\[ V_{SC} = 0 \quad \text{Blocks} \]

\[ V_{SC} = V_S \geq 2.2 \text{V} \quad \text{Conduct} \]
\[
\begin{aligned}
\frac{x}{5} &= \frac{15}{-5} \\
5x &= 25 \\
10x &= 50
\end{aligned}
\]
Getting ATP:

- Available in ECE dept labs on campus
- Request a license through http://www.emtp.org
  » Once you have confirmation they will send you instructions for downloading from a secure server
  » Or, once verified, I can give you access to a zip file with relevant files

Installing ATP:

- Minimum to Download
  » Mingw version of ATP
  » ATPDraw -- latest version or latest patch
    - Presently Atpdrawing57.zip
  » PlotXY
- Option: ATP Easy Installer
  » Download from secure sites in Japan
Getting ATP:

- Available in ECE dept labs on campus
- Request a license through http://www.emtp.org
  » Once you have confirmation they will send you instructions for downloading from a secure server
  » Or, once verified, I can give you access to a zip file with relevant files

Installing ATP:

- Minimum to Download
  » Mingw version of ATP
  » ATPDraw -- latest version or latest patch
    - Presently Attdraw57.zip
  » PlotXY
- Option: ATP Easy Installer
  » Download from secure sites in Japan
Installing ATPDraw

- Installation is fairly easy
- Default installation path "Program Files" to avoid this
- The space in the file name can create problems running ATP from ATPDraw
  - Install it somewhere else. I normally install in "C:\tools\prog\ATPDraw"
- Install program may create shortcut in the start menu, but not very cleanly

Running ATP from ATPDraw

- Still need a copy of ATP
- Licensed users can get other versions
- Follow installation directions for yours
- ATPDraw calls ATP from a DOS Batch file (extension *.bat)
  - For example, I call it "RUNATP.BAT"
- Passes full path to file when calls ATP
Sample Batch File

- The following batch file is for Ming32 ATP
  
  ```
  SET GNUDIR=C:\tools\prog\atp\n
  SET PATH=C:\tools\prog\atp;"%PATH%"

  tpbig both %1 s -r
  ```

  The first line defines variable GNUDIR
  
  » Different ATP versions use different name
  » Sets program working environment
  » The final "\" is important

Sample Batch File (cont.)

- Second line adds executable to your search path (not needed if set this at boot time)
- The next line calls ATP itself
  
  ```
  tpbig both %1 s -R
  ```

  » "both" tells program to write error messages to screen and to file (useful for debugging)
  » Could also set "disk" to only do disk file or leave blank for no message
  » First "%1" is input data file from ATPDraw
Sample Batch File (cont.)

- The "s" is to create appropriate output file.
- "-R" tells ATP overwrite existing output file if one exists
- This bat file will let you run ATP, and all of the support program (line constants etc)

Editing "startup"

- ATP reads a file called "startup"
  - Resides in same directory as tpbig
  - Sets variables for the program
- A few suggested changes from default
  - Change PL4 file format to work with PlotXY
    - NOBLAN set to 0 {ignore blank lines}
    - NEWPL4 set to 2 {won't work with Analyzer}
Setting Up ATPDraw

- Open up ATPDraw
- Select: "Tools" pull down menu
- Select: "Options..."
- Choose "Preferences" tab
  » You select a text editor, or use Notepad (default)
  » "ATP" is where you set path to your batch file
- Armafit: which we won't cover in this course

ATPDraw "Preferences"
Further Settings

- The "Files&Folders" tab settings are ok
- However, you do want changes in the View/ATP tab
  - Select "Edit settings" tab
  - You may want to change some of the default settings. However, you can change any of these for a specific data file

Simulation Settings

- Default time step (deltaT) is very small
- Default run time short
- Xopt and Copt ok
- Select "Power Frequency"
  - Reset to 60 Hz from 50Hz
  - Can mess up some sources
Saving New Settings

- The “Save” or “Apply” buttons aren’t sufficient to permanently save change
- Also choose: Tools --> Save Options
- These are all saved into a file called ATPDraw.ini
  - Typically saved in user’s settings
  - Could put copy in the directory with ATPDraw.exe

Example 1

- Try to run example case to make sure program installed and set up correctly
ATP Menu

- A new pulldown menu is now available at the top of the window, called "ATP"

ATP Menu

- Settings is changes deltaT etc. for a given case
- "Make File As" generates ATP data file from drawing
- Run ATP calls your bat file
- Each "Edit" calls text editor
- Make Names, makes node names for drawing
UI

Edit Commands

- Allows you to set additional commands
- Run other ATP versions
  - On Current ATP drawing
  - On Selected File
- Run plot programs
  - On Current PL4
- Use "Update" to set

UI

Saving New Settings

- The "Update" buttons isn't sufficient to save for next time
- All choose: Tools --> Save Options
Running an ATP File

- Now we run the example case opened earlier
- Always a multi-step process
  - 1) Make file to create ATP data file from drawing.
    - Must do this every time you change drawing
    - Default is to place this in "ATP" subdirectory under
      ATPDraw home directory (with extension *.ATP)
    - Can edit this file with "Edit ATP-File" option (not saved
to drawing file)
  - 2) Run your case
  - 3) Call plotting program

Running an ATP File

- The drawing file saved separately (save often)
- Remember to save your changes often
- Default is to save this in the "Project"
  subdirectory under ATPDraw
- Note that if want to save elsewhere, need to
  select a new home for both ADP and ATP files
  - PL4 and *.lis (or *.out depending on version) are
    written to same directory at *.ATP file
  - Need to cleanup directories periodically
Making You Own File

- Open a new drawing (from File menu or from icon)
- Can get the component menu by right clicking mouse in the drawing screen
- Each item lets you select components to create
- More later....

Transient Analysis of Control Systems (TACS)

- Introduced in EMTP in 1976
- Developed to model controls for HVdc converters (Pacific Intertie)
- Model interactions between system transients and control systems
- Each variant of EMTP has its own variant
- ATP has two: TACS and Models
What TACS can do

- Model control systems
  - Generator excitation and governor control
  - Control loops for power electronic converters
  - Firing circuit for power electronics
  - Relay algorithms

What TACS can do

- Monitor and post-process network variables
  - Analog and digital filters
  - RMS voltages and currents
  - Calculate P and Q
  - Compute motor/generator torque or flux
  - Reference frame transformations
What TACS can do

- Simulate mechanical/electromechanical
- Non-linear responses
- Create models for devices without built-in models – for example, arc resistances
- Create harmonic sources
- Variable frequency sources

TACS Relationship to Network Solution

- Control system models solved separate from network
  » Different equation formats
  » First network then TACS in each time step
  » Leads to on step time delay

Intro to ATP and ATPDraw 51 Spring 2013
Intro to ATP and ATPDraw 52 Spring 2013
General Format

- TACS design from point of view of reproducing
  Laplace domain block diagram
  » Converted to difference equations
  » Arbitrary connections of blocks
- Signal and variable names limited to 6 characters
- Can implement digital controls
- Some limited FORTRAN expressions

TACS and ATPDraw

- ATPDraw Interface for TACS
  » Not as nice as circuit interface, but much improved
- Not essentially to always draw connecting lines
  » Use the same variable names instead
  » Will generate a warning message about duplicate
    names when first run ATP file
- Several of the example cases shipped with
  ATPDraw have TACS modelling