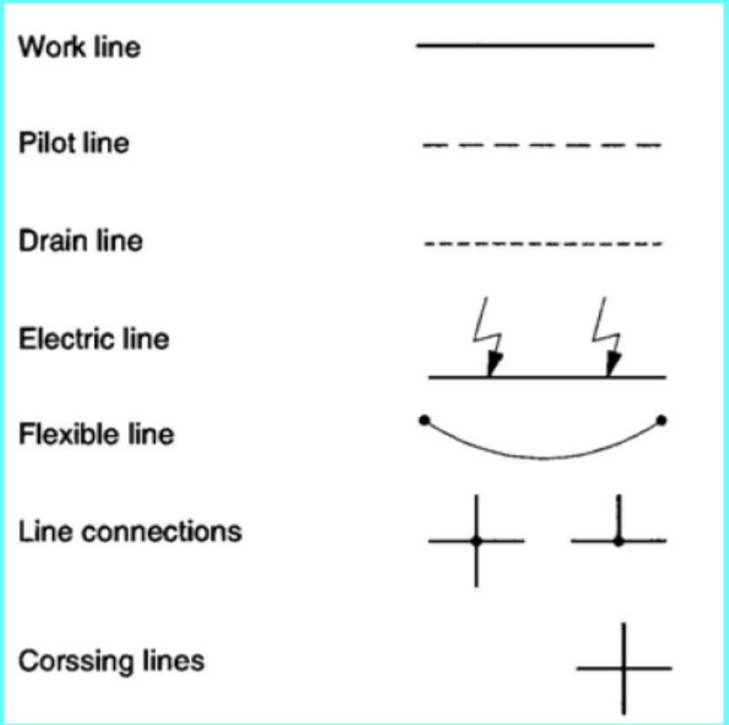
The most difficult task facing most neophyte builder is mastery of a new language. New and sometimes familiar words and symbols are needed to describe the ingredients that go into a "recipe for success"

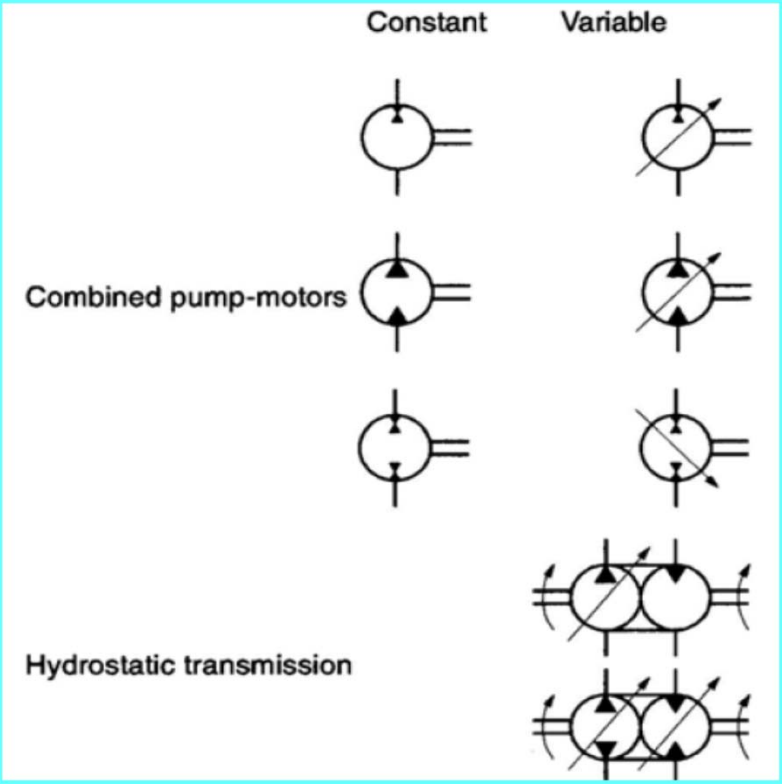
Words like . . .

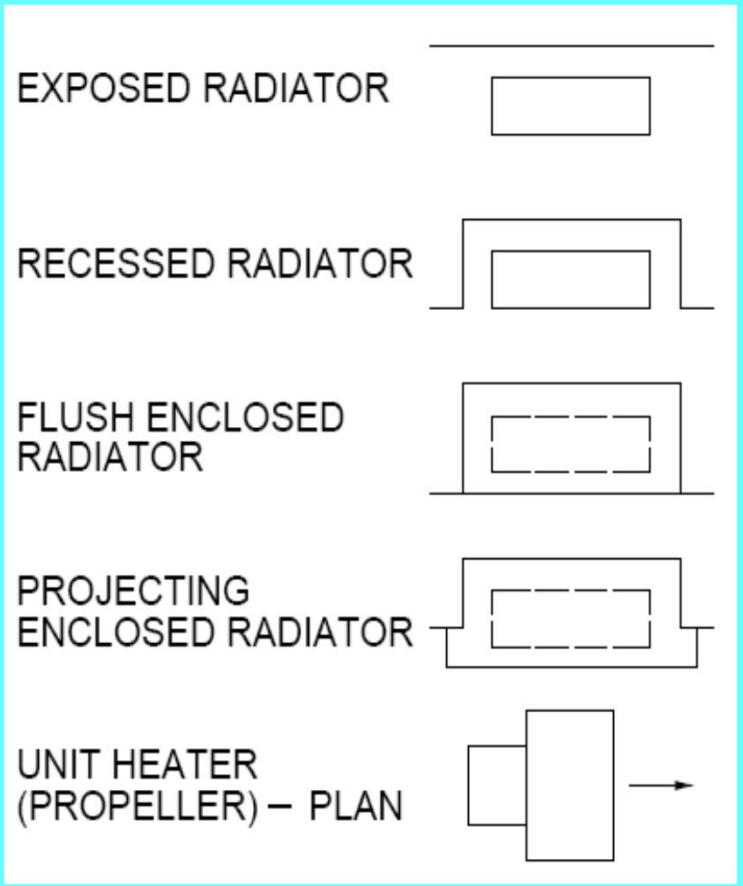
Volt	Contactor	Switch	Relay
Amp	BNC	Amplifier	Diode
Watt	Coax	Capacitor	D-Sub
Joule	Dipole	Resistor	Wavelength
Ohm	BALUN	Inductor	
Henry	Monopole	LED	
Milliohm	UHF	Gas Discharge	
Voltmeter	PM	Rectifier	
Ammeter	SWR	Shield	
Brush	Attenuation	Electrostatic	
Commutator	Slip Ring	Electromagnetic	

Every discipline needs a graphical and spoken language to convey meaning the various customers and practitioners of the craft:

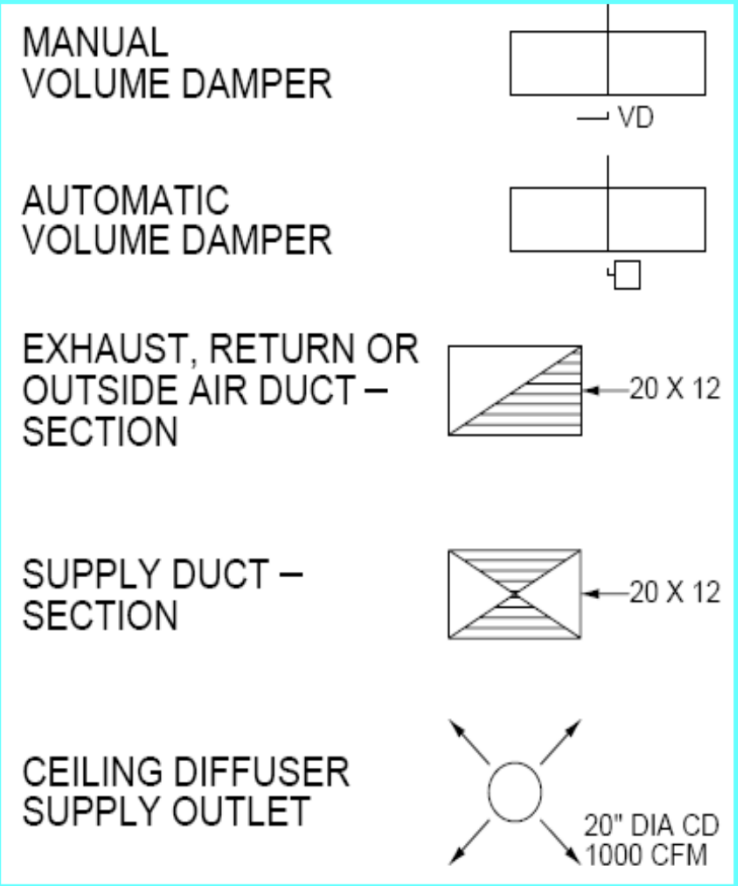
Hydraulics . . .






EXPOSED RADIATOR
RECESSED RADIATOR
FLUSH ENCLOSED RADIATOR
PROJECTING ENCLOSED RADIATOR
UNIT HEATER (PROPELLER) – PLAN

HVAC . . .


MANUAL VOLUME DAMPER
VD
AUTOMATIC VOLUME DAMPER
EXHAUST, RETURN OR OUTSIDE AIR DUCT – SECTION
20 X 12
SUPPLY DUCT – SECTION
20 X 12
CEILING DIFFUSER SUPPLY OUTLET
20" DIA CD
1000 CFM

ROADS AND RELATED FEATURES

Roads on Provisional edition maps are not classified as primary, secondary, or light duty. They are all symbolized as light duty roads.

Primary highway	
Secondary highway	
Light duty road	
Unimproved road	
Trail	
Dual highway	
Dual highway with median strip	
Road under construction	U. C.
Underpass; overpass	
Bridge	
Drawbridge	
Tunnel	

Topographical . . .

BUILDINGS AND RELATED FEATURES

Building	
School; church	
Built-up Area	
Racetrack	
Airport	
Landing strip	
Well (other than water); windmill	
Tanks	
Covered reservoir	
Gaging station	
Landmark object (feature as labeled)	
Campground; picnic area	
Cemetery: small; large	Cem

Railroad Braking . . .

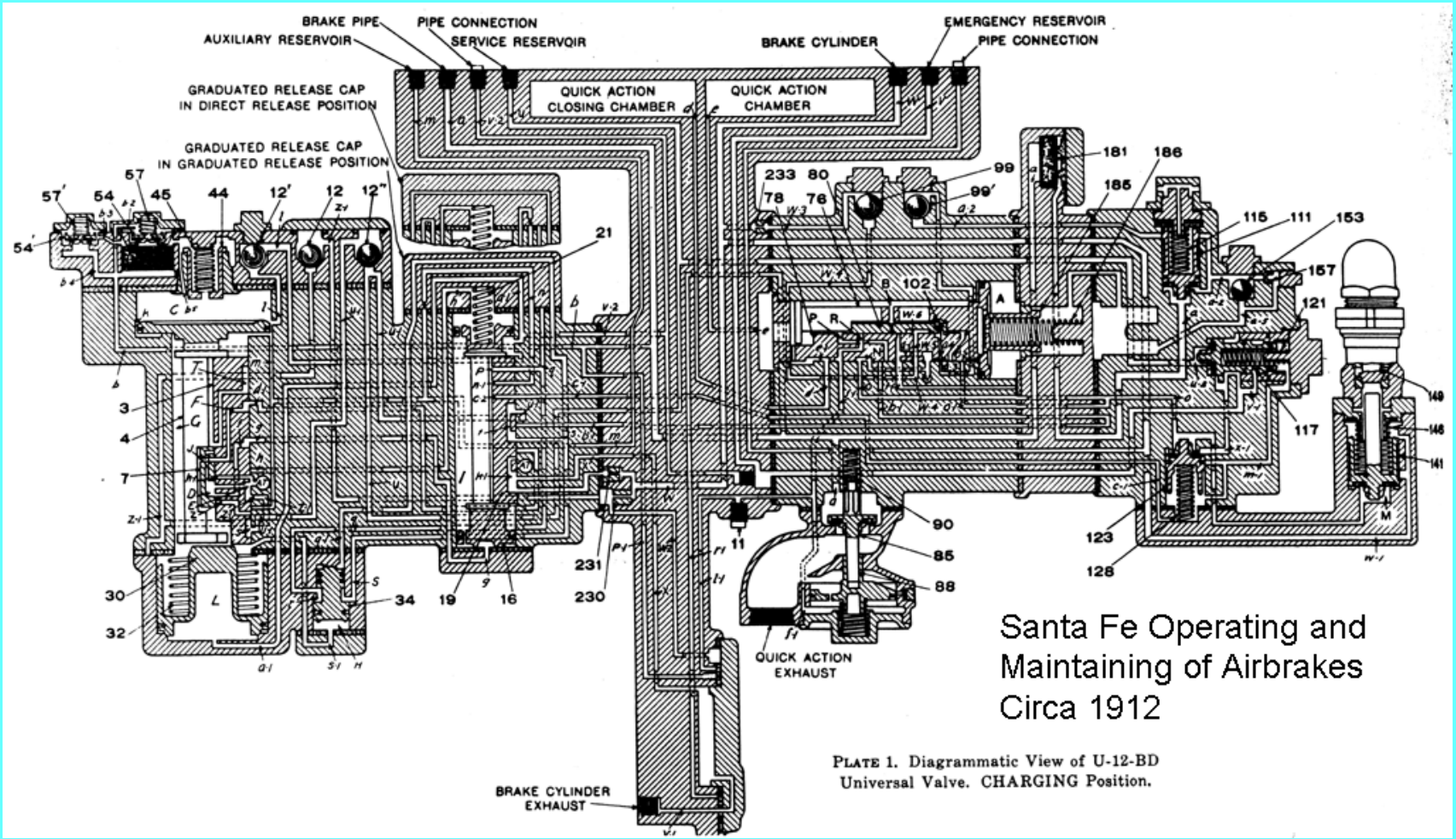
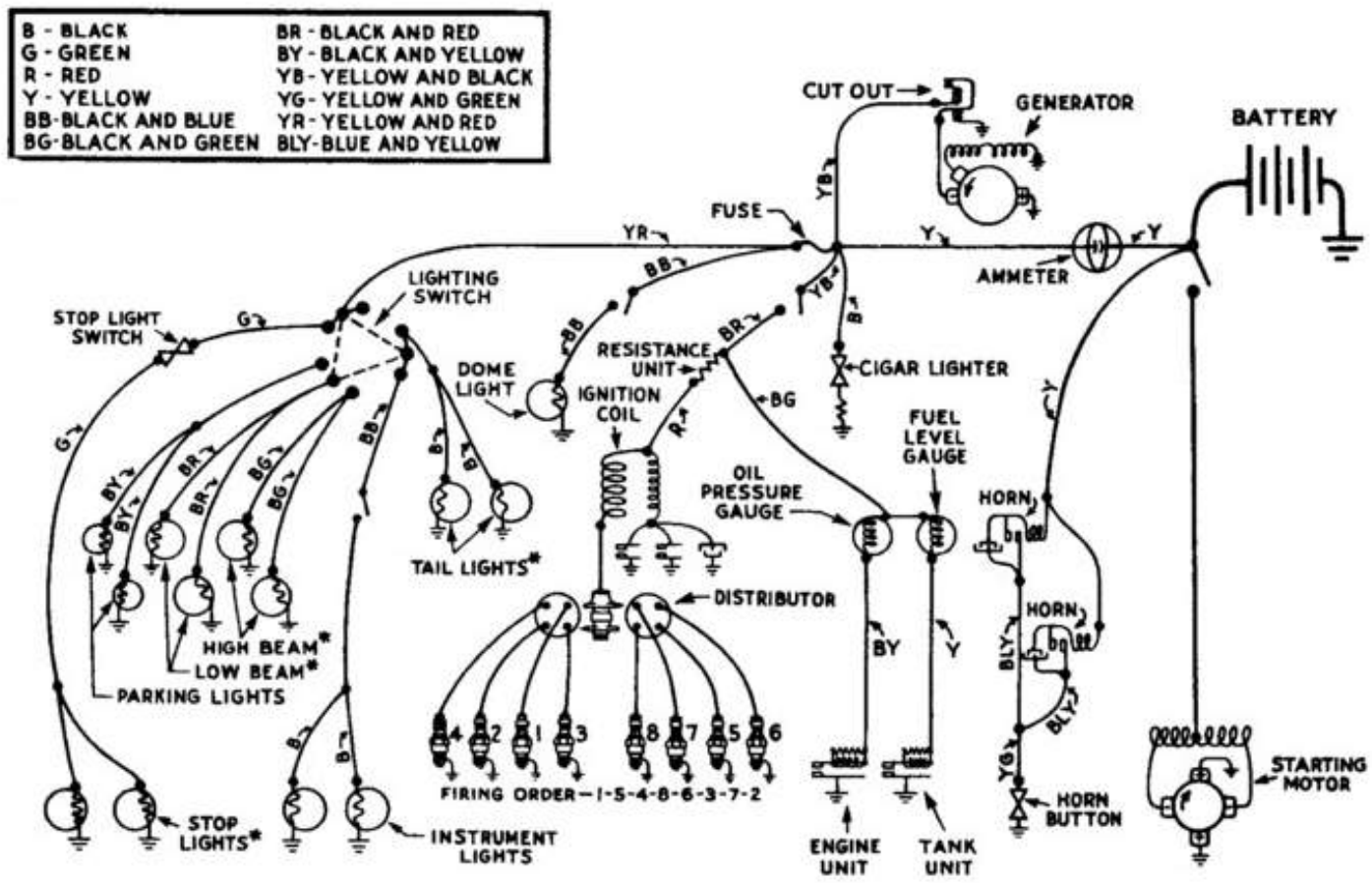


PLATE 1. Diagrammatic View of U-12-BD Universal Valve. CHARGING Position.



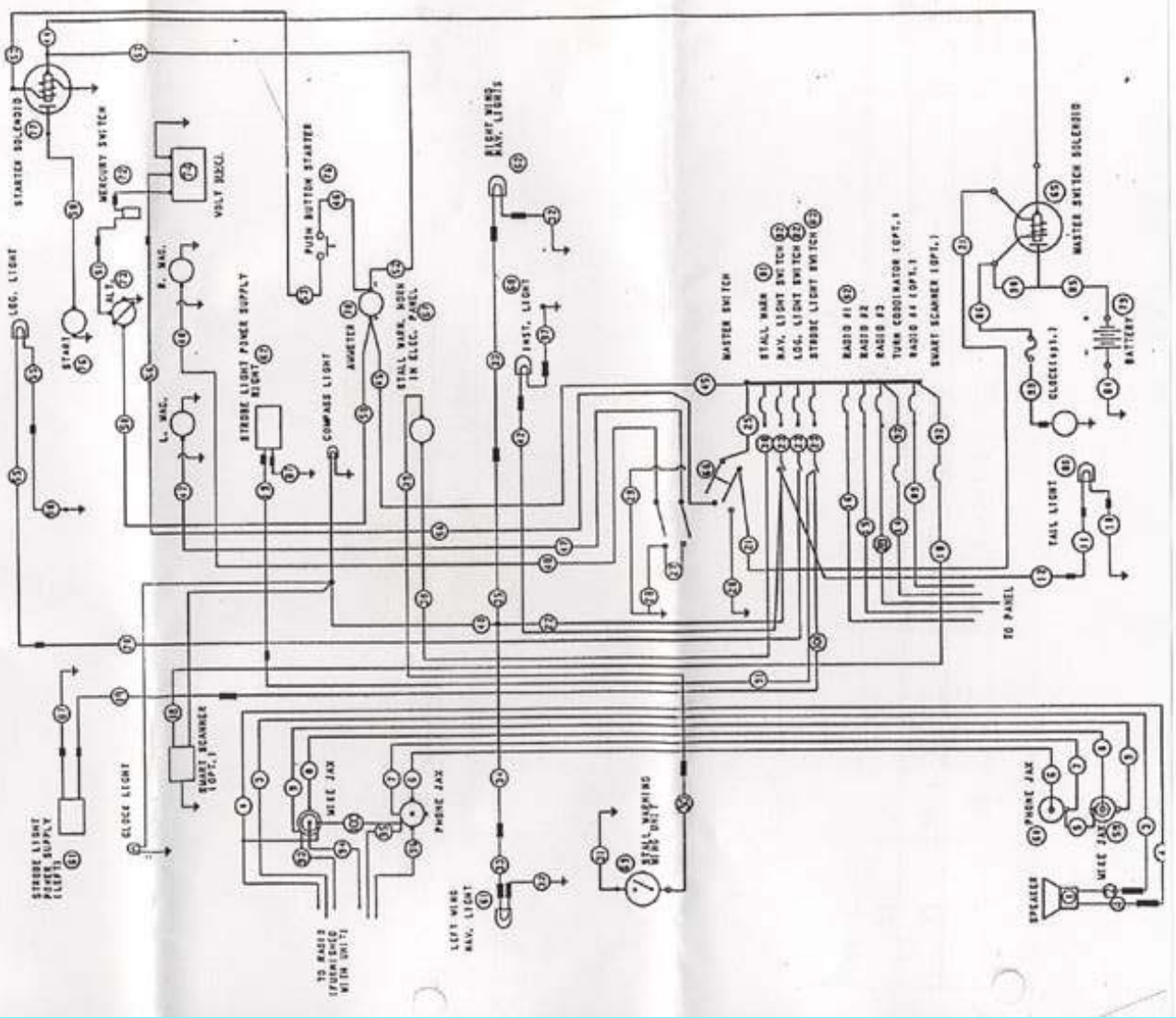
*Tail light and stop light bulbs as well as head lamp bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

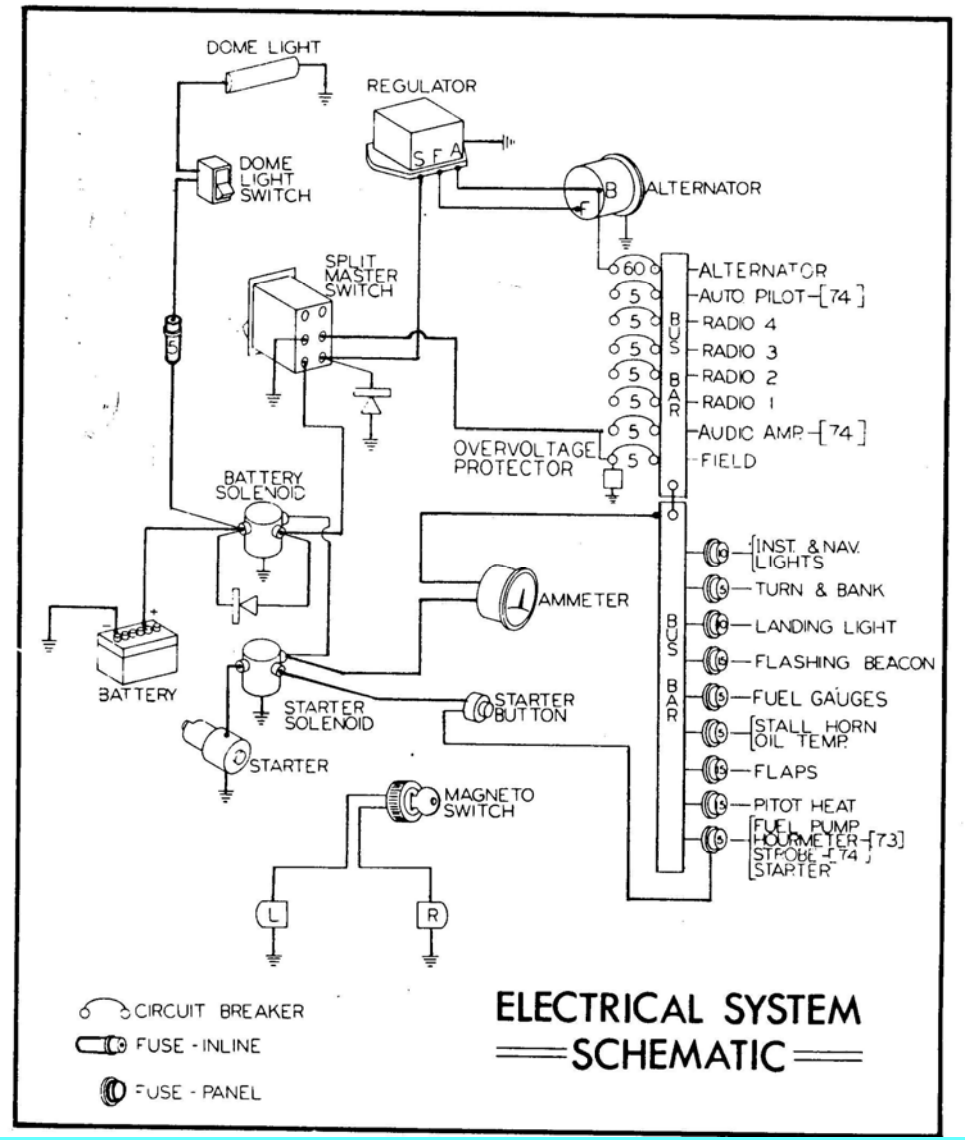
Wiring Diagram for Ford 1936 Models

AMERICAN CHAMPION AIRCRAFT CORPORATION
Rochester, WI 53167

CITABRIA (7ECA, 7GCAA, 7GCBC) PARTS MANUAL

FIGURE 14
ELECTRICAL EQUIPMENT AND SCHEMATIC



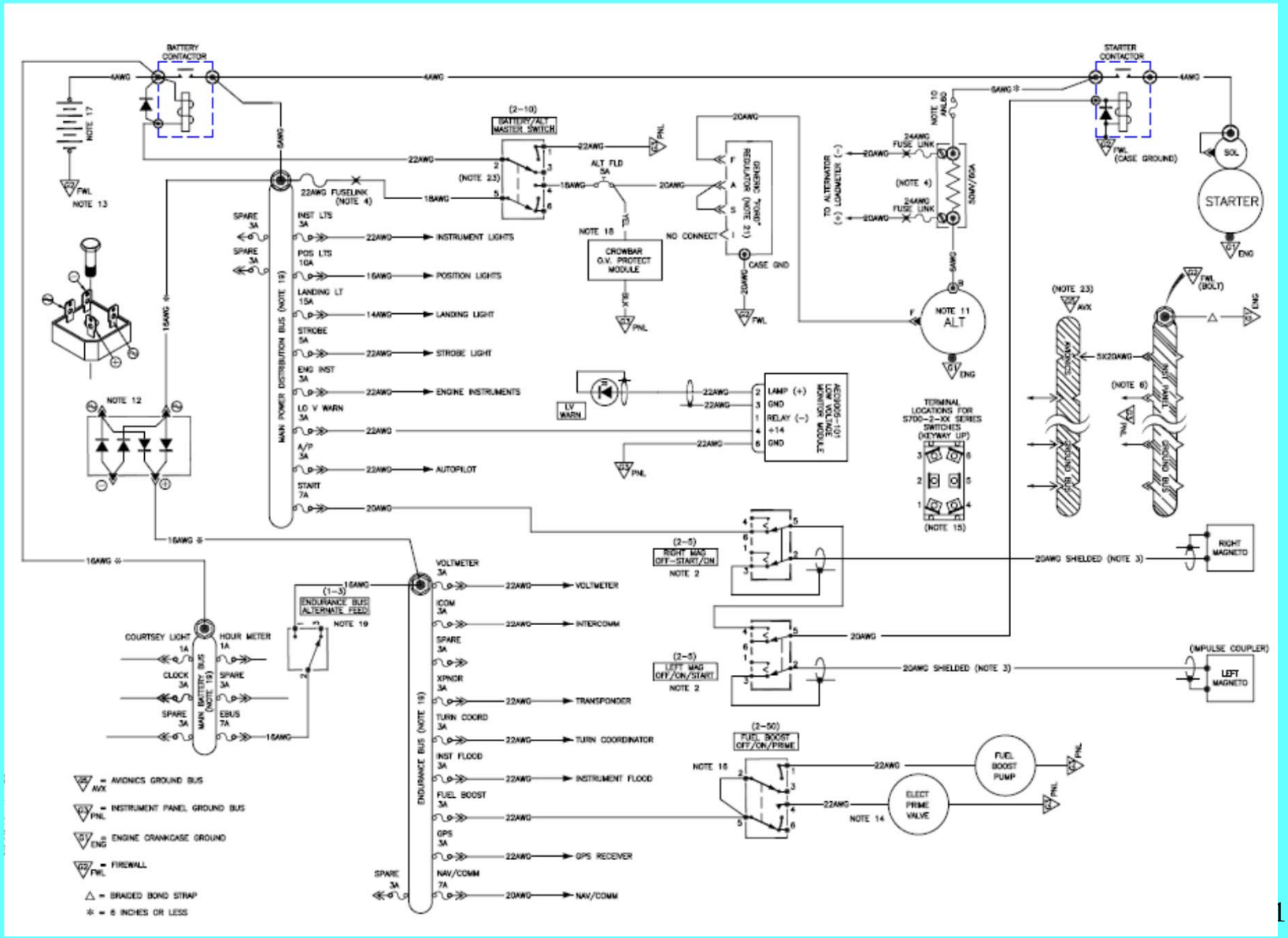


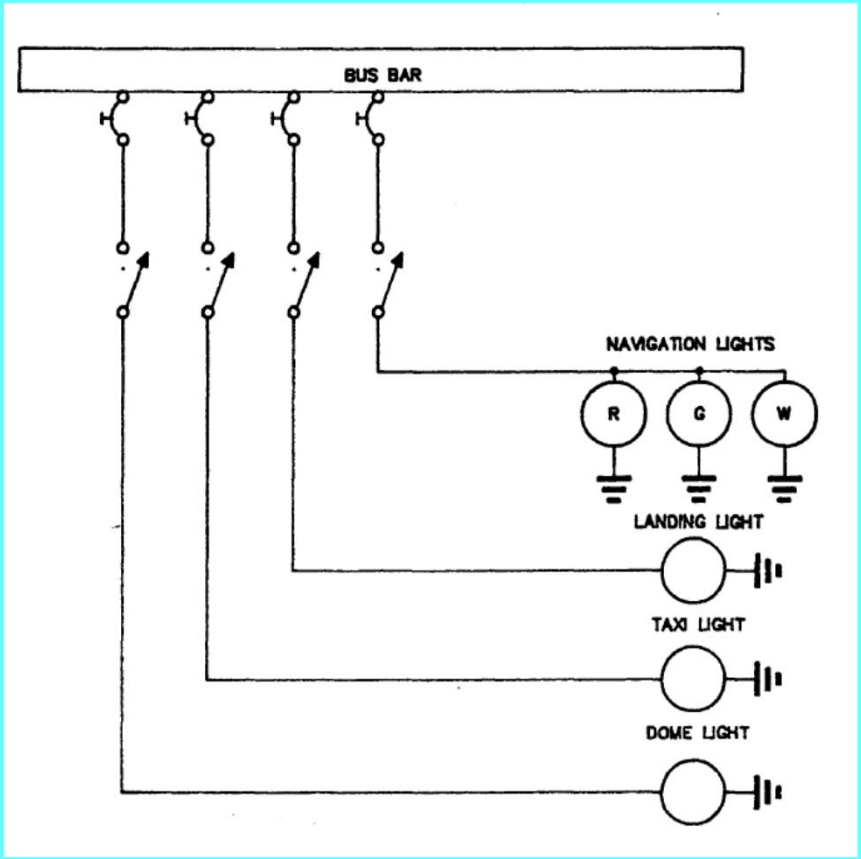
- **This is a power distribution diagram from a single engine aircraft pilot's operating handbook circa 1965.**
- **Note the LACK of an avionics master switch. It took us a couple more years to get "concerned" about that.**
- **Also, check out the "overvoltage protector" on the field breaker. It shunts right to ground. This must be some form of "crowbar ov protection". More on this later . . .**

Generating a Wirebook for your Project . . .

- **Unless you're already in possession of and proficient with some form of computer aided drawing/drafting system, stay with #2 pencil, pink eraser and spiral bound notebook for development and fabrication.**
- **Break the documentation down into page per system tasks.**

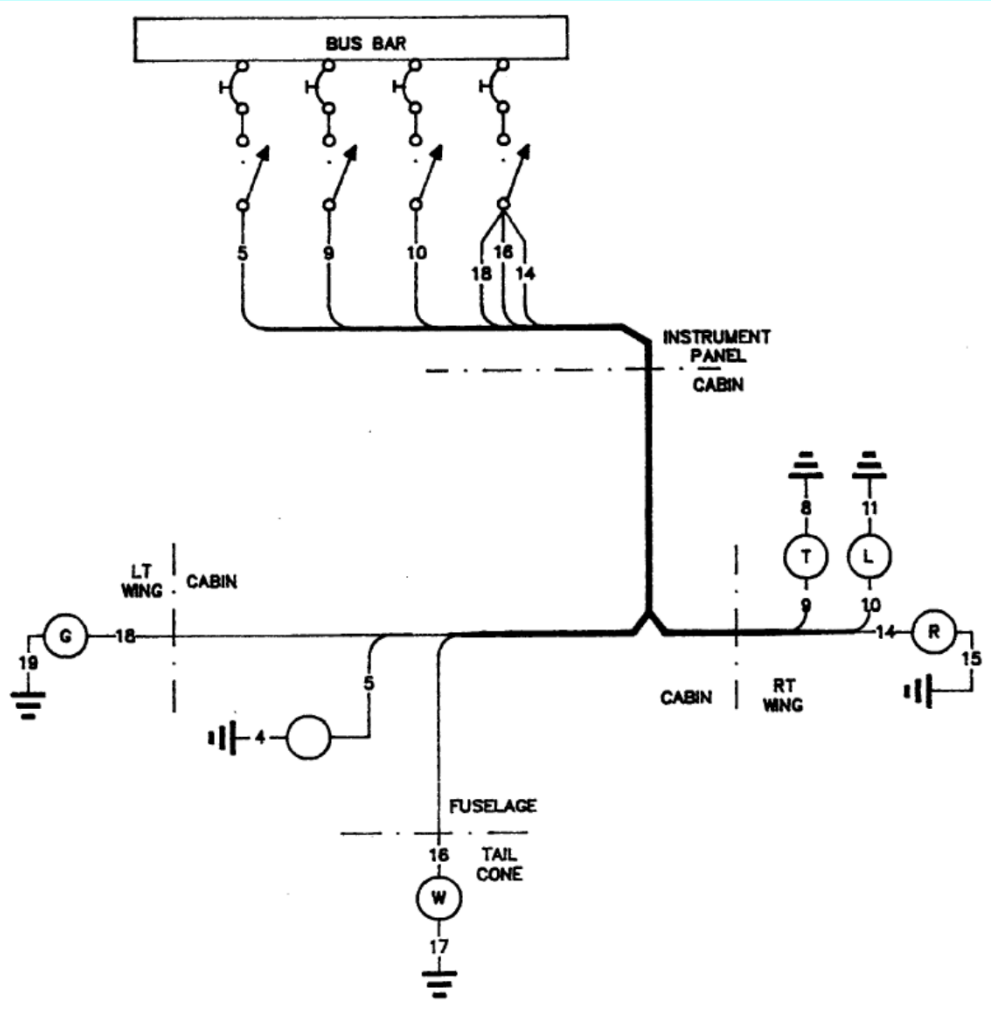
  - **Start with a Power Distribution Diagram (This defines your selected architecture) and a . . .**
  - **Load Analysis (This document sets the size of wire and circuit protection and helps you size battery and alternator requirements. It also establishes the numbers for "Plan B" events (tolerable failures).**


BATTERY CONTACTOR
STARTER CONTACTOR
STARTER
SOL
NOTE 17
NOTE 13
FWL
(CASE GROUND)
(2-10)
BATTERY/ALT MASTER SWITCH
(NOTE 23)
ALT FLD 5A
NOTE 18
CROWBAR O.V. PROTECT MODULE
NO CONNECT
CASE GND
REGULATOR TEMP (NOTE 21)
NOTE 10
ANL60
24AWG FUSE LINK
(NOTE 4)
50MV/60A
TO ALTERNATOR (-) LOADMETER (+)
NOTE 11
ALT
ENG
22AWG FUSELINK (NOTE 4)
MAIN POWER DISTRIBUTION BUS (NOTE 19)
SPARE 3A
INST LTS 3A
INSTRUMENT LIGHTS
POS LTS 10A
POSITION LIGHTS
LANDING LT 15A
LANDING LIGHT
STROBE 5A
STROBE LIGHT
ENG INST 3A
ENGINE INSTRUMENTS
LO V WARN 3A
A/P 3A
AUTOPILOT
START 7A
LV WARN
LAMP (+)
GND
RELAY (-)
+14
GND
LOW VOLTAGE ALT MONITOR MODULE (10-28VDC)
TERMINAL LOCATIONS FOR 5700-2-XX SERIES SWITCHES (KEYWAY UP)
(NOTE 15)
NOTE 12
(NOTE 23)
AVX
FWL (BOLT)
5X20AWG
(NOTE 6)
MULTI GROUND BUS
(2-5)
RIGHT MAG OFF-START/ON
NOTE 2
20AWG SHIELDED (NOTE 3)
RIGHT MAGNETO
(2-5)
LEFT MAG OFF/ON/START
NOTE 2
(IMPULSE COUPLER)
LEFT MAGNETO
(1-3)
ENDURANCE BUS ALTERNATE FEED
NOTE 19
VOLTMETER 3A
COM 3A
INTERCOMM
SPARE 3A
XPNDR 3A
TRANSPONDER
TURN COORD 3A
TURN COORDINATOR
INST FLOOD 3A
INSTRUMENT FLOOD
FUEL BOOST 3A
GPS 3A
GPS RECEIVER
NAV/COMM 7A
NAV/COMM
ENDURANCE BUS (NOTE 19)
MAIN BATTERY BUS (NOTE 19)
COURTSEY LIGHT 1A
HOUR METER 1A
CLOCK 3A
SPARE 3A
EBUS 7A
(2-50)
FUEL BOOST OFF/ON/PRIME
NOTE 16
FUEL BOOST PUMP
ELECT PRIME VALVE
NOTE 14
= AVIONICS GROUND BUS
= INSTRUMENT PANEL GROUND BUS
= ENGINE CRANKCASE GROUND
= FIREWALL
= BRAIDED BOND STRAP
= 6 INCHES OR LESS



Example of a schematic. While functionally accurate it offers no data specific to wiring segments, joining technology, etc.

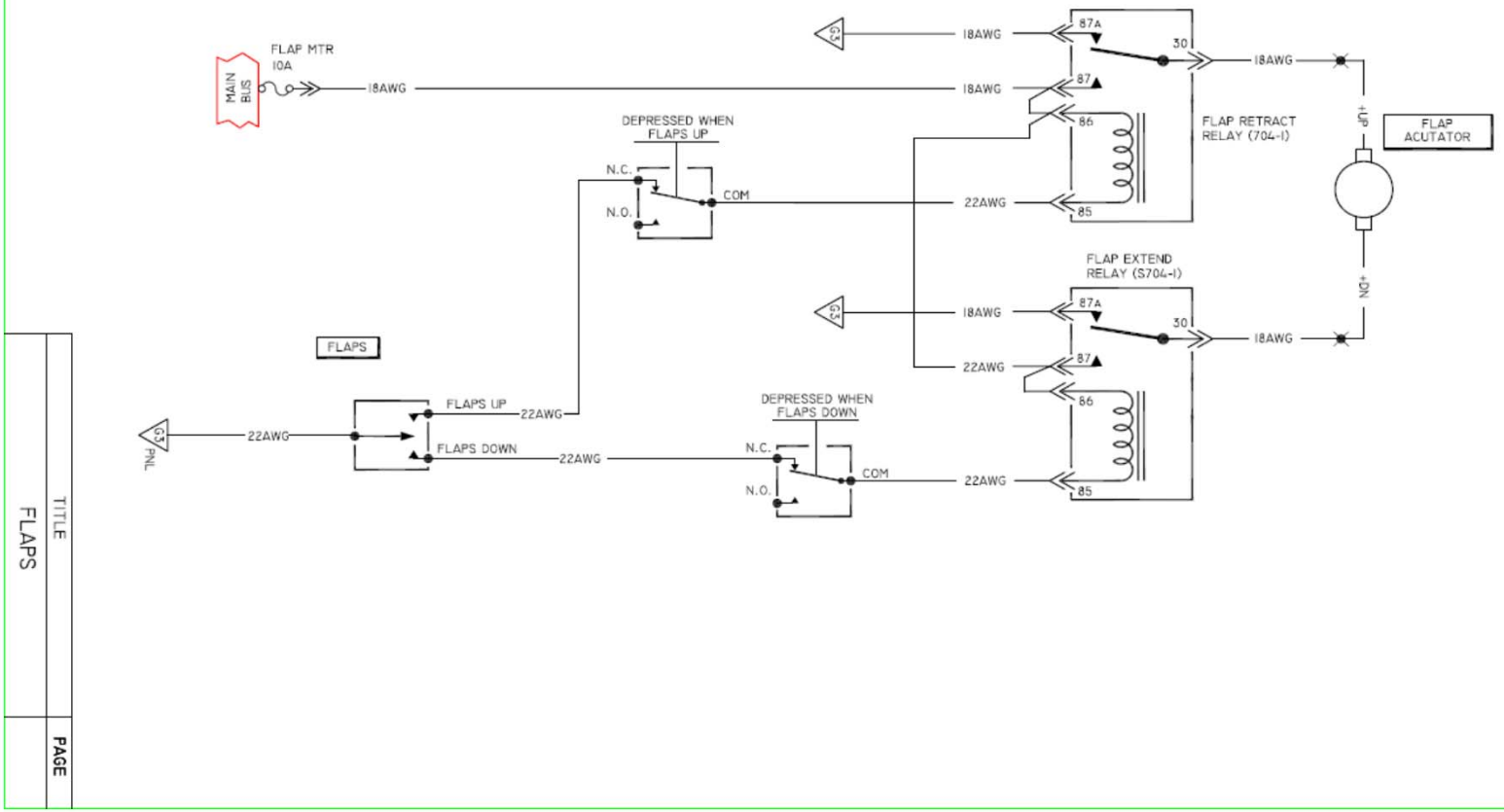
NOT RECOMMENDED

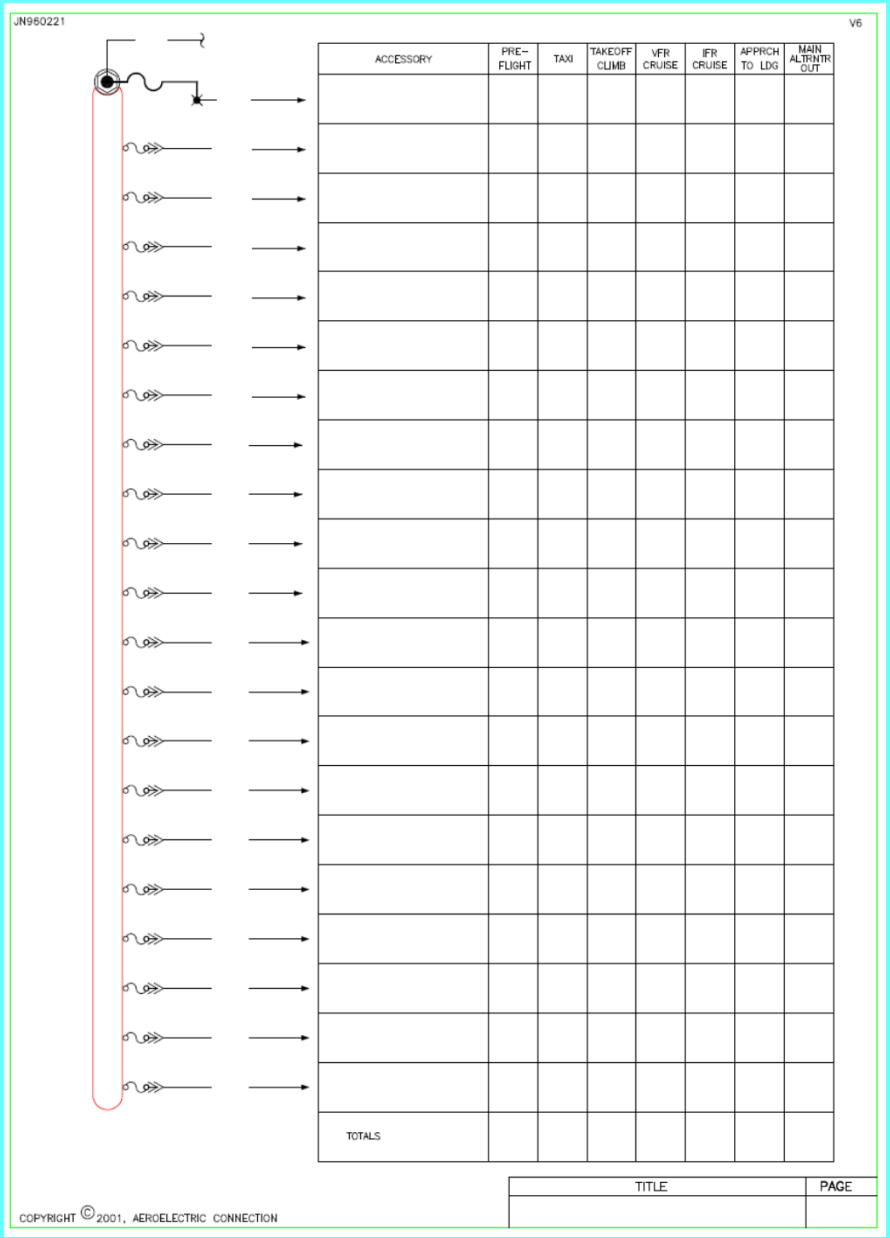


Wiring Diagram is similar to a schematic except that it adds wire bundling information and some hint as to where components are installed on the aircraft.

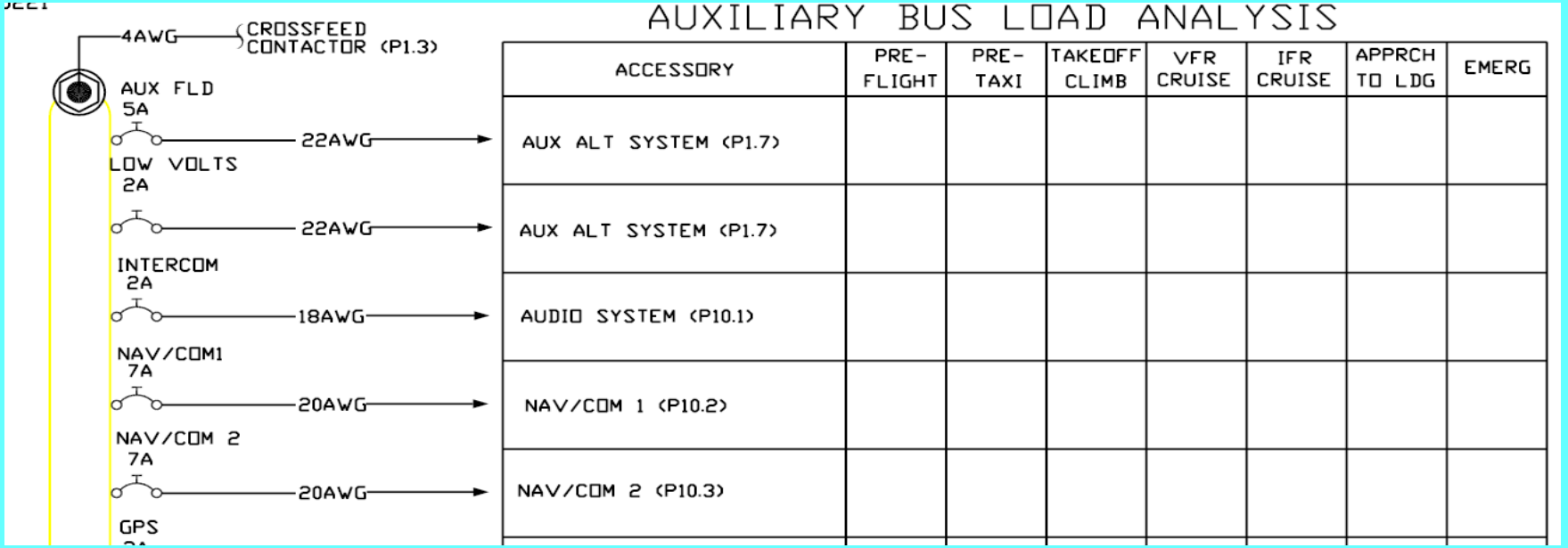
NOT RECOMMENDED

Page per system (PPS) wirebook drawing. Each wire segment is defined along with gage, identification, joining technology, etc





- **A load analysis is done on a bus-by-bus basis . . . you need a page like this for each bus.**
- **The average OBAM aircraft might have a Main Bus, and E-Bus and a Battery Bus.**
- **You need to acquire published or measured figures on the current draw for each accessory you intend to install.**
- **These pages assist you in sizing alternators, batteries, and crafting hardware and Plan-B procedures for alternator-out operations.**
- **These pages are also an index for the rest of your wirebook.**



AUXILIARY BUS LOAD ANALYSIS

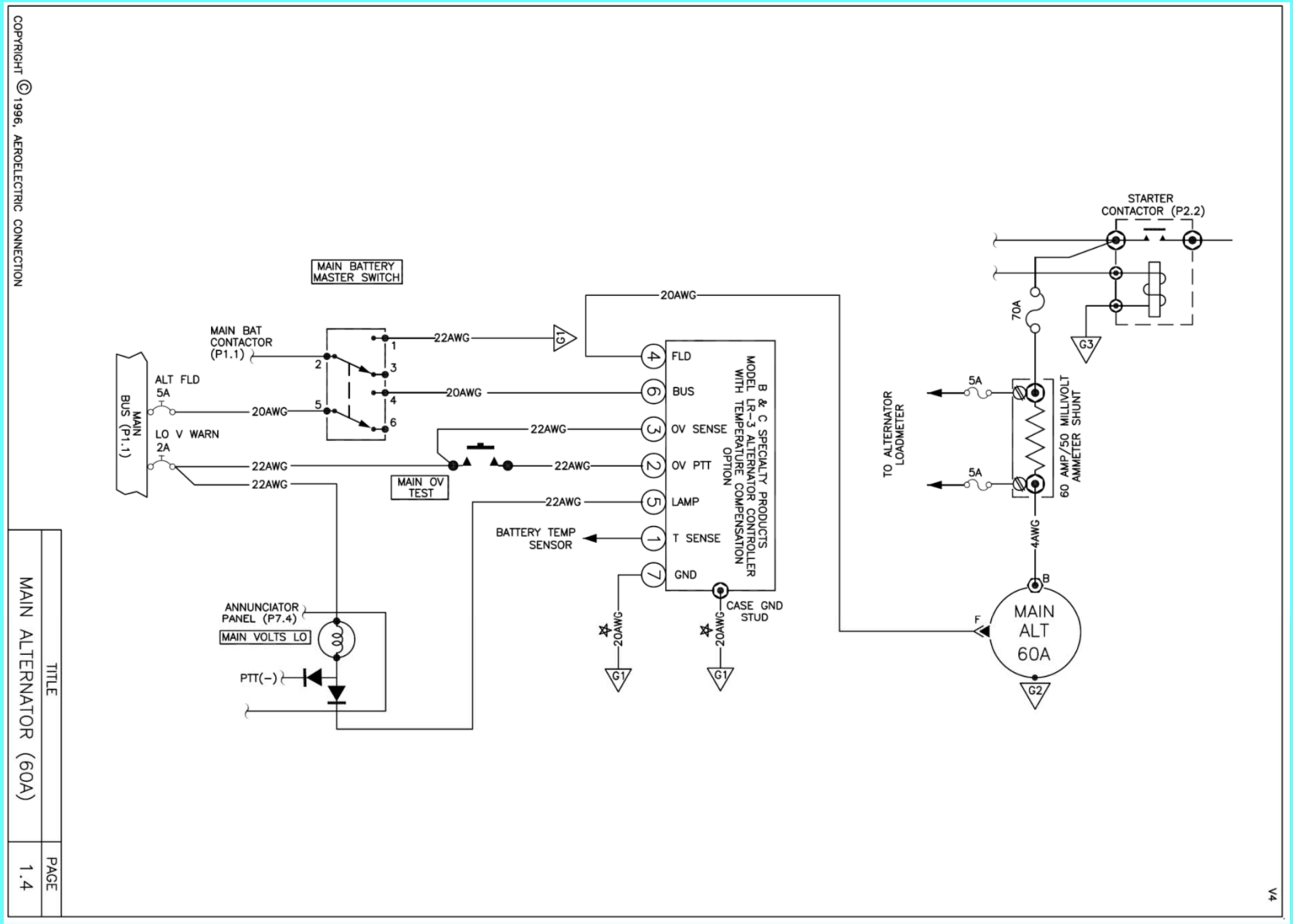
ACCESSORY	PRE-FLIGHT	PRE-TAXI	TAKEOFF CLIMB	VFR CRUISE	IFR CRUISE	APPRCH TO LDG	EMERG
AUX ALT SYSTEM (P1.7)							
AUX ALT SYSTEM (P1.7)							
AUDIO SYSTEM (P10.1)							
NAV/COM 1 (P10.2)							
NAV/COM 2 (P10.3)							

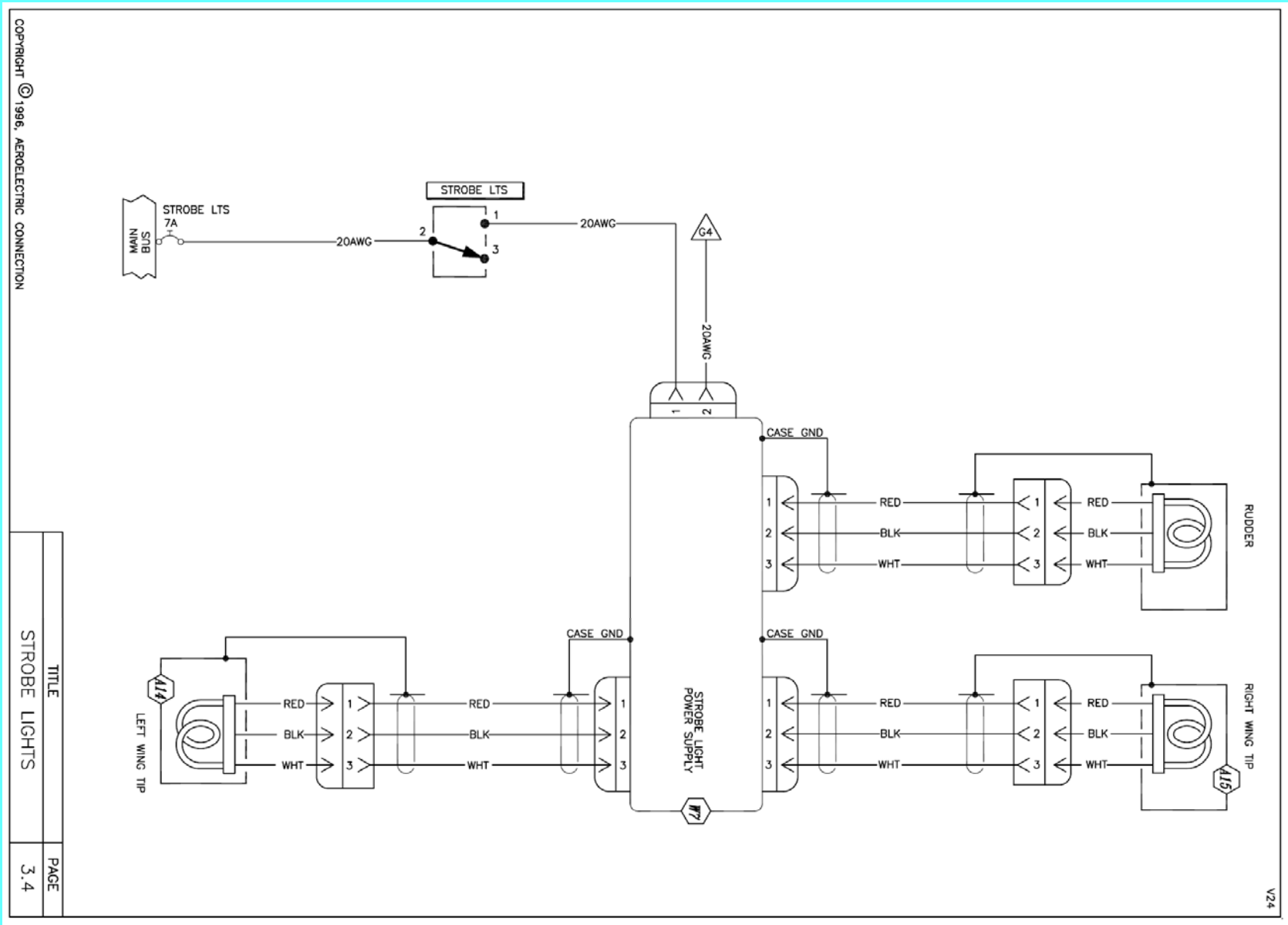
The load analysis guides you through a complete evaluation and planning of your electrical system:

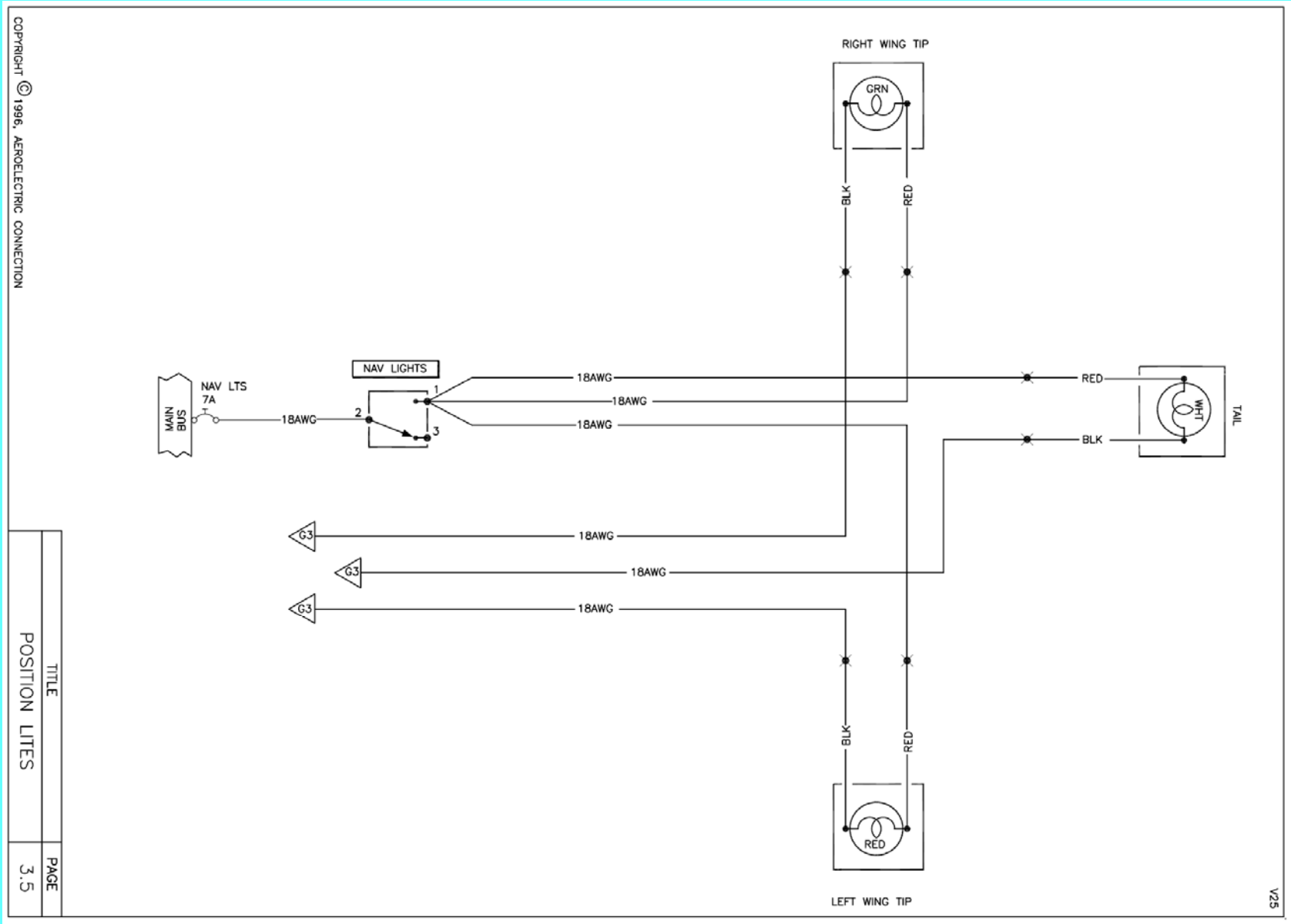
- **What bus powers the accessory?**
- **Size of protection and feed Wire.**
- **When is accessory needed and what are the power requirements for that condition?**
- **This page can also be an index for where to find the various detail drawings.**

Break the system down into chapters. A suggestion . . .

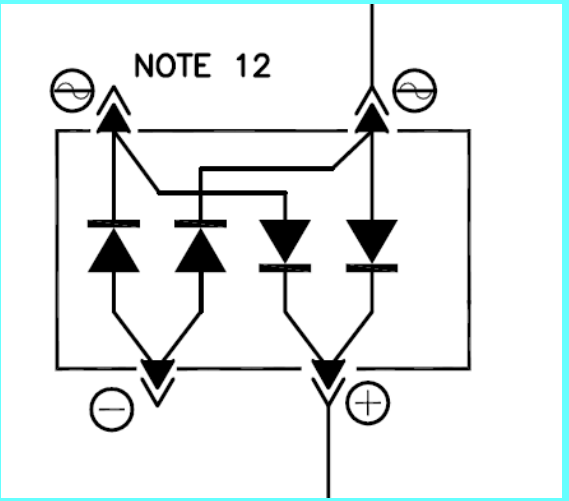
- **0.0 Load analysis and Reference Designators**
- **1.0 D.C. Power Generation and Distribution**
- **2.0 Engine**
- **3.0 Lighting**
- **4.0 Landing Gear**
- **5.0 Flight Instruments**
- **6.0 Warning and Annunciation**
- **7.0 Avionics**


COPYRIGHT © 1996, AEROELECTRIC CONNECTION
MAIN BATTERY MASTER SWITCH
MAIN BAT CONTACTOR (P1.1)
ALT FLD 5A
LO V WARN 2A
MAIN BUS (P1.1)
20AWG
22AWG
MAIN OV TEST
ANNUNCIATOR PANEL (P7.4)
MAIN VOLTS LO
PTT(-)
B & C SPECIALTY PRODUCTS MODEL LR-3 ALTERNATOR CONTROLLER WITH TEMPERATURE COMPENSATION OPTION
FLD
BUS
OV SENSE
OV PTT
LAMP
T SENSE
GND
BATTERY TEMP SENSOR
CASE GND STUD
G1
G2
G3
STARTER CONTACTOR (P2.2)
70A
TO ALTERNATOR LOADMETER
5A
60 AMP/50 MILLIVOLT AMMETER SHUNT
4AWG
MAIN ALT 60A
TITLE
MAIN ALTERNATOR (60A)
PAGE
1.4
V4


COPYRIGHT © 1996, AERO ELECTRIC CONNECTION
MAIN BUS
STROBE LTS
7A
20AWG
STROBE LTS
2
1
3
20AWG
G4
20AWG
1
2
CASE GND
STROBE LIGHT POWER SUPPLY
#7
1
2
3
RED
BLK
WHT
RUDDER
CASE GND
CASE GND
#14
LEFT WING TIP
#15
RIGHT WING TIP
TITLE
STROBE LIGHTS
PAGE
3.4
V24


COPYRIGHT © 1996, AERO ELECTRIC CONNECTION
RIGHT WING TIP
GRN
BLK
RED
NAV LTS
7A
MAIN BUS
18AWG
NAV LIGHTS
1
2
3
18AWG
18AWG
18AWG
RED
WHT
TAIL
BLK
G3
18AWG
G3
18AWG
G3
18AWG
BLK
RED
RED
LEFT WING TIP
V25
TITLE
POSITION LITES
PAGE
3.5

- **Both of these devices are full-wave bridge rectifiers**
- **The selenium bridge is circa 1930-1960 while the silicon bridge came along later . . .**
- **Both have the same schematic and similar electrical characteristics.**
- **The silicon device is much smaller, more efficient and is easily built for high voltage service.**



- **You almost can't have a silicon diode rectifier that is "too big"**

- **Electrically, a diode rated at perhaps 0.5 Amp and 50 Volts would be electrically appropriate for spike suppression on a contactor coil.**

- **The diode on the left is a 3 Amp, 200 Volt device chosen for mechanical robustness and ease of installation.**