Bridging The Gap

Investigating IBR EMT Model Documentation

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Intro

- Inverter based resources are becoming more commonplace
- More protection and studies engineers need to learn how to model these devices
- Investigating 4 different inverter manufacturers

- How well does the documentation explain EMT importing?
- How well does the documentation explain modification of behavior?
- What is done well overall?
- What is lacking?

EMT Model Prerequisites

Inverter 1:

- **Provides information on model basics such as**
  - Compiler requirements
  - Time step requirements
  - How to open and link the correct library files
  - How to use configuration files
- **Provides information on how the interface within the EMT model works**

Inverter 2:

- **Does not explain how to get the model up and running**
- **Mentions some commands required to run simulations, but does not inform on how to change them/where to change them**

Inverter 3:

- **Provides information on model basics such as**
  - Compiler requirements
  - Time step requirements
  - How to open and link the correct library files
  - How to use configuration files
- **Provides information on how the interface within the EMT model works**
- **Provides information on how to make snapshots**
- **Provides information on how to run multiple inverters**
- **Has screenshots of what the user can expect for each step**

Inverter 4:

- **Bare bones outline of the initial requirements, like compilers**
- **Some diagrams showing I/O internal to the model, but not much explanation**

EMT Model Parameters

EMT input control vs parameter file control

	Inverter 1	Inverter 2	Inverter 3	Inverter 4
EMT internal setpoints	8	8	7	10
Configuration file setpoints	~230	~31	~150	~70

EMT input controls compared

	Inverter 1	Inverter 2	Inverter 3	Inverter 4
V_ref	✓		✓	✓
F_ref			✓	✓
I_ref	✓		✓	✓
P set	✓	✓	✓	
Q set	✓	✓	✓	
V set	✓	✓		
F set		✓		
PF set	✓			
V_drop		✓		
F_drop		✓		
Mode set		✓	✓	
Start/Stop		✓		✓

Inverter 1

- **Provides a table of most customizable setpoints including:**
  - Setpoint name
  - Description
  - Units
  - Setting range
  - An example setpoint
- **Lists all setpoints in one table with small dividers between for different functions**
- **Separate from the table, functions are listed, including:**
  - Description of the function
  - A simple graphic showing the relationships of the variables
  - The name of the activation parameter

Inverter 2

- **Provides setpoints in the function section they are related to (for some functions), which include:**
  - Setpoint name
  - Description
  - Units
  - Setting range
  - A default setpoint
- **Includes the description of the function**
- **Includes diagrams, but some are low resolution**

Inverter 3

- **Provides setpoints in the function section they are related to, which include:**
  - Setpoint name
  - Description
  - A default setpoint
  - Units
- **Includes the description of the function**
- **Explains the impact of setpoints on function behavior**
- **Includes diagrams with supporting tables defining the points**

Inverter 4

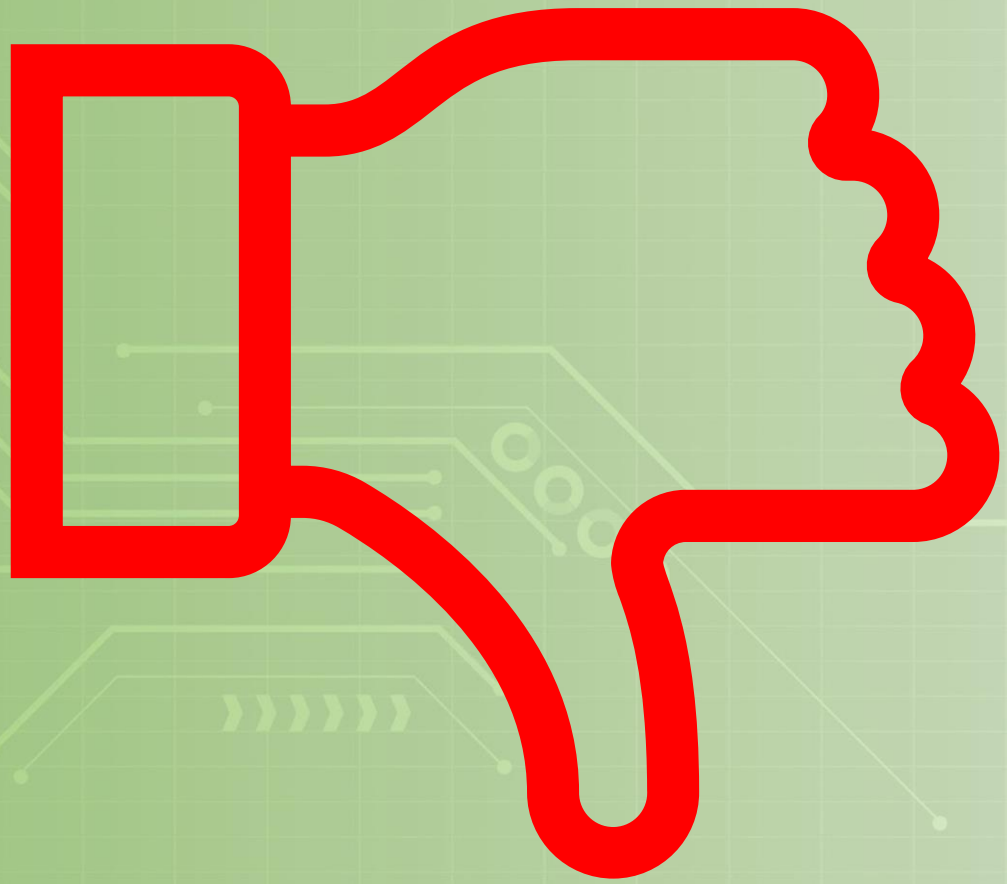
- **Provides a table of most customizable setpoints including:**
  - Setpoint name
  - Description
  - Default value
  - Ranges
- **Lists all setpoints in one table with small dividers between for different functions**
- **Separate from the table, functions are listed, including:**
  - Description of the function
  - A simple graphic showing the relationships of the variables
  - Flow charts showing the behavior of the function

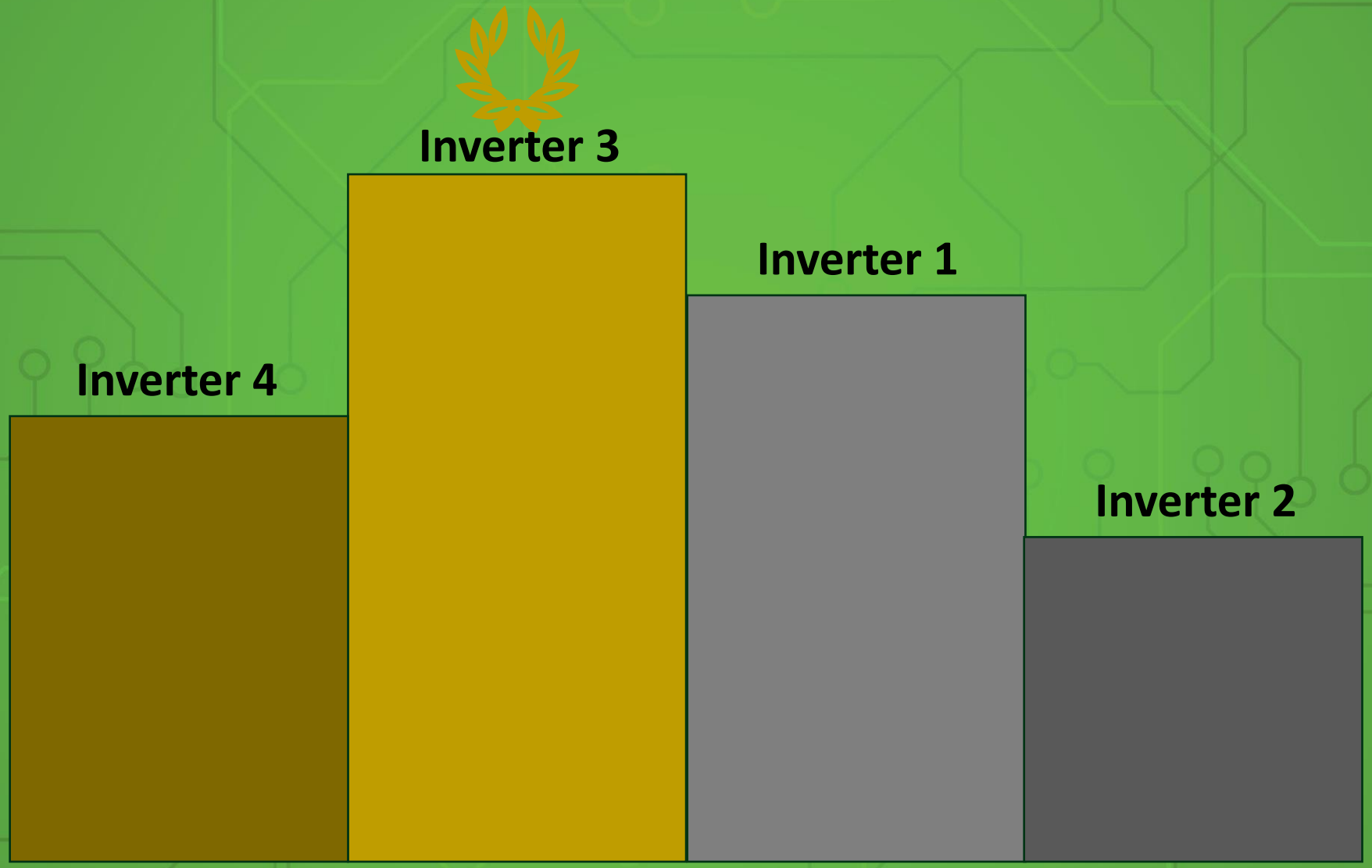
What Works?

- **Clean formatting**
- **Support for the creation of the EMT model**
- **Functions and setpoints being paired appropriately**
- **Clear graphics that explain:**
  - How a function behaves
  - Where to go in the EMT program to make changes

What Doesn’t Work?

- **Large tables of most/all setpoints**
- **Walls of text**
- **No support at all for creation of an EMT model**




Inverter 3
Inverter 1
Inverter 4
Inverter 2

Questions?