OVERVIEW

This document outlines the advanced conditional calibration, validation and diagnostic verify test plans. The conditional test plans are designed to identify setup errors, prevent damage to the TIM and/or calibration/diagnostic equipment, and provide the user with feedback to correct setup errors.

BACKGROUND

Cassini test systems include diagnostic verifies, calibration, and validation test plans for all instruments.
As a general principal, diagnostic verifies should be run before calibration and validate test plans to insure that instrument is operational before performing a calibration.
Cassini diagnostics test an instrument's operational capability. The instrument's internal components are exercised to detect hardware faults in a controlled test environment, performing various measurements to verify operation, consistency, and repeatability. These tests provide pass or fail results based on factory defined parameters of acceptance. Two modes of evaluation are expressed in the diagnostic tests list available to the user as either 'diagnose' or 'verify' in the test names. Collectively, both types of tests in the test list are referred to as 'diagnostics' on the Cassini test system with the descriptions of each as follows:
Diagnose tests check fundamental hardware functionality of an instrument's internal components. A damaged or malfunctioning component will cause the diagnose tests to fail.
Verify tests check the capability of an instrument to insure that it is compliant with performance specifications of a calibrated instrument. This includes conducting tests to gauge the repeatability of measurements using fixed instrument and I/O port setup conditions in a controlled test environment. In the case of RF instruments, the diagnostics can involve several interconnected instruments.

Calibrations quantify intrinsic source and/or measurement error in the form of deviation from standard parameters using traceable reference standards/devices. The measured deviation is used to determine error correction that compensates for this intrinsic error to ensure accuracy and traceability of the instrument. A Cassini instrument calibration consists of a pair or multiple pairs of test plans — a calibration test plan and validation test plan, that are executed in succession. A calibration test plan resets internal error correction for a specific reference parameter and performs a comparison of the instrument performance to the calibration reference/s using controlled instrument setups and parameters to ascertain the necessary error correction to attain parity. The measured error correction values are stored in temporary memory. The validation test plan performs a comparison of the instrument performance using the measured error correction values stored in temporary memory with the same calibration references, standards and equipment to quantify the residual error after calibration. The residual error is then limit checked against factory specifications. If the residual error does not meet factory performance specifications, the validation test plan is failed and the error correction is not stored to Guru because it is invalid. Note that the temporary, invalid calibration data remains active in the instrument until it is either physical removed from the test system or a system check is performed. If the residual error meets or exceeds factory performance specifications, the validation test plan is passed and the error correction is stored to Guru as the most recent, valid calibration for the instrument.
The calibration and validation test plans are designed to be executed as pairs from the Calibration Executive in order to automate the compile, execution, limit checking, and saving of calibration error correction. As a general principle, the results of a validation test plan are only valid when the validation is executed directly after a calibration has been performed using the identical setup, and reference standards/equipment as the calibration.

VERIFY TEST PLAN REVISION HISTORY

This plan verifies the RI8595B power amp. Note that it requires the 30 dB high-power attenuator.
Since diagnostics do not require a calibration kit definition, a nominal value for the attenuator is used.

10/17/17 - Created from the 'A' plan - DM

10/18/17 - Changed the set power from 35 to 32
because 35 dBm plus high amp gain puts us
in the beginning of compression. - RB&DM

06/13/18 - Updated the Set PAttenuator value
from 30.3 to 30.8. This average is a more accurate
representation of the average attenuator value
across the frequency band.
Rolled the revision number of the testplan
from 1.2 to 1.3. - DM

6/18/19 - Added RFMeasure 'load' and 'noise' buttons to reduce mismatch ripple. Re-titled a test section. Changed the PAttenuator to 30.6 - RB

01/19/23 - Changed to work with an updated fixture
definition that includes a button for the source output2:
'pwr amp' or 'no conn'. Setting it to 'pwr amp' eliminates
the need to manually calculate the source power.
It also enforces the software restrictions on source power
to avoid overcurrenting the testhead.
Note that this plan will flag an error if run
with the old fixture definition. - DM

01/20/23 - Added a 'max power' section at a customer's request. Changed to work with a new fixture def that includes a button for the source output2, 'pwr amp' or 'no conn'. Setting it to 'pwr amp' eliminates the need manually calculate the source power. It also enforces the software restrictions on source power to avoid over-currenting the testhead. Note that this plan will flag an error if run with the old fixture definition.
Added a conditional flag for the maximum power evaluation that insures the source power into the amplifier will not exceed a maximum of +5dBm during the sweep.
If the source power will exceed +5dBm, then the maximum power evaluation sweep
is not performed.

03/09/23 - Added flag checks on the measured +32dBm output sweep to skip Max Power testing
if the output uncertainty was greater than +5dBm or less than -5dBm. - DM

12/01/23 - Added additional conditional user prompts and conditional test aborts for multiple user setup errors:

1. Before testing begins, a conditional check of the presence of the calibration/diagnostic bottom plate is performed to determine if the fixture has been added to the System Configuration.

If not present in the System Configuration the user is prompted of the issue, the test plan will automatically abort, and the verify is failed.

2. The connection check has been enhanced to detect if the measured signal power is too high or too low(not connected to the amplifier output).

a.) If the signal power is too high, it is assumed the 30dB attenuator is not connected to the power amplifier output.
The user is prompted is of the issue, the test plan will automatically abort, and the validation is failed.

b.) If the signal power is too low, it is assumed the setup connections have not been completed.
The user is prompted with the connection instructions and can continue by clicking OK.

The connection is then checked a second time:

a.) If the signal power is too high on the second attempt, it is assumed the 30dB attenuator is not connected to the power amplifier output.
The user is prompted is of the issue, the test plan will automatically abort, and the verify is failed.

b.) If the signal power is too low on the second attempt, it is assumed the connections are correct and the issue is the amplifier.
The user is prompted that the expected signal power is not detected and can continue by clicking OK or clicking Cancel to abort testing.

If the user chooses to continue after the second attempt, the connection is checked a third time:

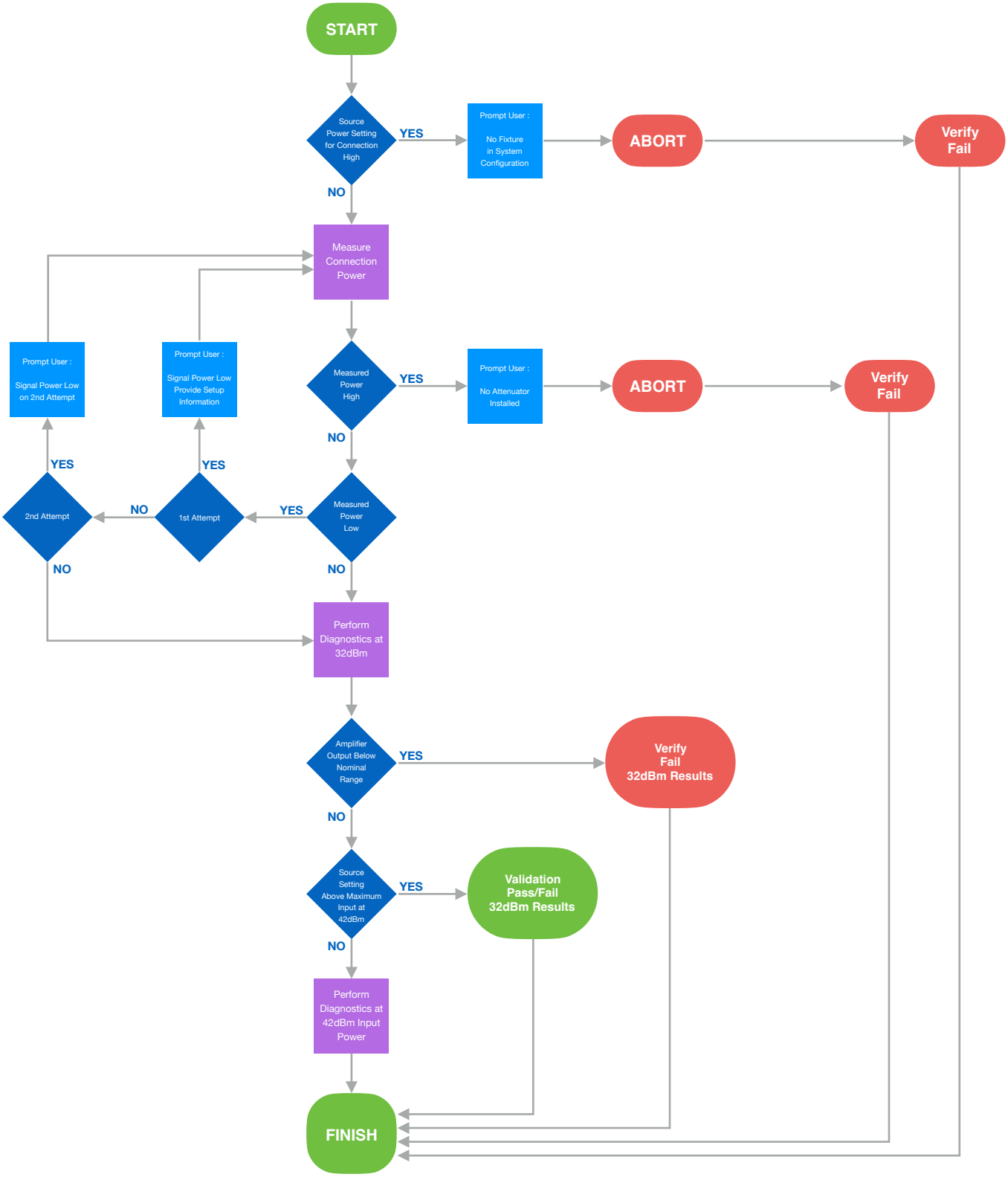
a.) If the signal power is too high, it is assumed the 30dB attenuator is not connected to the power amplifier output.
The user is prompted is of the issue, the test plan will automatically abort, and the verify is failed.

All combinations of above scenarios were tested to insure operation.

The conditional flag limit units for the max power testing were corrected from the default dBw to units of dBm.

The conditional test for Max power evaluation was updated to remove the upper limit. If amplifier output uncertainty is below -10dB, i.e - the amplifier output is severely degraded, then the max power evaluation is skipped. - DM

VERIFY TEST PLAN STATE FLOW



CALIBRATION TEST PLAN REVISION HISTORY

This plan calibrates the RI8595B power amp. It requires a power meter and a calibrated high-power 30 dB attenuator.
The specified cal kit must include the loss of the attenuator in a calibration factor called PMeterAtten.
The plan needs a source called RFSource1. RFSource1's output2 can't be specified to be connected to anything.

Revision History
10/17/17 - Created from the 'A' plan - DM

10/18/17 - Changed the set power from 35 to 32 because 35 dBm plus high amp gain puts is in the beginning of compression. - RB&DM

12/17/19 - added a 'test type' 'calc' button to the calc panels. This keeps the tester from emitting RIFL commands and speeds up the calculations. - RB

12/8/22 - Changed to work with a new fixture def that includes a button for the source output2, 'pwr amp' or 'no conn'. Setting it to 'pwr amp' eliminates the need manually calculate the source power. It also enforces the software restrictions on source power to avoid over-currenting the testhead. Note that this plan will flag an error if run with the old fixture def. - RB

11/28/23 - Changed averaging mode of the power meter to 'x1' to speed up calibration and match the validation settings.

Added additional conditional user prompts and conditional test aborts for multiple user setup errors:
1. Before testing begins, a conditional check of the presence of the calibration/diagnostic bottom plate is performed to determine if the fixture has been added to the System Configuration.
   If not present in the System Configuration the user is prompted of the issue, the test plan will automatically abort.
2. The connection check has been enhanced to detect if the measured signal power is too high, too low, or if the power meter is not connected to the amplifier output.
   a.) If the signal power is too high, it is assumed the 30dB attenuator is not connected to the power sensor.
   The user is prompted is of the issue, the test plan will automatically abort.
   b.) If the signal power is below the amplifier's nominal idle value, it is assumed the amplifier output is unloaded.
   The user is prompted of the issue, the test plan will automatically abort.
   c.) If the signal power is too low, it is assumed there is a connection issue of the cable, 30dB attenuator, or power sensor.
   The user is prompted with the connection instructions and can continue by clicking OK or clicking Cancel to abort testing.

   The connection is then checked a second time:
   a.) If the signal power is too high on the second attempt, it is assumed the 30dB attenuator is not connected to the power sensor.
   The user is prompted is of the issue, the test plan will automatically abort.
   b.) If the signal power is below the amplifier's nominal idle value, it is assumed the amplifier output is unloaded.

The user is prompted of the issue, the test plan will automatically abort.

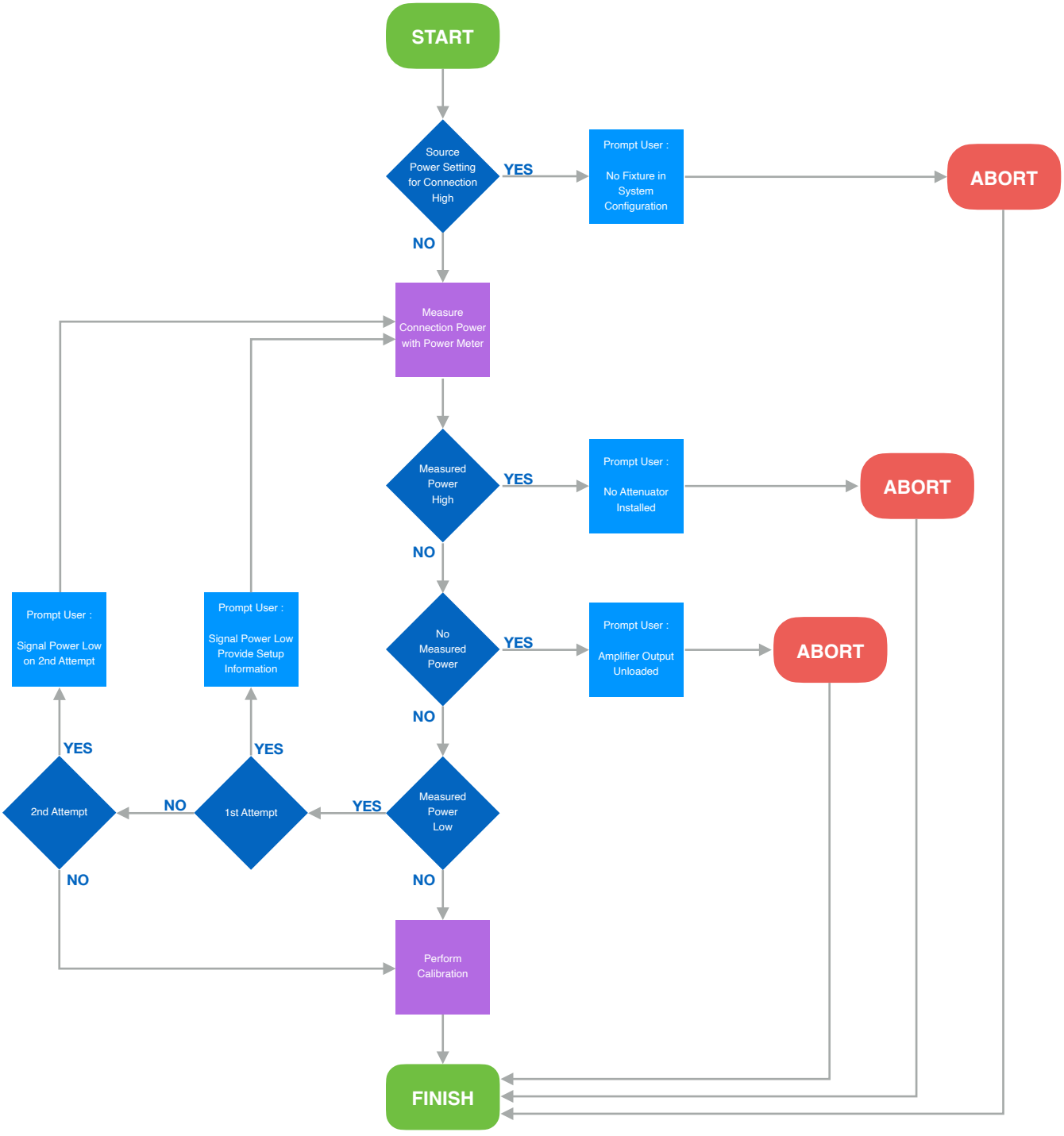
c.) If the signal power is too low on the second attempt, it is assumed the connections are correct and the issue is the amplifier.
The user is prompted that the expected signal power is not detected and can continue by clicking OK or clicking Cancel to abort testing.

If the user chooses to continue after the second attempt, the connection is checked a third time:

a.) If the signal power is too high, it is assumed the 30dB attenuator is not connected to the power sensor.
The user is prompted is of the issue, the test plan will automatically abort.

All combinations of above scenarios were tested to insure operation.

CALIBRATION TEST PLAN STATE FLOW



VALIDATION TEST PLAN REVISION HISTORY

This plan validates the RI8595B power amp. It requires a power meter and a calibrated high-power 30 dB attenuator.
The specified calibration kit must include the loss of the pad in a cal factor called PMeterAtten.
The plan needs a source called RFSource1. RFSource1's output2 can't be specified to be connected to anything.

Revision History
10/17/17 - Created from the 'A' plan - DM

10/18/17 - Changed the set power from 35 to 32 because 35 dBm plus high amp gain puts is in the beginning of compression. Removed an extraneous limit from 'output power'. - RB&DM

12/17/19 - added a 'test type' 'calc' button to the calc panels. This keeps the tester from emitting RIFL commands and speeds up the calculations. - RB

12/8/22 - Added a 'max power' section at a customer's request. Changed to work with a new fixture def that includes a button for the source output2, 'pwr amp' or 'no conn'. Setting it to 'pwr amp' eliminates the need manually calculate the source power. It also enforces the software restrictions on source power to avoid over-currenting the testhead. Note that this plan will flag an error if run with the old fixture def. - RB

01/19/23 - Removed limit on Output Power Max. Implemented single value averaging of the power meter to reduce test plan execution time. - DM

01/20/23 - Added a conditional flag and test limit of the calibration data
at the beginning of the validation that insures the amplifier is within
an expected nominal range.
If the calibration data of the amplifier is not within the nominal range,
the test plan is aborted without exercising the amplifier and the validation is failed.

Added a connection check that skips the user prompt information
of the 30dB attenuator and power sensor setup if still connected correctly
from the calibration setup. If the setup is not correct, the user is prompted
with the setup information.

Added a conditional flag for the maximum power evaluation that insures the source power into the amplifier will not exceed a maximum of +5dBm during the sweep.
If the source power will exceed +5dBm, then the maximum power evaluation sweep
is not performed.

05/24/23

Fixed limits on calibration data check to match the flag limits so that a conditional abort will also cause a failed validation.- DM

11/28/23 - Added additional conditional user prompts and conditional test aborts for multiple user setup errors:

1. Before testing begins, a conditional check of the presence of the calibration/diagnostic bottom plate is performed to determine if the fixture has been added to the System Configuration.

If not present in the System Configuration the user is prompted of the issue, the test plan will automatically abort, and the validation is failed.

2. The connection check has been enhanced to detect if the measured signal power is too high, too low, or if the power meter is not connected to the amplifier output.

a.) If the signal power is too high, it is assumed the 30dB attenuator is not connected to the power sensor. The user is prompted is of the issue, the test plan will automatically abort, and the validation is failed.

b.) If the signal power is below the amplifier's nominal idle value, it is assumed the amplifier output is unloaded. The user is prompted of the issue, the test plan will automatically abort, and the validation is failed.

c.) If the signal power is too low, it is assumed there is a connection issue of the cable, 30dB attenuator, or power sensor.
The user is prompted with the connection instructions and can continue by clicking OK or clicking Cancel to abort testing.

The connection is then checked a second time:

a.) If the signal power is too high on the second attempt, it is assumed the 30dB attenuator is not connected to the power sensor.
The user is prompted is of the issue, the test plan will automatically abort, and the validation is failed.

b.) If the signal power is below the amplifier's nominal idle value, it is assumed the amplifier output is unloaded. The user is prompted of the issue, the test plan will automatically abort, and the validation is failed.

c.) If the signal power is too low on the second attempt, it is assumed the connections are correct and the issue is the amplifier.
The user is prompted that the expected signal power is not detected and can continue by clicking OK or clicking Cancel to abort testing.

If the user chooses to continue after the second attempt, the connection is checked a third time:

a.) If the signal power is too high, it is assumed the 30dB attenuator is not connected to the power sensor. The user is prompted is of the issue, the test plan will automatically abort, and the validation is failed.

b.) If the signal power is below the amplifier's nominal idle value, it is assumed the amplifier output is unloaded. The user is prompted of the issue, the test plan will automatically abort, and the validation is failed.

c.) If the signal power is too low the test plan will proceed to capture output data from the amplifier with the validation failed regardless of the results.

All combinations of above scenarios were tested to insure operation.

The conditional flag limit units for the max power testing were corrected from the default dBw to units of dBm. - DM

11/30/23 - Added additional conditional test for Max power evaluation. If amplifier output uncertainty is below -10dB, i.e - the amplifier output is severely degraded, then the max power evaluation is skipped. - DM

VALIDATION TEST PLAN STATE FLOW