



FCC Licensing Guide for Encompass[®] 4 Readers

The screenshot shows the FCC Universal Licensing System (ULS) homepage. At the top, there is a navigation bar with links for Search, RSS, Updates, E-Filing, Initiatives, Consumers, and Find People. The main content area is divided into several sections:

- ULS Online Systems:** A central section with buttons for REGISTER, LOG IN, LICENSES, APPLICATIONS, and ARCHIVES. It includes instructions for new users and information on how to search for licenses and applications.
- Alerts:** A section on the right side listing various alerts such as 'Financial System Blackout Period', 'Enhanced Security Features in COBES', and 'New bank mailing address for manual payments'.
- Downtime Schedule:** A section indicating that there are no scheduled downtimes, with the exception of daily downtimes from 12 Midnight to 2 AM ET.
- Recent Releases:** A section on the left side listing recent public notices and notices of proposed rulemaking, including 'FCC to Hold Workshop on January 26, 2011 on VHF/UHF Narrowbanding' and 'Proposed Revisions to the Commission's Registration System (CORES)'.
- ULS Downloads:** A section on the left side listing various downloadable files, including Daily Transaction Files, Databases, Reference Copies, and ULS Online Systems.
- ULS Site Map:** A section on the left side providing a comprehensive list of links to various ULS services and resources.

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Revision History

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Disclaimer

This document is provided only as an aid to completing the application process and may contain errors and/or omissions. While the intent is to provide the user with the information needed to complete a typical application for the installation of a TransCore radio frequency identification (RFID) system, TransCore is not responsible for any misinformation provided by the applicant. The applicant is encouraged to contact the FCC with any questions or concerns they have while completing the application.

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GENERAL INFORMATION

Overview

Within the United States, TransCore Encompass 4 systems are authorized for modulated operation in the 911.75 to 919.75 MHz frequency band and for continuous wave (CW) operation in the 902.25 to 903.75 and 910 to 921.5 MHz frequency bands. These are the bands allocated by the Federal Communications Commission (FCC) for this type of equipment. Modulated protocols available on this reader can include eGo, Super eGo (SeGo) and/or Interagency Group (IAG) with American Trucking Associations (ATA) being the only available CW protocol. Up to only two of these protocols are available on a given Encompass 4 reader dependent upon which version was specified. Because TransCore readers radiate more than 3 milliwatts (mW) of RF power, in this case from 0.2 up to 2 W, the FCC under Section 90.351 must license them. This is accomplished by accessing the FCC ULS (Universal Licensing System) at <http://wireless.fcc.gov/uls>, registering with the FCC, and filing online using form 601, FCC Application for Wireless Telecommunications Bureau Radio Service Authorization along with any appropriate accompanying schedules. Specifically, this equipment is licensed for each site of usage under the LN Radio Service Code (LN stands for Location Narrowband, that is, the non-multilateration 902 to 904 and 909.75 to 921.75 MHz sub-bands). It is the user's responsibility to define the operating frequencies required and to file the proper application with the FCC. Due to a significant FCC processing time of at least three months, this process should be started early in the design phase. Potential interference between multiple readers in close proximity, that is, those within 1000 feet with an unimpeded LOS (line-of-sight) between them, should be identified early in the process so a suitable frequency plan can be developed before applying for the license. The TransCore dealer can provide assistance and support as necessary in completing the application.

Purpose

The intent of this guide is to provide the user with an easy to use reference when completing the online application. Most installations using TransCore RFID equipment are similar in nature. This guide will help the user determine responses for the various forms applicable to a TransCore RFID system that are typically required for approval. Those are forms 601 and accompanying Schedules D and H. If the user does not think these forms are appropriate for their particular application, they are encouraged to contact the FCC for further guidance. This document only addresses new U.S. installations and only covers TransCore equipment operating in the 902- to 928-MHz frequency band.

NOTE: *In some instances it may be required to register an antenna structure using the Antenna Structure Registration (ASR) online system (form 854). This is typically only for those installations requiring an antenna structure more than 200 feet in height or for those near airport runways. If unsure, you may want to review the ASR website, which is accessible via the ULS website, or contact the FCC.*

Governmental Entity: *If you are considered a governmental entity as defined by the FCC, you can use provisions of 90.353i to simplify licensing on a blanket area basis, using "temporary fixed" locations, and a waiver request of 90.137b. Governmental Entities also are exempt from FCC application and regulatory fees. Contact TransCore should you require examples of such applications.*

Requirements

You are required to provide site-specific information in the online application data entry and in a required attachment describing the system under rules set forth in 90.351 and following sections. These include the following:

- Site location including latitude and longitude coordinates to the nearest tenth of a second.
- Site elevation AMSL (above mean sea level)
- Type of antenna installed
- Antenna structure height AGL (above ground level)

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- Antenna height AGL
- Type of reader system installed

APPLICATION PROCESS

Getting Started

The ULS is a web browser-based system used for electronic filing. All submittals for an FCC license for TransCore equipment should be completed online.

Before proceeding, you are urged to print copies of the PDF version of Form FCC 601 and accompanying schedules D and H. Each question within the form and schedules are presented in detail. They can be found at <http://www.fcc.gov/formpage.html>. Proceed to the section for Form 601, copy the file, and print the PDF file. Alternatively, downloadable versions of these forms may also be found at http://wireless.fcc.gov/index.htm?job=forms_and_fees. The applications of similar systems are also available online as examples under the ULS online website.

Accessing the Website

The first step in the licensing process is accessing the website. The ULS homepage can be found at <http://wireless.fcc.gov/uls>.

Once there, you must REGISTER with the FCC.

1. New users should press the **REGISTER** button and then select the button under the **Register and receive your FRN** option on the next page. On subsequent pages, answer all questions appropriately. Returning users can skip this step and proceed directly to step 2. An employer identification number or tax identification number is required if this is a business registration. When completed, you will be assigned an FCC Registration Number (FRN). This number and the chosen password are required to proceed.

NOTE: Because the FCC prefers that all users of a licensee organization use the same FRN, research if any other FCC licenses have been obtained within your company.

2. Proceed to the ULS Online Registration System, that is, press the **LOG IN** button for online filing.

Applying for a New License

You will be guided through the new license application, step by step. You are required to fill in certain fields with user-specific information and other fields with equipment-specific information. The focus of this procedure is to explain the appropriate information required for the latter. This process will collect all the necessary information for completion of Form 601 as well as Schedules D and H.

1. Enter the **FRN number and password** and press **Submit**.
2. Select the link titled **Apply for a New License** to continue to the Select Service page.
3. Click on the **Select the radio service for the new license** drop-down menu.
4. Select **LN - 902-928 MHz Location Narrowband (Non-multilateration)** and press **continue**. This option guides you through the required fields of Form 601 as described in Schedules D and H.

NOTE: Sun Microsystems Java Runtime environment may need to be installed to proceed.

5. The default Application Information tab of Form FCC 601 will appear once Java has loaded.

*NOTE: The **Quit Application** button at the bottom left also saves the application for up to 30 days only. If incomplete, do not forget to complete the application within this time.*

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Application Information Tab

On the Application Information screen, enter the following information. It is assumed this is for a permanent license (non-developmental) and “N” should be entered.

Waiver of the Commission Rules

Select **No** button, unless you are a governmental entity applying for a blanket license, in which case select **Yes**.

Grandfathered Privileges

Select **No** button.

Attachments Be Filed

Select **Yes** button - always required for LN applications of TransCore equipment. Attach Exhibit A. See Appendix A for a detailed example of Exhibit A with a cover letter. This example is applicable to an Encompass 4 Reader operating with ATA-only and would need modification for the other protocols.

Regulatory Status

Select only the **Private, internal communications** option.

Type of Radio Service

Select only the **Radiolocation** option.

Interconnected Service

Select **No** unless you propose to provide interconnected service to the public switched telephone network as defined in the FCC rules.

Fee Status

Select **No** in both instances unless it is determined (by contacting the FCC) that the request is exempt from fees, such as in the case of governmental entities – and be prepared to submit the state-legislature enabling legislation if the organization has never been licensed by the FCC before. Select **Next Page** to continue on to the next tab.

***NOTE:** If the Application Information form had errors, an error message screen will appear and the applicant will be required to return to that screen to correct the entry errors.*

An example of a completed **Application Information** screen is shown in [Figure 1](#).

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Administrative	Location	Antenna	Frequency
Application Information	Applicant	Ownership Questions/Qualification Questions	General Certification Statements
FCC Application for Radio Service Authorization: FCC 601 Wireless Telecommunication Bureau Public Safety and HomeLand Security Bureau			Approved by OMB 3060-0798
Application Purpose <input type="text" value="NE"/>	Radio Service Code: <input type="text" value="000"/>	File Number: <input type="text"/>	Callsign: <input type="text"/>
If this application is for a Developmental License, Demonstration License, or a Special Temporary Authorization (STA), enter the code and attach the required exhibit as described in the instructions. Otherwise enter N (Not Applicable)			
If this application is for Special Temporary Authority due to an emergency situation, enter 'Y'; otherwise enter 'N'. Refer to Rule 1.915 for an explanation of situations considered to be an emergency.			
If this application is for a New, Amendment, Renewal Only, or Renewal/Modification enter the requested authorization expiration date MM/DD (this item is optional):			
Is this application "major" as defined in Section 1.929 of the Commission's Rules when read in conjunction with the applicable radio service rules found in Parts 22 and 90 of the Commission's Rules? (NOTE: This question only applies to certain site-specific applications. See the instructions for applicability and full text of Section 1.929).			
Does this application include a request for Waiver of the Commission's rules? If 'Yes', attach an exhibit providing rule numbers and explaining circumstances.		If a feeable waiver request is attached, enter the number of rule section(s) being waived.	
<input type="radio"/> Yes <input checked="" type="radio"/> No		Number of Rule Section(s) <input type="text"/>	
Are the frequencies or parameters requested in this filing covered by grandfathered privileges previously approved by waiver, or functionally integrated with an existing station?			
<input type="radio"/> Yes <input checked="" type="radio"/> No			
Are attachments being filed with this application?			
<input checked="" type="radio"/> Yes <input type="radio"/> No			
Regulatory Status This application is for authorization to provide or use the following type(s) of radio service offering (enter all that apply):			
<input type="checkbox"/> Common Carrier <input type="checkbox"/> Non-Common Carrier <input checked="" type="checkbox"/> Private, internal communications <input type="checkbox"/> Broadcast Services <input type="checkbox"/> Band Manager			
Type of Radio Service This application is for authorization to provide the following type(s) of radio service (enter all that apply):			
<input type="checkbox"/> Fixed <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Radiolocation <input type="checkbox"/> Satellite (sound) <input type="checkbox"/> Broadcast Services			
Does the Applicant propose to provide service interconnected to the public telephone network?			
<input type="radio"/> Yes <input checked="" type="radio"/> No			
Fee Status Is the Applicant exempt from FCC application fees?			
<input type="radio"/> Yes <input checked="" type="radio"/> No			
Is the Applicant exempt from FCC regulatory fees?			
<input type="radio"/> Yes <input checked="" type="radio"/> No			
Receipt Date (MM/DD/YY)			
<input type="text" value="3/25/11"/>			
?	Print Preview	Attachment	Check Errors
		Previous Page	Next Page
Quit Application		FCC 601 Privacy Act	Please review the PRIVACY ACT before submitting this application
			Submit

Figure 1 FCC Form 601, Application Information Page

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Applicant Tab

On the Applicant screen, enter all the required information in the following categories: Applicant Information, Real Party in Interest (RPI), Contact Information, and Demographics. If RPI is different from applicant, then enter FRN of RPI to retrieve name, otherwise leave blank. Demographics information is optional and those fields can be left blank if desired. An example of a completed Applicant screen is shown in [Figure 2](#).

Administrative	Location	Antenna	Frequency
Application Information	Applicant	Ownership Questions/Qualification Questions	General Certification Statements
Control Point			
Applicant Information FCC Registration Number (FRN) 0006083745			
Legal Entity Type: Individual <input type="button" value="v"/> If Other, please specify <input type="text"/>			
First Name: Joe MI: T Last Name: Greene Suffix: <input type="text"/>			
Entity Name <input type="text"/>			
If the licensee name is being updated, is the update a result from the sale (or transfer of control) of the license(s) to another party and for which proper Commission approval has not been received or proper notification not provided? <input type="radio"/> Yes <input type="radio"/> No			
Attention To: John Q. Public			
P.O. Box: <input type="text"/> Address: 301 North Ave. H			
City: Kermit State: TX Zip Code: 79745			
Phone No.: (512)777-0123 FAX Number: (512)777-0124 E-Mail: your.name@isp.com			
Real Party in Interest			
Name of Real Party in Interest (if different from applicant) <input type="text"/> FCC Registration Number (FRN) of Real Party in Interest <input type="text"/> <small>Enter to retrieve RPI name</small>			
Contact Information			
First Name: Ronald MI: A Last Name: Parker Suffix: Jr			
Company: Parking Access Enterprises			
Attention To: Jane B. Doe			
P.O. Box: <input type="text"/> Address: 711 Gold Coast Lane			
City: Timbuktu State: NV Zip Code: 87345			
Phone No.: (215)333-0123 FAX Number: (215)333-0124 E-Mail: poc.name@isp.com			
Demographics (Optional)			
Race <input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Asian <input type="checkbox"/> Black or African-American			
<input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input checked="" type="checkbox"/> White			
Ethnicity: Not Hispanic or Latino <input type="button" value="v"/> Gender: Male <input type="button" value="v"/>			
? Print Preview Attachment Check Errors Previous Page Next Page			
Quit Application		FCC 601 Privacy Act	
Please review the PRIVACY ACT before submitting this application			Submit

Figure 2 FCC Form 601, Applicant Page

Press **Next Page** when complete to proceed to the next tab.

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Ownership Questions/Qualification Questions Tab

On the Ownership Questions/Qualification Questions screen, answer **Yes** or **No** as appropriate to each question. These questions are with regard to alien status and basic qualifications such as has the applicant ever had a license denied, revoked, been convicted a felony, etc. For simplicity, the answer is assumed to be no to all questions in this case. An example of a completed **Ownership Questions/Qualification Questions** screen is shown in [Figure 3](#).

Administrative	Location	Antenna	Frequency
Application Information	Applicant	Ownership Questions/Qualification Questions	General Certification Statements
			Control Point

Alien Ownership Questions (If any answer is Yes, attach exhibit explaining circumstances.)

Is the applicant a foreign government or the representative of any foreign government?

Is the applicant an alien or the representative of an alien?

Is the applicant a corporation organized under the laws of any foreign government?

Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?

Is the applicant directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country?

If the answer to the above question is 'Yes', has the applicant received a ruling(s) under Section 310(b)(4) of the Communications Act with respect to the same radio service involved in this application?
Note: If the answer is "Yes", include in the exhibit required by the previous question the citation(s) of the applicable declaratory ruling(s) by DA/FCC number of the FCC Record citation, if available, release date, and any other identifying information.
 If the answer is "No," attach to this filing a date-time stamped copy of a request for a foreign ownership ruling pursuant to Section 310(b)(4) of the Communications Act. It is not necessary to file a request for a foreign ownership ruling if the Applicant includes in the exhibit required by the previous question a showing that the requested license(s) is exempt from the provisions of Section 310(b)(4).

Basic Qualification Questions (If any answer is Yes, attach exhibit explaining circumstances.)

Has the applicant or any party to this application or amendment had any FCC station authorization, license, or construction permit revoked or had any application for an initial, modification or renewal of FCC station authorization, license, construction permit denied by the Commission?

Has the applicant or any party to this application or amendment, or any party directly or indirectly controlling the applicant, or any party to this application ever been convicted of a felony by any state or federal court?

Has any court finally adjudged the applicant or any party directly or indirectly controlling the applicant guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement, or any other means or unfair methods of competition?

? Print Preview Attachment Check Errors Previous Page Next Page

Quit Application FCC 601 Privacy Act Please review the PRIVACY ACT before submitting this application Submit

Figure 3 FCC Form 601, Ownership Questions/Qualification Questions Page

Press **Next Page** to continue to the General Certification Statements tab.

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General Certification Statements Tab

You should read and understand the information on the General Certification Statements screen before completing. Enter the full name and title. The name entered will also be used as the signature name. This completes the required information for the basic form. An example of a completed **General Certification Statements** screen is shown in [Figure 4](#).

Administrative	Location	Antenna	Frequency
Application Information	Applicant	Ownership Questions/Qualification Questions	General Certification Statements
			Control Point

General Certification Statements

The applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application.

The applicant certifies that grant of this application would not cause the applicant to be in violation of any pertinent cross-ownership or attribution rules.*
*If the applicant has sought a waiver of any such rule in connection with this application, it may make this certification subject to the outcome of the waiver request.

The applicant certifies that all statements made in this application and in the exhibits, attachments, or documents incorporated by reference are material, are part of this application, and are true, complete, correct, and made in good faith.

The applicant certifies that neither the applicant nor any other party to the application is subject to a denial of Federal benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C § 862, because of a conviction for possession or distribution of a controlled substance. This certification does not apply to applications filed in services exempted under Section 1.2002(c) of the rules, 47 CFR § 1.2002(c). See Section 1.2002(b) of the rules, 47 CFR § 1.2002(b) for the definition of 'party to the application' as used in this certification.

The applicant certifies that it either (1) has current required ownership data on file with the Commission, (2) is filing updated ownership data simultaneously with this application, or (3) is not required to file ownership data under the Commission's rules.

The applicant certifies that the facilities, operations, and transmitters for which this authorization is hereby requested are either: (1) categorically excluded from routine environmental evaluation for RF exposure as set forth in 47 C.F.R. § 1.1307(b); or, (2) have been found not to cause human exposure to levels of radiofrequency radiation in excess of the limits specified in 47 C.F.R. § 1.1310 and 2.1093; or, (3) are the subject of one or more Environmental Assessments filed with the Commission.

The applicant certifies that it has reviewed the appropriate Commission rules defining eligibility to hold the requested license(s), and is eligible to hold the requested license(s).

The applicant certifies that it is not in default on any payment for Commission licenses and that it is not delinquent on any non-tax debt owed to any federal agency.

Typed or Printed Name of Party Authorized to Sign:

First Name: MI: Last Name: Suffix:

Title:

Signature:

Upon grant of this license application, the licensee may be subject to certain construction or coverage requirements. Failure to meet the construction or coverage requirements will result in termination of the license. Consult appropriate FCC regulations to determine the construction or coverage requirements that apply to the type of license requested in this application.

WILLFUL FALSE STATEMENTS MADE ON THIS FORM OR ANY ATTACHMENTS ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. Code, Title 18, Section 1001) AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION PERMIT (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

? Print Preview Attachment Check Errors Previous Page Next Page

Quit Application FCC 601 Privacy Act Please review the PRIVACY ACT before submitting this application Submit

Figure 4 FCC Form 601, General Certification Statements Page

Press **Next Page** to continue to the Control Point tab.

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Control Point Tab

Information included in the Control Point page is typically the home office location of the applicant. Use a real physical address and phone number that is normally staffed so that if the FCC is trying to resolve interference, it can request and promptly have your organization turn off the reader. Press the **Add** button and enter the appropriate information in the boxes provided. An example of a completed **Control Point** screen is shown in [Figure 5](#).

Administrative	Location	Antenna	Frequency
Application Information	Applicant	Ownership Questions/Qualification Questions	General Certification Statements
Control Point			
<p>Select Control Point</p> <div style="border: 1px solid gray; padding: 2px;"> <p>1 HC 61 Extrater</p> </div> <p style="text-align: right;">Action: <input type="button" value=""/></p>			
<input type="button" value="Add"/> <input type="button" value="Modify"/> <input type="button" value="Delete"/> <input type="button" value="Save"/> <input type="button" value="Clear"/>	<p>Address: <input type="text" value="HC 61 Extraterrestrial Highway"/></p> <p>City or Town: <input type="text" value="Rachel"/> State: <input type="text" value="NV"/></p> <p>County: <input type="text" value="Lincoln"/></p> <p>Phone Number: <input type="text" value="(775)729-2515"/></p>		
<input type="button" value="Print Preview"/> <input type="button" value="Attachment"/> <input type="button" value="Check Errors"/>		<input type="button" value="Previous Page"/> <input type="button" value="Next Page"/>	
<input type="button" value="Quit Application"/> <input type="button" value="FCC 601 Privacy Act"/>		<p style="font-size: small;">Please review the PRIVACY ACT before submitting this application</p> <input type="button" value="Submit"/>	

Figure 5 FCC Form 601, Control Point Page

Press **Next Page** to continue to the Administrative tab.

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Administrative Tab

On the Administrative screen, under the Eligibility section, the typical RFID rule section is 90.351. A description of the activity such as **Installation of RFID system to track vehicles entering and leaving the yard** is adequate for the next field. The Frequency Coordination Information may be omitted since these systems are typically self-coordinated. In the Extended Implementation section, the appropriate answer is typically **No**. There are no Call Signs associated with this equipment. The Broadcast Auxiliary Only section is not applicable. An example of a completed **Administrative** screen is shown in [Figure 6](#).

Application Information	Applicant	Ownership Questions/Qualification Questions	General Certification Statements	Control Point
Administrative	Location	Antenna	Frequency	
Eligibility				
Rule Section	Describe Activity			
90.351	Installation of RFID system to track vehicles entering and leaving waste disposal site.			
Frequency Coordinator Information (if not self-coordinated)				
Freq Coordination #				
Name of Freq Coordinator				
Other				
Telephone Number	Coordination Date	Has this application been successfully coordinated?		
Extended Implementation (Slow Growth)				
Are you requesting a new or modified extended implementation plan?				No
If 'Yes', attach an exhibit with a justification and a proposed station construction schedule.				
Associated Call Signs				
Select Call Sign #	Action	Call Sign		
			Add Call Sign	Save Call Sign
			Modify Call Sign	Delete Call Sign
Broadcast Auxiliary Only				
Is there an associated Parent Station?				
Facility Id of Parent Station	Radio Service of Parent Station	City of Parent Station Principal Community	State of Parent Station Principal Community	
If there is no associated parent station, this application is a		State of Primary Operation		
?	Print Preview	Attachment	Check Errors	Previous Page Next Page
Quit Application		FCC 601 Privacy Act	Please review the PRIVACY ACT before submitting this application Submit	

Figure 6 FCC Form 601, Administrative Page

Press **Next Page** to continue to the Location tab.

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Location Tab

The Location screen contains the most critical information required by Schedule D. Select **Add** to enter a new location for a reader system. Enter the appropriate information in the non-grayed boxes. Which boxes are to be filled out depends upon the selection for Location Description. This example will assume **F** for a fixed location. Thus, additional information such as FCC Antenna Structure Registration #, site latitude/longitude to 0.1 second using NAD-83 coordinates, street address, city, county, site elevation AMSL/height AGL, and support structure type is required. An example of a completed **Location** screen is shown in [Figure 7](#).

Application Information	Applicant	Ownership Questions/Qualification Questions	General Certification Statements	Control Point				
Administrative		Location	Antenna	Frequency				
Select Location								
<table border="1"> <tr> <td>1</td> <td>Fixed</td> <td>38-11-55.8N</td> <td>103-44-24.6W</td> </tr> </table>				1	Fixed	38-11-55.8N	103-44-24.6W	<input type="button" value="Add"/> <input type="button" value="Save"/> <input type="button" value="Modify"/> <input type="button" value="Delete"/> <input type="button" value="Clear"/>
1	Fixed	38-11-55.8N	103-44-24.6W					
Action	Location Description	Area of Operation Code		Location Name				
A	F Fixed							
FCC Antenna Structure Registration # or N/A (FAA Notification not Required)		Registration Number Press Enter to retrieve Tower data						
N/A								
Latitude (DD-MM-SS.S)		Longitude (DDD-MM-SS.S)						
37-14-25.7 N		115-48-31.7 W						
Street Address, Name of Landing Area, or Other Location Description			City	State				
Extraterrestrial Hwy (State 375), 38 mi South of Little A'le' Inn, Starbase 51			Groom Lake	NV				
County		Elevation of Site AMSL (meters) ('a' in antenna structure example):	Overall Ht AGL without appurtenances (meters) ('b' in antenna structure example):	Overall Ht AGL with appurtenances (meters) ('c' in antenna structure example):				
Lincoln		1356.7	3.0	4.0				
Support Structure Type	POLE Pole used only to mount an antenna							
Location Number: (only for Area of Operation Code 'A')	Temporary Fixed or Mobile Radius (km)	Airport Identifier	Site Status	P				
Maximum Latitude (DD-MM-SS.S) Use for rectangle only (Northwest)	Maximum Longitude (DDD-MM-SS.S) Use for rectangle only (Southeast corner)							
Description (only for Area of Operation Code 'D')								
Number of Units	Hand Held	Mobile	Temporary Fixed	Aircraft				
				Itinerant				
Would a Commission grant of Authorization for this location be an action which may have a significant environmental effect? See Section 1.1307 of 47 CFR.								
If 'Yes', submit an environmental assessment as required by 47 CFR, Sections 1.1308 and 1.1311								
No								
If the site is located in one of the Quiet Zones listed in Item 27b of the Instructions, provide the date (mm/dd/yy) that the proper Quiet Zone entity was notified.		Has the applicant obtained prior written consent from the proper Quiet Zone entity for the same technical parameters that are specified in this application?						
Do you propose to operate in an area that requires frequency coordination with Canada?		Do you propose to operate in an area that requires frequency coordination with Mexico?						
?	Print Preview	Attachment	Check Errors	Previous Page Next Page				
Quit Application		FCC 601 Privacy Act		Please review the PRIVACY ACT before submitting this application Submit				

Figure 7 FCC Form 601, Location Page

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NOTE: Up to 6 locations can be on one application, and each location may contain as many readers as necessary for that location (typically within 75 feet of each other). If there are more than six locations, then multiple applications will need to be submitted with additional fees for each application.

In most cases, the **Airport Identifier** can be left blank unless the proposed site is adjacent to an airport. In the **Site Status** drop down selection, you must determine if the frequencies used for this system are to have Primary or Secondary protection in conjunction with other fixed site facilities. This can be left blank if the Commission’s rules do not recognize Primary or Secondary protection. Otherwise, enter **P** if primary protection is wanted for the site or ‘S’ for no protection. In most cases, the typical selection would be **P**. See Section 1.1307 of 47 CFR to determine if transmitting from this location could have a significant environmental impact and answer the related question accordingly. In most cases, this would typically be **No**, otherwise an environmental assessment will be required per 47 CFR, Sections 1.1308 and 1.1311. Finally, if the site is located in a quiet zone listed in Item 27b of the instructions, then list the date the Quiet Zone entity was notified. This can usually be left blank. When complete, press **Next Page** to proceed to the Antenna tab.

Antenna Tab

An example of a completed **Antenna** screen is shown in [Figure 8](#).

The screenshot shows the 'Antenna' tab of the FCC Form 601 application. At the top, there are navigation tabs: 'Application Information', 'Applicant', 'Ownership Questions/Qualification Questions', 'General Certification Statements', and 'Control Point'. Below these are sub-tabs: 'Administrative', 'Location', 'Antenna', and 'Frequency'. The 'Antenna' sub-tab is selected. On the left, there are two lists: 'Select Location' and 'Select Antenna'. The 'Select Location' list contains one entry: '1 37-14-25.7N 115-48-31.7W'. The 'Select Antenna' list contains one entry: '1'. To the right of these lists are buttons: 'Add', 'Modify', 'Save', 'Delete', 'Refresh', and 'Clear'. Below the lists is an 'Action:' field. The main area contains several input fields: 'AAT(meters)' with value '1356.7', 'Antenna Ht. (meters)' with value '4.0', 'Azimuth (degrees)' with value '26.0', 'Beamwidth (degrees)' with value '50.0', 'Polarization' with value 'H', and 'Gain (dB)' with value '10.5'. At the bottom of the form are buttons for '?', 'Print Preview', 'Attachment', 'Check Errors', 'Previous Page', 'Next Page', 'Quit Application', 'FCC 601 Privacy Act', and 'Submit'. A small text box at the bottom right says 'Please review the PRIVACY ACT before submitting this application'.

Figure 8 FCC Form 601, Antenna Page

NOTE: If you are a governmental entity and are using the blanket licensing process, leave **Antenna Tab** blank.

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Select the location from the left and press the **Add** button. Enter the data required. The AAT (above average terrain) height is not required in the CW bands, that is, 902.25 to 903.75 and 910 to 921.5 MHz when the reader is configured for ATA-only. Enter **AAT** in meters AMSL (above mean sea level) for readers operating in the modulated band, that is, 911.75 to 919.75 MHz, for any of the other protocols (eGo, SeGo, or IAG). Enter the **Antenna height** in meters AGL (above ground level). The **Azimuth** is typically not applicable since it may not be known in advance, but refers to the angle in the horizontal plane of the antenna main lobe with respect to true north. The azimuth angle can range from 0° to 360° and defaults to north (0°) if nothing is entered. For nearly all installations, properly mounted antennas imply horizontal (H) **Polarization** for the system. **Beamwidth** and **Gain** are antenna parameters that can be found in [Table 1](#) for TransCore antennas, found under columns entitled Peak Gain (dBi) and Horizontal Beamwidth (deg). If you use other manufacturers' antennas, use their stated values for beamwidth and gain. If the **Polarization** and **Gain** fields are left blank, then default values of vertical (V) polarization and 6 dBi gain are used. However, **NONE of these parameters should be left blank**. When complete, press **Save** and then **Next Page** to proceed to the Frequency tab. For convenience, electrical parameters of commonly used antennas are listed in [Table 1](#).

Table 1 Electrical Parameters for Typical TransCore RFID Antennas

Antenna	Encompass 4 Maximum Power (watts)	Peak Gain (dBi)	EIRP* (watts)	ERP† (watts)	Horizontal Beamwidth (deg)	Vertical Beamwidth (deg)	Polarization (Linear)
Encompass 4 Internal/AA3153 Beacon Toll	2.0	10.5	22.4	13.6	50	60	Horizontal
AA3152 Universal Toll (UTA)	2.0	13	39.9	24.3	32	35	Horizontal
AA3110 Parapanel	2.0	11.5	28.3	17.2	75	28	Horizontal
AA3100 Yagi	2.0	12.15	32.8	20.0	41	49	Vertical or Horizontal
AA3140 PCB Log-Periodic (wedge)	2.0	8.15	13.1	7.9	60	90	Vertical or Horizontal
Phazar Dual Patch	2.0	10	20.0	12.2	60	45	Horizontal
Phazar ISM Panel (4-patch)	2.0	12	31.7	19.3	40	40	Horizontal

*Line losses not accounted for.

†In units of watts, $ERP = EIRP/1.64$. In units of dBm, $ERP = EIRP - 2.15$ dB.

If the antenna to be employed is not listed in the above table, contact TransCore for the required information.

Because the Encompass 4/SmartPass 4 readers typically seen in the field come with an internal antenna, the figures shown in the first row will apply in most cases. Encompass 4 readers with internal antennas can be identified by part number 10-400Y-0xx and model number 05530-yy. For cases in which the reader comes with the optional port for an external antenna, that is, P/N: 10-401Y-0xx and M/N: 05531-yy, any of these antennas could be employed depending on application requirements. Parameters shown above like those for peak gain and beamwidth are nominal figures based on specifications, not actual measurements. The actual figures seen in the real world can vary due to factors such as frequency, temperature, manufacturing tolerances, etc.

NOTE: The maximum ERP limit for Part 90 operation is 30 W which is about 44.8 dBm. This corresponds to an EIRP of 49.2 W or 46.9 dBm.

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Frequency Tab

Highlight the **location** in the Select Location box and the **antenna index** in the Select Antenna box, then press **Add Freq**. The frequency of the reader system should be input in the Lower or Center Frequency block. For this example, the default Encompass 4 reader frequency of 915 MHz was entered. The Upper Frequency and Frequency Carrier parameters may be omitted. Be sure to enter the center frequency to be used, not the band edge:

- IAG interrogation downlink modulated frequency band is licensed on center frequencies of 914.75 to 916.75 MHz.
- eGo/SeGo interrogation downlink modulated frequency band is licensed on center frequencies of 911.75 to 919.75 MHz.
- ATA CW may use frequency bands of 902.25 to 903.75 MHz and 910 to 921.5 MHz within the United States.

The Station Class should be selected as **LR** and the number of (reader) Units entered, typically **1**. The number of Paging Receivers should be omitted (leave blank, don't enter 0) since it is not applicable. Figures for Output Power and ERP (both in watts) can be found on [Table 1](#). However, these ERP figures do not take into account any line losses that would be seen when external antennas are used. Click **Save Frequency**.

In the Select Frequency box, highlight the frequency just added and then press **Add Emission** to open up the Emission Designator box. Input designator(s) appropriate for the particular type of reader to be employed as defined in the table below and press **Save Emission**. The reader type is dependent upon the type(s) of protocols available on the particular model, but typically come with ATA and eGo for parking access applications. So for this case only, emission designators of 33KON0N and 333KL1D would be entered as shown in [Figure 9](#). Thus, in cases of readers with two available protocols, the emission designator for each protocol should be entered for the same antenna, frequency and location.

For sites with two or more closely-spaced readers, that is, those within 1000' of each other, that can potentially cause interfere with one another, it is recommended that separate antennas be created for each even if they're all of the same type operating with the same protocol. This way, different frequencies can be assigned to each reader to mitigate potential interference issues. In general, it is recommended that each co-located reader have a frequency offset of at least 2 to 3 MHz from adjacent readers. For example, a site with three co-located readers might have a frequency plan for them to operate at 912, 915, and 918 MHz, respectively. It is prudent to anticipate and plan for such issues in advance rather than to react after an interference problem develops thus requiring modifications to the licensed frequencies after the fact.

FCC emission designators for each Encompass 4 Reader configuration available are shown in [Table 2](#).

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Table 2 TransCore Encompass 4 Reader FCC Emission Designators

Encompass 4 Reader Part Number	Available Protocols	Emission Designator(s)	Encompass 4 Reader Model Number	Serial Port
10-40XY-001	SeGo Only	500KL1D	0553X-05	RS-232
			0553X-06	RS-422
10-40XY-002	ATA/SeGo	33K0N0N 500KL1D	0553X-09	RS-232
			0553X-10	RS-422
10-40XY-003	eGo/SeGo	333KL1D 500KL1D	0553X-11	RS-232
			0553X-12	RS-422
10-40XY-004	IAG/SeGo	445KL1D 500KL1D	0553X-13	RS-232
			0553X-14	RS-422
10-40XY-008	ATA Only	33K0N0N	0553X-01	RS-232
			0553X-02	RS-422
10-40XY-009	ATA/eGo	33K0N0N 333KL1D	0553X-03	RS-232
			0553X-04	RS-422
10-40XY-010	IAG/ATA	445KL1D 33K0N0N	0553X-15	RS-232
			0553X-16	RS-422
10-40XY-015	IAG/eGo	445KL1D 333KL1D	0553X-19	RS-232
			0553X-20	RS-422
10-40XY-019	IAG Only	445KL1D	0553X-17	RS-232
			0553X-18	RS-422

As presented earlier, data for the internal Encompass 4 antenna are shown in [Figure 9](#) as an example of a completed **Frequency** screen.

Application Information	Applicant	Ownership Questions/Qualification Questions	General Certification Statements	Control Point
Administrative		Location	Antenna	Frequency
Select Location <input type="text" value="1 37-14-25.7N 115-48-31.7W"/>		Select Antenna <input type="text" value="1"/>	Select Frequency <input type="text" value="00915.00000"/>	<input type="button" value="Add Freq"/> <input type="button" value="Clear Freq"/> <input type="button" value="Modify Freq"/> <input type="button" value="Delete Freq"/> <input type="button" value="Save Freq"/>
Freq Action <input type="button" value=""/>	Lower or Center Frequency (MHz) <input type="text" value="915.0"/>	Upper Frequency (MHz) <input type="text" value=""/>	Frequency Carrier (MHz) <input type="text" value=""/>	
Station Class <input type="text" value="LR"/>	No. of Units <input type="text" value="1"/>	No. of Paging Receivers <input type="text" value=""/>	Output Power (watts) <input type="text" value="2.000"/>	ERP (watts) <input type="text" value="13.600"/>
Select Emission				
<input type="text" value="1 33KON0N"/> <input type="text" value="2 333KL1D"/>		Emission Action <input type="button" value=""/>	Emission Designator <input type="text" value=""/>	<input type="button" value="Add Emission"/> <input type="button" value="Delete Emission"/> <input type="button" value="Save Emission"/> <input type="button" value="Clear Emission"/> <input type="button" value="Modify Emission"/>
<input type="button" value="Refresh"/>				
?	<input type="button" value="Print Preview"/>	<input type="button" value="Attachment"/>	<input type="button" value="Check Errors"/>	<input type="button" value="Previous Page"/> <input type="button" value="Next Page"/>
<input type="button" value="Quit Application"/>		<input type="button" value="FCC 601 Privacy Act"/>	Please review the PRIVACY ACT before submitting this application	<input type="button" value="Submit"/>

Figure 9 FCC Form 601, Frequency Page

Completing the Process

The application should be ready for submittal. However, prior to submission the application should be printed (from the **Print Preview** button) and reviewed for errors by pressing the **Check Errors** button. Any remaining errors will be flagged and can be corrected at this point. When ready press the **Submit** button. After submitting application, the FCC file number will be displayed. Please record the number for future reference (including leading zeros) and click on **Print Preview** to get a PDF file of the application with the file number as proof you submitted. After these steps are completed proceed to the payment remittance process.

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Troubleshooting Print Preview Problems: If Windows Explorer does not open up a print dialogue box or display the print preview PDF, go into Windows Explorer Internet Options, click on the Security Tab, and click on Custom level and enable file download prompting.

TIP: *If you return to the ULS after having quit (meaning saved) the application, be sure to change at least one character in your address or similar box so that the ULS system will allow resubmission.*

One or two business days after submission, you can check the progress of the application by selecting the **ULS application** tab and entering the application file number. If the application has not been approved after three months, contact the FCC. In the past temporary licenses called Special Temporary Authorizations or STAs, were easy to obtain. Today it is almost impossible to speed up the process with an STA so remember to plan ahead.

Follow-Up

Once you receive the license you have one more step – the build-out notification.

Be sure to keep your FCC registration information and licensee information current. It is TransCore's understanding that there is no fee for an administrative update to change name of person, address, or phone number. Change of ownership or company name requires FCC consent in advance through FCC transfer of control form 603, which is filed online. There is a consummation follow-up notification associated with this process. If contacted, be sure to respond promptly to all FCC inquiries, and don't forget to renew your license, which typically operates on 10 year terms.

Build-out Notification

If you obtain a regular permanent license (generally not applicable to a Blanket License), you need to also notify the FCC when the station is constructed. Your license copy will have a build out notification date.

NOTE: *Be sure to follow up with this required notification because those new sites will automatically be TERMINATED approximately one year later.*

Normally, a licensee has 8 to 12 months from the date of issuance of a license to complete construction and then notify the FCC that the frequencies are in use at each location. This rule section 90.155 (of 47 CFR-Code of Federal Regulations) is now enforced by a computerized process.

The FCC wants to ensure its ULS database is current and accurate. To accomplish this, the FCC has chosen to use the above-described termination methodology as a means of attaining this accuracy if

- (1) your permanent FCC license has been granted for an RFID/AVI system in the LN radio service (the code for narrowband non-multilateration location systems, that is, any 902 to 928 MHz AVI system requiring a Part 90 license such as TransCore's equipment), and
- (2) if your license has a construction deadline;
- (3) then you must file the required construction notification before the construction deadline (typically the first year) expires, and within the timely period of 15 days of completion. Otherwise, the license will be terminated.

The FCC Public Notice for build-out notification can be found at:

http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-3143A1.doc

For further details on guidelines and instructions regarding build-out notification contact TransCore Technical Support.

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Exhibit A

INTRODUCTION

The purpose of this Exhibit is to provide additional information in support of the attached application for authorization of an automatic vehicle monitoring (AVM) station(s) under Section 90 of the Rules. The accompanying application proposes to use a TransCore reader. This non-multilateration system of transmitters falls under Rule section 90.351 and following.

We are applying under 90.353(i) to have a blanket license hence a table showing all locations currently planned is enclosed as an attachment. These locations at airports of the <agency name> are all in <county, state, and call sign if applicable>.

ELIGIBILITY

The applicant is eligible under the Sections of Part 90 of the FCC Rules as shown in the online filing. The applicant will use the proposed automatic vehicle monitoring facility to identify vehicles that have been tagged by or in cooperation with the applicant.

NATURE OF THE PROJECT AND PUBLIC INTEREST SHOWING

By this request, the applicant seeks to operate an AVM system. The system is to be installed is designed to identify vehicles as they approach the facilities specified herein. The installation will serve the public interest in that it will provide for more accurate and rapid identification of vehicular traffic thereby increasing both efficiency and safety of the applicant's operations and of the motoring public.

This system also contributes to enhanced security at these important airport facilities, by facilitating immediate credential checking and access control, and thus clearly is in the public interest.

DESCRIPTION OF SYSTEM OPERATION (90.357 (d))

This section supplies a detailed description of the manner in which the proposed system will operate. As such, it provides the information required by Section 90.357&)(d)(1) of the Rules.

Introduction

The TransCore system consists of tags (transponders), readers (interrogators), and software. The TransCore system works by having a reader send out a radio frequency beam toward a tag. The tag modifies a portion of the signal and reflects it back to the reader. It is the reflected signal that carries the identification code. These tags are attached to an object such as a railcar, container, or vehicle. When the object approaches a reader, an identification code is retrieved electronically from the tag. The reader then relays the identification code to a computerized management system. A diagram of an AVI system used for a typical gated access application can be seen below in [Figure A-1](#).

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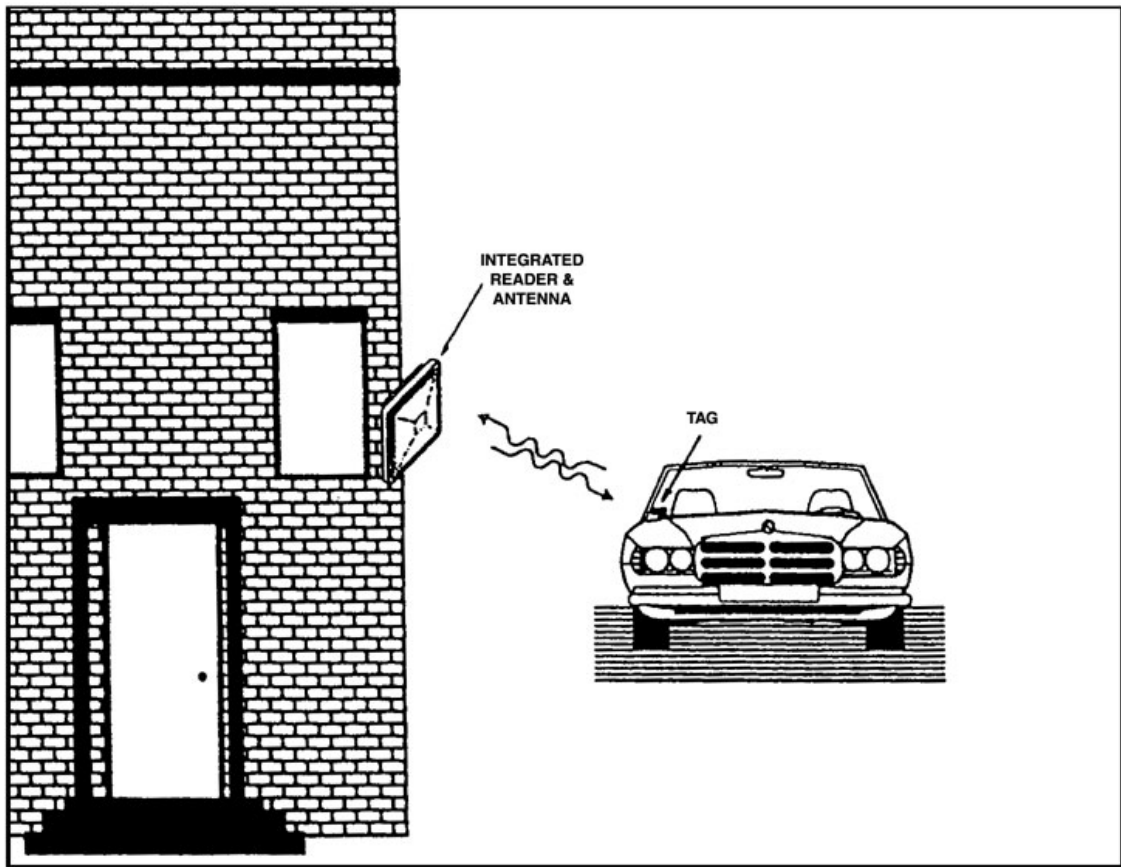


Figure A-1 Reader/Antenna and Tag Geometry

The tags can be either beam powered (no battery) or battery powered, but neither type emits an identification signal unless interrogated by a reader. Beam-powered tags use the signal energy from the reader to power the tag circuitry.¹ There is no RF transmitter on either version of the tag. Thus, the tag is not a transmitter and does not contain components to generate RF signals. This slight modification of the signal includes the unique identification code of the tag. This method of communication is called “modulated backscatter”. These battery powered tags stay energized at all times, and battery life is not affected by the number of times a tag is read. Both forms of tags use less power, and are simpler and less expensive, than many other reader/tag technologies.

The block diagram (Figure A-2) shows the function of each AVM system component. Note that the RF module is incorporated within the Encompass 4 Reader and not a separate unit as was the case with some older TransCore readers. The RF module transmits an unmodulated signal in the direction of a tag. The RF module receives the reflected signal from the tag and relays this information to the reader. The reader decodes the information contained in the tag and relays the information to a host computer for subsequent use to identify, track and schedule the tagged objects. Operation of the system is somewhat similar to the low-power CW Doppler radar used by law enforcement agencies to determine the speed of cars. The actual installation will use a single antenna integrated with the reader for easy mounting on a wall or relatively short pole.

¹ Batteries are used only to power the tag microprocessor circuitry facilitating reading from certain high-speed vehicles.

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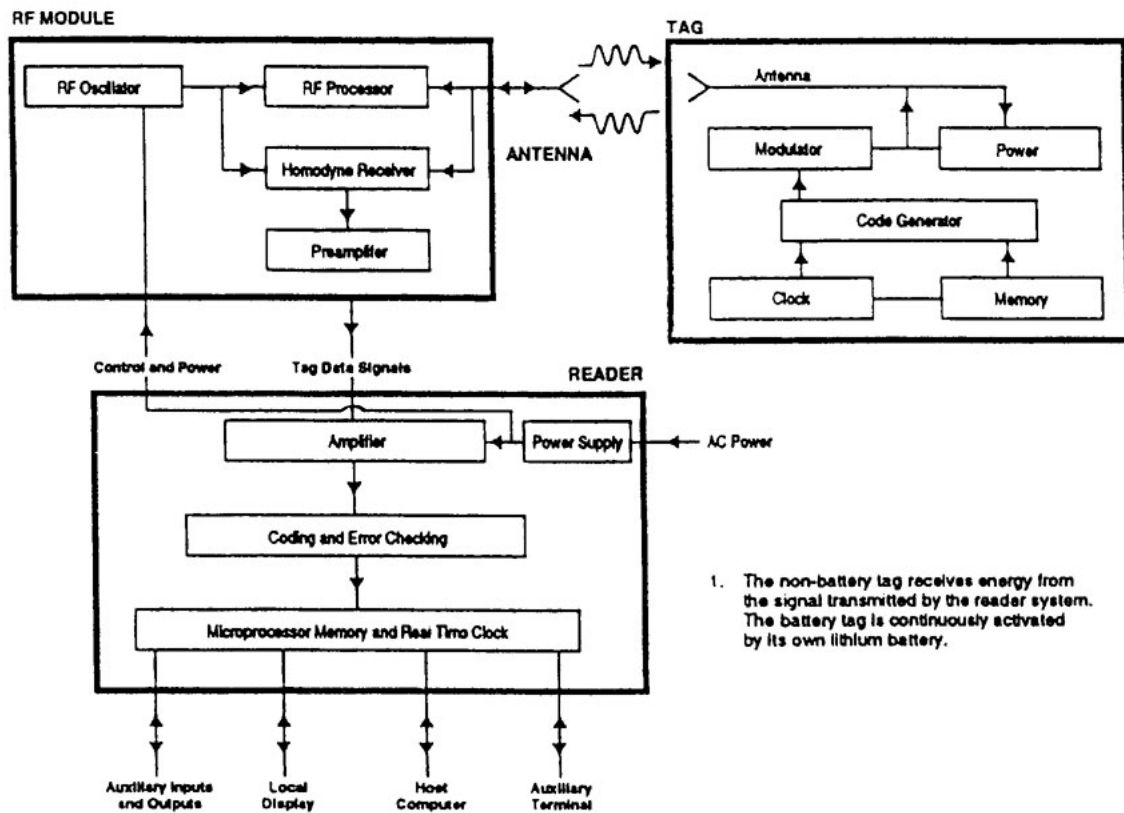


Figure A-2 Block Diagram of the RF Module, Reader, Antenna, and Tag

Description of System Operation (90.357 (d)(1))

RF Module

The RF module comprises an RF oscillator, RF processor, homodyne receiver, and preamplifier. The RF module transmits and receives radio energy. RF energy is generated by the RF oscillator and amplified by the RF processor. This energy is transmitted through the antenna, and the RF energy reflected by the tag is also received by the same antenna.

The RF module **transmits a single frequency** of RF energy and receives that same frequency after it is reflected as a modulated signal from the tag.

Transmitter output power is typically 2.0 W or less. Maximum effective radiated power (ERP) is as indicated in this application. Actual ERP will often be less than the maximum to operate with the least power that will provide reliable service. As previously mentioned the RF module has been incorporated within the Encompass 4 Reader and is not a separate unit.

Each reader may have internal or external antenna.

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Reader

The RF module receives the modulated signal from the tag and passes the 20 and 40 kHz modulating frequencies to the reader.² The reader decodes the frequencies into binary information equivalent to the 128 bits of data stored in the tag. The reader comprises the amplifier, decoding and error checking circuit, microprocessor, real-time clock circuit, and power supply.

This low power signal is continuously directed at the area into which tagged vehicles travel.

Accordingly, we request authority for continuous transmission.

Antenna

The reader system uses one antenna to transmit and receive RF energy to and from the tag. The antenna is for localized coverage in a specific direction; the antenna does not have omni-directional coverage patterns. Because the antenna will be mounted less than 20 feet above ground and is normally canted downward, signals at the horizon are minimized.

Tag

The TransCore tag is composed of the modulator, power, code generator and clock, memory, and antenna circuits. All of the tag's circuits are located on a single printed circuit board. The clock circuit sequences all circuit functions such that information stored in the memory circuits is conveyed to the reader system within precise timing. The information stored in the memory circuit is permanent, and is a unique code that is specified by the owner prior to installation of the tag onto its respective object (container, rail car, truck, etc.).

The code generator encodes the information stored in the memory circuit. The modulator collects the encoded information from the code generator and controls the antenna circuit such that the encoded information modulates the RF signal that is reflected to the reader system.

TransCore has the capability of producing two general classes of tags: battery powered and non-battery powered. The non-battery tag must be sufficiently close to the reader system's antenna to collect enough energy to activate the tag's electronics. The battery powered tag does not require as close proximity to the reader system's antenna as the battery powers the tag's electronics at all times. Advantages of the battery tag include greater range and reduced RF power required from the reader system, and advantages of the non-battery tag are an extended life and a lower price. Regardless of whether the tag has a battery or not, a tag does not transmit RF energy, it only backscatters energy at low data rates at a relatively low power relative to that transmitted by the reader.

The (ATA) tag conveys 128 bits of digital information by modulating the reflected energy. These 128 bits are divided into two 64 bit frames of data that are identical, allowing faster system operation. The reflected energy is modulated by varying the efficiency of the tag's antenna.

The homodyne receiver separates the transmitted CW energy from the information reflected by the Tag. This information is encoded into 20 and 40 kHz signals, which modulate the RF energy backscattered by the tag.

The tag has a user data capacity of 20 alphanumeric characters, externally encodable with a specified minimum operating life. Some characters may conform to industry standards.

² For a discussion of the system bandwidth, see "Bandwidth (90.239 (d)(2)).

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Bandwidth (90.239 (d)(2))

To accommodate transmitter drift, the bandwidth of the signal transmitted by the reader is approximately 50 kHz. When reflected from the tag, however, this signal spreads over a wider bandwidth. The occupied bandwidth of the reflected signal is about 2.5 MHz.

Vehicle Location Update Rates (90.357(d)(3)(i))

The vehicle location update rate is every time a tagged vehicle passes a reader location. At such times, its tag ID is read and the vehicle's location is updated.

Power and Modulation Techniques (90.357(d)(3)(ii))

Each reader configured for ATA-only emits a CW signal. The system has the specifications listed in [Table A-1](#).

Table A-1 ATA-only Reader Specifications

DESCRIPTION	VALUE
Nominal RF power (measured at transmitter)	≤2.0 W
Standard transmit and receive frequency	902 to 904 and 909.75 to 921.75 MHz
Transmitter occupied bandwidth (including drift tolerance)	50 kHz
Tag reflected signal occupied bandwidth	2.5 MHz

The reader output power can be reduced if a certain application requires that tagged objects not be read beyond a specific distance. Most applications require this reduction to record accurately tagged objects passing through a particular gate or lane. In such cases, if the power was not reduced, the reader system would read tagged objects passing close to the gate but not through the gate.

System Codes (90.357 (d)(3)(iii))

FCC rules require a table of bit frequencies and their alphanumeric or indicator equivalents, and a statement of bit rise time, bit transmission rates, bit duration, and interval between bits. The allocation and format of transponder data characters is as listed in [Table A-2](#).

Table A-2 ATA-Protocol Transponder Data Allocation

User Data*	Bits 1 through 60
First Check Sum**	Bits 61 and 62
Framing Bits	63 and 64
User Data*	Bits 65 through 124
Second Check Sum**	Bits 125 and 126
Frame Marker***	Bits 127 and 128

*All user character frames shall contain the most significant bit first, followed through the least significant bit last.

**A checksum shall be calculated by adding the total number of bits in the preceding data field (60 bits, 54 bits) and truncating the binary result to two bits, with one most significant bit first and the least significant bit last.

***The end-of-frame marker shall consist of six 40 kHz cycles followed by one 20 kHz cycle.

The tag electronics shall cause the data to scroll repeatedly without pause from bit cell 128 of a frame (a frame is the complete 128-bit set) to bit cell 1 of the succeeding frame.

Bit rate is a nominal 10,000 bits per second (bps). Bits are encoded in a frequency shift keying code as described in Section G. Signal rise times are less than 1 microsecond. Bit duration is a nominal 100 microseconds. The time interval between bits is zero, not allowing for rise and fall times.

The user data shall be encoded in a modified ASCII six-bit code as listed in [Table A-3](#).

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Table A-3 User Data Character Bit Code

Character	Code	Character	Code	Character	Code
(space)	0	6	22	L	44
!	1	7	23	M	45
"	2	8	24	N	46
#	3	9	25	O	47
\$	4	:	26	P	48
%	5	;	27	Q	49
&	6	<	28	R	50
'	7	=	29	S	51
(8	>	30	T	52
)	9	?	31	U	53
=	10	@	32	V	54
+	11	A	33	W	55
'	12	B	34	X	56
-	13	C	35	Y	57
.	14	D	36	Z	58
/	15	E	37	[59
0	16	F	38	\	60
1	17	G	39]	61
2	18	H	40	^	62
3	19	I	41	_	63
4	20	J	42		
5	21	K	43		

Specific industry standards use a bit packing scheme.

Some tag products are coded in Wiegand format, which uses a binary sub-field definition.

Statement of Interrogation and Reply Formats (90(d)(3)(iv))

A bit is coded by the tag with a modified FSK (frequency shift keying) code using two harmonically related frequencies, one (40 kHz) being the exact double of the other (20 kHz), with a frequency tolerance of $\pm 10\%$. A "0" bit consists of one 20-kHz square wave cycle followed by two 40-kHz square wave cycles. A "1" bit consists of two 40-kHz square wave cycles followed by one 20-kHz square wave cycle. All transmissions are phase continuous. The bit transmitter rate of the reflected signal is 10,000 bps. No synchronization pulses are used, although the frame marker is used to indicate the start of a message.

Planned Installation (90.357)(d)(4)

The applicant anticipates installation of the number of transmitters specified in the referenced list within 12 months of the grant of this application.

Prior Licensing History

The FCC has granted a host of identical or similar applications throughout the 902 to 928 MHz band previously. These applications, containing similar supporting material, were processed routinely and acted upon within a few weeks. Similarly, to the extent approval of the Interdepartmental Radio Advisory Committee (IRAC) is necessary; it has been secured without difficulty.

FAA Notification Exemption (if applicable)

Part 17.14(a) Statement on Exemption of Antenna Structure notification to FAA

The antenna for this automatic vehicle identification system is mounted less than 18 feet above the road pavement. In many cases these antennas are on the lower side of existing structures at the airport and do not extend above these structures. Any new structures will have similar height limitations and be under the control of the airport. Thus, FAA antenna notification is not required.

Waiver of 90.137b for Permanent Locations by Blanket License (if applicable)

Also being submitted is a Request for Waiver of 90.137b, required to allow permanent locations under the blanket area licensing that would otherwise designate these sites as temporary, to be moved in a year. This license application has been submitted in accordance with the new rules published March 23, 1995, as amended by various reports and orders, the most significant released September 16, 1997 (97305) allowing blanket licensing of sites.

Implementation Schedule

(Describe when installation will start and when operation will start.)

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