APPENDIX H: MANUAL

Please refer to the following pages.

Drive By Reader for *eTire*

User's Manual

1. System overview

The drive-by reader is part of the Michelin's electronic tire (*eTire*) system.
The *eTire* system consists of the components shown in the figure 1.1:

- Tags: Passive (batteryless) devices mounted inside the tires (measurement tags) or on the body of tractors and trailers (Tractor/Trailer ID tags). The measurement tags capture the pressure and temperature of the tires, whereas the ID tags contain identification numbers for the vehicles.
- Drive by reader: Captures the information transmitted by the tags and forwards the data to the host computer.
- User interface: Michelin's internet-based tire management program (BibTrack).

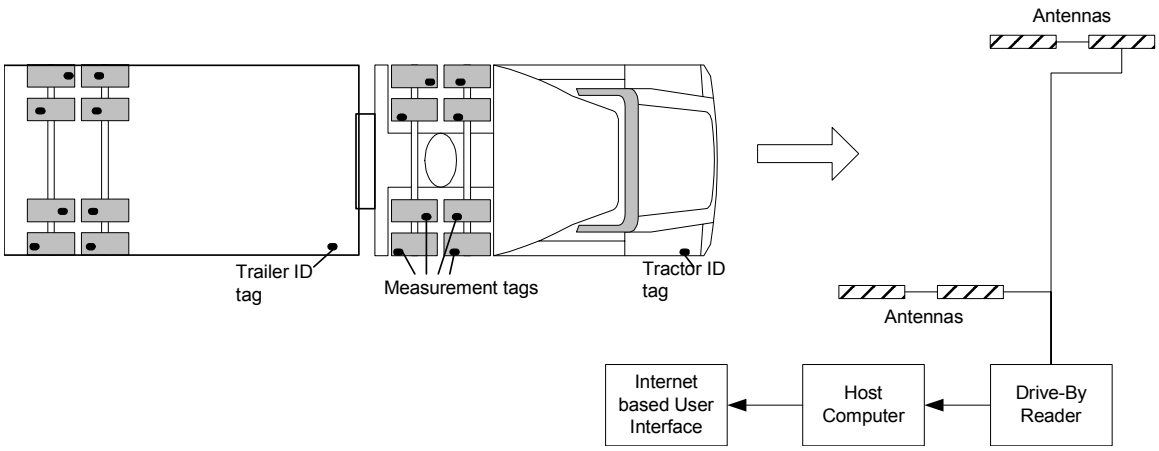

Figure 1.1. System overview

In a typical configuration, a truck consisting of a tractor and a trailer drives through a lane consisting of reader antennas. Photo switches mounted close to the antennas provide additional information to help the reader determine the axle configuration and to detect the position of the tags, as the position information is not stored in the tag. Both tractor and trailer are equipped with ID tags. The drive by reader reads the ID and measurement tags and provides the tire management software through the host computer with the data such as the pressure, temperature and position. The drive by reader also drives a red traffic light for visual control.
The drive by reader is bi-directional, I.e. that truck can enter the lane from both directions.

2. Installation and setup

2.1. Installation

The drive-by reader consists of 3 main units:

- 1 X The Digital Processing Unit (DPU)
- 2 X The Antenna Driver Units (ADU)
- 1 X The Power Supply Unit (PSU)
- 4 X Antennas
- 1 X Temerature sensor

In addition, there are peripheral components such as 2 traffic lights, 2 photo switches, the host computer and connecting cables.

For the drive by reader to function properly, it must be installed according to the following figure 2.1:

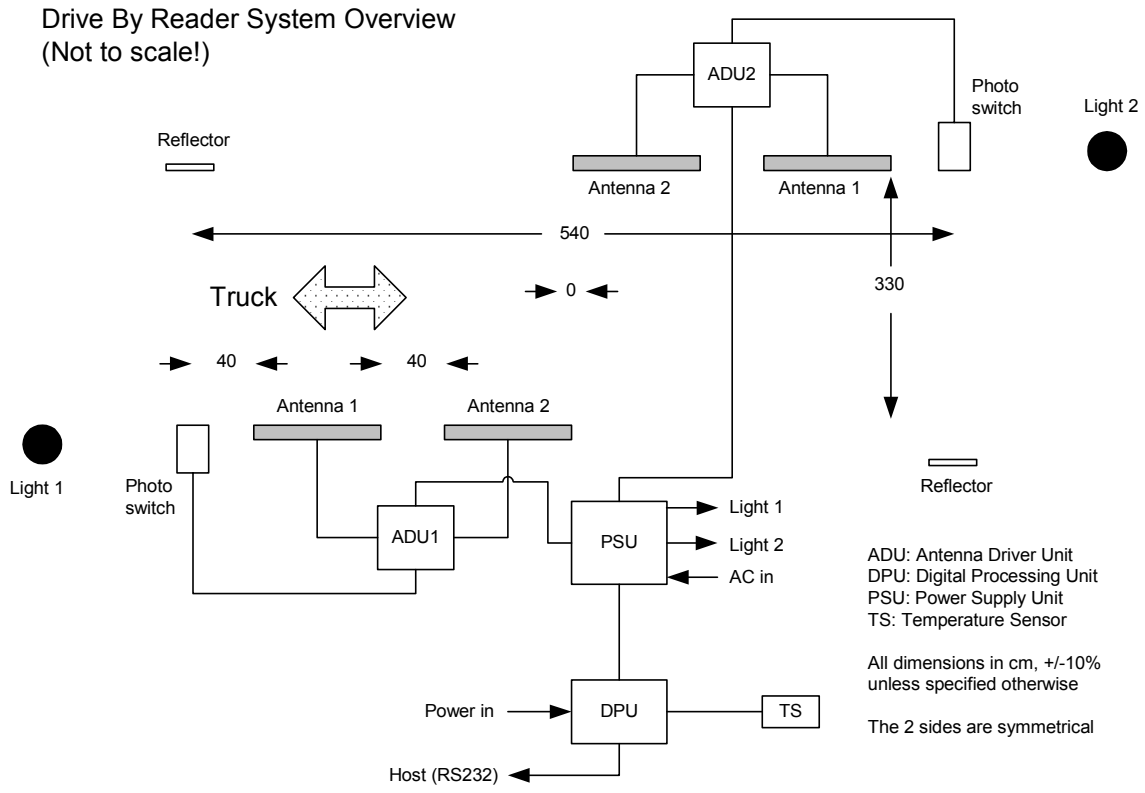

Figure 2.1. The lane installation and the overview of the hardware modules

- All dimensions are in cm, +/-10% unless specified otherwise.
- The 2 sides are symmetrical.

Important distances:

- Antenna 1 - Antenna 2 (edge to edge): 40cm
- Antenna 1 edge - Photo switch: 40cm
- Distance between the 2 photo switches: 540cm
- Left side antenna 2 to right side antenna 2: 0cm
- Lane width: 330cm (subject to adjustment)

Other installation issues:

- Prior to the wiring, make sure non of the components is powered. Unplug all related AC cords.
- Avoid installing cables in area of 30cm around the antennas, especially the photo switch and DPU-PSU cables.
- The temperature sensor must be installed outside and protected from the direct sunlight.
- The 2 Antenna Driver Units (ADU) and the Power Supply Unit (PSU) must be protected from direct sunlight, rain and water on the surface of the pavement.
- The cables across the lane (light, PSU-ADU2) must be buried for protection. Do not use protection strips. A smooth lane surface will minimize the additional mechanical noise and increase the performance of the system.
- The Digital Processing Unit (DPU) must be installed indoors.

2.2. System power-up

Please follow the following steps for the first system power-up:

- Make sure all components are properly wired and the photo switch reflectors in place.
- Verify that the voltage input switch (110/220V) for the power supply unit (PSU) is set properly. The switch is located on the back of the PSU and can be set accordingly after unscrewing the transparent protection plate.
- Connect the power to the PSU. The green light on PSU's front panel must go on.
- Adjust the position of the photo switches and the reflectors properly. A red indicator light at the photo switch will go on when the reflector is in correct, in-beam position.
- Power up the Digital Processing Unit (DPU) by pressing the on/off switch. If the DPU was already on, turn it off and on again.
- The on/off indicator light on the DPU's front panel must start flashing. While the indicator light is flashing, the system performs a check on all installed components and the auto-tuning of the antennas.
- The indicator light must stop flashing after about 15-30 seconds and stay on. If it keeps flashing, make sure the PSU is on, check all cables, the distances between the antennas, the reflectors and restart the DPU. The system starts only when all components are in place and powered up. A permanent flashing means that the system check routine has discovered a problem.
- Test the system by triggering one of the photo switches. The DPU's indicator light

must start flashing (indicating that a measurement is taking place) and stay on after about 20-30 seconds.

3. Normal operation

3.1. Measurement cycle

The system is immediately functional after a successful power up. With the exception of the line voltage selector, the drive by reader contains no user adjustable components and requires no maintenance or calibration.

In the idle mode, that is, when the drive by reader is waiting for a truck, there is no RF activity and all antennas are off. When a truck enters the lane it triggers the system by activating the photo switch. The system then turns on the RF power and starts a measurement cycle. Upon the start of a measurement cycle the traffic light away from the truck (for example, light 1 if the truck enters the lane from the left side in figure 2.1) is turned on to indicate that the lane is busy. This should prevent other trucks to enter the lane. As a further visual control, the front panel light of the Digital Processing Unit keeps flashing as long as a measurement is taking place.

Upon completion of the measurement, the drive by reader communicates the truck data to the *eTire* software through the serial interface of the host computer. The *eTire* software then checks the equivalent cold pressure of the tires against the specified values and instructs the drive by reader to turn on the warning light to the driver, if necessary. The warning light is the light that the driver can see in the back mirror (in this case light 2). For a detailed description of the software interface, please see the *eTire* software manual.

Upon completion of a measurement cycle the RF power is turned off, the lights are reset and the drive by reader returns to the idle mode.

3.2. Periodical system check

During the idle mode, a periodic function check is performed every 2 hours. This function check, including auto-tuning of the antennas, is performed on all components of the drive by reader. If the periodical function check detects a problem the system shuts itself down and flashes the lights forever. If the lights continue to flash after a manual reset (power off / on) of the DPU, the following items must be verified:

- Power to the PSU
- All wirings
- The distance between the antennas
- The photo switch reflectors in beam (photo switch indicator light must be on)
- Temperature sensor connected

Radio Frequency Compliance Statement

Saracom s.a.r.l is the responsible party for the compliance of the following device:

MODEL:	MXDBR10
TYPE:	10
FCC ID:	RT5-MXDBR10
IC:	4892A-MXDBR10

The user(s) of these products are cautioned to only use accessories and peripherals approved, in advance, by Saracom. The use of accessories and peripherals, other than those approved by Saracom or unauthorized changes to approved products, may void the compliance of these products and may result in the loss of the user(s) authority to operate the equipment.

Operation is subject to the following conditions: (1) these devices may not cause harmful interference, and (2) these devices must accept any interference, including interference that may cause undesired operation of the device.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communication. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

Industry Canada Compliance

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.