University College Cork

Anser Electromagnetic Tracking System

Quick Start Guide

Content

1 Inventory

The following components are required for using the Anser EMT system.

1.1 Hardware

1 x Anser EMT field generator (Figure 1)
1 x Anser EMT base station (Figure 2)
1 x Calibration probe (Probably needed for every system) (Figure 4)
1 x 3m centronics cable (Figure 5)
1 x USB A-B cable (Figure 6)
2 x Barrel jack power supply 15V (Figure 7)

1.2 Software

1 x Windows 7/8/10 PC
1 x National Instruments DAQmx driver

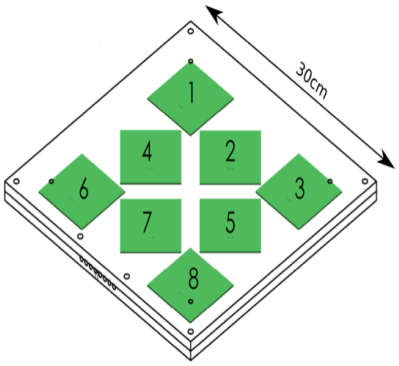


Figure 1. EMT field generator

Figure 2. Base station

Figure 3. Back panel of base station

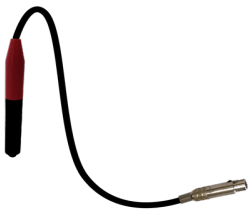


Figure 4.
Calibration senor probe

Figure 5.
Centronics cable

Figure 6.
USB A-B cable

Figure 7.
Power supply

2 Hardware & Drivers

2.1 Hardware Setup

1.

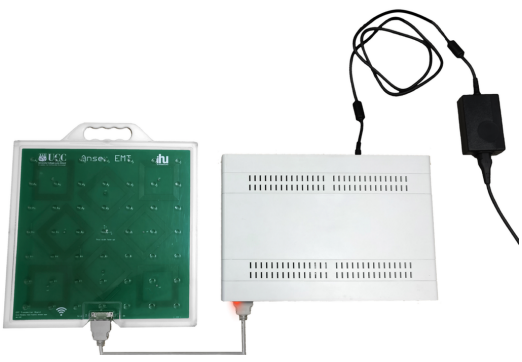
Place the Anser EMT field generator and base station on a metal-free surface.

2.

Connect the base station to the field generator using the supplied centronics cable.

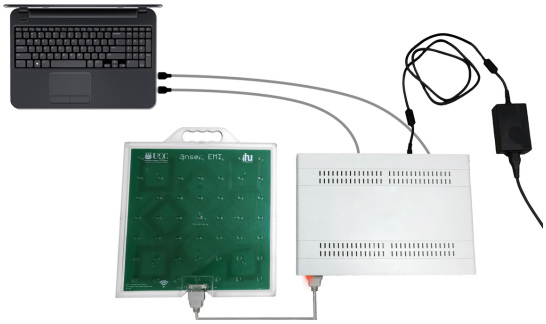
3.

Connect the barrel jack power adapter to the base station via the DC-IN port.
The red standby LED located on the front panel of the unit should light up.



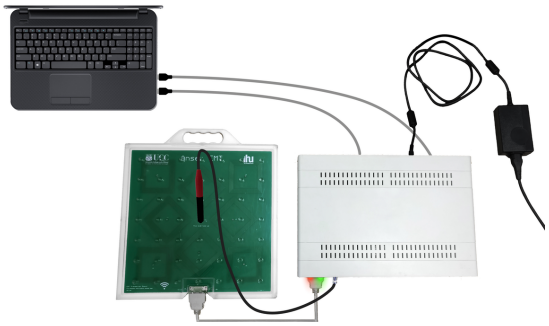
4.

Connect the Windows PC to the NI-DAQ port of the base station using the supplied USB A-B cable. Using a second USB A-B cable connect the Windows PC to the MCU port.



5.

Connect a calibration sensor probe to the first port on the front of the unit. Power on the base station by pressing the PWR button at the rear of the unit. The green LED located on the front panel of the unit should light up.



2.2 Drivers

On your windows PC install the National Instruments DAQmx driver. This can be found at https://www.ni.com/.

Once the PC has been connected to the base station the NI Measurement and Automation explorer provided with the driver should launch after approximately 10 seconds. Take note of the National Instruments device enumeration e.g. DevX. If this is the first time an National Instruments device has been connected to the PC then its enumerated name is Dev1 (see Figure 8).

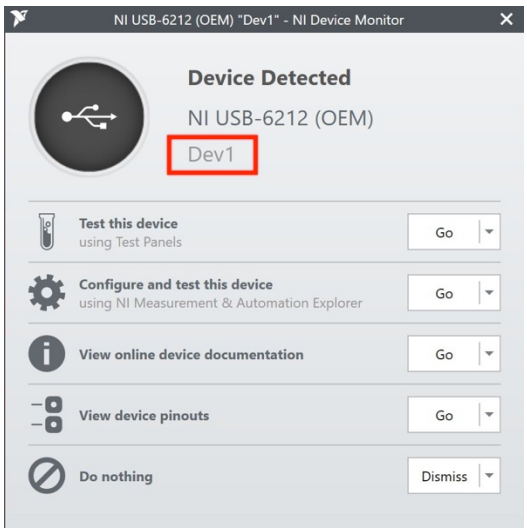


Figure 8. NI Measurement and Automation Explorer

3 Application Overview

3.1 Tabs

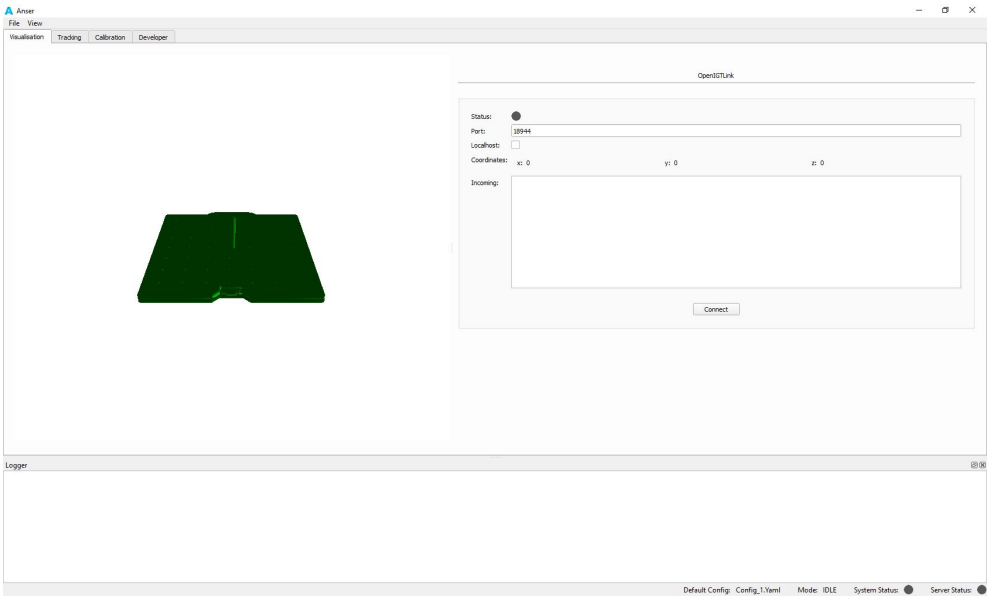


Figure 9. Main window of the application

The application consists of 4 tabs:

Visualisation Tab – 3D visualisation to display tracking information. OpenIGTLink (network communication protocol) to transfer sensor positions among devices and other software packages.

Tracking Tab – to initialise tracking and display system status information. The field generator frequency graph is a useful debugging tool that shows the frequencies emitted by the field generator in real time.

Calibration Tab – to create or remove sensors files, and calibrate the system.

Developer Tab – to configure the system and change settings such as emitter frequencies, system speed etc.

3.2 Status Bar & Logger

The *Logger* logs debug information, this is useful for troubleshooting. The *status bar* displays important system status information and notifications (see Figure 10).

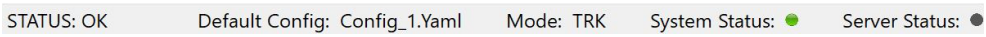


Figure 10. Status Bar

Status Notifications: indicate the current status of the EMT system and help to detect faults (see Table 1).

Default Config: The current configuration file being used by the system. Configuration files store the settings necessary to initialise the system such as frequencies, system speed etc.

Mode: The Anser application has 3 modes - IDLE, TRK (tracking) and CAL (calibrating).

System Status LED: shows the current status of the EMT system (see Table 2).

Server Status LED: indicates whether the server is active.

Table 1. Status notification index

Status Notification	Interpretation
OK	System is functioning properly
Power is OFF	Press the power button at the rear of the base station
(USB-B) MCU is not connected	Connect Windows PC to the MCU port using a USB A-B cable
(USB-B) DAQ is not connected	Connect Windows PC to the DAQ port using a USB A-B cable
Field Generator is not connected	Connect Field Generator to Base Station

Table 2. System LED colour index

System LED Colour	Interpretation
Green	System is on and connected to computer
Orange	System is not configured correctly
Grey	System is not connected to computer

4 Application Setup

Launch the Anser application and ensure the system is properly setup.

4.1 STEP 1: Configuration

To configure the system initially, **go to → DEVELOPER TAB**

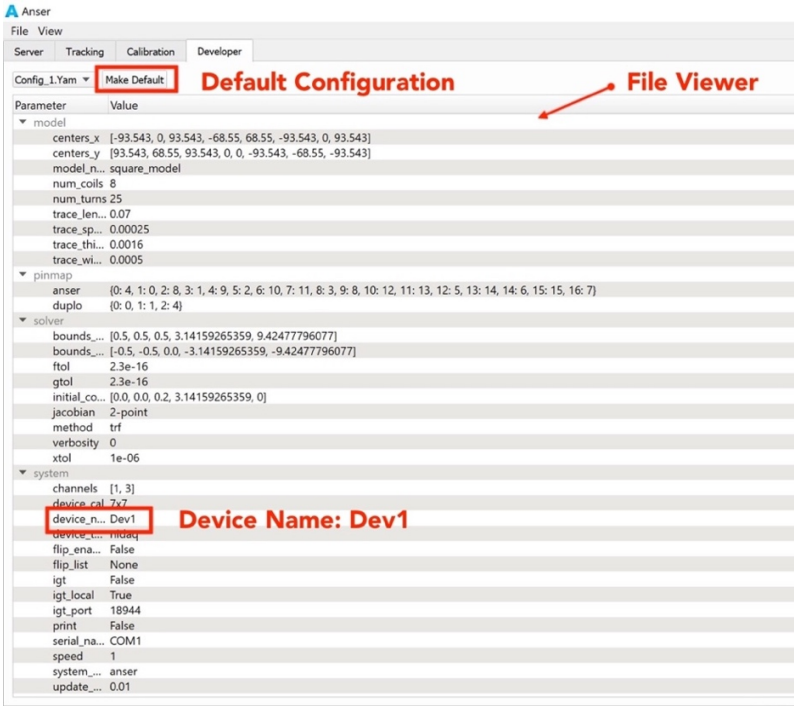


Figure 11. Configuration file editor

a) Select default configuration file
Select the provided configuration file 'Config_1.yaml' from the dropdown menu, and click the ***'Make Default'*** button. This ensures the application knows what settings to use on startup (see Figure 11).

b) Select DevX indentifier
Using the file viewer, scroll down through the configuration file and under *'system'* change the *'device_name'* to your DevX identifier (see Hardware Setup). Click the ***'Apply Changes'*** button (see Figure 11).

4.2 STEP 2: Add Sensor

Go to → CALIBRATION TAB

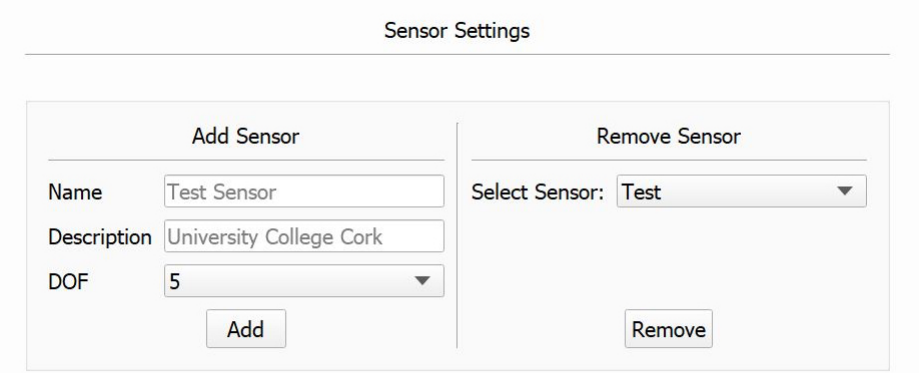


Figure 12. Sensor Panel

Add a sensor
Under *'Add Sensor'*, type in a name, description and select a 5 or 6 DOF (degrees of freedom) Click ***'Add'*** (see Figure 12). Note: 6 DOF is currently unsupported.

Remove a sensor
Under *'Remove Sensor'*, select the sensor from the dropdown menu. Click ***'Remove'*** (see Figure 12).

4.3 STEP 3: Calibration

Calibration of the EM tracking system is the process of fitting the magnetic field model of the field generator to the sensor. This involves gathering 49 (7x7) test positions located on the field generator. It is important to note that calibration is not only specific to each sensor but each sensor→ port connection i.e. calibration does not hold for all ports. Thus, before calibration you must select a sensor and the port it is connected to. Calibration data is stored in individual sensor files, so multiple sensors can use the same port interchangeably. We recommend using only the first 4 ports.

Go to → CALIBRATION TAB

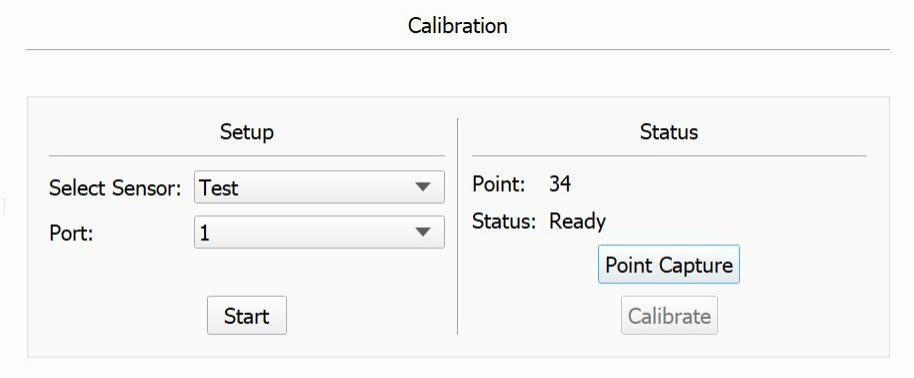


Figure 13. Calibration Panel

a) Begin Calibration Process
Under *'Setup'*, select your sensor from the dropdown menu and the port it is connected to. Click ***'Start'*** to begin the calibration process (see Figure 13).

Note

Look at the status bar, ensure the system status LED is green and you receive an 'OK' status notification. If not look to resolve the specified issue and restart calibration by repressing ***'Start'***

b) Capture Points
Under *'Status'* you will be prompted to move the sensor calibration probe to Point 1 on the field generator (see Figure 13). Fully insert the sensor probe into the base plate at Point 1. You can use the virtual field generator board for reference (see Figure 14) and press ***'Point Capture'*** once the calibration probe is in position. A field measurement will be taken and you will be then prompted to move the calibration probe to Point 2. Continue to acquire all points.

Note

After capturing the first point, you may use the ENTER Key (↵) for subsequent captures.

c) Calibrate
Once all points have been captured, the *'Calibrate'* button becomes enabled. Click ***'Calibrate'*** (see Figure 13). Wait for the virtual field generator board to reset to its default red colour.

The color coding scheme for the virtual field generator board is outlined in Table 3:

Table 3. Calibration point colour index

Color	Interpretation
Green Colour	Point has been captured
Red Colour	Point has not yet been captured
Blue Colour	Next point to be captured
Purple	Calibrating

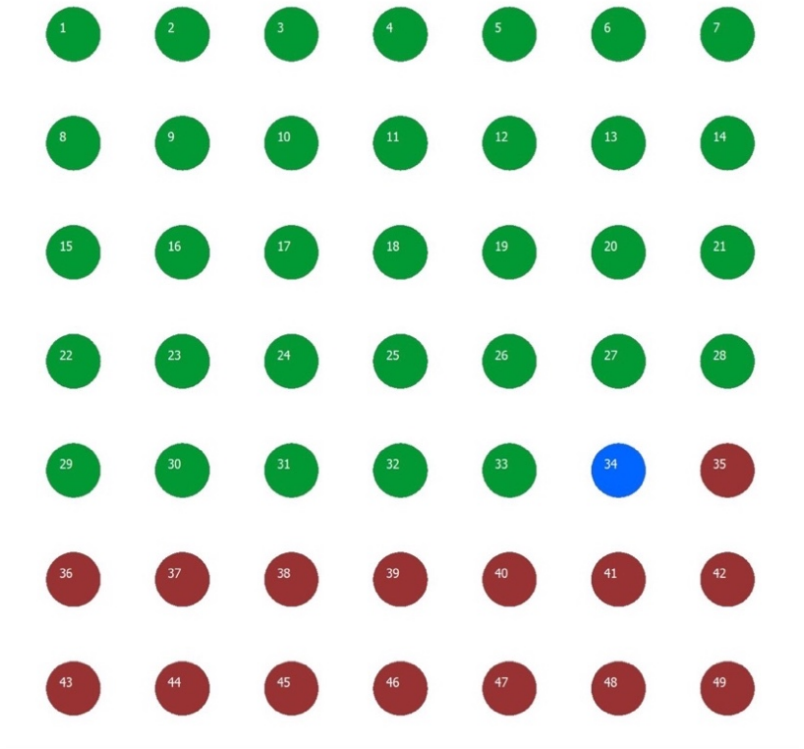


Figure 14. Virtual field generator board

4.4 STEP 4: Tracking

Tracking is only possible after calibrating the system with your sensor.

Go to → TRACKING TAB

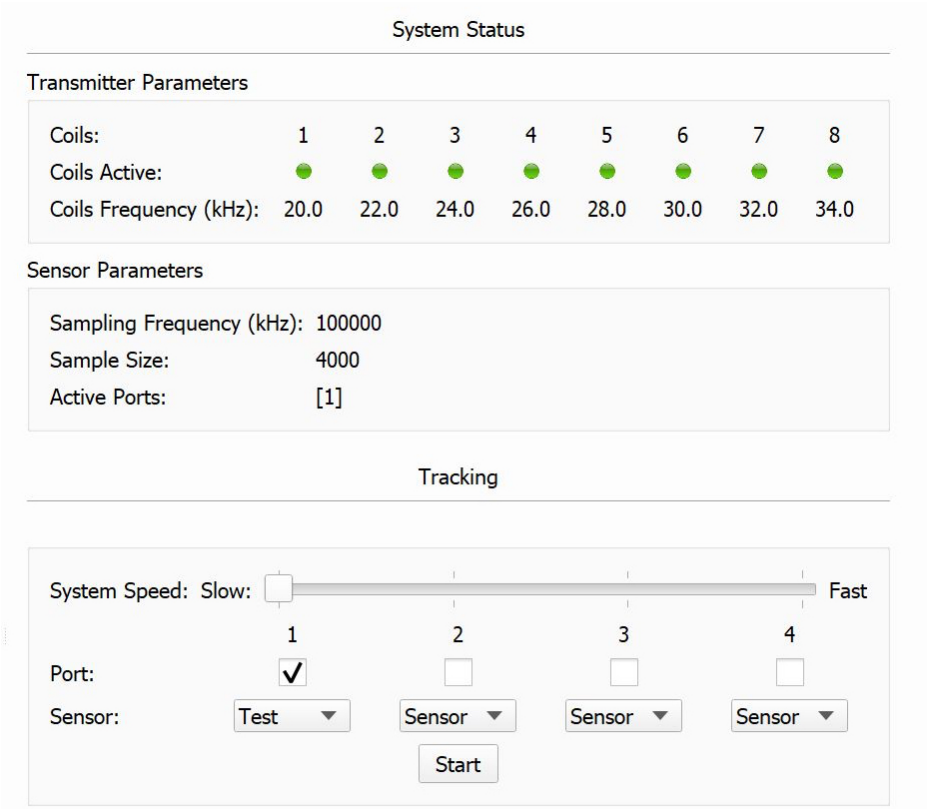


Figure 15. System and tracking panel

Begin tracking
Under *'tracking'*, select your sensor and the port number it is connected to. Select your preferred speed using the slider. Click ***'Start'*** (see Figure 15).

Note

Look at he status bar, ensure the system status LED is green and you receive an 'OK' status notification. If not look to resolve the specified issue and restart tracking by repressing ***'Start'****.`*

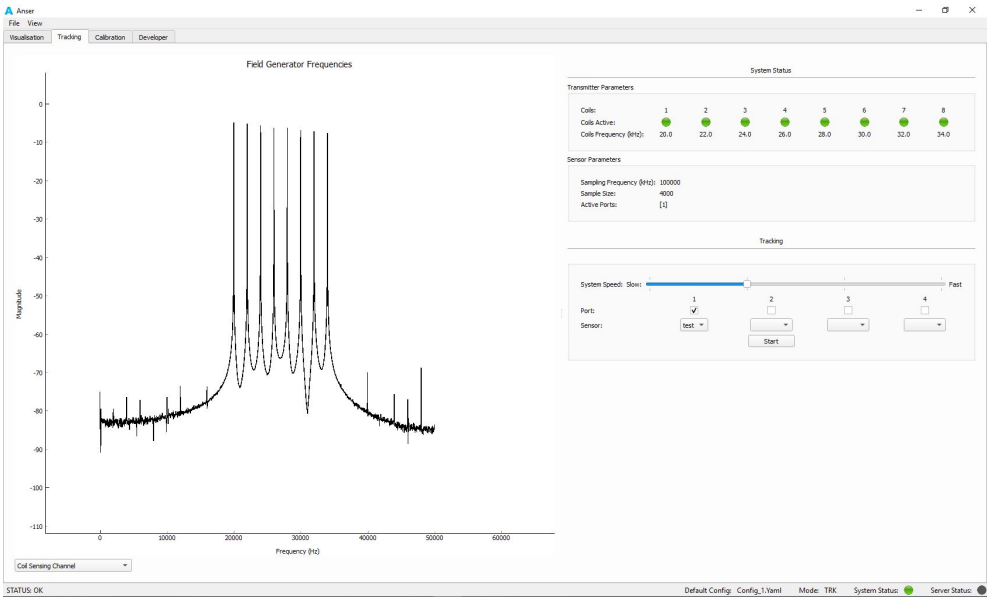


Figure 16. Field generator frequency graph

The Field Generator Frequency Graph (see Figure 16) should show 8 peaks at different frequencies between 20,000hz and 50,000hz (corresponding to the frequencies emitted by the 8 coils on the field generator).

The *'System Status'* section shows the status of each coil and its corresponding frequency. It also displays the current sampling frequency, sample size and active ports (see Figure 15).

4.5 STEP 5: Visualisation and OpenIGTLink

Go to → VISUALISATION TAB

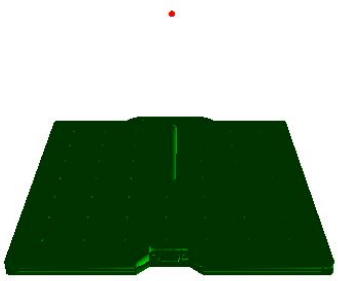


Figure 17. Sensor position in real time

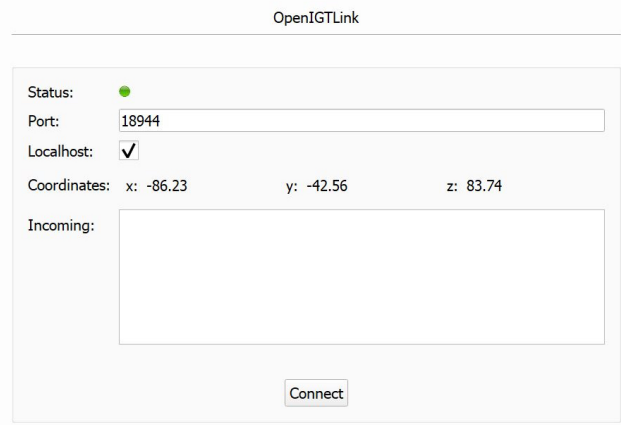


Figure 18. OpenIGTLink panel

Visualisation
Once tracking has started, ensure the sensors are responsive and functioning properly by referring to the 3D visualisation kit. Each sensor is represented by a small red sphere (see Figure 17).

OpenIGTLink
Under *'OpenIGTLink'*, select localhost and enter your preferred port (default is 18944). Click ***'Connect'*** to host a server and transfer sensor positions to an external application or device (see Figure 18).